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PLAINTIFF'S EXHIBIT

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THE TRANSACTIONS of the Twenty-second Congress of the National Safety Council are published in two volumes. In addition to this volume, a larger one, containing the General, the General Subject, and the Industrial Section sessions, has been distributed to Industrial members of the Council. It is also available to other members if they are especially interested in industrial safety problems.

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

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

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Street and Highway Traffic Section

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Chairman Rural Highway Hazards Committee—CLARENCE P. TAYLOR, State Department of Public Works, Boston, Mass.
Chairman Accident Records Committee—O. W. WILSON, Chief of Police, Wichita, Kan.
Chairman Membership Committee—WILLIAM C. KNOBLE, Milwaukee Safety Commission, Milwaukee, Wis.
Chairman Public Education Committee—F. C. LYNCH, Kansas City Safety Council, Kansas City, Mo.
Chairman National Traffic Safety Contest Committee—JOHN N. EBY, City Manager, Dallas, Texas.
Chairman Pedestrian Problems Committee—J. W. A. BOLLING, Seattle Traffic and Safety Council, Seattle, Wash.

TUESDAY MORNING SESSION

October 3, 1933

The first session of the Street and Highway Traffic Section was called to order by W. W. Matthews, Safety Director, Bureau of Highway Patrol and Safety, State Department of Revenue, Harrisburg, Pennsylvania, who presided. The gen-

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eral subject under discussion was "Traffic Accident Records." Chairman Matthews presented the committee report on accident records.

Report of Committee on Accident Records

By W. W. MATTHEWS

Vice-Chairman of the Committee

The speaker said in part: At this Congress, as in former years, we shall hear much of the necessity for complete accident records and for factual data as a prerequisite to intelligent remedial efforts. We need them to start our course, whether we are interested in engineering, education or enforcement.

It has been well said that we need more facts about more accidents, and certainly in the past we seem to have neglected accidents on rural highways. However, much progress has been made in the promotional work of interested states and municipalities in the collection of accident statistics. It is gratifying to be able to report that the Council now receives reports from 44 states as against 28 a year ago. This is the experience of an area of about 110,000,000 population and, therefore, our conclusions and estimates of the proper number of motor vehicle accidents are reasonably accurate. Some states are necessarily delayed in sending in these reports. From January to May, however, reports have now been made by states totalling 90 per cent of our entire population.

Your Committee finds much interest on the part of reporting agencies in a narrower spread in the age groupings. It seems to be a general feeling that there should be an additional grouping between ages 15 and 64, and researches already conducted indicate a rather clear dividing line at age 24. Requests are being received from various state departments for information on accidents occurring to persons of high school age in order that proper educational progress may be developed. It is obvious that the school safety patrols stop short at a definite point, namely, when the student reaches the age when he is no longer available for, or interested in, that particular kind of work.

Your Committee again emphasizes the necessity for complete and accurate reports of all motor vehicle accidents, and asks the cooperation of the other committees in the Street and Highway Traffic Section to the end that the importance of complete factual data may be recognized.

The Educational Value of Traffic Accident Written Reports

By SERGEANT ROSCOE ROE

Director, Accident Prevention Bureau, Metropolitan Police Department,

Kokomo, Indiana

The speaker said in part: Traffic planning is one angle to the subject. This might mean the changing of signs or lights, possibly the widening of an intersection, or installing signals. At one busy intersection, I found that the "change" or intermediate lights were not holding long enough to give traffic time to clear the intersection. A slight change in timing of the lights caused accidents to stop. This proves that we must be sure of our engineering before a too rigid enforcement program is started.

Most drivers have learned the value of reporting their accidents to the police. At the time of an accident, the other fellow is always to blame, but in going over the details a motorist can often see his own blame. One of the greatest educational factors is the discussion of these reports in an open safety meeting. The person who caused the accident can often be clearly shown a good driving lesson.

Filing accident reports by location will give the planning engineer an opportunity to discover new or unsuspected traffic hazards. Accident reports also disclose other conditions often considered by the average individual or driver as minor details. An instance of this is the weather. More fatal accidents occur in clear weather than at any other time—an 8 to 1 ratio. Time of day is another example. Reports show that most people are killed between 7 and 8 o'clock in the evening. This can be attributed to the inability of the driver to see hazards which, in daylight hours, would be visible at a considerable distance. Also, during darkness it is not safe to drive at the rate of speed which would be regarded as sensible during daylight.

One of the most important links in this chain of accident reporting, is the "follow-up" on accident repeaters. One particular case was a doctor who was an accident repeater. It was found that he was mentally doctoring his patients while en route on the streets or highways. After being tactfully advised of his error, he has gone 18 months without an accident.

Spot maps are also another important outgrowth of accident reports. These maps may show at a glance where the most accidents occur. With dangerous spots located, we may be able to work out a solution as to accident causes. Accident reports make it possible to construct a spot map which is 90 per cent correct.

How Traffic Accident Records Help

By A. B. HORWITZ

Duluth City Planning Engineer, Duluth, Minnesota

The speaker said in part: The ideal set-up for traffic control involves accurate and adequate records, their logical interpretation, and full application of the findings and conclusions. These records and analyses which show where accidents tend to occur, what accidents are due to mechanical defects of the vehicle or physical defects of the driver, what accidents are due to careless or ignorant driving, what accidents are due to hazardous traffic movement, what accidents are due to physical defects of the highway, and finally, such records would show the effectiveness of the remedies tried. With such complete knowledge of causes, effects, and suitable remedies, nearly complete safety should be built into the cars and highways and inculcated in pedestrians and drivers.

This is an ideal, but it should be our goal. We fall shorter of this goal than need be the case. While accidents are often inaccurately and inadequately reported, our greatest shortcoming lies in the insufficient use of the information that is gathered. Too often records remain filed and unused. Undoubtedly one of the chief reasons why records are not used more fully is that traffic police departments are not equipped to do so.

For example, Duluth has no traffic engineering division. While we have had accident records for the past ten years, permanent annual spot maps were made for only the last three years and accident reports have been filed alphabetically as to location only during the past two years. The placing of warning signs, stop signs

or automatic signals is determined only to a minor extent with reference to accident records. Equally little use is made of records to learn what effect a new measure is producing and whether it should be continued or abandoned.

The first intensive study of accident records in Duluth was made in 1931, in connection with the question of traffic control on Michigan Street between Mesaba and Thirteenth Avenue, following several fatal accidents. Michigan Street is the chief traffic artery between the central business district and the west portion of the city. Some 15,000 vehicles pass over it each day. It has a 56-foot roadway, running along the foot of a high hill, with practically no cross traffic from the north side and with relatively little of such traffic from the south side. There was no traffic control here other than a stop sign for north bound traffic at Ninth Avenue.

In 1929 "stop and go" signals had been installed on Superior Street, a main business street into which the traffic from Michigan Street flows, and these signals had been in operation two years. A study of the effect of this signalization on Superior Street showed that at the three signalized intersections accidents had been reduced some 43 per cent during a two-year period; whereas, in comparison, accidents on the portion of Michigan Street considered, had increased by 118 per cent.

Street lighting was another item considered. The several fatalities on Michigan Street had occurred at night. The street illumination consisted of 600 candle power lights, placed 400 feet apart. This produced areas of darkness alternating with those of glare.

Recommendations made upon this study were that automatic signals be installed from the signalized section on Superior Street to and through the portion of Michigan Street under consideration; that proper traffic guide lines be painted on the pavement and that the street lights be improved. It was recommended that "stop and go" signals be installed at Mesaba Avenue and at the junction of Superior with Michigan Street, that the northbound Ninth Avenue traffic continue subject to the existing stop sign, that a stop sign be painted on the pavement to control the small amount of traffic at Thirteenth Avenue, and that a regular "stop and go" sign be placed at 13th Avenue when certain paving plans were carried out.

Due to insufficient funds, the city did not install "stop and go" signs but painted pavement guide lines, changed the street lighting from 600 candle power lamps 400 feet apart to 400 candle power lamps 200 feet apart. Nevertheless, taking stock of results two years later, we found that accidents on this portion of Michigan Street for 1931-1932 dropped to 70 per cent as compared with former figures.

The pedestrian accident experience is worth noting. Before signal installation, the accidents involving vehicles-only were twice the number involving pedestrians. The signals resulted in only a slight reduction in pedestrian type accidents, but such a sharp reduction in vehicular-only type accidents as to bring that number to less than the pedestrian type. In Duluth, pedestrians are involved in 25 per cent of all traffic accidents but they constitute 50 per cent of the number injured and 50 per cent of those killed.

TUESDAY AFTERNOON SESSION

October 3, 1933

The session was called to order by General Chairman Clifford Davis, who stated the general purposes of the session to be a discussion of "Public Education Through Community Organization." Chairman Davis then presented F. C. Lynch, Director,

Kansas City Safety Council, Kansas City, Missouri, who presided during the afternoon. Chairman Lynch presented the report of his Committee.

Report of Committee on Public Education

By F. C. LYNCH

Chairman of the Committee

The speaker said in part: For a great many years we have recognized certain standard recommendations on methods of educating the general public for safety. The groups to be reached included all classes of the population, and the means and methods for educating the adult public included divers fundamental factors. While these general principles have been accepted by almost everyone, they have thus far been based on general experience and judgment, and not on scientific analysis or proof. We have a fairly definite idea that a safety program, including all these elements, is effective in a city of, say, 100,000 population or more—but if so, how must it be modified in smaller places? If we have a limited amount of money to spend, what parts of the program are most effective per dollar of cost?

But now, for the first time in the history of the safety movement, we are beginning to collect some facts on which we can make accurate answers to some of these questions. This information has been obtained from reports of cities entering the National Traffic Safety Contest conducted by the National Safety Council, beginning with the year 1932. Through a careful study of the reports of cities and towns entered in this contest, we have learned definitely what the various classes of cities are doing, and, more important still, what safety results they have been able to obtain.

Starting with the smallest population group, places under 10,000 population, six cities reported no public education work, but four of these were in Massachusetts where they probably considered the state campaign was sufficient. Of the 17 reporting educational activities, ten mentioned more or less newspaper publicity. Twelve reported special campaigns including Safety Weeks in three places, a Safety Month in four cities, other educational campaigns in four more, and participation in a State-wide enforcement or inspection campaign in the other four. In eight cities local organizations devoted one or more meetings largely to safety. Six maintained poster boards, from three to fifteen in number, and five reported radio programs broadcast from larger cities nearby.

In the next larger group, 10,000 to 25,000 population, nine of the 31 cities reported no public educational program. Of the remaining 22 cities, all but three reported newspaper publicity. Two cities reported radio broadcasts. Four cities maintained regular poster boards—about one board for each thousand population. Thirteen cities reported safety programs and meetings of local organizations and three reported safety meetings for the general public. Sixteen places conducted some sort of special safety campaign; seven of these represented participation in state-wide drives; six others had safety weeks, and four reported inspection campaigns. Four cities reported from two to four meetings for commercial drivers.

In the group of cities having 25,000 to 50,000 population only four of the nineteen failed to report a public educational program and all but two of the remainder reported considerable newspaper publicity. Only two cities, however, had safety broadcasts. Four cities maintained from 4 to 28 poster boards each. Nine of the fifteen cities reported from 4 to 37 meetings each, either for general public or safety pro-

grams of local organizations. Eight communities reported some sort of special campaign, mostly safety weeks. One had an inter-fleet contest while another reported four meetings for commercial drivers.

In the next larger group, 50,000 to 100,000 population, nineteen of the twenty-three cities reported public educational work, including newspaper publicity in every case. Ten cities reported from 2 to 80 radio programs during the year, one-half of them making use of the National Safety Council radiograms. Only three cities reported the use of street traffic posters. In eight places there were safety meetings of local organizations or for the general public, from 3 to 48 in number. Fourteen cities reported special campaigns. These included, a safety lane, an anti-jay-walking campaign, a one-month enforcement campaign, a safety day, as well as a women drivers' school. Others were a brake test week, law enforcement month, and inspection of Junior Traffic Police twice a year. Seven communities participated in special campaigns sponsored by a state or other larger organization; four put on their own equipment inspection campaigns, three had an annual safety week or month. In this group inter-fleet contests begin to appear, four of these covering from 10 to 40 fleets.

As we pass the 100,000 population mark into Group 3, cities of 100,000 to 250,000 population, we find that each of the 24 places making complete reports conducted public educational activities. All but three of these reported newspaper publicity, in about half of the places stories appearing three times a week. Radio safety broadcasts now become popular, being supported by 19 cities. One place reported 625 broadcasts during the year. One city broadcast a safety program weekly, and another daily. Eight of these communities maintained regular street traffic poster boards, while a ninth reported three permanent boards at entrances to the city. Fourteen cities had safety meetings for the public or local organizations, mostly ranging from one to twelve a year. Eighteen cities reported special campaigns, eight of which took the form of equipment inspection drives; four took part in State campaigns; one had a safety lane; four took part in the National Safety Council Enforcement Month and one had both a public safety week and an inspection campaign. There is a marked increase in commercial vehicle activities. Fifteen cities reported inter-fleet contests, drivers' meetings, or both.

In Group 2, 250,000 to 500,000 population, all but one of the 19 reporting cities had newspaper publicity, ranging as high as 1,000 articles per year. Fourteen cities had radio programs, mostly at weekly intervals. Only seven of these cities maintained street traffic poster boards in from 30 to 350 locations. Fifteen cities reported from 8 to 200 meetings of local organizations devoted to safety, and eight of these also reported meetings for the general public. Eleven cities reported safety campaigns. In two, this was confined to participation in the NSC September Enforcement Month; two others reported an annual safety week; one had a Golden Rule Campaign and one a safety rally lasting three nights. Three other cities reported two campaigns during the year; one had two safety lanes in addition to a safety week; while one had a brake test week, a slogan contest, and a traffic education month. Ten of the nineteen cities reported commercial driver activities; six had inter-fleet contests and eight held drivers' meetings, numbering from 1 to 50.

In the group of cities over 500,000 population, of which eleven reported their public safety activities, the programs were so varied as to defy formal tabulation. Pittsburgh, which took first place with an excellent record and with high marks on most of the activities, including public education, had an unusually elaborate program under auspices of the Better Traffic Committee, the City Traffic Planning Bureau,

the Western Pennsylvania Safety Council, and the two motor clubs, with many other organizations cooperating. The Pittsburgh campaign included over 500 newspaper articles and editorials; a bi-weekly cartoon mat service and articles to 40 neighborhood and foreign language papers; two numbers of "Better Traffic Magazine" to a mailing list of 11,000. Five local radio stations broadcast safety messages. The Bureau of Traffic Planning made a special point of issuing information on the local accident situation monthly through various publicity channels. An unusual feature was ten painted billboards on which the copy was changed regularly, as well as 3,000 posters distributed to truck fleets and garages and a series of nine street car cards. A great deal of miscellaneous advertising matter was distributed to private business firms and through them to practically every individual in the city, all boosting the safety drive and urging wholehearted cooperation. In addition to the regular meetings already mentioned, speeches were furnished for 25 local meetings. A Thanksgiving no-accident month was conducted. 105 fleets with over 5,000 vehicles participated in two inter-fleet contests, while two rallies for drivers were attended by 1,500 each.

Of even greater importance than the foregoing outline of activities is the question whether, and to what extent, these activities produced actual results. The study showed an unmistakable correlation between public educational work as a whole and the accident record. The cities which received the highest rating for public educational work also received three times as high a rating on the accident record as did those which got the lowest in educational work. It is noteworthy that there seems to be a more positive and regular correlation between educational work and the accident record than there is between either engineering or enforcement activities, taken separately, and the accident record.

The remaining question was to determine whether any particular items in the educational program produced outstanding results.

Newspaper publicity. There was a definite correlation between the amount of newspaper publicity and the accident record in the two groups of cities between 100,000 and 500,000 population. The cities having the best accident record reported nearly twice as much newspaper publicity as did those having the worst accident record and the intermediate groups were roughly in the same proportion. The cities over 500,000 population did not show such correlation, in fact, those having the poorest records averaged more newspaper publicity than those with the best records, due to inclusion of the large city mentioned above. In general, it may be concluded that the evidence indicates the value of newspaper publicity, especially in the medium-sized cities.

Safety meetings. The grading on this item was made chiefly on the number of meetings of various local organizations, during the year, devoted entirely or largely to safety. Quite a definite correlation appeared in each population group, and for all combined. The cities having the best accident record were found to have reported just twice as many safety meetings as those having the poorest accident record.

Special campaigns. On this item, covering inspection campaigns, safety week and the like, there is a definite correlation for the cities between 100,000 and 500,000 population. This was especially evident in the group of cities between 100,000 and 250,000 people. The cities with the best accident records reported more than three times as many special campaigns as those having the poorest accident records. For the group of cities over 500,000 population there was no such correlation. It seems reasonable to believe that these special campaigns are most effective in cities of medium or small size.

Commercial vehicle activities. Here the grades were based on the holding of inter-fleet contests and drivers' meetings. In general, the cities reporting the most activities along this line also produced a better accident record. This particular activity can, of course, affect only a small portion of the drivers in the community.

Street posters. This item showed a strong correlation for cities over 500,000, where it was found that all of the three cities with the best accident records had made liberal use of posters, none of those with the poorest records had done so, while the intermediate division had made either moderate or no use of posters. The indicated results are frankly surprising, as it has been generally considered that the use of street posters is an activity particularly appropriate in the smaller places. Further data are needed for satisfactory conclusions.

Other activities. The remaining activities considered under public education were radio broadcasts and the use of accident reports for the information of the public. Here the data did not yield any definite correlation, the average curve being practically horizontal.

Safety Activities of the City of Dubuque

By R. M. EVANS

City Manager, Dubuque, Iowa

The speaker said in part: Our city council authorized the city to join the National Traffic Safety Contest sponsored by the National Safety Council at the beginning of 1932. We became a unit in Group 5, for cities of 25,000 to 50,000 population, and were fortunate enough to finish in first place in that group. In the previous year, in 1931, our city had suffered five traffic fatalities. We finished the year 1932 and the contest period with no traffic fatalities.

I shall briefly point out here a few of the measures adopted at Dubuque in carrying on our safety program, all of which had their definite effect in giving us a perfect safety year.

The city council amended a local traffic ordinance to eliminate known hazards, to provide for more boulevard streets and corresponding stop signs, to authorize the purchase and installation of additional traffic lights. Four-foot yellow painted letters were installed on pavements at principal stop streets. Street cars were permitted to be substituted by modern buses with 50-foot bus parking spaces reserved along business sections. Many warning signs were erected.

Concentration of police and justice departments in bearing down on violations of traffic rules. Spot map analysis of traffic accidents. Assistance through public and parochial schools, including junior patrols, parent-teacher efforts, and distribution of literature to children. Cooperation furnished by local newspapers in printing monthly comparative results of accidents, editorials and news of safety information. Work of Dubuque Auto Club in schools, contests and in formation of additional patrols.

Increased precautions by Recreation Department in control of swimming at beach on Mississippi River; 167 persons were rescued during river swimming in 1932. No serious accidents occurred on playgrounds attended in summer period by 3,000 children.

Dubuque City is also represented in the 1933 National Traffic Safety Contest, and a still more elaborate program of safety education, enforcement, etc., is being car-

ried out. One of our principal features is the activity of a so-called vigilante committee devoted to the interests of safety throughout the community.

This committee is made up of a number of prominent persons, who have had experience in character building work throughout Dubuque, selected from the fifteen voting precincts in the city, each one to act as chairman for his district. Each of these precinct leaders was asked to appoint four additional persons living within the limits of his territory to assist in accident prevention. At a general meeting of the fifteen precinct leaders and the sixty additional persons appointed to help them, the following general program was adopted:

The members of the precinct committee and groups should study local hazards and report ways and means to prevent accidents and damage; that they, as citizens, should attempt to correct faults and negligence in other people's driving, so far as possible; that violations which they were unable to correct, were to be reported to the police.

At a later meeting, a more detailed proposed vigilante outline was adopted and individual copies of the rules were given to each precinct safety worker. The outline includes a signed statement by each vigilante member that he will be careful, will study traffic laws, will report traffic violations, and will use careful discrimination. Information is furnished on the form to indicate the information necessary to secure on a violator. The Mayor has a message to the group and the citizens at large asking that serious efforts be employed to reduce the traffic deaths and accident rate. The form also has outlined about 36 of the major traffic rules with corresponding numbers opposite each, so that the precinct reporter can use a traffic code number for reporting a violation.

The results of this secret vigilante committee seem favorable. Few violations have been reported to the end of the first six months of 1933; yet it is felt that considerable personal effort has been performed by the members among their neighbors. The press assists in frequent mention of the secret group which is twice the size of the local police department and who may report violations. General traffic accident rate is decreasing in spite of improved business conditions.

The Development of Community Safety

By JOHN V. BRERETON

Berkeley Traffic Safety Commission, Berkeley, Calif.

The speaker said in part: During the past ten years, as a part of the activity in the field of public safety, and under the leadership of the National Safety Council, cities and communities have formed their own councils or commissions for the study of traffic problems. The city of Berkeley organized the Berkeley Traffic Safety Commission in 1925 as a non-profit, non-political corporation. It is governed by a Board of Directors elected from its membership and is representative of the general citizenship, including all those companies and associations interested in the welfare of the community.

A few of the projects promoted by this commission will be presented to give a brief picture of the general program.

The work with children of school age has been one of the most important projects. Berkeley is fortunate in having one of the finest school boy patrol units in the country. It is called the Junior Traffic Police, and is made up of 500 youngsters who daily protect more than 10,000 children of the city. Their record of no fatal accidents and only one injury case in more than 10 years of service is noteworthy.

Another feature with the children has been the Police Department Safety Club, sponsored by the commission in connection with the Chief of Police. Here the children compete for membership by writing a letter, a poem or making a drawing on some safety subject. These letters or drawings are sent in twice each year and judged. The winners are made members of the club and receive from the Chief of Police a membership card and an official badge.

Special shows, safety playlets, and a continuous safety program in the class room has brought about a great safety consciousness in the minds of the school children.

One of our high lights in connection with the adult population has been the educational work in our class for women automobile drivers. The name of the course, by their own selection was "Rear-Admirals, Unlimited." More than 150 women attended the classes held for two hours each week for six weeks. At the conclusion of the course a driving test was given with members of the police department acting as judges. Prizes were awarded for the various winners, judging being made on a point system.

Public meetings, held usually in school auditoriums, have been used to great advantage in putting over the safety scheme. The programs of entertainment are usually arranged by the school with the commission offering a well-known speaker to give a brief talk on safety.

Turning to the more mechanical side of public safety, the commission has sponsored automobile inspection lanes, offering free testing to all who would take part. Certificates were provided to each of those who passed with others being advised to have proper adjustments made.

The commission also carries on special publicity programs throughout the year, calling attention to the need for proper brakes, lights, etc., and these campaigns are followed by enforcement drives conducted by the police department.

The outstanding feature of the traffic commission's program will be found in the traffic school. When first organized in 1931, this school was held twice a week during the afternoon and evening. Both classes were later consolidated into the evening class once a week. While this class is open to volunteer members, it is made up primarily of those sent in by the court or police department. Attendance varies from one to sixty-five with an average of about thirty at each meeting.

The court of Judge Oliver Youngs follows this usual procedure: On hearing a case in court, Judge Youngs decides as to the age, record, financial ability and general character of the defendant. From this investigation the following are usually sentenced to the traffic school:

1. Those under 21 and over 18 years of age who are students at any school or college and are not habitually reckless.
2. Those under 18 years of age who by choice select the school rather than being certified to the juvenile court.
3. Those over 21 years of age whose present financial conditions or family obligations would not permit the payment of a fine without undue hardship on them personally or their dependents.
4. Cases of first offenders over 21 years of age where, in the opinion of the court, a course in the school would accomplish the best results.

The student is required to attend a minimum of five sessions of the school and to take an examination on the 16th. If the class work and the examination is satisfactory, then the instructor reports the same to the court and judgment is suspended. If, for any reason, such as an absence or failure to do proper work, the instructor may

request that the student remain in the school for a longer period of time or may be returned to the court for some other sentence.

The classes at present are not truly lecture courses, but each individual is urged to take part in the discussions. Special problems are assigned to members of the class, usually students volunteering to take the problem. Each class is a complete unit in itself, except for work assigned during the week so that a student may enter at any one of the sessions and complete the course. The program varies from time to time including debates, essay contests, questions and answers, and accident problems.

WEDNESDAY MORNING SESSION

October 4, 1933

The session was called to order by Clarence P. Taylor, traffic engineer, State Department of Public Works, Boston, Mass., who presided. The special subject under discussion was "Hazards of the Rural Highway." Chairman Taylor presented the report of the Rural Highway Hazards Committee.

Report of Committee on Rural Highway Hazards

By CLARENCE P. TAYLOR

Chairman of the Committee

The speaker said in part: The Rural Highway Hazards Committee report for last year dealt broadly with the hazards found on rural highways. It seemed, therefore, that before any intelligent attack could be made on the rural highway hazard problem, we should have a complete picture of it in all its details. As a result, the work of the committee for this year has been devoted entirely to detailing rural highway hazards and their remedies. We have submitted a catalog of rural highway hazards and their remedies. This catalog, we believe, should serve the following purposes:

1. Form a comprehensive picture of the whole rural highway hazard remedy situation.
2. Complete this committee's tasks of outlining the rural highway problem.
3. Furnish this committee and others with a completely organized and related list of hazards and remedies for guidance in future activities.
4. Disspell the notion that any one hazard is the sole trouble with or solution of the rural highway problem.
5. Indicate that although the rural highway hazards are manifold they may be mastered to a great extent by the application of remedies already at hand.
6. Inspire the invention of more and better remedies.
7. Stimulate early adoption of remedial measures for certain neglected hazards.
8. Assist in guiding remedial efforts in the channels most productive of results.

It was the intention of the committee to include in this catalog all hazards and remedies that could be thought of regardless of how inconsequential they might be. No effort was made to emphasize hazards or remedies which are more important than others, although the desirability of doing this was recognized.

(The voluminous report of the committee, comprising some 32 pages, which is, as pointed out, strictly a "catalog," is on file for reference in the Library of the National Safety Council, Chicago.)

A Discussion of the Rural Highway Hazard Remedy Catalog

By W. SHERMAN SMITH

Assistant Professor of Civil Engineering, University of Toledo, Ohio

The speaker said in part: The causes of automobile accidents are many and varied, and to learn of their multiplicity has been the main purpose of our investigation and research. Statistics indicate that relatively few accidents are caused by roadway defects and that preventive efforts can more effectively be directed to other causes. Here is an interesting summary of accident causes, taken from the records of Kent County during 1932:

Road conditions, such as ruts, holes, etc.	5 cases or 2%
Loose gravel, causing loss of control	3 "
Vehicle hitting a culvert or bridge	7 "
Vehicle skidding for various reasons	11 "
Weather conditions, such as fog, smoke, etc.	8 "
Vehicle colliding with train	4 "
Pedestrian at fault or involved	38 " or 15%
Vehicle colliding with bicycle	2 "
Vehicle struck by swaying trailer	1 "
Vehicle colliding with an animal	2 "
Vehicle having defects or tires blown	5 "
Driver driving off roadway	2 "
Driver being asleep	3 "
Driver being intoxicated	14 "
Driver being blinded by bright lights	9 "
Physical defects of driver	2 "
Driver disregarding traffic signal or sign	21 "
Driver guilty of reckless driving	131 " or 53%
Vehicles colliding at intersections, due to obstructions to view	3 "
Cause unknown	4 "

Consequently, from the above statistics of this county alone, one can establish the fact that most of our highway troubles can be attributed to the man behind the wheel.

Our social order places at his disposal an instrument of destruction called the automobile. He probably thinks of it as a pleasure car. If he lives in Michigan, he must apply for an operator's license before he will be permitted to jeopardize his fellow men. He is asked his age, sex, color, weight, color, color of eyes, and color of hair. Also, if he has ever been convicted for a violation of any provision of any motor vehicle law. Of course, he knows all the laws governing the operation of his pleasure car. He replies: "No." He receives his license, jumps into his car, and is on his way—only God knows whither.

There had been an accident. Perhaps our man behind the wheel was Mr. J. J. of the following Jackson County case:

"A Ford sedan, driven by J. J. and going south at the rate of 50 miles per hour, was following a car driven by Mr. W. Mr. J. thought that his wife was in Mr. W's car. As they were making a turn on a curve, the Ford turned over twice, throwing the occupants out. Mr. J. was killed."

The report does not state what constituted the hazard in this case. It is a rare report which does express the driver's frame of mind, his condition, or his thoughts. These are open to assumption only—a rather delicate manner in placing the blame.

Therefore we can assume that Mr. J. was driving with an unsafe attitude, or under an unsafe mental condition, or with great recklessness. He thought of his wife being in another man's pleasure car. He took the curve under great speed, but was oblivious to his danger. He lost his life due to a self-made hazard.

Case 2. "Mr. W. was driving north. He was accompanied by Mrs. W. (same initial but not name) who was asleep with her head upon his shoulder. Finally he too fell asleep. The pleasure car ran off the left side of the road and struck a concrete culvert head-on. Estimated speed of car 40 miles per hour. Mr. W. had been driving all night. Mrs. W. was killed."

Is this not another case of a self-made hazard? The "driver being asleep" caused nine, or 4 per cent, of the accidents during 1931 in Washtenaw County, and six or 4 per cent during 1932. The "driver had been drinking" is mentioned in eight or 4 per cent of the accidents during 1931, and in six or 4 per cent in 1932. Eight intoxicated drivers accounted for 4 per cent of the accidents during 1932 in Monroe County.

Hazards due to the improper use of the highway cause the greater number of cases. In this classification are the glaring examples of some driver violating some motor vehicle law so as to be guilty of reckless driving. The infringement consists of: side-swiping a car; cutting in too quickly; colliding at intersections; cutting left-hand corners; hogging the pavement; driving on the wrong side of the road; exceeding the speed limit; losing control of the vehicle; turning without proper signals; bumping vehicles in the rear; parking on the highway; striking pedestrians, bicycle riders, and animals; and disregarding traffic signals, stop signs, and through highways.

Of a total of 591 cases reported during 1932, in Wayne County, 176 or 30 per cent were due to the driver disregarding the traffic signal. This constitutes the most serious problem which confronts the authorities of that county. They are asking what they can do to prevent this hazard.

Perhaps our man behind the wheel was fortunate enough to have read the September, 1932 issue of *Public Safety* and stowed in his brain are these words: "Pedestrian-motor vehicle collisions are the most important type of accident in the rural area in claiming fatalities." Yet when he drives along the highway, does he remember what he has read. One will not think so as one gazes at the long list of names of young children and aged men and women either injured or killed by the motorist each year. Of course, the blame for such collisions cannot always be attached to the driver. Statistics will show that in most cases the pedestrian himself is at fault. The record of pedestrian-motor vehicle collisions in Kent County, between January to July, inclusive, 1933, showed six deaths, five of them being the pedestrian's fault and one questionable.

What are we going to do, also, about those cases in which children are not soliciting or stealing rides, but are invited to ride and are willingly permitted to stand on running boards or to sprawl over the fenders while the vehicle is in motion? I believe that such children should be considered as pedestrians and given a place in the classification "riding on vehicle in unlawful manner."

For example, a Ford roadster with six boys riding in it and on it was going west, and a Chevrolet coach was going east. They tried to pass each other on a sharp narrow curve. One boy was riding on the left rear fender of the Ford, and was rolled between the two cars and killed.

Two more hazards are presented by the following acts: First, coasting upon an incline which eventually crosses a highway; and second, vehicles pulling load sleds upon which are children. Reported cases cover each.

The riding of bicycles and of motorcycles presents problems to be considered. There is a tendency of either vehicle being so driven as to weave back and forth across either one lane or the entire roadway. This greatly adds to the annoyance of the automobile driver.

I believe that a thorough and constant education is the means to employ upon our man behind the wheel if his yearly amount of destruction is to cease, or at least to lessen.

The catalog lists many remedies and practically all of them are sound, worthwhile, practical and necessary; but I believe that the one foremost at the present time is the one demanding uniformity of the motor vehicle laws among several states. For even if our man does know the law of Michigan, he will find himself in trouble when he enters the state of Ohio or Indiana.

Ask yourself the following questions: Do I intelligently know how to operate my vehicle? Do I intelligently know the laws governing the operation of my vehicle upon the rural highways of at least my own state? Do I intentionally regard traffic signals as a menace? Do I intelligently know the meaning of signs, especially those which read: stop; do not pass on the right; use center lanes for passing only; and do not park on the travelled portion of the highway? Am I my normal self when I am driving, or have I become just another man behind the wheel—a motor maniac—a hazard?

*Big man
L. B. G. T.*

Seeing and Highway Safety

By MATTHEW LUCKIESH

Director, Lighting Research Laboratory, General Electric Company,
Nela Park, Cleveland, O.

The speaker said in part: On the highways by day or by night, seeing should be done quickly, and with certainty. Here a split second may mean eternity. The story of poor seeing on the highways is one of damage and death.

Eyes are an important part of us, but they are merely tools, just as light, color and lighting are, as exemplified in signs, signals and white lines. Seeing is much more complex than vision, as a human being is much more complex than the visual sense. Human beings are seeing-machines, with all the characteristics of machines, upon which are superposed many psycho-physiological characteristics of human beings who have thoughts, sensations, feelings, emotions, sentiments, volitions and associations.

Seeing is a chain of three complexities intricately interwoven.

The external physical realm consists of objects, backgrounds, light and lighting. These factors, as they pertain to highway safety, are generally controllable. The fundamental physical factors which directly influence the visibility of an object are the size of critical detail, contrast in brightness (and color) between the object and background, the brightness of the object or its immediate background, and the time available for seeing. There are other external factors which are commonly neglected. Most of these may be classed as distractions. The general background is usually a maze of pattern, brightness and color. It operates as a camouflage background and reduces visibility. Other distractions are extraneous noises, conversation and activities, such as driving an automobile. All these decrease the available sense capacity, reducing the ability of the human seeing-machine and, therefore, decreasing the visibility of the object.

The visual sense is the next complexity in the chain of seeing. It involves the abilities and limitations of the eyes and the visual sense. Eyes differ greatly in defectiveness. Glasses can correct refractive errors. Old eyes are dulled by age and abuse. Factors of safety should be great enough to allow for the normal variations, although refractive errors should be corrected within reason by means of glasses. Some of the external factors, such as brightness, aid the eyes indirectly. Therefore, by controlling the external physical factors some degree of control is indirectly exercised over the eyes and visual sense.

The internal realm of psycho-physiological effects is the third complexity in the chain of seeing which has been generally ignored. The importance of this realm and of the end-products of seeing becomes obvious when the human being is considered as a human seeing-machine. Seeing as an activity drains human resources. Even the simple act of reading a newspaper results in a waste of energy through muscular, neural and mental channels. This we have termed nervous muscular tension and have successfully measured it. Also, the eyes are doorways of visual impressions as well as tools for seeing. Through them the external world gives rise to stimulation, depression, confidence and many complex feelings which influence the human seeing-machine.

One drives on a country highway with noticeable ease in the daytime when there is little traffic. As the city traffic is entered, one sits straighter and grips the wheel more tightly. At night what a tremendous difference one experiences on turning from a well lighted boulevard into a poorly lighted street! Again one sits straighter and grips the wheel more tightly. To carry on, consider a fog or drizzling rain. At the end of an hour's driving one is glad that his journey has ended. One is noticeably tired and is conscious of relief from strain. Most of this fatigue is due to the responsibility of seeing and much of it is due to poor seeing. In fact, human beings expend more energy through the visual sense than through all others. Artificial light is the outstanding controllable factor which can reduce this fatigue due to poor seeing and increase the speed and certainty of seeing under these conditions. It can play its part in signs and signals and motor-vehicle and highway lighting.

Imagine a driver approaching an intersection. He has a certain total sense capacity available. A part of it is used in operating the motor vehicle, even though he may think he does this automatically. A part of it is used by the sense of hearing, because this tells him something about the traffic at the intersection. Even the extraneous noise of traffic uses some of his sense capacity. These and other distractions reduce his ability as a seeing-machine. The traffic sign or signal occupies only a small part of his field of view. Its background is a haphazard pattern of brightness and color. The visibility of a traffic sign or signal can be readily determined by observers intent upon it. But what is its visibility to those for whom it is installed?

As has been seen, only a fraction of the driver's attention is devotable to a traffic sign or signal and the latter must impress itself in a fraction of a second if it is to be effective. Taking into account the facts of seeing, there seems to be only one general solution. The sign or signal must be self-luminous to raise its brightness well above that of the surroundings. Next, color does its part. Thus we have the self-luminous traffic signals which are highly effective if bright enough. When they are not bright enough they begin to fall in the class of the traffic signs which are not self-luminous. The effectiveness of the latter may be gravely doubted. Appraising these from the new viewpoint and with the numerous new facts in mind, one may conclude that

most of them in cities, such as boulevard stops, are often worthless even in the daytime to those unfamiliar with them. Others scarcely need them. On country highways where there are fewer distractions they are quite effective in the daytime.

The visibility of traffic signs and signals may be increased by increasing any factor upon which visibility depends. It is most practicable to increase brightness. It is possible to work out a factor of safety which would provide visibility high enough. From a practical viewpoint this means self-luminous signs as well as signals. No court should convict anyone for not obeying a sign which is not self-luminous, unless it is much more prominent than the common signs. A driver along the highways has a right to powerful aids which permit him to relax. The solution is easily found in properly controlled artificial light expended in driving aids, such as signs and signals, highway and street lighting, motor-vehicle markers and headlamps.

Statistics and analyses emphasize the need for the application of the science of seeing and in a very practical manner they support the logic and philosophy necessary to interpret this science into its beneficence to humanity. Excellent papers have been presented teeming with statistics of accidents and analyses of the economics involved. Expert engineers are recognizing the importance of the science of seeing and are basing their recommendations upon this new knowledge and viewpoint. For the comments which follow, the author is indebted to colleagues, Kirk M. Reid, engineer of street and highway lighting, and W. C. Brown, engineer of automotive and aviation lighting.

For several years night-traffic accidents on highways have been increasing more rapidly than day-traffic accidents. For example, a survey covering a year's traffic fatalities on the state roads of Indiana showed that the hazard per car was four times as great by night as by day. The same ratio was found in a recent New Jersey survey. A substantial proportion, although of course not all, of the greater hazard by night is attributable to the reduced ability to see.

Seeing along highways at night is influenced by a number of factors, such as the color of the pavement, its specularly, and the contrast between the pavement and the road shoulder; but the most important factor is the lighting. With proper and adequate illumination, seeing is quick and certain. With poor lighting it is not. Therefore, the problem of traffic safety on highways at night is largely a matter of proper illumination by automobile headlamps or by fixed highway lighting equipments, or by both.

The question which frequently arises is whether or not on heavily traveled highways the use of fixed highway lighting, supplementing modern automobile headlighting, is warranted. Mediocre highway lighting—and many of the early installations unfortunately were mediocre—is generally considered to be of doubtful value, and it is only during the past few years that installations of highway lighting have been made which are satisfactory enough to warrant accident analyses before and after the lighting was installed. One such analysis was made on Bay Shore Boulevard near San Francisco, and others were made on the Schenectady-Albany and Schenectady-Troy highways in New York State. The results showed a decrease of approximately 40 per cent in the night accidents following the installations of the highway lighting.

While these data are too meager to be conclusive, they are indicative. Furthermore, they check the much more extensive tests on urban streets, where it has been found that adequate street lighting reduces night traffic accidents 35 to 50 per cent.

Notwithstanding the general recognition, at least among safety organizations, of the value of highway lighting in reducing accidents on heavily traveled highways, it

is legally possible in only half a dozen states for any political unit—state, county, or township—to pay for highway lighting. This situation is not an intentional prohibition of highway lighting: it simply represents an inheritance of legislation which was passed before there was any knowledge of the value of highway lighting.

Attempts have been made to analyze accidents on highways without fixed lighting in order to determine the shortcomings of the present automobile headlighting and headlighting regulations. Notwithstanding the difficulties involved, at least one state, Connecticut, has made such analyses covering several years. Invariably they have shown more accidents due to insufficient light than to glare. For example, during the year 1932, they reported 32 accidents caused by insufficient light and only 5 accidents caused by glare. In 1931 there were 30 and 7, respectively.

It will be noted that this is contrary to the opinion held by many persons to the effect that glare causes most of the night accidents attributable to lighting. Instead, the lack of adequate lighting, causing an inability to see quickly and with certainty at the critical moment is ordinarily responsible for the accident.

Our present knowledge of the new science of seeing leads directly to the same conclusion, even without any supporting evidence from the field. At 50 miles per hour, an average highway speed, the actual braking distance under typical conditions is 400 to 500 feet. Therefore, headlamps must reveal obstacles at about 500 feet to avoid serious danger of accident.

Even if such intensities were provided by present-day headlamps, in many states the greater safety on the highway could not be realized because of regulations still biased by the assumption that a single fixed beam can meet driving requirements without causing serious glare. Practically, this means that the beams are aimed so low as to provide insufficient driving light for a speed in excess of 25 m.p.h. The opinion held by substantially all authorities who have made a study of the characteristics and use of headlight beams is that reasonable safety now demands at least two beams of different characteristics under the control of the driver—one for driving on the open road and the other for use in meeting other vehicles. All American cars made during recent years have been so equipped and over 80 per cent of the cars now in use have depressible-beam equipment.

The new developments of the asymmetric passing beam represent a still further refinement. With these equipments the light on the left side of the road is depressed as before, but the light on the right side is maintained or even augmented. Furthermore, the development of fixed-focus headlamps, now on all cars manufactured, has removed the greatest hindrance to proper adjustment.

WEDNESDAY LUNCHEON SESSION

October 4, 1933

This fourth session was devoted to the annual business meeting of the Street and Highway Traffic Section. The meeting was called to order by General Chairman Clifford Davis, who presided.

For the committee on Membership, Chairman William Knobelke, chairman of the Milwaukee Safety Commission, reported that an analysis of the effectiveness of different appeals for membership in the National Safety Council had been made among different kinds of prospects. This was done in an effort to aid the National Safety Council staff in its membership solicitation activities.

For the committee on National Traffic Safety Contest, Lloyd A. Blanchard chairman pro tem, reported that a detailed analysis of the 1932 contest had been made

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Orig. paper
Ad. 12-17-34-1-2-3-4-5-6

by S. J. Williams, director of public safety, of the National Safety Council staff. In deciding to repeat the contest for 1934, certain changes in rules had been adopted. Communities under 10,000 population should be permitted to enter on a special basis of competition; also, means should be developed to include states on a percentage of eligible cities or towns enrolled from the state and the results of these communities considered in the contest.

Harold G. Hoffman, Commissioner of Motor Vehicles of New Jersey, chairman of the Committee on Annual Congress Program, called attention to certain features which had been incorporated into the program this year.

Chairman E. J. O'Meara, of the Nominating Committee, moved that the by-laws be amended to combine the present committees on enforcement and police activities under the new name "Committee on Enforcement and Police Activities."

The motion was formally adopted.

Chairman O'Meara then presented the report of the Nominating Committee and officers of the section for the ensuing year were elected as follows:

General Chairman—Harold G. Hoffman, State Commissioner of Motor Vehicles, Trenton, N. J.

Vice-Chairman and Chairman, Committee on Annual Congress Program—Frank C. Berry, Mgr., Safety Dept., Minneapolis Automobile Club, Minneapolis, Minn.

Vice-Chairman, Committee on Annual Congress Program—F. C. Lynch, Director, Kansas City Safety Council, Kansas City, Mo.

Vice-Chairman and Chairman, Committee on Traffic Engineering—Lewis W. McIntyre, City Traffic Engineer, Pittsburgh, Pa.

Vice-Chairman, Committee on Traffic Engineering—Reyburn P. Hoffman, Secy.-Mgr., St. Louis Safety Council, St. Louis, Mo.

Vice-Chairman—O. W. Wilson, Chief of Police, Wichita, Kansas.

Vice-Chairman—William C. Knobel, Chairman, Milwaukee Safety Commission, Milwaukee, Wis.

Chairman, Committee on Enforcement and Police Activities—Franklin M. Kreml, Dir., Accident Prevention Bureau, Police Department, Evanston, Ill.

Vice-Chairman, Committee on Enforcement and Police Activities—Judge William C. Larson, Municipal Court, Minneapolis, Minn.

Chairman, Committee on Uniformity—Arnold H. Vey, Traffic Engineer, Division of Traffic Control & Regulation, State Department of Motor Vehicles, Trenton, N. J.

Vice-Chairman, Committee on Uniformity—John P. Arnoldy, Chief Highway Patrol Officer, State Highway Department, St. Paul, Minn.

Chairman, Committee on Rural Highway Hazards—Clarence P. Taylor, Traffic Engineer, State Department of Public Works, Boston, Mass.

Vice-Chairman, Committee on Rural Highway Hazards—W. Sherman Smith, Department of Civil Engineering, University of Toledo, Toledo, O.

Chairman, Committee on Accident Records—W. W. Matthews, Dir. of Safety, Bureau of Highway Patrol & Safety, State Department of Revenue, Harrisburg, Pa.

Vice-Chairman, Committee on Accident Records—W. Graham Cole, Dir. of Safety Service, Metropolitan Life Insurance Co., New York, N. Y.

Chairman, Committee on Public Education—Lewis E. MacBrayne, General Manager, Massachusetts Safety Council, Boston, Mass.

Vice-Chairman, Committee on Public Education—W. F. Irvin, Traffic Study Engineer, Toronto Transportation Commission, Toronto 2, Canada.

Chairman, Committee on National Traffic Safety Contest—John N. Eddy, City Manager, Dallas, Texas.

Vice-Chairman, Committee on National Traffic Safety Contest—Frank E. Ballantyne, General Manager, Automobile Club of Philadelphia, Philadelphia, Pa.

Chairman, Committee on Pedestrian Problems—Maxwell N. Halsey, Traffic Engineer, National Bureau of Casualty & Surety Underwriters, New York, N. Y.

Vice-Chairman, Committee on Pedestrian Problems—J. W. A. Bullong, Traffic Engineer, Seattle Traffic and Safety Council, Seattle, Wash.

Secretary—Earl J. Reeder, Traffic Engineer, National Safety Council, Chicago.

WEDNESDAY AFTERNOON SESSION

October 4, 1933

This session was devoted to a joint meeting with the Delivery, Taxicab and Bus Section of the National Safety Council. The meeting was called to order by General Chairman Clifford Davis, who presided. He immediately called upon the first speaker.

Training the Driver

By G. A. ROGERS

Nutley, N. J.

The speaker said in part: The success of any training program must be predicated on the following factors: reasons for training; proper selection of applicants; preparation of a definite plan, even to details; method of informing him of current changes and development in products and policies; continuity of re-education; proper selection of instructor; means for checking results; and subsequent supervision. A careful correlation of all these factors should result in the evolution of a standard performance and of a good practical technique for the driver.

The driver may be the only, or the best, contact you have with your trade. The attitude of drivers toward their jobs and their company may nearly make or break the delivery organization. It is bad business simply to engage a driver, give him a brief description of his duties and his territory, telling him to go to it, and hope for the best. When we talk about driver training, we are talking about an effective means of increasing the value of the driver by giving him practical methods which will help to create and sustain good will, through this last contact between the driver and the customer.

Although we have assumed the proper and intelligent selection of applicants, let us remember that we have no entrance examinations here although some firms use one form or another of questionnaire, but we can have the benefit of credentials of past employers, we can check up rather closely on the man's home conditions, and on his personal history.

It seems to me that the degree of success of any training might be about in direct proportion to the care with which your plan is worked out. Just what do we want to teach the driver? How fast can he absorb training? Has the program been so planned as to reflect a proper balance between theory and practice?

It was six years ago that I saw the inauguration of such a driver's training course in New York City and the results have been so good that this training, changed in detail as conditions warranted, became a fixture in that company's operating policy.

We started off by telling the men who owned the company, how old it was, where it was going and how and why; we told of its policies, traced its development from conception to the present day and injected enough sentiment into it to make the men realize that it was a human organization, and also just where they might expect to fit into the picture, not only today but tomorrow and in other years to come. We were very careful not to exaggerate and to confine our training to the strict truth and to show the men how they could compete with one another to break through; we showed them how sales, delivery and advertising should cooperate; we pointed out that there was a very fine line, if any, of demarcation between sales and delivery, for example.

No training course would be complete without stressing the accident prevention problem, both from a driving and a personal injury standpoint. The driving end of it is handled by an actual review of accidents within the company's own fleet and courtesy is the watchword with respect to prevention; mistakes of other drivers are pointed out from the constructive criticism angle, for drivers are taught that accidents are a challenge to management's ability to learn something of value to other drivers. Emphasis is given to the fact that there are two phases to each accident: the first, that in which the driver has everything within his own control; and the second, that where circumstances have passed beyond the control of the driver and he is in a jam and must use his better judgment in getting out of it.

With respect to the personal injury standpoint, a loaded truck is put on the garage floor and the supervisors show the men just how to handle themselves in getting on and off the truck; they are shown how to take merchandise off the roof in such a manner as to put no undue strain on their bodies, and then are shown the right and wrong way, together with results that follow from both methods. Then the drivers themselves "work" the load and this training usually takes about half a day.

On the final day of training, the drivers are taken through the manufacturing plant by the production manager, are introduced to and addressed by one of the owners or executives, and are then taken to dinner as the guests of the management. Then comes the assignment to a route where they work for a week under the supervision of an older driver or supervisor and under actual pay conditions for the instructor is on a salary basis.

The drivers may be informed of current changes and developments in products and policies through the use of several media any or all of which are good, such as home organs, bulletins, posters, etc. We developed a weekly delivery program which was prepared and distributed to all departmental employees carrying current news to them and at the same time offer including personals with respect to drivers, their families, accidents, etc. Short and snappy weekly meetings were also effectively used.

But you cannot give a man an initial training and then forget him; you must continually re-educate him, keeping his mind alive and assisting him in forming the habit of learning. Drivers are brought back periodically somewhat in the manner of a post-graduate where they can tell us of their reactions to the training that has been given them. Any well defined training program should include a sufficient degree of flexibility to permit of constant revision in order to write into it the suggestions and thoughts that the drivers bring in from the field.

Every training program should provide means for checking the results; by this means only, is it possible to know if the program is accomplishing its objective. We

set up an individual folder for each driver into which was placed the final set of sheets used by him in his school transaction. Into this folder from time to time went any customer complaints, any accident reports, road inspector reports and, in fact, anything and everything pertaining to that individual driver. Drivers are free to examine this folder once each week, at which time the delivery superintendent involved discusses the driver's performance with him, pointing out the connection between practical performance and his training work.

An attempt should be made to safeguard against the existence of economic losses resulting from labor turn-over due somewhat to lack of constructive supervision on the road. The most promising student at school may acquire bad habits for the want of interpretation of instruction out in the territory. Under normal conditions each man is picked up once a day by a supervisor and his driving, delivery technique, and store courtesy are all carefully checked. An inspection report is made out and signed by the driver himself, for we feel that we want every driver to know frankly anything good or bad that has been reported by his superior, and it is through the instrumentality of these reports that we are constantly building and revising our code. It has been my experience that drivers will cooperate and talk freely to a supervisor on the road.

As to whether driver training pays or not, please note these results: In the organization in which I installed the training program I have described to you, driver complaints during the year 1932 averaged one to each 40,000 stops; dealer reaction to these same drivers is second to none in the territory in which they operate; in four years' time not a driver has left our employ of his own volition.

How to Train Drivers in Traffic Safety

By J. RUSSELL CRAIG

Safety Director, Pennsylvania Indemnity Corporation, Philadelphia, Pa.

The speaker said in part: In a consideration of this subject certain problems are quite important.

1. How often a year and when do you expect to talk traffic safety?

Immediately you will recognize that a planned program is necessary, because it is efficient and places a real value on the management's work of safety education. Then, too, it will insure a well balanced program with learning or educational values. Drivers will look forward to the regular scheduled safety meeting as something necessary, worth while, and thereby you will get a better attitude than if your meetings were spasmodic.

2. What material should be used?

The foundation of all traffic safety is made up of two elements: (a) Safety attitude; and (b) Knowledge of the motor vehicle code of your state.

There are three ways in which to ascertain the exact and proper knowledge of both of these which your drivers may possess:

(a) By trial and error. Let your drivers have traffic accidents, then analyze the causes and ways to prevent them.

(b) By written test. Have each driver now employed and every new one hired, take Dr. Herbert J. Stack's National Safe Driver's Test, with instructions as to how to use it. This test will give you their safety attitude.

(c) Problem discussion. Take the motor code of your state, analyze it in an interesting manner at your safety meetings.

The next logical thing to do is to have the men make a serious study of actual accidents in which one of their number has participated. There are several things to be said here: (a) Actual cases of your own men will be less and less, if the former suggestions are used. (b) Actual cases, unless properly handled, may cause laxity on the part of your drivers and accidents increase.

I strongly recommend from time to time that outside speakers be brought in. They may be your own insurance carriers, engineers, or those of other companies because a fresh and new viewpoint stimulates real interest in the meetings and the subject of safety. Your local safety councils can recommend proper outside speakers for you.

3. What method of presenting your material will you use?

(a) A straight lecture method where the speaker or leader does practically all of the talking. This method should not be used because many times the speaker is too apt to begin by preaching rather than instructing.

(b) The conference method whereby those involved will sit around a table and the leader or speaker endeavors to bring the men into the conversation most of the time. This is better for small groups and is very effective if the leader can get the men to participate freely.

(c) The demonstration problem conference method. This has the good advantage of the former two methods with some improvements added. If it is a small group then they should get around a large table, or if it is a large group they could be placed in a horseshoe or semi-circular formation, which eliminates the stiffness of the classroom style. The speaker should be at the open end of the horseshoe or semi-circle. A blackboard to be used to illustrate the point or to explain and solve the problem is very valuable. Some persons prefer an outline of a street or intersection using small toy vehicles for demonstration purposes. Visual instruction is at least five times more effective than just receiving instructions through the ear.

4. What results are you endeavoring to accomplish?

(a) Create safety-mindedness by appealing to men's emotions, intelligence and experience.

(b) Safe driving habits—thus eliminating all traffic accidents by furnishing facts they should know.

(c) Proper regard for their positions by stating that "Accidents are an insult to their driving abilities." (It has been my observation that swearing and cursing while talking to drivers, and so-called risque stories, are objectionable to most drivers. Many supervisors feel that drivers do not understand any other language, but they are mistaken. Commercial drivers of today respect their superiors and supervisors in the same measure that the latter show their respect for themselves by firmness, ordinary courtesy, and rigid discipline.)

(d) Loyalty to their employer by showing their acts of driving will bring or develop good will, good advertising, good friends and new business—by safe driving habits.

(e) Careful of the equipment which they drive because they realize that the name of the firm for which they work is on the side of the vehicle and is just as important as the salesman's business card. The driver's acts reflect upon the company he represents.

5. What backing does the management give to your traffic safety program?

Unless the management is safety-minded and willing to back up the safety pro-

gram, the efforts of those in charge of traffic safety will not amount to much. The attitude of the management is always reflected in the rank and file of the organization.

What Fleet Operators Think About Present Traffic

Regulation and Control

By C. G. HOBART

Wieboldt Stores, Chicago

The speaker said in part: Well, to be frank, we don't think much of it. The present laws are either obsolete or inadequate. Speed laws are kept so low that no driver with a modern car can keep within the law. Parking regulations are generally wrong, and where right are not enforced. In many places traffic lights are not synchronized so that a car going at normal or reasonable speed can proceed without stopping. Imbeciles, half-baked juveniles and drunks, as well as people wholly incapable physically of driving properly because of poor sight, lack of coordination, excess of nerves, etc., are allowed to drive because there is no requirement for driver's license.

If you will refer to the records, it can be clearly seen that accidents from commercial vehicles have been reduced consistently, but accidents of passenger cars have been rapidly mounting. Truck drivers of large fleets generally have been trained, warned, pestered and watched until they are becoming more and more careful, but it is time something was being done to regulate and control the passenger car driver. The police themselves are honest enough and capable enough but when they see that the worst offenders have their cases fixed or even have the officer reprimanded for doing his duty, he naturally loses interest and finds it easier to do nothing.

What, then, should be done about it?

First, we need honest enforcement of regulations.

Second, the speed laws should be amended so that the public can travel at a reasonable rate.

Third, parking laws should be enforced as far as possible, and where they are not, signs should show the variation. All parking should be parallel and not over 12 inches from the curb, but all parking should be prohibited on narrow streets, especially those with street cars.

Fourth, proper lights and reflectors should be installed on all vehicles.

Fifth, drivers' license laws should be enacted, as it is a known fact that states with drivers' license laws are reducing accidents, whereas states without such laws are generally showing an increase in rates of accidents.

Sixth, every automobile owner should be required to carry insurance.

Seventh, amber lights should be eliminated, because people in both directions encroach on the amber light of the "start and stop" signal instead of waiting for the green light.

Eighth, there should be more one way streets, especially narrow streets.

Ninth, stop and go lights should be on all railroad crossings.

Tenth, all street cars should be equipped with stop lights so as to avoid rear end collisions when stopping or turning a corner.

Eleventh, all business having motor driven vehicles should carry on an active safety campaign among their drivers and should reward the safe drivers.

*Orig. paper
Ch. 878
also
Ch. 815*

What Fleet Operators Think About Present Traffic Regulation and Control

By HENRY J. MINEUR

Safety Director, Borden's, New York City

The speaker said in part: I believe we could find no fault with the majority of the traffic laws and ordinances as now written, if the spirit of their provisions were more generally understood. Understanding would lead to better observance, which in turn would be promptly reflected in improving the accident record. Unfortunately, however, many of the laws and regulations are obsolete and should be stricken out entirely, while others are greatly in need of revision.

I am strongly of the conviction that a single practical enforceable regulation, if clearly understood, will receive popular support and be observed by practically all drivers. This would do more to promote safe driving than a dozen other rules that are only casually observed and not enforced. It is the latter type of regulation that causes drivers to become impatient, to resort to cheating and (as it is more commonly referred to today) "chiseling." In such cases we can readily see that drivers are not familiar with the fundamental idea of the regulation. Lack of knowledge on this subject is responsible for the fact that drivers acquire a narrow selfish viewpoint and have no thought of the other fellow's equal right to the use of the road within the limitations prescribed by law.

The fleet operator is always striving toward the ideal which is, or at least should be, the viewpoint of all regulations, namely, the most rapid movement of his vehicles consistent with safety. There are very definite reasons for his interest in the accomplishment of this end. He thoroughly appreciates that the economical operation of his fleet depends absolutely upon the practical application of this theory. He knows the limitations of his own equipment and carefully instructs his driving personnel on this important requisite to safety. He has long since learned that the failure to observe traffic regulations will ultimately lead to accidents and a series of irrecoverable losses. His experience has taught him that accidents will impede traffic, interrupt service, cause damage to company equipment, create substantial public liability claims, develop ill-will toward the company, the ultimate costs of which must be absorbed as a normal part of his operating expense. With this added expense and burden it is utterly impossible for him to operate his fleet economically. He is seriously handicapped with the competitive field and his business must suffer proportionately. It is, therefore, quite easy to understand why the fleet supervisor or safety director bases his whole vehicle safety program upon the spirit of the traffic laws and ordinances. I say "spirit" because there are so many provisions which, to the large majority of drivers, are considered ill-chosen because they are unnecessary, impracticable, unenforceable, and in many cases inconsistent with the acknowledged principles of safe operation.

It is the latter provisions which seem to conflict with the efforts of those in charge of fleet safety work. This opinion is based upon the fact that we have been most exacting in our demands upon the operators of commercial vehicles, particularly those of large fleets, and we should not require them to observe regulations which are poorly written, unwisely adopted, without merit, unpopular, and for these reasons totally ignored by most of the drivers. I do not feel that a regulation should be made a law until its necessity has been very carefully considered and, in addition,

whether it will serve a purpose consistent with the fundamental law, will have popular appeal to all drivers, and whether it can and will be enforced.

In our fleet activities we try to educate our drivers to observe the regulations, but you can readily see how difficult the task becomes when it is not being done by all other drivers and apparently is condoned by enforcement officials.

The desire of some drivers to always be at the head of the procession is an offense that causes no end of grief to many of us and particularly the operator of a commercial vehicle. This situation is at its worst when cars are slowing down for a warning or a light, or stopping at an intersection, and another driver comes along but is unwilling to take his place in line, shooting around to the wrong side of the road or using the shoulder on the right to get by, cutting in sharp and putting others in a tight place. If traffic is stopped, this type of driver will take what he believes is his place—at the head of the line—on the wrong side of the road or off the road entirely—then jostle for the right of way as soon as traffic starts up again. It is most unfortunate that he is permitted to get away with this even in the presence of an officer. In fact, I have seen several cases of this kind where the officer narrowly escaped being run down but nevertheless failed to stop the driver as he sped merrily on his way to the next intersection and doing the same thing all over again. When a driver is permitted to do this sort of thing and go ahead unmolested it certainly sets a bad example for others and encourages them to do likewise. This habit seems to be increasing and conditions are getting worse all the time.

In this connection, I would like to suggest consideration of a standard procedure in police investigations of vehicle accidents causing injury or death. While there are many angles to this subject, it would seem to be that the first step in the direction of uniformity should be elimination of the old and unreliable method of using a tape measure to determine the efficiency of brakes. There are many variable human factors in this system and it should be abandoned in favor of a decelerometer. An improved instrument of this character will take the guess work out of brake efficiency tests, facilitate the work of the investigating officials and provide them with an accurate method of reaching decisions that are fair and uniform in all cases.

THURSDAY MORNING SESSION

October 5, 1933

The session was called to order by Frank C. Berry, Vice-Chairman of the Street and Highway Traffic Section, and manager, safety department, The Automobile Club of Minneapolis, who presided. The session was devoted to a consideration of traffic and legislation problems. Chairman Berry called upon the first speaker.

*Orig. paper
N217-574-H. Temp.
also - 5482 - Uniform Vehicle Code*

Report of Committee on Uniformity

By CAPTAIN LAURENCE A. LYON

Deputy Superintendent, Uniform Division, State Department of Public Safety
Lansing, Michigan

The speaker said in part: This Committee not only places itself on record in favor of the Uniform Vehicle and Operators' Code of the National Conference on Street and Highway Safety as the only basis for State and municipal regulations,

but it also condemns recent departures from the Codes by state and municipal officials as interfering with the progress of uniformity and tending to prompt further deviation from the Uniform Codes.

These documents were intended to be, and since their inception have been, a standard guide to states and municipalities in formulating their motor vehicle regulations. The value of the basic qualities of these documents is evident by the fact that 40 per cent of the existing state motor vehicle laws conform in substance with the Uniform Vehicle Code, while numerous municipalities have ordinances substantially in harmony with the Model Municipal Traffic Ordinance. The Uniform Vehicle Code and the Model Traffic Ordinance, since their adoption, have been subjected to relatively minor changes; therefore, it may be assumed that these standard documents offer the proper basis for advance toward uniformity.

In the continuance of the program of uniformity, your Committee recommends as follows:

1. That the machinery of the National Safety Council now in operation, such as publicizing the need for and advantages to be derived from uniform traffic regulations through magazines, circulars and the press be continued in order to maintain interest in uniformity.
2. That the National Safety Council ask all safety and motor vehicle committees, and all motor clubs and similar interested groups to assume the obligation of informing state and municipal legislators of the need for uniform traffic legislation and the benefits to be derived therefrom, and promote bills to secure the adoption of standard codes.
3. That the Street and Highway Traffic Section of the National Safety Council conduct a publicity program including a series of articles drafted and published in newspapers and magazines, and broadcast by radio, in an effort to stimulate interest in uniformity.
4. That the membership on the Committee on Uniformity be enlarged to obtain a broader representation of the needs and ideas of the various parts of the country.
5. That the Committee on Uniformity be authorized to cooperate with the National Conference on Street and Highway Safety and the American Association of Motor Vehicle Administrators in the development of changes and additions to the Uniform Code and Model Ordinance.
6. That the Committee, through the headquarters staff of the National Safety Council, request members of the Street and Highway Traffic Section and other interested parties to submit suggestions for possible changes and additions to the Uniform Code and Model Ordinance.
7. That the Committee review the suggestions submitted, make such additional studies as are necessary and draft for presentation at the Board Conference a series of recommended changes.

Planning A Drivers' License Administration

By E. P. LEE

Special Assistant Attorney General, State of Minnesota, St. Paul, Minnesota

The speaker said in part: I believe that a drivers' license law should be designed with the single idea in mind that it is primarily a safety measure. Such a law should not be made a revenue measure. The fee should be as small as possible, yet

large enough to accomplish the purposes of the law. Starting, then, from the premise that the law is a safety measure, we must attack the problem of administering it in such a manner as to accomplish most successfully that which the lawmakers intended it to accomplish, namely, the one objective—reduction of automobile accidents.

If we start with a base figure of 100 per cent as being representative of all the money and effort available for the administration of a drivers' license law, we will first have to deduct the amount that is actually necessary for office work. This includes the expenses incurred for the issuance of the license, the filing and recording of all instruments necessary in the administration of the law, and all routine correspondence and general office work. Supposing that we use up for these purposes the entire 100 per cent of the money and effort available, we will have nothing left for education and enforcement.

Now, in order not to use up the 100 per cent in this manner, we must plan the routine work in the administration of the law so as to have the greatest amount of money and effort possible available for education and enforcement. This may be accomplished in several ways, one of which is to anticipate the requirements of a department so far as routine matters are concerned and then to thoroughly analyze every step in the routine administration so as to eliminate as much internal friction as possible. A study of existing offices should be made, as much information can be gained from the experience of others. This procedure has been followed in Minnesota, and we have finally worked out a plan of administration that seems to be the ultimate of efficiency and economy.

For example, we saved a single item of \$5,000 in the printing costs of application blanks and license cards, by merely changing the size and details of the printing forms, without losing any essential quality. We saved another \$20,000 in devising the most economical method of mailing license certificates. We have also developed a very interesting system of filing which, in addition to entire efficiency, is an item in economy of administration.

Enforcement of the law should be only so technical as may be necessary to remove from the highways the criminally negligent or wantonly careless operators. It should not be the ambition of the enforcement personnel to collect a lot of fines or fill the jails. These measures should only be used in cases where the public welfare demands such drastic action. In my mind, it is much better if we can educate the motor vehicle operator so that he will be in sympathy with the aims of the administrators on this type of law. Therefore, in selecting your personnel, that will come in direct contact with the public in enforcing the law, you should select persons who have the ability and temperament of serving in an educational capacity.

How To Organize A State for Safety

By LLOYD A. BLANCHARD

Executive Secretary, Governor's Committee on Street and Highway Safety, Boston, Mass.

The speaker said in part: The Massachusetts Governor's Committee on Street and Highway Safety was organized in 1926, following the First National Conference on Street and Highway Safety held at Washington, D. C. Our first three years of operation were on a voluntary basis, the committee being made up of about twenty

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members, representative of the counties of the Commonwealth. But the officers of this voluntary organization sensed that more intensive and fundamental work was necessary, if the accident problem was to be coped with successfully, hence early in 1929 the governor was requested to reorganize the committee and plans were developed for securing sufficient financial support to enable the employment of an executive staff on a full-time basis.

The governor appointed one hundred outstanding citizens to the committee, including the original members, from which 15 were elected to an executive committee, which subsequently was increased to 18. The original chairman was retained and served until about a year ago, when he was forced to resign because of business changes. I mention this incident, which is typical of our present officers and members, only to indicate the interest of the members of our committee and their devotion to our work. Approximately 40 per cent of our budget, which is about \$28,000, comes to us from the Commonwealth, the balance being secured from outside sources. We are recognized as a semi-official agency but enjoy freedom from red tape and other procedure that would exist were we strictly a state department.

One of the first steps taken after the committee was reorganized was to request the appointment of local safety committees, by mayors and boards of selectmen in each of the 355 cities and towns of the Commonwealth. Under our supervision these committees were expected to conduct a continuous highway safety program in their respective communities. In a great many instances, considerable work along this line was carried on, but gradually the interest and activities of these local committees began to wane until at the present time only a small number are really functioning, those inactive being replaced by one or two contact men, appointed by the mayors or chairmen of the board of selectmen, at our suggestion. In nearly every instance our first choice for contact man is the Chief of Police, and second, the Highway Commissioner or Engineer. An outstanding citizen as a contact man has often proved successful. Our great obstacle in maintaining community interest has been the difficulty in securing the comparatively small sums of money necessary to finance a local program because of economic conditions.

There are a number of difficulties that occur to me in connection with local safety committees that I would like to pass on to you. In the first instance, it is almost hopeless to interest those in a small community where the accident experience is not sufficient (from their point of view) to indicate a real problem. Then, again, the local safety committee is a voluntary agency whose recommendations are only advisory and are often ignored or ridiculed by politicians in power. If our budget had permitted the maintenance of a staff member exclusively for field service, there is no doubt but that we could have kept alive a great many of our local safety committees.

The main objective, however, is the organization of a local safety committee until at least a preliminary survey consisting of analysis of the community's accidents had been made in order that the local program may develop around these facts, rather than generalities. Also in this connection, it must be remembered that certain limitations exist in the amount of work that can be undertaken, and it is our belief that we should concentrate upon the communities showing a serious upward trend in motor vehicle accidents, rather than dissipate our energies through working in communities having an accident frequency which is so slight that sound conclusions cannot be drawn upon which to base a prevention program. We are now proceeding on the basis that at least a preliminary survey of a community should be made and

that the local safety organization and program should be developed as the survey indicates.

Our executive staff consists of the executive secretary, field representative, engineering representative, assistant engineer and draftsman, press representative, two state police officers, chief clerk and three clerical assistants. A large staff is necessary in work of this nature, as the program is largely one of personal service.

Now, as to the program, we view our scope as affording an opportunity to do considerable laboratory and research work. We have amassed considerable valuable experience and data that we are constantly using as a basis for activities. Our program is divided into several groups, namely:

Public education: (1) Adult—safety talks, radio broadcasts, contests, tests, posters. (2) Child—safety talks, films, schools, playgrounds, theatres, civic and fraternal groups, commercial vehicle drivers, state supervision of safety education, lesson outlines.

Commercial vehicle drivers: State-wide contests, posters.

Engineering: Traffic safety surveys, isolated hazards, consulting work with police departments as to accident records, investigation of complaints as to isolated hazards as reported.

Enforcement: State-wide intensive law enforcement programs coordinating all enforcement agencies. Advisory and consulting work with police departments, relative to the relation of motor vehicle law enforcement to motor vehicle accidents.

Legislative: School bus regulations—lobby for or against proposed legislation. Advisory capacity to Legislature on motor vehicle accident prevention legislation. Support of legislation proposed by existing governmental agencies. Advisory capacity to cities and towns on Uniform Traffic Ordinance. Propagation of state codes for uniform signs, signals, etc.

Community safety work: Establishment of contact group or individual in each of the 355 cities and towns in the state. Continuous contact via field visits and news-letter service and joint conferences. State-wide annual conferences of all community representatives.

What the American Legion Can Do

By J. R. FRANKS

Chairman, Department Safety Committee, The American Legion,
Department of Florida

The speaker said in part: Many people have expressed surprise that The American Legion should be engaged in a program of public safety. This comes from people who know nothing of our organization. After more than a year in directing the safety program in Florida for the Legion, I am convinced that we have only tapped a source of strength and effectiveness that could be converted into a great tide of public sentiment. I do not know of any other organization in a state which can so effectively promote a public safety campaign. Some remarkable work has been accomplished in Florida recently under the handicap of lack of funds, etc. Safety campaigns have been carried on effectively in several of the large cities, through our efforts two of our largest cities are now engaged in an intensive campaign to improve local conditions. Model Municipal Traffic Ordinances have been adopted and studies are being made of street traffic conditions with the view of improving them.

I believe that school activities offer the most fertile field for the safety movement. If we cannot get our message across to the receptive minds of the school children, and if through the very many avenues of control open to us for handling the children we cannot make our schools safe and insure the safety of our children between homes and schools, there is not much hope for us among adults. Experience shows that the greatest good is accomplished in teaching safety as a definite part of the school curriculum and by the organization of school boy patrols and school safety councils. Through our auxiliary and its contact with the Parent-Teacher organizations, and through the local Legion Post activity with the school board and officials, we have been successful in getting quite a number of schools organized in this manner. We have had splendid cooperation from the American Automobile Association. The safety calendars of the National Safety Council should be in every school room, but we have not as yet worked out a satisfactory program of getting these placed.

Safety posters are also a fine medium for educational purposes. Much favorable comment has been received from the limited number of boards so far established. The posters are changed monthly as received from the Council. These boards carry the name of the Legion and of the local Legion Post.

I am convinced that the Legion must always recognize and cooperate with existing agencies in the safety movement, and we should always endeavor to avoid overlapping or duplication of effort. In many instances, the aid and support of the Legion is all that is necessary to put over some safety campaign already started by another organization and we should never lose the benefit accruing from such effort. On the other hand, the aid and support of some other organization is all that is needed in some instances to make the Legion campaign a success.

The Legion's safety program is most comprehensive; it provides a field for every Legion Post no matter what local conditions may be. The first step in organizing a state safety department is to secure an active department committee, and instruct the members as to their duties in their respective districts. A varied program is offered the local Posts and local conditions govern the particular phase upon which the Post safety committee centers its activities. Visits from the department chairman and members of the department committee to local Post meetings, district conferences and state conventions, are necessary, and this must be followed up with a continual stream of bulletins and literature to the local committee. We have to keep in mind always that most of our Legionnaires never heard of organized safety before. We also keep the program before the public through the daily press and daily radiograms from our principal broadcasting stations.

The State Traffic Engineering Department

By ARNOLD H. VEY

Traffic Engineer, Department of Motor Vehicles, State of New Jersey

The speaker said in part: In order that a safety campaign be successful in bringing about greater safety upon the streets and highways, it is paramount that the activities be planned not alone on factual data showing the causes of motor vehicle accidents, but also upon sound engineering principles, so that highway facilities and motor vehicle and traffic regulations shall be made fool-proof as far as possible.

The department should be organized and function as a separate State agency, or

it may be attached to an already existing department such as the Motor Vehicle Department, the State Highway Department, or some other agency dealing with the problem of street traffic. Regardless of how it is organized, it should be designed to give the greatest service to the citizens of the state with the least conflict and overlapping of duties and functions of other agencies.

The department should be given supervisory powers over all traffic matters, regardless of whether they concern roadways under the jurisdiction of the state government or local governments. In this manner only can uniformity and proper coordination in the design and application of traffic regulations be assured. Local officials largely amenable to political considerations are often compelled, against their better judgment, to accede to requests from their constituents in the matter of traffic regulation and signalization. The State Traffic Department can usually withstand this local political pressure. The State Traffic Engineering Department should not be given dictatorial powers over local traffic matters but merely that of approval. It should be empowered, however, to prohibit local governments from placing into operation regulations which have not been first approved by the department.

In addition, the state traffic department should have authority and should be given proper facilities to cause investigations to be made of all matters coming before it in order to obtain sufficient information upon which its recommendations may be based. It should also be enabled to gather and compile statistics of motor vehicle accidents to determine the condition involved and the causes and the results of street and highway accidents. Still another power should be jurisdiction over the application of uniform motor vehicle and traffic laws so that the fundamentals of traffic control and regulation may be similarly applied in all political jurisdictions of the state.

In New Jersey during the past two years, the Division of Traffic Control and Regulation of the Motor Vehicle Department has assisted and cooperated with local units in three county safety campaigns by furnishing material relative to the accident experience in these counties and by presenting safety talks to members of the safety organizations and citizens of the counties concerned.

THURSDAY AFTERNOON SESSION

October 5, 1933

The session was called to order by Franklin M. Kreml, director, Bureau of Accident Prevention, Police Department, Evanston, Illinois, who presided. This session was devoted to the problems of "Traffic Law Enforcement." Chairman Kreml presented his committee report.

Report of Committee on Law Enforcement

By FRANKLIN M. KREML

Chairman of the Committee

The speaker said in part: The past year has witnessed substantial forward steps in the field of traffic law enforcement. Your Committee has engaged in activities designed to reveal the place of enforcement in traffic accident prevention, to acer

tain the essentials of effective enforcement, and to promote the use of these essentials by cities throughout the country.

In April, Public Safety Memo No. 90, "A Program of Traffic Law Enforcement for Cities," was prepared by the National Safety Council's staff, approved and distributed. It was based on the experience of cities that were members of the National Safety Council, the result of the National Traffic Law Enforcement Demonstration, the reports of the National Traffic Safety Contest for 1932, and other sources of information.

In April the cities that had participated in the National Traffic Law Enforcement Demonstration in 1932, were invited to continue their cooperation by sending to the National Safety Council office each month a report of arrests and convictions for traffic offenses. Twenty-one cities have submitted 89 monthly reports, sufficiently complete for compilation and analysis. As the reports have accumulated, they have been compiled and studied and letters have been written to each of the reporting cities commenting on the effectiveness of their enforcement and, in several cases, recommending desirable improvements.

Other new developments in traffic law enforcement should be mentioned as follows:

1. *The enforcement index* was developed as a product of the National Traffic Law Enforcement Demonstration to serve as a measuring stick of traffic law enforcement. It is the number of convictions for offenses involving driven vehicles per accident involving personal injury or death. Your Committee recommends to all city traffic law enforcement officials the adoption of the enforcement index as a guide to the extent of enforcement in relation to the traffic accident problem.

2. *Selective enforcement* is a term coined by this committee for describing the directing of enforcement activities vigorously at those offenses that are most commonly involved in accidents, and at those areas or streets on which accidents are most common, particularly during those times when such accident problems are most acute. It suggests the most efficient use of limited enforcement personnel and facilities by directing them at the location and offenses where the greatest results can be accomplished in preventing accidents.

3. *Warning tickets*, for warning violators of minor regulations that they will be subject to arrest if the records indicate that their violations are persistent, have been inaugurated in some cities. Violators are given an opportunity to correct their bad practices and to demonstrate that they are not "repeaters" by being allowed an accumulation of two or three tickets before a summons is issued. This plan has been effective in relieving traffic courts of many minor cases, a large percentage of which are usually discharged when they are first offenders and in reducing "fixing."

4. *Accident investigation* to assemble evidence for the conviction of traffic law violators has made considerable progress in several cities in recent years. The reports of the first National Traffic Safety Contest, conducted in 1932, showed 58 cities conducting such activities to a greater or lesser extent. The benefits and results of the operation of accident investigation squads are well known. Your committee considers this the logical development and strongly recommends to all cities that such investigations be inaugurated for handling the serious accidents at first and later expanded to include those of lower severity. There is no better way to inaugurate a more vigorous policy and program of traffic law enforcement than what has been aptly called "post-accident enforcement," the vigorous prosecution of traffic law violations that have resulted in accidents.

Your Committee believes that in a more vigorous prosecution of traffic law viola-

tions, following a reasonable plan of arrests and the establishment of a greater certainty of punishment for such offenses, lies one of the greatest opportunities for reducing traffic accidents.

Experience Exchange

By CAPTAIN MATTHEW J. BOLGER

Traffic Division, Police Department, Newark, N. J.

The speaker said in part: The high accident and death rate of American cities proves that traffic law enforcement is a serious problem that will be solved only when the traveling public unites with the safety organizations and the police in a strict observance of enforcement of all traffic laws. The main responsibility for the enforcement of the various laws and ordinances pertaining to regulation of traffic must always rest upon our police department. This responsibility will be lessened only when the general public learns that proper enforcement is a necessity and not a fad.

In order to properly perform its duty, modern police departments have found it necessary to create a separate division usually known as the Traffic Division. This new traffic division calls for a high type of officer. In our city we have weeded out the old and inefficient officers and we now have on practically every intersection in our business district a very competent and highly trained officer, especially educated to deal with traffic problems. This Traffic Division is under a superior officer who has full authority to recommend a transfer from the division of any man unfit for traffic duty and to obtain replacements from the Patrol Division. Minimum standards of height, weight, appearance, etc., have been adopted.

As the division is now properly manned, the training of these men has become the next problem. A Traffic Officers' Training School was established under the supervision of the officer in charge of the traffic division. The faculty and facilities of the regular police training school was placed at his disposal. In order not to disrupt the division, these men were sent to school in groups of 24 at a time. They were required to perform night traffic duty while attending school. In addition to their attendance at the training school, the members of the mounted squad were ordered to attend drills at a local armory two days a week for a period of three months under the instruction of a cavalry officer. The members of the motorcycle squads were examined by a lieutenant of the division and where necessary were given instruction in the care and maintenance of their equipment.

All officers attending the training school were thoroughly instructed in the following: (a) the city traffic ordinances; (b) the state traffic laws; (c) the state motor vehicle act; (d) the code of hand signals; (e) filling out summonses, accident report forms, and other standard forms; (f) elementary first aid; (g) proper procedure of conduct in traffic court routine; (h) operation of an automobile; (i) the handling of emergency traffic situations resulting from accidents, fires and the like; and (j) military drill and calisthenics. This instruction was in addition to the training these men had received in the regular police training school.

Upon graduation from the training school, the officers were assigned to intersections throughout the city. No officer was permanently assigned to any particular intersection. All summonses issued by the members of the division were carefully studied and when an officer issued an unusual number, a survey was made of his assignment in an effort to learn whether the officer was properly performing his

duty. These surveys sometimes disclosed the fact that the officer was not capable of performing efficient duty at that intersection. If the fault was a serious one, the officer was transferred out of the division. If a minor one, the officer was assigned to a different intersection. Generally this shifting about was successful in producing a higher grade of service.

Further organization was effected by dividing the city into districts with a lieutenant in charge of each district, and subdivisions were made with a sergeant in charge of each subdivision. The lieutenant is in full charge of his district and must be familiar with traffic conditions and traffic officers in it. He must also investigate all complaints received from his district. Traffic officers must report all serious accidents at or near their assignments and the probable causes for them. This is in addition to the regular report form. The report is investigated by the lieutenant of the district who must, in turn, report any negligence on the part of the officer. Members of the division must also report all accidents in which they are involved whether on or off duty at the end.

It was impressed upon all members of the division that the prevention of violations was a primary duty and the issuing of summonses or making arrests a secondary one. This has led to an improvement in traffic conditions with a resultant decrease in the number of summonses issued. It has also created a more cordial relationship between the motorist and the traffic officers.

In the correction of motorists who leave their automobiles parked double, on cross walks, or too close to intersections, we have found that the only permanent deterrent has been the towing of the offender's automobile to a police garage.

Traffic in Cities from 10,000 to 20,000

By PAT HENRY

Chief of Police, Mankato, Minnesota

The speaker said in part: In order that we may approach the subject intelligently, it is necessary to understand not only the individuals, but their mental attitude toward regulations as well. People in larger cities are accustomed to rules and regulations, made necessary by the congested population. But people living in smaller cities and rural sections have enjoyed a freedom unknown by large city dwellers and have been accustomed to the free use of their streets and highways. When it became necessary for these smaller cities to adopt traffic ordinances and attempt to enforce them strictly, the country folks who had come in to patronize the merchants naturally resented it. The attitude of police officers was also resented, as it was their nature to regard violations of traffic ordinances in the same category with any other criminal offense, and the driver of an automobile is seldom a criminal and never recognizes himself as one.

All of these things caused me to give serious thought and study to the matter of traffic, and I came to the conclusion that it was not so much a question of enforcing laws as it was of educating the public. I found that a traffic officer in a small city by strict adherence to the law could do more to injure the good name and business of the community than any one individual. I realize that the average traffic officer of the small town accepts his position not as a regulator of traffic, but rather as a policeman. One of the greatest handicaps that the traffic officer in the small city or town has to overcome is the infringement of these rules by his personal friends,

and the friends of personal friends, and how to overcome this thing was a great problem.

I, therefore, requested the local press to permit me to give traffic talks through the medium of the press every Tuesday and Friday. On Tuesday I called attention to the accidents that had occurred over the week-end, pointing out just what mistakes drivers made which led to these accidents. On Friday I called attention to what might occur over the coming week-end and used words of caution so that all might profit by it.

I then interested the school officials, faculties and parent-teacher associations in my work. I want to say here and now that I am deeply grateful to them for the able assistance which they gave me in educating the youth of our schools and the people in general, and assisting me in creating the school patrol.

The automobile club of our city was induced to finance the school patrol. While it was no great outlay of expense, it was the greatest investment that any like organization has ever made, for it has resulted in saving many of our school children from accidents, and I feel mighty proud to tell you today that since the inauguration of the school patrol in our city we have not had one accident resulting in injury to our school children going to or coming from school.

I then made it a practice to visit the schools and talk to the children and endeavor to impress upon them the various dangers to which they could expose themselves in moments of carelessness, and in talking to these children I have impressed them that the officers are their friends; and I say this without any spirit of braggadocio, but simply to point out what coming in contact with these children means. I am known to more children in my home city today as "Pat" than I am as "Chief of the Department."

Wishing to overcome misunderstandings of traffic rules and to impress on the surrounding community that the officers of our city and the business men as well had nothing but the most cordial feelings toward the people outside of our city, I spoke to the different farm clubs and explained to them, not only the traffic regulations, but the necessity for such regulations. I have made this a part of my duty and have spoken to these various farm organizations within a radius of twenty miles around the city of Mankato, and have been repaid a hundred-fold, for I have found in the farmers and people of surrounding towns not only a willingness to cooperate, but a desire to do so. I wanted them to know that the police department of Mankato, and particularly the traffic department, was their friend.

To inspire courtesy on the part of drivers, I brought about what was known as the Courtesy Drivers Club. This was the issuing of free theatre tickets for acts of courtesy on the part of drivers toward pedestrians or other vehicles on our city streets. These tickets were donated by the theatres of our city. No driver knew when he was being watched and did not know that he was the winner of a courtesy card until his name appeared in the press, and it was surprising to see the results of this one act alone. We are all human and we love to win a prize, whether it be in a beauty show or a poker game.

Realizing the inconvenience that might be imposed upon visiting shoppers to our city, who were not familiar with our parking ordinances, and wishing to make their stay in our city a pleasant one, we adopted what was known as the guest card system. This permitted all shoppers from out of town to park their cars over the time limit in parking zones. By simply calling at the station they were given a sticker for their car, and it relieved the shopper of worry and further necessity of

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moving his car every hour, and what was best of all, it sent the shopper and visitor away in a happy frame of mind. Henceforth he was usually a man who wished to cooperate with the traffic department in observing all traffic regulations in our city.

There is one thing that I wish to say, and I mention it because of the grave injustice which I feel has been done to the women of our land. It would surprise the stronger sex if they were to look into this one particular phase to find that fewer accidents are caused by women drivers in proportion than by men. I attribute this to the fact that as a rule women will observe traffic laws and while it may be claimed that in extreme emergencies they may not act as quickly as a man, yet they do that which men fail to do, and that is, they avoid the occasion of emergencies by observing traffic rules and regulations.

THURSDAY AFTERNOON SESSION

October 5, 1933

The joint session with the Institute of Traffic Engineers was called to order by Lewis W. McIntyre, vice-president, Institute of Traffic Engineers, and vice-chairman, Street and Highway Traffic Section, National Safety Council, who presided.

The Law of Negligence as Applied to Traffic Accidents

By LLOYD F. RADER

Assistant Professor of Civil Engineering, Brooklyn Polytechnic Institute, Brooklyn, N. Y.

The speaker said in part: The following summary of the law of negligence as applied to traffic accidents may be made:

A plaintiff in an action must show a duty imposed by law upon the defendant, a violation of that duty, and that this violation proximately caused the injury to the plaintiff. The plaintiff must prove negligence on the part of the defendant. It is not necessary to have eye-witnesses of an accident to establish negligence, but there must be some evidence indicating negligence in the circumstances surrounding the occurrence.

Contributory negligence is generally a matter of defense, the burden of proving which is on the defendant. In some states, notably Illinois, the plaintiff must show that he was not guilty of contributory negligence in order to recover. In order to bar a recovery, the contributory negligence must have been a proximate cause of the injury. Usually, the violation of a statute or ordinance is *prima facie* evidence of negligence, but this does not prevent recovery when the proximate cause was the negligence of another.

Negligence must always be considered in connection with the care required of a prudent man under the circumstances. All travelers using a street or highway are required to observe ordinary care to avoid inflicting injuries on other travelers. The rights of vehicle drivers and pedestrians are equal and reciprocal under the common law. Some courts have held that an automobile driver must even exercise a greater caution in using a highway than a pedestrian. All persons, whether vehicle drivers or pedestrians, must exercise a degree of care and prudence measured by the care of a prudent man in like circumstances. The measure of care required varies with the

circumstances, and it is usually a question of fact for the jury to determine whether the individual exercised due care measured by this rule.

The general ruling with respect to the care to be exercised by a guest in a motor vehicle allows the guest to rely upon a driver whom he believes to be careful. The guest is not required to keep a lookout nor give warning, except in cases of rare emergencies, of danger known to him but unknown to the driver.

A person may assume that others will exercise reasonable care to avoid injury to others, but if he sees others violating rules and not exercising reasonable care, he is bound to look out for his own safety.

The common law rules of the road have been superseded in many states and municipalities by statutes, ordinances and police regulations. Lack of uniformity in traffic laws and regulations has caused much confusion. The National Conference on Street and Highway Safety has prepared the Uniform Vehicle Code and the Model Municipal Traffic Ordinance for adoption by states and municipalities respectively for the purpose of making all traffic laws and regulations uniform.

The laws of the road are not inflexible and one is charged with a duty to violate temporarily the rules in an emergency if necessary to escape danger to one's self or to prevent injury to others. Furthermore, the observance of traffic rules does not in itself prove a person free from negligence.

The courts hold that driving at immoderate speed may constitute negligence. Of the methods in use for prescribing speed regulations, the method prescribed in the Uniform Vehicle Code requiring a reasonable and prudent speed considering the condition, the conjunction with *prima facie* limits, is considered to be enforceable and is satisfactory legally in providing protection to parties injured in accidents where unreasonable speed was a factor.

The courts have held that at an uncontrolled intersection the vehicle arriving first at the intersection is given the right of way, and that the vehicle on the right has the right of way if the vehicles arrive simultaneously.

The common law gives vehicles and pedestrians equal rights on the highways at all points. Many ordinances have changed the common law rule so that pedestrians are given the right of way at all crosswalks at uncontrolled intersections, and so that pedestrians must yield the right of way to vehicles between intersections. When vehicular traffic is heavy, it is difficult for pedestrians to assert their rights at crosswalks, and physical protection by means of traffic signals and officers is necessary. Rotary intersections do not provide adequate physical protection to pedestrians when vehicular traffic is heavy.

Pedestrians are given the right of way over vehicles on the green, or "Go," signal at controlled intersections. Regulations permitting turning of vehicles on the red signal reduce physical protection to pedestrians even if they have the right of way. Traffic control signal practice in some cities provides for pedestrians-clearance intervals for the protection of pedestrians.

A pedestrian at the time of his injury at a point other than on a crosswalk in violation of an ordinance has been held guilty of contributory negligence, but not necessarily non-suited in an action for damages against an automobile driver.

Emergency vehicles are given the right of way over all vehicles and permission to exceed legal speeds when proceeding to an emergency, but their drivers are required to exercise due care for the safety of others. Ordinances ordinarily require emergency vehicles to be operated in accordance with traffic rules and regulations when not answering a call for service.

The majority ruling is that the city cannot be held liable for the negligent acts

of its officers if the officers are engaged in a governmental function. Many authorities believe this rule should be changed, by legislation if necessary, so as to spread burdens caused by accidents over the community rather than let them rest on an innocent victim.

Report of Committee on Traffic Engineering

By LEWIS W. MCINTYRE

City Traffic Engineer, Pittsburgh, Pa.

The speaker said in part: It is believed that the fundamental subject of "Accident Analysis and Its Application" should be treated in a manner that will be readily understood by any layman. A strictly technical presentation of the subject would limit its practical use to the relatively few experienced traffic men. On the other hand, setting up the subject from an elementary beginning right through to the technical phase will make material available for use by many times the number of present technical men employed in traffic work. This accounts for the subsequent treatment of the subject in this report.

The purpose of accident analysis is to provide the basis for a balanced program of traffic accident reduction through:

1. The promotion of a better understanding of traffic accident prevention work by bringing out the facts about traffic accident causes, and hence the enlistment of public and official support for an accident prevention program.
2. The promotion of more and better traffic accident reports.
3. The development of forms for statistics on accidents which show to what extent the driver, the vehicle, the pedestrian, the location, the traffic regulation, etc. are responsible.
4. The establishment of an engineering program commensurate with the size and character of the accident problem.
5. The correlation of enforcement activities with accident causes and high accident locations.
6. The indication of the fundamentals of child and adult educational work.
7. Proper motor vehicle legislation (revised and new, both local and state).

To properly study accidents, use must be made of such information as is available concerning accidents which have already happened. Such information must be obtained from accident reports, and the sources of such accident reports are as follows:

1. *Police accident reports*, which may be particularly complete if made upon forms substantially similar to the Standard Report Forms recommended by the National Safety Council; 2. *Operators' accident reports*, which, to be complete, demand the passage of state laws and local ordinances requiring each operator involved in an accident to submit a detailed report on a form provided; 3. *Coroners' records*, especially useful in checking fatal accident causes; 4. *Health departments*, which sometimes have considerable accident data; 5. *Insurance companies*, providing the insurance company can be convinced that the information will be kept absolutely confidential; 6. *Automobile clubs, newspapers and interested individuals*.

In the classification and reporting of accidents, the following items and procedures are valuable:

Monthly and annual accident summaries: The tally form and summary form

prepared by the National Safety Council, as the result of much consideration and experience, are especially recommended. Analysis of the statistics in summary form should be made monthly, semi-annually, and annually, and a report prepared bringing out the salient features of the accident situation. It is excellent material for newspaper stories and campaigns to inform the citizens of the actual accident situation. In the monthly summary, separate and summarize all accidents involving vehicles only, adult pedestrians only, and child pedestrians only; then combine these into the final summary. A monthly accident curve chart is also advisable. Also, a graphical record or trend curve showing by months the cumulative totals from the first of the year as compared with previous years, is also desirable.

Accident spot map: A spot map should be kept up to date so as to keep attention continually directed to bad accident locations. Special spot maps may be prepared to bring out special information, such as child pedestrian accidents, commercial vehicle accidents, etc.

Driver record: When the spotting of reports on the map has been completed, a driver record card should be made out. This driver record enables compilation and study of those drivers having frequent accidents, so that appropriate legal steps may be taken to weed out accident-prone and incompetent drivers. The card should contain all necessary information, also a record number so that reference to the actual accident report may be readily made.

Accident location file: Accident reports should be filed according to location, namely, at or between intersections (see Public Safety Memo No. 40). Any intersection or particular location where five or more accidents have occurred should have a separate index or folder. Any street along which more than twenty accidents have occurred should be so subdivided, so that no folder will contain more than fifteen reports.

Accident evaluation: The spot map may sometimes give an important accident picture, certain locations appearing bad but the majority of accidents being only minor in character. This is particularly true when police reports are used. Some method of evaluating reports is therefore suggested. This may be done on a basis of property damage reported, assigning personal injury and fatalities an arbitrary money valuation.

Under the general heading of "Application of Accident Analysis," the three general divisions, engineering, enforcement and education are to be considered.

The first application of detail accident records is to the study of high accident intersections or high accident areas between intersections, through the preparation of collision and condition diagrams. (The method of preparing these diagrams is given in Public Safety Memo No. 61.) Such diagrams depict accidents and furnish a summarized accident picture for a given period. By revealing a similarity in circumstances of accidents, they are invaluable in pointing out possible remedial measures. They cannot, however, always be depended upon to give the true accident picture, if the diagram becomes too complicated for an accurate picture, if the accident reports are not properly interpreted, or if the accident reports do not give all necessary details and circumstances pertaining to each accident. It is important that reports be complete. It is usually necessary to supplement information contained on the accident report by field examination or other study, such as traffic volume counts, speed checks, etc.

Entire dependance should not be placed on accident records to bring out hazardous locations, inasmuch as many accidents may not be reported. Citizens' complaints could receive detailed investigation and be correlated with the accident record. An-

other effective method of finding hazards is by dividing the area in question into districts. Competent observers should ride over every thoroughfare in this district with particular attention being made to the manner in which it is necessary to drive in order to be safe. Improvements will then suggest themselves. In practice, these should be checked with the accident record and subsequent factual study made when necessary.

It is important that all serious accidents, certainly all fatalities, should receive immediate field investigation by a police accident investigation squad. This should not result merely in a filing out of reports which may be filed and little attention be given to analyses. The engineering field investigation should be made at the same time of day and under similar conditions as prevailed at time of accident.

In many cases, particularly where areas other than intersections are being considered, a tabulation of accident types may be found more useful than collision diagrams. This is especially true where the accidents at any one specific location may be too few for a collision diagram to bring out the predominant type.

In determining how many accident reports should be on hand, or what severity should be evident before an analysis is made, there may be considerable difference of opinion. Certainly, locations having ten or more accidents in one year should be specially investigated. The efforts of the staff should not be dissipated by investigating minor accidents when there are still major accidents uninvestigated.

A study of accident records is extremely useful in making the enforcement procedure more effective, as follows:

1. The record of high accident locations can be correlated with past motor vehicle law enforcement activities at the same location; that is, arrests, type of convictions, fines, etc. Adequate correlation, of course, demands also adequate police records of arrests and fines.
2. Accident causes can be correlated with violations for which motorists have been apprehended.
3. Future enforcement activities can be guided by the accident information by: (a) establishment of motorcycle route with accompanying accident charts; (b) establishing necessary locations for fixed post traffic officers; (c) preparing accident charts for route patrolmen.
4. Informing the police officers to concentrate on these violations which have caused accidents during the preceding year.

An organized accident analysis procedure includes the formulation of a campaign of education, directed toward specific bad driving or walking habits rather than mere generalization. It enables:

1. A comparison between the amount of educational effort being extended to a definite age group and the accident experience in that age group.
2. The concentration of safety education on those pedestrian age groups experiencing the highest accident frequency. If the accident frequency is high for children of pre-school age, it is obvious that the educational effort must reach into the home. If, on the contrary, those of school age are having the highest accident frequency of the age group, here, too, concentrated educational efforts are possible.
3. The comparison of the accident history of different residential districts with the amount of safety education taught and made available in each.
4. Development of motorist educational material according to the residence of operators experiencing the majority of accidents.
5. The development and maintenance of the safety educational work in accordance with the varying monthly accident experience.

Effect of Signalization on Motor Vehicle Accident Experience

By ARNOLD H. VEY

Traffic Engineer, Department of Motor Vehicles, State of New Jersey

The speaker said in part: I shall briefly review here the results of three studies of the usefulness of signals in the prevention of traffic accidents, as made in three different sections of the country. The first and the most extensive study was made by the National Safety Council in 22 cities throughout the country, including Chicago, Detroit, St. Louis, Buffalo and Baltimore; this study included 354 intersections and was based on accident statistics, in some cases for more than a year before and a year after signalization. The next study was made by the traffic engineering department of the city of Philadelphia, embracing 190 crossings. The third study was made in the city of Trenton, New Jersey, which covers 55 crossings.

In the case of the National Safety Council survey, 62 per cent of the intersections had a decrease after signals were installed, while 38 per cent had an increase. As a whole, accidents decreased at the 354 intersections after installation of signals by slightly more than 20 per cent, or a reduction of one out of five accidents.

In the Philadelphia survey, 54 per cent of the intersections showed a decrease and 34 per cent an increase, while 12 per cent had no change in accident experience. The general decrease in this Philadelphia survey was 15.5 per cent after signalization for the 190 intersections, or a ratio of one out of slightly more than six accidents.

The Trenton survey showed somewhat similar results; namely, 56 per cent of the intersections showed a decrease, 29 per cent an increase and 15 per cent no change. There was a general reduction of 28 per cent in accidents at the 55 intersections studied, or again expressing this percentage in ratio, one out of nearly four accidents was prevented by the installation of signals.

An interesting comparison is found in the Philadelphia and Trenton surveys by grouping the accidents into three classes according to their frequency. Those intersections which had three or less accidents the year before signals were installed, in the Philadelphia survey showed a general increase of 39 per cent, while the Trenton survey showed a general increase of 70 per cent. Those intersections that had four to five accidents before signalization, in the Philadelphia survey showed a general decrease of 23 per cent, while the Trenton survey showed a general decrease of 19 per cent. Those intersections which had five or more accidents before signalization, in the Philadelphia survey showed a general decrease of 20 per cent, and in the Trenton survey a general decrease of 49 per cent.

This analysis indicates that those intersections which had the least accident frequency, ranging from nothing to three accidents the year before signals were installed, showed a greater accident experience after the installation of signals. In other words, instead of the traffic control signals causing a decrease in accidents, there was a decided increase.

A review of these accident statistics indicates that the traffic control signals had a decided curtailing effect upon collisions between vehicles approaching at right angles. For example, the Philadelphia survey indicates a 51 per cent reduction in this type of collision for the year after signals were installed compared with the previous year. In the case of the Trenton survey, there was an even greater reduction, namely, 62 per cent, or an average reduction for each of the two studies of 56 per cent.

In the case of the rear end collision type of accident, it was found that there was

an increase of 46 per cent for the Philadelphia survey, while in the Trenton survey there was no change, there being 26 accidents of this type either year.

Under the classification of pedestrian accidents, the Philadelphia survey showed a decrease of 4 per cent after signals were installed, while in the case of the Trenton survey there was an increase of 24 per cent, or an average decrease of 3 per cent.

Under the classification "All other accidents" there was a 34 per cent decrease for the Philadelphia survey and a 42 per cent increase for the Trenton survey. The Trenton survey also showed a 52 per cent increase in collisions between vehicles approaching in opposite directions where one vehicle was making a left turn, and also an increase in head-on collisions.

In general, also, it was found by these surveys that traffic control signals perform a greater function and are far more useful at intersections having higher traffic volumes, not only from a standpoint of more properly regulating the flow of traffic at the crossings, but also in preventing accidents. A further analysis showed that intersections which had an average hourly volume of traffic of 900 vehicles or more in all cases experienced a decrease in accidents after the installation of signals.

The National Safety Council survey compared the average percentage reduction for intersections located in different types of districts. This analysis indicated that with other things being equal, the chances of a good accident reduction following the installation of signals are better in the best residential districts, where there are fewer pedestrians, a more uniform traffic flow, and wide streets. In industrial and poor residential districts having numerous pedestrians, irregular traffic and narrow streets, the possibility of a large reduction in accidents is not great.

A further analysis by the Council indicated a greater effect following the installation of signals at simple intersections than at the more complicated ones.

Report of Committee on Headlighting

By R. N. PALGE

Research Engineer, Guide Lamp Corporation, Anderson, Ind.

The speaker said in part: It appears that under laboratory conditions—a driver with normal eyesight looking through a clean windshield on a clear, dry night—about 5,000 candle power is required to reveal a light colored object one foot wide and three feet high. Under similar favorable conditions, about 25,000 candle power is needed to reveal a dark colored object. Under adverse conditions, wet or dirty windshield, defective eyesight, facing oncoming headlights, etc., the required value must be several times greater.

From this, it appears that there are many conditions experienced in ordinary travel when at least 50,000 candle power is needed to show up obstacles at a safe distance ahead. To compensate for losses due to depreciation, wet and dirty lenses, low voltage, etc., the desired value must be at least 100,000 candle power.

Obstacles are most frequently located directly ahead at the level of the headlamp center. This is the direction which the maximum intensity must take to serve to best advantage. To provide adequate foreground illumination, show the way around turns, and reveal obstacles on upgrades, the intensity must shade off downwardly, well to either side, and upwardly. While such a beam serves admirably when the driver has the road to himself, it is not at all suitable for use when meeting another vehicle. At close range, both drivers would be blinded and its purpose would be defeated. To avoid dangerous glare, the intensity directed into the eyes of others

must be relatively low. For this condition, an entirely different type of beam is needed.

In actual practice, cars traveling at relatively high speed over dark country highways slow up very little upon meeting an occasional vehicle. Consequently, it is just as necessary to see obstacles and turns at a distance of 500 feet as when the driver has the road to himself. However, the light need not all come from one's own headlights. The oncoming headlights help a good deal in lighting the way. Also, the need for distant visibility is confined very largely to the right side of the road.

The beam best suited for this purpose is one aimed low on the left, to keep the high intensity below the other driver's eyes and high on the right, preferably with added intensity on that side, to reach well ahead and cut through the glare from approaching headlights. Occasional glare when meeting on right turns is much more than offset by the added visibility on the right at all times. A third beam, aimed low all the way across the road, serves nicely for continuous use with minimum glare hazards on lighted streets and highways and in medium to heavy traffic when speeds are low and other headlights help to light the way. Parking lamps should never be used alone when the car is in motion.

These are the considerations which lead to the development and introduction of three and four beam headlights as standard equipment on half a dozen well known makes of cars during the past year.

The automotive industry has been very active in determining safe lighting requirements and supplying equipment to meet them. It has cooperated with interested technical societies and state enforcement organizations in establishing the fundamental requirements underlying good headlighting. It has developed and produced headlights capable of meeting these requirements.

That there has been no corresponding degree of improvement on our roads at night is due to the fact that other phases of the problem have not received the same careful attention. It is not enough to provide headlights capable of producing satisfactory results in service, it is essential also that the headlights be properly serviced and used.

While important developments in production, service, and legislative fields are getting under way, we should be paving the way for an educational campaign designed to encourage proper adjustment and usage in states where the multiple beam practice is approved. A consideration which has seriously interfered with activity along this line in the past is the danger of criticism and confusion in single beam states. These difficulties would be avoided, of course, if we could all agree to promote the one practice.

From the foregoing it appears that an essential requirement in bringing about the essential and lasting improvements in headlighting conditions throughout the country is the adoption of a practice acceptable to the motoring public and the full cooperation of all interests involved in putting it across. Should any one of these interests fail to do its part or go off on a tangent, the efforts of all others are rendered ineffective.

In view of its wide contact with public officials, safety organizations, and others interested, the National Safety Council appears to be in an excellent position to cooperate in bringing about a better general understanding of the headlighting problem and in writing up these interests to proper advantage.

A summary of the points outlined in this paper is as follows:

1. The function of headlighting is to reveal objects at a safe distance ahead.
2. Modern operating conditions frequently require a visibility distance of at least 500 feet for safety.
3. At least 50,000 candle power is needed to insure this visibility distance.
4. Any beam which projects light high enough to show up obstacles 500 feet ahead, must glare if used when meeting other cars.
5. Two-beam headlamps now available on more than 75 per cent of all the cars on the road, provide a second beam aimed low enough to avoid glare in passing.
6. Three and four-beam headlamps recently introduced on several makes of cars, provide a third meeting beam aimed low on the left to avoid glare and high on the right to provide distance visibility.
7. The following are the three major headlighting difficulties: (a) laws specify the obsolete single-beam practice and are not being enforced; (b) headlamps are not correctly adjusted because adequate service facilities are lacking; (c) motorists are not using the lower beam for passing because of the confused legal situation and the lack of an educational program as to usage.

The following recommendations are made by this committee:

1. That the multiple-beam practice, sponsored by the Illuminating Engineering Society and the Society of Automotive Engineers in their 1933 specifications, be recognized by the National Safety Council as providing the type of headlighting required for safety.
2. That the Council advocate adoption of a multiple-beam practice in the Uniform Vehicle Code and in the laws of all states together with adequate enforcement; that in doing so it discourage the inclusion of current technical specifications in statute laws.
3. That the Council conduct an intensive educational campaign to impress upon motorists the need for maintaining headlamps in correct adjustment and for using the meeting beam when passing other vehicles.

Parking Problems at Secondary Schools

By E. B. LEFFERTS

Manager, Public Safety Department, Automobile Club of Southern California, Los Angeles

The speaker said in part: The automobile parking problems that exist at secondary schools, commonly termed high schools, are comparatively similar to those found wherever there is a like concentration of people and vehicles. It can be stated with certainty that there are few school traffic problems that are not aggravated and made more complex by uncontrolled curb parking. A brief outline of curb parking problems may be given as follows:

One evil is the moral hazard. Allowing students absolute freedom to sit in their cars during the luncheon or other school hours often invites contact with unsuitable types of persons and the formation of undesirable social relationships.

The presence of student cars closely parked in front of property nearly every day not only gives it an unsightly appearance, but in the event it is residential property, removes to some degree the privacy and quietude to which the residents are entitled. The parked vehicles are an inconvenience and accident hazard to the owner of the property and to his guests. The attractiveness of the locality as a residential district is decreased and consequently there is a depreciation of property values.

Uncontrolled parking at schools is found to have its influence in thievery or pilferage. Vehicles parked at random about school grounds are attractive to that repugnant type of person who makes a vocation of pilfering articles of value and of removing parts from the vehicles themselves.

All these problems, namely, vehicular congestion and accident hazards, moral hazards, depreciation of property adjacent to school grounds, and pilferage constitute perplexing questions associated with uncontrolled curb parking at secondary schools and are those problems that have in recent years justly warranted attention by the authorities. These agencies have been active and there now are in operation in the locality of the writer various plans to handle the problem induced by them.

Off-Street Parking: This is being effected by utilizing vacant portions of the school grounds as storage space for student and faculty cars, and is proving a satisfactory solution of the problem. In some cases, where there is not adequate space on the school premises, vacant property near the school has been rented.

Designated Curb Parking: Where off-the-street parking space is not available, another plan requires that students park their cars in front of improved lots only, instead of in front of apartment houses, residences and other buildings. Each student is required to fill out an automobile registration blank at the beginning of each school semester, and at this time he receives a map of the streets and lots contiguous to school property on which are shown the restricted parking areas.

Utilization of School Safety Committee: While the above suggestions meet only a part of the problems previously outlined, a supplementary plan utilizes a sub-committee of the school safety committee by having designated members of the committee patrol the premises during the school day. These students generally patrol during the hour that normally would be their study period in order that they will not miss any regular classes. It should not be inferred, however, that utilization of the school safety committee to patrol the school premises is limited to attacking the moral and pilferage hazards only, because when properly organized it results in safeguarding property and also in enforcing school parking requirements. The members of the committee greatly assist in the prevention of loitering.

It is concluded from this analysis that controlled parking is highly desired at secondary schools. It further is concluded that in the planning and building of future schools the problem of parking automobiles should be considered and provision made for off-street parking.

From the plans described for vehicular control at schools, it is evident that the utilization of the safety committee is more desirable and can be employed effectively by schools having sufficient vacant area on the grounds to store student automobiles, as well as in cases where there is not sufficient storage space on the grounds but the use of vacant property has been obtained near the school where students may park their cars. At those schools where off-street parking in any form cannot be acquired, and the designated curb parking plan must be used, it also has proved beneficial.

FRIDAY MORNING SESSION

October 6, 1933

The session was opened by Harold G. Hoffman, Commissioner of Motor Vehicles, Trenton, N. J., who presided. The meeting was devoted to a discussion of General Traffic Problems.

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Report of Committee on Pedestrian Problems

By MAXWELL N. HALSEY

Traffic Engineer, National Bureau of Casualty & Surety Underwriters,
New York City

The speaker said in part: The seriousness of the pedestrian accident problem is indicated by the following figures for 1932: (1) There were 280,000 auto-pedestrian collision accidents; (2) 39,500 pedestrians were killed; (3) 282,000 pedestrians were injured.

The Committee, therefore, recommends that more efforts be spent on preventing pedestrian accidents.

The relative seriousness of the pedestrian problem compared to the automobile passenger problem is shown by the following: (1) 46.8 per cent of all people killed in automobile accidents were pedestrians; (2) 71.2 per cent of all people injured in automobile accidents were pedestrians.

The Committee recommends that of all the amount of time and money available for accident prevention work, a greater proportional amount be spent on pedestrians.

The monthly variation of pedestrian accidents is shown by the following: (1) The rates of deaths per auto-pedestrian collision are 25 per cent greater in the first and last quarters of the year than in the second and third quarters; (2) In October 40.6 per cent of all personal injury accidents involved pedestrians; (3) In January, February, November and December auto-pedestrian collision accidents produced more than 50 per cent of the auto deaths.

The Committee recommends that pedestrian accident prevention methods be increased during the first and last quarters of the year, particularly during October. Emphasis on better lighting and reduced speed is believed necessary.

The age variation in pedestrian accidents is shown by the following: (1) The rate of the 0-4 age group per non-fatal injury resulting from auto-pedestrian collisions was 1.1 per cent worse than the average of all ages, but 64.6 per cent worse than the 5-14 age group; (2) the 5-14 age group was 38.6 per cent better than the average; (3) the 15-64 age group was 2.2 better than the average; (4) the 65 and over age group was 265.6 worse than the average.

The Committee recommends concentration on the 0-4 age group and the 65 and over age group, and a seasonal concentration on those under 14 years of age during the summer and those over 15 during the winter.

The actions of pedestrians involved in accidents may be traced as follows: (1) At intersections, 32.3 per cent of the accidents and 21.6 per cent of the deaths; (2) between intersections, 28.1 per cent of the accidents, and 30.8 per cent of the deaths; (3) walking on roadways, 3.5 per cent of the accidents, and 15.6 per cent of the deaths.

The Committee recommends concentration on: (1) Walking on roadway; (2) working in roadway; (3) getting on and off vehicles other than street cars; (4) crossing diagonally; (5) riding or hitching on vehicles; (6) crossing between intersections; and (7) crossing against signals.

The Committee also recommends concentration on the pedestrian problem during dusk and darkness.

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Street and Highway Traffic Section

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Education of Pedestrians

The following detailed program is recommended for the education of child groups, particularly pre-school groups and the group of 65 years and over.

In pre-school groups the following is recommended:

Parents—Supervision of and counsel with child. Solicit aid of other children in family. Utilize play grounds and the back yard or vacant lot.

Churches—All sects (Sunday Schools) correlation of religious instruction with highway safety rules and practices.

Kindergartens—(Public and private). Oral and written instruction by teachers.

Parent-Teacher Associations and Mothers' Clubs—Through periodic talks, distribution of printed material to parents.

Visiting Nurse Agencies—Counsel with parents and distribution of printed material.

For adult groups, middle-aged and aged and general, the following are recommended:

Newspapers—Periodic releases on current accident facts. Cartoons of various types. Stories and photos of accidents and investigations. Essay contests. Articles on respective rights and responsibilities of motorists and pedestrians; use of traffic signals, crosswalks, etc.

Radio—Daily or weekly broadcasts on review of current accidents, timely safety hints, seasonal hazards, unusual accidents. Special periodic broadcasts by judges, police chiefs, other officials, dramatized accident prevention activities. Special broadcasts of traffic court proceedings. Contests of various kinds. Special fillers for use by announcers.

Billboards and posters—Secure cooperation of local billboard advertising companies in using billboards for educational material. National Safety Council street posters. Posters on front, rear and inside of trolley and elevated railway cars. Posters inside and out of buses, outside on commercial vehicles. Use in all passenger and freight subway and terminal stations. Filling stations, garages, automobile sales rooms, factories and retail stores and similar establishments.

University extension—Evening and continuation school classes. Distribution of material and poster displays. Periodic talks by uniformed police officers.

Group meetings of service clubs—Fraternal and social organizations. Special rallies of citizens. Periodic safety talks and the distribution of material.

Employers-employees meetings—(a) Commercial vehicle drivers. (b) Industrial employees. (c) Retail store employees. (d) Accident prevention articles in house organs.

Motion picture theatres—(a) Use of slides carrying slogans, special hazards and other appeals. (b) Occasional run of photos of unusual accident investigations and dispositions. (c) Short trailers by local theatres on special problems. (d) Special programs on Saturday morning for children. (e) Contest to reveal safe drivers and pedestrians with free tickets to winners. Slides showing winners, etc.

Churches—Periodic correlation of accident prevention material with sermons. Special announcements relative to serious local problems. Educational material in weekly bulletins, slogans, etc. on bulletin boards inside and out.

Casualty and Life Insurance Companies—Issue pedestrian safety pamphlets to assured. Correlate pedestrian educational material with advertising. Issue pedestrian safety posters. Arrange for engineers, inspectors, claim adjusters, etc., to propagate pedestrian safety education.

Pres. - ...
Sec. - ...

Traffic Signal Control of Pedestrians

The Committee recommends that special pedestrian lights be used to show the pedestrian "go" and "change" periods. Also that a special pedestrian period of red and yellow be shown in all directions simultaneously, to be used, however, only at heavy pedestrian intersections, "T" intersections, rotary traffic circles, or when vehicular turning movements are heavy.

The following points are recommended by the committee for any pedestrian installation:

1. If there is not enough vehicular traffic to warrant signals alone, (a) the signal should be automatically turned on and off so as to be on only during the time when the chief pedestrian flows exist; or (b) pedestrian push buttons should be used; or (c) traffic actuated signals should be used.
2. If vehicular volume alone warrants signals, (a) changes in period or cycle length to provide adequate time for pedestrians to cross should be automatically provided during the time of day when they are needed; or (b) pedestrian push buttons should be used.

Auxiliary devices, such as the use of bells, buzzers, or whistles are not recommended, since it is believed that they do not add much to effectiveness and cause a disturbance and distraction in excess of their value.

The following auxiliary signs are believed to be of material assistance to signals:

1. Signs on safety islands urging pedestrians to cross the street on the "go" signal;
2. At the time of installation, signs explaining the meaning and operation of the signals;
3. Where signals are not in operation continuously, signs stating the hours of operation.

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Legal Side of the Pedestrian Problem

The Committee recommends the following legal steps to improve pedestrian safety:

1. The sections of the Model Municipal Traffic Ordinance respecting pedestrians should be passed by all municipalities.

2. The ordinance should be passed requiring pedestrians to cross streets only in crosswalks, mid-block crossing should be prohibited unless painted or marked crosswalks are provided.

3. States should pass laws requiring pedestrians to walk on the left side of the road facing traffic.

4. Consideration should be given to laws punishing pedestrians for disobedience of the above. This might take the form of fines, the relinquishing of certain rights in civil actions resulting from accidents, or some other method.

5. Special consideration should be given to public education of the enforcement of these laws.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Child Education Section

Officers 1932-33

Chairman—DR. THOMAS W. GOSLING, Superintendent of Schools, Akron, O.
Vice-Chairman—W. H. BRISTOW, Department of Public Instruction, Harrisburg, Pa.
Secretary—MISS MARION TELFORD, National Safety Council, New York City.

WEDNESDAY AFTERNOON SESSION

October 4, 1933

The session devoted to a business meeting of the Child Education Section was called to order by General Chairman Doctor Thomas W. Gosling, who presided. Miss Marian Telford served as secretary.

The importance of the Standard Accident Report card and Summary Sheet was discussed at length. Dr. Charles J. Prohaska, chairman of the Statistics Committee of the Section, commented on the value of child accident statistics in the development of school safety programs and reported on a practical difficulty sometimes encountered in attempts to extend the use of the reporting system. Some school officials fail to see the value of student accident statistics and feel that the collection of this data does little more than increase the clerical work of the school department. Miss Mary May Wyman, supervisor of health and safety, Louisville, explained the manner in which data on child accidents is collected in Louisville and the extensive use made of it. Dr. Sherrard, associate superintendent of schools, Pittsburgh, reported that the use of accident report cards and summary sheets in the schools of that city had resulted in the appointment of a building inspector for the public schools. The members of the Section agreed that an adequate reporting of accidents is a fundamental part of a safety program. Efforts to increase the collection of data on accidents to school children will be continued.

Dr. Herbert J. Stack, chairman of the Secondary School Committee, reported on the work he is doing with Dr. Ireland of the New Jersey Department of Public Instruction, through county conferences of superintendents, to be followed by meetings of principals and teachers. The presentation of the safety problem at these meetings is to be followed by the development of courses of study. Dr. Stack emphasized the importance of safety materials in state courses of study (in the state health course, for example, as in New Jersey) and of reaching the students in teacher training institutions. The county conference plan of stimulating safety activities was recommended to other states. It was pointed out, however, that this plan may require considerable help from outside the schools and may not make adequate allowance for the differences between rural and city areas in many states. It was argued that in every plan of activities an effort should be made to reach the normal schools.

Methods of securing reports on safety activities from the members of the section were considered at length. It was suggested that officers and members might well be invited to prepare special reports or articles for *Safety Education Magazine* or an informal bulletin to be prepared especially for members. Miss Florence Nelson, editor of the magazine, expressed her interest in new material.

Legislation requiring safety instruction was warmly discussed. Dr. Gosling and Mr. A. W. Whitney took the position that curriculum making by uninformed legislators was undesirable. Dr. Prohaska said that the legal requirement for health and safety teaching saved the program in Connecticut. He pointed out that both art and music, neither protected by legislation, were discontinued in many schools in the state in the interest of economy. Miss Telford commented on the unsatisfactory programs being developed where a law specifies the teaching of only one phase of safety, fire prevention or highway safety, for example. It was suggested that the Section should take a general stand against attempts to legislate safety into the schools but, where legislation seems inevitable, should recommend a general all-inclusive law. The secretary was instructed to make a study of existing legislation on safety education and prepare a bulletin on the subject for members.

Mr. Whitney made an interesting announcement on the researches in accidents in athletics and other fields sponsored by the fellowships of the National Bureau of Casualty and Surety Underwriters. Captain Fred Mills commented on the safety program of the Boy Scouts and Miss Olive McCormick on similar activities among Girl Scouts.

New Section Officers

Doctor Thomas W. Gosling, Superintendent of Schools, Akron, Ohio was re-elected to serve as *General Chairman* of the Child Education Section through 1933-1934. Other officers were later appointed as follows:

Vice-Chairman—William H. Bristow, State Dept. of Public Instruction, Harrisburg, Pa.

Secretary—Marian Telford, Education Division, NSC, New York City.

Chairman Program Committee—Thomas W. Gosling, Superintendent of Schools, Akron, O.

Chairman State Activities—Walter D. Cocking, Commissioner of Education, State of Tennessee, Nashville, Tenn.

Chairman Statistics Committee—Mary May Wyman, Public Schools, Louisville, Ky.

Chairman Elementary Committee—H. Louise Cottrell, Stockton School, East Orange, N. J.

Chairman Secondary Committee—Francis L. Bacon, Evanston Township High School, Evanston, Ill.

WEDNESDAY AFTERNOON SESSION

October 4, 1933

The session was devoted to a Demonstration of Child Safety Activities at School, presented by various divisions of Girl Scout troops and Boy Scout troops, the features taking place in the Eighth Street Theatre. The following were responsible for the development of this interesting program: Doctor Charles Lunak, Associate Superintendent of the Chicago Schools, and Miss Kathryn Galvin of the Lowell

Schools; Captain Fred Mills of the Boy Scouts of America, New York City, and Mr. Hallen, a Chicago Boy Scout leader; and Miss Olive McCormick of the Girl Scouts, New York City, and Miss Elizabeth Mundie and Miss Chidlaw of the Chicago Branch of the Girl Scouts. Ushers for the meeting were provided by Mr. Paul C. Husted, Assistant Safety Director of the Chicago Motor Club.

THURSDAY MORNING SESSION

October 5, 1933

The session was devoted to a panel discussion of the subject "Who should assume the responsibility for teaching young people how to drive?" F. C. Lynch, manager, Kansas City Safety Council, presided over the session and participants in the general discussion were as follows:

Francis Bacon, Principal, Evanston Township High School, Evanston, Illinois; Dr. Herbert J. Stack, National Bureau of Casualty and Surety Underwriters, New York City; Bert Keeler, Sponsor, Motor Traffic Club, Hammond High School, Hammond, Indiana; Franklin Kreml, Director, Accident Prevention Bureau, Evanston Police Department, Evanston, Illinois; Mrs. B. F. Langworthy, First Vice-President, National Congress of Parents and Teachers, Winnetka, Illinois; Mary May Wyman, Supervisor of Health and Safety, Louisville Public Schools, Louisville, Kentucky, and Marian L. Telford, Field Secretary, Education Division, National Safety Council, New York City.

Every member of the panel and a large percentage of the audience participated in a lively two-hour discussion of the general question.

After introductory remarks by the chairman, Mr. Kreml opened the discussion by describing the Evanston plan of coöperation between public and school officials in the presentation of instruction in good driving to the students of the Evanston Township High School. Mr. Kreml took the position that the responsibility for the instruction of young drivers rested primarily upon the police, secondarily upon school officials. He emphasized the need for careful selection of the public officers assigned to this special work in the schools. Mrs. Langworthy expressed the belief that the training of young drivers should begin long before the students reached high school and suggested that parents should be considered responsible for early instruction, particularly general instruction in law observance. Miss Wyman held the theory that formal school instruction should be given by teachers who have carefully prepared themselves for their profession, rather than by men whose training has been largely in police rather than educational fields.

The chairman then pointed out that a discussion of *how* safety instruction is being given at the present time and some agreement on what needs to be taught might aid in placing responsibility for the program. Mr. Keeler then described the organization of the Motor Traffic Club in the Hammond High School. This club is a part of the general extra-curriculum activities program of the school. When the Motor Traffic Club was announced 400 students applied for admittance. Since such a large group could not be handled in a single organization the number was cut to 50 by limiting membership to those students holding Indiana driver's licenses. After the organization was completed the club studied the state motor vehicle law, the local driving ordinance, the causes of automobile accidents and many other topics having a bearing on safe and efficient driving. Miss Wyman described the organization of the Motor Traffic Club in the Louisville Girls' High School, placing emphasis upon

the fact that the club is organized in such a manner that its members can reach every student in the school through reports before home rooms. The Safety Council of the Evanston Township School was commented upon at length. This organization is made up of home room representatives who (1) make the rules necessary to insure safety on school property—traffic rules, for example, (2) reach the entire school membership through reports to home rooms, to wide use of posters, and (3) conduct a general instruction course in driving open to all students. Dr. Stack described the drivers' tests used so widely in the high schools in Massachusetts, Maryland, New Jersey and Pennsylvania.

Discussion next turned to *what* a student needs to be taught. The chairman pointed out that each student must be given an opportunity to develop skill and judgment and to become familiar with the motor vehicle laws and general driving customs.

Mr. Bacon discussed both method and program content and advanced an opinion that safety instruction in connection with health is ideal in theory but impractical in practice because of the large number of secondary schools without health programs. He said that the integration of safety instruction with civics was the most feasible.

The discussion closed with the participants and audience agreeing with a general statement presented by Mr. Sidney Williams to the effect that the responsibility for the instruction of young drivers belongs first to the home, particularly training in law observance, then to the school supplemented by the assistance of police, traffic and other experts. The conference group accepted Mr. Bacon's suggestion that an effort be made to arrange a similar panel discussion before the next meeting of the National Association of High School Principals.

THURSDAY MORNING SESSION

October 5, 1933

The session was devoted to the problems of Vocational Schools. Gordon C. Graham, safety engineer, Detroit Public Schools, called the session to order and presided during the morning. He first gave a brief résumé of the year's activities and then called upon the first speaker.

Safety in the School Shop

By JOHN J. METZ

Editor, Industrial Arts and Vocational Education, Milwaukee, Wis.

The speaker said in part: Statistics show that child deaths due to accidents have decreased since school safety instruction was commenced in 1922. In the school shops, however, while the shop teachers have been aware of their duty, safety instruction has not been quite so successful. A study made by Wayne M. Judy, covering the industrial arts school shops of an entire state, showed that at least 12 per cent of the accidents that happened in those shops were caused by conditions which could have been controlled by the schools in which the accidents occurred. Evidently someone in authority in the schools of that state was not fully alive to his responsibility for remedying these conditions.

One of the most important factors predisposing to school shop accidents may be directly traceable to the erroneous idea held by school officials, superintendents and

principals, that the school shop is a logical dumping ground for all sub-normal and troublesome students. A study made by Doctor Max Heng at the Essex County Vocational School, shows fairly conclusively "that the lower the intelligence level, the greater the likelihood of accidents." He also shows that the less intelligent group furnishes the greatest number of repeaters.

Confronted by the necessity to make safety conscious that large body of young people who leave our schools to enter industry, the first necessity is to make safety instruction in the school shops vital and dynamic. Safety education must also be specific. There must be no vagueness about what the student is to avoid, or how he is to act under certain conditions. The teacher must foresee what may happen and help the student establish safe habits, but he also must assist him in working up a technique that will allow him to go unscathed in spite of a probable mishap. Thus a student must be warned to avoid allowing tools or other materials to fall when he is working with them on a raised platform or scaffold. He must, however, also be warned that if he should allow something to fall, he should be exceedingly careful not to make any unthoughtful attempt to stop it in its descent, because it is better for that object to fall to the ground than that the worker should lose his balance reaching for it and then plunge down after it.

It is also well to show what carelessness means in the life of the worker. A lost hand or a missing arm may be the mark of heroism in the case of a soldier, but an industrial worker who has lost a limb is usually looked upon as one who most likely deserves blame for carelessness. It is well also to point out how the actions of the unsafe worker endanger others, whether they be fellow workers or those who are dependent upon the worker for support. Moreover, the relation of good health to accidents must be stressed. The man who is in ill health, no matter from what cause, must be doubly careful because his condition predisposes him to accidents. Likewise, the improper use of food or drink, or carelessness in getting the proper amount of rest at night, may and frequently does make the worker subject to accidents.

Other general safety rules with which all workers should be fully conversant, have to do with the lighting and ventilation requirements over which employees may not have much control, but with which they should be conversant nevertheless. Likewise, the student must be impressed with the fact that all guards and safety appliances must be used even if he should find it more convenient or more comfortable to work without them. A pair of goggles may not be very comfortable on a hot summer day, but it is better to wear them than to lose an eye. Then, too, the need of keeping fire escapes, doors, stairways, and passageways clear and approachable, must be made a plain duty for all.

Much of this instructional work may be carried on by means of the discussion method accompanied by demonstrations. Posters also should be used. There are some teachers who object to the use of posters showing the disfigurements caused by actual accidents as being too shocking to young boys. This objection ought not to be considered too seriously. It is better to be shocked by a picture than by an actuality which affects one's own person. Of course, the teacher should be careful to show the students that it takes but ordinary, even though diligent care, to avoid the disfigurements pictured lest the one or the other student equipped with a nature that is so sensitively attuned may develop a fear complex which will do more harm than good.

Shop trips, with the definite objective of studying the safety devices and guards used in a particular industry, are also conducive to a great deal of good, especially

if the teacher has gone over the ground before, so that he may point out the essential facts to the students while they are going through the shop. Later the high lights of such a trip should be recalled to the students' minds by a discussion, either oral or written, or by a test of some kind after the trip has been completed.

Much good, too, can be done by safety talks given by men actively engaged on work done on machines similar to those used in the school shop. The shop students frequently have the idea that the instructors may know theory but that for information on practical work they must rely on men outside of the school. Inviting outsiders, then, to speak on the safety movement usually has beneficial results.

Other valuable aids are the many safety bulletins issued by some of the concerns manufacturing guards, goggles, and other safety appliances. Most of this material may be obtained free. The National Safety Council is issuing excellent material with which the school teacher ought to be provided because it will help him to bring his safety instruction up to the minute. Furthermore, it may help him get the infectious enthusiasm which many large industrial firms have injected into the safety instruction given by their men.

In order to put the safety instruction in such form that the student can refer to it again and again, the material ought to be in unit instruction form so that it may be made part of the student's own notebook. Then there ought to be numerous tests given to the students, in order to test their knowledge on the safe use of hand and machine tools. These tests, duly signed by the students, should be carefully kept on file by the teacher. They may become valuable, in case of accident, as evidence in cases where boys deny that they received instruction in use of the tools on which or with which they were hurt. Safety instructions and warnings also ought to be posted in various places in the shop, and no pupil should be allowed to use a machine tool without previous instructions on how to use it correctly.

In all of this safety instruction, the teacher should be careful to show his pupils that the subject is so important that even he will not shoulder all of the responsibility, but they must share it with him. For that reason he will appoint safety inspectors and safety foremen among the students in each class, thus increasing the safety supervision in these classes to a much greater degree. It will be found that the boys are willing to assume responsibility, too, and the results of this closer check-up will quickly become apparent.

Doctor Henig has published the results of a study made to determine the mental causes of work accidents among students. The results of this investigation were quite enlightening. Lack of foresight was the cause of the greatest number of accidents. Then followed "ignorance of the hazard", "taking chances", "disobedience", "haste", "inattention", and "fatigue" in the order named—fatigue being given for the smallest number of accidents.

It is well also to arouse the interest of the students in the cause of safety by keeping a record of all injuries in each class. This record should occupy a prominent place in the shop so that it is visible at all times, thus permitting one class to compare its injury record with that of other classes. At the end of the school year, probably at a graduation exercise, special mention should be made of the class with the smallest injury record. It is not uncommon now for even comparatively large plants to run for weeks and months with a no-injury record; probably the school shops will be able to do as well.

There are those who have the mistaken notion that only those shops equipped with machinery are really in need of safety instruction. There are, however, many acci-

dents traceable to the use of hand tools, and the safety instruction in shops where these alone are used should be as carefully and as thoroughly given as in shops equipped with power machinery. In these shops especially the shop safety instruction may have a great carry-over value for safety in the home. In all shops the attention of the student must be called to such things as the proper piling of materials and of unfinished or finished projects; to the safe carrying and stacking of tools; to the correct use of ladders; to the safe handling, lifting, and moving of heavy objects; and to the proper manner of carrying long bars, pieces of lumber, and other bulky materials through the shop.

The teacher must not forget also that many accidents are the result of horseplay, and the boy must be carefully warned against such practices as connecting electrical wires to a machine in order to shock the boy who will next use that machine. The danger of playing with the compressed air hose must be impressed on the young worker. Men have lost eyes because someone playfully turned on high pressure under their faces from such an angle that the eye was blown out of the socket. Others have been crippled for life because someone in a playful mood snatched a high stool or other support from beneath them.

What Training in Safety Means to the Industrial Worker

By RUFUS JARNAGIN

Senior District Supervisor, New York State Department of Education,
Buffalo, N. Y.

The speaker said in part: Industry early discovered that 70 to 90 per cent of accidents result from unsafe practices rather than from inadequate or ineffective mechanical safeguards. The elimination of these unsafe practices has been the objective of organized safety work within industry almost without exception during the progress of safety campaigns.

How is it done? By organizing safety committees representing all workers within the industry, who meet regularly and with sufficient frequency; by providing regular safety lectures and safety talks; by showing motion pictures or stereopticon slides that provide a safety moral; by distributing and posting illustrated pamphlets and posters; by providing premiums for the habitually careful and safe employee and punishment for the habitually careless or negligent employee.

Has the time not arrived in vocational education for us to take this leaf out of the book of industry and adopt it as a part of our general training system? Can we not organize safety committees among the students chosen from their own membership who shall meet regularly and report all accident hazards? The local industries will provide stereopticon slides, motion pictures, safety speakers, and appropriate pamphlets can be secured from the National Safety Council. Such a program will not only inculcate the ideas of safety in the minds of the students but will make them safe workers in the future.

Perhaps I can illustrate the need of this training by some of our experiences in the Buffalo vocational shops during the past ten years. One student electrician lost 50 per cent of his right hand because of electrical burns. He forgot or neglected to throw off the switch before he attempted to make some minor wiring repairs.

Another boy in a different vocational school attempted to crank an automobile without assuring himself that the gears were in neutral. He succeeded in starting the car which ran him down and squeezed him between the front bumper and the

brick wall of the school. Serious injury resulted and it was necessary to amputate his left leg.

Still another boy lost two-thirds of his right hand in the operation of a circular saw. The saw had a proper guard but it had been removed when the accident occurred.

Still another boy, while learning auto repairing, lost an eye in one of our vocational schools because he was not wearing his goggles.

Each of these boys was 16 or 17 years old when these serious and permanent injuries were caused. Naturally, a permanent injury at this age is much more serious than in an older man. Their whole future is blighted in the very springtime of youth. And we know from our experience in industry that such accidents can be prevented through organized and scientific training in safety.

At present, accidents such as these are not covered by any state compensation law. It is rare, if ever, that any damages are paid. Court actions are rarely instituted. Where they are, generally they are not successful. In all the cases cited, which are illustrative of others, the parents were in humble or very mediocre circumstances. Because of these serious injuries probably not more than one of these boys would have been able to continue his training without some financial assistance from an outside source.

Is this social justice? Do not such injuries come within the spirit of compensation legislation? Have we not reached the stage of our development where compensation can be considered in cases such as these, at least payable in accordance with the minimum provisions of the laws of the state in which such accidents occur? Such legislation has been considered for some years by responsible educators and labor department officials in New York, but thus far no effective plan has been evolved. I suggest its consideration by other progressive states.

ADJOURNMENT

TWENTY-SECOND ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Home Safety

FRIDAY MORNING SESSION

October 6, 1933

The Home Safety session was called to order by Dr. R. M. Little, Director of Rehabilitation, New York Department of Education, Albany, New York, who presided. Chairman Little made a short but striking presentation of the home safety problem, and called attention to the important but wholly inadequate activities that are being carried on to curb accidents in the homes of the country. He then introduced the first speaker.

The National Home Safety Survey

By R. L. FORNEY

Statistician, National Safety Council, Chicago

The speaker said in part: Of the 89,000 accidental deaths in the United States in 1932 approximately 28,000 were the result of home accidents. This is only 1,500 less than the 29,500 deaths from motor vehicles and far exceeds the occupational death total of 15,000 or the public (not motor vehicle) total of 18,000. In addition to these fatal accidents there were probably about 4,000,000 non-fatal injuries, many of them resulting in permanent disability.

From 40 to 45 per cent of all house fatalities result from falls. In 1931 it is estimated that 12,800 persons lost their lives from home falls. Another 5,600 died from burns, scalds, and explosions and about 2,100 from asphyxiation and suffocation. There is considerable variation at the different ages in types of accidents. Among young children burns and scalds are by far the most important type of accident, accounting for 36 per cent of all deaths to children under 5. The importance of burns and scalds decreases at the older ages and that of falls increases. Among persons 65 and over, 76 per cent of all home deaths result from falls.

The National Home Safety Survey, conducted by the National Safety Council during February, 1933, together with other available data, indicated that more home accidents occur in the kitchen than in any other part of the house. In fact, about 34 per cent of the home accidents were charged to the kitchen, 23 per cent on stairs and in halls, 13 per cent in the living room and the basement, and the remainder in scattered locations. These combined locations inside the house account for about 73 per cent of all home accidents, the remaining 27 per cent occurring outside the house on walks, porches, etc.

Every community should maintain a continuous record of home accidents, at least fatalities, because the types of accidents vary a great deal from month to month and from city to city, and an effective prevention campaign will be possible only if the character of the problem in each city is definitely known and prevention measures directed at the most serious hazards as brought out by the records. The number of deaths from home accidents and the most important facts regarding them can be obtained from the death certificates filed with the local registrar of vital statistics. Any city in which this information is not now being made available should immediately arrange for it.

The number and character of non-fatal home injuries can be obtained to some extent from hospital records. For the many thousands of less serious home injuries, however, it is recommended that a survey be made as a part of the National Safety Council's plan to maintain a record of all home injuries for at least one month of the year. The next of these surveys will be in November, 1933, and all organizations interested in home safety are invited to participate.

*Orig. paper
H/55*

Safety in the Kitchen

By MRS. MARY KOLL HEINER

Assistant Professor, Department of Home Economics, University of Chicago

The speaker said in part: I consider it quite unfortunate that many of us in the field of educating home makers are unaware of the excellent accident prevention material that has been so effectively assembled for visual education by the National Safety Council in film strips and in Home Safety Pamphlets. I feel that in addition to getting a wider distribution of this already available material, the National Safety Council can make a significant contribution toward reduction of home accidents by sponsoring an educational program that might so train the oncoming generation that many of the accidents now current would be listed out of the realm of possibilities.

The statistics assembled by the Council give ample evidence of this need. They serve in addition to illustrate what William E. Ogburn, sociologist, so aptly terms our "cultural lags." Our non-material culture, says Mr. Ogburn, our customs, traditions, and behavior lag behind, change less rapidly, do not keep pace with our material culture, i.e., the technological improvement in industry, equipment, tools, conveniences, and such. In other words, we do not know how to use the conveniences and advantages that science ruins down supposedly for our greater comfort and well being.

That we do not train our young people in the fundamental principles underlying the effective and safe operation of our myriad conveniences is evident on all sides. We are still in the "rule" stage as far as the control of household convenience is concerned. This is practically brought out in the pamphlet "Flaming America" which asks "Why is it that Europe with the poorest fire departments in the civilized world, has such a low fire loss when compared with America, which has the most magnificent fire-fighting equipment?"

Years of living may or may not give a "common sense" knowledge of the "how and why" of coping with accidents in the kitchen. Your statistics would seem to indicate that it cannot be presumed upon. Taking this, and the needed equilibrium or poise (and both are increasingly difficult to acquire with our increasingly com-

plicated ways of living) safety training would seem essential to a program of prevention.

When certain fundamental laws are violated, accidents will always occur around the four major work centers in the kitchen, viz., the stove, the sink, the work area, and the storage areas. Burns and scalds constitute about one-quarter of all injuries in the home and about 50 per cent of these occur to children under 15 years of age. This obviously indicates the need of teaching causes and principles of control around the sink and stove.

On this basis, attempting to analyze causes in some such fashion as here briefly indicated, we should say accidents around the stove have to do primarily with an unbalanced supply of air. This may be divided into those based on (a) an inadequate supply and (b) too much, resulting in flames. Where the inadequate supply occurs, incomplete combustion follows. This may be (1) a small degree of carbon monoxide in the air, resulting in vitiated atmosphere leading to lassitude, stupor, and headache, with the probability of increased accidents in working about the kitchen. (2) A large degree (in the case of some types of manufactured gas with improperly selected appliances unintelligently cared for) with enough carbon monoxide to cause death. In some large cities this cause averages one fatal poisoning a day.

Control over this type of factors which consists in knowing how to buy safety, rather than charm, in a stove and how to control the secondary air supply to effect complete combustion in types of utensils, cleanliness of portholes and effective chimney connections.

The sink and stove together are the contributing causes of burns and scalds. These may be fundamentally based on a lack of knowledge of the effects of such extremes of temperature, or the unequal expansion and contraction of materials about the kitchen, or the most effective means of cutting off the excess air that encourages flame. With 36 per cent of the deaths of children under 5 traced to this set of causes, one is led to speculate as to what degree a faulty knowledge of child training and to what extent over-crowded conditions in the kitchen are contributing factors. One wonders if, instead of taboos around the sink and stove, the natural curiosity of childhood were anticipated by arranging utensils properly about these two areas and scheduling work in terms of a child's rest and play periods, what might be accomplished by these means in control in this lamentable group of fatalities.

A study conducted for the President's Conference on Home Building and Home Ownership discovered 66 per cent of the American white families in scattered areas in Chicago eating the main meal of the day in the kitchen. Does this again represent a cultural lag echoing back to farm days when this practice was a necessity, or is it due to bad architecture, placing too great a distance between the kitchen stove and the dining room table? Or is it due to a misplaced sense of values, i.e., having dining equipment too fine to be enjoyed by the family and reserved only for "parade" purposes with guests?

Accidents about the work and storage areas may be grouped under two headings: those having to do with bad architectural planning and those based on erroneous ideas of economy such as storage shelves placed out of all reach without climbing, and then climbing on makeshift boxes or chairs rather than a properly stabilized ladder. Since 40 to 50 per cent of all home fatalities result from falls, two points of attack would seem to be needed on this score.

Aside from these four major working areas as points of attack, electricity will no doubt be an increasing source of injury until women as well as men are trained in the A.B.C.s of its relationship to the human body as a circuit; and until a fundamental sense of values is given homemakers (both male and female) floors will continue to be conserved at the cost of limbs.

Isolated admonitions will never make a significant contribution. Progress in reducing accidents and fatalities in the home will come when we train people to be cognizant of the same concrete cause and effect relationships in the use of appliances and conveniences that we now use in the training for other phases of household problems.

FRIDAY LUNCHEON SESSION

October 6, 1933

In the absence of Doctor R. M. Little, this meeting of the Home Safety Committee was called to order by Curtis Billings, of the National Safety Council staff.

The discussion opened with the recommendation which Doctor Little had previously made that he no longer serve as chairman of the committee but that some well known woman, preferably a home economist, be selected for the post. Action upon this suggestion was deferred.

Among the suggested projects for the coming year was the stimulation of home economics departments in various colleges and universities to conduct these studies on different limited aspects of the home safety problem. A further suggestion was made that we concentrate on one type of hazard at a time and that the theses, if and when written, be narrowly limited so that each may be a fundamental contribution. These might cover such subjects as household equipment, falls, burns, safe house-keeping practices, etc. The protection of pre-school children might also be a subject for a thesis.

Possibly sub-committees of the Home Safety Committee might also be formed to undertake some special studies that might not be handled so well by home economics students.

Other recommendations included more elaboration and better placement of the home safety program at the next Annual Safety Congress; and the preparation of several new film strips on the subject of home safety.

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1934

TRANSACTIONS

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Incorporated

TWENTY-THIRD ANNUAL
SAFETY CONGRESS



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October 1 to October 5, 1934

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Publication Plan

THE TRANSACTIONS of the Twenty-third Annual Safety Congress, National Safety Council, 1934, are published in two volumes. The first, containing the General Sessions, the Special Subject Sessions, and the Industrial Section Sessions, is presented herewith. It is supplemented by a smaller volume containing the sessions of the Street and Highway Traffic Section, the Child Education Section, and Home Safety.

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

For the benefit of many members who have found it advantageous to distribute copies of these TRANSACTIONS to supervisors, foremen and others among their personnel, who may keep them for continuous reference, the following quantity prices are quoted: 1 to 10 copies of the large volume, \$1.50 each; 11 copies and over, \$1.25 each. Copies of the smaller volume, \$.50 each.

THE PLAN OF PUBLICATION is the same as that followed for the last three years. It is a condensed record. The papers of each session or division of the Congress have been assembled, edited with care and discernment to eliminate extraneous matter and abbreviate the less essential portions, and the concise remainder is presented for study and reference. Although not "complete" in the sense that every word is reproduced, it is an interesting and valuable record which emphasizes the memorable parts of each paper or address. The original manuscripts are on file in the Council Library, available for additional reference as desired.

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

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

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Council Purposes and Policies

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

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

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

Origin and Growth

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

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

Results of Organized Safety

Since the National Safety Council was organized in 1913, the national accident death rate in all fields excepting motor vehicle has been reduced 42 per cent. The motor vehicle accident problem continues to be a serious one. While there was a slight decline in fatalities in 1932—the first drop that ever occurred—1933 witnessed a slight increase, and the rise has been so accentuated during the first three-quarters of 1934 that the year will probably represent a new all-time high. Better-than-average results in motor vehicle safety have been achieved among school children, in commercial vehicle fleets, in states with properly administered drivers license laws and in cities with an effective community safety organization. These bright spots indicate that the national problem can be solved by a careful study and application of the methods which have already produced results.

The National Safety Council was started as an industrial safety organization and the best results are to be expected in this field. Here spectacular achievements have been made. The steam railroads, for instance, have reduced the accident rate among employees 75 per cent during the past ten years. A group of our largest steel industries have cut their accidents 90 per cent since 1913. Every year, scores of industrial establishments go through the entire year without a single disabling injury among their employees.

Along with these reductions the whole psychology of accidents has changed. Employer and employee both look at the proposition from a different viewpoint than they did some two decades ago. Accidents now are really out of date. In many

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plants they are considered a disgrace that casts a cloud over good management and efficiency. There is very little room today for the careless worker in modern industry.

Looking Ahead

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

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

Cooperation

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

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

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

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

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

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Annual Meeting of Members

MONDAY MORNING SESSION

October 1, 1934

The Annual Meeting of Members of the National Safety Council at the Twenty-Third Annual Safety Congress, assembling in Cleveland, Ohio, in the Cleveland Hotel, was called to order by John E. Long, President of the Council, who presided. An impressive invocation was given by the Rt. Rev. J. McFadden, Bishop, Catholic Diocese of Northern Ohio.

Chairman Long then introduced Hon. Harry L. Davis, Mayor, who cordially welcomed the Congress to the City of Cleveland, and called attention to the fact that simultaneously with the beginning of the Convention, there was being launched an intensive campaign throughout the city to prevent accidents—a campaign supported by all city authorities, a multitude of business and professional organizations, the schools, the churches, and almost every business interest and factory throughout the community.

The Mayor was then followed by Mr. Herman R. Neff, President, Cleveland Chamber of Commerce, who welcomed the Congress on behalf of the industrial and business interests of Cleveland.

Responding to these welcoming speeches, President Long, with a few brief words of thanks and appreciation, read his annual address to the National Safety Council.

The President's Address

By JOHN E. LONG

President, National Safety Council; Superintendent of Safety, The Delaware & Hudson Railroad Corporation, Albany, N. Y.

One of the striking lessons that history teaches us is the amazing endurance of the human race. War, famine and plague have repeatedly devastated large sections of the world, yet people have carried on their daily duties, even when destruction threatened. People must be fed, clothed and sheltered, and the unconquerable instinct to provide for these wants makes for the stability of our civilization. And after disaster has passed men calmly take up the work of rebuilding what has been destroyed.

The past five years have brought problems exceeded only by those of war. Industry has been hard pressed to keep income and outgo balanced and safety work has inevitably suffered. The Safety Movement has carried on with reduced resources but with undiminished energy. Unemployment has been widespread but the

majority of our workers have still been on the job and needing protection even more than ever. The Safety Movement has been rendering a valuable service to humanity and at the same time it has made a most practical contribution to industry in minimizing accident losses that could not be afforded.

While recovery has not progressed as rapidly as we had hoped, we have been confronted with many of its problems. We have found our safety programs complicated by the hiring of new employees. That, of course, is the safety man's job; he must take conditions as he finds them. He must work with imperfect human beings under conditions that are often far from satisfactory. To the everlasting credit of the safety man, he often does work wonders with limited resources. A certain amount of retrenchment has been inevitable in recent years but a starved safety department cannot meet all the demands imposed by present conditions.

Before discussing the problems which are confronting us, let us consider the financial picture of the Council.

I am pleased to report that the Council has come through the depression practically out of debt. Two-thirds of the bonds which comprise the reserve fund are still in our possession, and recent years have shown the wisdom of accumulating this fund which has enabled the Council to maintain its essential services and make progress.

This excellent showing has been the result of a most conservative policy of expenditures, and the curtailment of all but the most vital activities. The salary reductions for the staff have not been restored but those employees who had worked three days a week for two years have been restored to full working time. The Council is now almost in as good a financial position as in 1928-29, but the slender margin between revenues and expenditures does not permit an expanded program, and there are some very urgent problems calling for our attention, particularly in the public safety field.

During the past year the Council had the privilege of rendering invaluable service to the Federal Government. The services of Sidney J. Williams were donated for four months for the organization of accident prevention activities on the vast projects of the Civil Works Administration. Four million men on jobs scattered all over the United States provided the biggest industrial safety job ever attempted. Realizing that safety work could not be conducted from Washington, the National Safety Council appealed to members throughout the country to lend the services of their safety directors to the CWA for brief periods. The splendid service rendered by these safety men, often at a considerable sacrifice to themselves and their companies, was an outstanding example of peace-time patriotism.

While the immediate purpose of this immense safety enterprise was the protection of four million men for the duration of the CWA jobs, its effects were even more far reaching. Thousands of these workers had never received training in the prevention of accidents, and their ideas of first aid were meager and out of date. Much of their CWA training will go with them when they obtain regular employment in industry.

Through the cooperation of the CWA traffic surveys were conducted in several cities.

The Council has also maintained important contacts with many departments of the federal and state governments. For many years the United States Navy has carried on intensive safety work along industrial lines, and the results obtained would be highly creditable to private industrial plants with comparable occupations. More recently the Engineering Department has inaugurated safety activities, and has reported savings far in excess of the expenditures involved. The Civilian Conservation Corps, with a more difficult organization problem, has also become interested in accident prevention work.

Our channels for reaching the general public have broadened in recent years. Many influential publications are now showing an enlightened interest in our efforts for the conservation of human life. As specific examples, I would call your attention to the special articles in the *Atlantic Monthly*, and the series of brief safety talks which appeared in recent issues of *Liberty*. These articles, as well as more specialized articles for trade journals, have been prepared by members of the head-

quarters staff. The daily press is making liberal use of our releases which remind the public of timely precautions for home and highway.

Another medium through which we are reaching a wide audience is the radio. Almost since the beginning of broadcasting the Council has supplied the stations with short talks to be used as fillers. A few years ago a more ambitious program was launched with the cooperation of the National Broadcasting Company. The "Universal Safety Series," which included addresses by prominent men and women and human interest playlets, met with an extremely favorable response from the public. This year we sponsored another series in which electrical transcriptions were used by 53 stations located in all sections of the country. This series, featuring "The Old Observer," was unusually well received by both the radio stations and the listening public.

The contest idea seems to be losing none of its popularity. For several years the industrial sections of the Council have been holding contests in their respective industries for trophies which are awarded at the Congress. In 1932 the leading cities of the United States enrolled in the Council's First National Traffic Safety Contest. This year 650 cities are enrolled for the third contest. Among the other contests sponsored by the Council is that among the steam railroads in which trophies are awarded for accomplishments in employee safety.

The saving of life by the prone pressure method of resuscitation is recognized by the award of The President's Medal. Some 700 persons have won these medals and many more have received certificates for their assistance in saving lives. To encourage training in first aid, the Council also awards medals to winners in first aid contests, and this year the winners of the California State contest received these awards.

Regional conferences continue to draw large groups of interested people. These meetings have been particularly valuable in reaching many executives, supervisors and safety committeemen who are unable to attend the Annual Congress.

Our five monthly publications, the *National Safety News*, *Public Safety*, *Safety Education*, *The Safe Worker*, and *The Safe Driver*, are continuing to serve their respective fields. "Accident Facts," the Council's statistical yearbook, is regarded everywhere as the outstanding source of information on accident statistics. The 1935 Safety Calendar, which introduces a new note in safety teaching, has won enthusiastic praise for its artistic merit as well as for the safety lessons it conveys.

I might continue to list at great length the Council's accomplishments, but I know you will agree with me that the work has been carried on splendidly in spite of reduced income, thanks to the keen interest displayed and the efficient work done by the vice-presidents, executive committee members, other volunteer officers, and the personnel of the headquarters staff.

Now let us turn to some of the problems which are now confronting us.

First of all, there is the startling increase in all kinds of accidents from the low mark of 1932. The increase is particularly noticeable in traffic accidents and it is expected that the motor vehicle death rate will show an increase of about 20 per cent over that of 1933. Many causes for this increase have been suggested. Many motor vehicles now in use have become decidedly unsafe through wear and neglect. The newer automobiles provide greater speed and power, but there has been no noticeable increase in the driver's skill or discretion. Added to these factors has been the increasing use of alcoholic liquors by motorists. And to make matters still worse there has been in many communities a deplorable laxity in the enforcement of traffic laws.

All of these, no doubt, are having their influence on the increasing death toll. Unless energetic steps are taken it is inevitable that motor vehicle accidents will increase with any increase in gasoline consumption, and accident frequency will be increased still further by the other factors mentioned.

The problem of alcohol is causing considerable concern to those engaged in both public and industrial safety work. To be sure, we were not free from this problem during prohibition but the increased accessibility of liquor today is something to be considered. Thoughtful people have been wondering how the great mass of the people would use their new freedom. Statistics so far available have not proved drunkenness to be the outstanding cause of accidents, although many cities have reported substantial increases in accidents involving persons who had been drink-

ing. The problem, however, is one that may readily assume serious proportions if allowed to run unchecked.

Looking through the Congress Transactions of twenty years ago we find considerable discussion of the menace of drinking among industrial workers. Many years ago the railroads realized the importance of sobriety on the job and established strict rules. It seems to me that driving in traffic is almost as exacting as operating a locomotive. While the driver or worker who has been drinking is a recognized menace, we must not allow our attention to be drawn from the fact that the great majority of accidents are caused by those who are coldly sober at the time.

In many cities there has been a relaxation of law enforcement, which may be due, in part at least, to the depression. With municipal incomes seriously reduced, traffic departments have suffered from retrenchment. Not only have departments been inadequate for effective control in many cases but the morale of the force has also suffered. Community safety organizations have carried on valiantly but they too have been handicapped by lack of funds.

In looking over our past efforts, we must admit that some of our methods have been decidedly superficial. Few people have either the patience or the special ability to get at the root of a problem. Other movements have had experiences similar to ours; it is a very natural trait to jump at obvious conclusions—to treat symptoms rather than uncover and remove causes. This superficiality has been characteristic of much of our efforts to correct crime, poverty and other social ills.

The value of well-organized, scientific accident prevention work, as conducted in Evanston and Pittsburgh, has been clearly demonstrated in our inter-city contests. The control of accidents can never be brought about by an occasional meeting, by spasmodic campaigns to arouse interest, or by the publicity methods of the sideshow. To be sure, temporary successes have been obtained by these methods but unless followed up with a sounder plan of action, the work is sure to die a natural death. We must not ignore the emotional side, which supplies the motive power to the safety movement, but we must also study the technical, scientific and psychological phases if we are to secure the respect and cooperation of the thoughtful people who will give permanence to the movement.

A noted English physician and psychologist recently attributed the prevalence of war scares to the fact that the world is ruled by child psychology. Comparatively few so-called normal adults, she said, ever reach a mental or emotional age of more than 16 or 17 years.

This immaturity of mind and emotion complicates our entire system of living together. The personnel worker in the industrial plant, and the judge in the traffic court and the divorce court are all familiar with the person who has never grown up. The safety movement, like the movement for crime prevention, must face the results of bad environment and faulty training in the individual.

Every great movement undergoes several stages. During the early crusading days enthusiasm runs high and the proponents of the cause put forth their best efforts. At this stage it is not difficult to make progress. Then comes a period of settling down to uninspiring routine details and the following up of the preliminary work. Members may lose interest, or the movement may become a perfunctory affair with little power to stir the imagination.

The safety movement must appeal to widely differing groups. It is a great popular movement, so it cannot depend upon technicians alone. On the other hand, as I have pointed out before, it cannot enlist the support of scientific minds which are so urgently needed. I feel that the safety movement has been remarkably successful in combining these two appeals.

While we look with pardonable pride on what we have accomplished in less than a quarter of a century, we cannot ignore the immense amount of work yet to be done. The public does not yet understand our language. The man on the street has seen warning signs. He has undoubtedly heard the slogan "Safety first," perhaps used derisively. But he has an extremely hazy idea of the philosophy behind the safety movement and the modern methods of organized accident prevention. Perhaps some day we may be able to sum up the meaning of the safety movement in half a dozen words.

We must also realize that safety is not an easy subject to present to the public. The word "safety" is not inspiring; it may even suggest stagnation and inaction to those who do not understand its unselfish motives. Also, security to many people means merely boredom. We must therefore tax our ingenuity to find ways of dramatizing our subject.

The saving of life always appeals to the generous emotions, but the Safety Movement has a more difficult task than other organizations founded for this purpose. At first thought, prevention of accidents seems to be largely negative in its aims. But so is the prevention of cruelty to animals, a work which has a powerful popular appeal and many generous patrons. There is this difference, however. Deliberate cruelty shocks our sensibilities far more than any fortuitous event. The victim of an unpremeditated injury may suffer just as much but his fate will arouse far less sympathy or indignation.

We must remember also that the processes of accident prevention seem rather vague and incomprehensible to the layman. He can understand the relief of poverty through organized charity. He can understand the work of associations for the prevention of tuberculosis and other diseases. But when it comes to the prevention of accidents, he is still somewhat skeptical. Lurking in his mind is a survival of the old idea that accidents are more or less beyond human control. The law, indeed, still recognizes certain types of accidents as due to "acts of God," and many people are inclined to place all accidents in this category.

But if our progress seems discouragingly slow, let us remember that it took medicine many centuries to become a science. Illiteracy and superstition hindered its progress. I sometimes feel that its development would have been speeded up immensely had there been some organization, similar in purpose to the National Safety Council, to prepare the people for the acceptance of elementary truths about health and sanitation. Certainly, I feel we will all agree that the Safety Movement would be far behind its present position if those who were doing accident prevention work in 1913 had continued their activities independently. When we consider the number of years it takes for an idea to sink into the human mind, we should not feel discouraged.

The twenty per cent increase in motor vehicle fatalities this year is a startling reminder that the gains of the past two years are by no means permanent, and that our best efforts will be needed during the next few years. Whether we approve it or not, there may be higher speeds on the highway, and present methods of motor vehicle control are not adequate to meet such a situation. Should accident rates continue to soar, there is a possibility of drastic laws being enacted.

Industry too is facing equally serious problems. Recovery, while delayed, must come eventually, and the difficulties of the past year will be with us in a greater degree. Also, there is abroad in industry a spirit of unrest which is beyond the control of safety departments but which may prove a serious handicap to effective safety work.

In spite of the present trend in accident rates, the safety movement can point to some very substantial accomplishments. In spite of the heavy casualties resulting from private motor vehicle operation, the accidental death rate continues to be lower than that of 1913. Had the rate for that year continued, accidents would have claimed 190,000 more lives than they actually did in the subsequent years.

There are many other signs which should encourage our best efforts. Everywhere there is a better appreciation of the safety problem. Newspapers and magazines and the radio broadcasting systems have shown an encouraging willingness to help in spreading knowledge. State boards of education and the National Education Association are heartily in accord with our plans for the training of the younger generation in safety.

The Safety Movement has served humanity through a war and two depressions. Its value, both economic and social, is more thoroughly recognized than ever before, and I am confident that our Council will go on to even greater achievements.

President Long then appointed as tellers of the Annual Meeting the three men already appointed as Inspectors of Election by the Executive Committee, as follows: Frank W. Rodenheber, Chairman; George E. Clarkson and Floyd M. Jay.

The minutes of the last Annual Meeting, having already been printed and distributed, were then passed unread.

Report of the Nominating Committee

The Chairman then called for the report of the Nominating Committee. It was presented by C. B. Boulet, Chairman, who spoke as follows:

"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 6 of the By-Laws of the Council, and as further provided by Section 5 of Article 6 of the By-Laws, present herewith the report of the nominations for directors to serve until the Annual Meeting in 1937.

"The names of the following directors whose terms expire October 1, 1934, are submitted for re-election:

David S. Beyer, W. H. Cameron, James B. Douglas, Howard B. Fonda, Otho M. Graves, Harry Guilbert, Isaiah Hale, Charles E. Hill, C. L. LaFontaine, R. B. Morley, T. H. McKenney, Lew R. Palmer, George E. Sanford, C. W. Smith, George H. Warfel, J. M. Wolfe, W. E. Worth.

No other ticket having been nominated, a motion was made and seconded to direct the Secretary to cast one ballot for the candidates named for the terms for which they were nominated. This motion was carried. The Secretary cast the ballot. It was properly approved by the tellers and their report showed that 1168 votes had been cast for the nominees and none against. The Chairman then announced the formal election of the gentlemen named.

Report of the Resolutions Committee

Chairman Long then called for the report of the Resolutions Committee, and the following resolutions were presented by Lt. Col. Henry A. Reninger, and passed by the delegates:

WHEREAS, reports from all sections of the country show that accidents are increasing at a most alarming rate in all lines of activity; and

WHEREAS, there is every indication that accidental deaths for the year 1934 will total 100,000, representing more than ten per cent increase above the 90,000 figure for 1933; and

WHEREAS, it is apparent that this steadily mounting toll is mainly due: First (1), to a shameful disregard of caution on our highways; (2), to the natural increase in hazards in industry due to re-employment and increased production; and (3), to failure to recognize and give proper attention to the accident menace in our home life:

THEREFORE, BE IT RESOLVED that the members of the National Safety Council assembled at the Twenty-Third Annual Safety Congress and Exposition, do hereby pledge our untiring efforts to wage ceaseless warfare against the ever present menace of accidents throughout industry, in the homes, on the highways and elsewhere; and more specifically set forth as follows:

1. *Public Safety*—Unremitting and insistent efforts to cleanse the nation's streets of the carelessness, neglect and indifference which last year disgracefully slaughtered 31,000 citizens and injured more than 1,000,000 others, representing an economic loss of around a billion and a half dollars including property damage, together with immeasurable social loss; vigorous campaigns for strong drivers' license laws for all states in an effort to weed out the mentally and physically unfit, the drinking drivers and the wilful and selfish violators; insistence on uniform traffic laws for all cities and states to bring order out of traffic chaos as an essential element in the conservation of life and limb; modern traffic engineering methods; strict enforcement of the traffic code by the courts and strict observance of traffic rules by the driving public; a greatly intensified educational program with special emphasis placed on traffic safety in the schools, the plant and the home; and lastly, a vigorous campaign to awaken a proper sense of responsibility in the mind of the individual motorist as the major factor in the vehicular safety equation.

2. *Industrial Safety*—Special educational programs focused on the new worker; the safeguarding of all mechanical equipment and constant use of safety devices; revision of hazardous manufacturing processes and widening of our engineering pursuits to meet the demands of an increased production program; regular and thorough safety inspections and research in all industries, followed by prompt application of approved remedial measures; intensified investigation of the mental aspects of accidents; extension of safety contest plans; a wider recognition of the close relationship between industrial health and safety; full cooperation of the National Safety Council with affiliated community councils throughout the country.

3. *Home Safety*—More than one-third of all accident fatalities and nearly half of all accidental injuries are sustained in or about the home. Let us therefore broaden our educational program, particularly in the schools and with the General Federation of Women's Clubs, the National Congress of Parents and Teachers and kindred cooperative groups; if possible, let us increase the scope and activities of our Education Division; and lastly, through direct appeal to the housewife let us make an earnest effort to implant an understanding of safety values in the American home.

WHEREAS, this Twenty-third Annual Safety Congress of the National Safety Council, convening in the City of Cleveland, promises to be one of the largest and most notable in the history of the Safety Movement, an achievement which has been made possible not only by the enthusiastic welcome of the body of citizens as a whole, but also largely because of the forethought, careful planning and untiring cooperation of many trade bodies, technical and professional groups, prominent civic, business and social leaders of Cleveland, and the press, all of whom have thrown into the preparations for this Congress a zeal and devotion inspired by a true appreciation of the importance of this unique gathering to the whole community; and

WHEREAS, the members of the National Safety Council assembled from all parts of the United States and Canada and from other countries of the world, fully appreciate the fine and unselfish contributions of the citizens of Cleveland and the value of these contributions in furthering the Cause of Safety and in strengthening its protecting influence, not only in this City and State, but also throughout our Country and the World, and thus aiding in attaining the ideal of human life preservation; now, therefore,

BE IT RESOLVED, that a standing vote of thanks be extended to all magistrates and other civic authorities of the City of Cleveland and of Cuyahoga County; to the many executives and officials of the State of Ohio for their cooperation; to the Police and Traffic Department of the City; to all the various organizations throughout the community and to the many public spirited citizens who have done much to make this Congress a success; to the daily press and the local wireless stations that persistently have carried the news of Safety into hundreds of thousands of homes; to the Cleveland Chamber of Commerce and its affiliated organizations; to all the admirably organized and directed Cleveland Congress Campaign Committees, including that for School and Child Activities, that for Parents and Teachers, that for Industrial Plants, that for Police and Traffic Safety, that for Fire Safety, that for Home Safety, that for Public and Pedestrian Safety, that for Railroad Safety, that for Commercial Drivers, that for Passenger Automobile Drivers, that for Street and Railway Busses, that for Theatres, that for Street Advertising and Decorations, that for Newspaper Publicity, that for Radio Broadcasting, that for Hotel Reservations, that for Hotels and Restaurants, that for Local Registration and Information, that for Ohio State Delegations, that for Local Attendance, and that for Boy Scouts; to the nine other special committees on Reception and Entertainment of Delegates; to the twenty-five additional committees of Cooperating Sectional Chairmen; to the seventy-six special Group Committees who solicited local interest for the Congress throughout every business group in the city; to Judre Lee F. Sted for his service during this time as President of the Cleveland Safety Council; and to Hon. Harry L. Davis, Mayor of the City of Cleveland, who has served as Honorary Chairman of the Cleveland Congress Committee; and this vote

of thanks is accompanied with the deep appreciation of the leaders of the Safety Movement, who understand the need for intelligent guidance in the organization and direction of these many Congress activities, and particularly in placing before the people the facts about accidents and the scientific methods for their control, to which task this Congress is dedicated.

BE IT RESOLVED, that to President John E. Long the entire membership of the National Safety Council expresses its sincere appreciation and thanks for his high devotion to the Cause of Safety and for his inspired and untiring leadership during a year when the Safety Movement has been able to make such signal advances in the saving of lives.

BE IT RESOLVED, that the very grateful appreciation of the National Safety Council members is hereby extended to all the volunteer officers and executive committeemen who have given so generously of their time, thought and energy to the success of the Safety Movement, and whose counsel has been of such exceeding value in the rebuilding of the vitality and dynamic force of the Council.

President Long then, in a few well chosen words, introduced Mr. Donald B. Gillies, President, Corrigan, McKinney Steel Company, Cleveland, Ohio, who presented the following address:

Safety from an Executive Standpoint

By DONALD B. GILLIES

President, The Corrigan, McKinney Steel Company, Cleveland, Ohio

Several decades ago when the safety movement first came into being, it was "wishful thinking" to hope that executives might some day become deeply interested in accident prevention. Little did we realize at that time that within a few short years the safety movement would have to its credit a decrease of 31 per cent in the industrial accident fatality rate in the United States. This is a record of achievement in which organizations such as the National Safety Council, as well as individual safety men throughout the country, can take justifiable pride.

At the beginning, progress was necessarily extremely slow, due in part, I think, to the fact that executives employed safety engineers to prevent accidents and then these same executives held these safety men responsible for results without giving them sufficient backing and support to command the active interest of operating superintendents and foremen. Managers, as a rule, felt that they had done their share when safe working places were provided; that they had met all of their legal obligations and it was then up to the men to take care of themselves. This was not on account of any lack of sympathy for injured employees, but because it seemed to be an unnecessary task to caution workers to be careful and to educate them in accident prevention when it seemed that the law of self preservation was sufficient to get results. Unfortunately, we failed to take into consideration the fact that proximity breeds contempt; that workers must be taught to protect their own lives; that every individual considers himself more or less immune to accidents; and that it requires real positive initiative rather than mere passive hope if workers are to avoid injury. Managers were sorry when anyone was hurt or killed—and glad when injured men were properly compensated and their families made comfortable. It has often been said that corporations are soulless organizations, but I can tell you from my contacts with hundreds of executives that individual managers are human beings, after all, who do not lack pity, sympathy, and other normal emotions.

Fortunately, however, the old feelings of pity and apathetic helplessness have been expanded during recent years to include a strong determination that something can and must be done about the high toll of accidents in industry. We have learned from the safety movement in general and from the experience of you men that accidents can be prevented; that management must go further than merely meeting its legal obligations; that workers can and must be educated in the safe

ways of doing their jobs; that people can be taught to think of safety subconsciously during all of their waking moments. In brief, the prevention of accidents has become an essential and integral feature of good management in thousands of our industries throughout the country.

But what is safety? What does it mean? I think the best definition I have heard was given by the Rev. John McDowell. Some years ago he stood before a convention of steel men—with an empty sleeve that bore mute evidence of his early years as a Pennsylvania miner. He talked with authority when he said: "To save life is the noblest of all purposes. It embodies the highest ideal of humanity. It conserves the best asset of the nation; provides its best protection; and creates its real glory. It incarnates the spirit of democracy and brotherhood."

That this spirit has taken hold of industry generally is evidenced by the accomplishments which have been achieved with the co-operation of workers in eliminating needless accidents and thus adding to the happiness of homes throughout the land. Workers collectively and individually are more cognizant of safety in their daily occupations than ever before; furthermore, they have come to realize the economic importance to themselves, to their families and to their companies in avoiding accidents.

What has been accomplished in the conservation of human life in industry is the direct result of the policies of forward-looking management and far-sighted workers. It is highly fitting that we in America should have developed this new leadership. It is quite in keeping with our democratic ideals of sharing opportunity and responsibility, but best of all it brings a greater measure of happiness to our citizens.

It is a source of real satisfaction to me that the steel industry as a whole has played an important part in pioneering this great humanitarian and economic movement. Fundamentally, every employer owes a duty on humanitarian grounds, if no other, to use all reasonable efforts to safeguard the lives and limbs of his employees. For securing safety to employees, the employer not only meets the dictates of his conscience, but also saves himself needless pecuniary loss. And let me say here that it does not detract in any way from the broad humanitarian aspects of this work to consider its economic phases in sustained purchasing power, in providing steady employment, and in keeping the wheels of industry moving. In my own company, The Corrigan, McKinney Steel Company, and this is typical of most other companies, progress in accident prevention has resulted not only in a greater saving of life and limb, but also in a saving to employees in wages alone of hundreds of thousands of dollars.

It is not always easy to obtain satisfactory results in industrial accident prevention. It is, of course, impossible for the chief executive of any large business to attend personally to the safety problem. It is absolutely indispensable, I believe, that the matter of securing safety be delegated to a competent man who has his heart enthusiastically in the safety problem and that upon this man be placed the duty and responsibility of obtaining results. If the business is large it may require the energies of more than one man, but no matter what the size is, one or more men should primarily have the responsibility of obtaining results.

Dr. R. C. Engel, who has been medical director for The Corrigan, McKinney Steel Company for 17 years, has for the past eight years had complete charge of our accident prevention work. I take this opportunity to accord to Dr. Engel sincere tribute for the great humanitarian service which he has rendered. I commend him highly, and also his co-workers, for the outstanding accomplishments attained.

The United States Steel Corporation has achieved a noteworthy success in reducing accidents, all of which commands our attention and respect. This great organization has during the past 27 years reduced its serious and fatal accident rate some 57 per cent; that means about 72,000 men were saved,—to say nothing of their respective families.

Safety in industry is a great human problem, and cooperation if based on a real knowledge of fact is bound to bring out an effective and permanent solution. This obligates us to investigate every accident, not for fault-finding purposes, but so that intelligent corrective measures may be applied which will prevent recurrence of similar accidents. Remedies must be formulated which will accomplish

the desired results, whether through engineering, education, or approved supervision. Fortunately, no one can learn too much; the human mind is one thing that can keep on growing indefinitely.

It is one of the fine characteristics of accident prevention work, that in it management finds that the interests of employer and employee are more nearly similar than in probably any other contact. There can be no misunderstanding and argument about the prevention of accidents. Executives and workers are equally interested and both have everything to gain through mutual cooperation.

There is a direct relationship between accident prevention and all other industrial problems, both in the method of attack and the method of cure. While industrial executives must always keep a proper sense of proportion, I should like to say for the benefit of those not already converted that as the result of many years of experience, I am satisfied that safety goes hand in hand with economical and high grade production. The small cost involved is more than justified. There will always be risks in industry. While it is a fine thing to have accident compensation, and it is a splendid sentiment that causes hospitals and charitable organizations to provide for the unfortunate, it is much more worth while to prevent accident.

Progress in American industry is strikingly marked today by the dominance of a new psychology concerning industrial relations. Men, materials and money have combined in the development of our great resources, and brawn, guided by brain, wealth and labor directed by inventive genius and creative energy have brought the United States to a foremost position in the industrial world. Each of these factors has its place of importance in industrial growth now as always. But today, in sharp contrast with past industrial history, we find a new controlling thought. That is, the new appreciation of the importance of the human equation, of the economic as well as the social value of its protection and conservation.

This new guiding thought is not based on an unattainable ideal. It is productive of the most practical results. It adds greatly to the productive capacity of the individual, it greatly increases mechanical efficiency and output, it increases the buying power of the consumer, and raises the general standard of living. Furthermore, it greatly reduces labor turnover, the bane of all industry.

In these important respects, intelligent self interest is guiding the way toward better standards of operation and a keener appreciation of the human values in industry and of the mutual rights involved. The ideals of peace, toward which the minds and hearts of men are ever reaching, may not yet have been fully achieved, but at least we are moving toward them, as the Annual Safety Congress eloquently testifies.

Unveiling of Council Trophies

The unveiling of the handsome plaques awarded by the National Safety Council to winners in the various safety contests, then took place in a very impressive manner. President Long spoke briefly as follows:

"Ten years ago the first sectional safety contest was organized. Since then the idea has been adopted by others until this year seven such contests officially closed on June 30. These were conducted by the Delivery, Taxicab and Bus; Marine; Metals; Paper and Pulp; Petroleum; Public Utilities; and Rubber Sections.

"Time will not permit reading into the records the names of winners of the 106 plaques and 80 certificates. However, during this Congress, each section has set aside a definite period during which the meritorious achievements of their respective contests will be discussed in detail, and at that time, also, the trophies will be officially presented.

"Even though individual winners cannot be specifically mentioned, it is my pleasure and privilege, on behalf of the National Safety Council and its Executive Committee, to at this time officially unveil the trophies which stand as mute evidence of the sincerity with which industry as a whole endeavors to conserve human life and limb."

ADJOURNMENT



Annual Banquet

WEDNESDAY EVENING SESSION

October 3, 1934

The Annual Banquet for National Safety Council delegates and guests at the Congress was held in the Rainbow Room of the Carter Hotel. After the viands had been cleared away, Lt. Col. Henry A. Reninger, Past President of the National Safety Council, arose and announced the election of Council officers which had taken place that afternoon. He introduced the new officers with a group of felicitous phrases, as follows:

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

Vice-President for Public Safety—Robert I. Catlin, Assistant Vice-President, The Aetna Casualty and Surety Company.

Vice-President for Public Relations—D. D. Fennell, Consulting Engineer, Chicago.

Vice-President for Safety Councils—Lew R. Palmer, Conservation Engineer, The Equitable Life Assurance Society, New York City.

Vice-President for Engineering—Albert S. Regula, Executive Secretary, Industrial Relations Counsellors, Inc., New York City.

Vice-President for Industrial Safety—C. W. Smith, Director, Safety Department, Standard Oil Company (Indiana), Chicago.

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

Vice-President for Health—Cassius H. Watson, M.D., Medical Director, American Telephone & Telegraph Company, New York City.

Vice-President for Finance and Treasurer—William E. Worth, Manager, Twine Mills, International Harvester Company, Chicago.

Vice-President for Education—Albert W. Whitney, Associate General Manager, National Bureau of Casualty and Surety Underwriters, New York City.

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

Lt.-Col. Reninger, then, called the attention of his audience to a resolution which had been passed by the Executive Committee of the Council, that afternoon in session, as follows:

WHEREAS, the serious increase in motor vehicle accidents this year indicates an all time "high" of 35,000 deaths, more than a million injuries and about two billion dollars property damage, an amount comparable with our entire expenditure for public education; and,

WHEREAS, the experience of many cities and states crystallized in the recommendations of the National Conference on Street and Highway Safety sponsored by the Department of Commerce, the National Safety Council and other organizations, has shown that these losses can be reduced at least 50 per cent by legislative, administrative, engineering and educational measures of proven value; and

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WHEREAS, there is such pressing need for prompt executive action to put these measures into effect and stop these needless tragedies;

THEREFORE BE IT RESOLVED: That the National Safety Council respectfully urges the President of the United States to call the Governors of the several States into conference as early in the new year as practicable, to lay before them the seriousness of the situation, the remedies which have been developed for correcting these conditions and the necessity for prompt and united action in all the States to adopt and more energetically carry on an effective program for the protection of life and limb on our streets and highways.

By formal motion, and by a rising vote, the entire audience of delegates and guests approved this action of the Council Executive Committee.

Following this, Lt.-Col. Reninger read the following letter received from the President of the United States:

THE WHITE HOUSE
WASHINGTON

September 27, 1934

My dear Mr. Long:

I wish to extend to the members of the National Safety Council, in session at the twenty-third Annual Safety Conference, my most cordial greetings and my heartiest good wishes for the success of your endeavors.

The fact that you are concerning yourselves with saving life, that you are keeping in view human values and personal security commends your program to the entire country.

I am greatly impressed and pleased with the constructive steps already taken toward the elimination of accidents, especially highway disasters, which, because avoidable, are doubly tragic. This is a problem which we must attack with the utmost energy and persistence. Ultimately we may expect to reach the solution of highway safety, provided complete cooperation on the part of all citizens is given to concerted efforts of groups such as yours. At present the rising toll of fatalities on roads and city thoroughfares indicates in a manner all too grim that we are still far from the goal.

American automotive developments and our unequalled system of highway communications which have given signal contributions to our convenience, pleasure, and commerce, must not be permitted to devolve into instruments of death and disaster.

I assure you of my keen personal interest in your efforts and commend your splendid program to induce cooperation among every citizen in our nation with the movement looking to the prevention of needless fatalities—a drain upon our most precious natural resource which must be ended.

Very sincerely yours,

FRANKLIN D. ROOSEVELT.

Mr. John E. Long,
President, National Safety Council,
c/o Cleveland Hotel,
Cleveland, Ohio.

President John E. Long then arose and introduced Mr. Harold G. Hoffman, Commissioner of Motor Vehicles of New Jersey, who presided as Toastmaster. His witty introduction of the speaker of the evening, Dr. John L. Davis, of New York City, was highly appreciated by the big audience; and was only surpassed, perhaps, by the brilliant address of Dr. Davis, himself.

Dr. Davis was listed in the program to speak on "The Spirit of America." Despite this handicap, he seized the opportunity to present a highly popular monologue—so popular in fact that his success mounted steadily throughout the evening; and it was readily agreed, after an hilarious session, that no banquet of the Council had approached this for many a year.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Dust in Industry

FRIDAY AFTERNOON SESSION

October 5, 1934

The session devoted to a discussion of Dust in Industry was called to order by Dr. E. G. Meier, Director, Industrial Hygiene Laboratory, Employers Mutual Liability Insurance Co., Milwaukee, who presided. Dr. Meier briefly welcomed the delegates and then introduced the first speaker.

Types of Dust That Cause Occupational Diseases

By LEROY U. GARDNER, M.D.

Director, Saranac Laboratory for the Study of Tuberculosis, of the Edward L. Trudeau Foundation, Saranac Lake, N. Y.

The speaker said in part: Experience has demonstrated that the lung tissues can tolerate very large amounts of most kinds of foreign dust particles without serious interference with function. The lung may be intensely pigmented by colored dusts with no evidence that respiration is impaired. But dusts composed, in whole or in part, of silica have been shown to be dangerous because they stimulate the growth of the connective tissues of the lungs and bring about the formation of scar tissue. This destroys the normal elasticity of the organ which is necessary for respiration and it thickens the delicate membranes so that a free interchange of gases is impeded. Fortunately, these results only follow the prolonged inhalation of very large quantities of silica.

Experiments have demonstrated that the injection of silica into the tissues of animals kills the cells where the substance lodges and excites an inflammation. When healing takes place a very dense and characteristic kind of scar tissue forms. Most non-siliceous dusts produce no inflammation and very little scar. It has been shown that such changes do not follow the injection of silica unless the particles are very fine, three microns or less in diameter, and unless enough of them localize in one area. With larger particles the rate of reaction is so slow that little change occurs within a year. As a general rule, the finer the particles, the more rapid the cellular response. The reaction to fine silica begins within four or five hours and it continues for a period of years.

If the silica is combined with bases in the form of silicates, it rarely produces such active and progressive changes. The silicate of magnesium, asbestos, does cause the formation of scar tissue in experimental animals and in the human lung, but most other silicates are not generally recognized as irritating. Recently it has been claimed that a hydrated silicate of aluminum and potassium, called sericite, is responsible for most of the cases of silicosis. This silicate, a transformed feldspar, is often associated with quartz and it has been identified in the lungs of persons suf-

fering from silicosis. However, at least two types of sericite have failed to excite significant changes when injected into animals. Experiments with this substance are still in progress. Kaolin, an aluminosilicate of potash, has also produced quite characteristic changes in the lungs of rabbits. But our present knowledge does not permit us to assume that silicates as a class will produce serious tissue damage.

Most observers now believe that uncombined silica, or quartz, is poisonous to the tissues because it is slowly dissolved in the fluids of the body. Certainly the majority of the experimental observations suggest a chemical injury, but it is difficult to understand how enough of such an insoluble substance as quartz could be dissolved within eight hours to produce a well marked, acute inflammation. If solubility were the only factor one should discover a more active response after the injection of the more readily soluble silicates, but such is not the case. Formerly it was held that silica produced its effect mechanically. The hard sharp quartz particles were believed to abrade the lung surfaces and excite the formation of scar tissue as a manifestation of healing. This theory is no longer tenable for when animals are injected with other hard, sharp particles like diamond, carborundum or aluminum oxide, there is no inflammation and practically no formation of scar tissue. Ultimately it may be shown that the irritation of silica is due to some unrecognized property possibly related to its atomic structure.

When quartz particles are inhaled they produce three specific effects which are not excited by any other type of dust yet studied. They alter the behavior of the pulmonary phagocytes; they stimulate the formation of circumscribed nodules of scar tissue; and they subsequently increase the susceptibility of the lung to infection, especially tuberculous infection.

Phagocytes that ingest too many quartz particles are killed by this irritating substance. As the cells die they liberate their burden and several new phagocytes come out to take it up again. By a repetition of this process enough phagocytes accumulate so that many of them ingest only a few particles. Under such circumstances the stimulus is not strong enough to kill but merely accelerates the mobility of the cells. They naturally tend to leave the air spaces, enter the lymphatic vessels and accumulate in the lymph nodes. This process becomes more rapid under the influence of the irritating silica and very considerable numbers of particles are consequently localized in the nodes.

After six or eight years the quartz in the nodes has caused a marked overgrowth of the fibrous elements in these structures. Ultimately the reaction develops to such an extent that the node is entirely replaced by a mass of coarse, glassy scar tissue fibres, often several times as large as the original node. Such nodules encroach upon and compress the lymphatic vessels. The drainage system of the lung is choked and effective removal of subsequently inhaled dust is gradually diminished. Dust now accumulates around the lymph vessels and sheets of scar tissue develop in this location.

These preliminary changes do not constitute the disease, silicosis; they involve only the lymphatic system. The respiratory tissues are not appreciably affected. In good stereo X-ray films these preliminary changes may be visualized as a thickening and heading of the shadows cast by the blood vessels together with a widening of the shadow of the root of the lung. The blood vessels are thickened because the most important lymphatic vessels course through their walls. The heading is due to the minute nodules of silicotic scar tissue in the lymph nodes within the lung. The root shadow is widened because of the silicotic reaction in the lymph nodes in this location.

If still more dust is inhaled it can no longer be effectively carried off through the lymph vessels. The phagocytes now carry it into the walls of the air spaces. Often the cells group themselves in nodules but sometimes they are scattered. In these locations the silica again stimulates the formation of scar tissue. The result is a general thickening of the septa between the spaces and nodulation throughout the functional portion of the lung. This change seriously interferes with function as interchange of gas cannot take place through the thickened walls of the air spaces and the tissues lose their normal elasticity. Less involved air spaces dilate and their walls stretch, producing the condition known as emphysema, which is also incompatible with effective respiration.

With the formation of silicotic nodules in the functioning parts of the lung the

disease, silicosis, is said to begin. On the X-ray film such nodules cast clear cut, round shadows. As they increase in number and size they blot out the formerly accentuated linear shadows of the blood vessels. In a well marked case both lung fields may be thickly seeded with hundreds of such sharply defined, rounded, nodular shadows. Where there is emphysema, often at the bases, no markings are visible and the film appears black.

The condition of silicosis is a progressive one and it continues to develop after a man has left his dusty occupation. Serious results only follow, however, when he leaves with many nodules in the lung tissue itself. As such nodules increase in size they replace important functional elements. Obviously the continued growth of only a few nodules situated in the lymphatic system could have little effect other than to increase the obstruction already present.

The serious part of silicosis is its frequent complication by tuberculosis. This may arise from reactivation of a pre-existent latent infection or it may result from a new infection from without. The danger of infection increases with the amount of silicosis present. The course of the infection in the silicotic is usually chronic and it often fails to produce characteristic symptoms for months or years after its onset. Many times it is accidentally discovered in routine X-ray examination of groups of active workmen. However, evidences of disability are much more marked in silicotic individuals with infection than in those with uncomplicated disease. Occasionally tuberculosis may run a very acute course in the silicotic subject but this is also true in other persons. The cause of the susceptibility of the silicotic lung to tuberculosis is not perfectly understood, but it would seem that the action of the silica on the tissues creates a medium favorable for the growth of the bacteria. The tubercle bacilli multiply and a slowly progressive tissue reaction ensues, but the usual clinical symptoms of tuberculosis are often held in abeyance for a long time because the chances for absorption of poisonous products of infection are minimized by the obstructed lymphatic system. It is also possible that some of these poisons may be absorbed on the silica particles, as Cummins has suggested. Ultimately the infection gains the upper hand, symptoms develop and death from tuberculosis ensues.

The only other type of dust which is generally recognized as a cause of severe pulmonary injury is asbestos, a silicate of magnesium. This substance is fibrous in character and is more readily soluble than quartz. Apparently the protective upper respiratory mechanisms seem inadequate to prevent the inhalation of many such fibres and even quite long ones may penetrate into the finer bronchial tubes. These structures have irregularities in their walls which seem to hold the fibrous dusts. In this location the asbestos particles are surrounded and ingested by phagocytes. The cells do not seem to be particularly irritated for they are not especially numerous nor do they migrate rapidly into clumps as in the case of phagocytes dealing with quartz. Apparently most of them carry their burden of asbestos fragments directly into the walls of the tubes in which they lie. The mildly irritating dust sets up a proliferation of the connective tissue cells in the walls resulting in collar-like thickening of the tubes. Contraction of the new connective tissue narrows or closes the tube and thereby shuts off the ingress of air to the more peripheral air spaces. These spaces then collapse, a condition known as atelectasis. This in itself is a cause of fibrosis or scarring of lung tissue. The result is a fibrosis of numerous relatively small areas in the lung due to the collar-like constricting fibrosis about many small terminal bronchial tubes. The lymphatic system seems to play little part in disposing of asbestos dust and very insignificant amounts of this dust are found in the lymph nodes.

Not a few cases of asbestosis die of tuberculosis or bronchopneumonia but the prevalence of the former infection is probably much less common than in silicosis. Surveys of large groups of asbestos workers fail to reveal such a high incidence of tuberculosis as found in similar studies on silica workers.

The inhalation of unusual amounts of non-siliceous dusts apparently fails to produce significant alterations in the lung. It is of course possible that injurious ones may ultimately be discovered, but none are recognized today. The non-siliceous particles enter the lung and are ingested by phagocytes as in the case of quartz. The cells are not stimulated to move very rapidly and as a consequence many of them remain within the air spaces for a long time. Some, particularly those con-

taining relatively few particles, make their way into the lymphatic system and accumulate in the lymph nodes. In sufficient concentration, or perhaps because they are mixed with small amounts of silica, they set up a low grade, non-progressive chronic inflammation. But this reaction results only in a little thickening in the lymph nodes and about the lymphatic vessels. The lung tissue may be variously pigmented, black from coal or red from iron, but there is no formation of scar tissue that interferes with function. The susceptibility to tuberculosis of the person with such pigmentation is not increased but it is apparently quite definite that pneumonia is unduly prevalent in coal miners and that chronic bronchitis results from the inhalation of cement. The X-ray films of men working in non-siliceous dusts shows either nothing at all or a more or less marked accentuation of the linear shadows cast by the blood vessels. This, of course, is due to the chronic inflammatory changes about the lymphatic trunks in walls of blood vessels.

The effects of mixtures of free silica and non-siliceous materials are less clearly defined and should receive more serious attention. It would seem unwise to assume, as has been done in the past, that the non-siliceous substances serve only as inert diluents and that only the quartz component of a dust is of significance. Experimental and clinical data are accumulating which suggest that at least some other dusts may materially modify the action of quartz, both in its capacity to produce nodular fibrosis in the lungs and to increase the susceptibility to tuberculosis. For example, animals inhaling heavy concentrations of a mixture of equal parts of pure silica and hematite dust for eight hours a day over a period of 14 months have shown not even the slightest indication of nodule formation in the lung, whereas pure quartz dust, inhaled for only two hours a day, produces definite nodulation. It also seems to be true that animals inhaling such a mixture are much less susceptible to tuberculosis than those exposed to pure quartz. In the case of the human iron miner, some lungs show definite silicotic nodulation, others only a very few nodules and many no nodules at all. All exhibit heavy deposits of iron particles with a cellular connective tissue reaction. When these findings can be correlated with chemical analysis of the lung tissues and the approximate amount of rock work which these miners have performed, some relationship between the exposure to silica and the fibrous nodule formation may be established. Tuberculosis in these iron miners is apparently less prevalent and much less severe than in men exposed to pure silica. What has been said of iron miners is also probably true of foundry workers and coal miners. It is generally accepted that men in the latter occupation have less tuberculosis than the average for the age period. Cummings believes that they have the infection but that it is so atypical and benign in its manifestations that it escapes diagnosis.

Mention should also be made of mixed dusts like certain slates and granite containing large amounts of free silica in combination with silicates. Experimentally these substances behave atypically and do not produce nodular fibrosis unless there is complicating infection. The same may also be true in human beings. Unquestionably such dusts are capable of producing typical silicotic nodules and they predispose to tuberculosis. From a theoretical standpoint they should receive much more intensive study to clarify our views on the whole subject. At the present time it appears that the action of their quartz component is modified and partially neutralized by the other substances which they contain.

Using Exhaust Systems and Respiratory Equipment To Protect Workers Exposed to Dust

By STUART W. GURNEY and DAVID S. BEYER
Liberty Mutual Insurance Company, Boston

The speaker said in part: A number of our states have had references to dust elimination in their labor laws for a good many years, but no state has as yet thoroughly enforced these laws. The codes of five states which we investigated provide that grinding, buffing and polishing wheels should be exhausted, although two of the states exempt from these provisions wheels on which water is used.

This seems ill-advised, since a study of wet and dry grinding in Connecticut by Winstow and Greenburg has shown that the application of water does not by any means eliminate the dust hazard.

It may be remarked that, with everything else equal, a high static suction will give a higher velocity at the point of origin of the dust, fume or gas than a low one; but this alone is not a measure of the effectiveness of any exhaust system. Wisconsin has adopted the principle of specifying a limit to the number of dust particles of respirable size per cubic foot of air. After all, this is what we are primarily interested in, to keep the dust contamination down to a point where it will not be harmful.

These variations and conflicting provisions in state codes merely reflect the general lack of authoritative standards. It is accordingly fortunate that definite steps are now being taken by the American Standards Association to develop the proper basis for such codes. There are two committees working on this problem; the Ventilation Code Committee, sponsored by the American Society of Heating & Ventilating Engineers, and the Exhaust Code Committee, sponsored by the International Association of Industrial Accident Boards and Commissions. It is also arranged to appoint sub-committees to take up five specific subjects: Abrasive cleaning, chromium plating, granite cutting, rock drilling, and spray coating. In addition, a Sub-Committee on Fundamental Principles of Design and Operation and Maintenance of Exhaust Systems will be appointed.

The two most important considerations in an effective exhaust system are: 1. Velocity of air flow; 2. Arrangement of the inlets (from the standpoint of nearness to the dust source, shape, etc.).

Many an installation that is otherwise all right fails to remove the dust successfully merely because there is not enough air being drawn through the system. In a series of tests that were conducted under actual working conditions by Theodore F. Hatch, Department of Industrial Hygiene, Harvard School of Public Health, a machine used in dressing stone was employed, and it was noted that with an air flow through the hood of 230 cubic feet per minute, there were over one hundred million dust particles in the surrounding air. When the air flow was increased to a little over 250 cubic feet per minute, the dust concentration had dropped to forty million, a marked improvement. As the air flow was further increased, the drop in dust concentration was relatively slower, and it took a volume of about 380 cubic feet per minute to bring the dust concentration down to ten or fifteen million particles per cubic foot, which was considered reasonably safe for this type of dust.

It is accordingly possible sometimes to take an installation that is not satisfactory and, if the remainder of the system is well designed, by merely speeding up the blower or adding a larger one, to bring about the desired results.

Another very important consideration is to get the inlets of the exhaust system as close as possible to the source of the dust. The drop in efficiency as we get further away from the inlet is really surprising to one who has not studied the principles involved. It should be remembered that if we have the open end of an exhaust pipe or air duct in operation, the air tends to flow in from all sides, even from behind the opening. As we move away from the end of the pipe, the velocity drops very rapidly, so that even at a distance of five inches from the hood the velocity may be less than 10 per cent of that right at the hood inlet. This is the most important consideration to keep in mind and one which is frequently lost sight of in designing exhaust systems. It is not uncommon to see an exhaust inlet a few inches in diameter with which the person making the installation hoped to draw dust from a distance of several feet, but the air flow even a foot or two away from the entrance to the inlet may be negligible.

Still another important consideration having to do with the design of the inlet is the addition of a flange. The effect of this flange is to cut down the air that would flow in from behind the opening, thus drawing it nearly all from the front. Thus the efficiency of the system is substantially increased and the scope of the exhaust extended appreciably, without increasing the power consumption or otherwise adding to the expense of keeping up the system.

There are also other considerations of perhaps lesser importance. For example, air cannot be "pulled" from a distance by merely directing an exhaust pipe toward the point in question, but it can be "pushed" or blown, directionally, for a consider-

able distance. This principle may be used advantageously in directing the dust toward the opening of the exhaust inlet and thus getting the desired results with a lower exhaust velocity and power consumption than would be required if suction alone were depended upon. This principle has been applied effectively in drilling material containing asbestos, where the exhaust inlet is placed at one side of the drill and a small air jet at the opposite side of the drill, blowing across the table, turns the particles that would fly out from this side and directs them back into the exhaust system. It is also being applied to foundry shake-out work.

Other considerations in designing exhaust systems include the elimination of unnecessary bends or curves, the provision of clean-out doors, and the proper construction of joints. Where there is a general ventilating installation and one or more exhaust systems, care must be taken to see that they do not conflict with each other.

After an exhaust system has been installed it should be tested by taking actual dust counts to see that the dust is really being cut down to the desired point, and such counts should be taken at intervals after the installation has been made, to see that it is still functioning properly.

The fact that the dust particles that cause the trouble are so small that they are invisible under ordinary conditions (less than 10 microns or 1/2500th of an inch in diameter) often makes it hard to convince the practical plant manager that there is any dust present; it also makes it impossible to tell, without the use of special instruments, whether the completed exhaust system is actually removing the dust.

It might seem like an insult to one's intelligence to say that after an exhaust system has once been installed it should be maintained in good operating condition. However, the numerous cases one encounters in the plants where this obvious necessity is not carried out, indicates that it is really one of the major considerations in connection with the elimination of dust or fumes. Cases are not unknown where the blower has in some manner become reversed so that the air is being ejected and diffusing the dust, rather than drawing it in; other instances where the efficiency of the system has been lowered or its value nullified by clogging up, disconnection or wearing out of the piping, etc., are all too common.

One concern, of which the writers have knowledge, has a "U" tube permanently installed in one of its main exhaust systems so that the foreman or safety man can tell at a glance whether there are any changes that would indicate a break-down in the system. All such installations should have regular inspections by some competent person as a routine part of their upkeep.

It will be sufficient here to discuss respiratory equipment very briefly. The simplest form of this equipment is the filter respirator. Such respirators have a definite value for temporary use such as sweeping up, cleaning out bins, shoveling materials, etc., but they require careful fitting and constant supervision to see that they are being properly used.

It is our opinion, after watching the sincere efforts in a number of plants to enforce the use of these respirators, that it is rather impracticable to require them to be used on full-time operation. One notices the men, under these conditions, surreptitiously pushing the respirator aside and gasping in free air like a fish out of water. Certainly, if they are to be used any considerable length of time, frequent rest periods should be allowed where the men can get out into the free air for a few minutes refreshment.

There are also the large air-fed helmets, with which most of us are familiar, used for sandblasting, etc., which have been carried to a high state of perfection for the purposes to which they are adapted.

We believe, however, that much more use could be made advantageously of the type of apparatus that lies midway between the filter respirator and the air-fed helmet, namely, the light, air-fed respirator which covers the nose and mouth and leaves the rest of the face exposed. With a light hose attachment, this device offers considerable freedom of movement, and if air outlets were supplied so the hose could be quickly transferred from one outlet to another it would seem to be practicable to use them over a considerable area. They afford the advantages of a pure air supply without excessive weight and without the restriction to breathing that is imposed by the filter respirator.

The Medical Supervision of Workers Exposed to Dust

By W. J. McCONNELL, M.D.

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

The speaker said in part: The harmfulness of dusts varies widely in accordance with the physical and chemical natures of each individual substance. Certain dusts are soluble or slightly soluble in the body fluids and their harmful effects are proportional to the toxicity of the compounds formed. Lead, mercury, and arsenic are examples of poisonous dust. Other dusts exert their harmful effects locally on the skin and mucous membranes and through irritation to the respiratory passages. Chronic acid and alkalies are examples. Attention recently has been called to the probably harmful effect of dusts arising from radio-active ores. A fourth group of dusts which are insoluble or very difficultly soluble in the body fluids may initiate harmful pathological lung conditions. These may be subdivided into non-fibrosis and fibrosis producing dusts. The organic dusts, mainly the vegetable fibers, such as cotton, jute, hemp, etc., are non-fibrosis producing dusts. The fibrosis producing dusts are limited, so far as we have evidence, to a few of the inorganic mineral dusts, such as free silica, crystalline silicon, quartz, and certain combined silicates. Of the fibrosis producing dusts, those having a high percentage of free silica are admittedly the most important because exposure over a period of years to such dusts distinctly predisposes the individual to tuberculosis.

The effectiveness of dust control measures in preventing diseases produced by dusts can be determined only by careful physical examination of the workers so exposed under the guidance of competent medical supervision. The benefits which accrue to the employer and employee, alike, as a result of the physical examination of all applicants for employment, as well as periodical examination of those already engaged, would indicate very careful consideration by industry of a program for control of sickness. Such a procedure protects the employer from engaging an applicant already physically or mentally impaired who later may claim disability for a condition either not associated with employment or contracted during a previous employment. The applicant's physical and mental condition is established and by keeping record of his subsequent illnesses and accidents, the question of responsibility for injuries and sickness need never arise.

The applicant is protected from engaging in work for which he is physically ill adapted which, if undertaken, might easily bring about serious impairment of his health. For example, an applicant with an arrested tuberculosis who seeks work in a certain dusty occupation, if allowed to engage in such work might readily convert an inactive tuberculosis into an active one, thereby endangering life or at least seriously impairing the applicant's future efficiency and earning capacity. Whereas the same applicant if assigned to a position that involves no such exposure, might be expected to continue for years as a useful and productive workman. The examination of applicants for employment likewise protects those that are already employed from the risks of communicable diseases such as tuberculosis and various acute respiratory and other infectious being introduced into their midst by a new applicant.

Many of the younger individuals who seek employment have never before received a thorough physical examination and consequently are unaware of the defects from which they suffer. As a result of physical examinations, many defects are located which may be removed or corrected before they have caused irreparable damage, thereby increasing the efficiency of the worker and often averting definite and finally chronic diseases. Furthermore, incipient tuberculosis, unsuspected diseases of the heart, kidneys, and a host of other diseases of a similar nature, are discovered and the applicant referred for proper medical care and treatment which otherwise might have been postponed until too late.

Of even more importance than the initial physical examination of applicants is the periodic examination and care of old employees by an industry. Such a procedure serves to check the efficiency of preventive measures designed to prevent occupational diseases. It offers the most effective way of controlling the health of

large groups of workers by discovering early not only occupational diseases, but many other conditions that go undiscovered until the worker is acutely ill or becomes disabled. If the various contagious conditions go unrecognized others become infected, thereby causing serious economic loss, as well as endangering the health of a group of individuals.

The information obtained from physical examinations affords the medical supervisor the opportunity to make certain that employees are engaged in suitable work out of which they are getting maximum results, to correct the effects of undue exposure to harmful environmental conditions, and generally to lessen all occupational hazards. As a public health measure, it is impossible to over-estimate the value of periodic examinations in establishing interest in sickness prevention.

The set-up of a proper program for medical control of workers exposed to dust depends upon the number of employees involved and individual plant conditions. A series of articles under the title of "The Medical Department Manual" by Dr. Hart E. Fisher, appearing in current numbers of "Industrial Medicine," gives a comprehensive account of the organization and operation of a medical department.

1. The establishment of a medical department with adequate facilities and medical personnel who have qualified in the field of industrial medicine. A process analysis of all operations in the plant should be made and the medical supervisor should list all possible health hazards and familiarize himself with their physiological effects. If necessary, he should conduct research studies to determine the harmful effects of new substances introduced into plant processes about which little is known. In cooperation with other departments, he should investigate the extent of the hazards and devise measures of control.

2. The routine examination of all applicants for employment. The procedure should include a detailed history of the applicant's previous illnesses and accidents classified under (a) diseases of childhood, (b) general infectious diseases, (c) respiratory diseases, (d) venereal diseases, and (e) accidents and resulting physical defects. A detailed history of previous occupations engaged in is very important. A mere statement of the type of industry in which the applicant was engaged has slight value, if any. The exact duties performed in each occupation should be noted and information ascertained as to the probable length of exposure to hazardous substances. After the history has been taken and a photograph for identification purposes (if part of routine) is made, the applicant should be directed to the examining room where he is instructed to remove his clothing for physical examination. This examination should be made as complete as is considered necessary to determine the applicant's physical condition.

If the applicant has been or will be exposed to dusts which induce lung diseases, an X-ray picture of the chest is an important part of the examination. This part of the examination may be referred to an experienced roentgenologist, as the value of this method of diagnosis depends upon the type of pictures taken and the experience of the reader who interprets them. The examining physician also may need additional information obtained by laboratory analyses of the blood, sputum, and the urine. These aids to diagnosis should be provided or made available when desirable.

3. The rating and placement of applicants. In cooperation with the personnel department, the applicant should be rated and placed, not only on his training and past experiences, but also on his physical and mental abilities to fill vacancies occurring from time to time. The record of his physical and mental examination should be the confidential property of the medical department.

4. Periodical physical examinations. The frequency of periodical examinations necessarily must depend upon individual circumstances according to the need for such examinations as determined by the supervising physician. Where physical examinations are made for the first time, the employees of long standing should be given ample explanation of the benefits of such examinations and be given assurances that their jobs are secure.

5. Provision for the disabled. Employees who develop disabilities during the course of employment should be re-assigned to occupations which will not interfere with or aggravate the disability, or they should be provided for in other ways.

ADJOURNMENT



Fire Prevention

THURSDAY AFTERNOON SESSION

October 4, 1934

The Fire Prevention Session convened in the Statler Hotel with Chairman Harold L. Miner, Manager, Safety and Fire Protection Division, E. I. duPont de Nemours & Co., Wilmington, Delaware, presiding. After briefly welcoming the delegates, Chairman Miner introduced the first speaker.

How Home Fires Are Caused

By R. B. CRISWELL

Ohio Inspection Bureau, Columbus, Ohio

Speaking extemporaneously, Mr. Criswell gave a demonstration of the devices employed and the arguments advanced by himself and other members of the Ohio Inspection Bureau in bringing to the attention of school children the serious hazards of flammable substances in the homes. His object was to inform safety engineers, and perhaps others in his audience who might be interested in becoming safety speakers, how to use simple devices in convincing the school children of the necessity for caution to avoid fires and explosions. Each device and method was outlined briefly, but with striking detail, some of the demonstrations being as follows:

A match, still blazing, was thrown carelessly into a small waste basket, as so many persons still continue to do, and the waste paper immediately flared into a dangerous blaze. With a short talk about the forest rangers and their watchfulness in putting out smoldering camp fires in the North Woods, he next carefully broke a match to make sure the match had gone out completely before he tossed it aside. Said he, "Chaperone your matches; they shouldn't go out alone."

A small doll house, wired in similar fashion to a comfortable home, was exhibited, and after an explanation outlining the many light and lamp fixtures, coupled with electrical devices, which might be loaded onto the electric circuit in any home, the speaker attached these devices one after another until the fuse blew out; then he used a copper penny to plug the circuit until a fire developed in the attic of the doll house.

Strangely enough, an ordinary fish bowl, with the goldfish swimming about, if exposed in a sunny nook of the living room, with a flimsy curtain in the right spot beside it, or even a flammable rug underneath, can cause a disastrous fire. The circular fish bowl and the water act as a lens to concentrate the sun's rays. This has happened repeatedly, said the speaker.

A pretty little doll, made of pyroxylin, or some other flammable material, has often become ignited in the hand of a child and has burned the child severely before

the hazardous toy could be dropped. There are altogether too many toys on the market that carry death in their flammable substance.

A striking example to show that there are many dangerous dusts other than those commonly believed dangerous was then shown. Lighting a common candle to furnish the ignition point, the speaker took a small quantity of corn starch (such as used in every kitchen) and by means of a thin piece of cloth, sifted the starch down upon the candle flame. Immediately a rush of flame followed, somewhat resembling that when gasoline vapor is ignited. The speaker said that practically all dusts, if in the right percentage floating in air, are capable of producing fires and disastrous dust explosions.

Other experiments showed the tragedies that often follow the use of kerosene or gasoline to spur up what seems to be a reluctant fire in the kitchen range or the heating stove.

A last demonstration concerned the use of home cleaning fluids. The speaker exhibited a small can of a popular cleaning fluid, many of which are on the market. Dropping only five drops of this fluid into a small empty can, the lid was then put tightly in place, and by means of a single match blazing underneath the can, the gases inside arising from these five drops of fluid within a few seconds blew the lid off the can almost to the ceiling. The speaker said that practically all these home cleaning fluid preparations are extremely flammable under favorable conditions. Gasoline, of course, is the most deadly of all.

Modern Methods of Teaching Fire Prevention

By PERCY BUGBEE

Assistant Managing Director, National Fire Protection Association, Boston

The speaker said in part: It is fully as important to prevent fires and to control fires when small, as it is to build the building properly and provide adequate fire protection facilities in the first place. Examples are common enough of serious fires in well-built and well-protected structures. The really important job of an industrial man charged with the fire safety of his plant is to see that fire prevention and its value is really impressed upon the consciousness of the workers in the plant.

One of the most remarkable fire prevention campaigns coming to my attention was that carried on by the Youngstown Sheet & Tube Company. It was conducted under the direction of W. T. Filmer, Director of Safety and Fire Prevention, assisted by Fire Chief Philip Hart, of the Youngstown Works. This company, of vast size and with an army of employees, had had a large number of fires, a total of 2,274 during the year 1926. Mr. Filmer and Chief Hart set out to do two things: First, to secure the cooperation of the men in the mills to reduce the excessive number of fires by reducing fire hazards, and second, to develop the efficiency of the fire brigade of employees.

A series of meetings of employees was held in the plant, designed to demonstrate the practical value of fire prevention work. The value of fire prevention and safeguarding life and safeguarding their job was sold to the employees in common-sense language. The practicability of the campaign is demonstrated by one incident. Considerable oil and grease was found in one section of the plant because of the careless use of these materials. The fire prevention workers pointed out to the superintendent of the mill that a more careful use of oil and grease would not only reduce fire hazards, but would save money, and in fact a saving of \$583 in one month was effected through this means.

The fire brigade work of the plant was developed to a high degree. Each department has a fire company with a captain and lieutenant and from 4 to 10 members. There is a company for each shift and the companies are drilled at least once a month. An extremely practical method of drills is carried out. The Chief of the plant fire brigade hands the company an envelope which contains a description of an imaginary fire which might actually occur in some specific location of the plant. The company then proceeds to get out apparatus and go through such motions

as the case requires under the watchful eye of the Chief, who comments on their methods and offers suggestions after they have finished their drill. By this simple method, the men are trained to meet almost any conceivable condition and have become enthusiastic in their work.

Bear in mind that in 1926 the company had 2,274 fires. In 1927 this number was reduced to 1,127 fires, in 1928 to 624 fires, in 1929 to 579 fires, in 1930 to 254 fires, in 1931 to 114 fires, and in 1932 to 57 fires.

Another large corporation that has realized the value of fire prevention work is the Endicott-Johnson Corporation. Here again the personality and loyalty of one man, Fire Chief James R. Eldridge, has been largely responsible for a remarkable piece of work. Chief Eldridge has a real department consisting of himself, 2 assistant chiefs, 4 captains, 4 lieutenants, 16 men detailed to ambulance work, 6 switchboard operators, a fire alarm supervisor, and 82 full-time firemen. The men serve also as inspectors and watchmen of the plant. The actual work of fire-fighting has been but one of the numerous duties of the Fire Prevention Department. This department constantly inspects the many buildings which this plant controls. A complete check-up of every section of every building is made by a night patrol of 40 men and all reports are made at headquarters over a fire alarm system. A daily report on the condition of all fire-fighting equipment throughout the plant is filed by the department inspectors. It is the responsibility of the Fire Prevention Department to see that every man in the industry knows something about fire prevention work. The workers are trained in the use of fire appliances and given frequent fire drills. Good housekeeping is stressed as an important factor in fire prevention and especial emphasis is laid on the proper disposition of waste material. Every fire that occurs on the property is carefully recorded and analyzed with a view to preventing a similar fire. As a result, the total fire loss for the entire group of 34 manufacturing buildings for the five-year period ending in 1930 was only \$14,000, averaging less than \$3,000 per year.

Another striking fire prevention campaign is that of the Canadian Car & Foundry Company under the direction of George Greenfield, Director of Fire Prevention. This company has hit upon a novel way of arousing interest in its fire protection and prevention program. In each of the four large plants of the concern there is a fire brigade. For many years these brigades have held annual efficiency contests for a cup and for cash prizes. An elaborate scoring system has been developed for each plant, which includes not only points for efficiency in fire fighting, but on such subjects as general housekeeping, care of flammable liquids, obstructions to sprinkler systems, smoking, etc. The annual competition has aroused great interest and spirit among the plant employees.

The Sherwin-Williams Company is another concern that appreciates the value of fire prevention work. One of their activities has been the development of a very practical and easily-understood inspection form which can be filled out by the foremen in any of the plants without particular or intensive fire prevention training. It contains 46 points which have to be investigated and answered and is prefaced by the following statement: "The safety of our property and permanency of employment for those working on the premises depend on the conditions maintained in the various departments and the efficiency of their fire appliances. Therefore every employee, irrespective of position, can contribute materially to safeguarding our mutual interests." According to the safety division of this company, since these inspection blanks were introduced, housekeeping conditions throughout the plant were materially improved. The work of the inspectors in the safety division has been greatly simplified and reduced.

Another interesting plan to improve the housekeeping of a large industrial plant was that carried out by the safety engineer of the Cadillac Motor Car Company of Detroit. The plant has a clean-up committee consisting of one superintendent and four foremen who are appointed by the management each week. This committee grades the various departments on neatness, safety, and fire prevention. Inspections are held every Friday and each department is rated. When the tabulation is completed, the department with the best rating is awarded an illuminated clock which it holds for the week. On the clock dial is the following legend: "This was the cleanest department last week." The foreman's name is shown in the center of the clock dial. A fine spirit of competition is secured by this method.

One of the best examples of the value of forethought in saving an industrial plant from fire was cited by C. W. Mowry in a talk he made a year or two ago before the Massachusetts Safety Council. The Waterbury Clock Company, of Waterbury, Conn., had near one of its main buildings a row of two and three-story wooden buildings which were used for storing patent medicine and which contained several hundred gallons of alcohol. The management of the clock company realized the seriousness of the exposure. They equipped the windows with wired glass and installed rows of open sprinklers and instructed their watchmen in the use of open sprinkler systems, provided bags of sawdust for use in case of leakage around the windows, stored their goods on skids, and took other precautions. Within two years the expected fire came, at three o'clock in the morning. The trained watchmen acted promptly. Although the fire lasted for four hours and the wind was blowing the flames directly toward the plant, the Waterbury Clock Company suffered no fire loss and the next morning business was resumed as usual.

During the past few years there has been a considerable increase in the number of firemen's training schools and training schools for plant watchmen in various parts of the country. Every industrial plant that has a fire marshal or fire chief and has watchmen should take advantage of these schools for their men, not only from the viewpoint of giving valuable training to these employees, but in building up their spirit and interest in their work.

Plant fire brigades should be made an asset to those participating and not a chore. The men selected for a fire brigade should receive some form of recognition or extra compensation and membership in the fire brigade should be made a matter of pride rather than of drudgery.

There is a real value in holding fairly frequent demonstrations of the use of various types of fire extinguishing equipment which the various workers in the plant may see and participate in. You all appreciate that there is no one best fire extinguisher. Each type of extinguisher has its best function and should be employed to serve its best purpose and not used indiscriminately. You can never tell when any employee may have to use an extinguisher to save his plant and perhaps his life, and it should be a matter of common knowledge among the workers as to when and how to use the various types in the property.

The Value of Various Types of Fire Extinguishers

By JAMES A. HARTE

Engineer, American LaFrance & Foamite Industries, Inc., Tulsa, Oklahoma

The speaker said in part: Fundamentally, there are just two methods of extinguishing fire. The first is to bring the temperature of the burning material below a kindling point. The second is to exclude from the burning material the oxygen necessary to support combustion. Let us keep in mind the classification of fires that has been adopted by underwriters and manufacturers, as follows:

CLASS A. Fires in ordinary combustible materials, wood, textiles, paper, rubbish, etc., where the quenching or cooling effects of water or solutions containing large proportions of water, are of prime importance.

CLASS B. Fires in flammable liquids, oil, grease, paint, varnish, lacquer, etc., where a blanketing or smothering effect, is essential.

CLASS C. Fires in electrical equipment, motors, generators, switch panels, etc., where the use of a non-conducting extinguishing medium is necessary.

CLASS D. Fires in motor vehicles.

The following points should be observed in the inspection and maintenance of fire extinguishers in general:

1. A recharge tag should be attached to the extinguisher with the date of inspection and recharging entered in ink.

2. After inspection all parts should be returned to their proper places in the assembly with all defective parts replaced. The extinguisher should then be wiped off. A bright, polished appearance helps the operator to locate it quickly in an emergency.

3. The bracket or hanger on which the extinguisher is mounted should be on an easily accessible wall or partition with the top of the extinguisher not more than five feet from the floor.

4. It is recommended that a bright red panel, approximately 18 inches wide and 30 inches high, be painted behind the extinguisher so that its location will stand out conspicuously.

5. A piece of cup grease about the size of a pea should be smeared on cap threads. The grease will make it easier to remove the cap at the next inspection.

6. A supply of extra recharges sufficient to refill all carbon tetrachloride, soda-acid and foam extinguishers in service should be kept on hand. Carbon dioxide extinguishers must be returned to the manufacturer or to an authorized charging station for recharging.

Carbon Tetrachloride Extinguishers

The carbon tetrachloride pump-type unit is probably the most commonly used of all extinguishers. It consists essentially of a seamless drawn shell, a double acting pump mounted within that shell, an extended handle connected to the pump piston, a filler cap, a discharge nozzle, and a mounting bracket.

The liquid used as a filler is a specially prepared grade of carbon tetrachloride, free from moisture and impurities, and so treated that it will not freeze at temperatures above -50° F. When sealed within the extinguisher the liquid will not evaporate or deteriorate. It is a non-conductor of electricity.

Carbon tetrachloride is an extremely volatile liquid. When brought in contact with heat it develops a heavy non-combustion-supporting vapor. Under temperature conditions in the vicinity of an average fire one quart of liquid will develop 150 gallons of extinguishing vapor.

Operation. The operator, on arriving at the fire, unlocks the pump handle by giving it a quarter turn in either direction. This automatically opens the shut-off valve at the nozzle. The device is operated by a reciprocating motion of the pump handle. On the first outward stroke a dense stream of liquid is expelled. Usually an operator will empty a one quart extinguisher in about 40 seconds.

The fumes resulting from the application of carbon tetrachloride to a burning object are distinctly irritating. Operators should be cautioned to avoid breathing these vapors and fumes as much as possible during the actual fighting of the fire. Rooms in which these extinguishers have been used should be thoroughly ventilated before the operators return to their duties.

Suitability. Carbon tetrachloride extinguishers are not recommended for fires in ordinary combustible materials. (Class A.)

They are effective on fires involving small quantities of flammable liquids where the gas formed by the heating of the extinguishing liquid may be retained as a blanket on the burning material. (Class B.)

They are very effective on fires in electrical equipment, since carbon tetrachloride is a non-conductor of electricity. (Class C.)

They are also very effective in combating automobile fires before they reach serious proportions. (Class D.)

Recharging. Charging instructions are included in the nameplate on the extinguisher. They read: "Remove the hexagonal filler cap and pour in as much fluid as may be necessary to fill the extinguisher. Never fill with water."

These extinguishers should be refilled immediately after use. They should never be allowed to remain empty or partially empty. Only liquid supplied by a reputable manufacturer should be used. Commercial carbon tetrachloride is likely to contain impurities or moisture, either of which is sure to result in corrosion. It is necessary to refill the extinguisher only after use.

Maintenance and Inspection. Pump-type carbon tetrachloride extinguishers should be examined every third month to make sure they are properly charged and ready for use. Due to the nature of the liquid this type of extinguisher needs more careful supervision than the others. The extinguisher should be removed from its bracket and the following items given special attention:

1. The supporting bracket should be in good condition. The upper clips should

engage the pump handle snugly. The bottom well should be intact and should support the pump handle properly.

2. At each inspection the pumping efficiency should be investigated by discharging a small quantity of the liquid. Operate the pump a half-dozen complete strokes, three with the stream directed downward and three upward. The liquid should discharge in an unbroken stream with a range of about 20 feet.

3. The level of the fluid within the extinguisher should be checked. With the filler cap removed, the liquid level should be about one-half inch below the opening. These extinguishers should not be left empty or partially filled for any length of time.

4. Carbon tetrachloride evaporates rapidly. Therefore a leak in the nozzle will pass unnoticed. This makes periodic checking of the liquid level important.

5. Extinguishers need not be protected against freezing.

6. Recharging is necessary only after use.

7. If the inspection reveals defective pumping action, or if several consecutive inspections show a continuous loss of fluid, the extinguisher should be replaced.

8. After the inspection a check should be made to insure that the pump handle is locked.

Soda-Acid Extinguishers

The soda-acid extinguisher consists primarily of an outer tank, a wheel cap, a discharge hose, an acid bottle cage, an eight-ounce acid bottle with the acid filling line conspicuously marked, and a loose-fitting stopple that rests in the neck of the acid bottle.

The chemical charge consists of an acid bottle packed in a carton containing 1½ pounds bicarbonate of soda. The bottle, filled to the filling line, contains 4 ounces of concentrated sulphuric acid. Detailed charging instructions are printed on the package.

The bicarbonate of soda is dissolved in water and this solution is placed in the outer tank. The crown seal is then removed from the acid bottle and the lead stopple substituted. The acid bottle is inserted in its supporting cage and the cage is placed in the tank. Finally the wheel cap is screwed on to the threaded collar until the gasket seats tightly.

The charged extinguisher should be hung on a wall or partition in an accessible location so that the wheel cap is not more than five feet from the floor. For mounting a metal hook is furnished as part of the unit.

Operation. In case of fire the operator removes the extinguisher from the hook and carries it almost upright to the scene of the fire. On arriving at the fire the operator inverts the extinguisher, being careful to hold on to the hose. In the inverted position, the stopple falls free, permitting the soda solution and the acid to mix and react chemically. A pressure of about 100 pounds is developed within the extinguisher and this expels the solution through the nozzle.

Under average conditions, this extinguisher will discharge 2½ gallons of soda liquid. The range of the stream will measure 30 feet or more, making it possible for the operator to attack the fire from a safe distance. The effective discharge will last approximately one minute. A properly charged unit will extinguish a solid vertical partition, burning vigorously, having an area of 100 square feet.

Suitability. Soda acid extinguishers are effective in combating fires in ordinary combustible materials. (Class A.)

Not effective in fires involving flammable materials. (Class B.)

Not recommended for fires in electrical equipment since the liquid stream discharged will act as a conductor. (Class C.)

Not recommended for service on automotive units because the soda solution is subject to freezing, and because of the weight and size of the extinguisher. (Class D.)

Recharging. Detailed charging instructions are embossed on the nameplate attached to each extinguisher and are also printed on the carton containing the chemical charge.

Soda-acid extinguishers should be recharged immediately after use. This practice should be rigidly enforced. Furthermore, if an extinguisher has not been

charged during the year following its last charging, it should be discharged when this one-year period expires and recharged immediately. This is an Underwriters requirement.

It is recommended that the annual recharging of the extinguishers be made the means of familiarizing the plant personnel with their operation. When a batch of extinguishers are due for recharging, a group of operators should be gathered together and employees should be allowed to discharge one unit. This will give them a chance to get the "feel" of the extinguisher. They will learn the knack of inverting it, will become familiar with its range, its discharge period, and the nature of the extinguishing medium. Familiarity with an extinguisher may save precious moments at the time of a fire.

Maintenance and Inspection. The soda solution will freeze at approximately the same temperature as water, and should not be exposed to freezing temperatures.

Soda-acid extinguishers should be examined twice each year, preferably during April and October, to make sure they have not been tampered with or removed from their designated locations. One of these inspections can be made coincident with the annual recharging.

Each extinguisher should be removed from its hanger and placed on the floor. With the wheel cap removed the following items should receive special attention:

1. The discharge hose should be in good condition and should be securely threaded into the outlet elbow of the extinguisher.

2. The nozzle orifice should be clear. The inspector should blow through hose and nozzle assembly to make sure the waterway is not obstructed.

3. The screen protecting the discharge elbow on the inside of the extinguisher should be clean and free from any accumulation.

4. The acid bottle stopple should be readily removable.

5. The solution levels should be normal. The level of the soda liquid in the tank proper, with the acid bottle and cage removed, should be four inches below the top of the threaded collar. The level of the liquid in the acid bottle should be at the filling line molded into the bottle.

6. The acid bottle should be free from cracks, chips, or other defects.

7. The acid bottle cage should be intact and capable of supporting the bottle securely in position.

8. Cap gaskets should be in good condition. If the gasket shows signs of cracks or furrows it should be replaced.

9. The relief-hole, or holes, in the cap should be clean and open.

10. As a protection against mud daubers, a piece of light tissue paper should be wrapped over and around the nozzle outlet and tied with a light string.

11. At the October inspection, attention should be given to the exposure of the extinguishers. If installed where they might be subject to freezing temperatures, they should be re-located in heated buildings.

Foam Extinguishers

The foam extinguisher consists primarily of an outer tank, a wheel cap, a discharge hose, a cylindrical inner container extending the full length of the tank, and a stopple which serves as a cover for this inner container.

The chemical charge consists of a canister of powdered chemical "A" (aluminum sulphate), a canister of powdered chemical "B" (sodium bicarbonate), and a can of foaming ingredient. Detailed charging instructions are lithographed on each of the three containers.

The powdered chemical "B" is dissolved in lukewarm water and to this the foaming ingredient is added. This mixture is known as solution "B" and is placed in the outer tank. The powdered chemical "A" is dissolved in hot water, and this mixture, known as solution "A" is placed in the inner container. The inner receptacle is then inserted in the outer tank and the stopple slipped in place. Finally the wheel cap is screwed on until it seats tightly on the cap gasket.

The charged extinguisher should be mounted on an accessible wall with the wheel cap not more than five feet from the floor. A metal hook is furnished with the assembly.

Operation. The extinguisher should be carried almost upright to the scene of the fire. The charged extinguisher weighs 42 pounds.

On arriving at the fire the operator inverts the extinguisher, being careful to hold on to the hose. In the inverted position the stopple falls free, permitting the "A" and "B" solutions to mix freely. A chemical reaction takes place which develops a pressure of about 40 pounds within the extinguisher and at the same time generates a tough durable foam. This foam is the extinguishing medium, the internal pressure serving as a means of expelling the foam through the hose and nozzle.

Under average conditions this extinguisher will generate 20 gallons of foam. The range of the stream is 30 feet or more, making it possible to fight the blaze from a safe distance. The effective discharge will last one full minute. A properly charged unit will extinguish 12 square feet of burning gasoline surface.

The aluminum hydrate formed by the chemical reaction is an insoluble colloid which serves to make up the wall structure of the individual bubbles. The foaming ingredient does not enter into the chemical reaction. This ingredient, however, plays an extremely important part, in that it reinforces the bubble wall structure and thus develops a stabilized foam with desirable heat resistive qualities, and one that will stand considerable abuse without breaking down.

Suitability. Foam extinguishers are recommended for Class A fires because the extinguishing medium clings to horizontal and vertical surfaces alike. In addition its smothering action has a decided cooling effect. Foam contains more than 85 per cent moisture by weight.

Very effective on Class B fires since the medium generated, though heavier than air, will float on the lightest flammable liquid.

Not recommended for Class C fires because the stream is a conductor of electricity.

Not recommended for Class D fires because solutions are subject to freezing and because the bulkiness of available sizes is objectionable.

Recharging. Detailed instructions are embossed on the nameplate of each extinguisher and are also lithographed on each of the canisters that make up the charge.

Foam extinguishers should be charged immediately after use. If an extinguisher has not been used during the year following its last charging, it should be discharged when this one-year period expires and immediately recharged. This is an Underwriters requirement. As with soda-acid extinguishers, the annual recharging may also be the occasion for demonstrating the use of the equipment to the plant personnel.

Maintenance and Inspection. In general what has been said of soda-acid extinguishers applies also to foam units.

Carbon Dioxide Extinguishers

The fourth and last type to be discussed is the carbon dioxide extinguisher, the most recent addition to first-aid fire equipment and one that appears to have important possibilities. The device consists of a heavy duty steel cylinder, which serves as a container for the carbon dioxide liquid, a screw-type discharge valve which seals the liquid in the cylinder, an operating handwheel, a locking pin which holds the handwheel disengaged from the valve proper, a safety disc which is designed to rupture at 2800-2900 pounds, a flexible reinforced hose, an insulated hose grip, a discharge tube and a carrying handle.

Three sizes are available: the model 7½, containing a net weight of 7½ pounds of carbon dioxide; the model 10, containing 10 pounds net; and the model 15, containing 15 pounds net. When subjected to the pressure that exists within the cylinder, the carbon dioxide takes the form of a liquid, changing to a gas or a solid (carbon dioxide snow) as soon as the discharge valve is opened and the pressure released.

The extinguishers as received from the manufacturer are already charged.

Operation. Since the discharge range is limited to five or six feet the operator must approach as close as possible to the fire. A convenient way of operating is to set the cylinder—the heavy part of the assembly—firmly on the ground, and then withdraw the locking pin from the operating handwheel. This done, the handwheel snaps downward and automatically engages the stem of the discharge valve. The

discharge tube is then released from its catch. With the hose grip held firmly in one hand, the operator opens the discharge valve with the other by turning the handwheel in a counter clockwise direction, thus releasing the contained liquid. A cloud of gas interspersed with carbon dioxide snow will issue from the discharge tube.

For fires on the floor direct the discharge tube at the nearest edge of the fire. Using a sweeping, side to side motion, extinguish the nearer sections first.

For fires in vessels containing flammable liquids, approach as close as possible to the container, resting the discharge tube on the edge of the container. Direct the gas downward on the burning surface, being careful to avoid blowing the liquid out of the vessel.

The permanent shut-off feature incorporated in the discharge valve makes it possible for the operator to interrupt the discharge as soon as the fire is extinguished and salvage the remaining liquid. However, good practice dictates that the extinguisher should be discharged immediately after the fire.

The model 7½, extinguisher will discharge 65 cubic feet of gas. The effective discharge lasts from 25 to 30 seconds. A charged cylinder will extinguish 10 square feet of burning gasoline.

The model 10 will discharge 90 cubic feet of gas. Effective discharge lasts from 30 to 35 seconds. It will extinguish 15 square feet of burning gasoline.

The model 15 will discharge 135 cubic feet of gas. The discharge will last from 40 to 45 seconds, and will extinguish 20 square feet of burning gasoline.

Suitability. Carbon dioxide extinguishers are not effective on Class A fires because the discharged gas is not capable of wetting down the burning material. The discharge will knock down the flames temporarily but will not permanently extinguish a fire of this type.

Very effective in combating moderate sized Class B fires where the blanketing effect of the gas can be used to advantage.

Especially well adapted for Class C fires, since the extinguishing medium is not a conductor. It has the further advantage that the gas will penetrate every crevice of the burning equipment.

Not recommended for Class D fires, except in special cases such as gasoline tank trucks. The sizes commercially available are too heavy and too bulky for convenient mounting.

Recharging. High pressure charging equipment is required to compress the gas and extinguishers therefore cannot be recharged in the field. They must therefore be returned to the manufacturer or to an authorized carbon dioxide filling station to be refilled. The procedure is as follows:

1. Remove the hose and discharge tube assembly.
2. Raise the operating handwheel and insert the locking pin in the holes provided.
3. Ship the cylinder to the manufacturer's nearest branch or to an authorized charging station.
4. When the charged cylinder is received, attach the hose and discharge tube assembly, and record the date on the tag provided.

Extinguishers should be recharged immediately after use, even though only a portion of the contents has been discharged.

Maintenance and Inspection. Carbon dioxide liquid will not freeze at the lowest climatic temperature that will be encountered in service. On the other hand, extinguishers should not be installed where temperatures of 115° F. or over are likely to be encountered, because the vapor pressure within the cylinder increases rapidly as temperature rises.

Every third month the extinguisher should be removed from its hanger and weighed. The weight of the hose and discharge tube assembly is stamped on the hose coupling. The tare weight of the balance of the unit is stamped on the cylinder valve. To determine the weight of the liquid content, place the entire assembly on an accurate scale. From the scale reading deduct the total of the weights stamped on the valve and on the hose coupling. When this weight falls more than one pound below the nominal capacity of the extinguisher, it should be recharged.

Care should be taken in handling these extinguishers as their liquid contents are

under high pressure—900 pounds at ordinary room temperature. If an extinguisher is roughly handled, the valve may be broken off and the fragments thrown with considerable force by the sudden release of pressure.

The following points should also receive consideration in the quarterly inspections:

1. The hose should be in good condition and should be securely threaded into the outlet fitting on the valve.
2. The discharge tube should be free from cracks or other defects.
3. The locking pin should be engaged in the holes provided and the seal wire unbroken.
4. The locking pin chain should be intact.
5. After the inspection the hose should be arranged in a long radius coil and the discharge tube fitted on to the bayonet like fitting attached to the nameplate. The extinguisher should then be wiped off and returned to its hanger.

To secure the benefit of the entire contents of the extinguisher, the operating valve should not be opened until the scene of the fire is reached. The contents should be applied to the fire promptly after the discharge of gas has commenced as the early part of the discharge, during which "snow" issues, is the most effective.

Do not handle any carbon dioxide snow that may collect. It may cause a severe frost bite which will be difficult to heal.

If the pressure in the cylinder rises beyond a safe point as a result of temperature increase, the safety disc in the hexagonal fitting attached to the valve will rupture, permitting the gas to escape. The safety disc will rupture at 2800-2900 pounds. The cylinder proper is tested to 3300 pounds.

Larger Units

Throughout the discussion we have limited ourselves to the description of the smaller sized extinguishers of each type. There are larger units available for places in any fire protection layout where the risk is such that more extensive fires may be expected.

In the carbon tetrachloride type there are one-gallon and two-gallon units designed for service in large power plants. In the soda-acid and foam types there are 30-gallon extinguishers mounted on all steel running gears. In the carbon dioxide type there are 50-pound and 100-pound engines mounted on wheels. In each instance increased capacity makes possible the production of large quantities of fire extinguishing media and added accessories permit increased operating range and flexibility. In the main, however, the characteristics and outstanding features that have been described for the smaller units apply to the larger sizes.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Fusion Welding and Cutting

TUESDAY AFTERNOON SESSION

October 2, 1934

The session devoted to a discussion of Fusion Welding and Cutting was called to order by J. A. Voss, Director of Industrial Relations, Republic Steel Corporation, Youngstown, O., who presided. Chairman Voss welcomed the delegates and then introduced the first speaker.

Safe Practices in Maintaining and Using Electric Welding Equipment

By JOHN BAKER

Supervisor of Welding, Campbell Works, Youngstown Sheet & Tube Co.,
Youngstown, Ohio

(Mr. Baker first gave some interesting reminiscences about early experiences in welding operations, and outlined some accidents resulting from inefficient methods. He also outlined at some length various methods of gas welding. The brief portion of his address devoted to electric welding is reproduced herewith.)

We must safeguard our welders and see that they are provided with good soft leather gloves, also each one with leather sleeves, and instruct them to wear good substantial shoes. We must also provide them with good welding shields, and instruct them to wear good clothing that will not burn easily, being heavy enough to prevent the rays from the arc burning through the cloth. One of our men recently had a job to do on a warm day. He removed his trousers and worked with only his overalls on. Consequently, he was burned about the body by the rays from the arc.

We must be sure, also, that the men are provided with good substantial electrode holders; and if their work is aloft, be sure that they have a good platform, well guarded. Some persons think that a welder can work from a scaffold such as painters and structural iron workers use, but this is not true. We must remember that when a welder is working he is blinded more or less by the intense blaze of the arc, and when he raises his head he cannot see distinctly for a time. Therefore, he must be in a good safe place at all times.

I am a great believer in doing away as much as possible with overhead welding, and must insist on having the job properly set up to avoid strain. I think the way the job is constructed has as much to do with safety as the welding itself. Many failures in metallic arc welding are due to the job not being properly set up, and we must teach welders so that in years to come there will not be any accidents caused by careless welding of the past.

Safe Practices in Maintaining and Using Gas Welding Equipment

By R. L. CHRISTIE

Foreman, Metal Shop, Aluminum Ore Company, East St. Louis, Ill.

The speaker said in part: I have spent a good many years in handling and using gas welding equipment. After giving the subject of safety considerable thought, I began a check of my operators: First, to see if they knew any good reasons why they should be cautious in handling gas welding equipment; second, to learn whether or not they prepared and dismantled the gas cylinders properly; and third, whether or not they understood how repairs to the equipment should properly be made. Too much caution cannot be taken in this line of work, for in nearly every accident where oxygen or acetylene is involved, you will find that the accident was uncalled for and could have been prevented if a little forethought had been used.

Acetylene has a very wide range of explosive properties. When generated or compressed under a pressure greater than 15 pounds per square inch, it becomes very unstable and may become explosive at the slightest provocation. Acetylene and oxygen cylinders are not made of just ordinary metal, but are built of the best materials and must stand a number of severe tests before being approved. Acetylene cylinders are equipped with safety plugs located in such a position that it is practically impossible to damage them during ordinary handling. These plugs have a melting point of 216 degrees F. and should be guarded against being exposed to greater temperature. After being filled with a very porous material that has met the approval of the Interstate Commerce Commission, these cylinders are then ready to have dissolved acetylene compressed in them to a pressure of 250 pounds per square inch, at a temperature of 70 degrees F. Oxygen is compressed to a pressure of 2000 pounds per square inch in similarly manufactured cylinders, which have met their own important tests. It is well to remember that these pressures will increase when the cylinders are exposed to extreme heat; and because of the high flammability of acetylene and the fact that oxygen supports combustion, separate storage places should be maintained for each.

The practice of using poorly conditioned equipment is anything but a safe one, and it is also a very dangerous practice to use acetylene gas in tanks which are poorly ventilated. When cutting or welding in buildings that contain flammable materials, the operator should see that such materials are removed beyond range of flying sparks or protected by coverings of fire-proof material.

Conveying cylinders from job to job should be done on a suitable truck, designed so that the cylinders will always be kept in an upright position. They should also be chained or attached to the truck in a way to prevent them from falling off. On work where it is necessary to hoist cylinders, this should be done safely with the use of a cradle, specially designed to avoid all possibility of the cylinders falling out in transit. Avoid the use of slings of all kinds and never attempt to hoist cylinders by the use of a magnet.

Repairs should never be attempted on a leaky acetylene cylinder, but it should be removed to the open and the gas allowed to escape. In case acetylene becomes ignited, due to the release of the safety plugs, the cylinder should immediately be removed to the open and away from flammable materials. No oil should ever be allowed on any part of gas welding equipment, and the use of oily gloves and clothing should always be avoided by the operator.

All welders or operators of gas welding equipment are not capable of making repairs to them. The fact is that most of them cannot or will not clean out a tip properly. Every part of the equipment is required to be an exact and proper size and should be absolutely kept to its requirements or scrapped. A certain size tip should not be cleaned out by any other means except by being reamed with the proper size drill. The cleaning of tips, injectors and mixing chambers by use of wire or nails, is not good practice, any more than it is good practice to use stillson wrenches or gas pliers on connecting nuts of the outfit.

Only hose made to handle these particular gasses should be used in connection with the equipment and it is very essential that they be given as much attention as any other part of the equipment. Flash backs or back fires are very destructive to the inner walls of the hose, especially when the outfit is in the hands of an inexperienced operator. It is bad practice, after a heavy back fire has occurred, to continue to attempt to light the torch when upon opening of the acetylene valve a heavy black smoke is found to flow from the tip.

Good regulators are one of the most essential parts of the entire unit. A regulator that cannot be depended upon should not be used at any time, but should be removed from the outfit and kept out of service until such time as it has been placed in good condition. Most commonly used regulators contain two compartments. One is known as high pressure, or the cylinder side, and the other, the low pressure or working side. These two compartments are separated by means of a specially prepared seat and it is very essential that it be kept in first class condition at all times, because it is the best safeguard between the cylinder and the torch. In the low pressure side of regulators there is an additional safeguard known as the safety disc. This disc is very thin and is made to stand a pressure that will not be any greater than is necessary for the safe operation of the unit; it plays the same part as the fuse in an electric switch box.

When one stops to consider the mistreatment and misuse some gas welding equipments receive, especially at the hands of unskilled and inexperienced men, it is plain why these equipments should be closely checked and periodically inspected. Periodical inspection would require that all outfits be turned over at specified times and that they be given a thorough examination by one who is not only qualified as a welder but also has a knowledge of all parts connected with gas welding equipments.

During such inspection, if a regulator should be found to contain a creeping gage, it is necessary that the condition be remedied before further inspection is made. This should be followed by seeing that the hose is perfectly clean and free from all leaks and that the hose connections, nipples and nuts are in good condition. Next the torch should be thoroughly cleaned and all carbon removed. Torches should be checked for stoppages as well as for leaky valves and had conditioned tips. Any part of the outfit that is found defective and cannot be restored to its original condition should be removed and replaced by a new part. Substituting of parts or using home-made parts may cause serious trouble and should not be attempted.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Industrial Nursing

TUESDAY AFTERNOON SESSION

October 2, 1934

The Industrial Nursing Session was called to order by the Chairman, Mrs. Elizabeth Emery, American Museum of Natural History, New York City, and Chairman Industrial Nursing Section, N. O. P. H. N., who presided. Mrs. Emery briefly welcomed the delegates and introduced the first speaker.

How Can the Industrial Nurse Help to Prevent Accidents?

By OMILEE D. BRADFORD, R.N.

Beloit Iron Works, Beloit, Wisconsin

The speaker said in part: Some time ago I read an article on human engineering by Professor Angrove, in which he declared that 85 per cent of safety must be put across in terms of education. If correctible defects and ailments, as shown by the doctor's physical examination, constitute the key to solving a great number of our accidents, who, then, would be better fitted for this type of teaching than the nurse? She can do much to eliminate accidents in your safety program by teaching that health is the power and the glory of living, and that a lack of understanding of the human machine and its requirements is one of the primary reasons for ill health and sickness.

We will assume that every industry, whether employing five or 500 men, gives pre-employment physical examinations. The physical findings compiled in this record, with the cooperation of the management, are all the nurse needs to set about her health-building process, which will make the human machine a safe worker, in the same way that your tool makers keep your tools and machines in perfect repair, so that they will turn out good work.

On beginning my health program in 1929, I found that most of our employees were not sufficiently health conscious and were unaware that they needed medical or dental care. They were eager to discuss newspaper accounts of some murder or how the Cubs came out with the Giants, but it was difficult to get them interested in a discussion of how the absorption of poison from infected teeth and tonsils was causing their lumbago, instead of some fancy strain when they stooped to pick up some burden. It is very difficult to give the layman an understanding of the relation teeth bear to general health.

For the benefit of you who maintain a Health Department but have no idea of what the nurse does besides the routine first aid, I will give you a case history which will depict more clearly how physical ailments can affect not only the temperament of the individual, but the type of work he does. Also, how the nurse

brings about these corrections. No two people can be treated or managed in the same way.

One morning Mr. A came to the First Aid Department, and I greeted him with my usual cheery "Good Morning." By force of habit I scanned his hands for some sign of an injury. Not seeing any, I met his gaze, which reflected fire in his eyes and genuine hurt in his voice, as he said:

"I hate the word 'Safety' and all it stands for. It's the most used and abused word in the English language. Since this shop has gone safety mad it is going to the dogs, and, believe me, when things pick up these smart-alec foremen will have their eyes opened."

When he paused for breath, I said, "Why, Mr. A., you certainly are disgruntled. Won't you please tell me what is wrong? Perhaps I can help you."

Calming down a little, he said, "I have had such a fool headache and pains in my joints that I haven't been able to sleep for a week and my hands were so shaky that I made a slip and scrapped a piece of work this morning. So now I am sent home for a week—punished as if I were a naughty child; and it is my wife and kids that will have to suffer. Nurse, I don't know what this world is coming to. It looks like a losing battle for the working man."

By this time I had completely scanned his physical examination record and I am not ashamed to tell you that I was somewhat moved, for I saw beyond what the foreman had seen—a careless workman deliberately scrapping a piece of work. What I saw was a physical wreck on the verge of a complete break-down. For his case history ran like this:

Unemployed two years; lost 25 pounds last year; much under weight; vision poor, slightly corrected with glasses but should be rechecked at once; tonsils red and swollen; teeth and gums show marked infection, should see a dentist without delay; heart rate rapid; blood pressure somewhat elevated. And the doctor's note as follows: "This man is much undernourished. Seems very nervous but all his physical ailments are correctable and I believe he will prove a good man. Encourage necessary corrective measures. Recheck six months."

I looked kindly in this man's eyes and said, "I never interfere with the foreman's decisions because he must know his work better than I do or I would be doing his work and he mine; but I do say from the bottom of my heart that I feel dreadfully guilty. I have fallen down shamefully on my job. I should be sent home instead of you, and I should be denied a week's wages instead of you. As a health teacher, I should long before this have been able to make you realize that without your vision corrected you are groping in the dark and shouldn't be expected to do good work, and until you have all the infection in your teeth and tonsils cleared up, which is poisoning your system, causing you headaches, indigestion, underweight and fatigue, it is no wonder you are shaky and don't sleep nights. Please take your punishment, which in your case is a blessing in disguise. Go home and talk things over with your wife. Then come back to see me in the morning when you are in a better frame of mind." And as a parting word I said, "If you are short of funds, go to see your foreman. He is a fine fellow and will O. K. an advance on your check."

Next morning he was the one to greet me with a cheery "Good Morning." He said with a smile, "Nurse, you are the best friend a guy ever had. You surely made me see things in the right way. I didn't tell my wife the boss gave me a week off because I scrapped a piece of work. I told her I was sick and wasn't going back to work until I had all my teeth yanked out and my eyes tested—that I couldn't see to work for such headaches."

I agreed that he had done the right thing; and it goes without saying that this employee had all the medical and dental work necessary, which not only improved his health, but made him a very safe worker, and he is the best booster I have for health improvement.

One afternoon a foreman had a hysterical man in to the First Aid Department. This man was crying and half laughing, tears streaming down his face. The foreman said, "Here, Nurse, find out what is wrong with this man. Is he crazy? He wants to throw up his job because he can't sleep nights." On talking with this man for about five minutes, I found that he was a slave to black coffee, not only drank from

three to five cups during the night while working, but drank two cups with his breakfast before retiring. In trying to sleep he found himself a mass of twitching nerves which he tried to quiet by drinking more coffee and smoking one cigarette after another. By recommending coffee substitutes and milk, we saved this man's health and retained a valued machinist for the company.

There has never been a time when the need of teaching mental hygiene has been as important as in the past few years. The world is full of tragedies because of sheer ignorance of some simple fundamental principle of mental health which would have made such a fate almost impossible.

Visiting Nurses—Their Value to the Safety Movement

By LEVERETT D. BRISTOL, M.D., Dr.P.H.

Health Director, American Telephone & Telegraph Co., New York City

The speaker said in part: It is becoming more and more apparent that safety in the home should be the central objective and influence from which to radiate safety in all other walks of life. To this end, instruction on accident prevention and safety practice is of paramount importance. In this great work, there is no one in a more strategic position to accomplish results through sane and practical teaching than the home or visiting nurse.

According to statistical studies of the deaths due to accidents each year in the United States, nearly one-third, or considerably more than occur in industry, take place in the home. In spite of this, interest in the organization of accident prevention in the home has continued to lag. Safety in industry, in the school, in public places and travel has been built largely on the combined foundations of enforced regulations and education. In the home, on the other hand, most of our results in reducing accidents must be accomplished through education alone.

Home accidents, as a rule, are due to ignorance, indifference, or inadequate equipment. According to the findings of a recent study made by Zurrer under auspices of the National Bureau of Casualty and Surety Underwriters, home accidents cannot be ascribed to any specific hazards, general circumstances, particular duties, location or age. On the other hand, an analysis of home accidents, reported for a three months' period to four large hospitals in an eastern city, revealed the surprising fact that the majority of such accidents occurred on Saturday afternoons to male members of the household and were caused by falls in the kitchen. To a large degree, the problem is one of education of individuals, preferably in family and home groups. Ignorance and indifference must be dispelled and proper methods of using home facilities and equipment must be taught.

Health and welfare problems more and more are being solved with the family and home as the unit to be considered. So also the problem of accident prevention must be approached through the home, not only for the benefit of the home itself, but also in the interest of furthering all phases of human safety. As one of the agents in such work, no one is of more potential value than the visiting or public health nurse, who may be described as a home help and safety advisor and family friend.

The original Visiting Nurse Association rendered chiefly, if not entirely, a bed-side nursing service, having to do with sick people. At the present time the combination of both positive health instruction to well members of the family and bed-side care of the person who is sick, on the generalized district plan under specialized supervision, is emphasized as undoubtedly the ideal method of administering modern public health nursing. Under this plan, and with the present emphasis on education in her program, it should be possible and is highly desirable for the home visiting nurse to add instruction on accident prevention and safety practice as a part of her routine duties and responsibilities. To the directing staffs of the Nursing Bureaus or organizations carrying on such generalized district services, particularly in large cities, should be added where possible special supervisors on accident prevention and safety to supervise the work of the nurses on this particular subject; just as special supervisors are employed to advise or supervise the nurses in such activities as

maternal and child hygiene, school hygiene, tuberculosis control and nutritional instruction.

Instruction on safety should go hand-in-hand with instruction on health in general; health and safety cannot easily be divorced, because they are so largely interdependent. Accidental injuries often lead to ill-health and physical or mental ill health frequently contributes to the incidence of accidents.

Several years ago the writer had the privilege of directing the organization of a cooperative safety campaign in a large district of the congested East Side of New York City. This safety program is being continued at the present time as a part of a so-called Bellevue-Yorkville Health Center activities, and is being carried on both through periodic intensive campaigns and sustained year-round efforts. Among the various methods used, the Health Department nurses, visiting in the homes, have played an increasingly important part in this safety campaign by making special studies of accidents in the home, presenting various accident problems to residents of the district and instructing families as to methods of accident prevention in and outside of the home.

No one is doing more at the present time to stoke the fires of public health progress than is the visiting—or as she is now more popularly known—the public health nurse. This modern “lady with the lamp,” should be considered as a public safety nurse. Upon the work of this public health and safety nurse, working faithfully and efficiently in the home, under suitable medical and nursing supervision, must we depend to a large degree for our ultimate success in the new public safety as well as the new public health.

The Nurse's Part in Reducing Disability and Wage Losses

By MARTHA P. LANGLEY

Nurse Director, Visiting Nurse Association, Erie, Pa.

The speaker said in part: Before a nurse can join in the safety program of her plant, she should have some knowledge of how her particular factory is organized—and just how she fits into that organization. She should know what the factory is manufacturing, and how that product is made. If she understands the history of the industry she will appreciate the safety and sanitary devices set up for the protection of the employees of that factory. She should have some knowledge of the individual jobs of the employees, and above all, she should have an insight into the homes of these employees, for in the home are found many of the basic causes of the accidents occurring in the plant.

In the up-to-date plant today, physical examinations are given every man and woman before he or she is accepted for a job. Assisting the physician with these examinations is not the least important duty of the nurse. Physical examinations rule out those actually unfit for active duty. The commonest defects found upon examination are defective eyesight, defective teeth, defective tonsils, defective hearing and defective posture. More serious defects are often disclosed—thyroid, heart hernia, T. B., kidney, skin conditions, flat feet, peculiar behavior habits and many others. To get these defects corrected is the nurse's part in reducing disability and wage losses.

More and more, plant managers are finding out that good health is a safety measure, and that keeping a worker well cuts down the cost in production. By correction of defects, much sickness time is saved. Correcting the defects of strong men and women is not an easy job, but they are open to conviction and the nurse can do much toward persuading these men and women to carry out the instructions given by the plant physician. In these days when every penny counts, no worker wants to take the time to have his teeth repaired, or go to his family physician for treatment of disease. It costs money. But the nurse, by patience and repeated explanation, can convince that worker that he is not only saving time and money for himself, but prompt treatment cuts down sickness and disability costs, the inevitable result of delayed medical treatment.

The alert nurse unconsciously develops a keen understanding and often sees conditions unnoticed by the busy physician. By establishing and keeping an accurate, complete and legible record system, a nurse can be of great aid to the wage-earner as well as the physician. From these records, the nurse has an accurate picture of the kind and frequency of accidents in a given department. From her records she has an accurate picture of the frequency of certain types of illness among absentees. From her records, charts are made, which are of untold value to company officials in helping to reduce lost time and lost wages to the man on the job.

The nurse, in her function as teacher, can do much to make the worker safety-minded. By the use of posters and charts, by placing dodgers in the pay envelopes, by posting lists of accidents, she can do much to make the worker think safety. While bandaging an injured finger, the nurse can ingeniously instill in the mind of her patient at least one safety lesson. Stimulating the men and women to think in terms of safety is the nurse's part in the safety program of her plant. Teaching the principles of first aid comes well within her province. Group instruction in first aid not only cuts down disability losses in the plant, but the knowledge thus gained carries over into the homes and the community life of the workers.

For the nurse's part in the program of reducing disability and wage losses does not end within the factory walls. Her influence reaches into the homes of the men and into the intricacies of their community lives. Men and women will come to the nurse as friend and family counselor. No opportunity should be lost in helping that man or woman to adjust a family difficulty. Satisfaction and peace of mind regarding homes and families are a distinct aid to the reduction of accidents and subsequent disabilities within plants.

A visiting nurse, for example, walking from one case to another, observed a child shading her eyes from the sun's rays. The nurse took the time to visit the home of that child. The child's mother told the nurse that the family physician had recommended an operation—the eye was seriously infected and must be removed. The nurse called on the family physician. The doctor had advised removal of the eye; he had recommended an eye specialist; he did not know the father was only working two days a week. The physician issued an admittance slip for free hospitalization. The eye was removed—the remaining eyesight saved. When the child returned to school, the children gaily laughed—here was a one-eyed girl, an unusual sight. The child refused to return to the class-room. The mother called for the nurse. What could be done? “Try a glass eye” suggested the nurse. “Five dollars” said the optician, “the cost price.” The money was paid bit by bit, the glass eye inserted, and a happy normal child and a happy normal family resulted. If the father of that family had confided in the plant nurse at the beginning of that eye infection, could not untold agony have been prevented in that humble home? And if that father had injured himself while passing through that trying ordeal, could we not assume that this accident was directly caused by this particular home tragedy?

A visiting nurse, answering an emergency call to a home, found both doctor and father distracted in the midst of a scene of wild disorder. A new baby was entering the world. It was the sixteenth child. This latest arrival was too much for the grown daughters of that home—who gave loud vent to their feelings, stamping their feet, screaming, and pounding on the closed door. And to cap the climax, there were two babies instead of one—unwanted twins. Not an article of clothing prepared—not even a safety pin in that house. The visiting nurse did not leave that home until clothes were purchased, order restored, mother and babies bathed and resting comfortably. But next day, when that father returned to work, an accident occurred—he was painfully injured. Would the industrial nurse connect this man's accident with the distracting home even of the previous day? If that father had confided in the plant nurse several months earlier, surely the nurse would have made adequate arrangements with her local agencies for the advent of those two little ones, and the accident to the father would have been averted.

Visiting nurses are often called into the wage earner's home to nurse that wage earner himself. He may have been ill in bed for several days or weeks. How much disability time could be saved by that man if adequate bedside nursing had been

rendered at the onset of the illness. The industrial nurse can do much toward eliminating this waste of time and money by referring her patient to that agency prepared to render that bedside service. More community planning is needed if we are to build better safety programs for our workers. A good physiotherapy department established in a plant is a very decided method of eliminating disability time and consequent wage losses. The industrial nurse must, of course, have special training in physiotherapy before undertaking this work. If the plant is not equipped to give this service to its employees, the industrial nurse should know where to obtain these treatments for her patients.

The following case will illustrate what physiotherapy can do to lessen disability time. A foreman, 23 years of age, father of three children, was injured by sheet metal falling on his right forearm, severing tendons, nerves, and blood vessels. Ten days after plastic surgery—physiotherapy treatments were started. This man was able to return to part-time work in three weeks, and on full time in six weeks. After eight more weeks of treatment, he had completely recovered the use of his arm. If treatments had not been given, the lost disability time would have been four or five times greater. The cost of physiotherapy service was far less than the cost of paying for additional compensation time plus the wages of a substitute foreman.

There are approximately 3000 industrial nurses in our country and there are eight million wage earners. There is much industrial nursing still to be done. All plants cannot afford the services of a full-time nurse, but many small plants can afford the services of a part-time nurse. In planning for the future, plant managers should remember that nursing service can be purchased by the hour, and a public health nurse, entering a plant and rendering trained and efficient service to the employees for one or two hours daily, will prove invaluable in cutting down production costs.

ADJOURNMENT



Industry and Its Motor Vehicle Accident Problem

WEDNESDAY AFTERNOON SESSION

October 3, 1934

The session devoted to a discussion of Industry and Its Motor Vehicle Accident Problem was called to order by J. S. Baker, Fleet Safety Engineer, National Safety Council, Chicago, who presided. Mr. Baker welcomed the delegates briefly and then introduced the first speaker.

Safety on the Streets — A Major Problem for Industry

By J. M. ORR

General Manager, Equitable Auto Co., Pittsburgh

Thirty-one thousand people were killed and almost a million were injured non-fatally in motor vehicle accidents in the United States in 1933. The cost of these accidents, not including property damage, is estimated at 680 millions of dollars. Including property damage, a conservative estimate of total cost is one and one-half billions, or 1500 millions of dollars.

During the first five months of 1934, there were 12,010 motor vehicle fatalities, which is more than 20 per cent above the similar total for last year. For every five people that were killed last year, six are being killed this year. The number of motor vehicle fatalities that will have occurred in 1934 is most apt to establish an all-time high record.

Here is a challenge to the American Public, to industry, and to us as individual vehicle operators. None can deny the present inability to halt the rising tide and reduce the terrible toll of motor vehicle accidents. This being so, neither can there be any real consolation in the reflection that results would be far worse without the accident prevention work that has been done to date.

There are several things primarily responsible for today's condition. To begin with, it was not within our scope of wisdom ten or twenty years ago to anticipate and plan for the very rapid development of the motor vehicle and its application to personal, commercial and industrial transportation usage, and the results are too plainly obvious.

We can see now that drivers have been and are being licensed with inadequate assurances of physical, mental and financial competency, and without their thoroughly realizing the potentialities of motor vehicles as instruments of death and destruction.

We can see that our previously adequate streets, roads and highways have not been improved, revamped or expanded at a rate sufficient to meet increasing traffic requirements. Costs of such work, particularly in metropolitan areas, are prohibitive in many cases, which adds to the difficulties of this phase of the problem.

We can see the results that follow permitted operation of inadequately maintained vehicles on the road.

We can see the need for greater uniformity in traffic laws and regulations and for more of the three E's of Engineering, Education and Enforcement. We can see that the lack of safety on the highways has become one of our most important national and local problems, and that it must be solved. The seriousness of the situation is compelling. Present efforts are not enough.

The principal burden of motor vehicle accident prevention seems to be carried by the National Safety Council, State Highway Departments, motor vehicle administrators, insurance companies, some fleet owners, and some municipalities. These burden carriers must work harder, with the added impetus of a new approach, if a proper one can be found, to stimulate the work and obtain a satisfactory speedy result.

From the humanitarian standpoint, industrial and commercial operators have an obligation to minimize accidents and reduce the loss of life, limb and human suffering that follows, not alone in their own operations, but generally. As business men, and as representatives of sizeable businesses of character in the communities in which we operate, we are rightfully expected to lend substantial support and impetus to the safer operation of motor vehicles. Our vehicles are industrial tools. We control the uses to which they are put, and we can dictate their method of operation and use by our employees.

The machine age brought greatly increased dangers to industrial plant workers. Many toes, fingers, arms, legs and lives were lost. A demand for safety in industrial operations arose with management's recognition of the seriousness of the problem, and the result—an enviable one generally, is apparent in the plant safety records of most companies today. The seriousness of our motor vehicle accident experience should now be similarly recognized. Management's responsibility for commercial fleet accidents does not stop with "You Must Drive Safely" posters, rule books and instructions to drivers at headquarters. It rides with the driver on every inch of road traveled. Commercial vehicles must be maintained to high standards of safety, and they should be operated only by safety minded employees carefully chosen for their realization of the hazards involved and their responsibilities to their employees and the public. Drivers should be supervised on the road no less carefully than are the employees at work benches in the plant.

The advantages of a low accident experience are many, as has been found by operators whose accident frequency and severity are below average for their type of business. Non-productive service interruptions, idle vehicle time and idle employees' time are minimized. Fewer spare fleet vehicles are required. Insurance costs, or if a self-insurer, adjustment expense and claims paid are lower. Workmen's compensation, wage and welfare payments to injured employees, medical and hospital expenses, accident repairs and extraordinary vehicle depreciation as the result of accidents are lower.

It is doubtful whether drivers should be given special recognition and awards for safe operation. Some operators feel that safe operation is a measure of competency and that it is rightfully expected of an efficient employee. Public carrier and trucking fleets are more likely than others to acknowledge unusually good individual records with certificates, plaques, medals, etc., and even cash bonuses. I believe that the operator of a motor vehicle faces far greater hazards in his daily work than other employees. The National Safety Council has a comprehensive plan of stimulating interest and granting awards for safe driving that many fleets are using successfully. Many insurance firms also maintain an individual award service for their assureds.

Accident committees, or Company Traffic Courts, made up of operating supervisors and key men, are used extensively by all types of fleets to consider specific fleet accidents and accident trends. The committees act as fact-finders and investigators of specific accidents. Drivers appear before them, responsibility is determined, and recommendations for disciplinary measures are made to department heads or executives. Department heads should review all accidents as participated in by employees under their direction, and should lend full support to the Accident Prevention Manager in administering a program. Executives should insist upon a uniformity of compliance through given organizations, particularly large ones.

Frequent and careful inspection is apparently one of the cleanest methods of minimizing accidents. Vehicles must be inspected periodically to insure of their being in fit condition for the service to which they are assigned. This should never be slighted; if it is, maintenance costs, accidents, accident repairs, and claims losses will increase. Brakes, steering, lighting, horn, windshield, windshield wiper, and similar vital equipment should receive very close inspection and attention.

Tires are now very dependable, and they are responsible for fewer and fewer accidents. On the other hand, the best tires made can be grossly misused and contribute to the possibility of accidents. Most premature tire failures are due to blowouts, principally due to overload, under inflation, or high sustained speeds. Overload can only be corrected by properly tiring a vehicle or properly restricting its load. Most fleet operators recognize the advisability of maintaining regular inflation inspection, both in garages or terminals and while the vehicles are on the road. Blowouts which may be due to high tire temperatures, can be greatly minimized by proper studies of each individual vehicle and its operating conditions. It is necessary that the vehicle be adequately tired, adequate air pressure maintained, sustained road speeds governed as much as possible, sufficient brake drum clearance provided, and as much ventilation as possible given, particularly to the rear wheels.

In conclusion, it is my belief that present motor vehicle accident prevention measures and activities are not sufficient. We appear to have reached a very critical point and every effort should be made to enlist the support of all thinking people in a ceaseless campaign for safer vehicle operation. This could include strict and comprehensive requirements for the licensing of new drivers, with possible provision for periodic re-examination; the revocation of present licenses of accident prone drivers who will not or cannot correct their faults; the re-education and examination of accident liable operators; and the clearing from the roads of all unfit and unsafe vehicles through complete and thorough compulsory periodic mechanical inspections.

If industry will recognize the seriousness of our motor vehicle accident experience and trends, and devote the same degree of attention and effort to it as has been given to industrial plant safety, we can expect to see sizeable reductions in motor vehicle accidents. This would involve full acceptance of responsibility by the employer for his driver's actions on the road and a realization of his obligation to reduce accidents generally in his community. By minimizing the possibility of motor vehicle accidents to plant employees away from their benches or shops, the expense of training new employees, or of the necessary reallocation of work that follows absences would be greatly lessened.

An Industrial Safety Program That Includes Vehicle Drivers

By W. H. WELKER

Safety Supervisor, Sales Dept., Union Oil Company of California, Los Angeles

The speaker said in part: Our plan for carrying on accident prevention work is based on two fundamental ideas: First, safety is an operating problem deserving the same attention and close scrutiny from supervisory personnel which they accord any other production problem involving costs. (Our tangible money saving has been at least six dollars for each dollar expended.) Second, it is an educational process, necessitating a definite plan and objective.

Our plan has been in operation during the past five years, among 4,000 employees in a widespread geographical area. Accident frequency has been reduced 88 per cent and approximately 500 disabling injuries to employees have been prevented. The employees operate 500 wholesale petroleum marketing plants and a still larger number of retail plants in this area. The daily operation includes the bulk handling of large quantities of a potentially hazardous commodity and thousands of barrels, each weighing approximately 500 pounds, 1000 heavy trucks and 500 autos are operated daily, with a steady decrease in frequency and severity of automotive accidents. During one three-month period 1400 new men and supervisors were absorbed into our organization.

To profit by the experience of the past and provide definite and aggressive direction for future plans, it is always essential that a careful study be made of past accident experience. Our study disclosed the following:

Three routine operations, including handling drums and barrels, falls of persons from various causes, and cranking trucks had caused 60 per cent of the disabling injuries.

It developed that 35 per cent of the lost-time injuries were minor in nature; that there was in the majority of these cases no good reason for loss of time beyond the day of injury, or disability that would prevent the injured from carrying on his regular work. It was evident that because the injured employee had been given salary or wage consideration for these short absences we had many minor injuries which unnecessarily were classed as lost-time.

From the high ratio of accidents occurring to new employees, it was evident that they had not received the necessary training in their new jobs from the foreman in charge. Obviously, this not only resulted in lost-time accidents, but in much inefficiency from a production standpoint. There was also evidence that experienced employees had more accidents than should be expected.

Accidents were not reported as promptly as necessary.

The lessons learned from accidents had not been used to the best advantage.

Our plan, resulting from the above study, includes the following:

1. Establish responsibility for results in accident prevention.
2. Receive complete and prompt reports of accidents and fires.
3. Investigate lost-time accidents.
4. A comprehensive educational program along safety lines.
5. The development of safe practices for the most hazardous operations to be used as safety topics at safety meetings. The use of visual education, plus actual demonstration of standard methods, has been found effective.
6. The discipline of the flagrant violators of established safe practice, also for failure to report accidents.
7. Safety education of new employees—a supervisory responsibility.
8. A friendly spirit of safety competition between operating units.
9. A definite objective in accident frequency to be reached each year.

We found that the first seven items of the plan can be sold to the management without having the safety supervisor usurp the prerogatives of the foreman.

In our plan, the Division Manager is held accountable for the accident rate in his division. Plant Superintendents are held responsible by the Division Manager for their units. The Division Manager delegates to each Agent the responsibility for the safety of his sub-station employees. This assures the personal interest, enthusiasm, and cooperation of all these men. The results in each unit will vary directly with the knowledge and interest the Plant Superintendent or Agent establishes and maintains. The Agent is held responsible for education of the new men.

We have found that this plan of delegating responsibility for results along regular recognized lines of operating authority, is effective in operations other than marketing within the corporation. In drilling activities, the most hazardous work in the petroleum industry, we organized an identical line of responsibility, and within sixty days we had doubled the number of employees in this extra-hazardous activity without raising our accident frequency.

Complete and accurate reports of potentially serious or unusual accidents, fires, and lost-time accidents, are secured by an investigating committee whose report is approved by the Division Manager or his delegated assistant before forwarding to the Safety Supervisor. A mimeographed form is used. The investigation committee consists of at least three men, two of whom are employed in supervisory capacity.

Details covering employees include: Length of employment, Whether previously involved in accidents, and Nature of work being done.

Questions regarding safety instructions include: Was the accident the result of violation of an established safe practice? Has injured man taken active interest in safety meetings at plant? Who has instructed him regarding hazards of his job? When?

Questions to be answered under supervision include: What will you do to prevent recurrence of this accident? When? The basic cause must also be deter-

mined. The Basic Cause Chart by H. W. Heinrich of the Travelers Insurance Company is used to classify all accidents.

This report furnishes us with excellent material for safety posters and helps us to direct our efforts at the conditions and practices that are conducive to accidents.

Safety meetings conducted by a foreman, agent, or plant superintendent and attended only by the men working under his direction are the most potent force in building good accident records and training men in the best and most efficient method of doing their work. It is here that the foreman or other supervisor has an opportunity to demonstrate leadership and knowledge of the job; to develop the qualities of leadership which are essential to his development and promotion.

To secure uniform and effective meetings, it has been necessary to develop a method. At least a week before the foreman holds his meeting, he is furnished with a three or four page mimeographed pamphlet of safety topics for discussion. To assist him we offer the following guide:

1. These meetings must be confined exclusively to safety. They are attended only by men working for the foreman. Safety supervisors or superintendents never attend these meetings.

2. A thorough discussion of two or three subjects results in an effective safety meeting.

3. Actual demonstration of the correct method of doing a job leaves a lasting impression and should be made a part of the business of these meetings when possible.

In this manner the foreman is definitely committed to the safety program.

We constantly reiterate the following ideas in several ways in our Safety Topics:

1. Accidents indicate lack of skill.
2. Skill is acquired only by constantly thinking about the job being performed and seeking to improve the manner in which it is done.
3. Skill is rewarded. During periods of retrenchment the foreman makes every effort to retain his most skilled men. Skilled employees require a minimum of expensive supervision.
4. Skill in our job is the best way to acquire security—the aim of all.

Knowing that accidents are errors, that the object of disciplinary action is to prevent recurrence, we must examine the motive that resulted in the error. First, it is essential that the foreman postpone the disciplinary action until a careful investigation determines the motive of the man involved in the error.

Where a good motive but poor judgment is evident, the foreman must look the facts squarely in the face. Either the foreman used poor judgment in selecting the man to do the particular job or he failed to give him the proper instruction. With more instruction these men become skillful workmen, the backbone of industry. To discipline an employee for an error resulting from a good motive but poor judgment is a grave injustice and an indication of unskilled supervision.

In a large percentage of errors, perhaps 90 per cent, the investigation will disclose no motive, either good or bad. The employer loses when these men are fired. Every skilled foreman can interest men in their jobs and by so doing increase the work output of his gang. By interesting men in their jobs he promotes skill, which creates a measure of security for the workman. This human problem is a real challenge to foremanship and industry.

Selecting Drivers for Commercial Vehicles

By HERBERT W. CORNELL

Chief Examiner and Secretary of the City Service Commission, Milwaukee, Wis.

The speaker said in part: Up to the present time the City of Milwaukee has conducted tests for truck drivers every two or three years, including three elements: a written test, a practical driving test, and an evaluation of training and experience. It is not proposed to abandon any of these tests in favor of psychological laboratory methods, but it is hoped to add this fourth important element in the future.

Taking, first, the proposition of a written test, I insist that any test given where

the number of candidates will naturally be large, should be in short answer form. Tests which are answered by the candidates in discussion form take a great deal of time, not only in the examination room, which is relatively unimportant, but consume much time of the examiner in rating. Unless the number of candidates is less than thirty, it is quite essential in the interests of efficiency to use the short answer form, which has the further advantage that the candidate has practically no writing to do but shows his knowledge by correctly or incorrectly checking in answers to questions. This removes the objection so often heard that civil service examinations are too purely educational in their tendencies with disadvantage to the practical man.

Generally speaking, such questions may be divided into five groups: those referring to traffic laws or ordinances; those referring to automobile mechanism; those referring to street information such as the locations of various streets and important points in the city; those referring to safety practices and standards; and those of a general nature to test intelligence. All these factors are important, though recent researches have shown that the man having the best knowledge of traffic regulations or the best knowledge of automobile mechanism may be a very unsafe driver, while a really safe driver may sadly fail on these points. By this I do not mean that such subjects should be abandoned, but rather that they should not be made such an important part of the examination as has hitherto frequently been the case.

Short answer form questions are given in a number of methods, one being to give a question which has four or five answers given, only one of which is correct. The candidate is supposed to check the correct one.

Here is an example: "When driving on snow covered streets, the chief objection to disengaging the clutch and applying the brakes hard at the same time is:" To this statement there are four answers among which the candidate must choose, the four being—first, "Too much power is lost"; second, "Disengaging the clutch permits the motor to race, which is injurious to it"; third, "The danger of skidding is increased"; fourth, "Under such conditions the wheels are easily locked and this is hard on the tires."

The objection to this question is that the answer is a little bit too obvious. It does not distinguish clearly between the fairly good man and the very good man. A man who would get it wrong would either not be an intelligent driver or would misunderstand the question, but many men might get it right who are not especially good drivers.

Another example: "The chief objection from the standpoint of safety to having brakes unequally adjusted is:" To this there are four answers: first, "The extra wear on the brake bands"; second, "The unusual strain placed on the differential"; third, "The danger of skidding"; fourth, "The danger of stalling the engine."

This question at first sight might seem to be a good one. It directly refers to the recognition of dangerous conditions and is presented from the standpoint of safety. The objection to it, however, is that a man who really is not a driver at all, if he is of good intelligence and uses a little reasoning power, can, by a process of elimination, arrive at the correct choice even though he might not previously have been aware of the fact that there is any particular hazard to unequally adjusted brakes.

Consider the following question: "If there is too lean a mixture for a low speed the probable result will be:" To this there are four answers given: first, "The motor will run evenly and silently"; second, "The motor will pop and motor power decrease"; third, "The engine will stop dead"; fourth, "The cylinders will accumulate carbon."

This obviously does not have a very close connection with safety, but it does have a close connection with valuable knowledge which a truck driver should possess. We are aiming for safety as our principal objective, but there certainly is no reason why we should not include economic factors as well as safety factors. Similarly, questions regarding the geography of the city such as the location of important municipal buildings, the location of parks and approximate distances apart of important streets, house numbers at important street intersections, and the starting locations of diagonal streets, may well be made the basis of useful questions, although the factor of safety is not the one they are aimed at.

Consider now the following question: "If the car I am driving should start to skid on a wet pavement, under most circumstances I should do the following:" To this there are four answers: first, "Release the brake but not the clutch and turn the steering wheel in the direction the car is skidding"; second, "Release the brake but not the clutch and turn the steering wheel opposite to the direction in which the car is skidding"; third, "Put on the emergency brake"; fourth, "Put the engine in reverse."

Here we have at first glance a question which should be of high value as showing the applicant's knowledge of what to do in a given emergency. The trouble is, however, that the question stops short with its testing of knowledge. There is no testing of psychological reaction. To sit down in the examination room, study the alternatives one after the other and calmly decide which is the right answer, is one thing, but to act correctly in an emergency where even a small fraction of a second may be of the most vital importance is very different.

Another form of short answer test is that in which statements are given which are either true or false, with two columns headed "Right" and "Wrong" in which the applicant is to check as to the correctness or incorrectness of each statement. Such questions as "The value of an oil for lubricating purposes depends upon its viscosity", and again, "If the air pressure in tires is decreased, skidding is less likely to occur", and another, "A heavier lubricating oil is used in cold weather than in warm" have been used. These questions are open to many of the objections already indicated for the multiple choice questions, and in addition they have the disadvantage that a man not knowing the answer has a fifty-fifty chance to guess correctly.

However, in spite of the disadvantages to which I have alluded, there is no question that the short answer form of examination is superior in most cases to the old style discussion answer. There is less argument as to what is and what is not a correct answer, there is much less time required on the part of the examiner to rate the answers, a greater field of inquiry can be covered in the length of time allowed for the examination as the questions take so little time to answer, and it does not require a technical expert to mark the papers.

I do not wish to give the impression that we depend entirely on a written examination. We never have done so. We have used the written examination as a first elimination and those who qualify therein are given a performance test. This test consists in driving a five-ton truck over a carefully worked out route including turns in narrow alleys, stopping and starting on a fairly steep hill, getting into and out of a difficult parking space, and passing quite a number of points where arterial highway stop signs and other traffic signals must be heeded. The examiner does not merely rely on general judgment in rating the candidate, but takes along for each man a blank form in which he checks in the various errors which men are most likely to make. This is important since experience shows how difficult it is for examiners to make any kind of written notations while on a moving truck. The various items on the card to be checked read as follows:

1. Did not check oil, gas and water before leaving yard.
2. Backed into street from yard instead of turning in yard.
3. Did not sound horn or stop in leaving yard.
4. Did not make complete stops at arterial highways.
5. Did not give proper signals at turns.
6. Did not stop before coming out of alleys.
7. Did not make turns in alleys readily and without backing.
8. Did not back cleanly—too many stops or forward drives in backing.
9. Coasted down grade with clutch disengaged.
10. Handled hoist poorly.
11. Allowed truck to roll backward downhill in starting forward.
12. Raced engine when starting or shifting.
13. Started engine abruptly—truck jumped, uneven acceleration.
14. Jerky driving.
15. Rode the clutch.
16. Started with emergency brake on.
17. Stopped too suddenly and applied brakes abruptly.

Furthermore, a rather complete questionnaire must be filled out by the candi-

date, giving an account of his training and experience, and this is a ratable element in the examination.

Several years ago the Milwaukee City Service Commission obtained the consulting services of Dr. Sadie M. Shellow, Psychologist of the Milwaukee Electric Railway and Light Company, through whose assistance a machine is being devised by means of which we hope eventually to make certain interesting and valuable tests of the qualifications of motor vehicle drivers. While I would much prefer to tell you what the machine is accomplishing rather than what we hope it will accomplish, the best I can do is to make predictions and express a pious hope that they will be fulfilled. The machine is defined as an instrument to test the coordination of the sense of sight with the mental capacities resulting in a check of the perceptibility of the person being examined. It consists of a driver's seat, steering wheel and ordinary automobile set-up, including gear shifts, clutch, choke, etc., and a pair of irregularly oscillating pointers in front of the subject and also a manual pointer that is under his control by means of the coupled steering wheel. The subject is to take his seat in the machine and in the same way that he would steer the car, he is supposed to make the manual control pointer follow the movements of the irregularly oscillating pointer. This has the effect of keeping his eyes in focus directly ahead while a test to measure angle of vision is being made. It also tests his eye concentration by seeing how well he can make the manual pointer follow the mechanically oscillating pointer. This is recorded by means of a circular graph on which a record will be mechanically inscribed.

While the subject is concentrating his attention on making the manual pointer follow the mechanical pointer as closely as possible and thereby demonstrating his quickness of personal reaction and his degree of muscular and nervous coordination he is informed that the horizontal arms will be advanced from in back of him to the side and as soon as he sees them he is to step on the brake. Either one arm, or both can be brought slowly into his field of vision. His necessary concentration on the moving indicator in front of him prevents any looking sideways and we thereby determine whether his angle of vision is sufficiently wide to meet an acceptable safety standard. Not only that, but the moving arms may carry targets of different colors so that the width of vision for white, red, green, etc., can be determined. It is a well known fact, of course, that many persons have a very narrow angle of vision for some colors and a much wider for others, so that a child wearing a dress of a particular color might be exposed to a much greater hazard in crossing the street with such a driver approaching than a person wearing clothing of some other color. The point at which the brake is applied will also be mechanically recorded.

It must be realized that whatever the success of such a machine may be, it should be used as a complete test, nor need it be used as a first test. Only one candidate can be tested at a time and it will be found in practical necessity, as well as a reasonable procedure, to give a written test in short answer form such as we now give, though, perhaps, managing to avoid some of the pitfalls therein, and have this as a first elimination. Those surviving the first test would then be subject to the test of the machine and those scoring satisfactory ratings therein would be taken out in the field to undergo a driving test. The perception indicator is not supposed to be more than a valuable adjunct in civil service work. We would not recommend it as having a weight of more than possibly forty per cent of the entire examination.

The main point I wish to emphasize at this time is that up to the present our civil service examinations for truck drivers have been chiefly concerned with how much a man knows about truck driving. With the aid of this apparatus we are also going to try to find out whether he has the psychological traits and abilities that make for safe driving.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Maintaining Interest in Safety

THURSDAY AFTERNOON SESSION

October 4, 1934

The session devoted to a discussion of Maintaining Interest in Safety was called to order by Thomas P. Kearns, Superintendent of Hygiene and Safety, Industrial Commission of Ohio, who presided. After welcoming the delegates to the state and community, Chairman Kearns introduced the first speaker.

Keeping the Management Sold On Safety

By A. H. YOUNG and A. S. REGULA

Mr. Young is Vice President for Industrial Relations, United States Steel Corporation, New York City; Mr. Regula is Executive Secretary, Industrial Relations Counselors, Incorporated, New York City

(In the interesting demonstration in dialogue form given below the part of the General Manager was taken by Mr. Wesley Graff, National Bureau of Casualty and Surety Underwriters, New York City, who substituted in the unavoidable absence of Mr. Young. Mr. Regula took the part of the Safety Engineer.)

General Manager: The Budget Committee is advised by our Comptroller that we shall have to increase our budgetary item for workmen's compensation by 25 per cent for the year 1935. That is quite a shock, as I had been under the impression from your reports that we had maintained our rate of progress in reducing accidents and that this progress would be reflected in a reduction in costs. What's the matter?

Safety Engineer: Well, we've had some serious accidents on which the compensation costs run high. Since the first of the year there were three fatalities, one permanent total disability, and several cases involving the loss of eyes or dismembersments. One of the fatalities was the case of Jim Donovan, who was caught on the line shaft over in No. 2 Mill. You will recall that the recommendation to install engine stops and remote controls was turned down by the management, although approved by the Central Safety Committee, because of the cost of \$5000. The compensation on that case alone ran over \$10,000.

General Manager: Yes, I recall only too well. You've got me there, and knowing how I feel about it, it's like hitting below the belt to bring that case up. I'd pay the cost out of my own salary if it would bring Jim back.

Safety Engineer: The only reason for bringing it up, Boss, is to emphasize the fact that in our set-up of accident statistics, Jim's death wasn't given any more weight than a simple laceration involving a loss of one or two days' time. The full effect of these serious injuries is not reflected in the accident statistics as we prepare them.

General Manager: In other words, we are not getting the complete story?

Safety Engineer: That's correct. You will probably recall that in my annual reports for several years I recommended that our statistical methods be amended and be brought in line with accepted standard practice. But my suggestions were turned down. I was especially emphatic in my recommendation respecting a statistical set-up to reflect the severity and cost of accidents. All we tabulate now is the frequency of injury and the cause. Confining ourselves simply to frequency rates leads to wrong conclusions.

General Manager: As I recall it, you were going to charge a department having a fatality with several thousand days lost, and other serious permanent injuries on some sort of a relative basis. The foremen objected on the grounds that the basis of calculation would not be understood; there would be violent fluctuations from month to month that would be very perplexing.

Safety Engineer: Oh, they'll get to understand the basis of calculating severity rates if they'll start from the premise that we must have a measure of severity as a full reflection of the actual picture. As to violent fluctuations, that's a matter of detail; we'll simply calculate the rates on overlapping twelve-month periods, rather than on a month-to-month basis.

General Manager: Suppose you summarize briefly the statistical set-up as you think it ought to be.

Safety Engineer: Such a statement was incorporated in my last annual report, and included:

1. Injury frequency and severity rates by departments.
2. Cost of accidents by departments (monthly and annual; incurred and accrued).
3. Cause classification of injuries (annual).
4. Comparison of company records with those of other companies in our industry.
5. Reports of unusual and fatal and serious cases.
6. Comparison of lost-time injuries sustained in the course of employment with those occurring outside of working hours.

General Manager: Very well, I'll take up your recommendation at the next meeting of the Central Safety Committee. It's about time we found out just where we stood. Wait a moment, though. What's that you said about comparing injuries in the plant with those occurring outside of working hours?

Safety Engineer: I want to direct your attention to an important cause of loss of time that we've missed entirely. Frankly, I don't know what the situation is in our company, we've never attempted to keep any records on accidents to our employees outside the plant. Few companies do, but in these few the ratio of non-occupational to occupational deaths averages about two and one-half or three to one. One large company reports a ratio of 37 to one. If we knew what our situation was I'm sure we would extend our safety program in an effort to prevent some of these outside accidents.

General Manager: But you're assuming that we have some responsibility in the matter. Why should we as a company concern ourselves about accidents occurring to employees outside of working hours?

Safety Engineer: As I see it, it's quite immaterial whether one of our men is injured inside or outside the plant gates. The company loses the production due to his absence; the overhead on idle machinery or equipment continues; if he is killed or seriously injured we have the expense of hiring and training a new employee; the new man will not be as efficient as the man he has replaced, and there will be some interruption to production schedules, with an increased spoilage of materials. There's no compensation cost involved but we're carrying group life insurance, the cost of which is affected by deaths from non-occupational injuries. If we keep in mind the ratio of non-occupational to occupational deaths and injuries, the loss to the company is a very sizeable one.

General Manager: But why do we need to extend our program, as you put it? It seems to me that if our safety educational program is effective, our men will have acquired the safety habit and that habit should carry over outside the gates. It isn't something they put on and take off like a pair of overalls.

Safety Engineer: Well, the psychologists offer an explanation in terms of behavior characteristics. Our men on the outside are not subject to the direct supervision and discipline maintained in the plant. I'm not so sure but that plant discipline becomes somewhat irksome and the men throw off the restraint surrounding them in the plant. Fundamentally, we've got different conditions to contend with. One case out of our own experience will serve as a good illustration. About a year ago Pat Hennessey, who had charge of the stock room over in No. 10, was killed in a fall down the cellar stairs in his home. Pat had been chairman of the departmental safety committee for years. He ought to have acquired the safety habit, but that stairway did not have a hand rail. From the company standpoint, I'd class Pat's death as a catastrophe because we've been in all sorts of jams since.

General Manager: Yes, that stock room has been a bone of contention among the foremen ever since. I'll have to admit the logic of your argument. Do you know of any companies that have extended their safety program? How does it differ from what we have been doing?

Safety Engineer: Well, not directly, but I have heard that a number of companies in New York have become so interested in this broader field of safety work that they are putting on a campaign called "After the whistle blows." I have already written to the National Safety Council for details of the campaign. I have planned to outline a program for our own company based on their experience and submit it to you for approval.

General Manager: Very well. In the meantime, you'd better develop whatever information you can on our own experience. I was interested in your August report in which you commented on what you call the "New-old employee problem." Haven't we had the new employee problem with us during the whole course of our safety work?

Safety Engineer: No, the problem is now somewhat different. As we have expanded the force by reason of reduced coal hours, most of the jobs were filled by our former employees; there were comparatively few new faces. In our investigation of accidents I was struck by the number of injuries sustained by retired employees as well as by those who were new to the company. (S. E. exhibits chart.) Here's the story graphically for the year ending in September—or for one year under the Code. The injury frequency and severity rates are higher for those added to the force during the year than for the balance of the employees. And here's the relativity six years ago prior to the depression.

General Manager: I'd expect the rates to be higher, but I'm surprised the rates for the two groups should be so far apart, especially when compared to the pre-depression figures.

Safety Engineer: I can offer a fairly plausible explanation as to the cause. We've got to remember that some of our former employees have been out of work for rather lengthy periods. Most of them are in financial difficulties and are in debt; some have lost their homes; all have felt the pinch. Worry and grief have deranged the nervous system. During the period of unemployment there has been lacking the steadying influence of plant rules and discipline, and the readjustment is difficult; the fatigue element enters, and many have lost some of their skill and natural aptitudes even when placed on their old jobs. It's a problem requiring the earnest cooperation and coordination in employment supervision, medical supervision, job training and safety education. Another factor also has entered into the situation. Since the expansion under the Code, there has been a contraction in operation. We haven't laid the men off in any great numbers, but have been spreading the work. We're down to about 25 per cent of capacity, but carrying a force on short time sufficient to operate the mill at least to 75 per cent of capacity on full time. Under the "sharing-the-work" policy, social need rather than experience on the job governs the work assignment. We're transferring men from job to job. They are not always familiar with the occupational hazards of the particular job to which they have been temporarily assigned. In my opinion, job training is of particular significance and importance since it will individualize the training process and understanding of occupational hazards rather than relying entirely on putting the safety message across through mass education. Their whole mental make-up must be readjusted. And unless we set out to accomplish this objective we're going to have some serious accidents.

General Manager: I think you've let the situation prey on your mind and you're becoming a victim of your thoughts. A good many of the men returning to work are anxious to show their ability and to please their supervisors so that they can hold their jobs, and that will offset the factors you speak of. However, I wish you'd bring the matter up for discussion at the Central Safety Committee.

Safety Engineer: I'm disappointed; as a matter of fact I'll frankly say its discouraging. I've been here a good many years and have felt that there were real possibilities of getting somewhere in our safety work. But I've changed my mind and the situation has reached the point where I'm not so sure that I want to continue as your safety engineer. That is, not if I'm going to be honest with you and with myself.

General Manager: Hold on, young fellow, there's something on your mind. Come on, let's have it!

Safety Engineer: There's been something on my mind, Boss, for a long while, but I've hesitated to speak about it. You've taken a real interest in safety work, not only in the plant, but you've also been active in the local safety council, in fact, a past president. You called me in to find out why our compensation costs have gone up. I've pointed out a few things. As always, you show an interest, but the matter is passed on to the Central Safety Committee. That committee is invaluable, but after all, it has its limitations. Now, about two years ago I prepared a paper for the annual safety congress on "Capitalizing on Our Failure." You read it beforehand. Remember?

General Manager: Yes, I do. It was a good paper.

Safety Engineer: Well, Boss, that paper was a picture of our own situation then and now. The safety work with us is essentially a second-rank movement; the executives are interested, but safety has not yet been recognized as a major executive objective and an integral part of operating procedure and responsibility. We don't have the proper degree of coordination between the employment, medical, engineering, purchasing and safety departments. Accident prevention is not accepted by the supervisors as an operating responsibility, but the general attitude prevails that its primarily my responsibility.

General Manager: Well, if we accept the principle of safety as a major operating responsibility, where do you fit in as the safety engineer? It looks to me as though you're talking yourself out of a job.

Safety Engineer: On the contrary, I'm really talking myself into a bigger job. Let's compare this job with that of the chief engineer. He acts as the technical consultant and advisory agent to the operating heads of all ranks on engineering matters. If he were to assume authority in matters relating to the working forces there would be constant friction with superintendents and others of the operating personnel. The same is true of my work. If the operating heads will avail themselves of the technical knowledge and experience of the safety engineer and look upon him as an assistant in developing the plan or procedure, we'd make real progress. The actual administration of the plan will be up to them and they can take all the credit for the results accomplished.

General Manager: That's a bit hard for me to take in one dose. I can see where I'll have to indulge in a bit of self-analysis. Perhaps I've had the wrong slant on safety work.

(Phone rings—G. M. answers—hands phone to the Safety Engineer.)

Safety Engineer: There's another serious accident down in No. 6 Mill. They've been making some changes and the mill's shut down. One of the oilers fell while oiling up the shafting along the east side, and received a fractured leg and possible internal injuries. Four months ago the departmental safety committee recommended the installation of an oiler's platform. I investigated, endorsed the recommendation, secured cost estimates and the approval of the superintendent; but it had to be referred to the Central Safety Committee for approval because of the cost. It's still in that committee. It takes a hell of a long while to get action because the economy screws are down tight.

General Manager: I begin to see your point. In other words, while I'm interested in safety work, I haven't seen to it that we got action from the responsible

operating personnel. Damn it, I'm in charge of operations, and in future I'll see to it that safety is part of operating procedure and responsibility. Come out to the house tonight and we'll talk this thing through.

Safety Engineer: Thanks, Boss, I'm withdrawing my resignation.

Keeping Higher Supervision Interested In Accident and Fire Prevention

By A. L. ARMSTRONG

General Supervisor, Safety and Fire Prevention, Eastman Kodak Company, Rochester, New York

The speaker said in part: Interest can be aroused either through an appeal to emotions or to reason. An emotional appeal may be necessary so as to attract attention and get a movement or undertaking under way. The difficulty with such an approach lies in the fact that when the emotional appeal is allowed to die out, there is nothing to take its place and consequently results are usually unsatisfactory.

Perhaps I can best discuss my subject by outlining some of the experiences of my own company in stimulating the interest of foreman and supervisor in our own safety problems. During the first six months of 1933 the accident frequency in our largest plant was below the previous year's record. During the 7th and 8th periods, however, more accidents occurred in this plant than in the previous six periods. There had been no unusual addition of new employees, nor shifting of employees to new work, and management asked, "Why the sudden increase?"

For some time the company had been conducting a supervisor's conference program. The responsibility for accident and fire prevention had been discussed in general terms and it was intended that these matters would be taken up in detail to develop the application of the general principles to departmental problems. A number of department superintendents suggested that accident and fire prevention be taken up immediately; and I was glad to endorse these recommendations because it afforded an opportunity to get upper supervision together in an attempt to arrive at more effective means of carrying on safety work.

In the general discussion of accident and fire prevention, upper supervision had developed statements of the responsibility of the safety department and fire department or fire organization in connection with the prevention of accidents and fires. These statements of responsibility were approved by upper management. Representatives of the safety department had participated in the discussions that developed these statements and in these discussions the responsibility of the production and other departments and their relationship to the safety and fire department had been considered in general terms. Using this material as a basis, a rough draft of management's interest and responsibility in these matters and the general principles of management involved was prepared. Representatives of the safety department from the various plants, and the men interested in carrying on the discussion program, were called together to discuss this material. Their suggestions and the suggestions from other members of the organization, including supervision and management, together with the original material, were consolidated into text material. This text covered the fundamental responsibility of management, the effect of accidents and fires on cost and other factors, the company's safety policy, the causes of fires, the responsibility of the line organization and the safety of fire departments, the methods of preventing accidents and fires, the necessity for safety training, the necessity for safety inspection, the importance of investigations and reports of accidents, and the relationship of the departments and individuals interested in these matters.

All of this text material was prepared in great detail to emphasize the hazards and responsibilities toward safety of all individuals in the working personnel of the plants. (It is unnecessary here to outline this material in detail.) Upper supervision, including the superintendents, their assistants, and the men who were to lead the foremen's discussion of this subject in the departmental groups, were then supplied with copies of this material and called together in groups of 15 to 20 for

the discussion of the problems. Care was taken to make sure that as many departments as possible were represented in the membership of each group. A representative of the safety department attended each group meeting. The results of the discussion of the problems by these groups of upper supervision and executives were then consolidated into notes which were submitted to and finally approved by management. Copies of these notes were then issued to all who participated in their development. The notes were set up in two sections, "Management Notes" and "Conference Notes."

The first section, "Management Notes" covers that part of the development which, when approved by management, is a statement of the plan policies and management philosophy. These management notes are given out to the members of the departmental groups, as basic material in addition to the text, on which they can base their solutions of the remaining questions which in general pertain to specific and departmental application of the principles involved.

The second part called "Conference Notes" covers that part of the notes which is to be developed by discussion in the departmental groups. These notes are given out to the leaders of the departmental foreman's groups to be used as a guide in developing departmental interpretation and application which will be in line with the principles involved. These same general principles, together with the departmental application, are incorporated in the departmental notes which are approved and issued to the foremen and other departmental supervisors.

The purpose of the first problem was to develop: 1. The precautions necessary to make work safe if moving machinery, other devices, or work under way may present a hazard to the workman; 2. The responsibility of supervision in these matters; 3. The responsibility of the employee working under such conditions and the necessity of making the workman and his immediate supervisor responsible for, and granting authority to control conditions essential to safety while work is being done.

The problem was as follows: Employee caught in conveyor—multiple fractures of arm and shoulder. Repairman from the maintenance department was given an order to do a certain job on the conveyor. While he was working on the conveyor it was started up and caught his arm. The cost of this accident was several thousand dollars.

The questions regarding this accident were as follows:

- A. What general principle covers the prevention of this type of accident?
- B. On what jobs or work in your department should this principle be applied?
- C. What precautions should have been taken in this case?
- D. What precautions should the supervisor have taken?
- E. What precautions should the employee have taken?
- F. Would the employee have been justified in refusing to work under the existing conditions?
- G. What should the supervisor's attitude be toward an employee who points out a possible accident hazard?
- H. How can it be made effective?

The second problem develops the responsibility of supervision and the worker for recognizing possible hazards to the worker or to workers in the same or other departments and for taking the necessary precautions to guard against them.

Other problems dealt with the correction of careless habits, maintaining the proper attitude toward the care of minor injuries, supervision's responsibility for placement and follow-up of handicapped employees, responsibility for good house-keeping, the responsibility for the condition of machinery, tools and equipment, responsibility in connection with the adequacy and use of guards and other protective devices, and for the adequacy and use of goggles and protective clothing, and finally, the responsibility for preventing fires and training of employees in the necessary precautions and measures to be taken in case of fire.

In each of these fields, the responsibility of department supervision, the responsibility of the safety or fire department, and the relationship between all of those interested were considered. This discussion not only interested all levels of management and supervision in the problems of accident and fire prevention but afforded an opportunity for upper supervision to exchange ideas on possible methods and resulted in the development of suggested new procedures which were made

a part of the notes and finally approved by management. These consolidated notes were used as a basis for the discussion in the departmental groups and have already resulted in more effective measures in accident prevention training and fire drills, as well as more uniform interpretation of the company's policies in these matters, and a better application to the conditions in the various departments.

How To Sustain the Safety Interest of the Man on the Job

By C. B. BOULET

Insurance and Safety Department, Wisconsin Public Service Corporation,
Milwaukee, Wis.

The speaker said in part: Someone has said that the problem of maintaining interest in safety is "old stuff," and that is quite true. Safety, the daily need to keep safe among the many dangers surrounding the primitive man, is as old as the human race. But the need to maintain safety interest is not so old. In our modern civilization it is only too often not given any thought at all.

In the first place, man has always been, and still is, inherently selfish. He is interested in those things which without question affect him. Early man could not afford to forget safety even for an instant. His existence depended on his carefulness. But man today is protected to a great extent by society—his health is guarded by the Health Commission. Police protect his property and his life against those who would harm him. Laws give him certain rights and certain activities that he can pursue safely.

As a result man no longer feels the need of spending all his time giving thought to his protection. He now pursues his occupation, whatever it may be, without a thought of self preservation. These many interests have so diverted his mind from the need of preventing accidents that it has become more and more necessary to so stimulate and so arouse him that he will not fall victim to an accident which the same complex society which has pampered him, creates.

Our problem is to discover the best stimulants for this pampered individual.

First of all, then, in order to keep the man on the job interested, it is absolutely necessary to keep his immediate superior interested. You are familiar with many of the means adopted for accomplishing this; I would like to mention one additional item that we have found useful and practical. Each month we send to every foreman and supervisor our Safety News-Letter. This News-Letter contains such information as, description of accidents, seasonal hazards, excerpts from minutes of safety meetings, timely suggestions, etc. The information is so designed as to give our supervisory people the proper background to direct valuable discussions in safety meetings.

Every safety effort, if successful, must ultimately affect the man on the job. It is the man on the job who makes or breaks the safety record. It is useless, therefore, to inaugurate or continue any effort that does not finally influence this key man in the safety program.

It is the failure to fully appreciate this fact that has caused accident prevention efforts oftentimes to fall short of their mark. Take the safety meeting for instance: Is your safety meeting a meeting of, by and for the man on the job, or is it rather an hour set aside for the superintendent or foreman to show his importance?

The safety meeting should afford an opportunity for men and supervisor to discuss and settle those problems, the solution of which is vital to accident prevention. If the conference method is the secret of supervisory training, it can also be made the answer to successful training of the man on the job. Make the safety meeting his meeting. Let him do the talking. Respect his opinions, and where necessary, diplomatically direct them.

Is your bulletin board an integral part of your accident prevention program? Or is it merely a display of numerous posters, letters, bulletins, orders, reports and miscellaneous material that no man will take the time to read? Poster service should be given the attention it deserves by someone who is personally responsible for it. I feel that not more than one poster should be displayed at one time, but that poster should be selected with the utmost care and serve a definite purpose.

Were you so unfortunate as to have an accident due to a fall? If so, naturally the matter of falls, and their causes, was discussed in your safety meeting. Did you also display simultaneously posters relating to this subject? If you did not, you missed an opportunity to definitely create in the minds of your employees a safety consciousness that would go a long way to eliminate similar accidents in the future.

In making use of the bulletin board, much can be accomplished with so-called home-made posters. The attractive display of a shattered goggle, a sketch or blue print showing conditions under which a recent accident occurred, photographs that personalize the safety suggestion, a letter signed by the president or general manager carrying a safety message, or newspaper item referring to a safety record or a recent accident, all help to make the bulletin board a center of interest rather than merely a collector of dust.

In order to keep safety a recognized part of every operation, careful supervision is necessary. It has been our experience that adequate safety supervision cannot be given to the foreman alone. In our organization plan, we supplement the foreman's efforts with the service of a safety engineer. It is his responsibility to attend safety meetings, be with the men on the job as frequently as possible, assist in the investigation of accidents, and in general act in an advisory capacity on all matters pertaining to safety. His visits to all departments, while periodical, are not on a regular set schedule. He can be expected at any time, at any place. His contacts are direct with both the foreman and the men. I believe that this constant contact, with the discussions of hazards and unsafe practices, does much to maintain a live interest in safety work. It helps develop that safety consciousness in each employee that makes him ask before starting any job, "Is it Safe?" or "How can it be made safe?"

It is imperative that no serious accident go without investigation that definitely locates the cause, the responsibility, and makes positive recommendations on ways to eliminate similar accidents in the future. These investigations must be fair, but at the same time, must be thorough and uncompromising.

To illustrate: I recall a certain company with a rather high frequency. Investigation of accidents on that particular property seems to have one objective—"blame no one." In cases of fatalities, full responsibility is usually placed on the deceased. In other serious accidents, the cause is usually found to have been "unavoidable." Accidents continue. Why? The reason is self-evident. It is an unpleasant task to place even part of the responsibility for a man's death on some other member of the organization. It is much easier to blame the dead man; but this policy permits the cause of the accident to die in the files, to go without publicity; and ultimately, there is another accident and someone else pays the price for lack of moral courage on the part of the investigators.

Routine inspections of the plant and the premises to bring to light unsafe conditions and practices should be assigned to the man on the job. Experience indicates that properly directed and supervised inspections do much to teach the fundamentals of accident prevention. It is of course essential that suggestions that are made be given careful consideration. In each case the matter of correcting the condition noted should be discussed with the inspector and the suggestion complied with, or reason for its rejection given. Inspectors should be changed monthly in order to give numerous men the training that seems so desirable. It is but natural that a man's interest in safety will increase with his knowledge of its technical aspects. He will not cease to be on the lookout for unsafe conditions even after his term as inspector expires.

Too often the credit for a good record is given to the safety department or the supervisory forces. It should not be forgotten that the man on the job is the key man so far as the ultimate record is concerned. Failure to give him credit or recognition, both collectively and individually, will dampen his future efforts to stop accidents. Credit can be given through the use of the bulletin boards, through personal letters from the management, by means of a dinner, or the passing of cigars. His interest in a continued good record will be proportional to the joy of accomplishment he receives from past records. This joy can only be found through recognition.

ADJOURNMENT



Mechanical Methods of Handling Materials

WEDNESDAY AFTERNOON SESSION

October 3, 1934

The session devoted to a discussion of Mechanical Methods of Handling Materials was called to order by W. S. Paine, Manager, Engineering and Inspection Department, Aetna Insurance Co., Hartford, Conn., who presided. Chairman Paine welcomed the delegates and then introduced the first speaker.

The Safe Operation of Locomotive Cranes

By H. J. GRIFFITH

Sept. of Safety and Welfare, Pittsburgh Works, Jones & Laughlin Steel Corp., Pittsburgh, Pa.

The speaker said in part: Numerous crane accidents have happened due to the boom falling while carrying a load. Care therefore should be given in the design and construction of the boom. It is advisable to specify the grade of steel desired rather than construct from materials that may be on hand. Best results have been obtained when Open Hearth steel having an analysis between 15 to 30 carbon is used. The exact specification will depend upon the size and shapes from which boom is constructed, this of course depending on the length of the boom.

Booms up to 40 feet in length have been constructed by lacing two channels together, but beyond this length the weight of the channels prohibit their use. Booms more than 40 feet are usually of a lattice type.

Designers of booms should be exceptionally careful to overlook nothing when figuring stresses, being particularly careful to see that lattice bars are spaced so that unbraced lengths of members in compression do not exceed safe values. Some designers feels that it is almost impossible to figure all stresses, due to the difference in operation. If the operator is careless, unknown stresses enter the picture which cannot be anticipated.

A boom with the main members damaged or bent should never carry the full load for which it was designed. Cranes with booms more than 60 feet in length with or without load should not be swung more than 45 degrees from the center line of track without the use of out-riggers and the boom should be elevated to an angle not less than 60 degrees with the horizontal. If necessary to swing a boom less than 60 feet in length completely around while traveling, it should be done with the greatest care. When necessary to transfer a crane from one location to another and a boom 70 feet or greater in length is being carried in a horizontal position, the boom should be supported on a flat car or by another crane. Also when cranes are traveling through the plant the end of the boom should not be carried higher than the top of crane cab, and under no circumstances

should crane be allowed to drift or coast out of gear. Before going down grade, brakes should be carefully tested.

Most all crane manufacturers have tables showing the load that can be lifted safely at a given radius. These instructions also state when out-riggers should be used. A neglect to use out-riggers when making heavy lifts has led to numerous accidents.

Hazards in operation of booms include breaking of bolt through the friction which operates the lowering of the boom; throwing clutch out with steam on the engine will cause boom to drop; boom cables responsible for lowering and raising of boom may snap if not inspected frequently or overloaded; cables pulling from the sockets; etc.

Operators should never lift loads beyond the capacity of their cranes, which of course, depends upon the angle of the boom. Nothing will cause a crane to upset quicker than a poor roadbed. It is important that the crane operator check the gauge of the track on which he is going to work. A spread rail will permit wheels of crane to drop off track. Tracks laid on new fill are the most dangerous and require careful inspection. When making heavy lifts care should be taken to see that the crane is clamped to the rails and that out-riggers are properly extended and blocked to prevent upsetting of crane.

In making lifts, it is very essential that the reeving of cables be checked to make certain that reeving to lift two tons is not used to lift a greater load. This may mean that reeving will have to be changed several times during the day, but it is necessary for safe operation. Before work is started the crane operator must check the size and strength of chain or cable and also inspect the cable clamps.

Possibly the safest way to lower a load is to leave the hoist friction engaged and open the cylinder cock which allows engine to back-load down. This applies to single acting engines only. When necessary to make adjustments to hoisting friction for lifting heavy loads, it is important after making lift that friction be reset to former position. Also to check to prevent wear on friction. Care should be taken to see that friction does not drag but has full release after disengagement. It is ground man's duty to see that men working near when lift is being made are in the clear. Men should not walk or work under the boom unless absolutely necessary.

When cranes are working along main line railroads safety requires that the crane operators and helpers receive instructions from the railroad department and become familiar with railroad signals. The crane crew should take steps to protect themselves by using flags by day and lights by night. In moving a locomotive crane after sunset or when obscured by fog or other causes, a white light should be placed in front of the car and a red light on the rear end. The crane operator or conductor must consult with the railroad trainmaster or dispatcher relative to securing right-of-way and block signals. Under no circumstances should the crane conductor or operator occupy or run over main tracks without permission from the train dispatcher. No yard movements should be made without first getting permission from the yardmaster or the railroad's representative in the district. It is the duty of the crane crews to be continually on the alert for conditions that confront them, such as constantly looking at position of switches, that cars are in the clear on tracks running from leads, and having a man positioned at all times to protect the crane movement.

All locomotive cranes should be equipped with blue, red and white lanterns, also red and blue flags. Flags of the proper color should be used by day and lamps of the proper color by night, or whenever fog or other condition causes obscurity. The crane crew should also be familiar with the various types of signals employed by the railroads to indicate danger.

No person other than the crane operator and his helper should be permitted to ride on a crane. All persons should be positively prohibited from riding, sitting or standing on the car body of any locomotive crane. Where possible, riding steps should be prohibited and at no time should steps be permitted on cranes where cab overrides the deck. Another practice which should be prohibited is that of carrying bars, hooks and other tools on the deck underneath the cab. Many hand and arm injuries have been caused by this practice.

Many crane accidents are caused by misunderstanding of signals. This can be prevented by appointing one person to give signals and instructions be issued to the crane operator never to operate the crane unless signal is given by the proper person.

While oiling is being done machinery should be inspected for loose bolts and nuts, also inspection should be made of brake bands, pins and other parts in constant use. Operators must inspect their cranes at the beginning of each turn, and should be responsible for seeing that crane is in safe operating condition.

The safe and efficient operation of a locomotive crane or any other operation depends upon the person in charge to enforce the rules governing this operation. In this case the responsibility rests with the man behind the throttle—the crane operator.

Wire Rope Slings—A Few Safety Considerations

By A. J. MORGAN

Chief Engineer, Wire Rope Division, John A. Roebling's Sons Co., Trenton, N. J.

The speaker said in part: One of the most reliable materials used in industry is a cold drawn wire of good quality. Every boy learns that a very strong cord can be made by winding a number of pieces of relatively weak string back and forth and that the resulting product will often hold together when used for tying, even though a few of the individual threads break. If it is considered that a wire rope is quite similar to this, except that it is laid up with precision and the component parts are each and every one carefully tested and thoroughly reliable, it will be appreciated that a material of great strength and dependability is the result. It is of such material that wire rope slings are fabricated.

To illustrate more directly, a wire rope grommet can be considered, and the grommet is the main member of a great number and variety of slings. This grommet is made up of a single strand which is laid up by hand in the form of a wire rope. The wire rope in this case would be a 7-strand rope or, as more generally understood, a 6-strand rope with a strand center. Each strand is made up of a number of individual wires, usually varying from 19 to 37, depending upon the size of the sling to be made. The strand in this case goes completely around the circumference of the grommet seven times, and since it is made of one piece of strand, the two ends butt at one point, which is inside of the grommet structure. It will be seen, therefore, that a grommet type of sling is a very precise product and brings into play the strength and reliability of a number of wires wound around several times so as to complete the whole.

There are a number of slings, such as bridle slings, which consist of a single length or a number of lengths of rope with fittings on the ends. These lengths usually pass from one side of the thimble or supporting member which fastens to the hook and the ends then fasten to lugs or eyes, or some other part of the load to be hoisted. Thus the rope to be used is composed of a number of individual wires and the combined strength again becomes effective due to the tying together of a proper fabrication practice.

It is true that all types and manners of slings, employing chain, hemp rope, wire rope and even wire, are used to handle loads. There are all sorts of home-made slings with spliced eyes or long splices, slings made out of old rope, as well as new rope. A great number of these do not even approach good practice.

The total number of wires in a reliably constructed wire rope sling, whether made of grommet construction or from rope, is seldom less than 114, and very frequently, in fact in all sizes 1½ inch and larger, reaches 259 to 271, or possibly more wires. It is apparent that the breaking or cutting of a few wires in a sling of this type will not seriously impair its strength and yet ample warning will be given by such breaks that the sling is deteriorating and should be watched more carefully, or that the rope or grommet should be replaced.

The question of safety cannot properly be left without mention of loads for design. When a sling is purchased for a definite and particular life and no other, there is no question as to the proper factors to use for design. When a sling is

purchased for a lift to be made in a shop and the sling is to be used around that shop for other purposes, the question of the safe load to figure on becomes very important. For example, if a sling has been designed to handle a 5-ton load, but is still available when a 7 or 8-ton load is ready to be moved, this sling would in all probability be used to move the heavier load. It seems to make no difference whether the maximum safe load is painted on the sling or attached to it by means of a metal tag, the natural inclination of anyone having to move a load is to use something handy that will apparently do the trick. Fortunately, in the majority of cases these slings do handle the heavier load, although it is a practice that certainly cannot be recommended nor should it be allowed to continue. Such practice is dangerous and far from desirable, for the sling may become overstressed, and it is then liable to fail with loads of less weight than the one which overstressed it, and in fact of even less weight than the one for which it was originally designed.

Only a few simple rules need be kept in mind on the safe operation of a wire rope sling. The first and most important is that the sling be of proper design and of sufficient strength to satisfactorily handle the load. Lubrication of wire rope slings is often objectionable, due to the character of the material handled, but protection of the sling from corrosion is essential and this should be and can be taken care of with any number of products which are on the market for this purpose. The next thing to examine is the condition of the sling before a load is lifted. If it shows little deterioration and relatively few broken wires, with no evidence of corrosion, it can generally be safely assumed that the sling will lift the load if it is not in excess of that contemplated by the design.

If the sling shows deterioration of a marked degree it should without question be returned to the manufacturer for re-ropeing, since the fittings on a substantial and well-designed sling can always be used again—with the exception of forgings and castings in tension, where it is always safer to replace such tension members due to the impossibility of correctly gauging the action of fatigue. If there is any doubt in the minds of the operators, they should call in a representative of the wire rope company who is qualified to pass on the safety, or they should by all means play safe and have the sling re-rope.

Another point to keep in mind is that the sling should be applied in the manner intended by the design, using wood padding or special castings to carry the rope around the sharp corners should the design so indicate.

In these few simple rules it is stated that the sling should be used in the manner contemplated by the design. Most all slings, with the exception of anchor slings (although sometimes these are even included) have a safe load calculation based on the angle the rope makes with the horizontal. If the sling has a safe load value calculated on the basis of 60 degrees, it can under no consideration be assumed to have the same safe load value if used with an angle of less than 60 degrees. For example, one type of bridle sling could be used with the legs vertical, that is, making a 90 degree angle with the horizontal, and also with the legs making an angle of 30 degrees with the horizontal. In the latter case the safe load capacity would be cut in half. And it will be readily appreciated that should the angle be changed to less than 30 degrees, which is seldom economical and never recommended unless the limited head room makes it necessary, the stress in the legs will jump up very rapidly and the safe load go down proportionally, because could an angle of zero be obtained the safe load would become zero because the stress in the legs becomes infinite.

The proper design for a sling always takes into account the character of the load to be lifted and the means for fastening the sling to the load. This makes the radius of curvature of the lifting lugs or the load itself of particular importance, because the smaller the radius of curvature over which the sling is required to bend, the less the safe load has to be. The worst condition, of course, would be when handling material having a sharp corner over which the rope must bend. This is avoided as far as possible and the padding is always recommended, sometimes with special saddles to fit over the corner. A sling to handle loads of this character must be much heavier than slings which can safely handle loads having relatively larger radius of curvature.

In all cases possible the rope or grommet is passed completely around the load

so that the use of fittings in tension is avoided wherever they can be. When it is necessary to use fittings in tension only drop forged fittings or weldless forged fittings are used, when such can be obtained economically; otherwise, only electric furnace steel castings of good grade are employed.

A number of spliced ropes are used in making up slings, and they are perfectly satisfactory when employed in the right places. It should be mentioned that the splice in a rope should never be allowed to come in contact with the load to be hoisted. The splice should always be out in the open, pulling straight with the rope; or if a bend is made, the bend should be made in the rope proper where it is not spliced. Too often the bending of the rope in the splice starts the splice to work, which naturally produces a dangerous condition.

When machines or large parts are designed, careful attention should always be given to the method which will be employed to handle them. So many times a little consideration at this stage will save much money and make a safer job in the shops and during assembly. The proper use of lifting lugs or eyes will often save money in the design of the sling itself.

Portable Conveyors — Hazards and Their Elimination

By ROY D. PRUSHING

Manager, Portable Conveyor Division, The Jeffrey Mfg. Co., Columbus, Ohio

The speaker said in part: The term "portable conveyors" covers any type of portable conveyor, loader or unloader weighing over 500 pounds and designed primarily for handling loose materials, using chain and buckets, chain and drag bars, or flights, continuous apron or belting as the conveying means—except where such conveyors are exclusively for mine or agricultural use. Practically every industry, therefore, uses or has use for portable conveying equipment.

In earlier days, it was thought necessary that portable conveyors should be heavily constructed to withstand abuse, shocks and overloads. But it was discovered that the labor involved in handling them was almost as great as in moving the material by hand. Weight, therefore, was reduced, but the resulting machine proved as unsatisfactory and as unsafe as the heavy type. We have now reached the point, I believe, where we may safely say that portable conveyors are approximately correct in weight.

Why stress weight as a factor of safety? In the first place, extreme weight made it necessary to employ a number of men to move the equipment or to hitch it behind a truck. Thus moved, the conveyors sometimes upset when traveling over uneven ground or broke loose on down grades. Workmen were injured and property was damaged. When conveyors were built too light, breakdowns often occurred; running gear was not adequately guarded; chains snapped with abandon and upsetting was a common experience.

A portable conveyor 25 feet long for handling lump coal and materials of equivalent size should weigh between 3000 and 4000 pounds. Conveyors in this weight can be designed for even balance and easy handling. If the unit is provided with a tread of not less than 54 inches, danger of upsetting is practically eliminated. Where chain drives are used, the manufacturers' recommendations as to speeds and strength should be carefully followed.

Tried and proven electrical equipment should, of course, be used. The flexible cord employed in connecting to the power outlet should be a four conductor in the case of a 3-phase power, the fourth wire being grounded in all plugs and receptacles. The cable should be so arranged that it cannot be run over by trucks or other machines. If cable must cross a driveway, it should be hung on poles at a minimum height of 14 feet. If conditions require two or more sections of cable, the connectors should be elevated above the ground, as these machines are used most in the worst of weather.

Skirt or side boards should not be less than ten inches high to keep material from falling over the sides. This same safety feature applies equally to belt conveyors. No portable conveyor handling bulk materials should be without skirt

boards. The skirt boards prevent light or loose material from blowing off the belt and heavy materials from falling over the sides and hitting workmen. Troughing of the belt offers insufficient protection against such spillage.

The mechanism for raising and lowering the boom on all types of conveyors should be closely checked periodically, as it constitutes one of the greatest hazards in the use of portable machinery. Any positive type may be used, preferably the self-locking worm or jack-screw type. Gear drives should be completely housed and run in oil. All chains within easy reach of workmen should be thoroughly guarded and a system provided for convenient oiling of chains.

Warehouses use a portable stacker for stacking or breaking down bagged material. The boom of these conveyors usually consists of two sections to permit their use in a small space. Utmost safety is achieved only when the transfer point from one section to another is designed to avoid roll back of bags.

Practically all loose material handled by portable conveyors is shipped in hopper cars and various methods have been devised for removing it. Car unloaders to feed conveyors offer the best arrangement. However, pits may be used if ground conditions permit. The method most commonly used, that of spreading a track tie for the accommodation of the loader, is fraught with danger. It compels the attendant to shovel four or five tons of material from the far pocket of the car to the conveyor, during which he is in a precarious position. The danger lies in the fact that much unloading is done on what is known as team tracks, on which railroads are permitted to shift cars at almost any time. There should be provided some suitable safety device which would make car shifting impossible until the crew is sure that no one is in the car.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



New Workers

THURSDAY AFTERNOON SESSION

October 4, 1934

The session devoted to a discussion of problems in connection with New Workers was called to order by D. D. Fennell, Industrial Consultant, Chicago, Illinois, who presided. After welcoming the delegates and outlining the purposes of the session, chairman Fennell introduced the first speaker.

Physical Examinations and Placement of Workers

By DR. F. G. BARR

Supervisor, Industrial Relations Division, the National Cash Register Co.,
Dayton, Ohio

The speaker said in part: I have had the good fortune to be associated with a company which has been health-minded for 50 years. The majority of our 6,000 workers are highly skilled and are employed on work which might be classified as light. Many of the workers are high school graduates, with quite a liberal sprinkling of college trained men and women among them. Few new workers have been absorbed into our force during the last several years; however, recently we reinstated 1,600 employees, and from the standpoint of the medical department their examination and health supervision were just as important as if they had been new workers.

Physical examinations of employees were introduced in the National Cash Register Company some 35 years ago, and this company was also one of the first to establish first aid according to medical standards. When we take on salesmen and executives, we are taking on new workers, and they also take the same examination as those who make the cash registers. No one can deny that executives need physical and mental health fully as much as the manual workers.

Our program has passed through many stages in its development. I do not agree with the authors of most textbooks on physical examination. Most of them do not know the great variety of industrial requirements necessary. If we follow arbitrary standards too literally, we are likely to reject many competent workers who could be placed in industry with benefit to themselves and to their company, if we understand the requirements of the job and the limitations of the man.

I have come to the conclusion that the fewer questions you ask, the fewer lies you will receive. Our examination forms contain few questions. There are none about family history. It is true that many facts would be of value if we could examine men both mentally, financially and socially, as well as physically, for most new and reinstated workers have suffered in all of these ways; but the full truth is often difficult to determine.

Our rejections have never been high; they average less than one-half of one per cent. There has always been the closest cooperation between the employment department and the medical department. Obviously, those with contagious diseases

cannot be accepted for employment. We do not reject men for hernia, except for certain occupations. A record is made at the time of employment and we insist that a truss be worn. These cases have given us no trouble. Hernia control, of course, has become more difficult in industry during the past four years because of unemployment and part time work.

We have found that some of the details formerly considered as routine essentials in the physical examination were not necessary. For years we required a urinalysis of all applicants for employment, but found that the results were not in proportion to the effort involved. Now we require urinalysis only of those with blood pressure of 150 or more. We have had men in our employ for ten years or more with hypertension of 240 or 250. Naturally, these men are carefully placed and come under the close supervision of the Medical Department. The young physician who is looking primarily for disease is likely to exaggerate the danger of hypertension. The men just mentioned are seen every two or three weeks. They are not well, but they are useful to the company and we feel that we are doing our duty by them and the community.

We also accept blind persons and mutes; in fact, one department has a standing order for mutes. Men handicapped by amputations are also given every possible consideration. We do not accept men with tuberculosis, diabetes, or nephritis, but we have found few of these ailments applying for jobs.

Some of our earlier standards have been found incorrect. For years we set 140 pounds as the minimum weight for service men and as a result we rejected many good men. Our only hernia cases have been among those weighing more than 140 pounds.

We have felt that the reinstated employees have a prior claim on the company. Many of them need the supervision of the Medical Department more than ever before. Among the 1,600 who were recently taken back to work, examinations have revealed many defects, due largely to the mental and physical hardships through which they have passed. As an example, a former trucker, aged 65, has shown marks of deterioration; he has been placed in a department doing light work.

Our department has been fortunate in being able to place workers whose physical inventories were below normal. In the N. C. R. plant there is a department known as "Inspection D," which is a euphemism for the Salvage Department. All men at this work are paid 45 cents an hour and the department is self-supporting. In it are men ranging in age from 35 to 82. Even epileptics are included. Many an old, loyal employee has been able to support himself through this kind of light work.

Our Medical Department takes advantage of every opportunity to contact employees for physical examination. Last year the department had 50,000 visitors, or more than nine visits per employee per year. In many cases, the Medical Department was able to render a service to the employee of even more importance than the correction of the minor ailment or injury which was responsible for the visit.

Athletics provide a wholesome influence in the life of any industrial organization, but it is important that those participating in competitive sport be sound physically. All athletes are examined, and here we have another contact with a group of employees who are above the average physically. The health of executives is also watched carefully. Of course, we are always on the look-out for contagious diseases.

Every employee is weighed every six months. This procedure takes comparatively little time and we consider it of great importance. We have never examined 6,000 workers without finding one or two cases of tuberculosis. When an injured employee reports to the Medical Department for treatment, he is also checked for other possible defects. Perhaps an ulcer that refuses to heal indicates the need for a Wassermann and the result is positive. Blood tests and X-rays also reveal significant facts about the individual's condition. We do not, however, take X-rays of new employees as a routine measure.

The methods I have described are the result of years of study and experiment to meet conditions in our own organization. Some of these methods, perhaps, would

not be adaptable to every industrial organization. Although all industries have many problems in common, certain details of medical department procedures must necessarily be varied to suit local conditions.

Training the New Worker

By A. V. ROHWEDER

Supervisor of Safety and Welfare, D. M. & N. Railway Co., Duluth, Minn.

The speaker said in part: It is a well recognized fact among students of accident prevention that some of the most severe injuries to industrial employees occur during their early service. The apprentice just entering the shop, the new hand just assigned to work in a track gang on a railroad, the older industrial worker reassigned from one class of employment to another, present a challenge to the management and the safety department to see that immediate protection is afforded. Managements' duty may be outlined as follows:

First, to see that men are selected who are fit for the work to be done; (a) as to ability; (b) as to physical fitness.

Second, the management should provide proper working conditions and proper supervision that will insure the safe use of equipment and material by the new worker.

Third, the management, through experience, should provide proper safety regulations and establish a safety department to direct an efficient safety campaign.

The supervisory force directly in charge of the work should be men of much ability and intelligence, and able to impart to the new man a working knowledge of the hazards of the particular property where he is employed. I do not mean, instruct him in all the hazards of his trade, but I do mean that the supervisor should instruct the new man in any hazards that are peculiar to the plant or property. He should furnish the new man with a book of safety rules and request him to study them sufficiently to pass either a written examination or at least a verbal examination within five days. He should also advise the new man of standard arrangements regarding first aid, medical service in the event of injury, and such other provisions as are made for his welfare in the plant or property.

The supervisor can, I think, make an efficient, cooperative workman in the first day of his contact with the new man, or he can create within the mind of the new man a spirit of utter lack of appreciation of the work to be done except as something to produce a pay check. The basis of 90 per cent of all misunderstandings that occur in industrial life are due to the faulty interpretation of the management's policies by the supervisor.

The safety department of any industry has a marvelous opportunity to immediately influence the future safety record of its plant or property through the new man. Properly backed by the management and supervisory force, they can see that the new man is properly instructed as to the safety regulations, medical service, first aid, welfare, and that he understands that the rules and regulations given him upon entering employment are the result of years of experience designed to correct unsafe practices that will prevent loss of life and limb if followed by him in his daily work.

Some companies use a special letter, signed by the director of safety of the plant or property, that is handed to the new man inviting suggestions as to unsafe practices and conditions that he may observe, further inviting him to attend the various safety meetings, and in general, definitely advising him that his willingness and ability to work safely must be his first consideration and admonishing him of the fact that failure to comply with the safety regulations of the company will mean removal from the service.

The new man can do much to help himself, and an appeal to his pride, if he be a clever craftsman, to demonstrate his ability to work safely often results in an immediate feeling of cooperation in the safety program.

Four Million Green Men

By **SIDNEY J. WILLIAMS**

Director, Public Safety Division, National Safety Council, Chicago

The speaker said in part: The unusual features of the CWA safety job were size and speed. When I was appointed Director of Safety on December 13, 1933, more than two and one-half million men had been put at work in four weeks. In the next four weeks the number was increased to nearly four million.

Most of the men were inexperienced at the particular work to which they were assigned. Perfect placement was impossible anyway, because most of the jobs were construction, many of them with picks and shovels, this being about the only kind of work that could be organized hastily on a large scale. For the same reason, thousands of foremen were green at their jobs. Many of them should never have been made foremen at all, and these were weeded out as rapidly as possible. Others had supervisory experience but not in this particular kind of work.

Most of the men were physically soft from long idleness. That would not have been so bad, if they had also been lazy; but most of them were not lazy—they were pathetically eager to make good. Inexperience, physical softness, and a proud determination to make up for that softness by sheer willpower—what a beautiful set-up for Old Man Accident!

The first purpose of the Civil Works Administration was not, as in private industry, to obtain the greatest production efficiency; the first purpose was to put at work, on useful projects, great numbers of men whose production efficiency had been zero because they had been supported by the Relief Administration in complete idleness. After getting the jobs started, the second objective was to increase the efficiency as rapidly as possible. Of course, the output per man never reached that which is expected in a stable, smoothly running organization. A fairer comparison can be made with the construction work in 1917 during the war emergency, and I have been told by men in touch with both operations that the comparison would be favorable to the CWA.

The whole CWA operation was decentralized, each state having its own administrator, some with larger staffs than the headquarters at Washington. As for accident records, there were none available—they would come, eventually, to the Federal Employees Compensation Commission, but far too late for our use. But while we were discussing our safety program with Assistant Administrator Jacob Baker a newspaper clipping was brought in, reporting the death of nine men in a landslide, on a highway construction job out in the mountains of Colorado.

The great question was what to do first, because every hour was precious. Should we first try to collect and analyze the accident reports? There wasn't time to wait for that. Should we develop detailed rules or safety standards for the various kinds of work? There wasn't time for that either. Should we assemble and train a large staff of safety men to visit the various jobs? How could we expect to stop accidents without either a staff of experts or a set of definite instructions for the engineers and the supervisors?

The answer was pressure. We fell back on the good old principle of executive responsibility. A telegram was sent over Mr. Hopkins' name to every state relief administrator telling him in no uncertain terms that it was up to him to stop accidents to his workers. Some of the states at once duplicated this telegram and sent it on to all their district and county administrators. The very first day, safety was definitely established as an executive policy.

But pressure wrongly applied may be like a football player running for the wrong goal. To be effective, pressure must have direction and that requires expert personnel. Therefore our first telegram also instructed the state administrator to follow the example of the Federal Administrator and appoint a safety director. There was not time to train these men so we had to find them already trained. In other words, we had to commandeer some of the best safety experts in the country. In most states we suggested to the administrator the name of a competent safety engineer who might be borrowed from his company to advise the administrator. The Safety Movement may feel very proud of the way in which the companies re-

sponded to this call and the way in which the safety men, thus borrowed, worked day and night in setting up a safety department and carrying the safety message to every corner of the state.

After putting on the pressure, and starting the organization of expert personnel, the next essential step was to outline the program of activity. This program was very brief, in fact it occupied one typewritten page. It had to be brief because our people were too busy to read a longer outline. The nine items in our one-page program included guarding of machinery; maintenance of tools and machines; selection and placement of men; instruction of new men; daily inspection of every job; keeping green men away from special hazards; safe driving of trucks; first aid; and weekly reports of all injuries together with immediate telegraphic reports of all deaths.

As time went on, the program was expanded in a series of mimeographed bulletins to the number of 20 or more. However, Program was always kept subordinate to Pressure and Personnel. Over and over again I said to state administrators, "You won't get anywhere until you have a competent full time man in charge of this job." Over and over again I said to state safety directors, "I have given you a nine-point program to start with, but don't take it too seriously—your job is to stop accidents in your state and we don't care how you do it."

The great importance of keeping Personnel ahead of Program was well illustrated in one large state where the state administration promptly sent out copies of our nine-point program and the subsequent bulletins to all the county administrators, but did not at once appoint a state safety director to interpret and apply them. Many of these county administrators did not understand the bulletins and started writing to Washington for information. I promptly made a trip to the state, secured the appointment of a high grade experienced man as state safety director, and he immediately set up an organization of regional and district safety directors competent to put the program into operation.

The fourth and last item of our plan was Posters. First, we issued a special poster tying in safety with the CWA. Then came a first aid poster obtained from the National Safety Council. About 100,000 copies of each were distributed through the state administrations.

We also made great use of personal contact with the various state directors. Within four weeks after starting the job, I had personally met the safety director or his assistant from 35 of the 48 states, most of them at regional conferences. Those in the far west, whom I could not meet, I talked to over the long distance telephone. It soon became evident that we needed an even greater amount of personal contact, so we started a definite schedule of field work. In addition to my own visits, Mr. W. O. Wheary, my assistant and later my successor, covered the eastern part of the country, and Mr. E. W. Corn was employed as a field representative to cover the western part.

On the initiative of the American Red Cross, first aid training courses were established early in the campaign and a total of at least 70,000 of our men completed the special fifteen-hour course. This proved very valuable because it not only insured prompt and efficient first aid for thousands of injuries, but also got the men to thinking and talking about accident causes and prevention.

When case after case was reported of men toppling over from heart failure or succumbing to minor injuries because of bad physical condition, our state safety men began to suggest a general plan of physical examination, to weed out the people who ought not to have been put to work at all. Some of the state administrators and others thought this subject was too hot to handle. They foresaw objections from organized labor, and embarrassing problems regarding the selection and payment of the doctors to do the examining. In Virginia, however, the administrator and the safety director were not easily discouraged and after weeks of conferences we arrived at a plan which was approved all around and I think can be said to be a real contribution in this field.

Suffice it to say that, instead of classifying all the employees in only two groups, those who could work and those who could not, we used four classifications: First, those fit to do any kind of work; second, those fit for ordinary but not for continuous heavy work; third, those fit only for special light work; and fourth, those not fit for any work at all. To our delight, less than one per cent were found to

fall in the latter class. Ten per cent fell in class three and were permitted to continue clerical or other light jobs where they would not endanger themselves or others. You can see how much trouble we avoided by not rejecting entirely the ten per cent in class three, as well as the one per cent in class four.

What were the results? When our work was started, the compensation experts were already studying the probable number of accidents in order to determine how much money should be set aside for compensation claims. They finally decided, in view of the special hazards and circumstances of the CWA work, that the accident frequency rate would probably be around 80 and might reach 100. On that assumption, they estimated about how many deaths, permanent disabilities and temporary disabilities there would be, and about how much they would cost for compensation based on the Federal Act.

If the accident frequency rate had actually been 100, there would have been about 960 deaths. If the frequency rate had been 80, there would have been about 770 deaths. Actually, we had 343 deaths. Our fatality frequency rate after January 1 when the program in most states had got under way, was 39 per cent below the rate prior to January 1. On any basis of figuring, we saved more than the \$2,000,000 which were spent.

But now, does this CWA experience throw any light on the effective methods of meeting the new worker problem? I think it does. The results may be summarized thus:

1. Uncle Sam went on record, in a big way, as recognizing Safety as an essential part of this tremendous employment program.
2. By holding our death rate to one-half, the average of the construction companies reporting to the National Safety Council and showing a reduction of 39 per cent after our campaign got under way, we proved beyond any possible doubt that accidents can be controlled by prompt, energetic action, even in the face of unusual difficulties.
3. We used no new methods. Starting with pressure—executive responsibility—we followed the familiar path of inspection, instruction and discipline.
4. We were able to do this because we were able to mobilize almost over night an army of hundreds of trained safety men who knew exactly what to do.
5. We found that the new worker, when left to himself, would do unbelievably foolish things such as literally digging his own grave in a gravel pit or a sewer ditch, just because he did not know any better. The green foreman would permit him and even require him to do this because he, too, did not know any better.
6. With few exceptions, however, both the green workers and the green foremen changed their attitude in a hurry when told that the big boss was not going to stand for accidents. When tactfully approached, most of them were eager to learn how to do their work in the right way which is the safe way.

After this demonstration, how can it be claimed by any employer, public or private, that "Accidents are Unavoidable"? They are not. We can stop them if we want to.

ADJOURNMENT



Poisonous Fumes and Vapors

FRIDAY MORNING SESSION

October 5, 1934

The session devoted to a discussion of Poisonous Fumes and Vapors was called to order by Dr. H. E. Howe, Editor, "Industrial and Engineering Chemistry," Washington, D. C., who presided. Dr. Howe welcomed the large audience and briefly stated the objects of the session. He then introduced the first speaker.

Occupational Poisoning From Toxic Gases, Vapors and Fumes

By HENRY H. KESSLER, M. D.

Medical Director, Newark Rehabilitation Clinic, Newark, N. J.

If we take 1925 as a base year, we find that 72,000 laborers and semi-skilled operators were employed in various chemical and allied industries in the United States. Another 141,000 were employed in rubber factories, 275,000 in miscellaneous industries in which chemical hazards exist, and about 200,000 in metal industries, such as lead and zinc, excluding wire and steel work. Furthermore, about 65,000 were employed in petroleum refineries. The report of the German chemical industry for 1926 showed that 1,000,000 workers were engaged in that industry, a veritable army of men subjected to the potential hazards of occupational poisoning from the products and by-products of chemical manufacture.

How many of these people actually get occupational poisoning, no one knows. There are no reliable statistics in this country. Our census reports include data of deaths only, not of illness.

It is true that writers like Oliver and others, have found that the manufacture of chemicals, with its accompanying hazards of gases, vapors and fumes, was one of the most unhealthy of industries, and one in which it was frequently difficult to protect the worker. But he was writing of conditions thirty years ago. Today, with automatic methods of operation, and such devices as the solvent recovery process, the ill effects of these hazards have been mitigated.

If we are to know what are the principle toxic substances that menace the health of the workers, such as toxic gases, we must turn to published statistics of cases of poison from these substances. We cannot assume a hazard from the mere presence of chemicals which may be toxic. A revolver is a dangerous instrument, not when it lies in a museum case, but when it is in the hands of a "cocked-up" criminal or insane person. There is no personal protection against these two.

Specific data concerning instances of occupational disease are very limited. A study made by Hayhurst in 1924 showed that there were nine departments of labor, and twenty-one departments of health, which were receiving, or supposed to be receiving, reports of occupational disease. In ten states where compensation laws

covered occupational disease, some records were available. But the regulations were so indefinite, and the method of reporting so chaotic, that the resulting data have no value. In some states, there are provisions for enforcement by the infliction of penalties in case of negligence in reporting cases. In others, there are no penalties, while in still others, a monetary award is given. Yet only seven states published even the most meager data on occupational disease.

If we turn to several of the state reports, we find the following: In *Minnesota*, report of the Bureau of Labor from 1919-1920, shows a total number of occupational disease report of 138. Of this number, 38 cases may have assumed to be due to toxic gases, vapors and fumes, although the report does not specify whether the effect of the poison is systemic, or local on the skin. The *Connecticut* Department of Health, for its report for the fiscal year of 1933, lists 522 cases of occupational disease which are carefully classified as to the effects, whether systemic or local. Of this number, there were only 63 cases of systemic poisoning due to toxic gases, vapors and fumes, and of this number, 26 are due to lead. *Ohio*, in the years 1920-1925, listed 883 cases of occupational disease, of which number 95 were cases of poisoning due to toxic gases, vapors and fumes, undifferentiated as to systemic or local effect. There were also 460 cases of lead poisoning undifferentiated.

The German figures for Prussia, Bavaria and Saxony, for years 1928, 1929, also show a comparatively low incidence due to toxic gases, vapors and fumes. The statistics for Prussia show 1,801 cases of lead poisoning compared to 577 cases of poisoning due to benzol, aromatic, nitro-amido compounds, sulphur dioxide, sulphur chloride and carbon monoxide. The English figures for 1926, show 154 cases due to carbon monoxide gas, carbon dioxide gas, sulphur dioxide, sulphur chloride, chlorine, nitrous gas, ammonia, benzol, naphtha, tetrachlorine, and other miscellaneous poisons.

From this meager data, it would seem that the incidence of occupational poisoning from toxic gases, vapors and fumes, is quite low. This may be explained in several ways. There may be a marked improvement in the mechanical methods of operation, thus preventing and reducing the health hazard. On the other hand, inability to recognize the effects of these poisons by the medical profession may be a more potent factor in the lack of adequate and correct data. I am more inclined to the latter explanation.

The list of toxic gases, vapors and fumes is a rather long one. The number is constantly growing with the advance of technology and invention. The effects of these chemical hazards may occur in a variety of ways, and may result in a variety of conditions. The raw material, the intermediate products and the residue can cause a caustic action, a skin affection, or a systemic toxic action coming on immediately or gradually. The substances which act on the individual without his being aware of it are the most important. Lead, carbon monoxide, and mercury vapor owe their great danger to the fact that their fumes and gases are without smell or taste. In addition to these substances, the most dangerous ones are those which can be absorbed by the unprotected skin. Nitro-amido derivatives of the aromatic series are in this class. I have in mind a case of a laboratory worker who was cleaning some glassware with absolute alcohol. He inadvertently immersed his finger in a flask containing butyl-phenol. He died immediately. Acute accidents and poisoning from toxic vapors, and gases, are still a common result in the cleaning out of vats containing toxic fumes, and in the operation of leaky mechanical apparatus.

I have mentioned the fact that the reporting of occupational disease has been altogether inadequate. While true that this error is due in large part to lack of cooperation, I am inclined to believe that the difficulty lies in the inability to make the diagnosis of occupational disease. When we realize that in many instances multiple toxic factors are present, we can understand the inability to define the one dominant factor. Furthermore, the lack of a distinctive pattern is most typical in the case of occupational disease. While the classical instances of wrist-drop in lead poisoning, and tremor in mercury poisoning would seem to contradict this statement, experience shows that these phenomena are unusual rather than common. When we further realize the marked variation in individual resistance and susceptibility, we can understand the inability to properly evaluate the role of chemical hazards in producing symptoms. One fact that is frequently overlooked is the wrong

interpretation placed on the effects of the inhalation or ingestion of fumes, gases and vapors. These effects are due to the physiologic rather than the pathological action of the specific chemical; that is to say, the threshold of physiological compensation has not been exceeded, and therefore, the mild symptoms resulting must be construed as temporary effects to which the individual will make a variable adjustment. Some of these mild physiological effects are difficult to distinguish from other causes, such as colds, fatigue and personality disorders. It is important in coming to any conclusions with respect to relationship of the toxic exposure and complaints of the worker, that all the factors be correlated before assuming a direct cause and effect sequence.

A long experience in the detection of occupational disease has taught me to be less dogmatic in my conclusions, and has further taught me to place less reliance on the classical text book description of occupational disorders. New products are constantly being manufactured and marketed, frequently without knowledge of the physiologic or toxic action. Old well known toxic agents, such as lead, are showing themselves in new forms. A severe intractable dermatitis occurred recently in the owner of a printing plant; the diagnosis of lead poisoning being made only after close observation and study. Another case of lead encephalopathy in a painter who had given up his work over eight years, came into the hospital with a diagnosis of brain tumor. He developed definite cranial nerve involvement, convulsive seizures and increased blood pressure. The diagnosis was made only after a period of observation in the hospital during which the symptoms subsided and the laboratory findings of blood, urine and feces directed attention to lead as the causative factor.

Although all these toxic agents may affect the body in a variety of ways, any may even show a predilection for certain tissues, it has been my custom to study carefully the blood and the central nervous system in every case of suspected occupational disease. Although the differential diagnosis between functional psychogenic nervous disorders and physiologic or pathologic effects of occupational poisons is sometimes very difficult to make, nevertheless, careful observation under controlled conditions, such as a hospital, will repay the diagnostician. So too, study of the blood under properly controlled conditions will yield information which cannot be obtained by the uncontrolled and inadequate methods usually employed. Only now are we beginning to realize how sensitive the entire blood forming system may be, either physiologically or pathologically, to the ingestion of hazardous gases, vapors and fumes.

Conclusion: From these scattered facts it would seem that in so large a key industry as the chemical industry and its branches, a large number of workers are exposed to potential hazards from toxic gases, vapors and fumes. The lack of adequate information makes it difficult to determine with any degree of exactness the amount of sickness arising out of, and in the course of, employment in chemical trades. This inadequate information is due to the lack of adequate reporting. Certainly the inclusion of occupational disease in the compensation laws of all the states would be a progressive step in the solution of this problem. Just as Workmen's Compensation has reduced accidents and improved working conditions by making it necessary to report every accident, so too does the expansion of the Workmen's Compensation to include occupational disease promise a reduction in occupational disease, and health hazards.

The lack of equipment and training on the part of the physician may be corrected by an extension of the number of courses in industrial medicine in undergraduate and graduate instruction. I would like to see in this country the establishment of occupational disease institutes similar to those that have been organized for a great many years in foreign countries. It is of interest to note that in large cities in Russia today, well equipped and organized occupational disease institutes have been established, not only for the purpose of giving treatment to those who suffer occupational injuries and disease, but also to serve as centers of training and instruction to physicians in the field of industrial hygiene. Furthermore, many of these institutes have extensive exhibits and are utilized for educational purposes in teaching the general population safety and disease prevention.

Finally, while I have stressed the fact that the diagnosis of occupational disease is frequently obscure, the difficulty in making a diagnosis may readily be overcome by resort to proper study in hospitals. In making this diagnosis, proper weight can

only be ascribed to each factor in the case, occupational history, subjective symptoms, physical findings, and laboratory and X-ray study, by a critical evaluation of all these factors.

Decreasing the Hazards of Poisonous Fumes and Vapors By Respiratory Protective Equipment

By ALBERT E. RUSSELL, M.D., F.A.C.P.

Surgeon, U.S.P.H.S., Associate Director of Health, Tennessee Valley
Authority, Knoxville, Tennessee.

The speaker said in part: Inasmuch as this is such an extensive subject, I will direct my remarks mainly to protection with the three types of protective equipment in general use. Much of the burden of protection with masks can be removed by good ventilation and by local exhaust at the source of hazards. In many cases this makes adequate protection much easier and a less expensive problem. Careful study of an industrial hazard is very necessary before attempting to alleviate harmful working conditions. Ignorance of such problems has proved expensive, and the same is true of poor judgment in the selection of inadequate and unsuitable protective equipment.

The first respirator was patented in the United States in 1849. There are three main types: (1) filter, (2) canister, and (3) positive pressure. The principle of the first two types is to remove the harmful dust or gas by filtration, and the third to provide air or oxygen from an outside source. The canister is designed to have the air drawn through layers of cotton, wool or felt between which are chemicals or materials, such as soda lime and activated charcoal. These materials vary according to the purpose for which the mask was designed. They must conform to certain principles to be effective. Lack of comfort and failure of maintenance may cause defeat of their sole purpose. Failure to educate the worker about the hazard to which he is exposed and the function and maintenance of his mask may also lead to difficulties. A respirator should be light in construction, conform readily to the contour of the face, and not interfere with vision. Breathing resistance should be kept at a minimum, and the upkeep should be simple and at a nominal cost.

Dust respirators are all of a filter type, excepting the positive pressure helmet which brings pure air from a distant source and supplies it to the worker. This mask also has some value in certain types of fumes. Materials that have been employed as filters are (1) sponges, (2) papers, (3) felt, and (4) cloth.

The efficiency of sponges varies greatly because of the lack of uniformity in the pores; the cartridge or nozzle in which the sponge is carried is large and cumbersome. The porosity of filter papers can be controlled; they are inexpensive, easily replaced, and the container for filters does not have to be large. Felt has been widely used and offers good filtering resistance; the felt pads can be changed easily, and a large container is not necessary. Cloth of various kinds has been used, such as gauze and flannel (cotton and wool); the porosity and efficiency of these materials may vary widely.

The masks used in the Army during the World War had canisters which contained about 600 c.c. of mixed granular activated charcoal and soda lime between two filters of cotton wool, one-fourth of an inch thick and held in place by wire screens. These masks were effective not only in removing war gases, but also in screening out fine dusts and mists of poisonous or asphyxiating solid and liquid particles which were thrown into the air by explosives. This canister type of mask is now being used extensively for protection against many gases and vapors encountered in industrial processes.

However, it has certain limitations in industry, in that it does not completely restrain and absorb gases exceeding 5 per cent in the air. The canister becomes saturated after a certain amount of gas has been taken up, thereby limiting its efficiency, and it is not effective for ammonia and carbon monoxide. It does not supply oxygen which is essential to sustain life. The Bureau of Mines has since developed a gas mask to which the name "Universal" has been given, because it protects

against ammonia and carbon monoxide, as well as other types of poisonous gases, the canister containing hopcalite, manganese dioxide, and copper oxide. The latter, a catalyst, changes carbon monoxide to carbon dioxide.

The limitation regarding high concentration and inability to supply oxygen still holds for all types of canister masks. The canister of the army-type mask, containing activated charcoal and soda lime, is especially useful to absorb acid gases, such as hydrogen sulphide, sulphur dioxide, phosgene, chlorine, and others. It has limited value against organic vapors, such as gasoline, benzene, aniline, chloroform, etc. Charcoal will absorb these gases, but it soon becomes saturated and ineffective.

McCaig, of the Bureau of Mines, developed a self-contained oxygen breathing apparatus at the request of the U. S. Navy for their use in handling petroleum vapors. The self-contained oxygen breathing apparatus can be used in the presence of all poisonous gases. It is the most valuable equipment for mine rescue work. The apparatus contains a tube of oxygen which is released through a set of valves, tubes, and rubberized bags. The oxygen is inhaled through the mouth, and the exhaled carbon dioxide and oxygen are circulated through soda lime and the carbon dioxide removed, permitting the oxygen to be used again.

It must be borne in mind that one respirator is not good for all purposes. Those must be selected which have a known efficiency for the particular hazard against which they are designed to give protection. A mask designed to protect against ammonia fumes obviously will give no protection for hydrogen sulphide, and one designed for hydrogen sulphide will give no protection for carbon monoxide, etc.

For practical use of a respirator it is well to select one designed for a particular purpose, because the life service of a respirator depends a great deal upon the amount of dust that has been removed and the extent to which it is plugged, the latter causing an increase in resistance to a point where it is not comfortable to wear.

Masks with changeable filters give longer service. As an example, a very highly efficient respirator designed for use against a fume or dust of small particle size would soon become clogged if used for fumes and dusts of larger particle size.

The continued efficiency of good respirators and masks depends entirely upon their care and maintenance. The parts may deteriorate or warp, and thereby diminish their effectiveness and comfort.

The safety department of an industry should insist on periodical check-ups with the medical department. This is a very necessary step in the conservation of human resources so vital to industry. This service from the medical department has a dual value—it establishes early diagnosis for industrial diseases, as well as other conditions not necessarily due to occupation but to latent infections and those conditions incident to advancing years.

In providing protection against poisonous fumes and gases, one should: (1) remove hazards at their source if possible; (2) provide good masks; (3) educate workers concerning the hazards and the proper use of protective equipment and (4) make regular check-ups with the medical department.

Dr. Leonard Greenberg, Yale Medical School, New Haven, Conn., was another speaker on this interesting program. He spoke on the subject "Decreasing the Hazards of Poisonous Fumes and Vapors by Exhaust Systems and Confining Processes." To illustrate his talk he showed a number of lantern slides; but inasmuch as his address was made extemporaneously no record is available for these transactions.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Safety Equipment

TUESDAY AFTERNOON SESSION

October 2, 1934

The session devoted to a discussion of Safety Equipment was called to order by Chairman Buell W. Nutt, President, Safety Equipment Service Company, Cleveland, Ohio, who presided. After welcoming the delegates and outlining the purposes of the session, the chairman introduced the first speaker.

Safety Equipment—A Factor in Accident Prevention

By JOHN CAMPBELL

Director, Bureau of Inspection, Pennsylvania
Department of Labor and Industry, Harrisburg, Pennsylvania

The speaker said in part: Ever since the beginning of the safety movement, the first and perhaps the greatest effort has been to provide guards for machines. Machine guarding was considered the proper and only means to overcome accidents. This is proven by the fact that Compensation Rating Bureaus carried a schedule of credits for those companies having well guarded machines. In other words, there was an expensive rating for industries not having well guarded machines. In carrying out this program many safety devices were developed which admirably suited the purpose and the accidents from machines began to decrease. Originally, most of the guards were made by the users of the machines. It is now common practice for the machine tool builder to design his product so as to eliminate as many hazardous features as possible and to furnish guards where necessary to overcome dangerous conditions which cannot be eliminated in the design.

In some states the practice has been for purchasers to require that a machine before being shipped shall be equipped with sufficient safeguards as are required by the laws or regulations of that state. Some purchasers in other states do not make the same stipulation but take it upon themselves to equip the machine when it arrives at its destination.

Safety codes should include in their provisions a requirement for safety devices wherever such devices are required and general detailed specifications should be given. In a general way these specifications may be set up in either one of two ways: namely, detailed mechanical, or specifications based on performance. For example, the punch press guard may be described in detail for its construction, whereas a respirator should be required to function so as to exclude dust or toxic fumes up to a certain percentage, the details as to how this is to be accomplished being left to

the manufacturer. It is not enough to say in a code that certain hazards must not be permitted; the code must specify the actual type of safety device to eliminate the hazard.

Specifications for safety devices should be set up by competent and experienced engineers or safety directors. These specifications should be largely uniform so far as it is possible. There is no reason why one state should require 55,000 pounds tensile strength in a window cleaning device and another state should require 60,000 pounds tensile strength. If 55,000 pounds tensile strength is safe for a man's life in one state it should be safe for a man's life in all states. Manufacturers of safety equipment should see to it that the states adopt a uniform standard in safety equipment.

Safety devices in the shop have an almost incalculable visual value to employees. The very sight of guards brings to their minds the thought of the employer's backing and willingness to prevent accidents wherever possible. The employee cannot see any proof of money spent by his employer when it is expended merely for oral safety directions, meetings of committees or engineers; but there is a visible presence of the employer's interest shown in every safeguard used in a shop.

Again there is an added gain in the mental reaction of the employee in a well guarded shop. To illustrate, we are prone to be careless in our personal habits if we work or frequent a carelessly kept workroom or office. We do not mind throwing a cigaret butt or a paper on the floor of a dirty room or office, but we hesitate twice before doing so on a floor of a scrupulously clean and well-kept room. I believe that in a well guarded shop, the moral and mental stimulant to become a safe worker is greatly accentuated due to guarding and that we can expect the workers to react by conducting themselves as safe workmen.

There are plenty of instances where proof can be obtained as to the value of safety devices in accident prevention. A short time ago a project was completed within our own state, in the nature of road building, lasting only a few weeks, and yet during that time thirty-six pairs of goggles worn by the workmen were broken. Had these goggles not been worn, there is no question but that thirty-six persons would have had eye injuries resulting probably in the loss of eyes to some of them. At the Greater New York Safety Congress held last winter, statistics were circulated to the effect that the loss of an eye entailed a monetary loss of approximately \$12,000. In the instance I speak of, the wearing of thirty-six pairs of goggles insured a possible money saving of some \$432,000.

In the olden days the operator of a mill expected accidents just as surely as he expected breakdowns in his machinery. The situation is different now, however, for an accident in a mill means an investigation as to its cause, a rigid inquiry into somebody's carelessness, and in most cases, a punishment for the man in charge of the operation because of the accident. All we need to do to size up the value of safety devices is to imagine what industry would be like today if all our safety devices and safe practices were abolished and manufacturing plants returned to their former careless state of years ago.

Protecting the Feet and Legs, Hands and Arms, Face and Head of Industrial Workers

By H. R. BIXLER

Industrial Relations and Employment Department, Union Carbide Company,
New York City

The speaker said in part: In a recent publication of the Industrial Commission of Ohio, under the heading "The Destructive Big Six," I find the following:

"An analysis of occupational injuries in Ohio in 1933 shows that a large percentage of the total of all mishaps in industry are directly traceable to six principal causes. The most prolific source of injuries to industrial workers is that of handling objects. This cause is charged with 26 per cent of the total injury claims for these six causes for the year 1933. Next in accident frequency is machinery, with 24 per

cent. Hand tools next, 15 per cent. Falls of persons, while fourth in order of frequency with 14 per cent, lead in severity. Stepping upon or striking against objects are fifth with 13 per cent; and the operation of industrial motor vehicles (while this is not directly related to our subject) is sixth with 8 per cent. In summing up the 1933 totals for these six causes, it is found that they were accountable for over 73 per cent of all injury claims filed, for over 44 per cent of all fatalities, for approximately 80 per cent of all permanent disability cases; and were charged with a time loss of over 50 per cent of the total for all causes."

One of the major considerations in the design of protective clothing for special uses, in addition to the mechanical features of such clothing and equipment, is that of the materials with which they are made. A specialist in the design of safety apparel offers the following comments:

"Primarily, three types of material are used in the manufacture of safety apparel. These are leather, asbestos, and fireproof duck. Duck of this kind should really be called "flame-proof." Flame-proof duck when exposed to flame or fire, even at high temperatures, will not ignite. There will, however, be a process of oxidation which will eventually consume the cotton in the duck. Fireproof duck is the cheaper of the three substances ordinarily used and is suitable where the hazard encountered does not require impervious protection. Asbestos, the second material, is also commonly used in the manufacture of protective clothing. Many people think that asbestos is a heat insulator, while actually it is a heat conductor. Asbestos can be compared in this relation to any other mineral and while it will not conduct heat as readily as metal, it certainly will conduct some heat. Such equipment, therefore, should have some heat insulation, as for example, a cotton lining in an asbestos glove. Asbestos, of course, is absolutely fireproof. The third material commonly used in the manufacture of protective clothing is leather, which for most safety apparel is horsehide or cowhide. Leather can be either grain or split leather. The grain leather is comparable to the tough outer layer of skin, while the split leather can be compared to the bottom layer of skin. In tanning leather it is necessary to use oil. While there must be a certain amount of oil in the leather, the buyer of protective apparel must be careful that there is not too much oil in it, since such leather, when used near hot operations, deteriorates rapidly."

In the estimation of this specialist, leather is the best article for all-around wear and hard usage. He believes, for example, that a leather legging should outwear at least three fireproof duck leggings, and from two and a half to three times as long as three fireproof duck leggings. This same comparison applies to leather gloves. He recommends using leather for all general purposes except those where its weight will defeat its purpose by tiring the user or making him too hot while working.

Many types of specially designed protective clothing are made of rubber, or of a composition of some other material with rubber. Such equipment is usually designed for protection in connection with operations involving hazards because of acids, fumes and vapors, work in wet areas, and those operations involving the handling of liquids. Special rubber protective clothing and equipment has been designed for electrical hazards and include rubber gloves, boots, overshoes, sleeves, coats, hats, and line covering material, such as blankets, line hose, insulator hoods and protectors.

Felt is used in some types of protective clothing as a protection against heat, where the use of clothing made from fireproof duck, asbestos or leather is not desirable. One industrial concern having electric furnace operations uses paper-mill pressed felt to make protective jackets and trousers for its furnace operators, because of its protective features, comfort of the wearer, and relatively low cost. This material is pure wool felt and offers good protection from radiated heat on account of its low thermal conductivity; while it will burn, it will do so very slowly and without flame.

Referring to the first two sections of our subject, without attempting to go into the physical details of material requirements and mechanical design, let us say that protective clothing for the feet and legs of industrial workers would include shoes, toe guards, spats, leggings, knee pads, thigh guards, and aprons, for most operations. In protecting the hands and arms safety gloves, hand pads, mitts, finger cots, arm protectors, sleeves, jackets, and the like are commonly used. In addition, for complete body protection, are found protective suits, consisting of

jackets and pants, or complete jumper suits. Protective ointments are also used for the skin in operations involving acids, fumes and vapors.

The third division of our subject, for protecting the face and head of industrial workers, is one which is receiving increasing attention because of the hazards involving the eyes and respiratory organs. While eye protection has long been a part of industrial accident prevention work, the necessity for the use of goggles is not fully recognized since we learn from the National Safety Council that there were 300,000 industrial injuries to the eyes in the United States last year, each resulting in at least one day of disability. Of this number 70,000 were compensable cases, which means seven days or more of lost time, for which the average cost was \$375, and \$125 additional for medical cost. In 2,000 cases there was complete loss of vision in one eye, while 75 persons lost the vision of both eyes. The total estimated loss of 3,600,000 days per year from work was attended with a total cost in time lost, compensation and medical bills of approximately fifty millions of dollars.

Perhaps the most authoritative source of valuable information for safety engineers at this time concerning the protection of face and head of industrial workers is the head and eye safety code, which is now being revised under the supervision of the American Standards Association. The title of this code is being changed to the "American Standard Safety Code for Protection to Heads, Eyes and Respiratory Organs." A study of the code's revisions, even in its present tentative form, will be of great value in the individual's consideration of our subject; and in its final form, when published, will be of inestimable value.

Of special interest are the following requirements for respirators and gas masks, as proposed in the revised code:

Requirements for Respirators and Gas Masks

"The respirator, gas mask, with mechanical filter, or hose mask is permissible.

"The respirator shall be so designed and constructed that, when it is worn in its proper position, it will permit only air which has passed through the filter to enter the mouth or nostrils of the wearer. The material used for the body of the respirator shall be such as to combine mechanical strength and lightness of weight. The respirator shall be comfortable to wear and shall not impede free action by the wearer. The facial contact edge of the respirator body shall not irritate the skin of the wearer and shall not allow leakage of unfiltered air. If rubber is used, the rubber compound shall be free from lead and mineral sulphates. If used in work requiring goggles, the respirator when in place on the wearer shall permit the use of various types of goggles without impairing the effectiveness of either the goggles or the respirator, or the goggles may be permanently attached to the respirator. An automatic exhalation valve is optional.

"The gas mask is permissible for limited exposure. For higher concentrations and for longer exposures to any gas, a hose mask, or a hood with positive air supply may be used.

"The hose mask shall be of such design and construction as to completely protect the respiratory organs of the wearer from toxic gas and dust, and make a gas-tight fit when in its proper position on the wearer.

"Canister type gas masks shall be of such design and construction as to protect the eyes and respiratory organs of the wearer from acid and organic vapors, ammonia, carbon monoxide, dusts, smokes, and mists, either singly or in combination, where the oxygen content of the surrounding atmosphere is not less than 16 per cent. In places where only non-irritant gases, such as carbon monoxide, are present, the eyes need not be covered. Gas masks shall be of such design as to insure a gas tight fit when in proper position on the wearer. Cartridge-type masks shall meet all requirements for the canister type except as to canister, connecting tube, and body harness."

Among the devices designed for the protection of the individual worker against dusts, by far the most important is the positive pressure respirator. In particularly dusty operations, such as sandblasting and metal grinding, where the particles may injure the face, the helmet type of respirator is preferred. Whatever type of air

mask is worn, it is essential that the apparatus be provided with an adequate air supply drawn from a pure, dust-free source. Some authorities recommend as much as six cubic feet per minute, while others are of the opinion that respirators constructed on modern principles are efficient when used with but one or two cubic feet of air per minute. The source of air supply is equally important. The mistake is frequently made of taking the air directly from a compressed air line without providing the air intake to compressors with a filter capable of removing the fine dust particles. Sometimes the air of the compressed air line is wet and oily and there may be a possibility of carbon monoxide poisoning due to oil being partially burned in a reciprocating piston-type compressor. The air, under these conditions, is unsuited for use in the respirator and it becomes necessary to install a small rotary compressor blower, supplied from a clean source of air. This latter method is applicable particularly to plants not equipped with compressed air.

Respirators should be selected for their comfort to the wearer and for their protective efficiency. The manufacturer should be required to submit a laboratory report of the efficiency of his device, for the purpose selected. Although respirators should never be regarded as substitutes for local exhaust ventilation, they provide a practicable means of protection for workmen engaged in dusty operations carried on only occasionally or for short periods of time. The positive air pressure type of respirator, unfortunately, cannot be worn by workers engaged in operations requiring freedom to move about unhampered by air hose. The only available protection for the worker under these conditions is to wear a respirator with a filtering medium of fibre or tissue. Only those types which have been demonstrated to possess the necessary filtering medium to give sufficient protection against fine dusts should be selected.

The importance of the use of the positive pressure respirator in dusty work conditions is illustrated by the results of an analysis conducted by Dr. Leonard Greenburg and Charles Pierce, of the Laboratory of Hygiene at Yale University, in connection with the study of the subject of "Ventilation and Its Relation to the Control of Dust, Gases and Fumes." They found that air drawn from a cabinet containing 61 millions of dust particles per cubic foot retained four and one-half million particles per cubic foot when drawn through a respirator; two million particles were drawn through helmet and respirator; four-tenths of one million of dust particles per cubic foot were drawn through helmet with positive air pressure; and but two-tenths of one million were drawn through a respirator and helmet with positive air pressure. This demonstrates conclusively that a respirator alone has limitations in effectiveness when used in heavy concentrations. The reason for this lack of satisfaction arises from the fact that the fit of the respirator to the face is made by soft rubber which, even though the best available, is not air tight when the wearer is working. Where dust exists which cannot be otherwise controlled, partial protection can be obtained through the use of respirators; however, if practicable, a positive pressure helmet system should be installed, since it gives almost complete protection.

Safe Protective Equipment as Related to Accident Prevention

By R. B. ROAPER

Safety Engineer, Humble Oil & Refining Company, Houston, Texas

The speaker said in part: I am convinced that a combination of education and safety equipment is essential for accident prevention work. The use of protective equipment cannot prevent all accidents, nor can the training of employees prevent all accidents. No matter how proficient employees may become in the performance of a duty, they must not lose sight of the fact that certain hazards and conditions require protective equipment.

In order to determine just what equipment must be used, it is necessary to study past experience in each class of work. If it is found that men engaged in certain types of work are prone to receive injuries to certain parts of the body, even in

spite of using safety precautions, then it becomes necessary as a routine part of that job to wear the type of equipment designed to protect against that particular type of injury. Such study should be exhaustive and the results should be reasonable enough to appeal to the workmen. A man will not wear protective equipment unless he is convinced that he is actually in danger without it. In spite of any evidence of its value that you may produce, and in spite of any definite orders you may issue, you cannot be assured that a man will take advantage of such protection. It has come to my personal attention on many occasions that men would subject themselves to the greatest hazards rather than wear equipment that was provided.

There must be some reason for this attitude. I feel that it is due in a great measure to the desire of the manufacturer to sell the equipment, rather than to design it for the maximum of protection and comfort. Equipment that protects, yet at the same time does not permit free movement, and actually hampers the activity of the workmen, will not be popular, and in fact might prove as hazardous to use as to be left unused.

This condition is now being relieved because the makers of certain equipment are beginning to realize there are some features in addition to mere protection. Manufacturers are employing men who not only have technical knowledge but who are acquainted with the actual conditions under which the equipment will have to be used. Comfort is now being recognized as an important feature. With this changed condition, manufacturers can be assured of greater sales because the management of the companies can enforce the use of necessary protective equipment with less effort.

Types of Equipment

One of the most recent and successful innovations in the field of protective equipment is the so-called hard-boiled hat or cap. Injuries to the head are usually very serious. In some types of work where there is danger of objects falling from a height, we have found it profitable to insist upon compulsory use of head protection by all employees exposed. In our rig building department particularly, we have found that only through the use of head protection are we able to eliminate entirely injuries that result from falling bolts, washers, and nuts. In construction work where it is practically impossible to avoid having one group of men working above another, and where each group is handling bolts, nuts, rivets, tools and materials of all descriptions, the prevention of head injuries is one of the most serious safety problems, and the solution lies to a great extent in providing the employee with head protective equipment and seeing that he uses it.

Probably the oldest and the most extensively used protective device is goggles. There are many kinds of eye accidents in industry and usually a large assortment of goggles is necessary to protect against all the hazards encountered. A careful study must be made in order to secure the right kind of goggle for each eye hazard, and too much effort cannot be expended in seeing that employees wear their goggles when there is danger of eye injury. We have adopted the policy of providing each workman with a pair of goggles for his individual use.

The present trend in goggle manufacture is to embody comfort, wide range of vision and freedom from distortion along with the protection features. This should assist in securing the cooperation of employees in wearing goggles, but our experience has been that even with this improvement by the manufacturer as to comfort and quality, still it has been necessary for us to carry on a very extensive program of instructing men in the proper way to fit and wear goggles. The tendency of most men is to have the head band so tight that the goggles are very uncomfortable.

The hazard of breathing injurious dust and fumes is becoming more fully recognized as a health problem in many industries. In our company, we have spent a great deal of time in supplying respirators to each group of workers, in training them in proper use thereof, and in inducing them to send the equipment in for replacement when necessary. We soon learned, however, that this equipment was not being kept in good condition, and when the need arose equipment would not be safe enough to insure adequate protection. We have revised this system by making the foreman in charge of the unit responsible for the equipment and its

condition. Whenever a crew needs respirators, this foreman as a part of his regular duties secures them for their use. As an example, let me cite the use of respirators in cementing wells. The toolpusher is held responsible for seeing that the crew gets the equipment and that it is in a safe working condition. This new method in a short time has proved itself more satisfactory.

It is always imperative in handling acids or any corrosive liquids that some protective equipment be worn at all times. The very minimum amount of equipment that should be worn by workmen handling any of these liquids is rubber acid goggles and rubber gloves. When this work involves the repairing or opening of acid lines, pumps, etc., considerably more protective equipment may be necessary. Some companies insist that workmen opening acid or caustic lines, regardless of what precautionary measures have been taken to bleed the lines, must wear rubber acid hoods that cover the entire head, neck and shoulders, rubber gloves and rubber aprons until an opening has been made in the line, after which the rubber goggles and the rubber gloves will suffice.

The question of the proper sand blasting equipment that should be used is quite a problem and from our experience we have found that the most satisfactory equipment is the type that covers the entire head and part of the body and to which fresh air is supplied.

The subject of protection against gases and vapors by wearing gas masks has been thoroughly covered many times. There are precautionary measures other than the wearing of gas masks that aid in reducing accidents from inhalation of toxic gases. The fact remains, however, that it has been impossible in the oil industry, where the handling of sour crudes is necessary, to carry on safe operations without the aid of gas masks. The wearing of gas masks by employees has presented one of the most trying problems in my experience in safety work. We have spent much time and money in an effort to design a gas mask that would be efficient and still comfortable to the wearer. The half mask has more nearly approached the solution of this problem than any other type. However, where work is required in enclosed places we have found it necessary to continue the use of the full face gas mask.

We had the same experience in the use of masks that we had in the use of respirators. Masks were formerly assigned to different units for their use. This soon led to a condition wherein no one would assume the responsibility of repairing them or replacing them and at times even reporting their condition to the management. No amount of instruction or appeal or reprimand improved the situation. The men did not object to the use of the masks, but rather to the unsanitary practice of the community use of one mask. Thereafter, we issued each individual a personal mask and made him responsible for its condition both for safety and sanitation. Since that time we have had no trouble, after convincing the workmen of the value of this type of equipment, in inducing him to use it for his own protection.

In our refineries, hose masks for emergency use located at specific places are inspected periodically. The face pieces are wrapped to keep them clean and the entire assembly, blower, face piece trunk and hose is kept in a weather-proof metal cabinet. These are brought into the safety warehouse for inspection, cleaning and sterilization each time used, and periodically whether used or not. Other inspections are carried out at the location.

Hose masks for transient service are kept at the safety warehouse and issued as required. These are inspected each time before going out and when brought back. This also applies to fresh air masks used in sandblasting and compressed air work.

In the producing division of the oil industry it is absolutely necessary for men working in derricks to wear safety belts. As a result of the compulsory use of such belts by derrickmen, serious accidents resulting from falls from derricks have practically been eliminated. I might also mention here briefly derrick slides or escape lines for men working in derricks. In certain fields where high pressure gases are present, the use of safety slides has prevented many fatalities.

The severity of many foot injuries has been minimized by the use of safety shoes with the box safety toe. While these shoes are known as safety shoes, in reality they provide no more safety than any well constructed work shoe except

in so far as the box toe is concerned. Furthermore, they usually cost no more than ordinary shoes. In order to afford the maximum foot protection, any shoe should have in addition to the safety toe a sufficiently heavy and well constructed sole, should not have a rubber heel, and should have non-sparking nails if there is any possibility that it may be worn in a gaseous atmosphere.

In our particular company we are continually testing and studying protective equipment so that we may at all times provide our employees with the highest quality and best suited equipment that is obtainable.

ADJOURNMENT

*TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL*



Safety Organization and Program

TUESDAY AFTERNOON SESSION

October 2, 1934

This session devoted to a discussion of Safety Organization and Program was called to order by F. W. Braun, Manager, Safety Engineering Department, Employers Mutual Liability Insurance Company, Wausau, Wisconsin, who presided. Chairman Braun welcomed the delegates and introduced the first speaker.

Putting the Safety Man's Job Under the Microscope

By R. T. BAKER

Assistant Superintendent, Union Carbide Company, Sault Ste. Marie, Michigan

The speaker said in part: What is a safety man? 1. He must be a good organizer; 2. He must be observant; 3. He must be a diplomat; 4. He must be an engineer; 5. He must be an orator; 6. He must be a first aid expert. He must also be energetic, sympathetic, physically fit and have plenty of initiative.

Such a safety man should be put in charge of all the safety work in the plant. If possible he should be a person developed in your own organization, familiar with all of the operations, and when you have obtained such a satisfactory individual, he should be retained in this capacity as long as possible.

He should develop the proper training in safety problems incident to each particular department and in a general way create among men an organized spirit of cooperation. He will supply the foremen of the various departments with whatever information or assistance they may require for their regular departmental safety meetings. Practically the entire success of these meetings will depend upon the safety man, who should prepare or assist in preparing the subjects for discussion and occasionally will personally address the men at these safety meetings.

The safety man should be an advocate of and thoroughly sold on the necessity of maintaining clean working conditions in every department. Experience has proved that without good housekeeping we can achieve no extended periods free from accidents unless we get down to business and make a serious problem of housekeeping. Fire prevention work and housekeeping go hand in hand, and it is therefore necessary that the safety man, if his duties include these items, as in a great many plants they do, should give considerable of his thought and time to these two plant requisites. Regular and careful inspection of all plant fire fighting equipment will be included in his duties, as well as the training of plant fire squads and the supervision of their drills and the handling of fire fighting equipment.

The safety man should be observant, and the best way for him to keep in touch with things going on in the plant is actually to be out there where things happen. The safety man best serves his employer and himself by being out on the job as

much of the time as possible. This gives him the opportunity of inspecting the plant equipment in operation, learning the existing hazards and observing whether or not mechanical guards have been placed and educational measures are being carried on.

It is also desirable that the safety man arrange for group plant inspections at intervals of each week or two. These groups, comprising four or five persons in a squad, should be a representative cross-section of the particular plant personnel. A careful safety survey should be made of the entire plant or a definite portion of it, the items requiring attention being carefully noted and later typed, with copies to all those interested. The follow-up should be in the hands of a safety man, to see that hazards and the recommendations for their elimination are handled in the order of their importance.

The safety man should see that a detailed report is made of all accidents so that this information may be used in analyzing accident costs, the number and percentage of the different classifications of accidents so that they may be looked over frequently, monthly or oftener if necessary by the management. Should an accident occur, the safety man, together with others interested, should make a thorough investigation, determine why and how the accident happened and supplying the necessary corrective measures to prevent a recurrence.

The safety educational program for employees should be directly in charge of the safety man. He should direct the servicing of bulletin boards, the preparing or distribution of posters and other safety bulletins, the preparation of special safety displays, including broken goggles, hazardous tools, etc., and if special talent can be found among the plant personnel (as there usually is) the safety man should encourage the preparation and display of homemade cartoons, posters and photographs to emphasize hazards and safe practices about the plant.

There does not seem to be any question but that the safety man can develop his field of activity to a considerable degree if he can induce the employees to give him the benefit of their ideas through suggestions. How best to accomplish this is quite debatable. Suggestion boxes have been tried. Many fine ideas seem to find their way from the men through the assistant foremen and finally to the safety man through this channel. These suggestions should be carefully recorded, showing all necessary data, and particularly the names of the persons making them. If they have merit and are workable they should be used and the workers who made the suggestions given full credit for them, or else advised that they may not be feasible.

The safety man should keep in touch with the latest developments in safety devices and safe practices by reading the *National Safety News* and other literature on this subject, and should then impart his information to his employers and his fellow employees so that all may benefit thereby.

The safety man should also be capable of intelligently inspecting drawings for any proposed new equipment to be installed about the plant, so that his experience, ideas and suggestions may be included in their building. Thus you are assured that the necessary guards, proper clearances for aiseways and headroom are provided for in order that the operators may work without exposure to accidents. The operation of the new equipment should be followed up by the safety man so that he may know that all details for the safety and convenience of the men have been provided for, and if not, that any desirable changes or additions shall be made. He should have a very carefully outlined program for following up the maintenance of equipment guards which have already been installed. This requires the cooperation of the entire personnel of the different departments.

The safety man should be familiar with every type of guard, device or protective clothing or other safety equipment in use in his plant, and should personally know that the department heads and employees are also familiar enough with the available protection so they may be used when and where provided. This may be very materially augmented by safety exhibits being substituted for departmental safety meetings once each year, covering a period of one or two weeks, or limited to the time whereby as many of the men as possible may be reached, and where there will be on exhibition as many of the protective devices in use in the plant as possible. The safety man should be in charge of such meetings, explaining the use of all items so thoroughly that those in attendance have an indelible impression of their value.

As far as possible, the safety man should be allowed to attend safety conferences, and especially the Annual Safety Congress of the National Safety Council. There he will have an opportunity to contact with the leaders of the nation's most advanced ideas on the subject; exchanging ideas on programs of safety procedure with other members of the Council and seeing the many types of newly developed guards, mechanical equipment and protective apparel. Then when he returns to his home plant he may use this information in further additions or improvements for the better protection and convenience of his men.

Moreover, the safety man should be proficient in first aid practices and frequently give demonstrations in the plant so that certain key men in the various departments may know the location of the stretchers and with his assistance learn how to properly place and carry a patient to the plant dispensary. He should know how to use the plant first aid equipment and how to administer artificial respiration. At safety meetings he should be able to demonstrate his knowledge for the instruction of others in the plant personnel.

Finally, to be able to carry on all this work in a successful manner, the safety man must have the unqualified backing of the management.

Safety Inspections—Who, Where And How?

By VERN D. SUTTON

Supervisor of Accident Prevention, Postum Company, Inc., Battle Creek, Mich.

The speaker said in part: There are two types or classes of inspectors. I might call them "definite" and "casual" inspectors. By definite inspectors I mean those who go into the plant or department for the definite purpose of inspection; casual inspectors who are those who keep an eye open for hazards while pursuing other duties. Definite inspectors make periodical inspections, and casual inspectors should be on the job all the time. Inspections, by the way, are one of the very, very best ways of advertising safety. Every time an inspector or group of inspectors goes through a department, it is advertising safety.

The first definite inspector I shall mention is, of course, the safety man. He should make regular inspections either personally or by proxy. That is, he may have assistants or inspectors if he is considerably confined to desk work. He should nevertheless get out into the factory himself as much as possible. If he is a white collar man, he better have a pair of overalls and use them. Moreover, believe it or not, it gives you standing with the boys in the plant if they see you are not too nice to put on the recognized uniform of the fraternity, and if you will just rub under your nose with a greasy finger it will be the badge of comradery.

Committee members will of course make frequent inspection trips. This not only uncovers hazards and advertises safety, but members can more intelligently discuss matters in your committee meetings if from time to time it is arranged for them to make inspection trips. These trips will have to be repeated frequently, as I presume your committee is rotating.

Sub-committees appointed by a safety committee should either inspect the whole plant or a certain department each month. It is good to have a sub-committee inspect a selected department and bring a report for discussion in the accident prevention committee meeting.

The foreman should not only be a casual inspector, but should from time to time make definite or periodic inspections in his department. It is also a good idea to have two foremen "exchange pulpits": go into each other's department and report, preferably to the superintendent or safety man.

By special supervisors I mean those men having charge of certain equipment or operations distributed throughout the plant and whose duties therefore take them into the various departments. They should not only be interested in safety, so that they can make casual inspections as they do their work, but it is well to have them participate definitely in ladder week, fire hazard week, guard week, goggle week, etc.

Then there is the insurance company inspector. Urge your insurance company

to send their inspector as often as they will. He is an expert looker. He may not know the ins and outs of your particular industry, but he has developed a sharp eye that will be beneficial. And the same applies to the state labor inspector.

The accident investigating committee may be a new thought to some. Perhaps your accidents are investigated by the safety man or safety committee or the foreman, or not at all. A standing committee in each department for the investigation of accidents in that department, or an especially appointed committee to investigate a specific accident, will not only get more details regarding the accident, but will become intensely interested in accident prevention and will advertise safety to the work people. Such a committee is making a definite inspection of hazards causing that accident and a casual inspection of all other hazards.

I need hardly comment on the casual inspectors, more than I have already done. The main thing is to get these inspectors so interested that they will look for hazards and report them. How to do this, more properly comes under the heading of maintaining interest, to which another session of this Congress is devoted.

The first man to enlist as a casual inspector is the superintendent. If your superintendent passes right by a hazard without seeing it, Bill Workman and Sam Shopman are not going to get all steamed up about the importance of safety. And if they or their foremen go to the superintendent's office and find a fan on a low fling case, a framed chart about to fall from the wall, and a spindle file where it may be sat on—well, it makes it pretty hard for the safety man.

The mechanical engineer not only gets around the plant enough to make him a valuable inspector, but in planning installations it means a lot if he has the right attitude. Also, the maintenance superintendent, or foreman is twin to the mechanical engineer from a safety viewpoint. You are rather out of luck without his cooperation. A safety-sold purchasing agent is also certainly an asset, although it may be a little far fetched to call him an inspector. It is of inestimable value to have the purchasing agent qualified to consider goods from a safety standpoint as well as other phases of adaptability to the purposes required.

Committee members are listed both as casual and as definite inspectors. The foreman is a casual inspector as well as definite. He must be on the safety job not only 8 or 10 hours a day, but actually 24 hours a day. He is as important to safety as the safety man himself. In fact, while I enthusiastically recommend that every plant, large or small, have a safety man, to be especially responsible for safety work, I believe that with a group of foremen thoroughly awakened to safety, and as responsible for safety as other phases of production, a plant could really dispense with a safety man.

Some of you may claim that enlisting all workmen as safety inspectors, is more idealistic than practicable. But the very word safety implies an ideal rather than an actually feasible accomplishment. By pressing toward safety you will get your plant nearer and nearer a Utopian condition, although you may not actually get it so that one can't get hurt in it.

The sub-divisions in our title "Where" and "How" are pretty closely connected. Where to inspect may be briefly described as everywhere. But the first place to inspect is certainly around the safety man's desk. This is not a mere axiomatic "Sweep your own dooryard first"; they are watching you and they are going to get something on you if they can, and it will be first page news throughout the plant if they do.

Another thing needing frequent inspection and which is especially pertinent to the safety man, is the poster boards. I think it preferable to have separate poster boards for safety, and not put your posters on the general boards where, if they are not obscured entirely, attention will at least be divided with other notices, bulletins, etc. If you or an assistant directly under your control does not place posters on the boards, inspect frequently to see that safety posters are displayed as they should be. See that old and soiled ones are removed, see that safety posters are placed on safety boards and not elsewhere, see that they are not merely stabbed on a nail or tack and allowed to curl, see that they are not held on someone's desk until outmoded. Also see that safety boards are located where they will be seen. There may be a hundred reasons why your safety poster boards have been moved or set aside for some reason, and only frequent inspection will assure you that the

boards are still out in a prominent place where they will carry their safety message to every passerby.

If I were starting safety work in a plant or taking a position in a plant new to me, the very first thing I would do would be to take a general inspection trip through the plant. This would help familiarize me with the plant, give me an opportunity to meet some of the boys, let everyone see me and know that we had started something, and find what hazards I could.

This, and every other inspection trip through the plant, should not be confined to the main boulevard. Every plant has its boulevards; it's main avenues of travel. But in making your inspection trip don't neglect the rat cellars and the bat bellies. Don't neglect the place where "nobody ever goes." And don't let anyone argue that a hazard is unimportant "because no one was ever hurt there yet." If there's any phase in the English language that gets in my hair it is that. Fate alone holds knowledge of how long a hazard can exist without causing an accident, but it is certain that the longer the time that has elapsed the nearer we are to the inevitable accident. Where a hazard has not caused an accident, an accident is imminent. I heard a man telling of a shop he inspected where he discovered a crushing mechanism for breaking up large pieces of metal so they could be thrown into a cupola. His suggested safeguard was rejected because the operator, an old man, had worked on it for eighteen years without an accident. But two weeks later he was asked to come back and re-explain his safeguard; the old man had been killed.

Next I would study the accident experience. Where accidents have occurred they can occur, unless correction has been made. I would try to determine if there was some building or room where accidents occur with significant frequency. I would try to determine if some type of machinery or tools or method of work was responsible for an unusual number. I would try to determine if some foreman was having an unreasonable number of accidents to his people. Then I'd inspect there. I would not only inspect where serious injuries have occurred and where lost-time injuries have occurred, but where any accidents have taken place, some perhaps not causing injuries at all, and where accidents almost have occurred.

Then I'd take building by building or department by department and comb it. Then I'd consider types of hazards and look for them. Accident experience would guide me somewhat in the order I chose these types. Gears and sprockets, belts and pulleys, slipping hazards, falling objects, ladders—there's a good one. Ladders and stepladders will bear inspection any time.

Some are guided in where and how to inspect by a blank to be filled out and mailed to the insurance company periodically—a good plan as far as it goes, unless it results in doing the job perfunctorily. I have known of cases where such a blank was filled in from a desk and some of those locations hadn't been seen for weeks by the person filling in the blank. Some prepare a check list, basing it on Bureau of Standards Rules, past experience, and good judgment. This is also a good plan unless it encourages perfunctoriness—routine to the neglect of originality, mechanization of conduct to the sacrifice of thoroughness. Use whatever blanks and forms facilitate but do not hamper.

As to how to make inspections, there can be prescribed no universal formula. And as to where, I shall begin with the inspector himself. I am not so sure but that the whole HOW of inspection rests with the WHO and the WHAT of the inspector. An inspector with the right characteristics and personality will do a good job no matter how he does it.

First, diplomatically. Be friendly, be discreet. Don't antagonize anyone in the plant. Don't argue and insist. If you have authority, go ahead and use it but use it sweetly. I should be very much inclined to measure an inspector's efficiency, in the absence of actual results, by the attitude of the men in the plant toward him. If they say "regular fellow or a right guy, I wager he's getting results."

Diplomacy embraces self-effacement. Wherever possible make it appear that the foreman of the department is making the recommendation. If not the foreman, a worker in the department. Discuss the situation with him and first thing you know he is making the suggestion, although you may have had it in your mind long before. If you are doing a good job as a whole the management will give you credit; let others have credit for individual suggestions.

Be frank. Don't bluff. There are probably a lot of things about the shop man's job which are Greek to you. If you don't understand what he's talking about, don't think it's to your discredit. It will be a lot of gratification to him to explain to you what you don't understand.

Inspect systematically. Do it regularly. This does not mean with a clockwork precision so that those in a certain department will know you are there always at a certain time and will have a chance to doll the place up, but with a regularity which precludes recess or neglect. Also inspect with persistence. Probably no one meets more rebuffs than the safety man. Some discouraging, some upsetting. Once a hazard has been discovered keep it alive until it's corrected or correction refused by someone in authority who gives a reason for rejection. Have some kind of a follow-up. If the foreman says he'll fix it, don't drop it there; he may forget it. Cross it off only after it has been corrected. And then have some provision in your system for notifying the maker of the suggestion. His interest in making new suggestions is stimulated by the knowledge that his previous one received full attention.

Also inspect with thoroughness. A hazard can be identified by the answer to the question, "can an accident occur here?" An accident can occur wherever a precaution has been neglected. Someone has said, a hazard is a violation of common sense, and inspection is applying common sense to correct the hazard common sense should have prevented.

ADJOURNMENT



Safe Use of Chemicals in Industry

THURSDAY AFTERNOON SESSION

October 4, 1934

The session devoted to a discussion of the Safe Use of Chemicals in Industry was called to order by M. F. Crass, Manager of Package Control, Graessli Chemical Co., Cleveland, Ohio, who presided. The chairman briefly welcomed the delegates and then introduced the first speaker.

Safety in Electroplating Operations

By E. J. SMITH

Safety and Health Director, Hawthorne Works, Western Electric Co., Chicago

The speaker said in part: At our plant all acids, with the exception of sulphuric and hydrochloric, are stored in carboys arranged in rows in an open yard. When acid is stored in buildings there is always a possibility of the containers breaking through fire, impact, or other causes. Carboys are conveyed to and from the plating department on skids, mounted on electrically driven lift trucks. Eight carboys are loaded on each skid, securely roped together and fastened to the truck. Specially trained men are used for all trucking of acids around the plant. Before the carboys are moved from the storage yard, all stoppers are checked for looseness and any that are found loose are securely bound into place. Empty carboys are washed by the department using them and tagged "washed", and none will be removed by our trucking organization unless they bear this tag. Before refilling carboys they and the wooden boxes they are packed in are given close inspection for such defects as loose bottoms, broken boards, cracked glass, missing neck guards, and dry rot.

The chief acids used in plating at Hawthorne are sulphuric, hydrochloric, nitric, phosphoric, acetic and hydrofluoric. The latter is handled in lead containers, but all others are conveyed in these carboys. In addition, there are two 10,000 gallon tanks in the storage area—one for sulphuric and the other for hydrochloric acid. These are above ground and afford a safe way of storing a large quantity of acid in a small area. Pipes, valves, and the tank for hydrochloric acid are lined with soft rubber. The sulphuric tank and its fittings are unlined, however, because on the first filling an insoluble sulphate forms and deposits on the inner surface of the tank, forming a satisfactory insulation in itself.

Carboys to be filled from these tanks are placed upon a skid and a telescoping spout attached to a filling valve is lowered into them. The valve, being of an alloy which is resistant to both acids, is actuated by a solenoid interconnected with an automatic weighing mechanism which can be set to cut off after any desired weight of acid has passed through. The net weight for each acid is stenciled on all carboys, but for automatic operation the scale is set at about 105 pounds for muriatic acid, and 160 pounds for sulphuric acid. This system eliminates overflowing.

Inspection of this entire equipment is made at regular intervals, with particular attention to the discharge lines, including both hand operated and automatic valves.

and necessary repairs are made immediately. Whenever a leak is detected in a discharge line, a convenient safety valve located beneath the bottom of each tank is closed and kept locked in that position until repairs are made. An emergency plug controlled by a rod extending through the top of each tank is provided for arresting the flow of acid if the safety valve should fail. In cases of severe leaks, provision is made to neutralize the accumulated acid with an alkali.

In addition to an emergency shower of cold water for the protection of the operators, a supply of an alkali is kept in the scale or control cabinet at all times. The conventional emergency shower is generally 6½ feet above standing level. A quick opening valve, generally lever actuated, is placed in the riser about three feet above the ground. If the shower is located outside, exposed to freezing winter temperature, it can be operated by a valve in the feed line below frost level, actuated by a small rod extending three feet above ground with its top bent to form a handle. Whenever it is necessary to apply water an effort should be made to get it directly on the skin, by removing the clothing if possible.

Cyanides and other poisonous substances of a virulent nature received from suppliers in galvanized or tin containers, soldered air-tight, are kept in a building separated from the rest of the plant by fire walls extending from the ground to the top floor. When cyanide in any form is stored in a department preparatory to use, it is kept under lock and key in a steel chest. The supervisor alone has possession of the key.

To minimize the exposure to breakage, filled carboys, upon reaching the plating department, are stored in an area specifically reserved for them. They are conveyed to the rows of dipping crocks or plating machines by electrically driven trucks, and are then moved by a small hand truck from crock to crock. Acid is forced from the carboy to the crock through a goose-necked pipe under five pounds pressure, obtained from a compressed air line. This arrangement eliminates tilting or splashing and further reduces the possibility of breakage.

In some of our later plating installations we have adopted the downdraft type of exhaust. In this type the hooding extends up the sides of the tank and over the top to a point just above the anodes. This top portion is hinged and can be folded back to facilitate access to the anodes when necessary. Pulling the air across the surface from both sides permits less chance of fumes escaping than there would be with the overhead upward pulling type of exhaust.

Chromium plating presents two conditions not common to most types of plating. These are the spraying produced by the plating action and the tendency of chromium fumes to form ulcers in the nose. In many cases these are so severe as to perforate the septum, if the exposure to fumes continues. To overcome this and to completely arrest both fumes and spray, we have equipped our chromium plating tanks with a combination blower and suction system. Air is blown across the surface of the plating bath from both sides of the tank and drawn up into the suction exhaust at the center.

Another matter of interest from a safety standpoint is that of maintaining poison signs over dipping tanks and in other locations where hazardous chemicals are used. Ordinarily painted signs become obliterated in a relatively short time in these places. We have found, however, that signs of the vitreous enamel type stand up best.

Protective clothing is an important item in a plating shop. I suppose woollen soled shoes have been standard equipment for platers throughout the country for years. We use them, too, but a variant type to those frequently furnished to employees. Some years ago our engineers collaborated with shoe manufacturers and today we have a wooden soled plater's shoe with a safety toe cap of fibre. Periodic inspection of the uppers of safety shoes for cracks and loose rivets is well worth the effort. A shoe with a crack in the uppers is worse than no shoe at all, because the acid leaks in and is held there where it can cause considerable trouble. Gloves are also an essential item and should be looked over carefully. We have found that heavy-duty rubber sandblasters' gloves with a five-inch gauntlet are the most satisfactory in point of comfort, durability, and protection in this department.

Of all the items of protective clothing, goggles are the most important. They are vitally necessary in the dip shop. Here, where you can always expect the unexpected, goggles have saved many an eye. However, some types of goggles should not be used on this work. I refer mainly to the spectacle type, either with or with-

out side screens. We have adopted a cup type goggle with splash proof air vents as standard for acid dippers.

Protective equipment is necessary where considerable manual handling is involved. Our engineers have developed an automatic acid dipping machine which does the whole job without the aid of human hands. An operator dumps the parts to be dipped into a hopper at one end of the machine, which is composed of a series of crocks in a row, all enclosed and served by a common exhaust. The parts fall into a hinged basket in the first crock. After a predetermined time the basket turns out of the solution upon its hinged side and the parts roll out and into a hinged basket in the second crock. This continues until the sequence of dipping operations has been completed. After the final dip, the parts are pushed through a drying oven or screw conveyor, dumped into pans which in turn settle upon a moving belt and the cleaned parts are conveyed back to the operator.

All employees engaged in metal plating at our plant are given a complete examination once a month, with special stress on the condition of the lungs, heart, kidneys, and the blood.

The still type of plating entails a considerable amount of racking and unracking of parts, with the attending hazards of puncture wounds and scratches about the hands and arms. In unracking plated parts we at one time experienced considerable trouble from dermatitis. This was due to traces of cyanide in the moisture on gold plating racks attacking the fingers of operators. The use of surgeon's rubber gloves prevented this occurrence, but they proved uncomfortable, especially in hot weather. The trouble was finally eliminated by drying up all moisture in an electric oven preparatory to racking.

Accidents in the Plating Department at Hawthorne are a negligible factor. However, it is absolutely necessary to keep driving away at safety all the time. Every Hawthorne foreman talks to his workers individually about the hazards of the particular job. He outlines to each individual the time and money the company has spent to protect him from bodily injury, and points out that since the management is so interested in his physical well-being, he himself, with so much more at stake, certainly should have an intense interest in his own safety. In the case of a new employee, the foreman or supervisor shows him the safe way to perform his work, stays with him until he demonstrates that he has caught the idea and checks him up from time to time during the first week to see if he continues to follow the prescribed safe method.

Safety rule books or instruction cards are also necessary, and we have found it pays to draw foremen into their preparation, for by so doing you capitalize upon their experience and enlist their support at the outset. Having played a direct personal part in the formulation of safety rules, the foremen will develop a greater zeal for their enforcement than would be the case if the rules had originated higher up and enforced upon him. Periodic inspection of his department will show a foreman many things that need correction.

Men continually handling acids and caustics should be encouraged to change their clothes and take a bath before leaving the plant at the end of each shift. In some plants a double compartment locker is assigned to each man; one compartment to contain work clothes, the other street clothes. In locating lunch rooms, it is well to have the workmen enter through a washroom so they can wash all chemicals from their hands and faces before eating.

Safe Handling of Dyestuffs

By S. WARZALA

The Calco Chemical Company, Inc., Bound Brook, N. J.

The speaker said in part: The title of my paper implies rather definitely that dyestuffs are not a safe commodity. While it is impossible to undertake to speak of all the dyestuffs, individually, it can be fairly stated that, as a commodity group, and with very minor exceptions, they do not present a health hazard.

Of course, their ingestion is sometimes harmful. So is their inhalation, and

when bodily cleanliness is not observed the addition of dyes to personal neglect does not improve the condition.

The troublesome elements in the dyestuffs industry are the intermediates. However, it is not my intention to dismiss the subject of intermediates in any other way than with a warning that precautions of the most thorough and effective character should be employed.

The precautions in the manufacture and processing of intermediates are not elaborate. They are quite simple, but they must be thorough and they must be constantly observed. Processes should be chemically reliable. They should be closed, they should be equipped with installations to eliminate fumes and to reduce to the minimum personal intervention and handling. Where operations are conducted under pressure, recording thermometers and gauges should be provided. Regular inspection of apparatus and safety valves should be maintained.

Full information should be available from proper study, research and inquiry, before any process is initiated, of the chemical behavior, at different stages of manufacture, of the several constituents used, and of their effect upon the human system. Appropriate precautionary measures should then be adopted.

Shops should be well ventilated. They should be maintained in a state of surpassing cleanliness, order and general housekeeping. Only men who upon physical examination, are found to possess good powers of resistance should be employed. They should be re-examined periodically to discover as early as possible any development which may in time produce an impairment of physical condition. Men addicted to liquor should be excluded. The working clothing and underwear of men in nitro and amido processes should be laundered cleanly and changed at least twice a week, or more often if circumstances require it. Enough should be known of the men to make certain that their mode of life is regular, at least, from the standpoint of diet. Personal cleanliness should be insisted upon in the matter of thorough daily bathing, and washing of hands before handling food.

It is perhaps quite natural that this admission of a hazard in the handling of intermediates should be taken as supporting the popular assumption that the industry is a hazardous one. Where that notion exists it may not be unwarranted, but conditions are changing daily in the direction of improvement. Even the short time which has elapsed since the hectic war period, the spawning season of the chemical manufacturing industry in the United States, has wrought material changes in that industry. First, the number of manufacturing units has been very drastically reduced so that the survivors of this process of selection more and more represent ability and responsibility. Second, the character of manufacture has shifted from explosives and gases to peace time commodities; and third, the ensuing competition of the new era and the recognition of losses incident to inefficient manufacture have made the introduction and maintenance of constant improvements in production indispensable to economic survival. These conditions have been, and are today, responsible for the plant efficiency which is quite general in the chemical industry. Technological improvements, in order to make the processes as independent as possible of that most variable factor in production, and the one which lends itself least to effective control (the man), efforts to make the processes more and more efficient in terms of cost sheets, research to improve their chemistry, plans to improve the shop conditions through redesign as well as new installations, and the establishment of well organized and competent medical departments with research and prevention as their primary responsibility, are some of the developments which are taking place in the chemical industry today. These, therefore, with more experienced working forces in key positions are contributing toward the favorable standing the chemical industry is enjoying in points of accident frequency and severity in comparison with other industries.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Safe Use of Electricity in Industry

WEDNESDAY AFTERNOON SESSION

October 3, 1934

The session devoted to a discussion of the Safe Use of Electricity in Industry was called to order by A. B. Campbell, Engineer, Edison Electric Institute, New York City, who presided. Chairman Campbell welcomed the delegates and then introduced the first speaker.

Miniature Voltages for Portable Electric Equipment

By JOHN M. STEWART

Electrical and Power Plant Engineer, McCormick Works, International Harvester Company, Chicago

The speaker said in part: There is a general belief among electricians and those in allied trades that voltages of 110 to 220 are not particularly dangerous and can produce fatal shock only under "extraordinary" conditions. A study of the annual reports of the department of gas and electricity of any city will show the fallacy of this belief.

In Chicago during 1933 there were four deaths officially reported from 220 volts or less. There were five in 1932, five in 1931 and three in 1930. We have no means of knowing the number of near fatalities that were not reported.

At McCormick works during the past few years we have had several cases where men were tied up on 220 volts but were released from the circuit before resuscitation was necessary. There was also one case where artificial respiration was applied for an hour before the patient was in condition to be removed to the hospital. These cases were not in particularly hazardous locations. They occurred in shops, engine rooms, sub-stations, etc., and generally occurred in changing a broken bulb in an extension cord. The only serious case occurred on 110 volts, the current passing through the man from his right ear to his left hand. His ear was in contact with the frame of the punch press against which rested a live conductor and his left hand was grasping an air pipe.

About fifteen years ago in one of our plants, a repair man inspecting the interior of a boiler received a severe shock from the 220 volt extension he was using. His helper outside the boiler saw his predicament and freed him by pulling the extension cord.

The chief steam engineer demanded something be done about it.

The electrical engineer in charge decided to run an actual test to see the voltage at which a man could make his muscles function. Rough test apparatus was set up, consisting of a variable transformer, galvanized bucket, and a hand electrode. One side of the transformer secondary was attached to the water pail and the other to the electrode. The electricians were then invited to step up and try it. The subject grasped the electrode with his left hand and endeavored to pick up a small

object from the bottom of the bucket with his right hand. The test was tried on four men, and the conclusions were that a man could take only from 12 to 20 volts under these conditions and retain control of his muscles. We decided that six volts would be safe beyond question and adopted this as standard for such locations.

Recently we have held another series of tests, a little more elaborate than those just mentioned, and covering 18 men. These tests were conducted under the supervision of S. W. Johnson, M.D., whose opinion is as follows:

The obvious conclusion of this series of experiments to determine the voltage at which unsafe, uncontrolled muscular contraction takes place when an electrical circuit is completed through a wet contact is that, regardless of the general health of the man, anything over 12 volts is extremely dangerous. At that voltage, even those in the best physical condition complain of contractions in their hands, arms and shoulders which they could control only with real difficulty.

It must also be borne in mind that these tests were made with the patient expecting an electrical reaction. Certainly, where shock is unexpected, it is reasonable to assume that the muscular reactions would be greater and would include the normal defense reactions of pulling away from the source of the shock.

This substantiates earlier rough tests and confirms the practice we have followed during the past 15 years, that all repair men working inside boilers, man-holes, catch basins, sewers, tanks or other locations where a large area of the body may be exposed to ground connections, must use six-volt extension lights.

The extension light equipped consists of a 50 or 75-watt 220 to 6 volt transformer. In boiler rooms these transformers are made a part of the lighting installation, and no other extension lights, except the six-volt, are allowed in the boiler rooms. There is some chance that these six-volt extensions might be carried to some other location and plugged into 110 or 220-volt receptacles, creating a serious hazard. If something more than supervision seems necessary to prevent this, a different type of plug and receptacle might be provided for this equipment.

To the repair men whose work takes them in such locations as man-holes, catch basins, sewers, tanks, etc., we issue equipment consisting of the same 75-watt 220-volt to 6-volt transformers. The extension is permanently connected to the 6-volt side with a standard receptacle cap on the 220-volt lead. This cap is connected to the transformer by not more than two feet of a satisfactory heavy duty cord. This makes it impossible for the transformer itself to be carried into the man hole or catch basin, and it may be plugged into any 220-volt outlet without danger. Close supervision is again relied upon to see that only these extensions are used in such locations. The transformers are made by a reliable manufacturer and subjected to a shop test of 1,000 volts between the primary and secondary coils. It may be possible to obtain portable electrical tools which operate on voltages low enough to be safe in such locations, but I do not know of them. Our practice is to use air-driven tools in such locations whenever possible. If electrical tools must be used, we see the tool and cord are in good condition, the frame properly grounded, the circuit properly fused, and that a reliable, alert man is stationed outside ready to cut off the current should trouble occur.

In 15 years of operation with low voltage equipment, we have not had an accident, and we are convinced that this equipment is the best safeguard in such locations.

Safe Maintenance Work on Industrial Electrical Equipment

By J. D. DONOVAN

Superintendent of Maintenance, Central Alloy District, Republic Steel Corp., Massillon, Ohio

The speaker said in part: The problem of operating and maintaining high voltage equipment and overhead electric lines from the standpoint of man-safety is similar to any other safety problem. It is peculiar, but true, that the accident ordinarily occurs from what is commonly considered to be a non-hazardous situation; for the problem that presents the known hazard is very carefully thought out. It is checked and each situation fully covered and preventive action provided. The

workmen themselves are highly alert during the process of the work because of its unusualness.

In the other case, where situations are such that little or no hazard is apparent, the detailed checking may be either absent or loosely performed, and the workman goes into a situation in which he is either ignorant of the hazard, or if the hazard is present and it is apparently of a minor nature, there is lack of concentration on the hazard because it is a minor one.

Naturally, one of the first considerations in safe maintenance work is in the original installation of equipment. By careful selection and installation of approved equipment, we naturally lessen maintenance and the hazards which accompany it. Manufacturers of electrical equipment have done much to help industrial safety by incorporating safety features in their products.

It is the general opinion that all electrical apparatus be enclosed and only authorized persons allowed to come into contact with the current-carrying parts. No open wiring is permitted. The electrical engineer in the steel mill has a difficult problem because every piece of electrical apparatus that is installed must be done in a manner that will permit ready removal in case of trouble. It must be accessible for inspection and repairs, and at the same time meet the safety requirements. Motors must be installed so that the whole motor may be removed quickly in case of motor failure.

In connection with new as well as old electrical installation, a very important safeguard is safety locks. Too much importance cannot be placed upon the conscientious use of safety locks. Hasps for safety padlocks are now standard equipment on low voltage enclosed safety switches. The standard rule should be made that no mechanical or electrical repairs, regardless of how trivial, be made unless each craft working on the job has placed a safety lock, locking the power feeder open on the switch.

The list of accidents directly chargeable to switches, that is, burns and shocks from contact with live parts of switches, is a very long one. The list of accidents chargeable to unexpected closing of switches is also a very long one and the results are usually more serious than from contact with parts of switches. The contacts may result in burns or shock; closing unexpectedly may result in running machinery over persons, crushing them between moving parts, entangling them in gears or belts and numerous other things. Some of the burns from flashes are on the eyes and it is not uncommon for the result to be total loss of sight.

In working with electrical equipment, one all-important general rule should be rigidly enforced—open breaker and disconnects. All main oil switches should be interlocked with disconnects so that it is impossible to open disconnects without first opening the oil switch. This interlock can either be mechanically or electrically operated, or a combination of both. To merely open an automatic oil breaker is not a sure way of preventing its closing. The normally operated disconnecting switches must be opened and either the cabinet enclosing them be locked or else the blades themselves be tied and locked out. In this operation there is again danger of opening disconnects under load. This is eliminated by interlocking oil breaker with the disconnects, either mechanically or electrically, in order that blades cannot be opened unless the oil breaker is opened.

On the smaller systems, where the smaller switches are adequate, mechanical control through levers operated by hand is perfectly practicable. In the large systems the main oil switches are so heavy as to make manual control impracticable, and it becomes necessary to close and open the switch by means of electrical power. This introduces in place of the simple direct hand control, a more complicated electric circuit in which the storage battery, relay and trip coil are the more important elements. The two most important advantages derived from electrical operation are: 1, safety, 2, flexibility of automatic control. Through electrical operation only low voltage circuits are on or near the control board which the operator handles. All of the primary or high voltage circuits are located at a distance from the operator, thus eliminating the possibility of the operator coming in contact with live parts in his routine work.

Emergency switches are usually remote control devices and should not be trusted to protect a man while working on equipment. Emergency switches are also employed as safety stops. Here we have the possibility of failure due to grounds, etc.

Such switches should be tried out daily if they are to be depended upon. Generally speaking, emergency switches should be inspected and operated at frequent enough intervals to insure their positive operation in event of emergency.

The following tools should be available at all sub-stations for the safety of electrical maintenance men: 1. Disconnect poles of the various lengths required; 2. Disconnect lock outs; 3. Voltage indicators for testing high voltage lines and conductors before applying grounds; 4. Ground chains and sticks, provided with clamps to insure ready and positive connection to ground. Each maintenance man should be provided with goggles, safety lock and belt as part of his personal safety tools. Careful inspection of safety belts at regular intervals is important. Hand tools should be well selected and maintained to insure safety.

Clothing and shoes should be watched carefully to avoid trouble. The clothing should be dry and free from excessive amounts of flammable materials, it should also be as close fitting as possible. For line gangs doing maintenance work in wet weather, raincoats, hats and rubber gloves are important. Shoes should have good soles properly fastened, as a loose sole is a dangerous hazard. Safety shoes should be worn. A safety shoe for an electrician should be free from any metal and should, of course, carry an insulated sole. Non-slip soles are very desirable.

Another item which should be insisted upon in all installations, is that of the marking and tagging of switches, circuits and other equipment. The proper identification of switches and equipment when clearing lines is imperative. The scheme of identification is a matter of personal choice, whether it be by number, letter, or some other symbol, but in any case a system should be followed that will be consistent throughout the plant. Identification markings should be distinct and plainly visible so there is no possibility of error in selecting the piece of equipment that should be operated. Some plants employ a map showing the location even of all poles and towers and give each a different number. This map is framed and placed in different locations, especially in the sub-stations.

The Hazards of Low Voltage Circuits

By S. E. WHITING and G. F. TONKS

Mr. Whiting is Assistant Chief Engineer, and Mr. Tonks is Louisville Resident Engineer, of the Liberty Mutual Insurance Co., Boston, Mass.

This discussion will be confined to injury from electrical shocks, and the main consideration is whether or not the shock may prove fatal in its effect. A secondary concern applies to non-fatal electric shocks, in that they may cause disturbance of personal equilibrium and result in falls from overhead or into adjoining hazards of a non-electrical nature. It is true, also, that, very rarely, a non-fatal shock of electricity will produce a prolonged nervous disorder that is difficult to treat. We should like to confine our discussion to the particular question of receiving an electric shock that proves fatal. We might say right here that because the death is not immediately fatal—that the victim makes some apparently voluntary movement or even a few remarks after receiving the shock—is no proof whatever that he has not received a shock. Death from electric shock is not necessarily instantaneous.

Severity a Question of Dosage:

Formerly there were assertions by high authorities in electrical engineering that human beings could not be killed on low-voltage circuits; at least, they could not be killed on 110-volt lighting circuits. Fortunately, this broad denial is gradually lessening, due to further study of the subject and the accumulating statistics of fatal accidents occurring on low-voltage circuits.

As with practically all other causes of injury, the measure of electrical shock is one of dosage. When we talk about "the voltage" of an electric shock we are not describing the dosage with any accuracy. We use the voltage measuring stick merely because that is the only element of the dosage of which we have any knowledge whatever in accidental electric shock cases. The electro-therapist in applying dosages of electricity to the treatment of human ailments expresses his treatment

primarily in terms of current or amperes flowing through the body and he also considers the time or period over which the current continues to flow through the body. Furthermore, he considers very specifically through what portion of the body he will send the current to produce particular bodily reactions by means of electricity. Again, he uses different kinds of electricity in respect not only to voltage and current, but also in respect to direction of current flow (whether in one direction or in periodically reversing direction) and also how rapidly that direction is reversed per second or the frequency of the circuit. We cannot go into these details at all but must confine ourselves to the ordinary electric utilization circuits: either the direct-current circuit now rarely used or the common typical 60-cycle alternating-current circuit. Whether direct-current circuits or alternating-current circuits of the same voltage are the more dangerous, we do not know and practically we do not care because accidental electrocutions have occurred repeatedly on both of them.

The Time Factor:

First, let us dispose of the time factor in the electrical shock hazard. Obviously, this is highly variable. An extremely brief contact with a circuit means a correspondingly small dosage of electricity through the body. There is at least this merit to high-voltage circuits (such as 20,000-volts or 100,000-volts) that the person is quite likely never actually to contact the circuit wires at all, since at these voltages the electricity promptly jumps through the air to the body.—20,000-volts jumping one inch between needle points and 100,000-volts jumping more than 5 inches. Although an arc becomes established and electricity continues to flow through the air to the body, the physiological reaction causes rapid muscular contraction that will usually draw the body away from the circuit. This does not necessarily break the arc but, as the arc lengthens to several feet or more, it is quite likely to shunt itself directly to a better path to ground and the victim is thereby released. Believe it or not, there is apparently less danger of immediate death of the victim from these high-voltage shocks than from the relatively low-voltage shocks. However, there may be extensive body burns that will cause a delayed death due only to the burns, or localized injury of such severity as to require amputation, say of both hands, because of the rapid destruction of bone and flesh by the intense heat of the arc itself.

However, the point was in respect to the time factor in the dosage. Contrast the above with the case of someone grasping in his hand a charged low-voltage device and the electric shock causing the same muscular contraction but in this case producing an uncontrollable grip on the circuit, thereby vastly prolonging the time element of the dosage. Men have been killed by shock and drawn out of a boiler or tank still holding onto the charged electric lamp socket with a death grip. This, we feel, is the explanation of the common phrase "being hung up by the circuit" and we see no merit in the talk about "electricity attracting the body" or "the current throwing the man across the room," etc. We can explain the very numerous varieties of gymnastics performed by anyone who receives a severe electric shock on the simple basis of an extreme nervous impulse to some group of body muscles. It is credibly reported that one woman of vigorous build actually broke a bone in her arm as a result of muscular contraction through a severe electric shock. It is good practice for electricians, if they must use their hands to test whether a low-voltage circuit is alive or not, to make that test with the back of their fingers and not with the front. However, we condemn this practice under any circumstances.

The Current Factor:

The other element of electric dosage, the current strength passing through the body (which we may call "shock current"), has indeed some direct relationship to the voltage applied to the body (which we may call "shock voltage"). The layman is quite apt to confuse the real shock current with the current that is flowing in the electric device but not through the body. Thus, a low wattage extension lamp has less current flowing through it than has a high-wattage lamp and they both take very much less than the current that is usually flowing through a motor

or through the copper bus bars on the back of a switch board. These are all separate currents in separate paths. The shock current is in a separate path of its own, i.e., the human body, and it has no relationship whatever to the current through the lamp or the motor or the bus bar or whatever utilization equipment may be involved in an accidental shock. In fact, an extension lamp with the filament broken so that no current whatever is flowing through the lamp may still give a fatal electric shock by sending current through the body. This apparent mystery to the layman can be understood if he will remember that he can turn on or turn off the lights in his bedroom without in any way whatever disturbing the lights in his dining room or his electric refrigerator. Each and every lamp and motor takes a current that is controlled by its own resistance and its own switch.

The Relation of Current and Voltage:

We now have the problem of what connection exists between the current and the voltage in any circuit because you do not have a current flow without a voltage or electromotive force to cause it. Fortunately there is a simple relationship or law between the two that was discovered generations ago by a contemporary of such men as Galvani and Volta and Ampere. His name was Ohm and the law is called Ohm's Law:

$$I = \frac{E}{R}$$

The "I" represents the current, the "E" represents the voltage and the "R" represents the resistance. Practically we can pin our faith on Ohm's Law in considering any ordinary electric circuit whatever whether it be an electric lamp or a motor or even the human body. The exact scientists will pardon us for apparently disregarding inductive effects on alternating circuits, counter electro-motive forces in motors, electro-static charges on surfaces and what they call "transient phenomena." We are talking about the business proposition of typical utilization circuits and typical electric shock hazards.

Analogy to Ohm's Law:

Those who have forgotten what they were taught about Ohm's Law can recall it by the confessedly inaccurate analogy of a water pipe system in which the rate of water flow, say, in gallons per minute, is analogous to the current; the water pressure in pounds per square inch, to the voltage or electrical pressure; and the friction that impedes the flow of water, to the resistance. For Ohm's Law, the quantitative units are the ampere, the volt and the ohm, or:

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

You will pardon this digression from practical matters but we have been forced to it because electrical experts themselves have at times denied the application of Ohm's Law to the human body. On the contrary, we feel that its application to the human body is the very key to a practical understanding of the low-voltage shock hazard. We have mentioned only the current flowing through the body itself (the shock current) and the voltage that is applied to the body (the shock voltage) but, because of Ohm's Law, we must now consider the resistance of the human body itself. Otherwise we cannot determine what the dosage or shock current amounts to. Very obviously, from the Law itself, we would get only a small shock from a given voltage if the body resistance were very high but we would get a large shock if the body resistance were very low.

Body Resistance Highly Variable:

The body resistance is nothing that is very definite from the very nature of our anatomy. We can pass current through the right hand and out the left hand; in through the right hand and out the left foot; in through one foot and out the other; in through one hand and out through a large area of the body—as by sitting in wet clothes inside of a boiler or taking a tub bath without any

clothes on at all. Your common sense tells you that the body resistance will be different under these different conditions and you can also imagine that these different paths for the shock current through the body will also be different in respect to the injury the current may do to vital organs such as the heart or the nerves. If we sent current in and out between the two fingers of one hand, we would not expect to reach any vital organs whatever. The fact that the body is a very complicated structure, when we consider it as an electric circuit having resistance, is no proof whatever that it cannot be so considered, nor proof that Ohm's Law does not apply. We are talking as practical engineers and not as electro-pathologists.

Actual Body Resistance Values:

We can easily measure body resistance and express it in terms of ohms and this has been done time and again. We get a great variety of values and considerable variation under different conditions of measurement. We find that the body resistance varies from 100,000 ohms or more down to 1,000 ohms or less. When, for example, we take the measurement from hand to hand, we find that an extreme range of values can be obtained depending on how good contacts we make with our hands on the testing circuit. Light pressure, dry skin and small areas of contact give very high resistance; heavy pressure, moist skin and large areas of contact give very low resistance. By Ohm's Law there is a corresponding but inverse variation in the shock current without any change of voltage whatever. If, then, you admit the question of killing a person from electric shock is one of electric dosage made up of the two elements of time and shock current, you are forced to admit by Ohm's Law that the hazard depends not only on the voltage (to which, other things being equal, the dosage is directly proportional) but also on the apparently trivial and accidental question of body contacts. We shall demonstrate this point to you immediately but we wish strongly to emphasize the importance of the body contact variability since it is directly related to the practical problem of preventing low voltage electric shock fatalities. One illustration will suffice. If you are sitting on your wooden office chair handling your dictaphone with dry hands, you need not worry about the fact that it is a portable motor-driven device that might become charged. If you are sitting in a bathtub, you should most decidedly worry about handling any electrical utilization equipment whatever,—although we admit if you do handle it, you won't perhaps worry about it very long.

No Data on Minimum Lethal Dosage:

Unfortunately, Mr. Jacobs would not agree to take any dangerous dosage of electricity or amperes through his body. In fact there have been so few volunteers on this question that we do not know with any accuracy whatever what is the minimum shock current that will endanger life. The legal electrocutions are not voluntary, but what is more to the point, no attempt is made to give only the minimum lethal dosage of electricity. To make absolutely sure of the execution, the amperage used in legal electrocutions is vastly more than would cause death—5 to 10 amperes but for only a few seconds of time, otherwise disintegration of the body would be produced. The path through the body is also chosen to make certain that sufficient current will pass through the heart and the nervous system to cause what is probably instantaneous death without any suffering whatever. In accidental electrocutions we never have any such data as to the current flow that caused the fatality. Certainly it is never enough to blow a fuse. Certainly every utilization circuit has a current capacity way beyond the minimum needed to supply a fatal shock current. Electro-therapists measure their medical dosages in terms of milliamperes. On 60-cycle circuits or on direct current circuits, we understand they never run over 10 to 20 milliamperes or a very small fraction of one ampere which itself is the amount of current that will light, say, an ordinary 100-watt lamp.

Why Shock Injuries Vary So Widely:

You can feel a current of 5 to 10 milliamperes, even painfully, and it is only in this range of values that we are making our demonstration of actual current flowing through the body in showing you how readily the body resistance can be varied from its safe high values down to its unsafe low values. Remember this is a range of proportions as great as 100 to 1 and hence the shock currents we get accidentally have an equally wide range, sometimes just making us jump or say "Damn!" and other times knocking us flat, or, especially if we cannot let go of the circuit, suspending life completely—possibly forever.

(Demonstration of actual current through the body was made by use of a Westinghouse Illuminated Dial Switchboard Type D. C. Voltmeter of about 11,000 ohms resistance. This was connected across a 110-volt d. c. circuit with two flexible leads in series with which the demonstrator could insert his body resistance from hand to hand. The Voltmeter readings varied all over the scale with varying contact connections to the hands.)

Trivial Defects May Cause Fatalities:

We now come to the demonstration on specific electrical equipment of safe and unsafe conditions and we do not apologize at all for the evidently kindergarten nature of most of our demonstration. The defects seem trifling, merely the conditions that you have seen in use repeatedly without anyone being killed, but it is exactly these trivial defects that have often been directly responsible for electric shock fatalities on low-voltage circuits. If you are doubtful on this point, we shall not prove it for you but merely refer you to the statistical record of the N. S. C. Low-Voltage Electrical Committee whose reports have been published in the Transactions of former Safety Congresses.

Demonstration by Wired Robot:

We are not attempting to deceive you with any fake equipment which adorns Mr. Jacobs. We are merely using Christmas tree lights to demonstrate the presence or absence of a shock hazard on various types of normal and defective electrical equipment. We cannot use the actual shock current through the body because it might be large enough to cause a fatality right here—a possibility against which, of course, we certainly hope we have taken infallible precaution.

(A variety of drop lights and extension lamps with different types of sockets and holders in perfect and defective condition were demonstrated. The method of demonstration was through use of an operator dressed in a uniform upon which were mounted two sets of small Christmas tree lights, each containing eight 15-volt lamps in series, distributed from hand to foot on each side of the body with insulating contacts for hands and feet and a midway cross connection between the two groups of lamps. The operator makes foot contacts with a sheet metal plate to represent ground and grasps the various devices in turn with either hand. The lighting of the body lamps indicates the presence or absence of a shock hazard and the path of shock current through the body.)

Lamp Sockets:

Regarding lamp sockets in general, there is no need of concern over dangerous shocks from them if a suitable type of lamp socket is chosen for each location where the lamp is to be installed. Rigid compliance in both installation and maintenance with the existing provisions of the National Electrical Code is ample and sufficient for safety. Thus, the use of brass socketed drop lights is forbidden by these rules in all locations where persons can be grounded through damp floors, in basements, in bathrooms or near kitchen sinks or wash tubs. It will be understood, of course, that the normal brass socket does not have any charge on its outer shell, but due to failure of the shell insulation because of deterioration by dampness, etc., or through careless wiring of the socket, such external charge can develop.

Brass sockets are used extensively also on ceiling fixtures, wall brackets and

rigid conduit drop lights. They are entirely safe for such installations if, as usual, they are in metallic contact with the fixture or conduit support and the latter is grounded.

Extension Lamps:

Sockets are also used for extension lamps and since these are of a portable nature they should always be of the positively shock-proof type since they may be used at any time in grounded locations, and furthermore, they are usually grasped firmly in the hand. The lamp cord itself is also important. The ordinary braided and twisted lamp cord is forbidden by the N. E. C. Rules for such service yet there is widespread neglect for this rule because anyone can purchase the materials for extension lamps from hardware stores and apply them with no knowledge whatever as to official restrictions in such use. So many persons have already been killed from the use of sub-standard extension lamps that this danger needs more thorough advertising than it has received. It is evident that extension lamps (both the socket itself and the cord or cable) are subjected to unusually severe exposure and the depreciation factor alone fully justifies the slightly greater expense of using only approved equipment for extension lights. The practical solution lies in the exclusive use of non-breakable non-metallic sockets or substantial insulating lamp holders. (Samples of such equipment were demonstrated.)

Stationary Electric Equipment:

Electric utilization equipment that is permanently set up in one location or so-called "stationary equipment" requires not merely the protection of complete enclosure of all current-carrying parts such as switch blades, motor terminals, fuse cut-out clips and starting box connections but there should be also adequate protection against accidental charge developing on the enclosing parts themselves. Indeed, it is more important perhaps that the casing of a starting compensator be protected against charge than that the knife blades of a main switch should be enclosed by substituting the so-called "safety switch." The visual evidence of copper metal on the open knife switch together with an obviously insulated handle with which to operate it is a warning that is usually respected whereas the dead-metal handle of an oil switch or a compensator starter appears entirely safe to handle in spite of the fact that unless equipped with a protective ground it will have an electric charge on it if the internal insulation has broken down or has been bridged across by a metallic dust deposit or for other reason. The investigations made by National Safety Council above referred to would seem to indicate that there have been more actual deaths on the modern enclosed control devices of low-voltage electrical equipment than from the old type open knife switch, although this is partly due to much greater volume of exposure.

Dead-Metal Grounding:

The standard method of protecting against shock from accidental charge of dead-metal parts of electrical equipment is their permanent connection to ground, to carry off any accidental charge and protect the operator. This applies to all such equipment within reach of persons when standing at floor level and is particularly important, from the shock standpoint, when the floor is damp or otherwise conductive. Examples of such locations are all bare ground and basement floors in general; all plants at any floor level where the grounding of the operator's feet can be produced through metal floors, wet operations, or those involving chemicals. This permanent protective grounding of dead-metal parts should apply not only to the necessarily handled starting equipment but also to frames of motors on or near floor level and to all exposed transformers, cutout boxes and electric conduit. It is true that all conduit is required by the rules to be permanently grounded whether exposed or not, from the standpoint of fire hazard. This is obtained by metallic continuity through screw couplings between lengths of conduits, firm clamp connections at metal outlet boxes and final connections to ground through conductors usually at service entrances. The best grounds are on water pipes. If the conduit system also makes up metallically into the starting devices, protection of the latter through grounding is attained but repeated instances are

noted of isolated lengths of conduit with breaks in this continuity. All such breaks should be bridged by a ground wire jumper connecting through standard ground clamps carefully installed and adequately maintained from the electrical standpoint. There have been accidental electrocutions from failure to maintain a mere 10c ground clamp! No safety inspector should pass up any installations of a starting compensator where the wires enter it by jumping through the air a few inches from the free ends of a conduit installation; this gap should be bridged by a ground wire. This oversight also has been responsible for fatal electric shocks. Evidently if any conduit system is to serve this important function of protective grounding, it must be a thorough job in itself, properly maintained and tested for continuity.

Portable Tool Grounding:

General stationary equipment is usually satisfactorily protected against shock or it can be very easily made so. With portable motor-driven tools and machines the practical problem is more difficult and expensive but the shock hazard itself is greater than from stationary equipment because portable equipment from its nature is used in all sorts of locations, some of which are hazardous. That the hazard from portable electric tools and machines is an important one is shown not alone by the single fatalities happening from time to time. It is further emphasized by such records as two men being killed in an automobile body plant at the same time by the same unprotected electric drill; both men having their hands on the drill while one was teaching the other how to operate it. It is again emphasized by the record of an electric-driven coal loader in a retail coal yard which killed three men in the same accident; these men were all pushing the loader along damp ground at the time.

The general answer is the same as for stationary equipment and for portable lamps. The cable feeding the portable tool should be of the highest grade of wear-proof mechanical rubber. Unless all exposed metal parts of the tool can be covered with reliable insulation (and this is only practicable with extension lamps), these metal parts should be reliably grounded.

Special Problems of Grounding Portables:

Since the equipment is portable the protective grounding wire must also be portable and this means a three-wire cable for single-phase equipment and a four-wire for three-phase equipment. This mere change in cable is itself highly expensive to a coal yard, for example, that has hundreds of feet of high grade cable already in service but lacking the protective grounding wiring. In addition, to make the equipment dependable, it becomes necessary to have every service outlet, from which the portable tool might be used, of the special type which provides an additional pole for grounding on both the plug and the receptacle. Makeshift ground wire clamps onto conduit might be substituted for the special plugs and service receptacles, but this is not dependable because it is neither automatic nor certain in application.

With large portable tools used at only a few locations the special service outlets are, of course, financially feasible. There remains, however, the small electric drill that can be serviced from any lamp socket for which a financially acceptable solution has not yet been developed. Theoretically, so-called "polarized wiring" might be one answer, the neutral or grounded side of the socket itself being used with polarized attachment plug to ground the dead-metal parts of the tool. This solution cannot be applied to existing wiring that is not polarized and it has the further inherent objection that any accidental break in the neutral circuit wire places a charge on the casing of the tool, even before its insulation has broken down.

(A demonstration was made of typical portable electric-driven equipment with and without protective grounding. Two points were emphasized. Unless protected, the equipment continues in full operating condition, even after its insulation has broken down and caused a hazardous charge on the dead-metal parts so that the user is given no warning of danger. Unless protected, the charge itself resides on the entire dead-metal structure that is motor-driven, entirely regardless of its shape or extent of mechanical dimensions, thus indefinitely extending the exposure, possibly to several persons simultaneously.)

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



The Injured Worker

WEDNESDAY AFTERNOON SESSION

October 3, 1934

The session devoted to a discussion of The Injured Worker was called to order by Dr. C. H. Watson, Medical Director, American Telephone and Telegraph Company, New York, and Vice-President for Health, National Safety Council, who presided. Chairman Watson welcomed the delegates, and after briefly stating the purposes of the session, introduced the first speaker.

Physical Therapy in the Rehabilitation of the Injured

By JOHN S. COULTER, M. D.

Member Physical Therapy Council, American Medical Association, Chicago

Physical therapy is the treatment of diseases or injuries by physical agents such as heat, light, massage, water, exercise and electricity. Everyone is discussing methods to reduce the cost of medical care. Physical therapy is doing much to solve this problem by shortening the temporary and reducing the permanent disability from disease and injury. We are also trying to keep down the cost of administering the required physical therapy by using home made apparatus and instructing the patients and members of their families to aid us by using heat, massage and exercise at home. The following are some of the common conditions in which physical therapy is known to be of definite aid in the rehabilitation of the disabled.

Chronic Rheumatism or Arthritis. The American Committee for the Control of Rheumatism states: "The disease chronic arthritis prevalent in all temperate zones, represents one of the most important if not the most important of existing social and industrial handicaps." Pemberton, chairman of this committee, says that physical therapy has probably nearly as much value in the treatment of arthritis as any other at our disposal.

As it would be impossible to consider the use of physical agents in chronic arthritis in a short paper, it is desired to illustrate here certain important principles of their use in this disease. Those principles are, that physical therapy should be prescribed by a physician, often administered by him; and never turned over to a technician with indefinite directions. The best physical agents to use are the simplest, cheapest and most easily obtainable, i. e., heat, water, massage, rest and exercise.

In arthritis the application of external heat both locally and systemically has an extensive and varied application. While in the hospital an electric lamp bather (1) for the application of radiant heat is left in their room, and when they go home one is often sent with them. They use this form of radiant heat over the affected part for half-hour periods, one to six times a day.

In addition to this local heat the application of heat systemically is of value. There has always been a popular belief in this application of heat for elimination, but Pemberton believes this has only a limited value for this purpose. Some of the other effects of the exposure to heat have a definite value in the treatment of arthritis. These are the increased circulation and metabolism induced. These effects are increased if following the general bake or bath a Scotch douche is given.

In the use of water in treatment of arthritis the Scotch douche and cold shower after a bake furnish a "metabolic and circulatory whip" if properly used. Where the proper apparatus is not available a full wet pack is a valuable substitute. For home use again the patient should be given definite instructions. (2)

We do not use contrast baths, because we found that in giving contrast baths—one minute in hot water and one-half minute in cold water—we reduced the peripheral circulation instead of increasing it, as shown by direct observations of the capillary bed at the cuticle of the nail under the microscope.

The effect of massage in arthritis is to open vascular channels and increase circulation. If this is so and there is a deficient circulation to these joints, it must follow that massage must be given at frequent intervals. For this reason we have our patients bring in some interested member of the family for instruction in the use of heat, massage and exercise at home. The details of the technique of massage are given in the Handbook of Physical Therapy issued by the Council of Physical Therapy of the American Medical Association.

If chronic fatigue is one of the chief factors in all arthritis, certainly rest is one of the most important agents in the treatment of the disease. Swain states that fatigue is not only a subjective symptom but the physical signs of it are also present, for example subnormal morning temperature, poor pulse, vasomotor instability, low blood pressure, lowered metabolism and poor muscle tone. He believes that fatigue of this kind is due to disturbances of the normal physiology of the organs in the thorax and abdomen, and has its effects chiefly through the circulation and sympathetic nervous system, as is shown by cyanosis of the lips, cold hands and feet, localized blanching skin changes and deranged heart action.

Rest should be prescribed with as much discrimination as any drug. Usually the rest should be in bed for certain periods daily or continuously. At first, after each meal a pillow is placed under the shoulders, the hands are placed under the head, and a pillow is placed under the knees. This raises the chest and abdomen, hyperextends the dorsal spine, flattens the lumbar spine, and results in abdominal breathing with better use of the diaphragm.

After a half hour the face prone position is taken and radiant heat is applied to the spine to stimulate spinal circulation. These periods are given after meals whether the patient is in bed continuously or ambulatory. If continuously in bed these periods are continued until exercises and proper supports enable the patient to continue this correct position when up. He is then allowed up for increasing periods.

Rest is also an important agent in the local treatment of the affected joints. This rest should be in a position that is the best adapted to prevent strain or contracture, thus preventing deformities.

Exercises in arthritis are important to correct and atone for faulty mechanics and malposture, locally to prevent deformities and to increase the blood supply to the joints. Atrophic arthritis is more common in the thin, stoop-shouldered, flat chested and relaxed abdomined person. Their muscles are weak, their chest is narrow, their diaphragmatic excursion is small, their abdominal viscera is sagged and the weight bearing lines of their joints are not true. These bad body mechanics can be corrected by proper exercises and postural rest periods; and it is inevitable that there should be some improvement in their cases, if there is more room in the thoracic cage for heart and lung action and if the diaphragmatic pump can be set working again on the abdominal veins and viscera and if the joints can have their normal weight bearing lines restored. In hypertrophic arthritis the same principles apply to correct faulty body mechanics. It usually occurs in older people, and the remodeling is harder, but there is usually less to be done.

Again, the patient and some interested member of the family are instructed in the use of body mechanic exercises. These instructions are on mimeographed

sheets. (2) The exercise program of every chronic arthritis case should be started with body mechanic exercises. These exercises are based on the development of a firm flat lower abdomen. The importance of posture and body mechanic exercises cannot be over emphasized in the treatment of arthritis.

For local joint conditions during the acute stage, deformity must be prevented by rest in proper supports, but painless active motion is encouraged. These joints should never be manipulated by passive exercise, for swelling interferes with the circulation which is already poor and trauma is done to the diseased tissues. After the acute stage has passed, joint motion must be restored. Here again exercise is given on prescription by the physician. There should be a mimeographed sheet of exercises for each joint by which the physician can indicate the exercises to be used. (2) The best result in the restoration in stiff joints following chronic arthritis is not from passive movements but by the gradual use of these joints by directed exercise and occupational therapy.

Exercise for a single joint is monotonous, but this exercise given by an occupation with a definite object in view makes the patient forget the exercise by thinking of the task to be finished.

Fractures. Wilson recently said that physicians who are experienced in the art of physical therapy consider it absolutely indispensable in the treatment of fractures. It is believed that physical therapy in fractures must start early and that the surgeon and the physical therapy department must cooperate. Our principles for fracture treatment are:

1. Splint them where they lie.
 2. Early and complete reduction.
 3. Splint the part so that the greatest amount of joint motion will be permitted without disturbing the position of the fragments.
 4. Immobilize the joints requiring it in the most favorable position for recovery of function.
 5. Avoid dependent positions and use elevation when necessary to increase effect of heat and massage and thus maintain normal circulation.
 6. Start heat and superficial stroking massage early. See table in Handbook of Physical Therapy for the time to start.
 7. If rigid plaster-of-paris casts are applied, remove the whole or part as soon as possible for heat, massage and mobilization.
 8. If the fracture is treated by traction and suspension, heat may be applied several times a day by a baker in the patient's room; and motion can usually be started in some joint of the immobilized extremity.
 9. Use under water exercises in a tank (1) early in spine and leg fractures.
 10. Early substitution of light protective splints or walking calipers for the completely immobilizing splints.
 11. Instruction of patient and some member of his family to give heat, massage, exercise and occupational therapy at home daily or twice daily, when the patient leaves the hospital and have them report to the physical therapy department twice or three times a week for continued treatment.
 12. When reporting to the surgeon and the physical therapy department for treatment these cases should be given some form of heat, massage, electrical muscle stimulation and exercises. For electrical muscle stimulation a sinusoidal faradic coil may be used with a sliding core (1). For exercises we use mimeographed sheet of directions (2), one for each joint for home use, and in the physical therapy department we use home made exercise apparatus (1).
 13. The surgeon checks these cases at least once a week, and finally discharges them.
 14. Little apparatus is necessary to give physical therapy in fractures. Heat appliances can be made (1). Exercises can be given without apparatus, see sheets for directions (2) or the apparatus can be made by the local carpenter as we use at the I. C. Hospital (1).
 15. Physical therapy for fractures must be given under the direction of a physician trained in the art, and a well trained technician.
- Joint Injuries.* Moorhead recently stated that the early and concurrent use of physical therapeutic procedures in the treatment of acute joint injuries insured an earlier and more complete restoration of joint function. Preservation of joint func-

tion after a joint injury or operation is one of the commonest and most difficult problems in surgery. Our use of physical therapy in various hospitals has proven Moorhead's statement. It is believed that in the application of heat one of the most useful appliances is a whirlpool bath where the part is heated with hot water and gently massaged with the air bubbles and swiftly circulating water. This also can be made by a local plumber (1). In the after treatment of injuries to weight bearing joints we use a tank for early under-water exercises (1). It is surprising how joints that are too painful to be moved in any fashion can be moved by the patient in water. Again heat is applied several times daily with a baker, and the patient or some member of his family is taught the use of massage and exercises at home and given definite mimeographed directions. In the early exercises of weak and painful joints by the patient if a tank is not available we use exercises with the patient lying and the limb exercised on a powdered smooth board or card board to eliminate the weight of the limb. This enables a weak muscle to work, which could not do so if it had to lift the weight of the limb.

Peripheral Nerve Lesions. Peripheral nerve lesions are comparatively rare injuries, but when they occur physical therapy plays an important part in the treatment. Again the cooperation of the surgeon for corrective splinting is absolutely essential. Also heat, gentle massage, and muscle reeducation can be used by any surgeon in any place. The muscle reeducation exercises must be taught to the patient so that at least four times a day he will do these exercises from five to ten times. We also use electrical muscle stimulation to prevent atrophy and fibrosis, to increase nutrition and to conserve the functional capacity of the paralyzed muscles until sufficient nerve regeneration has taken place to permit active motion. Many expensive types of machines for this electrical muscle stimulation are being sold but the only requirement of electrotherapy is that it shall produce a contraction of the paralyzed muscle. Obviously, this cannot be brought about by stimulation with faradic current, as the duration of each shock is too short in relation to the changed chronaxia of the nerve and muscle. Pollock recently stated that the contraction of a muscle resulting from stimulation by an interrupted galvanic continuous current is as useful as that produced by any other type of galvanic current. Therefore a dry cell battery with electrodes and an apparatus to interrupt the current are all that are necessary (1).

Burns. Blair has stated many times that for extensive burns of the body and extremities the combined use of the saline bath and dry heat is most efficient for cleaning these wounds surgically in preparation for skin grafting. The patient is placed in a warm salt bath (up to 5 per cent sodium chloride) for one to three hours a day, and then lies without dressing on a Bradford frame with electric lights above to supply warmth.

For the scars following burns the whirlpool bath, ultraviolet radiation, massage and exercise are used.

In conclusion it is again emphasized that the cost of physical therapy to the physician can be decreased by the use of home made apparatus and the cost for the patient lessened by using it at home under careful directions from the physician.

Footnotes:

(1) Constriction plans can be secured from the Council on Physical Therapy of the American Medical Association, 535 N. Dearborn Street, Chicago.

(2) Directions will be furnished on application to the Council on Physical Therapy.

Emergency First Aid to the Injured Worker

By W. R. REDDEN, M. D.

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

Inflexibility is the first sign of senility and most people die of mental sclerosis long before arteriosclerosis sets in, raises blood pressure—bursts an artery and rings down the curtain on life. Fixed ideas begin early in life and their accumulation creates one of the greatest barriers to progress just as truly in industrial safety as in the life of the individual.

I know of a number of men who still use a set of seven old fashioned razors, one for each day, instead of using the modern safety razor, which is fully as effective and far safer.

I know of a business man who has never used a fountain pen because he would not bother to find out that modern fountain pens save time and bother.

There are still many industries that do not know the safety value of first aid training. For some reason they have developed a fixed idea about first aid so that nothing can penetrate their minds.

However, industrial groups that have actually tried first aid training know that it is one of the best safety education devices available, and that properly administered first aid on the spot reduces lost time, severity rate and the cost of accidents.

The best assurance that the injured worker will be given effective first aid is to supply adequately trained First Aiders with unit first aid kits. Experience has demonstrated that kits furnished with uniform sized packages, delimited in variety and quantity to meet the needs of the particular industry, are most economical, most fool proof, easiest to handle and most readily kept up. This form of unit kit is readily obtainable from supply houses that specialize in first aid equipment.

What are some of the results noted from the handling of the injured worker by the First Aider with a kit?

Infections among injured employees have been so strikingly reduced that the cost of training and first aid equipment have been frequently reduced to the vanishing point.

For example, during many years the New York Telephone Company had from 25 to 35 infected cases among employees in the field who were often far removed from medical care. During the past ten years, since the employment of first aid kits by trained First Aiders, only two or three infected cases have occurred in periods of two or three years. This report covers groups of workers whose work takes them far afield and on jobs which result in a vast number of injuries that break the skin.

It is the prompt first aid treatment with proper equipment by trained First Aiders that stops infections on the spot, before the microbes have a chance to settle down to raising families to the tune of millions or billions.

The recent experience of the United States Leather Company is one for the book in the reduction of infections in various plants. Prior to two years ago none of the plants had a medical, nursing or first aid service. Then the company developed a program of first aid training throughout the plants. This was followed by the purchase of first aid equipment, the establishment of first aid rooms and the use of the best First Aiders to take charge of the first aid work.

Last October one layman in one plant reported the treatment of about 1,800 injuries, that broke the skin, without a single infection. This happened in a plant which had such a high rate of infected injuries that the insurance company made it clear that something must be done to clean up the situation.

It is clear that with sterile dressings, a safe antiseptic and the proper application of both at the time of injury, infections can be reduced to the vanishing point, even in a tannery where infections are the most common type of injury.

Now let us turn to the problem of handling the injured worker with improvised equipment.

"When is a First Aider not a First Aider"? calls for only one answer: "When he has to have a first aid kit to handle the injured."

Every employer should be as much concerned about injuries that happen to his employees "after the whistle blows" as before the day's work is done, for the loss of a worker, irrespective of the time and place, is still a loss which requires readjustment to keep the machinery running efficiently. But, employees do not carry first aid kits in their hip pockets, hence most extra-industrial injuries must be handled without formal first aid equipment. Nor is the problem limited to the after-work phase, for accidents in the shops happen frequently when no first aid equipment is at hand. Therefore, the life of the injured worker may depend upon the ingenuity of the First Aider.

Let us consider a few types of injury that can be handled without equipment:

The injured worker has severe bleeding, which may kill or may increase shock which turns the tide in favor of death. Any First Aider knows that he can plug the

wound and apply pressure to stop bleeding, if it can be stopped by first aid methods. He also knows that on the head and the extremities there are places along main arterial lines at which he can stop bleeding by manual pressure without using a tourniquet. If a tourniquet is needed he uses a belt, a necktie, a woman's stocking, or any other article of clothing which can be torn into strips long enough to encircle the arm, leg or head.

The problem of fractures is readily handled on the arm, wrist and ankle by the use of the ordinary one cent wire coat hanger applied with pieces of shirt, ties, garters or stockings. The broom handle, mop handle or carpet sweeper handle all make excellent splints for broken legs; and the ironing board can not be beaten for handling a person with a spine injury, for it acts, not only as a splint for the back, but also as a stretcher. A Western Union safety engineer declared to me recently, that the coat hanger splint gave him the best idea he had had about improvised splints among employees of his company, for, said he, "Our line men always have plenty of wire with them and it is a simple matter for them to do a bang-up job with wire in case of a fracture."

Broken ribs simply require compression of the whole chest, which is readily accomplished by tightening up the vest or shirt of the injured person by pinning tucks in there, either in back or at the sides, as the victim exhales.

A broken jaw needs only a garter and a tie, or two bits of shirt to hold the jaw shut.

Slings for injured arms are improvised readily. The coat sleeve, the shirt sleeve, or waist sleeve, is pinned to the material on the opposite side, ligh up on the chest, or the hand is inserted above the last button of the coat, vest or shirt.

Bandages for use in the application of dressings to large areas, such as the chest, lower trunk and arms, are easily made by using the underwear where it is, but applied more firmly by taking in tucks at the sides or at other favorable places. The shirt sleeve is the easiest bandage to apply over a dressing for the arm, just as a woman's stocking is the best sort of bandage to hold a dressing on the whole leg. A man's sock does nicely for a foot and lower leg or ankle bandage.

Tourniquets are easily made by using garters, suspenders and belts, to say nothing of a woman's stocking which has length, strength and flexibility.

Get away from the idea that bandages must be white. Any material may be used. For dressings, clean handkerchiefs are safe. Above all things, don't fool yourself into thinking that you can make any cloth more sterile by flaming it, as is suggested by some First Aiders. That is pure bunkum foisted onto the public by those who know nothing about what it takes to kill germs.

If you have available a flat iron, say, in the home, the quickest way to get a safe dressing is to wet a cloth in tap water, then iron it as you would a handkerchief. Again, the color makes no difference.

For handling small puncture wounds, simply force the wound to bleed by a milking pressure toward the wound. This will force the blood from the wound, and even if there is only one drop of blood it is worth more than anything you put on the outside, for the blood is the only thing on the inside pushing out. Put no dressing or antiseptic on a puncture wound, for there is no hole there, since the injured part has closed down, or has filled with blood and injured cells.

Large materials thrust into the body—head, chest, abdomen, legs, arms and feet—should be left in place for the physician to remove, for the knife, large splinter, spike, or other material acts as a plug to prevent bleeding.

In like manner, a real First Aider, should be able to handle any emergency with improvised equipment.

Before closing, I shall present a new first aid approach to handling fractures of the leg, especially the thigh.

In 1925 Surgeon General Ireland, of the United States Army, told me that during the World War our soldiers were dying at the rate of about 75 per cent, among those with fractures of the leg.

Reason: bleeding and shock from increased pain as simple fractures were compounded when the victims were jounced and bounced in ambulances as they hurried to front line stations and more remote hospitals! Then General Ireland secured the best fracture surgeon he could find in the country, put him in charge of training one

thousand picked laymen in the application of just one splint: the Thomas splint developed by a British surgeon at the time of the Franco-Prussian War.

Result: When these trained laymen began to do their stuff among the wounded American troops, mortality from fractured legs was reduced from 75 per cent to 17 per cent—a record to be proud of in any phase of treatment.

When I related this to a British World War medical officer, he gave me the figure for the British Army, as follows: before the use of the Thomas splint, mortality for leg fractures was 82 per cent, but after the trained laymen got busy this was reduced to 12 per cent.

Now, the American College of Surgeons has developed a splendidly coordinated Fracture Committee with a National Director and local committees in all the important cities. Their chief function is to teach the general practitioner the most modern methods of handling fractures, and to devise methods for giving the best immediate treatment to people with fractures.

Already every ambulance in New York City is equipped with Thomas splints, and interns and ambulance attendants are trained in their application at the scene of the accident, instead of waiting until the victim reaches the hospital.

Object: There are two things essential in the immediate treatment of a fracture: fixation or immobilization, and extension or traction. Traction is the most important treatment a First Aider can give within the first thirty minutes, for traction relieves pressure of fractured bones on soft tissues and thereby reduces pain.

A well-known surgeon in New York has repeatedly told us that the treatment of a fracture within the first thirty minutes, constitutes the most important phase of the total treatment.

Learn what to do in an emergency! Learn how to use formal first aid equipment! Then use your imagination in the use of anything at hand in the treatment of all types of injuries. **THIS IS REAL FIRST AID.**

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Why People Fall

FRIDAY MORNING SESSION

October 5, 1934

The session devoted to a discussion of reasons Why People Fall was called to order by C. T. Wilson, of the National Safety Council Staff, who introduced Mr. E. T. Durice, Educational Director, Hamlin & Co., New York City, who presided. After cordially welcoming the delegates the first speaker presented his paper.

Why Do People Fall? Do They Slip, Trip or Stumble?

By JAMES L. GERNON

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

The speaker said in part: It is not generally known that falls of persons in industry in New York State cause more deaths and permanent total injuries, cost more money, and are more numerous than injuries caused by all mechanical apparatus, including elevators, hoists, and conveyors, used in all the industries of the state. No doubt this is also true of other industrial states.

The more carefully we study the subject of falls, the more we become conscious of how limited is our knowledge as to the basic causes of these injuries, and how meager is the preventive information we are imparting to the public and those engaged in industry regarding the hazards of this type of injury. Slipping and tripping are in a large measure the basic or contributing cause of most falls, and there are many instances of tripping and slipping which do not result in falls, but cause painful and costly injuries.

Let me give you some figures on the number and cost of compensated accidents by chief causes in New York State during 1933.

1. *Handling Objects and Tools:* Total number of cases 27,320; total compensation \$5,392,165; total weeks of lost time 381,742; average compensation per case \$197.
2. *Falls of Workers:* Total number of cases 16,227; total compensation \$7,120,882; total weeks of lost time 563,737; average compensation per case \$439.
3. *Mechanical Apparatus:* Total number of cases 9,031; total compensation \$3,422,979; total weeks of lost time 284,020; average compensation per case \$379.
4. *Vehicles:* Total number of cases 7,043; total compensation \$3,959,967; total weeks of lost time 397,433; average compensation per case \$562.
5. *Falling Objects:* Total number of cases 3,564; total compensation \$1,554,323; total weeks of lost time 133,878; average compensation per case \$436.
6. *Dangerous and Harmful Substances:* Total number of cases 4,113; total

compensation paid \$1,424,796; total weeks of lost time 141,129; average compensation per case \$346.

7. *Stepping On and Striking Objects:* Total number of cases 3,716; total compensation \$588,259; total weeks of lost time 46,487; average compensation per case \$158.

8. *Other and indefinite causes:* Total number of cases 3,473; total compensation \$1,210,837; total weeks of lost time 110,333; average compensation per case \$349.

The totals were as follows: Total number of cases 74,487; total compensation \$34,674,209; total weeks of lost time 2,058,759; average compensation per case \$331.

There is considerable significance in these figures when carefully analyzed. They indicate that the group of injuries due to "Handling Objects and Tools" is the greatest in number of cases and second in total cost of compensation. The group "Falls of Workers" is second in number of cases but first in total cost of compensation. The group "Mechanical Apparatus", including elevators, hoists, and conveyors, is third in number of cases but fourth in the cost of compensation. "Mechanical Apparatus" was responsible for 12 per cent of the total number of cases and 13 per cent of the total cost of compensation. "Falls of Workers" were responsible for over 21 per cent of the number of cases and over 28 per cent of the total cost of compensation paid.

The human body when functioning properly is a complete demonstration of balanced mechanism, more marvelous and more delicately stabilized and coordinated than the finest watch or machine. This is especially true of the human foot as a part of this wonderful body. The watch or machine performs merely the same movement again and again, while the human body, and particularly the foot, must perform thousands of varied actions or movements, each requiring an instantaneous adjustment of the entire mechanism, and must do all of this under tremendous stress.

The human body is out of all proportion architecturally to the narrow base formed by the feet. Equipoise depends on the perfect coordination of the nerves and muscles, and the correct control of the lever-like bones, fulcrums, and shifting surfaces of the feet. Unbalanced feet mean unbalanced posture, and unbalanced posture means muscular strain from crown to heel and toe when the body equilibrium is disturbed. An erect carriage can be maintained only by the constant compensatory effort of the spinal muscles. Soon these muscles become toxic with fatigue when subjected to improper stress and strain.

Dr. John Martin Hiss, a leading authority of the country, claims that "three persons out of five in the United States suffer from some form of foot trouble. Thirty per cent of these wince from broken arches and bunions. We are in truth a nation of cripples." You will no doubt recall that in 1918 over 30 per cent of those in the army draft had defective feet, and apparently men have not improved since that time. Let us not forget also that this does not include the female portion of our population.

No organ of the body receives so much abuse or so little intelligent consideration as the foot. Ninety per cent of foot trouble is due to the use of shoes made without reference to the foot or its normal stresses in movement. The wrong type of shoe acts as an instrument of torture, more or less severely dislocating the bones of the feet, thus giving rise to maladies known as broken arches and bunions. The human foot falls into about five classes and fourteen types. Many shoe salesmen are responsible for much torture by selling shoes that are too small, as well as the wrong class or type. In a recent survey conducted by one shoe manufacturing company of 18,000 civilians, it was found that 52½ per cent of the men and 57½ per cent of the women had shoes that were fitted short; in 60 per cent of the cases the left foot was longer than the right, and in 40 per cent the reverse was true.

The natural functioning of the foot is most interesting. Its inner portion should be called the "spring arch." In walking we continually transfer the weight of the body forward from one foot to the other, and the function of the "spring arch", equipped as it is with a strong, thick cushion of muscles, is to soften the jarring impact of the weight as it descends upon each foot in turn. The outer "weight-bearing arch" on the other hand is more rigid and sustains the greater part of the load.

In the normal distribution of weight upon the feet, in walking with the feet about six inches apart and pointed straight, a person should walk with a free and easy step, relaxing the foot as the heel touches the surface. The weight of the body is then distributed involuntarily from the heel to the outer side of the foot, and thence across to the ball of the great toe. The step should be completed by the use of all the toes, the great toe pointing straight forward, then back to the heel. As this is performed the body involuntarily synchronizes in perfect balance. The feet of 99 per cent of the people of the United States cannot perform completely these adjustments.

If you want to test how good you are on your feet, take off your shoes and try to stand on one foot without other support. At once the inner side of your foot comes into rapid play with the slight, constantly fluctuating adjustments it finds necessary for the preservation of the bodily balance. Now observe that the outer side of your foot remains comparatively immobile, and that your whole weight tends to focus upon it.

Again try to stand on one foot, this time as long as you can. Presently you will feel the muscles of the foot tiring, and soon the muscles of the leg also will tire. No study of anatomy can give you such quick grasp of the fact that practically all the leg muscles (from the knee down) are involved in the control of the feet and are knit to them by tendons passing through the ankles.

By these two simple experiments you will not only learn much of importance about the structure of your feet, but you will also be able to test their condition. The normal unspoiled foot will balance the body perfectly with graceful, easy movements and only a slight swaying of the body. The weak or crippled or deformed foot will make violent and jerky efforts to balance the body and will fail. Broken or weak arches, for instance, will force one to grasp for support and bring the other foot to the ground, or maybe fall in a heap.

It is evident that because of the inability to use the foot and leg muscles as nature intended, a large percentage of people are subject to the hazards of slipping, tripping and falling while traveling on stairs and level surfaces, and injuries of this class are greatly increased.

There are divers reasons for slipping and falling in addition to defective construction, insufficient maintenance or poor housekeeping. Many industrial establishments and public places maintain excellent conditions, but in most of them the management fail to recognize that their failure to provide proper walk surfaces or to maintain them in proper condition is the cause, or are at least a contributory cause, of many injuries.

There are two classes of modern floor surfaces—rigid and resilient. In both classes there are some types where persons are susceptible to slipping. Many falls are caused by floor surfaces with too much frictional resistance when used on or in proximity to stairways or platforms.

It is needless for me to dwell long upon unclean or poor housekeeping, improper storage or incomplete maintenance, slippery and wet floor surfaces, and unsuitable stair construction in industry, homes and public places, except to say that imperfect and unsafe conditions exist in all three groups of places.

Imperfect eyesight is a contributing factor in a large measure of injuries due to falls. Leading oculists of this country claim that only 10 per cent of our people have normal eyesight. A noted physician has stated that 60 per cent of eyes are so defective as to cause ill health and reduce efficiency. If these estimates of the infirmities of our people are correct, then we must admit that those employed in our industries are working under a severe handicap.

An important factor is not only improper shoes worn by far too many of our people, but the poor maintenance of foot-wear, such as run-down heels and worn soles of shoes, and this bad practice is very prevalent in industrial establishments.

Employers' reports of injuries occurring in industries in New York State indicate in too many instances that the persons fell apparently without cause. It is important, however, to keep in mind that there are a greater number of falls on level surfaces than from elevations, which includes stairs, and that a large percentage of falls on level surfaces happen on floor and walk surfaces that are apparently in safe condition. Of the 16,227 New York State closed compensation cases for injuries due to falls in 1933, 53 per cent were for injuries occurring on level surfaces.

What the Worker Can Do to Prevent Falls

By HARRY GUILBERT

The Pullman Company, Chicago, Illinois

The speaker said in part: Falls have always been, and still are, a most prolific cause of accident. Every human being has probably suffered a fall at some period, and in reviewing the situation, I thought it would be a good idea to obtain the viewpoint of Pullman men and women. We asked for experiences and suggestions, placing the request in the form of a contest and offering a series of rewards for the best replies. The letters we received abound in human interest.

One letter in particular impressed me. The writer said that while crossing the tracks he jumped from the car steps, landing on a steam box which broke under the impact. All the bones in his left instep were broken. A rusty spike penetrated the other foot. This poor chap underwent 25 operations and visited the doctor 540 times. Both limbs had to be amputated. Today he wears artificial legs, just because, as he frankly says, "I didn't take the time to go around the right way."

The replies as a whole reveal an intelligent grasp of the subject and a keen insight into human nature. For example, the underlying reason for falls while getting on and off trains. Most people place the blame on the train, car steps or step boxes; but our porters in their answers point out the real cause—excitement. The thrill of meeting old friends or loved ones; the joy of watching for smiling faces when we should be watching our step. Mother returning from her vacation sees Dad on the platform and she cannot wait to find out if he left the dirty dishes in the sink, or if he put the cat out every night as per schedule. Lovelorn Willie gets a glimpse of his sweetie who looks prettier than ever and for a moment he forgets about commonplace things such as steps and step boxes and the need for descending carefully.

Porters plead a strong case against the danger of high-heeled shoes, and here is something else of interest. Many communications point out the common practice indulged in by some passengers of carrying too many personal parcels, such as brief cases, typewriters, hat boxes, fur coats, and other objects which the porters are only too willing to carry. Ladies appear to be the greatest offenders; not in order to avoid a tin, as one porter points out, but rather the fear of trusting anyone else with their personal property. When one is loaded down with miscellaneous parcels to such an extent that one cannot see clearly where one is going, then the fine art of pedestrianism becomes a rather dangerous procedure, especially around moving trains.

Don't get the idea that any of our people are trying to dodge responsibility. Careless habits and poor housekeeping come in for some very strong criticism; also failure to inspect thoroughly and at regular intervals. Safety men are, and should be, fully aware of the importance of these matters, but sometimes we are not so sure that our workers fully appreciate them.

One of the encouraging results of our questionnaire is reflected in the application of safety principles to the home, which indicates that our men are not hanging up their sense of caution along with their overalls. Many of the replies reveal a full appreciation of home hazards and prove conclusively that the writers have given thoughtful consideration to this important phase of accident prevention.

Old stuff, you say; yet to me it is inspiring to learn that the seed of our educational efforts has borne fruit in the home as well as in the shops, yards, offices, laundries, etc. Scores of hazards were dragged out of their lurking places from every room in the house, the yard and the garage. One indignant gent who had just skidded on a piece of soap immediately sat down and sent in his complaint, writing the letter with one hand while caressing the afflicted portion of his anatomy with the other.

Another chap wrote describing a contest sponsored by the Delaware Safety Council, from which it appears that the majority of home accidents occur on Saturday afternoon to male members of the household, and that most of the injuries are caused by falls in the kitchen. This indicates that the lady of the house leaves some work for the bread-winner to perform on his day off and in his haste to complete it

—wishing to attend the ball game—he fails to apply safe practices as he does in the shop. "Such accidents," he concludes, "could have been prevented by the use of a little more time and care."

Incidentally, the "hurry-up" theme is predominant in a great many letters. In the opinion of one author, we move too quickly; we do not think fast enough. In other words, he intimates that while the tempo of our work has been speeded up to conform with the demands of a modern age, we still think along Victorian lines. There may be some logic in his statement.

Some writers go into considerable detail in describing the reason we have so many falls on stairways. They point out the danger of poor railings, lack of them, obstacles on steps, neglected steps, etc. Some correspondents remind us that basement stairways are often too steep and have dangerous turns. They point out the risk of poor lighting facilities and emphasize the hazard in connection with piling "junk" on stairways.

There is considerable food for thought in one letter calling attention to the fact that in those homes where front stairways are kept neat and tidy at all times, the stairs leading to attics and basements are often neglected. This is a slovenly habit, and if it were not for an element of pride, the front stairs would be just as untidy and dangerous as the others. Our neighbors seldom see the basement or attic stairways, and therefore the lazy housewife or husband fails to pay much attention to them.

Our contest was an experiment and the reaction opens up a fertile field for future endeavors. Regardless of results, we do know for a fact that for a time the subject of conversation among thousands of Pullman men—and railroad men generally—because of this contest, was falls; and the effort involved was more than justified. The solution of the whole problem is more intensive supervision. For instance, snow and ice on steps, platforms, walkways, etc., are a prolific source of falls. Certainly they are entirely unnecessary and could be prevented by the use of salt, cinders, or sand; but a great many employers only consider the expense—a later remedy.

What Can Management Do to Lessen Casualties from Slippery Floors

By H. WEAVER MOWERY

The Safe Tread Company, New York City

The speaker said in part: Every five years more of our people die from falls than were killed in all our wars since the Revolution, including the World War. A single state pays over \$8,000,000 per year for compensation, hospital and medical expenses for workmen injured through falls.

A prominent doctor has gained considerable notoriety with the idea that to prevent a person from falling while walking, his flat or broken arches must be cured, or the angle at which he places his feet with relation to the center line of the direction in which he is going must be studied and corrected. The use of a particular type of shoe and the establishment of a school for teaching walking were actually suggested.

Such ideas may have their day; but management wants the truth, it wants sincere cooperation, a sound diagnosis and a sure remedy. If we as "safety doctors" can agree upon a diagnosis and prescribe a tried and proven cure, management will do its part faithfully and effectively.

It is true that improper foot gear, splayed feet, poor sight and numerous factors are contributing causes of falls, but do not be misled into accepting the thought that such physical infirmities or defects are the promoting, or exciting cause of a fall. Persons with such defects compensate for them by greater care. People can walk safely on ice. But when one is walking normally, and unknowingly steps on a banana peel or other slippery spot, the result is obvious. In such cases the infirmity may prevent recovery of balance and so it is only a contributing cause. Even with the infirmity, the accident would not occur without the hazard. That is

why the hazard of unsafe walkway surfaces must be eliminated if falls from this source are to be prevented.

How, then, shall safety in walkway surfaces be defined? What is safe or unsafe, as applied to them?

That is the fundamental question on which opinions differ as much as there are types of materials to sell and maintain. There is just one answer and that is experience. Until adequate data from disinterested sources is developed, no universally acceptable answer can be formulated. The U. S. Bureau of Standards has devised a machine simulating the action of a person slipping, with which to measure the frictional resistance of walkway surface materials. Another machine was developed under the same auspices to reproduce in new materials by laboratory methods the frictional resistance of such materials under normal service conditions. And with these machines over 150 different types of materials have been prepared and their frictional resistance measured and recorded.

Even with that data, who can say what is the point of frictional resistance that under certain conditions of service is safe or unsafe? The marble dealer, the tile setter, the steel manufacturer and everyone with something to sell claims his product is safe, and his claim cannot be effectively proved or disproved because safety engineers, insurance companies and others involved have not developed intelligently their records to show the causes of falls with relation to the type of material on which slipping occurred. Such data must be developed extensively before a definite and just decision can be reached. No more valuable contribution can be made to safety than by such effort.

Management is waiting for counsel, but it wants that counsel backed by knowledge based on facts, not presumptions. It wants to know, not what someone considers safe frictional resistance for its factory floors, office corridors, shower baths, etc., not what someone thinks is the danger point, but what is unsafe and safe in the light of wide experience and authenticated facts. Sometimes management has taken the trouble to develop this data for itself with astonishingly satisfactory results, but it is our duty to develop it for universal use.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



All Ohio Day

GENERAL SESSION

October 2, 1934

The General Session of the All Ohio Day program was called to order by Chairman Thomas P. Kearns, Superintendent, Division of Safety and Hygiene, Industrial Commission of Ohio, who presided. After welcoming the large audience in characteristic manner, and outlining the purposes of this meeting in cooperation with and as a part of the Annual Safety Congress of the National Safety Council, Chairman Kearns introduced the first speaker.

Management's Opportunities and Responsibilities for Winning Employee Cooperation in Accident Prevention Work

By CHARLES R. HOOK

President, The American Rolling Mill Co., Middletown, Ohio

The speaker said in part: While a foreman in a sheet mill plant, back in the early 1900's, I became convinced that the best way to prevent accidents and reduce costs was to win the cooperation of the men. I learned through experience that once you had convinced the men of your sincerity, the hardest part of your task was done. You could put your problems up to them—make them a part of management—and usually they would find the solution. During the intervening years I have never had any cause to change those convictions.

Confidence is the basis of cooperation. You can't have effective cooperation without it. The men must be convinced that the management is fair, honest and sincere, and acting always in the interest of the greatest good. The management must be convinced that the men are willing to respond and will put forth their best efforts once their confidence is won.

How are we going to create understanding and win cooperation? By stripping away the mystery which envelopes most businesses, by being frank, by permitting men to see, and explaining to them what makes the wheels go round. The management of the American Rolling Mill Company believes it is their responsibility to cut away the wrappings of their business, to be frank, to make facts about the business available to all interested parties. We believe that certain ideals and principles must be established. We believe the general management must indicate what it wishes to be done; it must act in a legislative capacity, for the administrative powers must of necessity be vested in the supervisory organization. At Amco we have a published platform which was written by our Chairman of the Board, Mr. George M. Verity, and officially adopted by our Board of Directors. Everyone in an execu-

live capacity, including our president, is expected to make his decisions and his actions harmonious with the principles incorporated in this pamphlet, which is known as Armeo Policies.

Armeo policies are distributed not only to the supervisory organization, but to the workman. In this way they serve as a pledge to the public and there is a standing guarantee that any employee who does not feel that he has been treated in accordance with Armeo policies may carry his case through each ranking supervisor successively, if necessary, to the president of the Company. You can well imagine the valuable intangible benefits Armeo policies bring to us in winning employee cooperation in all their work.

Armeo once acquired a plant which had been operated under different policies for a good many years. Several weeks after we took this plant over, I asked to see the accident report. It actually made me shudder. The matter was important enough to cause me to make an immediate visit to that plant. I talked with the Works Manager, and explained that we believed that a good safety record and a good cost and production record went hand in hand. I told him that it was good business to get those accidents down.

He replied: "Mr. Hook, I agree with what you say, but the old company operated under different policies. You can't change the thinking of even the superintendents over-night. If I call them in here one at a time, will you talk to them privately?"

I agreed, and I well remember the attitude of one superintendent. He was the head of an important new department, a brilliant fellow, but erratic and headstrong, and his accident record was especially bad. I could see my talk to him was making little impression, so finally I said: "John, the directors of this company represent the owners and the stockholders. They are all outstanding business men of long experience. You and I both work for them. They want you to make accident prevention a part of your job as much as production. Whether we agree with them or not, they want this plant operated under certain policies which experience has shown them to be profitable, and they've even published these policies in pamphlet form. Here is a copy. I want you to read it and if there is a single policy contained in this book that you cannot conscientiously support, just let me know."

I'd like to say that this superintendent changed his viewpoint over-night, but human nature doesn't operate that way. But it does give me a great deal of pleasure to say that he sincerely tried and today he is one of the most outstanding superintendents we have.

A number of years ago we noticed that the departments which had the best accident records also had the best cost records, and this led us to believe that there was a definite relationship between accidents and cost. Carrying on this line of reasoning, we observed that the departments with the best cost and safety records were those in which the men had been most thoroughly trained. Therefore it seemed logical to the general management that it was our responsibility to maintain training facilities adequate to the needs of each of our manufacturing units and to organize our training activities in such a way that they would be concerned mainly with the problems of operation rather than academic theory.

As we see it at Armeo, the general problem of winning employee cooperation in accident prevention work must be broken up into three separate and distinct sections. 1. Training the supervisory group. 2. Job training the worker. 3. The exchange of information from management to men and from men to management.

As the supervisory group is not particularly susceptible to accident, it must be approached from another angle. The approach that has seemed most logical to our personnel division is that of management. Their line of reasoning is simply this. The company may provide splendid equipment and fine raw materials with which to work, but the conversion of the products of the business into a finished article of high quality and at a reasonable cost is in the hands of the supervisors. A business grows as men grow, and no company can grow unless it has well-trained, interested supervisors. The foreman has responsibilities greatly similar to the works manager, but differing widely in degree and scope. All too frequently he does not live up to these responsibilities merely because he didn't realize they were attached to his job. The first task, then, is to cultivate in him a managerial viewpoint; next provide

him with the necessary information and training to enable him to manage, and finally to assist him in organizing his work so that he can manage.

The supervisory training program is created by the general staff personnel department and sent to the works managers. This permits all plants to conduct a program which is synchronized at all times. The general subject of each year's program is established at a conference of works managers and the personnel staff. Different subjects are selected each year. For instance, the program has been based on the general themes of Conservation, Prime Output per hour, Prime Yield, and so on, but each year's work has been prepared from the angle of management. Costs have always played a predominant part, and the wastes and costs of accidents have come in for their full share of discussion and study. The relation of sickness to accidents and the cost of illness has also had preferred attention.

A few years ago we developed an incentive plan for supervisors based on departmental performance. To bring home the cost aspect of accidents, we penalized every department for its injuries. In operations we set certain reasonable standards for rejections, output, and so on; but in the case of accidents the standard was set at zero. Every accident reduced the supervisor's bonus, and that had a most favorable influence upon accident prevention.

During the years I have spent out in the mill, I have always found that safety is easy to sell to the men. And it should be, because no one really wants to get hurt. But equipping men with the necessary skill and knowledge to avoid injury was a matter far more difficult. Here again Armeo turned to experience for guidance, and observed that the best workmen not only turned out the greatest output of quality product, but they suffered the smallest number of injuries. One of our safety advisors went so far as to assert that if every man in the mill did his job perfectly at all times, we would entirely eliminate accidents. So our safety training department decided to job train every man in every plant. A typical operation was selected as a proving ground. We were then experiencing a number of major accidents in our roller leveling departments. Job training simply erased those accidents and for several years we did not have a single major accident among the roller leveling crews in any of the plants. Encouraged by this success, the job training program was pushed on all fronts. We found that a willingness to cooperate existed almost universally, but knowing how to cooperate was the missing link—a link which was management's responsibility to supply.

Job training is the most elementary form of training. It is simply a demonstration of how the job should be performed according to the best accepted practice, and is aimed at improving technique. In our industry we have operating, or production, foremen and maintenance foremen. Both take part in these classes, which if possible are held in the mill beside the equipment the men operate. The production foreman explains how the equipment should be operated, the quality, product defects, and so on. The maintenance foreman goes into the mechanical details. The safety and training adviser then goes into the hazards of the job and explains how they can be avoided. The men are not only shown how each operation or motion is performed, but they are told why. Job training has proved invaluable in winning employee cooperation. Where we have a job on which we are having difficulty, whether it is production, quality, or accidents, we take immediate steps to correct the difficulty by training the group responsible.

The Personal Equation

By BERNARD M. ROBINSON

General Counsel, Firestone Tire & Rubber Co., Akron, O.

The speaker said in part: I am told that the word "safety" is derived from the Latin word "salvum," which means "whole." It is easy, therefore, to see why the English speaking race selected the word "safety" for the problem of safety is the problem of keeping one's self whole.

It occurs to me, however, as I look over this great audience and see competitors in steel sitting down together, competitors in rubber assembled here side by side,

employer and employee here in common concourse, that the word "salvum" has another significance. It means that in this Safety Congress and in this safety work, all warring factions bury their bitterness, bury their differing opinions and contentions, and are united for the consideration of a common problem—the conservation of human life.

It was the habit of the philosophers of old to occasionally withdraw from their every-day activities, and enter upon a period of retreat and reflection, sometimes taking to the solitude of the mountain top, there to better appraise things accomplished and assess objectives to be attained. Theirs was an individualistic age. Ours is essentially a social one. Solitude is scarcely possible to us. Perhaps it is not desirable. However, we too feel necessity for stepping aside for a while to survey what has been done and to plan more deliberately what is to be done in the safety world.

So this National Safety Congress of those interested in the economics and the humanities of safety work is again here convened. You have withdrawn from your routine to meet here and ascertain each other's experience and take back a different, a broader, and perhaps a new conception of progress in accident prevention.

To be reminded that the very simple act of flying a kite had a most important and revolutionary bearing upon the discovery of electricity, to be reminded that the accidental dropping of a bit of raw rubber, mixed with sulphur, upon the hot lid of a stove led to the discovery of vulcanization, to be reminded that a host of other great inventions of untold value were conceived from some very simple manifestation lying right at hand—all this is to be assured that your reflections here will discover better means to protect life and property and novel methods of inculcating safety consciousness in the public mind.

We must not accept safety as a finished subject, a closed book, or as a common-place which admits of development neither in fundamental principles nor in application. We live in an age of extraordinary economic and industrial development. When the history of this age is written, it will not only be recorded as an age of invention and of industrial and commercial achievement, but it will be known as an age when men achieved a new concept of social and public welfare and when the unselfish efforts of mankind were bent to the protection of the worker from accidents and from injury in the wonderful mazes of this industrial life. Mankind has conceived a new duty and a new responsibility toward his fellow man. Today it is the industrialist who is leading the way, but society as a whole is injury-conscious, and resents the destroyed or diminished happiness, health and earning power of its citizens due to injury.

No longer is there any difference of opinion on the part of the employer or labor on this vital subject. It is but a truthful statement to say that no incident of business today causes a greater concern to that business than the happening of injuries to its workmen. Losses of other sorts may be absorbed. Industry today regards the injury of its workmen as an irretrievable loss, from the ill effects of which it does not recover, irrespective of the question as to where lies the fault.

No accident occurs in our organization without an immediate and a searching inquiry being made to determine the responsibility and the cause, and to provide against recurrence by the exercise of every reasonable means within our power.

In this, as in other respects, business has undergone a revolution in its purposes in recent years. Business has come to appreciate, as Dr. Nicholas Murray Butler has said, "that no system of insurance that the wit of man can devise can equal the protection afforded to industrial organizations by public opinion when it becomes convinced that industry is seeking to gain through service, and not without service or concern for any other man. We have brought about a situation in which it is within the power of organized society to quickly punish any industrial undertaking of which it does not approve. Society in a hundred ways can ruin a business undertaking with which it has no sympathy or which has aroused its antagonism."

It lies in your hands to promote this modern concept of business and its proper relationship to the public. Industry proposes to profit by gaining good will for itself, its products and its policies by serving. Serving is akin to saving. This serving means not only serving the public with the best product that it can make at the lowest price, but it means meriting the good will and cooperation of the employee public by saving that employee public from industrial injury and disease.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



FERA Safety Conference

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the FERA Safety Conference was called to order by Mr. Thomas Hibben, Chief Engineer, Federal Emergency Relief Administration, Washington, D. C., who presided. It was the original intention to hold this conference during one day, but such was the interest of the many State Directors of Safety who attended, and so diverse were the subjects they wished to discuss, that the conference extended intermittently until the afternoon of October 4.

Chairman Hibben, at the opening session, called attention to the fact that in ordinary industrial activity the objective is the first consideration and the employees second. With the Relief Administration the process is exactly reversed: we start with a certain number of workers and create projects according to their abilities. He stated that our people should be given the opportunity not only to earn their living, but to earn it in the lines of their own skills. He said: "We want to have our programs efficiently run, so that the workers not only benefit by the work but also derive pleasure from accomplishment. The Federal Emergency Relief Administration wants the work to be conducted on the best principles of safety. All we ask is that the program go on as well as it did under CWA."

Mr. D. F. McMurchy, State Director of Safety for Ohio, spoke on the subject "Accident Reporting Systems." He stressed the importance of insisting upon prompt weekly reports from every county, with the correct number of man-hours worked.

Mr. Joseph E. Watson, Montana State Director of Safety, spoke on "Safety Coverage in Public Works Projects." Mr. Watson stressed the importance of mental as well as physical rehabilitation of relief clients in setting them at work as a vital factor in accident prevention. He spoke of the need for engineering, education and enforcement. He called attention to a fact which is not ordinarily realized, that the social worker and her staff have an opportunity to educate whole families in safety during their home visits. Mr. Watson gave graphic illustrations of the type of problem which must be dealt with on ERA projects, and the emergencies peculiar to the drought areas, such as moving herds of cattle, slaughtering cattle, coping with grasshopper and cricket plagues, dust hazards, etc. He urged a competent placement department which would see that only those fit to labor on the various types of projects be placed at work. He stressed the value to the safety education program of publicizing accident prevention incidents and first-aid service, and closed his talk by urging that while the obstacles to success seemed insurmountable they could be overcome now as in the past.

Mr. W. Alva Fry, State Director of Safety for Oklahoma, spoke on "Safety Coverage in Workrooms." He called attention to the opportunity of the safety man on relief projects to raise the morale of people discouraged by adversity. He mentioned the part of proper arrangement of machines and proper lighting and ventilation in prevention of workroom accidents. Particular problems include removal of

finished mattresses to prevent piling them; providing cork blocks for storing needles when not in use; helping relief workers become accustomed to using modern tools in the right way; providing U-shaped asbestos guards to prevent underwear burns when reaching into kettles on canning projects; providing sheaths and guards for knives. Mr. Fry urged proper selling of county administrators on the value of the safety program and closed with the statement that if as much attention is given to workroom projects as has been centered on out-door projects, the frequency rates of workroom accidents would be reduced considerably.

Mr. C. G. Wheeland, State Director of Safety, California, spoke on "Safety Coverage in Maintenance and Demolition Projects." He read a series of reports on a single demolition project to indicate the importance of superior supervision on the project, and frequent inspections and re-inspections by the safety man as the work progresses.

The Luncheon Meeting

The Chairman at the luncheon meeting was Mr. Sidney J. Williams, Director of Public Safety, National Safety Council, Federal Director of Safety under the Civil Works Administration. He spoke warmly of his pride in the achievements of the State Directors of Safety. He pointed out that the death rate on CWA projects, in terms of man-hours, was 39% below what it was before January 1, and that the mortality record was less than half that reported by the construction industry. He said, "I hope that we have sold safety to the construction industry. We have at least proved that safety is practical and not just a theory."

Miss Eleanor Little, Relief Administrator for the State of Connecticut, spoke on "What a Safety Program Means to the Relief Administration." She said in part, "One of the most important things in dealing with these people who are on relief—who by the selection process are the least able to maintain themselves—is that we return them to normal employment as well able to keep the jobs as possible. And that means that they do not have accidents. * * * It is evidence of good management not to have accidents. * * * We can have high standards if we will. If we are going to rehabilitate the men working for us, we must have them doing good work. Good work is possible only with good supervision and from our standpoint, good supervision means good foremanship, and a person is not a good foreman unless he is thinking of good work and safe work."

Mr. William M. Aicher of the Federal Emergency Relief Administration, Washington, D. C., spoke on "Compensation and Medical Treatment." An abstract of his talk follows:

The first question that must be considered is whether those engaged on Work Relief projects are employees within the meaning of a state compensation law. If they are held to be employees it is essential to define the employer and to arrange for coverage on the most economical basis.

In several states legal or administrative decisions have been rendered in the negative. In other states, statutes are extant which restrict the state, or in some instances political subdivisions, from providing compensation for public employees.

Existing Compensation Acts would fail in general to meet the situation for our workers, since they are based on the theory of a percentage of wages. The earnings of relief workers are restricted to meet budgetary need and the inference is readily apparent. Besides, many instances are on record of a relief worker's receiving direct relief and work relief simultaneously. There is also the possibility that in applying certain existing state Acts the flat minimum or fixed monthly compensation would result in the payment of greater amounts to a worker while on disability than he had received while on work relief.

The most practical and equitable method of meeting this problem is to adjust the benefits to a worker and/or his dependents according to the established need in the case. Medical and hospital treatment, prosthetic appliances and any other expenses incidental to the injury should be provided.

The medical and hospital program should be well established in order to provide prompt and adequate care to an injured worker. Such programs should be worked out in consultation with state and local medical and hospital societies so that proper professional standards may be maintained and that the administration may continue

to receive the cooperation of the constituent professional membership of states and localities. It must be borne in mind that these workers have no resources of their own and that all treatment must necessarily be at the expense of the state or local city. For this reason treatment rendered must be efficient and adequate while the cost must necessarily be restricted to minimum charges.

We have been encouraging states to set aside reserves to meet the obligation incurred through permanent disabilities and fatalities. Payments in these cases should continue during the period of disability or financial dependency of the disabled worker and/or actual dependents. A number of states have already made provision for this responsibility either through legislative action or by executive order.

The general trend of plans submitted by states indicates radical modifications of existing state compensation acts. Such plans, while they may relieve the situation temporarily, fail in their attempt to meet the responsibility and may serve to weaken or impair existing compensation acts. It is not the desire of the administration that activities conducted during the emergency react unfavorably on compensation legislation. While we are not in a position to dictate how state or local funds should be disbursed, we are anxious that any plan sponsored by State Emergency Relief Administrations should meet the situation adequately and on an equitable basis.

Mr. Robert P. Duncan, Director of Safety for the State of Washington, spoke on "Shoring, Scaffolding, Handling Materials." He stressed the importance of having safety equipment and safe materials provided for in the original plans of the project. Without this arrangement, he stated, scaffolds will be weak and inadequate, if provided at all, and illustrated his points by describing accidents which occurred because of this lack in the original plans. He cited experiences which showed that what seemed economy proved expense when accidents occurred because of poor material in safeguards.

Col. William M. Myers, who served as State Director of Safety for Virginia under the Civil Works Administration, spoke on "Physical Appraisal Projects." He recounted the history of Virginia's pioneer work in this field, the obstacles, such as objections of labor organizations, securing the consent of county medical societies to the established fees, and the achievements. Every CWA worker in Virginia was examined and classified. Class A workers were qualified to perform any type of work; Class B were able to perform ordinary labor; Class C were eligible to do light work; Class D were unfit for any type of labor. Only .67% of those examined were found to be in Class D.

Mr. John Campbell, State Director of Safety for Pennsylvania, (also Director, Bureau of Inspection, Pennsylvania Department of Labor), spoke on the subject of "Workroom Hazards." He stressed the fact that in Pennsylvania the unusually strict state laws must be complied with irrespective of what is considered safe by a safety engineer. He analyzed a building inspection as it must be made in his state. First, power equipment is checked (elevators, etc.); second, structure of the building (slow-burning or fire-resistive); third, the load to be placed (static, moving load machinery, etc.—light machinery on the top floors—free aisles—clearance for hand trucks—unobstructed floors—piling of material) with different laws to be complied with for one-story or two-story buildings; fourth, compliance with fire and panic laws (exits, whether "tower" or escape type depending on the number of floors and the number of people on each floor—fire-alarms—night occupancy—sprinkler systems for certain types of building—rubber mat under switchboard—double control on machinery—guards—rawhide faces in belts—gears guarded—hand tools properly dressed—needle guards on sewing machines—shuttle guards for textile projects); fifth, working conditions (250 cubic feet of air space to be supplied per worker—temperature—clothing of workers—dust conditions—exhaust system—housekeeping—rest room for women—hot water). Mr. Campbell stated that inspection certificates must be posted on boilers and elevators. He said careful inspection should be made of unfired pressure vessels in packing houses, open vats, railings, toe boards, stairways, emergency wheels. The need for goggles should be checked and the first-aid kit should be inspected. He stated that 36 eyes had been saved through use of goggles.

Mr. Robert L. Morrow, State Director of Safety for New York, spoke on "Safety Equipment and Special Hazards." He called attention to the need for

goggles, boots, gloves and other items of safety equipment. He described methods of preventing accidents during blasting activities. In every instance, he said, before the charge was set off, the men on the project are required to gather at a certain point, such as the tool house, well out of range, and are counted. The charge is not set off until every man is accounted for. Mr. Morrow said that repeated inspections are of great importance in keeping the projects safe.

Mr. William J. Ducey, Colorado, spoke on the same subject. He mentioned the geographic hazards peculiar to Colorado, dangerous heights of the mountains and heat and dust of the plains. He pointed out that men were physically deficient, unaccustomed to the type of work, ignorant of the technique of group labor. Respirators were provided for men working on rock crushing projects, and leather mittens or gloves were issued to men engaged in rip-rapping. The black widow spider was a menace in the mountains as were rattlesnakes in the plains. High altitudes caused constant trouble; improper scaling of loose rock, and landslides offered acute problems. He spoke of an archeological project in which walls erected shortly after the time of Christ threatened to give way on modern workers as the debris of centuries was removed. Special problems arose in connection with the projects in which wells were being sunk; through transferring workers to county boards, state highway departments, etc.; contact with poison ivy and with poison spread for grasshoppers; trench mouth resulting from use of the common drinking cup; and the rapid labor turn-over. Mr. Ducey expressed his belief that the good being accomplished will last "long after the ERA has been relegated to the history books."

Mr. Carl Campbell, State Director of Safety for Kansas, spoke on "Shoring." He stated that in Kansas shoring is required for every trench over five feet deep, and in some cases for even shallower trenches. Special instructions are given to foremen on the need for shoring, type of materials required and methods of applying, and their cooperation enlisted to see that instructions on shoring are carried out.

Mr. Thomas Cowperthwaite, State Director of Safety for Arizona, discussed "Explosives." Knowing that the foreman is the man on whom a safety director must depend to stop accidents, he held each foreman responsible for the accidents happening under him. A Weekly Accident Report was instituted, listing under each foreman's name the accidents that had occurred to his men, and this Report was sent to each foreman, with a critical discussion of accidents that could have been avoided. This Report did as much good as two or three men in the field.

Mr. Herbert J. Braumner, State Director of Safety for Missouri, spoke on "Transportation." He used by way of illustration a large photograph made of the removable bench section, designed by the CWA Safety Department in Connecticut for use in transporting men in trucks, and stated that the same procedure is used in Missouri. Dump trucks are forbidden for transporting men unless the tripping device has been prevented from accidental operation by bolting or chaining the body of truck to chassis. Mr. Braumner stated that proper hand rails are invariably provided for trucks used for transporting men, and that foremen are definitely in charge whenever trucks are being loaded or unloaded.

Mr. Neal H. Dow, State Director of Safety for Indiana, and Mr. E. G. Padgett, State Director of Safety for North Carolina, spoke briefly on "Keeping Safety Sold." Both stressed the importance of this problem but stated that the subject has been thoroughly covered through other talks and the numerous discussions.

During the sessions Mr. J. J. McEntee, executive assistant director of Emergency Conservation Work, was invited to speak on the "CCC" camps.

Miss Elizabeth Wickenden, assistant to the federal director of transient activities, was invited to speak and answered numerous questions on the subject of mandatory safety inspections of transient shelters.

The relative value of posters was discussed. Problems of heating mattress workrooms safely was repeatedly considered. Numerous group meetings were held following the formal sessions.

At the close of the meetings Mr. W. O. Wheary, Federal Director of Safety, thanked the State Directors for their loyalty and interest in the intensive discussions and urged renewed activity upon their return to headquarters.



Industrial Safety Lectures

Two of the outstanding features of the Twenty-third Safety Congress were the early morning safety lectures. This year these morning classes were presented in two series, each of two lectures: the first, on Tuesday and Wednesday mornings, by Mr. Homer J. Buckley, President, Buckley, Dement & Company, Chicago, who discussed "Selling the Safety Idea"; and the second, on Thursday and Friday mornings, by Doctor J. A. Melrose, Department of Philosophy and Psychology, James Millikin University, Decatur, Illinois, who outlined "The Psychology of the Safety Movement in Changing Times."

The speaker, each morning, was presented by Mr. W. H. Cameron, Managing Director, the National Safety Council, who presided, and the attentive and appreciative audience each morning entirely filled the large Rainbow Room of the Carter Hotel.

In the following pages, each series of lectures has been consolidated and condensed by the author into a single concise manuscript; and these are now presented for study and reference as a part of the Transactions of the Congress.

Selling The Safety Idea

By HOMER J. BUCKLEY†

President, Buckley, Dement & Company, Chicago

Salesmanship is very much needed today on the part of operating executives to sell the safety idea to employees and to the management itself. The safety idea has progressed under the most severe handicaps—and the most trying and discouraging of all these handicaps is the frequent indifference of management to fully understand and appreciate the significance of putting behind the safety program the same selling ability that they demand and expect in the marketing of their company products.

We, in the selling end of the business, know that this is an age of hard fought competitive battles.

The markets for which manufacturers are fighting were never as valuable as they are today. The money available to fight these competitive battles is almost unlimited.

†Editor's Note: Mr. Buckley is an outstanding authority on Direct Mail Advertising. He was the founder and twice president of the International Direct Mail Advertising Association. As a trustee of the Century of Progress, he headed up the Committee on Public Information in both 1933 and 1934. His name is on the staff of lecturers of practically all the universities in the midwest. For many years he was associated with one of Chicago's leading department stores. He now directs his own organization of 400 people devoted to writing, planning and producing Direct Mail Advertising.

As a result, there has never been as great a premium placed on genuine sales ability. Business is literally crying aloud for good salesmen. No other vocation can lift its followers more quickly to success and respect.

I have spent a lot of time reviewing the literature of safety programs, as inaugurated and promoted in many industrial plants. With few exceptions it has run to theory and inspirational material that would be very quickly discarded in any merchandising or marketing campaign of the sales or advertising department of the industrial company. Why should factory operating executives feel that they should employ such an altogether different psychology?

Apparently these individuals prefer to maintain the so-called "Employer and Employee" relationship—rather than deal with the human elements and with the fundamental principles of good selling and efficient workmanship.

I want to tell you of an experience—dating back a few years ago—which illustrates what I mean—

A young engineer of my acquaintance came to visit me one evening—seeking counsel and advice. This was his story:

"My firm has asked me to take charge of the Safety program which is about to be inaugurated in our plants. As I view it, it is not only an organization job—but more important—it is a *selling* job. I have never sold anything in my life. Tell me how to go about it. You know our company—its personnel and its products."

Fire appeared in the eye of this young engineer and his earnestness impressed me in the analysis he had made of what his new assignment really involved.

My reply to him was:

"Engineering principles cannot be employed in selling the safety idea any more than the yardstick of measurement can be established in the sales department of your company in making sales of your products to the various markets."

"Remember this, if engineering were operated on the same principles as salesmanship, you'd never cross a bridge or enter a building, you would be afraid it would collapse any minute."

"Salesmanship principles deal with ideas and human minds—and there is no magic button or engineering yardstick to be applied for either of these, and selling is the most important factor in today's competition. It represents the PLUS a business needs for unusual success."

The interview continued at some length, and I shall endeavor to give you now a series of questions and answers that passed between us—many of which may be questions some of you men in my audience have in your mind at the present time—and perhaps would like to bring out in discussion.

Question: Isn't safety like any other commodity? Isn't it an idea that can be sold to the public or the workers if the right appeal is used?

Answer: Safety is really a commodity but unfortunately it always seems to apply to the other fellow, until after the accident and then it is too late. Most safety material needs more of the "YOU" element in it—YOU benefit by doing so and so—YOUR eyes are safe when you wear goggles. "It is YOUR arm—be careful with it." I have noticed several safety bulletins which refer to the boss. Three or four which have come to my attention carry a main headline reading "Your boss orders." This is decidedly the wrong selling angle. It is the wrong psychology. An employee reacts unfavorably to boss orders. Safety material should show the employee how he can benefit.

Question: Industrial concerns spend vast amounts of money in advertising to keep the public sold on their products. How should the safety man go about keeping the employees sold on working safely?

Answer: Manufacturers spend money in advertising to keep the public sold on their products. All of their advertising deals with the theme "How you benefit through our products." The employee should be sold in the same manner on safety. How does he benefit—what does he gain?—It should be subtle—human—kindly and understanding.

Question: What is your opinion of the relative value of "scare" advertising (pyorrhea, halitosis, etc.), with the more wholesome type? Is there

a parallel here with gruesome versus non-gruesome posters? In your opinion wherein lies the value in each, when should each type be used, etc.?

Answer: "Scare" advertising can be used effectively in safety work. It doesn't have to be the bloody, gruesome type of advertising, but nevertheless it can be of a "scare" nature. It can show an employee after an accident—a hospital bill—expenses piling up—reduced income—family in want, etc. This is "scare" advertising, but it is not the type that shows a man's arm dropping off after it is cut in a machine. Where you are dealing with the uneducated type of worker "scare" advertising can be made very effective.

Question: What is the relationship between heart appeal versus pocketbook appeal?

Answer: In safety advertising I would say that the pocketbook appeal is stronger than the heart appeal because it applies directly to the individual himself—finances and the family budget are always a major problem.

Question: For years safety has had its own selling standards. They are good but I wonder if our methods are keeping pace with modern salesmanship technique?

Answer: Again I would say that more of the "YOU" element can be put into safety posters. Show the worker how he profits through observing safety rules. Make your posters as real as possible, using photographs. Show a worker as he really is—not some glorified Apollo, but a worker dressed as a worker would be in the industry being portrayed. Use a minimum of copy. Vary the size. Use Herculean illustrations. Another suggestion would be to adopt the strip idea in safety poster work. I don't necessarily mean comedy but I do mean putting human interest into the illustrations or photographs.

Question: What can we do to revitalize safety meetings? How can we tell the story in a different way, at the same time sticking to our basic theme, education? Do we need new frames for our pictures; or just frequent renovation? Or, do we need new pictures altogether?

Answer: There are many ways in which you can revitalize safety meetings. Instead of devoting the entire meeting to safety as it is practiced by employees, you might vary interest by showing safety as practiced by nature among the animals. I have seen pictures of this type and they have been very interesting. You would have to get one that was the proper length of course. Too much time could not be spent on it. Or you might be able to get some pictures showing safety as practiced by the Government in the Army, Aviation Corps, etc. Reels could also be shown, picturing the results from lack of safety principles. It might be in industry and it might be in housing. For example, I have in mind a picture similar to some of the sport reels put out by Grantland Rice. He takes, for instance, the subject "Speed" and carries it out say from the turtle clear through to foot racing, horse racing, motor boats and up into the airplanes. Picturing safety to a group of workers could be handled in some similar way.

As I view the subject of Selling the Safety Idea, it would appear to me that there are three major selling problems to be considered and kept constantly in mind.

1. Selling the Safety Idea to the executives.
2. Selling the Safety Idea to the foreman and other supervisors.
3. Selling the Safety Idea to the employees.

In the twenty-three years in which this organization has held conventions and conferences, many talks on these subjects have been presented by industrial executives, personnel managers, factory engineers and by casualty companies' engineering experts.

These men, who have been in the spotlight of these discussions, are mainly on the operating and production side of the business and I suppose it is quite natural that this group of executives should be in the forefront. Yet it does seem to me

that this whole program is a "selling job"—and I cannot help but wonder why more sales managers, sales promotion and advertising executives have not been called upon to play a more important part in this all important selling job.

It appears to me that Selling the Safety Idea to the foreman, supervisors, or employees, is often futile and ineffective, unless the key executive of industry is fully sold—and I mean actively, enthusiastically sold—lock stock and barrel—on these very pertinent points—which cut deep into the finances and management control of the business, namely—

A. The effect of accident losses on their Compensation premiums.

B. The effect of accident on their overhead. (I am told that uninsured production losses amount to four times the actual losses paid out for Compensation and medical services on accidents.)

This clearly indicates that the problem is so vitally important as a sustained "selling job", that the sales promotion or advertising department should be charged with the special assignment of selling and the burden of responsibility should not be left on the shoulders of the personnel managers, factory superintendents, foremen or engineering departments, who altogether too often do not understand or know how to apply the selling psychology that the sales department or advertising department employ every day in selling the products of their company.

I am prompted in making this statement after reading many articles relating to the subject of safety, but one in particular by Mr. Louis J. Baker, President of Baker Bros., entitled "Safety had a Direct Connection with Sales."

The astonishing revelation to me is that of the hundreds of published articles and speeches on the subject of Safety, only a few cover the subject in its relation to sales, which further reveals the fact that the fundamental principles of sales approach and sustained advertising in selling merchandising and keeping it sold have not been brought into the picture by the management of so many industries—in developing and maintaining, week in and week out, a selling program of Safety in their factories.

Selling is a very human process that requires resourcefulness, versatility and a full understanding of the motives of action and reaction of people in all walks of life—and cannot be measured or determined by an engineering yardstick.

In introducing the art of salesmanship into the program of "Selling the Safety Idea", it is well to realize that we will progress with old organizations only as far as tradition will permit. "A man is a good deal like a tack—he can go only so far as his head allows."

Men think in their traditional channels. These typical attitudes of mind—of salesman and engineer—are very real difficulties that must be faced in creating a new world of accident prevention. These attitudes will color many decisions and may generate more heat than light in many discussions of plans and methods. When the educational process goes far enough, a mutual respect will be developed that will help both to a greater and more profitable cooperation. So, to educate the public, we must first educate the teachers, i. e., the managers and salesmen who will guide and apply the program.

In order to clarify any standards, let us at this time, set down a few fundamentals: A business is financed, a plant is built, and an organization is developed for the purpose of producing something that can be sold at a profit, and *then* selling it.

Therefore, the creation of an efficient selling process is the ultimate purpose of an organization, and if it fails there, the organization fails. The vital importance of the selling process is obvious. It is the only reason why a business exists. We sell to a public. That public doesn't have to buy of us. That public is a peculiar thing. It is busy, fickle, indifferent, and exacting. We know less about it than we should. We do know, however—

1. It is a fallacy that. The public will automatically seek the best.
2. It is a fallacy that. The public knows the difference between price and value.
3. It is a fallacy that. The public will automatically reward enterprise and service.
4. It is a fallacy that. The public knows what it wants.
5. It is a fallacy that. The public will demand over any great length of time what it is not reminded of.

Therefore, we have salesmen and sales departments with their educational methods.

Selling is an absolutely essential function in all enterprises depending upon public support. During the next decade it will be the major problem of industry. I repeat, it is a very human process, because no matter how much it may depend on price, or quality, it must be guided and controlled by those qualities which I shall generalize under the cloudy phrase of personality, which can tip the scale in favor of a particular firm or line of goods.

The public must be educated, i. e., informed and instructed. What does it matter what the price of an article is if I do not know I need it? It matters still less if I do not want it.

If management is to sell employees on the idea of observing the fundamental precautions, it is important that the solicitation and selling job be more than an elaborated series of "don't's".

If I were to try to be epigrammatic about that rule, I would say, "Don't don't your workers."

When safety is only a passive consideration, you will not evoke the interest in its desirability until the occasion for its observance is past, and that is after the accident. However, give your employee something positive to work on and he will start setting new records for safety.

When you tell a man to be careful, there is nothing competitive about it. He may be careful five years or fifteen or twenty-five years and in his own mind he will not have attained anything.

Set a premium on safety records, observance of safety regulations, and general interest in the subject of safety is manifested in a number of different ways.

Man naturally is a vain creature. He seeks distinction in every way that he can. If you don't believe me, tell me why there are a lot of people who want low license numbers on their automobiles where people can see them.

Capitalize on this vanity by giving the man something to shoot for. This may be in the form of department records for safety, individual records, or factory records. You need not score the winner on the basis of no accidents but on the basis of best observance of all safety regulations. Score the men or the departments on the basis of points. Penalize if you want for any infractions but give credit in accumulated points for each day or each shift on which they do their work properly, so far as safety is concerned.

Reward those who score highest. It doesn't make much difference whether the rewards are cash prizes, time off with pay, or merely mention on the bulletin board or the company house organ as long as their fellow workers can see it.

When you put this on a department basis you get every employee urging the others in the department to do the right thing. Suppose you go in a department that is leading all others in the number of points and you discover a man at his machine without wearing the safety goggles that are intended for him. You penalize the whole department, and you let them know what the penalty is for. Next time somebody is going to remind that man to wear safety goggles.

Piece workers are probably harder to sell and keep sold than the time workers. They are anxious to make short cuts and pile up their production at the expense of safety. Discourage that tendency by again offering some kind of reward, either cash or honorary mention, for the individuals who manifest the greatest concern for safety.

I heard of one superintendent who posted his safety regulations on the bulletin board and asked the foreman to call the attention of the men to them. Later on that day he went out in the factory himself with \$10.00 in his pocket. He planned to give a dollar bill to the first ten men he talked to who knew the safety regulations which appeared on the bulletin board. After questioning the employees throughout the plant, he still had half of his money left.

Stunts of that kind are always desirable. They change the emphasis from safety as a passive subject to something very positive.

The job of "Selling the Safety Idea" is all important to management in this period of business—more so than at any time in the last decade. The reopening of many plants presents new problems, for it should be recognized that the former

employee returning to work presents much the same serious problems from the standpoint of production and safety as does the new and inexperienced worker.

The "new man" of today is the old man of yesterday returning to work after a period of unemployment. Give full consideration to the fact that he has very probably been submitted to anxiety and unusual mental strain in his efforts to secure a livelihood; that he is in many instances less fit physically than normally, due to the unaccustomed demands of varying types of temporary employment he has been obliged to undertake. He may be "out of trim" for his regular work, and until he regains his usual condition of bodily health and mental ease he needs assistance and guidance.

The Psychology of the Safety Movement in Changing Times

By DR. J. A. MELROSE

Department of Philosophy and Psychology, James Milliken University,
Decatur, Illinois

I

I am glad to share once again in the discussion of some vital matters of this Congress. The safety movement symbolized by this great gathering, is both a powerful practical movement in safety work, and also a great movement of social sympathy growing out of the new problems of our Industrial Age. Practical problems will and should get much consideration here; however, I should like to limit my discussion to matters of social vision and understanding which are also of great importance and very practical, too, in the long run.

One must not think too close up to his problem; he must see the outlying relations. The same piece of iron will float in mercury and sink in water, warning us that even physical things do not depend for their behavior alone upon their intrinsic nature, but also upon surrounding conditions. The principle is even truer for social facts and yet the so-called "practical" man, impatient for immediate results and often blind to outlying conditions, is always urging us to give our whole attention to things near at hand.

However, soon or later, outlying conditions affect things near at hand and then our problem becomes doubly difficult for there is both a bad state of affairs and a confusion as to the real nature of the trouble. This is where we are today. The chief troubles in the safety movement come from general disturbances of economic and social life. The safety leader must learn to be both a safety man and a real human leader in industrial problems.

II

In turning toward a general understanding of the safety movement, the safety leader is in step with what is taking place everywhere. The old way of holding the mind to facts close at hand has failed and a general movement has set in to examine outlying facts and conditions. This new trend is found in science. Physics, the foundation science, describes the new trend as a "turning of emphasis from the charge to the field." In education, the movement is marked by a relaxed emphasis upon departmental knowledges and a new emphasis upon social science. Industry shares this drift and recognizes that the problems of today are large human prob-

lems. The safety movement must catch the new step; it must not lose itself in a narrow view of its function, but must develop leaders who see it as a part of the new social development of the times.

In fact, the safety movement is one of the great movements of our industrial and social life. It therefore shares the fortunes of the social upheaval of the times and it must accordingly develop leadership of social vision both for its own protection and in order to do its work effectively. Our whole industrial and social trouble gives evidence of the urgent necessity of social vision. Safety and personnel leaders will do well to join hands with other leaders to work out a better understanding of the human problems of our machine age.

III

The soundness of the large human viewpoint should be clear enough to the informed safety leader. His whole experience emphasizes it; the history of the movement accentuates it. The very effectiveness of safety devices, safety programs and safety campaigns has again and again been found to depend upon general factors of interest, understanding and general industrial morale. A safety survey made by the surface car lines in our convention city of Cleveland a few years ago, shows that the major causes of accidents were (1) moral carelessness, (2) emotional tenseness, (3) bad judgment, and (4) slow reaction-time—all general factors which go far beyond mechanical conditions for safety. Other studies agree with these findings and uncover similar human factors such as subtle defects in vision as causes of accidents.

The whole experience of the safety movement indicates that safety is a human problem which roots deeply in the social life. To control safety we must not alone know safety technique; we must control the social life. Today the acute problem lies in this latter factor more than ever. No safety devices have been lost but safety work has been upset by general social and industrial factors whose disturbances the safety movement very naturally shares. One may say in the light of safety experience, and say with some assurance, that if the safety movement does not do its part in developing leaders with large social vision, it will be a relatively shallow and ineffective side-issue of industry rather than a great human movement.

There are special reasons why the safety movement should develop men of independent vision who understand the times. The safety movement and the personnel movement are the two pioneer human movements within machine industry. The human emphasis within industry has lagged and is being taken up with fresh vigor today. It is exhibiting a thrust of interest that is having a telling force in every phase of life. In view of conditions, these pioneer movements are in a strategic position today, for this new interest in the human problem is potent enough to be both full of promise and full of danger; it needs wise and experienced direction such as leaders within industry who have social vision ought to be able to give. The overweening emphasis upon the mechanical phases of industry has brought us to an impasse. The time for social leadership is at hand. It is your hour. The sole question is whether or not you have the wisdom and the courage to lead.

IV

I have opened a big subject. Any attempt to give general vision upon it would be a big task indeed. I am seeking less to instruct than to ask that we all become aware of this large social problem; leadership in it is the task of many, not one. However, I can raise two general questions which will give direction to our thinking, and I can attempt to throw some light upon them. These questions are:

(1) What attitude should one take today to help promote this new human movement and yet keep it under control so that it does not become blindly emotional and upset our political institutions?

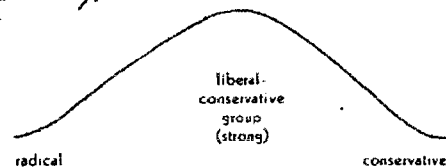
(2) How do the changes taking place today differ from those of a mere "business cycle" and challenge a more enlightened leadership for the industry of the future?

These are very large and general questions. However, I shall try to deal practically with them by appealing directly to natural facts. The facts to which I shall appeal are natural facts at the foundation of human nature and of human group organization. These facts are at the bottom of all human affairs and are the most potent causes of all human events.

There is today a strong tendency to become emotional on economic and political questions and go either "right" or "left." This tendency is everywhere. Already it has swept some European peoples from their moorings out to the sea of feeling and to uncertain destiny. This extreme emotionalism is in the air of the whole Western world. Even in our country, less given to emotionalism than other countries, certain groups are leading hysterical attempts to whip up emotional excitement and lead the masses into either a *radical* or a *conservative* camp.

Where do you and I stand on these issues? Should we go conservative? Should we become more radical? Or is there a deeper insight coming out of facts which can steady our emotions with realistic thought? Surely we, as leaders, do not want to remain in confused neutrality amid the impact of vital problems which we ought

cut 2219.



BELL CURVE
(stable form)

Graph "A"

to help solve. If we are realists, we will want to get back to relevant facts. We will not be too much impressed with human advocates but will look first for guidance from the witness of *natural facts*. A study of the natural forms of group organization will furnish our minds with just the foundation facts they need for a time of social upheaval like ours. These natural facts will show us what we, as a people, must do to keep a stable form of social life while at the same time we make the changes which the times demand; they will uncover the dangers of revolutions which are to be avoided.

The accompanying graphs (A and B) show the natural form of social organization, stable and unstable:

We are now in changing times and change is unsettling. We are well into some of these changes and cannot avoid them, for over-ripe facts compel changes in rather definite directions. However, we have the problem of keeping our affairs on a steady keel while these unsettling changes are taking place and a new adjustment is being made. The nature of these two types of social organization, as illustrated in the graphs, shows us the basic nature of our problem. These facts are deeply significant for they are of the sort that man did not make and man cannot destroy. Let us look at these graphs for a moment.

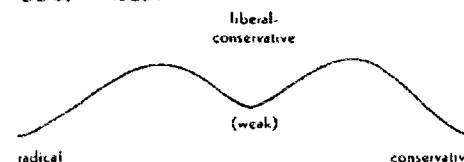
Graph A is the bell-curve of organization. It is *nature's* curve. When social conditions are normal, social organization takes this stable form in which there is a strong liberal-conservative group, while the conservative and radical wings, although stimulating to thought, remain relatively weak. This is the normal form of stable social organization.

Graph B is the unstable form of group life. In times of stress and confusion there is a tendency for even the middle group to give way to emotion and to go either "right" or "left," thus giving to the social organization the dangerous bi-modal life. This movement of group life is the road to revolution which some modern nations have already taken. The new emotional heat of both conservative and radical thought in America is threatening democratic freedom and calls for clear-headed, balanced leadership.

A glance at this basic nature of social group organization admonishes us against rushing blindly into social action either to proclaim the new or to defend the old. Rather, we must keep both a conservative and a liberal attitude and examine the facts by which we have to live. If we do this faithfully, we shall make a safe adjustment to the conditions of the changing times. True leaders are those who lead in patient fact-finding thought and courageously refuse to go into any emotional camp of any special interest group.

This sound social position may require us to stand against tendencies both of the industrial plant and also of the front office. If so, we must take such a stand with the truth. It is the stable, social way; it is the fair human way; it is the pro-

cut 2220.



BI-MODAL CURVE
(unstable form)

Graph "B"

foundly wise, religious way. Said Jesus: "A scribe instructed into the kingdom of God is like a householder who takes from his store things both new and old." Nothing can be more urgently important today than a leadership that is liberal-conservative in opinion and which gives place to no prejudice except that in favor of tested facts, whether the facts are old or new.

V

What is the nature of the changes which are upon us and which demand, for their patient solution, the emotional stability of which we have just been speaking? We do not speak of policies of man, for these are not inevitable but have a wide option between safety and opposite dangers. But there is a direction of change in facts themselves, which is inevitable and we are enquiring about the foundation conditions which give this inevitable change its character. What are the facts at the bottom of these inevitable trends of change today which man cannot stop?

All social life and change roots, first of all, in original human nature which is the basic social cause. This fact of human nature is the first fact one should try to understand if he wishes to have a fundamental knowledge of cultural change.

Man has two sides to his nature which give him two kinds of conscious life: that of *feeling* and that of *sensation*. These two phases of life cooperate when life is running smoothly, but they are separate and they operate over different mechanisms in the body. The two graphs C and D represent these mechanisms. *Feeling*, the

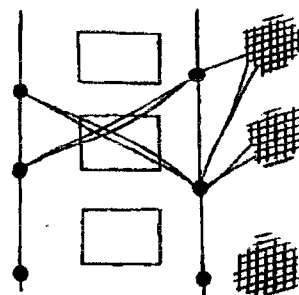
internal consciousness of values, is the source of spiritual experience. This phase of life operates over *C*, the autonomic nervous system. *Sensation* is an external type of consciousness which reveals the environment and is the basis of physical experience. *Sensations* come from *D*, the central nervous system.

When conditions are such as to keep these two phases of life adjusted to each other, there is basic stability in the individual and in the social life. However, when life gets unbalanced so as to continue to stimulate one phase at the expense of the other, there is a profound loss of stability in which individuals become restless and social life moves toward upheaval.

The Middle Ages went to extremes in the direction of *feeling*, unity and authority, and there followed the revolt to *sensation* which started Modern Times and a movement toward individualism. Now at length we have gone to such extremes in the new direction that we are in the midst of a reverse revolt, or a rush back toward *feeling* and unity.

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Autonomic



Graph "C"

VI

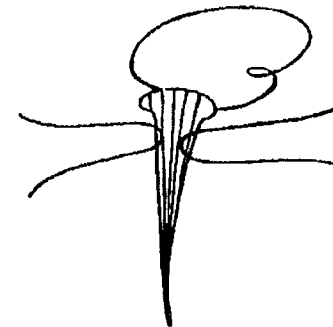
The nature of the present swing of Western civilization away from individualism and toward social solidarity, can best be seen by an historic graph showing the direction of life when the Modern Period came in and the reverse direction that is being taken today. These great swings of history can be understood basically only by reference to man's dual *physical* and *spiritual* nature. (Graph E.)

Before the year 1600, *feeling* was in the ascendancy and the study of facts was neglected. *Feeling* gives unity and the Middle Ages developed great unity and control.

About 1600 the secular forces began to be in control and to grow more and more potent. *Sensation* makes for diversity and individualism and since the year 1600 there has been a period of achievement in the individualistic sense. This is the age of material sciences. It has centered upon external achievement and has neglected feeling and values.

A new turn began soon after the year 1900 and is now in full swing. It is a movement back toward human values and unity. The movement itself is inevitable but it demands understanding and guidance.

Central



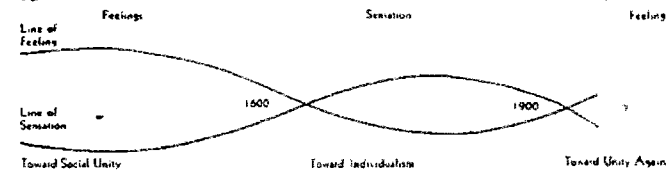
Graph "D"

Many factors are at work today to make our restless age have its special characteristics. The maladjustment of the two basic sides of human nature, *feeling* and *sensation*, is the fundamental factor. It is this factor which makes current changes as wide and deep as Western culture; it is this factor which makes the general direction of the changes inevitable. Our problem is to take advantage of this new human movement, the swing back to *feeling*, but at the same time not to swing to the other extreme again. We are challenged amid this inevitable change with the problem of holding to our flexible institutions and building a true social democracy, permanently stable because it is built upon both feeling and sensation, the twin phases of human nature and need.

VII

It will be well to distinguish the profound changes we are now having from those short rhythmic occurrences in economic life called "business cycles." The accom-

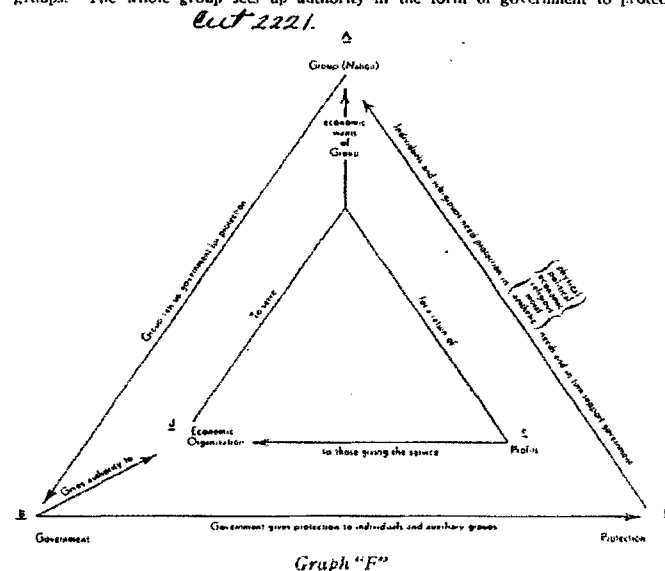
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Graph "E"

panying Graph F indicates the relation of the economic cycle to the more general cultural cycles of which we have just spoken, one of which we are now acutely experiencing.

Economic life is often discussed independently of other phases of life, but it is well to recall that it is not independent of the life of the whole group but merely a basic phase of that life. Economic life arises to serve the economic wants of the group; the group as a whole is primary and the seat of social authority. The group has many other wants which are also supplied by the work of individuals and sub-groups. The whole group sets up authority in the form of government to protect



members and groups from unjust and socially dangerous behavior of individuals or groups. The citizens and sub-groups support the government in return for protection. Such mutuality of interest prevails in the cycle of activity of all stable social organizations.

Progress of group life implies change. There are two factors to social change: (1) material gains such as invention of new machines or new techniques, and (2) the progressive readjustment of these material changes to human needs. The first of these come by way of the *sensory* side of human intelligence, and the second through the *feeling* side, factors which we have already pointed out. The first is physical gain; the second is spiritual gain. Science has done most to promote the first factor and religion has done most to promote the second factor. There is a common but dangerous illusion that the first factor alone makes progress. However, it is quite clear that progress requires the control factor just as much as a motor car needs

steering gear and brakes to control and guide the power of the motor. However, in social affairs, there is a natural lag in the second or control factor, and this gives rhythm to the social life. The times of crisis in economic life caused by this lag in adjustment are known as business cycles.

Business cycles are merely phases of material readjustment of the economic process when the process becomes unbalanced by the lag in the human control factor. Such crises are purely mechanical in nature. They do not involve any fundamental change of theory with respect to politics, economics, religion, morals, etc. All that occurs is a slowing up of the economic life until the congestion is removed by the normal activities of economic life and balance restored. This type of economic problem has generally been solved by the working of natural economic law and without planning. The cycle of this economic activity is suggested by the internal triangle of the Graph F.

When, however, there is a lag in the control factor of a more general and fundamental sort, the lag affects not only economic life but breaks over into the larger field of cycle ABC of the graph. Such a disturbance indicates that the facts of change have moved so far that *theory* itself lags behind the new conditions of life and needs to be readjusted to them. The problem now becomes a thought problem as well as one of action. Accordingly, there occurs a disturbing change of views on theory of politics, economics, religion or morals or aesthetics, or more probably, on theories of all of these phases of life together. Of course, during such a time, economic life is in upheaval and confusion but so also are all other phases of life in the midst of confusing change.

Needless to say, this type of social crisis is more serious than a business crisis. It is the birth struggle of a new social view of life and it requires for its understanding and guidance, a much more profound insight into human affairs. It is quite evident that we are in such a cultural crisis today, which is marked by a general swing, and in some places a dangerous and headlong swing, from individualistic ways of thought toward views of social unity. This movement is bringing all theory under fresh examination and provoking the emotional migration into opposite camps, which, as we have said, marks the menacing danger of such times of change.

It is a mistake to take times of yeasting unrest and change too seriously. Much of the old is sound, and if we neglect its worth, we shall have to come back to it repentantly later. However, it is also a mistake to take the changes too lightly. There is no error more fatal than complacency. Neither the conservatism nor the radicalism, of which we hear much, has anything to offer in itself. We need to distrust the emotionalism of contrary opinions of the conservative versus radical type. There may be two sets of opinions but there is only one set of facts. Some of these facts are *old*, some are *new*. We must seek the facts impartially in the true fact-finding spirit and treat them with natural piety, for in them and in them alone we have our salvation.

VIII

The times call for wise leadership. It is not enough to be "idealistic"; it is not enough to be "practical" in the usual sense. The leadership which is needed must be both idealistic and practical in the best sense. Safety and Personnel leaders are in a favored position for leadership in the present crisis for the following reasons:

- (1) They represent movements which are the pioneer movements of the modern trend toward humanizing machine industry. They are the first-born movements of the new age and they are still in their youth.
- (2) Safety and personnel leaders are in industry and they know its problems. Their idealism should be practical and realistic. This is an industrial age and the real problems of the times are in industry. The great modern industrial organization has long since outgrown individualistic dimensions and become a great social institution with power like that of the government and the church. It becomes necessary to humanize the spirit of profit-making in modern economic organization in order to stabilize social life and in order to mend and avoid upheaval.
- (3) The problem is a human problem and needs leaders who are accustomed to think of industry in human terms. We must solve our problems humanly in order to

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solve them wisely and permanently. We need leaders with the vision to avoid extremes and to build solidly upon the foundation of the whole of human nature and need. Our democratic institutions are flexible and responsive to us and we can so build if we have wise leadership. There will be many kinds of leaders needed for this task and the human leaders within industry are among them.

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Accident Prevention Equipment Manufacturers' Section

Officers 1933-34

General Chairman—BUELL W. NUTT, Safety Equipment Service Company, Cleveland, Ohio.
Vice-Chairman—I. W. MILLARD, Industrial Gloves Corporation, Danville, Ill.
Secretary—GEORGE S. SHULL, Safety First Supply Company, Pittsburgh, Pa.
Treasurer—L. J. BOWKER, Mine Safety Appliances Company, Pittsburgh, Pa.
Executive Committee at Large—
E. W. BULLARD, E. D. Bullard Company, San Francisco, Calif.
FREDERICK WAHLERT, Pulmosan Safety Equipment Corporation, Brooklyn, N. Y.
CHARLES H. GALLAWAY, American Optical Company, Southbridge, Mass.

BUSINESS SESSION

September 30, 1934

The annual business meeting of the Accident Prevention Equipment Manufacturers' Section was called to order after a pleasant dinner by General Chairman Buell W. Nutt, Safety Equipment Service Company, Cleveland, who presided. Reports were heard from the General Chairman and the Chairmen of Standing Committees on activities during the past year. The report of the Nominating Committee was then called for, and new officers for the Section were nominated and elected as follows:

Chairman—Irwin W. Millard, Secretary, Industrial Gloves Corporation, Danville, Ill.
Vice-Chairman—George Shull, President, Safety First Supply Co., Brady Bldg., Pittsburgh, Pa.
Secretary—William Wahlert, Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y.
Treasurer—L. E. Dickson, Vice-President, Standard Safety Equipment Co., 75 East Wacker Drive, Chicago, Ill.
Executive Committee-at-Large—
J. T. Ryan, V-Pres., Mine Safety Appliances Co., 201 N. Braddock, Pittsburgh, Pa.
F. R. Davis, President, Davis Emergency Equipment Co., 55 Van Dam St., New York City.

R. T. Solensten, V-Pres., Elliott Service Company, 242 W. 55th St., New York City.
B. W. Nutt, President, Safety Equipment Service Company, 1228 St. Clair Ave., NE, Cleveland, O.

ADJOURNMENT

Accident Prevention Equipment Manufacturers

Who Made Exhibits at the Twenty-Third Annual Safety Congress
and Exposition, Statler and Cleveland Hotels,
Cleveland, Ohio, October 1-5, 1934

American-La France & Foamite Industries, Inc., Elmira, New York
Fire protection equipment
American Optical Company, Southbridge, Massachusetts
Industrial eye protection service
Bendix Products Corporation, South Bend, Indiana
Automotive testing equipment
Robert A. Bernhard, Rochester, New York
Saf-T-top applicator bottles for antiseptics
Binney & Smith Company, New York City
Emulsified carbon black for concrete pavements
Bishinger-Koehler Manufacturing Company, Pittsburgh, Pennsylvania
Oxygen equipment products
Bradley Washfountain Company, Milwaukee, Wisconsin
Group washing equipment
Brown Shoe Company, St. Louis, Missouri
Safety Toe Shoes
R. H. Bulrke Company, Chicago, Illinois
Safety belts, straps, buckets, and tool guards
E. D. Bullard Company, San Francisco, California
Safety equipment for mines and industry
Burroughs Wellcome & Company (U. S. A.), Inc., New York City
First aid and medical equipment
Godfrey L. Cabot, Inc., Boston, Massachusetts
Emulsified carbon black for concrete pavements
Chicago Eye Shield Company, Chicago, Illinois
Head and eye protection equipment
H. Childs & Company, Inc., Pittsburgh, Pennsylvania
Safety footwear
Cunningham-Hall Aircraft Corporation, Rochester, New York
Sand blast helmet and suit
Davis Emergency Equipment Company, Inc., New York City
First aid, gas masks and safety equipment

Eagle Signal Corporation, Moline, Illinois
Traffic signal equipment and industrial timing equipment
Elliott Service Company, New York City
Elimination of waste, promotion of efficiency and safety
Evans Products Company, Detroit, Michigan
Railroad grade crossing and barrier and traffic signals
The Gerson-Stewart Corporation, Cleveland, Ohio
Soaps, disinfectants and cleaners for planned sanitation
Harley-Davidson Motor Company, Milwaukee, Wisconsin
Special police motorcycles and equipment
Hunter Auto Equipment Company, Inc., New York City
Fleet specialties, rubber mirrors, stop and tail-lights
Hynson, Westcott & Dunning, Inc., Baltimore, Maryland
Mercurochrome and Thantiz lozenges
Industrial Commission of Ohio, Columbus, Ohio
Accident record charts and graphs, educational safety literature
International Shoe Company, St. Louis, Missouri
Safety shoes
Junkin Safety Appliance Company, Louisville, Kentucky
Safety guards for punch presses
Walter Kidde & Company, Inc., New York City
Permanently piped fire systems and portable extinguishers
Lehigh Safety Shoe Company, Allentown, Pennsylvania
Safety shoes and boots
Lima Cord Sole & Heel Company, Lima, Ohio
Non-slip soles and heels for footwear
Liquid Carbonic Corporation, Chicago, Illinois
Fumigant for infestation control
Macwhyte Company, Kenosha, Wisconsin
Wire rope and braided slings
Martindale Electric Company, Cleveland, Ohio
Protective masks, safety roadway signals
Metropolitan Life Insurance Company, New York City
Insurance, industrial group, etc.
Mine Safety Appliance Company, Pittsburgh, Pennsylvania
Mine and industrial safety equipment
National Automatic Safety Signal Company, Chicago, Illinois
Safety flash signal for rear of trucks
National Safety Council, Chicago, Illinois
Poster, Library, Research and Education Divisions
The Patent Scaffolding Company, Chicago, Illinois
Ladders and scaffolds for industry and construction
Portable Lamp & Equipment Company, Pittsburgh, Pennsylvania
Electric mine lamps and safety equipment
The Positive Safety Manufacturing Company, Cleveland, Ohio
Power press safety devices
Protectosol Company, Chicago, Illinois
Safety cans for washing, bench, storage, etc., tank fittings
Pulmosan Safety Equipment Corporation, Brooklyn, New York
Respiratory protection and general safety equipment

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Pyrene Manufacturing Company, Newark, New Jersey
Hand fire extinguishers and systems

Reece Wooden Sole Shoe Company, Inc., Columbus, Nebraska
Wooden sole safety footwear

The Safety Clothing Company, Cleveland, Ohio
Safety clothing and equipment

The Safety Equipment Service Company, Cleveland, Ohio
Goggles, safety clothing and other safety equipment

Safety First Shoe Company, Holliston, Massachusetts
Safety shoes

Safety Signal Devices, Inc., Chicago, Illinois
Safety stop-light for cars, trucks and buses

The Service Recorder Company, Cleveland, Ohio
The Servis Recorder for trucks and buses

Shepherd Safety Shoe Corporation, Chicago, Illinois
Safety shoes

The Sight Light Corporation, New York City
Instruments for measuring light in industries, etc.

Standard Safety Equipment Company, Chicago, Illinois
Dust protective equipment and general safety devices

Stonelhouse Signs, Inc., Denver, Colorado
Metal accident prevention signs

The Surety Rubber Company, Carrollton, Ohio
Rubber safety equipment for linemen and industry

Weaver Manufacturing Company, Springfield, Ill.
Automotive testing equipment

West Disinfecting Company, Long Island City, New York
Disinfectants, insecticides and sanitary supplies

Willson Products, Inc., Reading, Pennsylvania
Eye, head and respiratory protective devices

Wil-X-M'fg Corporation, Brooklyn, New York
Fire extinguishers and equipment

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Aeronautical Section

Officers 1933-34

Chairman, Lester D. Seymour, President, American Airways, Inc., Chicago, Illinois.
Vice-Chairman, Captain E. V. Rickenbacker, North American Aviation, Inc., New York City.
Secretary, W. Dean Keefer, Director, Industrial Safety Division, National Safety Council, Chicago, Illinois.

WEDNESDAY MORNING SESSION

October 3, 1934

The Aeronautical Section session was called to order by Mr. Paul Wright, of the American Airways, Inc., Chicago, who presided. Chairman Wright introduced Mr. John W. Burton, who made a brief address of welcome on behalf of the Convention City. Chairman Wright then introduced the first speaker.

Safety in Aviation

By J. H. DOOLITTLE

Aviation Manager, Shell Oil Company, St. Louis, Mo.

The speaker said in part: There are few of us who appreciate the great care that is exercised in the operation of a modern air transport line to assure safety and a degree of comfort as well. Any normal man or woman having average eyesight and no physical disabilities, and being possessed of average intelligence, can learn to fly an airplane in a relatively short time; but it is a far cry from the mere fact that one knows how to fly an airplane to the art of flying as practiced by airline pilots who have made it their profession. These pilots are not only masters of every branch of the art of ordinary flying, but must take a post graduate course in blind or instrument flying. This training is given in special airplanes equipped with a hooded cockpit and the pilot is obliged to fly by means of his instruments alone, as he cannot see outside the airplane.

Probably unknown to the vast majority of air travelers, there exists in every modern air transport company today a complete medical division which closely examines the physical and mental qualifications of all their pilots once every month or six weeks. The examination is strict and thorough, and is given by physicians trained in aeronautical work. These examinations are in addition to those required semi-annually by the United States Department of Commerce. The eye examination requires that the pilot have not only normal vision, but that his judgment of

distance be accurate. There must be no strain due to faulty balance of the muscles of the eye. No night blindness or color blindness can exist, and a test is given to make sure that when looking straight ahead the eyes are capable of seeing objects to either side in a wide arc of vision.

Functions of the organs of the ear which have to do with equilibrium are tested, and the hearing must be efficient for the use of the radio telephone and other ordinary instruments. The general physical examination includes diligent search for diseases of the tonsils, teeth, heart, lungs, abdominal organs and nervous system.

Most of the large airplanes now used on the modern transport lines use two pilots, one senior to the other in the matter of experience and proven judgment. Many of our larger airplanes also carry as a member of the crew a trained nurse in the capacity of stewardess. These young women are carefully selected from the ranks of registered nurses for the reason that nurses have had a rigorous institutional training and are accustomed to discipline. The stewardess' duties involve taking complete charge of the passengers while they are in the airplane.

Every modern airplane flying scheduled duty has a radio receiver in it attuned to the radio beam of the airway over which it travels. If the pilot is flying directly on the beam he gets a constant humming noise in his head-phones which is a series of long dashes. If perchance he should stray to the right or left of the beam these signals will be radically changed, and he will thus know that he is not following his true course. There are about 100 of these radio transmitters laying down the "roads of the air" practically all over the United States. They have a rated output of from 50 to 2,000 watt power, depending upon the course over which they are directed and the distance required along that course. These transmitters emit a 1,000 cycle tone modulated continuous wave signal for radio range transmission.

At periodic intervals on the ground along this airway are smaller beams and intermediate landing fields, and the pilot in checking his progress knows exactly where he is, in spite of the fact that he cannot see the ground. Likewise, in order to be informed on the condition of the weather ahead and just how close to the ground this cloud layer is at the point of destination, he is equipped with two-way telephone radio apparatus, so that he is in constant communication by word of mouth with his ground control station and they with him.

One of the peculiarities of the radio beam is that directly above the beam installation at the air port of destination is a point of silence known technically as the Cone of Silence, so that the pilot, realizing how fast his airplane is flying and taking into consideration the direction of the wind, not unlike the captain of a ship, can hold to his course by the use of the radio beam and tell approximately when he reaches his destination.

Radio, together with modern navigational instruments, de-icing equipment and other safety devices, is making it possible to fly regardless of weather conditions. Other principal advances in aero-dynamic efficiency in the past few years have resulted from the following:

(a) Utilization of the stressed skin type of construction in metal airplanes. In this type of construction the skin forms not only the surface exposed to the air, but also contributes substantially to the strength of the structure.

(b) To the development of the N. A. C. A. cowl and the fairing of engine and nacelle into the wings of multi-motored airplanes, thus greatly reducing the drag and increasing the overall efficiency of the airplane.

(c) The practical application of flaps which have the effect of increasing both the drag and the lift of the wing and thus steepening the landing angle and slowing down the landing speed.

(d) The controllable pitch propeller has the effect of greatly improving take-off and climb and appreciably improving cruising speed and fuel economy.

(e) The retractable landing gear has improved efficiency and increased speed by removing, when the airplane is off the ground, one of the principal causes of parasite resistance.

The above are the principal improvements made in the most modern airplanes of recent years and none of them are directly attributable to air racing, but rather to safe, sane aeronautical development.

Safety Problems of Airships

By DR. KARL ARNSTEIN

Vice-President in Charge of Engineering, Goodyear-Zeppelin Corporation, Akron, Ohio

The speaker said in part: The fundamental requirement for safety in engineering is the proper visualization of the potential risks. First of all, the engineer must realize and appreciate all conceivable risks which may arise and he must then shape his design so that these risks are accepted and provided for in the proper order of their relative importance.

The visualization of risks, at least in the broader categories, is probably the easiest part of the problem. As a matter of fact, by reviewing all aeronautical accidents of the past one may enumerate most of the conceivable risks. Having done so, it is a simple task to draft an absurd set of specifications which would absolutely prevent the recurrence of accidents. To attain this end one might have to specify that the airship should have sufficient strength to permit it to fly into mountains, high buildings, or into the ground or sea, and to encounter such meteorological disturbances as hurricanes, typhoons, thunder storms, and Kansas cyclones without incurring structural damage.

After all, we are not living in a Utopia where such super-vehicles might be found. We are just human beings, doing our best to build practical commercial airships; vehicles capable of flying through the air and safely carrying adequate pay loads over sufficient distances and at such speeds as will guarantee a satisfactory financial return to the operators.

As in all fields of engineering, there are some risks which must be reduced to a reasonable degree and then accepted. Compromise is necessary and the final solution will be a balanced design which probably will prove sufficiently satisfactory with regard to any single requirement, but which will provide what has been experienced to be adequate strength and safety while still staying within the bounds of commercial acceptability.

Of course, in any given status of the arts, and with an airship designed for any given purpose, there is probably only one efficient solution. As the art progresses, however, the improvements are made in the various contributory fields, the picture tends to change and the relation between safety and performance changes with the advances in the arts and with the dictates of a riper experience.

I can probably best clarify my point by discussing the means by which an airship engine room may be rendered fire-proof. If we start with the preconceived notion that an airship engine room is to be a potential source of fire, then every attempt must be made to prevent engine room fires from spreading to the other parts of the ship. There was a time when, from stationary power plant practice, one might say that a fire-proof engine room had to be built of structural steel, lined with brick or concrete, and perhaps be equipped with heat-insulated outer walls. Such an engine room might be successful as a means of preventing the spread of fires, but would be prohibitively heavy for airship use. Alternatively we use thin metal walls, covered with asbestos and tested to a known degree of fire resistance. The relative inferiority of this type of wall is compensated for by other light-weight fire-resisting equipment which tends to make this type of wall adequate. Hand extinguishers are available, and in addition, all engine rooms are equipped with built-in carbon-dioxide spray systems. The engine rooms are ventilated directly to the outside of the ship and other safeguards include anti-backfire screens on the carburetors and complete exhaust manifold protection and cooling. Further attempts are now under way to eliminate much of the fire hazard due to volatile fuels by the use of heavy oil and other "safety" fuels. There is always a mechanic on duty at each engine, and there are at least two men in each engine room during the "landing station" period while the engines are being maneuvered. On the whole, the installation is considered as sufficiently safe, the heavy-weight, fire-proof vault having been replaced by a series of lighter weight protective means coupled with an attempt to tackle the problem at its source by the use of constant operational supervision.

Such a use of many separate and distinct agencies for the attainment of safety is a cardinal principle in airship construction. The airship hull is built on the triple-layer principle in which the buoyant gas is held within separate cells or balloons, the stresses due to flight and static loadings being taken by other independent structural members. The whole system is bound together by a taut outer cover which protects the interior from the elements, adds to the structural strength, and in an emergency constitutes some protection against the loss of gas. The mutual inter-relation of elements permits each unit to serve at least as a partial replacement of the other in case of local failure. Nowhere in the ship have we relied upon a single structural unit to completely perform a single important mission.

Our determinations of the overall safety of the airship structure are based upon an accurate knowledge of the capabilities of the various structural elements and the distribution of both the primary and secondary stresses in the completed structure. The airship engineer has a detailed knowledge of the properties of his materials, particularly in regard to tensile strength, yield point, buckling, bending, shear, creep, fatigue, corrosion and aging. He is constantly making a detailed check of these properties by painstaking testing at every phase of the manufacture and erection.

The ship's propulsive system is made up of a number of separate units, any one of which is adequate to maintain steerageway and bring the ship home. The value of this division of the power plant system was evidenced on a trans-Atlantic flight attempt of the "Graf Zeppelin" which was interrupted by failure of four or her five engines. She turned about after the third engine failed and landed safely on the fifth engine.

How the "U. S. S. Macon" is Constructed

I might cite the control system of the "U. S. S. Macon" as an example of the way in which many methods are provided for the accomplishment of a single result. The ship is normally steered in the horizontal plane by two rudders and in the vertical plane by two elevators. The main control cables which operate these surfaces emerge from the forward control car and are divided to pass down both lateral gangways so that the crippling of either gangway (for instance through structural damage) would still allow the control surfaces to be used. Additional clutches at the control car allow the ship to be steered by the use of single movable surfaces so that even with one rudder and one elevator gone the ship can still be steered satisfactorily. As a further precaution to guard against the jamming or damaging of control cables between the forward control car and the rear of the ship, a complete emergency control station is built in the lower fin. All controls can be operated from here and the ship flown from this position without difficulty. Furthermore, all control wiring is open to view and is readily accessible so that any damage to the cables or their sleeves can be easily repaired in flight. There is hardly any conceivable set of circumstances under which the ship would go completely out of directional control, but should this ever occur she still need not come to harm, for by proper operation as a free balloon she may be kept aloft until some form of control can be regained.

The ship's electrical power supply system is built in duplicate, two complete gasoline power plants, each running separate generators. If both of these power plants fail, the electricity needed for instruments, electrical equipment and emergency radio, is supplied by storage batteries. The ship is equipped with a dial telephone system by means of which any station in the ship may talk with any other station, and it is so arranged that in any emergency the captain may call any or all stations and emergency information may be broken in on any lines which happen to be busy. The telephone system is supplemented by telegraphs (similar to those used on steamships) which will mechanically transmit the required signal to engine rooms and key points of the ship. The system of three longitudinal keels and transverse corridors also permits runners to quickly reach vital parts of the ship in an emergency.

In safety work it is difficult to find a substitute for experience and the modern airship engineer profits greatly by his knowledge of the good and bad experiences of the airship pioneers. The engineer values highly his store of personal experience and uses it constantly in his appraisal of the relative importance of various safety

features. There are times, however, when deeply rooted practices appeal to the conservative mind and are retained as safety features even though experience shows no precedent. A case in point is that of the subdivision of the buoyancy into many separate gas cells for fear that a leak in a single gas container would cause the stranding of the ship. Actually, with the stresses taken by the structural framework, the gas cells merely act as gas containers and there has never been a precise case where a single gas cell in a Zeppelin type airship has ever been completely deflated in flight.

The rigid airship is particularly fortunate in being able to carry a functional crew wherein no men, excepting perhaps the captain and his watch-officers, are required to perform or be responsible for several different types of tasks. In this respect the airship is more comparable with a large surface craft, while an airplane compares better with a small pleasure craft. In the latter perhaps only one man is carried who must perform all the duties of pilot, radio operator, meteorologist, and mechanic. A single man cannot be expected to achieve perfection in all of these lines.

In the choice of men for an airship crew there is little excuse for stopping at anything less than the best obtainable. A good man weighs no more than a poor man and he does not eat more food or take up more space. While every member of an airship crew is not a qualified captain, it is undoubtedly good practice to train all crew members in free ballooning, meteorology and radio, with the thought that their emergency value is greatly enhanced by their ability to perform added functions in times of stress.

It is very evident that high crew morale is important to safety. By the provision of adequate relief, exercise, properly heated and ventilated mess rooms, lounges, smoking rooms, quiet bunk rooms, together with good food and plenty of it, the crew spirits are kept high and fatigue is not experienced even on long flights. For these reasons the crew is generally in excellent physical and mental shape even on flights of three or four days duration.

The history of airships has shown that when disasters have occurred there has generally been some combination of circumstances or coincidences which has magnified a series of minor failures into a major catastrophe. To my mind, the experienced crew is the best guarantee against an accumulation of errors and is the primary step toward fool-proof operation of airships.

Perhaps one of the largest factors affecting the safety of the trans-oceanic flier today is the adequacy of his fuel supply. In the present state of the art the airplane has the difficulty that long range hops are dangerous because of the possibility of fuel shortage enroute or because the desired fuel load has been gotten aboard only at the expense of a decidedly overloaded take-off.

In a regular commercial airship service the fuel loads are carefully chosen on the basis of past experience and weather studies so that ample fuel reserves will be aboard for the longest conceivable flight over that route. But there still remains a reserve or an additional safety factor available to the captain. He has only to slow down slightly and his range is markedly increased. Suppose, by some trick of fate, the captain finds himself 1,300 miles from his base with only 20 hours fuel left and he is operating at 65 knots through a region where there is little or no wind. Theoretically, he could just get home, but the safety margin would be too close for comfort. Alternatively, he elects to fly at a slower speed, say 50 knots. At this reduced speed his original 20 hours supply of fuel will last at least twice as long and his range will be extended to 2,600 miles, giving him an ample margin of safety for his 1,300 mile trip home.

I have often been asked what would be done if an airship arrived near its terminal only to find mooring conditions so bad that a landing could not be made. We are hoping that this contingency will seldom arise in our proposed commercial operations of the future and feel sure that it will cause little or no difficulty. Elaborate studies of terminal weather conditions show that airship sites may be chosen just as one chooses harbors for surface craft and that when are available where mooring and docking operations may be carried on with startling regularity under a wide range of surrounding weather conditions.

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The only other risk which I can conceive of is that of fire and here American, helium-inflated airships have a definite advantage. No matter how carelessly helium is treated it will never become combustible and the pilot on a helium-inflated ship undoubtedly rests easier than his colleague who flies with hydrogen.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



**American Society of Safety
Engineers—Engineering Section**

Officers 1933-34

General Chairman—S. E. WHITING, Liberty Mutual Insurance Co., Boston, Mass.
Vice-Chairman—E. F. BLANK, Jones and Laughlin Steel Corp., Pittsburgh, Pa.
Vice-Chairman—A. S. REGULA, Industrial Relations Counselors, Inc., New York, N. Y.
Secretary—W. DEAN KEEFER, National Safety Council, Chicago, Ill.

Members at Large—

CYRIL AINSWORTH, American Standards Association, New York, N. Y.
C. B. AUER, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.
J. I. BANASH, Consulting Engineer, Chicago, Ill.
E. W. BECK, United States Rubber Co., New York, N. Y.
H. R. BIXLER, Union Carbide and Carbon Corp., New York, N. Y. (Metropolitan Chapter).
C. B. BOULEY, Wisconsin Public Service Corp., Milwaukee, Wis.
J. E. CULLINEY, Bethlehem Steel Co., Bethlehem, Pa.
R. E. DONOVAN, Standard Oil Company of California, San Francisco, Calif.
W. M. GRAFF, National Bureau of Casualty & Surety Underwriters, New York, N. Y.
HARRY GUILBERT, Pullman Company, Chicago, Ill.
A. P. HUCKESTEIN, Pennsylvania Department of Labor and Industry, Pittsburgh, Pa. (Western Pennsylvania Chapter).
R. McA. KEOWN, Industrial Commission of Wisconsin, Madison, Wis.
G. A. KUECHENMEISTER, Dominion Forge & Stamping Co., Limited, Walkerville, Ont., Canada.
M. G. LLOYD, United States Bureau of Standards, Washington, D. C.
JOHN P. McCANN, New England Power Engineering and Service Corp., Worcester, Mass. (Boston Chapter).
W. S. PAINE, Aetna Life Insurance Co., Hartford, Conn.
G. E. SANFORD, General Electric Co., Schenectady, N. Y.
C. W. SMITH, Standard Oil Co. (Ind.), Chicago, Ill.

H. S. SMITH, Union Carbide and Carbon Corp., New York, N. Y.
 W. R. SMITH, United Engineers and Constructors, Inc., Newark, N. J. (North-
 ern New Jersey Chapter).
 R. F. TITANER, Buick Motor Company, Flint, Mich.

WEDNESDAY LUNCHEON SESSION

October 3, 1934

The annual meeting of the ASSF—Engineering Section of the National Safety Council followed a luncheon, and convened with S. E. Whiting, General Chairman, presiding.

Attention was called to the fact that all reports had been mimeographed and copies distributed at the luncheon table.

The following resolution was passed unanimously:

"The Annual Meeting of the American Society of Safety Engineers—Engineering Section of the National Safety Council has just heard with deepest regret of the death of Dr. Calvin Winsor Rice, well known engineer and for the past 28 years Secretary of the American Society of Mechanical Engineers, in New York City, on Tuesday, October 2, 1934."

"Dr. Rice has always had a deep and sincere interest in organized safety engineering work and has been ever ready to lend his aid and that of the A.S.M.E. to the furtherance of our objectives."

"Therefore, be it resolved, that we formally record our deep sympathy in the loss to us of Dr. Rice, and that this resolution be made a part of the record of this meeting, and that a copy be transmitted to the A.S.M.E. and to the family of Dr. Rice."

The Science of Seeing and Safety

By DR. M. LUCKIESH

Director, Lighting Research Laboratory, General Electric Company, Nela Park, Cleveland, O.

The speaker said in part: In the course of civilized progress increased burdens go hand in hand with increased convenience and comfort. Artificial conditions are substituted for natural ones without full knowledge of the consequences. Mankind came indoors and imposed new tasks and new environments. It was obvious to human beings that they needed light, but unobvious penalties remained hidden. Modern civilization has imposed upon eyes and human seeing-machines unnaturally severe prolonged critical visual tasks under greatly restricted light and altered lighting. Hours of close work are now the rule under meager light and unnatural lighting for eyes and human beings that evolved under an abundance of natural light outdoors when close visual work was casual. Convergence of eyes requires effort and so does concentration of attention. Abnormal visual tasks under sub-normal conditions is a combination of circumstances worthy of deep suspicion. This and many other facts and analyses eventually led us to develop a new and extended viewpoint which, in turn, opened a new vista of research. The chief result has been the development of the new science of seeing from which is being born a new science of lighting.

The science of seeing was born of radically new concepts. A science of vision has been evolving for a long time but it deals with the eyes or, more broadly, the visual sense. The science of vision is concerned with the abilities and limitations of eyesight as a tool. Seeing involves this tool and another tool—lighting. But seeing is much more than this. It is an activity of human beings operating as human seeing-machines. Seeing is work that a human being does. It requires lighting and vision but also human effort. It involves muscular activity, the nervous

system, and mental reactions. In other words, seeing is an activity of the human body and mind. It utilizes human energy and other resources just as any other task does. These new concepts have opened a vast new vista for thought, research and analysis. They reveal the extreme narrowness and inadequacy of the older viewpoints and practices which were erroneously assumed to deal adequately with seeing. They have cleared the way for the development of a science of seeing which in turn is laying the foundation for a science of lighting.

The major new concepts have given rise to many others. The human seeing-machine no longer need be merely satisfied to barely see but has a right to see easily. Studies of vision are concerned with thresholds, that is with limiting visibility. As long as study and consideration were confined to vision, practices were more or less anchored to the realm of barely seeing. However, when seeing is properly considered as work which human beings do we are immediately concerned with seeing easily. Therefore, the science of seeing is concerned with optimum conditions for easy seeing instead of being confined to minimum conditions of barely seeing or threshold visibility.

This human aspect of seeing, firmly entrenched through the new conception of human seeing-machines, shows that old ideas must succumb to their own inadequacy. The efficiency of a worker is no longer measurable by the useful work he does per dollar or per hour. His welfare as a seeing-machine is determined by the useless work he does—not merely externally in blundering due to poor seeing but internally through waste of energy and other human resources. The difficulty of a visual task assumes a new importance. It is obvious that it is more difficult to see a small object of low contrast than a large one of high contrast. But no longer is this merely an external factor. The new viewpoint directs the attention to internal penalties paid by human seeing-machines. Research must relate the external visual tasks to the internal costs of seeing—and it is doing so. The science of seeing places lighting in the class of labor-saving devices and also elevates it to the level of things which affect the entire human being.

The conception of the human seeing-machine requires revision of old ideas of visibility. A traffic sign or an advertisement on a bill board may have high visibility to a person doing nothing else but looking at it. However, when that person is doing something else simultaneously, such as driving an automobile, his efficacy as a human seeing-machine is reduced. The science of seeing reveals that any other activity of a human being reduces his ability to see. Therefore, a new concept of visibility arises. A human seeing-machine, being human, has a certain total sense capacity. His efficacy as a seeing-machine depends upon how much of his sense-capacity is devotable to seeing. Distractions of every kind must be taken into account in appraising seeing conditions. This applies to human beings in the work-world, in traffic or even when leisurely reading in their own libraries. The science of seeing has emphatically introduced the human element into seeing and therefore into lighting. Not only the physical aspects but the psychological aspects assume a decisive importance.

The old ideas of visibility must be expanded to include seeing quickly, accurately and with certainty. The requirements should not be merely sufficient under ideal conditions. Factors of safety must be developed for seeing and for lighting just as they have been applied to man-made things such as bridges, which are much less subject to vagaries, subtle influences and uncertainties than human seeing-machines.

An appreciation of the adaptability of the eyes to various conditions for seeing leads directly to the minimization or elimination of many abuses imposed on the visual sense. The science of seeing introduced experiments which proved that the ability to perform a visual task under certain conditions was not necessarily an indication that the conditions were satisfactory to the eyes. Thus, production of work, which has been a criterion for dictating the conditions under which exacting seeing was done, is no longer a logical or justifiable criterion. These experiments clearly indicated that the eyes were frequently penalized by their willingness and ability to function under handicaps. Experiments which seek to indicate the relative influence of various conditions for seeing by measuring production are usually significant only when the subjects are expending the maximum energy and are near the point of exhaustion. This is a rare condition and unjustifiable excepting in emergencies.

Statistical analyses of the prevalence of defective vision establish the fact that

the eyes become defective through age, use and abuse. It is apparent from these data that although the eyes have the ability to compensate for severe or unnatural visual conditions, they are eventually injured in doing so. That the eyes are slow to complain of abuse is a fundamental reason why a consciousness of the costs of seeing would be a valuable asset to a half-seeing world.

In this sketch of the new science of lighting it is seen that human welfare is emphasized. In fact, the science of seeing is largely the extension of the older viewpoint of lighting and vision as tools into the psychophysiological realm of human beings; and, therefore, into the realm of end-products such as human efficiency, behavior, health, safety and welfare. Lighting for seeing aims to reduce the costs of seeing to human beings. These costs are not only in impaired eyesight and bodily disorders resulting from eyestrain. These have long been known but the recently extended viewpoint from vision as a tool, into seeing as an activity which affects the neural, muscular and mental processes of human organisms throws new light upon them. It reveals a goal which encompasses the unobvious as well as the obvious. To see most easily instead of to barely see is the new goal. This means the minimization of heretofore hidden wastes as well as eye-strain disorders. It means human welfare in an all-inclusive sense.

The social scientist has heretofore ignored or inadequately considered the costs of poor seeing in his elaborate studies of work conditions, rest-periods, hygiene, and other welfare aspects of human beings. The new knowledge already added to those older aspects of the science of seeing, which have been developing for a long time, will not continue to be ignored. Seeing in its broader aspects is now shown to be a drain upon human resources in ways heretofore hidden or unobvious. As seeing in this new and more extensive sense is comprehended by the social scientist, light and lighting will receive the consideration they deserve. Thus lighting becomes a part of social science. There are powerful indications that civilization is entering an era in which social science will be very important.

A new science of lighting calls for a new economics of lighting—an economics founded upon the welfare of human beings. Lighting should no longer be appraised by the useful output of the worker. This involves the welfare of the employer rather than that of the worker. Lighting must be appraised by the hidden costs or savings in human resources in homes and in schools, in traffic and in the work-world, and everywhere throughout civilized activity. Obviously the extended viewpoint of seeing reveals a widespread need for scrapping old ideas of cost of lighting and for revising lighting economics in terms of newly revealed values of light and lighting in the realm of human welfare.

Report of Nominating Committee

Mr. C. B. Auel presented the report of the Nominating Committee, the personnel of which included C. B. Auel, Chairman, R. F. Thalner, and E. W. Beck. The following officers were elected for the coming year:

General Chairman—A. S. Regula, Industrial Relations Counselors, Inc., New York City.

Vice-Chairman—E. F. Blank, Jones and Laughlin Steel Corporation, Pittsburgh, Pa.

Vice-Chairman—C. W. Smith, Standard Oil Company (Indiana), Chicago, Ill.

Secretary—W. Dean Keefer, National Safety Council, Chicago, Ill.

Members of Executive Committee for Three Years—

Cyril Ainsworth, American Standards Association, New York City.

C. E. Ralston, Pittsburgh Plate Glass Company, Pittsburgh, Pa.

R. C. Stratton, The Travelers Insurance Company, Hartford, Conn.

Member of Executive Committee for One Year—

D. L. Royer, The Ocean Accident and Guarantee Corporation, New York City.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Automotive and Machine Shop Section

Officers 1933-34

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Vice-Chairman—K. A. CALLAM, Detroit, Mich.

Secretary—G. E. SANFORD, General Electric Co., Schenectady, N. Y.

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L. E. AVERILL, C. H. Dockson Co., Detroit, Mich.

HOYT L. FRACHER, Detroit Steel Products Co., Detroit, Mich.

R. F. THALNER, Buick Motor Co., Flint, Mich.

R. A. SHAW, The Murray Corporation of America, Detroit, Mich.

CARL L. STORCK, Delco Products Div., General Motors Corp., Dayton, Ohio.

MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Automotive and Machine Shop Section was called to order by General Chairman M. J. McCarthy, Fisher Body Corporation, Detroit, who presided. Chairman McCarthy introduced Mr. Charles H. Hazelton, Directing Manager, Foote-Burt Co., Cleveland, who made a brief address of welcome on be-

half of the convention city. General Chairman McCarthy then presented a brief resume of the year's activities of the section, including the accomplishments of Chairmen of Committees and Section Officers. The chairman then introduced the first speaker.

Eye Injuries in Industry and Their Treatment

By DR. P. G. MOORE

Oculist, Cleveland, Ohio

The speaker said in part: Will it be possible in the future to prevent all eye injuries?

Will every man engaged in industry have to wear goggles?

The following examples are a few of the serious cases I have treated where goggles were not used and where total loss of vision has resulted.

1. A foreman showing a workman how to scrape a bearing runs the scraper into his eye with loss to the eye ball.
2. Two track men driving spikes into railroad ties are struck in the eye with chips of steel, with loss of an eye in each case.
3. An electric line repair man striking an electric cable with a hammer is struck in the eye by a chip and suffers the loss of the eye ball.
4. A sheet metal worker's helper holds a sheet of galvanized steel through which the worker drives a rivet and a slug of steel lodges in the helper's eye. The eye is saved, but all useful vision is lost.
5. A workman pours babbit metal, wearing his goggles on top of his cap, the metal splashes in both eyes, destroying both eye balls.
6. A workman crosses in front of a furnace in which scrap is being melted, a slug from the furnace strikes him along side of the eye ball rupturing the retina and destroying vision.
7. Several men have lost eyes from being struck by flying nails which they were driving into hard wood.
8. A large number of automobile mechanics work without goggles.

I mention these few examples to show that there are still large numbers of men exposed to risks, who suffer severe injuries to the sight and who are not in those classes commonly expected to be wearing goggles.

The greatest number of eye injuries consist of foreign bodies on the cornea. The importance of eye injuries of this character is just as great as that of the perforating injuries to the eye ball, because if these foreign bodies are infected, or if the instruments used in their removal are infected or if the conjunctiva is infected, loss of vision or of the eye ball may result.

These foreign bodies may consist of small bits of carbon lying loose on the cornea or bits of emery or oxidized metal burnt into the surface of the same. The removal of a bit of carbon from the surface of the cornea should be just as aseptically done as the removal of a piece of steel from the inside of the eye ball. The foreign body should not be wiped from the cornea, but picked up from it, for in wiping it off the cornea may be scratched and infection introduced.

Foreign bodies may be wiped off the conjunctiva with an applicator wrapped in cotton, but if a bit of carbon with its fine teeth is lying on the cornea then it should be lifted off with a sterile instrument in order to prevent scratching the surface.

Emery and oxidized metal on the cornea comprise the most important class of foreign bodies in the eye. Usually the patient is not conscious of these foreign bodies being present until an hour or so after the time of the accident, as at first the hot particle tends to anesthetize the corneal surface.

During working hours the patient formerly went to some person in the shop who was skilled in removing these foreign objects with a pocket knife or sharp instrument. I will grant that these men were skillful in this kind of work and relieved their patient, but the patient ran a great risk of having an infected ulcer of the cornea due to the use of infected instruments.

The proper treatment of these cases should be the immediate removal of these

foreign bodies by a person thoroughly trained in the technic and in the use of sharp and clean instruments. The man who removes foreign bodies from the eye is as much a specialist as the throat specialist who takes out tonsils. A nurse with good eye sight and proper temperament can be taught the technic and do the work satisfactorily, but should not be allowed to do it on her own responsibility.

The essential things required in the removal of a foreign body from the cornea are: A strong comfortable chair with a firm head rest. A good light. A magnifying glass. A good anesthetic; a 4 per cent cocaine solution or its equivalent. A sharp knife.

Where the particle of carbon, or stone or cold metal has been removed from the cornea, without causing a serious wound of the corneal surface in its removal there should be no scarring of the cornea and no impairment of vision. If the foreign body struck the cornea hot and burned the surface, and if the foreign body and burnt scale are removed skillfully with a sharp clean instrument, the wound will heal leaving a thin gray scar which if it is not too thick will disappear in a number of months.

If the foreign body penetrated the deeper layers of the cornea due to the heat or if extensive laceration of the tissue took place in its removal then a small scar may persist and if it lies in the central papillary area serious impairment of vision may result. Particularly is this true if there is a slight warping or cupping or flattening of the corneal surface.

One should be guarded in making a statement about the loss of vision in cases where there is a scar over the center of the cornea. This scar may be visible to the observer, but still cause no impairment of vision.

In cases where the wound is infected at the time of injury or the conjunctiva is infected, the period of disability is much longer and may run into several weeks' time. The wound may develop into an infected ulcer which if it lies over the center of the cornea will destroy all useful vision and the infection may involve the entire eye ball resulting in its removal.

Foreign bodies in the cornea consist of chips of metal which are driven into the corneal tissue. Sometimes they lie on the inner most layer of the cornea and efforts at their removal may push them into the anterior chamber. They may lie between the layers of the cornea. They are generally so small and so tightly wedged in, that if they happen to be iron or steel their removal with a magnet is impossible. By carefully cutting around them with a sharp knife they may be removed. This type of foreign body is often overlooked by the examiner, as they are hard to see in the deeper layers of the cornea, and if the foreign body is found several days later, the patient thinks he has a case of malpractice against the physician.

The prognosis in these cases is good as to recovery of vision, if the injury lies to one side of the central area of the cornea and no infection occurs.

If the wound is extensive, over one-eighth of an inch long, warping of the cornea may result causing impaired vision. If the wound is infected as it is generally, if the patient happens to be working on a used automobile a serious ulcer is likely to develop and loss of the eye ball may be the outcome. The operator must be extremely careful with his technic as the wounds are deep and if infection is carried in or if the anterior chamber is punctured serious results will occur.

Penetrating wounds of the eye ball are more serious and should be treated in the hospital, if hospital beds are at all available. This class of wounds follows penetration of the walls of the eye by sharp objects, bits of glass, ends of wire, broken tools, chips from dies, hammers, etc. The object may or may not remain in the eye.

Unless the foreign body can be seen it is advisable to have an x-ray picture taken and the presence or absence of a foreign body determined. If a foreign body is present its position in the eye ball and its size should be plotted out. The removal of the foreign body should then be accomplished, if possible within the first twenty-four hours for if it remains longer it becomes embedded in blood clot and fibrin and its removal becomes more difficult. Every effort must be made to save the uninjured structures and preserve what sight there is left. The prognosis in these cases is serious.

If the foreign body was small, less than one-eighth of an inch in length and

the lens uninjured, good vision may be preserved. If the wound of entry is large, one-half inch or more in length, or if the wound occurred in the ciliary region just outside the cornea, the chances are that the eye ball will have to be removed. If the foreign body was infected as most particles from used automobiles and dirty tools are, then a general infection of the eye results and removal of the eye ball becomes necessary.

Blows on the eye ball may result very seriously as to injury to the sight. The external wall of the eye may not be injured, but the iris may be torn causing a hemorrhage within the eye ball.

The lens may be dislocated destroying all useful vision and may necessitate the removal of the eye ball.

The retina may be torn and detached, destroying all vision in the injured eye. Burns ranging in severity from the causing of a dryness of the cornea and conjunctiva to the sloughing of the entire eye ball.

Burns of the cornea which do not leave extensive scars and which do not apparently interfere with vision may cause disturbances in the retina with an atrophy of the fine nerve endings which leave the vision seriously impaired.

The seriousness of a burn cannot be estimated until several days after the accident.

The recovery from serious chemical burns is prolonged and painful.

The prognosis in these cases is extremely doubtful and may be uncertain for months.

Every eye accident is a distinct problem in itself as to treatment and result.

How the Automotive Industry Can Help in Reducing Street Accidents

By DEL SMITH

Manager, Detroit Street Railway, Detroit

The speaker said in part: The manufacturers and designers of automobiles have done much to promote safety on the highways. Perhaps no phase of development has occasioned as much concern as headlights, and unless we are definitely associated with the industry we can have no conception of the vast amount of research work that has been carried on. Today, the illuminating equipment of an automobile is nearly everything that can be desired, but the research continues, in the hope that artificial light which will have nearly the same effect as daylight can be produced.

We should not overlook also the marvelous achievement of the scientists who have brought fame to the producer of tires. And one of the recent steps of progression is the development of shatter-proof glass and its prompt and nearly universal adoption by the automobile industry. Body design and construction now mark an epoch in the building of safety into the machine. Wheels also have nearly reached the apex of perfection, and steering gears, axles, driveshafts, and every component part represents the finest handiwork of the skilled artisans in striving for efficiency and safety.

One of the most important developments, especially in its bearing on accident prevention, is the four-wheel brake. Its introduction and universal adoption by the industry took place within two years.

Now that we have had a brief review of the credit side, perhaps an examination of the debit side may reveal something of interest. Most states enact their own laws, regulating the fitness of those who operate motor vehicles, but most of the states entirely disregard the importance of such regulations or tolerate regulations that are not sufficiently rigid to give the necessary protection. Therefore, it seems to us that the very first step to be taken is a move for standard regulation of a person's physical ability and mental alertness. There are agencies whose coordinated efforts could help in bringing this about, and one of these is the automotive industry. The insurance companies have some responsibility in the matter, and the National Highways Association and the National Safety Council would render

yeoman service. Enforcement of the regulations seems to lie properly within the province of the State.

We hear of many cases where collisions between machines have resulted in disastrous fires, and it occurs to us that, until such time as engines using lower grade fuels have been perfected, something in the way of a flameless magazine could be attached, which would go into action whenever the spread of gasoline followed a collision.

All upholstery should be made of as nearly fireproof materials as possible; and still another major change that appears in the offing, and that in our belief will make for greater safety, is the mounting of engines at the rear. From a standpoint of comfort and health, air conditioning is highly desirable, and the automotive industry will see to it that such features are provided.

The automatic transmission is heralded as one of the refinements that will go a long way toward simplifying driving; increasing the comfort of the operator, and consequently lessening the accident hazard. In fact, this device is so nearly perfected that undoubtedly it will be a feature of practically all makes of automobiles in the near future.

Recently, Michigan enacted a law called the Financial Responsibility Measure. This provides that the car owner does not have to carry liability insurance, but if he has an accident, damaging another's property, or injuring a person, and judgment against him is obtained, and he tries to evade payment or has not the money to pay, then he is deprived of the right to operate a machine until the judgment is satisfied. The Automobile Club of Michigan was responsible for the passing of this law and its great value was demonstrated very quickly.

Developing Safety Consciousness and Cooperation in the Supervisory Force

By HARRY W. DARR

Safety Supervisor, Cambria Plant, Bethlehem Steel Co., Johnstown, Pa.

The speaker said in part: Many men in years gone by were classed as excellent supervisors in the industrial plant because of their ability to produce both quantity and quality product, but, sad to say, at the sacrifice of human life and energy. These men now become our major safety problems. The young supervisor who has reached his position since the advent of real safety activity in the industrial plant should not present this problem, because safety has been a major part of his early training. Our main problem, then, is making the supervisor, old on the job, conscious of the new problems that face him daily.

How can this be done?

After 20 years of dealing with all types of men in the matter of accident prevention, we have arrived at the conclusion that the only effective method is the old adage, "Learn to do by doing." During those years we followed a number of avenues with a view of reaching the employee who is always imbued with the "I don't care" spirit. It finally dawned upon us that a more perfect organization must be effected.

Thereupon we set out to build up a more perfect and farther reaching organization, known as a Permanent Safety Committee. In our plant this committee consists of 60 men and holds regular monthly half-day sessions under the direction of the safety engineer and a representative of the general manager's office. Matters discussed are of a general character and intended to be of some benefit to the plant at large and of an inspirational and thought provoking nature. The personnel of this committee is made up almost entirely of foremen, each one representing about 200 employees. A record of the proceedings of the entire session is prepared and conspicuously posted at about 75 different points throughout the plant. The names of all committeemen and the division they represent appear on the face of each set of minutes, which automatically places them before their constituents as their safety representative.

We will now assume that we have been successful in instilling safety conscious-

ness into the minds of 60 leaders or supervisors—and we can truthfully state that this method does wake them up—what about the remaining three or four hundred, occupying similar positions, in the average sized plant?

In order to reach the farthest nook and to contact the most arbitrary and remote leader, as well as those who already are doing what they can, a series of monthly divisional or departmental safety meetings are scheduled for the entire plant. This schedule covers eighteen district points and is prepared one year in advance. The superintendent of each division, on the instruction of the general manager, conducts this meeting in his own locality and in the presence of the safety engineer. The total monthly attendance at these meetings usually averages about 500, made up first of the Permanent Safety Committeemen of the division, second, the remaining foremen, and third, other workmen who display an interest in accident prevention, and sometimes the workman who shows no interest at all.

Now the question arises: How do you spend from one to two hours talking about or discussing the same old thing, month after month? Well, if it were the same old thing each month it would be real irksome, but if you make it a new thing each month, it becomes an easy matter, more interesting, more attractive, and more effective.

In order to arouse and maintain a growing interest, it is vitally necessary that some specially designed and appropriate line of work akin to accident prevention be injected into and made a part of these meetings. Specially designed courses of instruction are available. But it is not a difficult matter to compile and apply a course applicable to one's peculiar needs. In our plant we have just recently completed the third such course of 8 to 10 months' duration, with a lapse of several months between each course.

It is desirable that each of the divisions start this course of instruction during the same month, so that at the completion of each subject or at the end of each month or conference period a review of all department conferences can be made and the best discussion of each subject be transcribed verbatim and posted for the benefit of all workmen. Some of the subjects used were the following: "Does safety work pay?" "Safety work and the industrial depression." "The new employee." "Are safety and good housekeeping related?" "What is a foreman?"

During each of the 18 monthly department meetings, about one-half the time is given to local or department problems. Recently, when the subject of "Good Housekeeping" was discussed, the division or topic, "The effect of good housekeeping on industry," was assigned to a foreman who was never considered a live safety man, and whose general housekeeping was of the lowest type. He produced, however, an excellent brief paper on his subject. At the conclusion of his paper he sat down, looked around and heard no comments, but saw plenty of knowing grins. It is very obvious that his mind immediately went back to his dirty and disorderly shop, and he did not forget it when this discussion was one of the nine selected for posting that month on the bulletin board.

Now, let me ask you this question: Dare this supervisor ever go into another slump where the appearance and safety of his shop are concerned?

If you do not yet know it, may I digress just long enough to inform you that our National Safety Council has a number of just such courses of training available at a very nominal cost. All such publications are flexible enough that they can be made applicable to any line of industry.

Now you will naturally wonder, how did you or would you reach the superintendent, the man who maintains the direct line of contact with the plant manager?

In any plant of any consequence there always is, or should be, an intermediate agency that directly contacts the plant manager. This person should, by all means, be the head where all auxiliary agencies, such as Safety, Welfare, Police, Employment, etc., should merge. If this intermediate executive has the ability and tact, he can so arrange and coordinate his various reports and requests as to have a genuine appeal to the powers that be. After a very short time, through the medium of reports of accidents, comparisons with other plants, cost of accidents, and other data originating with the safety engineer, the plant manager will soon fill up with an enthusiastic desire to show some improvement and the fountain of interest in human life and welfare will overflow and rush down through the executive chain-

nel, taking with it superintendents, assistants and others, until it finally reaches the last man in the organization.

Dare the safety engineer not speak to the department superintendent? Sure, and he should on matters pertaining directly to his department, but since effective safety work has come to reach so far beyond simple safeguarding and other similar activities in the plant, it becomes necessary to establish a system of uniting the greater principles of this work which are all embodied under one great system of education—hence the impetus given by the plant manager. We must recognize the fact that God made the only true safeguard, the brain of man, and that we must learn how to use it. And when properly used safety becomes a matter of desire and pleasure, and not the result of compulsion. Personally, I do not believe in many rules, but rather in the application of common sense, urged on by a pleasant desire to please, protect and preserve all human life and energy.

We cannot leave this phase of the subject without referring briefly to another auxiliary agency known as a General Safety Committee. This committee is composed of the safety engineer as chairman and the four department superintendents, who serve for a period of from 3 to 6 months, rotating in such a manner as to always have at least two men on the committee familiar with the duties related to their appointment. One of the main duties of this committee is that of investigation and recommendation where irregularity breaks in on the established routine of the industrial organization. This is particularly true in the case of all serious or fatal accidents. But the work and influence of this committee is manifested even more so in the case of accident where no personal injury is the result. Such accidents are often passed by entirely too lightly. We have found that the influence of this committee on the supervisory force and workmen in general in arousing safety consciousness and enlisting their cooperation is incalculable. The recommendations of this committee are also made public.

There is another phase that is old and yet new. I refer to the mechanical feature of safety. Machine guards, signs, bulletin boards and other similar auxiliary agencies are being sadly neglected. Every employee of any industrial plant comes in contact with some of these fixtures many times during the course of the working turn. Would it not be wise to secure some executive order and place the responsibility on the department superintendent to have all guards plainly discernible by means of an attractive color, coupled with efficiency and neatness?

Thus far we have said little or nothing about cooperation. Let us start with the superintendent or the divisional supervisor. Here is where the safety engineer figures very strongly. He must be a man with a pleasing personality, tactful, and filled with a knowledge of his subject and vocation. He must never fail to avail himself of the opportunity to call upon this official when in his territory. When calling, he should have some definite thing in mind pertaining to the particular department and the superintendent, and present it in a pleasing and catching manner. Although usually absorbed in problems pertaining to costs and production, the superintendent, if properly approached, will readily discuss the great problem of accident prevention as an economic measure.

The safety engineer should establish as many friendly contacts as possible. One venture that has proved quite successful is the establishment of a plant mailing list, including plant manager, assistants, superintendents, foremen, safety committeemen. In fact, as far as possible, the entire supervisory force. Here again the safety engineer must display tact and ability in the preparation of material which will prove both interesting and instructive. He might enumerate such subjects as "Comparative monthly contest statements," "Analyses of peculiar accidents," "Forewarnings of seasonable accidents," "Outstanding achievements in other plants in accident prevention," "New developments in accident and sickness prevention," and many others.

For a report of the Joint Session with the Power Press Section, held on October 2, 1934, turn in this volume to the general division entitled "Power Press Section."

WEDNESDAY MORNING SESSION

October 3, 1934

The Game of Life

By G. A. KUECHENMEISTER

Personnel Manager, Dominion Forge and Stamping Co., Walkerville, Ont., Can.

The speaker said in part: Some of my friends express surprise when they learn that our safety meetings are so well attended. To me it is not at all surprising that people are interested in safety, for we talk about the greatest of all mysteries—Life, and the equally mystifying and to some people very awesome thing—the End of Life.

To me life has always been a game. Just a great game that all of us must play whether we want to or not. That does not mean that life is always fun—there are times in all games when fun ceases and the pleasure is gone. My mental attitude toward life is that it is a great game that has pleasure, fun, disappointment, hard labor, rest periods, penalties and rewards in it, and we must all play whether we want to or not. When you begin to think of life as a game it opens up some interesting avenues of thought. The first thought I had when I began to think about life as a game was that all games are regulated by definite rules and our proficiency depends very much upon our ability to learn the rules and use them to advantage.

There are some people, of course, who think that rules are made merely to be broken. They try to ignore the rules and take a short cut to the end of the game. When we catch them at it we call them cheaters and penalize them. If they persist we throw them out of the game and refuse to let them play.

A few cheaters now and then do not permanently affect the game, but when all the players in any game quit playing according to the rules the game ends right then and there. It simply cannot continue.

I believe the game of life is played in exactly the same manner and if we want to stay in the game and have the game continue we must play it according to the rules.

The first rules that come to mind, when you begin looking for rules in the game of life, are, of course, the Ten Commandments; and then, that other rule that to me always seems to be more of an explanatory footnote—The Golden Rule.

Our experience and newspaper reading show us that more and more people have been breaking these fundamental rules of life.

The man who employs child labor or operates a sweat shop at starvation wages breaks one of the Commandments, because he kills. The man who operates a factory and refuses to safeguard dangerous machinery is guilty of causing the death of workmen. That is not a new interpretation of the law. Way back in the days of Moses, the law was given that if a man built a flat-roof house and failed to put a guard rail on it and a man fell off this roof, his blood was on the house owner's hands. It is safe to assume that if there had been modern machinery in those days, Moses would have included in his law the safeguarding of that.

Perhaps if we had the penalties attached to our present-day compensation laws that they had in ancient times, we would have fewer industrial accidents.

In Exodus we find a law that says if a man owns an ox and it kills a man or woman, the ox must be stoned to death and the flesh not eaten, but the owner may go free. But if the owner has been informed that the ox is vicious and does nothing about it, then if that ox kills a man or woman the ox shall be stoned to death and the owner also killed.

The plant manager who raises money either by selling stocks and bonds to investors or by borrowing depositors' money from the bank, and then gives that money away to customers because he manufactures a product and sells it far below cost, is just as guilty of stealing as a man who forcibly takes it from a man or a bank; and any man capable of managing a business certainly is capable of knowing whether he is selling far below cost; to justify his doing so by saying that

he does so because others do it is just as poor an excuse as saying that because some men are racketeers and kidnapers, we should all be the same.

The reason we have our NRA today is because more and more people were breaking the rules of business until finally the players had to throw up their hands and admit that unless some way was found to compel people to play fair the game was ended.

The best test I know of for deciding whether a thing is worth while and good and durable is to ask this simple question: "What will happen if everyone does that?" The best and quickest way to break up any "racket" is for all of us to go into it. On the other hand, our safety movement will stand that test because it will grow and be strengthened if we all go into it.

There are certain rules of the game that we must obey if we merely want to stay on earth and be nothing but spectators—just to stick around and watch other people go places and do things.

One of the most common causes of injuries and deaths is collisions. If it were true that every collision had a separate, distinct and new cause of its own, the problem of preventing injuries caused by collisions would be too big for most of us to tackle. There would be no possibility of catching up with the hazards. But the truth is, of course, that a collision is due to but one thing, the breaking of one of God's most fundamental laws—the law that says, "Two objects cannot occupy the same space at the same time."

It is easy to figure the result of a collision in advance. All we have to do is to take an engineering handbook and use the formula for the impact of moving bodies. But we don't. We go right on breaking the rule and take our punishment.

If a man in an automobile tries to occupy the space occupied by a baby in a carriage—we call the result negligent homicide. If a man in a car occupies the space about to be occupied by a locomotive and the roadway is clear for a mile or more each way, we wonder whether he committed suicide. One of the Commandments the authorship of which is never questioned says: "Thou shalt not kill."

The next big cause of sudden and violent death is slips, trips, falls, and falling objects, and again a fundamental law plays an important part.

You can step off a cliff, off the top of a building, get on a weak ladder or scaffold any time you want to. There is nothing in this world to prevent you except your own good sense or the intervention of someone who has good sense. But the moment you step off the cliff or building, or the moment the ladder or scaffold breaks, another one of God's laws will go into action—the law of gravitation. And the result of your folly will be determined by still another of God's laws—the law of averages.

Wise men tell us that if that law were removed the entire universe would fall in a heap in a moment. That may or may not be true, but we do know that the law of averages does apply to what we call industrial accidents. It is so true that the engineers of Travelers Insurance Company have worked out a definite ratio. They call it the 1:29:300 ratio—meaning that for every incident that results in death or serious disablement there are twenty-nine incidents that result in so-called minor injuries and 300 other cases where, fortunately, no one is injured.

The trouble with the ratio, of course, is that, like the working of the law of averages in all other matters, it does not tell us which case is going to result seriously. All we know about that law is that if we do a thing a certain number of times we will get certain results, and if we repeat it for the same number of times we will get the same total results, but we can never be sure of just when certain things will happen. But we can be sure of one thing: That is that every time we indulge in an unsafe practice successfully, we are just that much nearer to the time when it will not be successful. The man who drives past "blind corners" without having his car under control, the man who grinds without goggles, and the man who indulges in any other unsafe practice and thinks that because "nothing has happened yet," that nothing will happen, had better be careful, because he is very close to the time when something will happen. Because he has done it "for forty years" is no reason it will not happen.

There is another angle in the 1-29-300 ratio that may be misleading. That is the part relating to the 29 cases where the victim is "hurt only a little bit." We used to talk about minor and major injuries. We have quit doing that. We have learned that any and every injury may very quickly become a major injury resulting in serious disablement or death.

The statistician of the Workmen's Compensation Board of Ontario called my attention to that fact very forcibly one day when he said: "Gus, you name any injury you want to and I'll guarantee to find, in compensation records somewhere, where that injury you name has already caused a death." He did not say—"You name the injury and I'll prove that it may cause a death." He said, "You name the injury and I'll show you that it has already caused a death"—and probably many of them.

Report of Nominating Committee

At this point General Chairman McCarthy called for the report of the Nominating Committee, and officers for the ensuing year were elected as follows:

General Chairman—Merle C. Hale, General Motors Corp., Detroit, Mich.
Vice-Chairman—C. T. Winegar, Dodge Brothers Div., Chrysler Corp., Detroit, Mich.

Secretary—M. A. Clark, United States Rubber Co., Detroit, Mich.
News Letter Editor—W. J. Denniston, Hyatt Bearings Div., General Motors Corp., Newark, N. J.

Engineering Committee Chairman—G. E. Sanford, General Electric Co., Schenectady, N. Y.

Health Committee Chairman—Dr. A. L. Brooks, Fisher Body Detroit Div., General Motors Corp., Detroit, Mich.

Membership Committee Chairman—C. W. Bishop, Locomotive Manufacturing Co., Williamsport, Pa.

Posters, Slides and Safety Kinks Committee Chairman—Nelson Kiser, Studebaker Corporation, South Bend, Ind.

Program Committee Chairman—Marvin A. Heidt, Budd Wheel Co., Detroit, Mich.

Publicity Committee Chairman—C. A. DeMonge, Kelsey-Hayes Wheel Corp., Detroit, Mich.

Statistics Committee Chairman—R. F. Thalner, Buick Motor Co., Flint, Mich.

Members Executive Committee at Large—
L. E. Averill, C. H. Dockson Co., Detroit, Mich.

C. M. Dotterrer, Revere Copper and Brass Inc., Detroit, Mich.

H. L. Fracher, Detroit Steel Products Co., Detroit, Mich.

M. J. McCarthy, Fisher Body Detroit Div., General Motors Corp., Detroit, Mich.

R. A. Shaw, The Murray Corp. of America, Detroit, Mich.

Carl L. Storck, Delco Products Div., General Motors Corp., Dayton, Ohio.

The Safety Man's Responsibility in Industry

By T. P. ARCHER

President, Terndstedt Manufacturing Co., Detroit, and Vice President, Fisher Body Corporation

The speaker said in part: I want to take, in discussing this subject, what may appear to some of you as a somewhat unorthodox position. The Safety Man's responsibility in industry to me is one thing; safety supervision of responsibility for safety supervision in industry is another thing; and I have never believed that they could ever be successfully considered as one and the same thing.

Let me define that a little. Safety supervision will not be successful safety supervision unless it includes all supervision. Safety supervision can never suc-

cessfully be placed in the hands of one man or two men, or of three men. It cannot be the job of one little group. Safety supervision, to be successfully adequate and efficient, must be the responsibility of all supervision.

So when I talk to you about safety supervision, I am not speaking particularly of the man whose title is Safety Engineer, Safety Man, or Safety Director, or Vice President in charge of Safety. When I speak of safety supervision, I am speaking of all supervision. When I speak of a safety man, I speak of the man whom we consider should supervise safety supervision. There is a real difference. I do not want to feel that a sound safety man can successfully supervise safety in a plant of any considerable size. He is not big enough, he cannot cover enough territory; he does not know enough, and he can never learn enough. But any safety man who has the right fundamentals and the proper understanding of what makes up a safety supervisor, can successfully supervise safety supervision, so long as the entire organization realizes and understands the fact that safety supervision is the responsibility of the entire supervisory board.

We did a little investigating a few weeks ago of just what this matter of successful supervision could mean, and we came out with a definition which I am going to try to repeat to you. "Successful Safety Supervision will consist of an unique understanding of applied mechanics, combined with a sound appreciation of the psychological factors, psychological forces, which motivate an operating personnel."

Now, there is a mouthful of words for you to digest. Let us look at it in another way, like this: Sound safety supervision also must, to a degree at least, define a sound and successful safety supervisor; and if that defines a sound and successful safety supervisor according to our definition, it defines a safety supervisor of any operation and any industry; and it also defines the responsibility and the place of the safety man in industry.

In plain language, it just means this. That a good safety man will be a "jack-of-all-trades," with an unholly gift of gab and the cily persuasiveness of the champagne salesman.

It is my opinion that a safety man does not necessarily have to be a sound mechanic. He has to have an appreciation of applied mechanics, yes. I am almost certain that he won't be successful if he is an unsound mechanic. He must know mechanics. He must know and appreciate what operations are necessary and how those operations are applied and whatever processes are involved in the operation of an industry. Those things he must know, but he must know the majority in a little different way than we would understand as sound mechanics.

We have in all our industries experts to develop process. We have mechanical engineers, die engineers, tool engineers, and all sorts of engineers to determine sound mechanical practice, sound mechanical results, and to assure ourselves that we are going to get a pre-determined production.

But our safety engineer must approach his job from a different angle. His job is not to determine before hand what a product will be. His job is to determine before hand what a problem might be. It is not his job to determine what will be the results when all mechanical movements and processes are going entirely right. His job is to determine what are going to be the results when mechanical movements and processes go entirely wrong. And thus, in my estimation, it is one of the prime places of the safety man in industry not to look upon our operations and the application of our processes from the ordinary standing of an engineer, but to look at them from the unordinary outlook of a man who is not looking for certainties at any time, but is always searching for the uncertainties.

But now I want to talk to you a little, not so much about the safety man's present place in industry as about his new place in industry. Everything we pick up nowadays is new; everything we read is new; everything we think about is new. So our whole thought, our whole set-up of conditions today revolves around something new. If we haven't already got something new we are searching for something new every day. We are in a state of flux, we are in a state of constant change, searching for a sound foundation on which we can again begin to build; and that has developed, it seems to me, an unique opportunity for the safety man if he realizes and appreciates the fact that he has a place in this new order of things and that he has a new responsibility in serving industry.

The one thing which has come out in this entire situation resulting from all this newness which is distressing, and which is causing apprehension, is this feeling of unrest among the average employee, the man upon whom we have been depending for so long—this feeling of class consciousness which he has developed. I hate to use that term "class consciousness." I don't understand why it has become necessary to unleash the forces which have developed it; but it is developed, and we, as industrialists, must recognize it, and must find the proper counteracting forces to either eliminate or so control and guide it that eventually we will have arrived at a new level of operation which is satisfactory and fair to all.

So I want you to think about the safety man's new position with this idea in mind, that he occupies an unusual opportunity to be an ambassador of good will, an ambassador of increased confidence, an ambassador of those sound things which have really stood in American industry during all its history.

This matter of getting over to our men, getting over to the mass of our men, the fact that there is and always will be a mutuality of interest if success is to be had by all, has become the most important factor in our supervisory operations, and to my mind the safety man occupies the most unique position possible in his ability to assist in accomplishing that very thing. He has without doubt the best opportunity of any man in our entire organization to get close to the man at the bench. He has the best opportunity to get his side of this picture which is being daily discussed. He has the best opportunity to get his sympathy, the best opportunity to appeal to his better side; and after all, today the thing that is most to be regretted in this entire industrial situation is the loss of confidence which has developed for reasons beyond the control, I believe, of any man.

Safeguarding Machinery at its Source

By W. S. GUNDECK

Manager, Co-operative Department, Studebaker Corp., South Bend, Ind.

The speaker said in part: In the past machines were designed along more or less standard lines, with the emphasis on machine capacities or volume of production, and the machines were single purpose machines. However, with the era of efficiency and high production it was necessary to adapt machines to multiple purposes. This adaptation presented new dangers and problems in safeguarding. Even though the manufacturer had made suitable safety provisions on the machine, the user of the machine, in adapting it to multiple purposes, gave very little consideration to the safety factors.

When standard types of machines are adapted for special or multiple purposes, there are two important safety features to take into consideration: 1. Protection of the workman from physical harm; 2. Protection of the machine from damage. What this involved is indicated by the following statement: All vertical tool heads must be fully counterbalanced. For many functions such as reversing rotating members, traversing members, dwell for facing and counterboring, skip feed, there is a choice of mechanical, hydraulic or electrical means, or combination of all these means. A choice can be made based on trouble free, safe, and positive operation.

It can readily be seen, therefore, that re-adapting a machine presents many problems which the user may fail to take into consideration.

The cost of the machine is also a consideration. There is no doubt today that there are in use thousands of old type machines that lack proper safeguards. The user of these old machines feels that he cannot afford to purchase up-to-date modern equipment and may often spend more than the price of a modern machine in attempting to adapt his present equipment to new uses.

Special machines should be provided with the same type of control and safeguards as the standard machines. When purchasing special machines the buyer should consider this and not demand such short deliveries, causing these features to be neglected due to lack of time.

Another important limiting factor in building safety appliances into the machine

is: How close to point of operation can a machine be guarded? I believe that we have few accidents caused by the gears, pulleys, or other parts of the machine because the manufacturer of the machine has very thoroughly safeguarded these points, and I believe that most machine accidents are caused by the cutting tools of the machine at the point of operation. It would be unreasonable to expect the manufacturer of the machine to provide adequate safety controls at the point of operation unless he is given sufficient time to properly design, build, and thoroughly test the machine.

Here is a concrete example of how close to the point of operation a machine can be guarded. The square shear has been considered almost impossible to guard at the point of operation. In 1933 we had two unfortunate accidents on square shears, two employees were injured within a period of two weeks, resulting in amputations. After these accidents, our safety engineer visited several users of large numbers of square shears and was advised that no suitable guards had been developed. The problem seemed baffling, but he was determined to develop a guard that would properly guard the knife. Suffice it to say that he did develop a guard that makes it impossible for the operator to get his fingers under the knife. Moreover, I believe that this installation can be incorporated in the manufacture of the machine at very little additional cost.

The question naturally occurs, what attention, if any, should be paid to the tools, the jigs, and the fixtures? There are certain types of machines that despite the fact that every movable part of the machine is guarded to its fullest possibility, yet the only point at which an injury may occur is totally exposed. I am thinking now of the wood shaper. We attempted to guard the heads of all shapers in the best possible way, but were not successful to any appreciable degree, due to the fact that the men were not able to see the actual work which the machine was doing or that the guard was in the way and considerably slowed down operation. We finally decided that our greatest difficulty was in our equipment—namely, our jigs and fixtures. We then reconstructed all of our shaper jigs and made them much wider than they had been, with the object of keeping the operator as far away from the shaper heads as possible. All of our jigs were ordered not less than 12 inches wide and 16 inches in width was specified where possible. All of the jigs were provided with upright handles for the operator to grasp and a No. 14 gauge piece of sheet metal formed in a half-moon shape was set just in front of the handle to serve as a protection for the operator's hands. We found this type of guard very effective and it practically eliminated all of our wood shaper accidents.

In so far as the responsibility for adequate safety provisions in the design of a machine is concerned, I believe this to be a joint responsibility to be shared by both the manufacturer of the machine and the user, because the manufacturer is in a position to theorize, test, and improve on the machine under ideal conditions, whereas the user of the machine is perhaps more familiar with the type of work he expects to produce. He also has the advantage of experience with the machine under operating conditions.

Many purchasers say nothing about safety features, probably because they assume that the maker of a high-grade machine has attended to them. Occasionally a purchaser will have special safety requirements and usually wants them built into the machine. However, if he does not pass the information that he has gained on to the manufacturer, he is lacking in his appreciation of the problems that the manufacturer is facing in designing accident proof machines.

Where does the safety engineer fit into this picture? I believe that the safety engineer could quite properly be the medium for the exchange of this information through a committee of the National Safety Council.

I am convinced that a closer relationship between the manufacturer, purchaser, and designer would result in and would bring about a more sympathetic understanding of the problems involved. From the interest evidenced by both the manufacturer and user in this subject, I am convinced that there is a sincere desire on the part of the manufacturer to build a machine as accident proof as possible, based on experience and sound engineering principles.

In conclusion, I might summarize the following thoughts:

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1. That the cost element of safeguarding a machine at its source is not of great consequence.
2. That the manufacturer is conscious of the desirability of safeguarding machinery when it is built.
3. That the manufacturer will appreciate suggestions as to methods of guarding.
4. That the purchaser must assume his share of the responsibility if he fails to specify safety devices on machines that he is purchasing.
5. That the safety engineers of machine purchasers be given authority to okay or reject machines and tools that do not meet reasonable safety standards.
6. That the high-grade manufacturer of machines is up against a state of competition, making it difficult to collect the slightest differential in price for safety features.
7. That there must be willingness on the part of the purchaser to pay these differences.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Cement Section

Officers 1933-34

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Vice-Chairman—W. W. HAMILTON, Alpha Portland Cement Co., Easton, Pa.
Secretary—A. J. R. CURTIS, Portland Cement Association, Chicago, Ill.
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F. E. TOWN, Manitowoc Portland Cement Co., Manitowoc, Wis.
H. VANDERWERF, Medusa Portland Cement Co., Cleveland, Ohio.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Cement Section was called to order by General Chairman J. B. Zook, Great Lakes Portland Cement Corp., Buffalo, New York, who presided. Chairman Zook introduced Mr. Edward J. Maguire, Vice President and Treasurer, Medusa Portland Cement Co., Cleveland, who made a brief address of welcome on behalf of the City of Cleveland. The General Chairman then presented, under the heading, "Our Work—Today and Tomorrow," some brief thoughts on the future activities of the section and followed with brief reports from the chairmen of standing committees. He then called for the report of the Nominating Committee, and new officers for the section were nominated and elected as follows:

Report of the Nominating Committee

General Chairman—J. B. Zook, Great Lakes Portland Cement Corp., Buffalo, N. Y.

Vice-Chairman—W. W. Hamilton, Alpha Portland Cement Co., Easton, Pa.

Secretary—A. J. R. Curtis, Portland Cement Association, Chicago, Ill.

News Letter Editor—Jack Dempster, Canada Cement Co., Ltd., Port Colborne, Ontario, Canada.

Engineering Committee Chairman—Frederick B. Hunt, Nazareth Portland Cement Co., Nazareth, Pa.

Membership Committee Chairman—H. A. Reninger, Lehigh Portland Cement Co., Allentown, Pa.

Poster Committee Chairman—M. P. Greer, Marquette Cement Manufacturing Co., Cape Girardeau, Mo.

Program Committee Chairman—D. B. Coleman, Missouri Portland Cement Co., St. Louis, Mo.

Members at Large—

R. B. Fortuin, Pennsylvania-Dixie Cement Corp., Nazareth, Pa.

E. Posselt, International Cement Corp., New York, N. Y.

C. F. Raiston, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

F. E. Town, Manitowoc Portland Cement Co., Manitowoc, Wis.

H. Vanderwerp, Melusca Portland Cement Co., Cleveland, Ohio.

Analysis of Accidents in the Cement Industry

By A. J. R. CURTIS

Assistant to General Manager, Portland Cement Association, Chicago

The speaker said in part: Since 1924 lost time accidents in the Cement Industry steadily decreased through 1933. In the first eight months of 1934, however, we find that all accidents have increased 55.5 per cent over the corresponding period of 1933, with an increase of 42.8 per cent in fatalities. In actual number this is 154 accidents, including 10 fatal, in eight months of 1934, as against 99 accidents with 7 fatal for the same period of 1933. For the entire year of 1933 there were only 148 accidents, including 7 fatalities.

It seems clear that good safety records in the past offer little protection for the present and poor safety records get much worse when neglected.

You have all regularly received the monthly accident reports and those of you who took the pains to analyze them perhaps found some unpleasant implications. The statement that many of these accidents clearly point to lack of supervisory interest bears repeating. Eye injuries in packing departments show lack of interest in having men wear goggles. These injuries are inexcusable. Accident after accident to men of long experience in the mill, but engaged in duties foreign to their training, indicate an assumption that is dangerous to the safety record. Accidents are occurring to new men blundering in a way that indicates no introduction to safety and no specific instruction in doing the job safely.

Study the chart comparing cement production and accidents and you will find that up to and including 1931, the two were fairly constant except during the June No-Accident Campaign. In 1932 the accident line levels off and shows a spotty variation, and in 1934 there is apparently no relationship between the two. It would seem that under operating conditions of the past three years we should find a direct relationship between accidents and production, but it looks very much as though accidents were now going their own way, quite independent of production.

What have we to do?

In general, we must make an appraisal of our past activities and compare them with a complete, well rounded program to determine the weakness, if any. We must set up a definite schedule of safety activities and then follow through to see that each activity is carried out. The following outline may serve as a guide and check list.

1. *Safety Committees.* Have they met regularly? Have the meetings become pure routine? Is every person asked to express himself? Have any company officials participated in the meetings? Has the committee personnel rotated? Are the P.C.A. accident reports discussed and acted upon? Are plant and departmental safety inspections made regularly. Is a written report required and is it acted upon? Have any recommendations been overlooked or neglected or does every suggestion receive careful consideration?

2. *Foremen.* What effort has been made to get action from foremen and supervisors? Have they been called together as a group, irrespective of the safety committee, and charged with safety responsibility? Have they had individual meetings with the superintendent to discuss safety? Have they been encouraged to discuss specific cases of safety rule violations? Are all foremen requested to analyze accidents occurring in their department and the cause thereof? Is it common practice for foremen to talk to new men about safety? Are they charged with the responsibility of instructing men on safe way of performing all duties? If so, is this procedure followed when men are shifted from one department to another?

3. *General Plant Program.* Have any general safety meetings or gatherings been held during the past year? When plant is reopened following shut-down, are employees reminded of safety? Is it possible to call all employees together at time of reopening of plant for a brief safety meeting led by superintendent? Have any contests been conducted? Are plant publications of any kind used? What general educational work is conducted? Are bulletin boards kept interesting by frequent change? Has any disciplinary action been taken for rule violation? Is recognition given to good departmental accident records? How are accidents and near accidents and infections publicized? Are accurate records kept of minor injuries? Are employees' families interested in the safety program? Are employees encouraged to report serious illness or other trouble in their families? Do you make physical examinations of your employees? Have you a first aid team in your plant? Do you encourage safety suggestions from all employees?

When we have answered all of these questions honestly, we are ready to set up an activity program for every month to include the following essentials:

1. Regular plant inspections to uncover physical hazards. Foremen should participate and be charged with responsibility of following through on every recommendation.

2. Regular safety committee meetings. Rotate the membership on these committees. Divide into sub-committees to report on such things as good housekeeping, bulletin board publicity, fire prevention, first aid, sanitation, sickness, etc. See that company officials appear before the committee frequently.

3. Reports and investigations. See that every accidental injury whether lost time or not, is reported fully and the real cause determined. Accept no reports that do not arrive at a definite conclusion as to cause. Publicize every report with photos or drawings. Hammer away at first aid reporting by publicizing possibility of serious infections.

4. Safety education. Plan your bulletin board material far in advance. Decide on a central theme for each month; for example, have a first aid month, a housekeeping month, etc.

Arrange interesting informal safety meetings without side speeches. Pep them up with boxing or wrestling matches between plant employees.

See that every new man is personally instructed in safety by his foreman.

Use contests which will allow participation of every man on an equal basis.

5. General. Conduct a series of foremen round table discussions for six weeks, one evening a week. Much foremanship training material is available. Make the final meeting a dinner and let the foreman do the talking.

See that the attitude of every employee toward safety is known to the foreman and the superintendent.

At least twice a year, see that the plant safety program is brought to the attention of employees' families.

How to Investigate Our Accidents

By M. P. GREER

Safety Engineer, Marquette Cement Mfg. Co., Cape Girardeau, Mo.

The speaker said in part: Accidents are investigated for three purposes: First, to determine direct and contributing causes; second, to fix the responsibility; and third, to take proper steps to prevent a recurrence. The time and place of investigation are very important considerations. An accident should be investigated just as quickly as possible after it occurs, for a delay might allow important evidence to be removed or destroyed. A trip to the exact location of the accident by the investigating body, to enable the members to get all the physical details and a reconstruction of the mishap in their minds, is usually found to be best.

There is a big difference of opinion regarding who should constitute the investigating body. Some prefer to have a general committee of several members to make the investigation. Others give the job to a group of department heads, or to a group of workmen. Some use a court of inquiry, and others place the responsibility of the investigation upon one man, usually the department foreman or the safety engineer.

It has been our experience that a committee composed of three members is best suited to handle the investigation of accidents. This committee is composed of the foreman of the department in which the accident occurs, one workman whose duties require him to work with or near by the man involved in the mishap, and the safety director, or engineer, completing the three-man committee.

There are several reasons why we have adopted this type of committee. First, you will note that the members, with the exception of the safety engineer, are interchangeable. As accidents occur in different departments, different foremen and workmen serve on the committee. This not only enables those best acquainted with the circumstances surrounding the accident to serve, but it is educational to many more employees than would be the case where a specific group makes all investigations. Second, this group of three can get into action quickly, two of the members usually being at the scene of the accident, and the three can be conducting an investigation while a larger group is trying to get together. Third, the report of an investigation made by this type of committee can be quickly broadcast through the plant by the safety department, and it is acceptable as a true report of the facts by the workmen, the supervisors, and by the company.

Not all accidents occur during daylight hours. Therefore, it is a good plan to appoint a special investigating committee on each of the night shifts. The shift foreman and two workmen, one from the department in which the accident occurs, could serve on these special committees. They should leave a detailed written report of each accident for the safety engineer, who, in turn, can call the proper committee together the next day, and if necessary, complete the investigation.

The investigating committee, upon arriving at the scene of the accident, should go over every detail carefully while looking for the direct cause and all contributing causes. Many committees make the mistake of trying to sift the evidence down to one outstanding cause, or main cause. In almost every case, there is more than one cause, and should the contributing causes of the accident be ignored, the investigation will not be a complete success, and the chances of preventing a recurrence will be greatly handicapped.

Pictures, or sketches, showing details of the accident, are valuable in passing the educational value on to all other employees.

After retiring to a quiet place to complete the investigation, the committee should call in witnesses and question them fairly and considerately. They should be shown that the sole purpose of the investigation is the prevention of future accidents, and that their cooperation in the matter is important. Unless this is handled in the proper way, it will be hard to get a true picture of all the conditions surrounding the accident, for some employees will fear that the investigation is made for the purpose of penalizing their fellow workers.

After the investigation is completed, the committee members should review all

facts collected, reach a conclusion as to the causes, and responsibility for the accident, and make recommendations for preventing a recurrence.

When fixing the responsibility for an accident, it is well to bear in mind that the injured man is not always at fault. The investigation may reveal that there was negligence on the part of the company, on the part of a fellow worker, or even on the part of some outside party. Whichever the case may be, absolute fairness is essential, and responsibility should be placed where it belongs.

In some plants, some sort of penalties are imposed for violation of operating rules. Since safety rules are as important as any other operating rules, it is only right that a penalty be enforced upon the man who is found responsible for an accident. If the person responsible has suffered an injury or a material loss in wages, this is usually considered sufficient penalty. In other cases, a short lay-off may be given. If the investigation shows the company to be at fault, or some dangerous condition or practice is revealed, immediate steps should be taken to have the condition corrected. In any event, the committee's report should be given widespread publicity throughout the plant, with details of the investigation, and recommendations made and action taken.

How to Investigate and Capitalize on Our Accidents

By O. E. WISHMAN

Safety Engineer, Lawrence Portland Cement Co., Thomaston, Maine

The speaker said in part: The trouble with most of our reporting of accidents is due to the informality associated with it. The management may get a few details and undoubtedly a wrong impression, because of hearsay and gossip which has spread through the plant. Before making a report from the safety department, full details must be obtained from the foreman in whose department the accident occurred. This can best be done through a written report, preferably on a blank form, and sufficient to cover accidents without an injury, as well as those involving injury.

In case of personal injury, a written report should be obtained from the injured employee at the earliest moment possible, preferably on a blank form, fully covering every question to make a complete report.

There are four agencies to be considered and served following an accident: The first being the highest plant authority; second, the supervisory forces or foremen; third, the rank and file of workers; and fourth, the industry at large.

Naturally, the report of an accident should be made as promptly as possible. A superficial report is worse than none, and that is why I say that a written report on a blank form from those involved should be obtained before the safety department can properly submit reports.

Reports to executives should be of a different sort than to any other agencies, and should include a detailed and written description of the instance, basic cause, probable direct and indirect cost, history of your activities on this phase over the years and proposed remedy, both temporary and permanent.

Reports to supervisors or foremen are best with a condensed statement of material presented in the executives' report, supplemented by suggestions as to similar operations in their department. A review of safe practices on the matter in question is useful and effective.

The crews must have the facts quickly. First of all, we are contributing to further injuries by letting workers resort to speculation, for while they ponder over hearsay and lend an ear to the breath-taking rumors of such accidents, they turn their minds from the work at hand. So serious is this matter that some plants dismiss the crews directly associated with an accident for the remainder of the day.

Every effort should be made to get a series of bulletins on the Bulletin boards as soon as possible, which will carry the facts, the causes of the accident and the remedy. From a psychological standpoint, the moments immediately following an accident are the most important to the safety department. Not only will accident

proneness be relieved, but the personnel will, to a man, learn a lesson when their minds are most receptive to it.

As to the industry at large, there has been a calling need for years for a quick report of mishaps and no finer effort can be made than to forward the details of an accident to that section of the National Safety Council to which you belong so that it may be broadcast to best advantage.

To completely capitalize on an accident we should not be content to merely secure a prompt correction, but should take advantage of a favorable psychological moment to engender a profitable reaction in our personnel. Thus, the period immediately following an accident or injury is the most opportune time for a special safety mass meeting of the employees.

Safetyizing Transportation in Cement Mills and Quarries

By W. J. WORTHY

Superintendent, Medusa Portland Cement Co., Toledo, Ohio

The speaker said in part: Nearly all raw materials are transported over rough tracks from the quarry or mine by steam locomotives and dump cars. This method of transportation creates a number of hazards, including locomotives and cars jumping from the tracks, uncoupling of cars, and stones falling from the cars.

Where several departments are working together, such as Quarry, Transportation, Crusher, and Track Repair Crews, each depending on the other for a portion of its safety, too little thought is often given by the employees to see that their own work is properly done, so that no injury results to employees of the next department.

For example, if a shovel operator is not careful to see that the loads put into all dump cars are properly balanced to prevent the cars jumping the tracks, or does not use care to see that large stones are not permitted to remain on the edge of cars, where they may roll off, this lack of care is liable to cause injury to some member of the train crew. These dangers are also passed on to other department crews.

In the past few years there have been many lost-time accidents involving crushed feet, fingers and hands, caused by improper cooperation between engineers and brakemen while coupling cars. The practice of riding on the sides of loaded cars, and the careless manner of getting on or off cars and locomotives while in motion, have also caused serious injuries, loss of legs, arms and broken bones. These accidents can be greatly reduced by instructing the operators on the safe way to handle their work and themselves.

Many accidents have been tallied up against the transportation department in the past few years by the shop departments. Many of these accidents are due to carelessness on the part of the workmen, and some are due to the unwillingness of the management to grant the expenditure of adequate funds to keep its rolling stock in a good safe operating condition. The quarry cars are continually being subjected to considerable damage during the process of loading and transportation of raw materials. This makes it very important that constant repairs should be made to keep them in a safe working condition.

Locomotive boilers are also a constant hazard, but no accidents have been experienced in our industry for several years; possibly because State Boiler Inspection Laws, Boiler Insurance and Boiler Inspectors, are continually bringing pressure to bear to see that all possible dangers developing in the boilers are promptly corrected. Locomotive running gears, however, are a different matter, and the locomotive running boards are not always of a standard height. This has caused brakemen to slip through the steps or to misjudge their footing, with serious results. It is just as essential to keep the mechanical moving parts of a locomotive in satisfactory condition as that of the boiler. No repairs beneath a live locomotive should be attempted unless there is a suitable pit for the workman to work in.

Our inbound car shipments consist mainly of coal, gypsum, brick and grinding

media. The switching and unloading of coal is the most dangerous and has resulted in many accidents, caused largely from the opening and closing of the dumping equipment. Coal cars are equipped for dumping with many different types of doors, some of which are opened easily, while others are quite hard to manipulate. At some plants coal is unloaded into pits, while in others cars are unloaded from ramps. Accidents mainly occur through employees falling either from the ramps or into the pits, for the reason that when the unloading devices were built the safety of the worker was not given enough consideration.

The switching of box cars to and from the packing department results in accidents from snapping car puller cables, cables becoming electrified, workmen being run over by moving cars, and packers being crushed between packing chutes and sides of car doors. These accidents can all be avoided if proper care and caution is observed by all employees, and the different departments concerned in this matter work in close cooperation.

While not many serious accidents have occurred in our industry from automobiles, yet this class of transportation carries the most dangerous type of hazard we have to deal with, and regarding which we are the most helpless to overcome. We may have the very best of drivers in our employ, and keep our equipment in the safest possible operating condition, but when we are out on the highway, our safety record, our safe practices, and our safe equipment are all at the mercy of any passing reckless or careless driver.

The hazards from automotive transportation cannot be eliminated until all drivers of this equipment are educated to drive safely and to live up to traffic regulations. A safety drive of this nature would be quickly and successfully accomplished if it could be handled through the business firms of the nation. If all business firms would agree to support a safety drive to combat traffic accidents it would only require: First, that they set an example by keeping their own automotive equipment in a safe operating condition and provide only safe dependable drivers who would abide by the traffic rules. Second, that they educate each individual in their employ on the necessity of driving safely and in keeping the equipment over which they have control in a safe operating condition.

For a report of the joint session between the Quarry Section and the Cement Section, held on Tuesday morning, October 2, 1934, see in this volume the general division entitled "Quarry Section."

THURSDAY MORNING SESSION

October 4, 1934

Joint Session with Quarry Section

Preventing Falls of Persons in the Cement Industry

By W. F. RICE

Superintendent, Crescent Portland Cement Co., Wampum, Penna.

The speaker said in part: During the first seven months of 1934, there were reported 105 accidents of all kinds in the cement industry; 18, or 17.3 per cent, of these accidents were due to falls, and of these, two resulted fatally.

Let us, for a few moments, look at the circumstances of some of these accidents; perhaps we can find some interesting facts that will point the way to accident prevention.

One of the two deaths happened to a construction foreman who was engaged in erecting a tower for hoisting purposes, to a height of 48 feet. The tower toppled over, carrying the injured man with it, and he died during the same night. The report shows that no braces or guy wires had been used to keep the tower

from falling. The report also states that the length of service of the foreman was only six days, which would tend to indicate that the man was not capable and that when hired his fitness was taken for granted.

The second death occurred while the man was painting steel work on top of a trestle over railroad tracks. He lost his balance and fell a distance of 50 feet, breaking his neck. This man was a carpenter, and the question arises, was he a fit person to be working at such a height, and was he a person who was experienced in this line of work and could keep his equilibrium? As his length of service was seven years, there was ample time to judge of his fitness.

We have three cases of men falling from railroad cars. One was that of a switchman; while running on top of box cars to the rear end, he did not notice that the car immediately behind the one on which he was running had become uncoupled and was falling behind. He jumped from the end of the car to the ground, his injury being a fractured limb. This man's length of service was only two months and he was probably one of those who wanted to make good with his new employers. If he had taken more time by walking instead of running, he no doubt would have noticed the cars moving apart.

Another injury was to a packing house floor man, length of service seven years. He was climbing on a box car to release the brake and drop car down the track and out of the way. He had grasped rung on top of car to pull himself up from side ladder when his hand slipped and he fell a distance of eight feet, receiving a compound fracture of both bones of the lower arm, dislocation of wrist, and fracture and dislocation of left side. This accident broke a 1228-day safety record, happening to a man who was most enthusiastic and preached safety daily to his co-workers. The underlying cause of this accident is obscure, but keeping one's mind on the job at hand is the only safe way to work.

Two stair accidents occurred while the injured were walking downstairs, missing a step in each case. While falls on stairs are due primarily to unsafe conditions, such as poor design, lack of guard railing, slippery, or broken or worn and too narrow treads, added causes are loss of balance, which may cause tripping, inattention of the worker, stepping on loose objects and insufficient lighting. It is bad practice to carry a heavy load up a stairway, when there is a danger of losing one's balance or not being able to keep one hand free for the hand rail. If more workers had a wholehearted respect for hand rails on stairways and made use of them, there would be fewer accidents. More must be done than provide safe stairs, as many causes contributing to falls on stairways lies in the fact that some people cannot or do not walk properly. About half of the people over 45 fail to walk as nature intended. Their faults are walking with feet far spread, increasing liability of tripping or slipping. Some people are afflicted with fallen arches, or with weak legs, which easily become tired, and with these impediments the feet are not properly placed to stand or walk correctly.

We have a report of only one accident caused by a fall from a ladder. A power engineer, length of service eight years, while up on a ladder to inspect a valve, the ladder broke and injured fell 18 feet to the floor, landing in a sitting position. Did you ever stop to consider that a ladder which looks apparently safe on the outside may be the most unsafe tool in the plant after being used for some time, especially if it has been painted, and the paint has covered defects? Linseed oil should be the only covering. No ladder is better than the poorest piece of material used in its construction. The use of automatic locks on extension ladders, instead of the old gravity locks, are a great safety measure. In many plants the same ladder is used by different departments, and no one is responsible for the maintenance. Most structural failures come from misuse rather than the actual stresses imposed by the user. There is only one sure way to handle safe ladders, and that is for one man to make a regular inspection and subject them to a physical test at regular intervals.

Too often supervisors and foremen think that safety is something tacked on to production, regarding it merely as an afterthought instead of a forethought; the result is an attitude which says "production at any cost—safety if possible." Each employee should be shown figures of the enormous cost of accidents, and impressed with the need of carefulness, and never allowed to take a chance, even when it is thought he can get away with it.

Poor housekeeping accounts for many falls, when materials such as boxes, tools, conveying buggies, and scrap are allowed to clutter up the floors. Oily and greasy floors are a hazard. Sloppy housekeeping gives a man a sloppy attitude, which in turn brings accidents. Neatness and orderliness with everything in its place is the best example for workmen's morale.

Wearing proper shoes is an important point in walking correctly, and the soles and heels should be made of a material that will provide a positive gripping friction between the sole and the floor. Hard leather soles become glazed and smooth, especially when used on hot floors. In a cement mill there is always the liability that a clinker, the size of pea or smaller, on which a person can slide easily, will cause a serious fall. Good housekeeping is again the remedy.

Hand Tool Accidents and Their Prevention

By W. T. GRONER

Superintendent, Southwestern Portland Cement Co., Osborn, Ohio

The speaker said in part: The Bureau of Statistics, of the New York State Department of Labor, shows that 7,389 persons received compensation in one year for injuries from hand tools. The total amount paid those injured for their loss of time was \$1,574,455. Hammers caused nearly one-third of all permanent injuries, and over 1,000 temporary ones. Knives caused the next largest number. There were 15 deaths, distributed as follows: 3 from hammers, 3 from knives, 1 from an ax, 4 from wrenches, 1 from crowbar, 2 from jacks, and 1 from tongs. In ten of these cases the original injury was a cut or abrasion which became infected, causing the worker's death.

These figures, of course, cover only those injuries which caused more than one week of lost time. Slight accidents where less time was lost were not recorded.

The Bureau also made an analysis of 100 investigated lost-time accidents from hand tools. Out of 28 activities listed, the machine shop led with 18 accidents, automobile repairs second with 8 accidents, and electrical contracting, public utilities and woodworking tied for third place with 6 accidents each. The 100 accidents caused 5,124 days of lost time.

Our company was still pointing proudly to its fine trophy won by having completed the year 1931 without an accident, when, after we had gone another 10 months and 11 days of 1932 in safety, a hand tool spoiled our record. On October 11, 1932, one of our most careful workers evidently had an off moment mentally for while closing a hopper bottom car door with a wrench that was believed to be safe, the handle that had been purposely bent to enable the operator to obtain a better leverage, turned about a quarter turn, catching the operator's little finger on his right hand between the handle and the smooth side of the hopper, and breaking the bone between the second and third joint. Down went our safety flag and with it the high spirits of our organization.

Most students of accident prevention have concluded that about the only possible good that can be gained from an accident is to use it as an example for preventing a recurrence. In the case of that broken finger accident, we promptly and definitely eliminated that hazard by welding a clamping device to one end of the bar, so it could not turn or slip; however, since the new device is too heavy, we are concerned that an operator might break a foot by dropping it.

Following are some of the methods used by our company that have proved most effective in preventing accidents:

1. We have always placed responsibility for preventing accidents on each individual employee, regardless of position or the number in a department, and we use every means possible to get each individual to accept his responsibility willingly. We place the greatest responsibility, of course, on the foreman, but we realize that the worker has the largest number of accidents and unless he can be convinced that safety pays and earnestly puts his heart and soul in safety, accidents will never be entirely eliminated.

2. In 1928 our company started paying a bonus of 1 per cent on the monthly

wages of each employee in all departments that completed a month without a lost-time accident. This plan has proved to be very effective in stimulating interest. It is especially effective in making each individual employee interested in seeing that his fellow employees work safely.

3. Our officials have always given their full cooperation to anything of merit for preventing accidents, and have unstintingly appropriated money to provide adequate guards, good quality tools, properly fitted goggles, first aid equipment, etc.

4. We use, with very good results, the Judge and Jury system that has been used in several other industries. We built an impressive judge's stand, jury box, witness stand, etc. A judge, sheriff, prosecutor, and jurors were elected. The sheriff selected deputies in each department that were truly undercover men, as no one but the sheriff knew who they were. It is the duty of every employee to turn in charges for violations of safety rules. These charges are filed and once a month court is convened. The defendants are advised of their charges several days before their trial, and they select anyone they choose to defend them, witnesses for both sides are picked and court is really in session. Various penalties are given to those found guilty.

5. Good quality and properly designed tools, we believe, rank second only to the operator's knowledge of the proper way to use them in preventing accidents.

Much has been written about the hazards of using hand chisels, punches, etc., that have become mushroomed, and many suggestions have been made for reconditioning these tools. Our method is to make tools that will withstand severe use and even misuse without mushrooming.

Round Table Discussion

This general discussion was led by General Chairman J. B. Zook. He submitted as a subject the question "What Effect on Employees' Attitude Does the Present Necessary Economy Measures Have, Particularly Relating to Company Loyalty and Safety?" It was the general feeling that the employer's own attitude is of extreme importance and that sincerity and fairness in dealing with employees will always reflect back in their attitude toward the management. It was also emphasized that proper individual training of the employee in the simplest details and the checking of every job are of extreme importance in these times when many new employees are being hired and also when older employees are returning to unfamiliar jobs. This special training program must also be carried on to what would appear to be extreme, at least, for a considerable time, if a satisfactory control of accidents is to be hoped for.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Chemical Section

Officers 1933-34

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MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Chemical Section was called to order by General Chairman John Roach, Deputy Commissioner of Labor, State of New Jersey, Trenton, N. J. Chairman Roach introduced Dr. W. R. Veazey, head of the Chemical

Engineering Department, Case School of Applied Sciences, Cleveland, Ohio, who made a brief welcoming address on behalf of the city and its many scientific organizations.

The General Chairman then spoke very briefly on the subject, "Our Objectives—Past, Present and Future," in which he sketched something of the great part which chemistry may be expected to play in the future, as in the past, and emphasized the continuing importance of safety organizations and safe practices to keep down the threateningly rising accident toll. Chairman Roach then introduced the first speaker.

Helping New Employees to Avoid Injuries in the Chemical Industry

By S. D. KIRKPATRICK

Editor, "Chemical & Metallurgical Engineering," New York City

The speaker said in part: Some people hold today that the present increase in accidents was bound to come as an inevitable accompaniment to the recovery process. Speeding up the industrial machine meant taking on new employees and bringing back some of the older ones, whose safety habits had become rusty through disuse during enforced idleness. To what extent is the new man responsible for the increase in accidents? Apparently we find rather conflicting views on this score.

I have tried, with fair success, to get some recent figures from our own members. One company whose records go back to 1929, gave me their frequency and severity rates covering a five-year period. This record seems to show that 1929 was the really bad year for new employees. However, this particular company started a very intensive drive in 1930 and our member believes that this was probably responsible for helping to bring down the rate in 1930 and 1931. In 1932 very few men were hired, which perhaps accounts for the low figures for that year.

Another member company reported five lost-time accidents in 1933 with men employed as follows: 1 month, 2½ months, 5 months, 9 months and 1 year and 5 months. However, in this same company the 1934 figures show a different picture: 4 accidents, only 1 less than 1 year, and the others occurred to men who have been in the employ for 3 years or more.

Another very large company reports employees with less than 1 year of service have an accident frequency of between two and three times that for employees with service records of over one year. During a certain period of this year, about 40 per cent of one kind of accident occurred to men who had less than one year of service.

Another member, who with great regret reported that their accidents represent practically 100 per cent increase over last year, also found that about 40 per cent occurred to employees of 6 months or under of experience on the job. His record for new employees involved accidents to 15 men and included 4 fatalities. The other accidents accounted for a total of 237 days of lost time.

A large eastern oil refinery, not, however, a member of the Chemical Section, reports that 44.3 per cent of accidents occur to men who have been employed less than one year.

All of this emphasizes the seriousness of the problem of helping these new men avoid injury in chemical industry. But let us see what some of these accidents are like—whether or not they can logically be charged to greenness on the part of new employees. Here is one:

A young man trained as an architectural draftsman, married, and out of work for some time, started working in the plant 2½ months ago. Transferred to pump-house. The first day he was operating this job alone a pipe fitting broke, spraying fluid all over the pump-house. Being "green" and not thoroughly acquainted with his job, he thought the liquid was acid, and had visions of serious damage to the building and equipment. Rushing over to a valve on the far side of the room

to stop the flow, in his haste he slipped on the wet floor, struck his side against a short ladder, fracturing two ribs. It so happens that the liquid was only salt water, which couldn't have caused any serious delay if left to run all day. Our member concludes: "This is evidently a clear case of a green man turned over to work alone on a job before he had been properly instructed."

Another member writes that he doubts if there is any real difference between green men and seasoned employees. He told of a case of a man who, after working 20 years on an unguarded punch-press finally got caught. His company immediately got out a special safety bulletin moralizing on the necessity for eternal vigilance as the price of safety. Foremen were warned of the importance of thoroughly instructing green men before they were placed in charge of hazardous machinery. Then, within a year, a new helper on a rubber goods press in this same plant lost his hand within three hours of being placed on the work. He was a young man trying his best to make good, so that he might be assigned to a permanent job, and at the time of the accident was merely pinch-hitting for a man that was out. Doesn't this emphasize that nervousness on the part of new men, especially in times like these, when they are so anxious to make good and end their unemployment, is really something that we all have to look out for?

Another case that interested me was that of a new employee who had recently graduated from a well-known technical school. He was doing some special work in a heavy chemical plant and had instructed the men to dump a hot charge of a certain material from the furnace onto the floor. He had forgotten and left his testing instruments on top of the furnace and without any warning turned and walked through the hot material to get them. What he got was two badly burned feet.

As a contrast, take the case of one of our members in a New Jersey chemical plant, who writes:

"In recent months we adopted the Sponsorship Plan of Safety Education throughout our local factories in order to minimize injuries among new inexperienced employees or former employees who have been out of work so long that their safety habits have become rusty from disuse. There is nothing especially original about this idea, but it is already producing some striking results. In addition to receiving instructions from the foreman, new employees are turned over to some older, experienced worker who acts as "his brother's keeper" during the breaking-in period. It has been our practice for a number of years to delegate certain employees as safety scouts to assist the foreman in matters concerning accident prevention, and this additional feature places increased emphasis on training the new employee."

Several of the papers I have read recently have emphasized the extreme importance of getting the safety story across to the new man in the first few hours he is on the job. I like the way the Chrysler Corporation handles the situation. In the waiting room, where the man awaits his turn to be interviewed, he has a chance to see some safety exhibits—not just posters, but some unsafe tools or some goggles that saved eyes. When the man is called out of the line for the first interview, he is asked if he would be willing to comply with the safety rules of the company, provided he is accepted for employment. Without going into these safety rules in any detail, this has the desired effect of giving the man that first impression that the company has adopted a safety policy and wants only such men as will willingly cooperate with their policies.

Next, the man goes to get his physical examination and here again he hears more about safety. The physical examiner may congratulate him on the fact that he hasn't any scars, pointing out that scars usually indicate that a man is careless and Chrysler has no place in its organization for the careless employee. In other words, if a man doesn't follow the safety rules, he'll find it hard to get employment in factories where safety is practiced.

The third man who sees the new employee is the write-up clerk who gives him his badge, his time card and his safety rules. He is told by the clerk that he will later be examined on these safety rules by his foreman, and the safety man. And again he learns that the company wants only those men in its employ who will respect and live up to the company rules and policies.

The fourth man to come into contact with the new employee conducts him to the department where he is to work, and introduces him to his foreman. He first checks over the equipment that the man has received, makes certain that he has his safety rules and explains to him their importance, pointing out that he hopes the man will be especially careful during the first few days of his employment, since that is the time when he should be studying his safety rules and learning as much as possible about taking care of himself in his new job.

Here then, even before the man has actually gotten to his job, we have had four men impress upon him the company's attitude toward safety. That first ten minutes is bound to make a lasting impression. It will help materially to pave the way for the instructions and the actual work demonstrations that follow as the man is broken into the job. A. M. Williams, Safety Director of Chrysler, writes: "The old ratio of six to one against the new employee has been entirely changed in our experience and we no longer find the new man an extra hazard."

Many of our companies represented in the Chemical Section are practicing procedures that are almost equivalent to the Chrysler plan. Harold Miner, of duPont, for instance, writes as follows:

"After the men have had their physical examination and a record has been made of their past experience and other pertinent information, they are given a talk on safety and plant rules by the Employment Manager. They are then turned over to the supervisor of the department in which they are supposed to work. This supervisor gives them a short talk on safety, in which he points out the principal hazards of the department. The men are next introduced to the foreman or leader, under whose supervision they are to work, who instructs them himself or has some other dependable employee to instruct them in the proper method of doing their job. In giving this instruction the foreman or leader points out to the men the hazards of the job, shows them how to do the job and watches and assists them if necessary on the first few operations. As one of our supervisors states it, 'We tell him, show him, test him, and check him.'"

I cannot close without a word or two of my own on the seriousness of this rising tide in industrial accidents. Whether they are due to new employees or to the man who has been on the job the past few years, doesn't really matter in the long run. Management is more than justified in saying that these accidents, whatever be their cause, have got to stop. There undoubtedly has been some relaxation of effort all the way down the line. The only way the situation can be corrected is through a general tightening up from the very top to the very bottom of the organization.

What I like about some of our chemical executives right now is that they are not hesitating to use drastic measures when they are necessary to bring home the seriousness of the present situation. Not long ago a certain chemical plant was actually closed down for 24 hours because it was turning in an unsatisfactory record of accidents. The employees were sent home and each foreman was required to go through his department and determine where the hazards existed and what was to be done to eliminate them. I like that sort of courage on the part of management. There can be no misunderstanding as to where safety stands in such a company. When the worker understands that management believes in safety and is willing to back up safety even at the sacrifice of profit, then he gets a new meaning of safety first. It becomes a natural and habitual part of his daily conduct.

Using Our Statistics to Advantage

By H. P. LEWIS

Assistant Manager, Safety & Fire Protection, E. I. duPont de Nemours & Co.,
Wilmington, Delaware

The speaker said in part: We have no patience with the accident statistics that cannot be applied to some good use. For instance, we are not generally interested in the number of falls our employees experience or the number of electrical shocks that occur. What we want to know from our statistics is what is wrong, what

is causing the injuries? We want to be able from our accident statistics to guide our safety program, to attack the fundamental causes of accidents.

A fall may occur. An employee may fall from a ladder. These two facts will not mean much to us in determining a safety program unless we get nearer to the fundamental cause. Why did the employee fall? Who was responsible? The Purchasing Department for not securing the right type of ladder—Supervision for not maintaining the ladder properly—the immediate Supervision for not instructing the employee in the proper and safe use of ladders, or the employee himself from wanton carelessness? Did the employee receive an electric shock, or did some object fall from above and strike him before he fell?

It is important to have all this information recorded, but in many cases it is impossible to keep it in tabular form. The safety engineer must use his memory. He must be able to retain in his mind and recall facts concerning similar accidents and it is important that he know as much as possible about the processes and plant arrangement in order that he may be able to have a clearer mental picture of the accident. It is important also to keep in mind that accidents do not always result in injuries. Near injuries and possible injuries often furnish information for corrective measures which may prevent major injuries and even fatalities at some future time. In order that our accident statistics may be useful in determining our safety programs, they must have sufficient "spread," i. e., they must cover a sufficient number of cases on which to base conclusions. In most individual plants this "spread" must be obtained by using the statistics on all minor, sub-major and major injuries. In extremely large plants or in groups of plants under one management, the major injury statistics will probably furnish sufficient basis for a general program.

Safety engineers should arrange to have all accidents on their plants reported to them and, if the reports do not present a clear picture of the incident, should not hesitate to request additional information. A thorough knowledge of the plant layout and the processes is extremely helpful to the safety engineer in forming a clear picture of the incidents which lead to the accident.

We are all constantly reminded by our accident reports of the failure of the human element. It is the one greatest obstacle in the path of the safety engineer. Why did this foreman not give his workman the proper instructions? Why did that workman violate safety rules with which he was thoroughly familiar? Why did an employee operate a grinding wheel without goggles? The answers to all these questions are to be found in human weaknesses. Lack of attention to the job, carelessness or thoughtlessness about accidents, insufficient safety supervision, anger, undue haste, worry and many other human weaknesses are common fundamental causes of accidents.

A thorough investigation of an accident will reveal the human characteristics which caused it. The supervisor in investigating the accident has an opportunity to do some very valuable missionary work if he assumes the teaching attitude rather than that of the detective.

Knowing that many of our accidents are caused by the human element, we then plan our attack on the problem. A disciplinary method of attack will be successful with certain individuals. It certainly does not help the situation very much, however, to discharge one employee for unsafe practices and then hire another who will get hurt the first day on the job. The educational method will produce better results.

Importance of Maintenance in Industries

By ALFRED VAKSDAL

Plant Engineer, Corning Glass Works, Corning, N. Y.

The speaker said in part: Old trades have been eliminated. New ones have been created. This is the natural course of progress and will so continue as long as man is able to reason. Some time in the future we may carry on production without human labor to operate the machines, but men will always be needed for experiment and repairs.

The same careful attention given to organization of men and machines, the same skill and judgment as applied in the direction of production, must now also be devoted to maintenance, as production becomes increasingly dependent on this factor for its success.

The handy man, or "Jack-of-all-trades" is gone. He was blacksmith and carpenter. He laid brick and drove rivets. He used the soldering iron and the blow torch, as well as the wheelbarrow and the crowbar. He dressed the slipping belt, repaired locks and clocks; replaced broken window panes; cleaned toilets; polished furniture and mixed concrete.

He had very little time for safety. He had never learned the art of planning, therefore emergencies scheduled all of his work.

Because maintenance expanded with the growth of the plant and because special skill became essential to machine production, this "catch as catch can" method is now inadequate. The first division of labor appeared in the millwrights, electricians or other groups of mechanics, but the same chaotic condition which existed with the handy man is still to be found in the different shops where any one man might be called to work on a great variety of unlike jobs.

It is a common fault to be satisfied with our own ability, but it is "block-headed" stupidity to put a man to work without definite instructions. Yet that is just what we are still doing. A man may be working all his life on breakdowns and never realize that it is his duty to prevent them. A man will accomplish more with greater ease, greater certainty, and with greater safety if he has a clear comprehension of his responsibilities and of the duties which he must perform.

Put a man in charge of the steam heating system and watch its performance and operating cost. Do the same with the motors and with everything else. Write down their duties and relationship, tell them it is their job and what you expect. The only excuse, under these conditions, a man can possibly have, if results are not forthcoming, is his own inability to obtain them.

To work up such a program for every man in the maintenance department is a big job, but it is a lazy man's excuse to say it cannot be done.

Carefully write down a complete specification of your entire plant, obtain age, initial cost, replacement cost, estimate the present value of your buildings, machinery and equipment, as well as check up on their physical conditions and capacities; then work out in all its details what must be done to meet the anticipated demand of the Sales Department without interruption to production. Group these duties according to the different shops, coordinate every single function of maintenance to each man in your organization best fitted for the particular task, set up an accounting system which will record expenditure and which will measure effort as well as accomplishment of every individual.

When you have done this you will not only know more about your own job, but you will soon have an organization of skilled and safety-minded men who will do the right thing at the right time without being told.

WEDNESDAY MORNING SESSION

October 3, 1934

Proper Protective Equipment for the Chemical Industry

By F. J. O'CONNOR

Superintendent Service Department, Dye Works, E. I. duPont de Nemours & Co., Deepwater Point, N. J.

The speaker said in part: The first requisite we demand of any safety device that we use or have developed in our plant is, that the article shall do the job efficiently; and the second, that it shall be reasonably comfortable to the operator.

The commonest of all the protection devices in our industry is goggles. It is no trouble whatever to purchase a pair of goggles which will afford reasonable protection against splashes of acids, alkalis or other dangerous liquids; nor is it

difficult to procure goggles equipped with lenses which will withstand heavy blows from flying pieces of metal, concrete and stone, or the sharp particles thrown by grinding wheels; but it is difficult indeed to go out and pick up a pair of goggles that will serve this dual purpose satisfactorily.

We have experienced considerable trouble on our plant with men wearing the wrong kind of protection, because we have an unusually large number of men engaged in maintenance and construction work, in addition to regular operators. A man chipping concrete and wearing a pair of acid goggles received an eye injury when a small lump of the concrete struck the lens and broke them. Several near accidents of this nature caused us to search for goggles that could be used for all kinds of work.

In making tests to find what we choose to call an all purpose goggle, our safety engineer has personally worn them for hours at a time to test them for comfort, fogging and eyestrain. We fitted up a dummy with goggles, at which we threw water from different angles, and squirted liquids directly into the ventilation ports to determine whether or not they would provide effective protection for chemical workers. In addition to these simple tests, we distributed several pairs of goggles to the operators and mechanics, so we might get the benefit of their practical reaction. As a result of these tests, a goggle has been developed in which our suggestions have been incorporated and it meets our purposes in both fields. Overall goggles of the same type for employees who wear spectacles have also been satisfactorily developed.

The nitrometer mask or face shield has found considerable application as a face protection for chemists and laboratory technicians against the hazard of flying glass and acid, in the event of bursting of the reaction tube of nitrometer apparatus. The mask consists of a lightweight metal frame supporting a sheet of cellulose acetate, a nonflammable material; it is difficult to puncture and acid proof, approximately 1/32 inch thick curved around a vertical axis of such radius as to set rather closely to the front and sides of the face. It is supported by a headgear of the same lightweight metal, the strips of which are lined with felt for greater comfort. Its wide unobstructed vision and ease of donning has made it popular and practical among laboratory men as a protective device for most any laboratory operation.

The characteristics of the canister gas mask are so well known to safety engineers that I do not consider it necessary to comment upon the construction and usage of this particular appliance. Of course, no dependence can be placed on any canister mask where there is a deficiency of oxygen or where there is a concentration of gas of more than 2 per cent.

There are many operating or accident producing conditions where the canister type mask is not suitable or safe for use; and when such conditions obtain, one of several types of air line masks may be used to advantage. The important consideration needed in any air mask is that a reliable supply of clean, fresh air is at hand, and we utilize three different sources for our supply: 1. The hand or motor operated portable blower. 2. The permanent installation of a small compressor and storage tank, similar to those in use at motor vehicle service stations. This equipment is not expensive and is an excellent appliance for either small or large plants where operations are concentrated in definite localities. 3. The use of air taken from the plant air mains.

An air filter should be used in connection with the last two methods. For this purpose we use a home-made filter simple in design and consisting of a cylinder about two feet in length made from a six-inch steel pipe. The cylinder is used in the vertical position and a blow down valve in its base makes possible the removal of moisture and scale that may have accumulated from the main supply line. The air enters through a horizontal line attached to side of cylinder about two inches above the bottom. It then strikes a baffle and filters up through two perforated plates between which is packed clean cotton waste. The air then enters a chamber at top of cylinder from whence it passes into a small line which may contain any number of outlets with suitable connections for quick attachment of hose and mask assembly.

The hose and mask assembly is also a development of our own. It consists of a standard face piece with the short length of corrugated hose. A brass reducing

coupling in the end of the corrugated hose makes possible the attachment of any desired length of 3/4-inch air hose. An air cock is inserted in the 3/4-inch hose at the man's waistline, by which he can control the air supply. A ring attached to this air cock fastens into a snap on the belt which is worn around the workman's waist. This prevents the drag of the hose from pulling the mask off the face.

If mask is to be worn in an atmosphere where the eyes do not require protection, a respirator type face piece may be substituted for the full face piece. A sign above each filter and outlet reminds the workman to drain filter and blow out line before using mask.

The air line mask with full face is also used by the sand blast operator—the air supply being taken from the plant air main. To prevent pitting of lenses, a lens attachment is provided which makes possible the use of easily changeable protective lenses. The head and neck are protected from flying particles of sand by a rubberized hood which can be easily and quickly snapped in place.

For certain types of repair work it is desirable to protect the head, neck and shoulders of the workmen against possible spills of corrosive liquids. Under such conditions, instead of the ordinary air mask, an air helmet is used. This consists of an ordinary full gas mask face piece to which is attached a form fitting skull cap and cape rubberized on both sides to facilitate cleaning. Head strips are unnecessary, as the helmet remains in place by virtue of the well fashioned skull cap.

Respirators, fume and smoke masks and similar devices for mild dust and fume conditions are standard equipment obtainable from any reputable appliance company.

We have been interested in foot protection for the past six or eight years and at some time or other have tried, I believe, every foot protective device available. We subjected the various guards and safety shoes which came to our attention to a rather severe test—that of a one hundred pound pig of lead dropped from a height of 29 inches. As a result of these tests, we finally decided to reverse our original decision and adopt the steel toe cap, as we considered it more suited to our general requirements.

Rubber goods, of course, are very common on all chemical plants. In the event of a mechanic having to enter a tank in which there might still be some poisonous materials, we have just recently devised a cover-all suit, rubberized on both sides with stitched seams coated over with a rubber cement, zippered from the crotch to the throat, and used with rubber boots and gloves, and with the helmet.

In the case of safety belts, I suppose more local ingenuity has been expended than upon any other small device. On our plant where we have an enormous number of tanks, tank cars, and vats, we have devised a very simple affair which is a plain leather belt with a heavy iron ring riveted to the back of it, and to which a rope is attached. It permits the bricklayer, lead burner or painter to do his job with practically no discomfort and is an inexpensive device.

Safety in the Unloading of Tank Cars

By ARTHUR C. WHITE

Technical Sales Division, Dow Chemical Co., Midland, Mich.

The speaker said in part: The simple rules for the unloading of tank cars laid down by the Interstate Commerce Commission and the Bureau of Explosives should serve as a fundamental ground work, upon which any specific recommendations should be considered as elaborations and not as substitutes.

My comments here must necessarily be brief.

It should be remembered even with so-called "harmless" loads "that no tank car is ever empty" and offers the same potential danger from its possible content of explosive and suffocating gases that any other closed tank has. Only electric hand lanterns or flash lights should be used to inspect tank cars, either when empty or full, and if it is necessary to remove the manhole cover, the opening should be covered with a wet burlap or wet canvas to prevent possible ignition from sparks. This precaution should be taken with all loads, whether considered hazardous or not.

No one should be permitted to enter a tank car—even after it has been thoroughly cleaned, unless wearing a fresh air hood or a hose and blower type of

mask. He should always wear a life belt provided with a strong life line, and at least one helper should be stationed at the manhole continuously as long as anyone is inside the car.

In general it is always good practice to ground a tank car which is being loaded or unloaded, but in the case of flammable solvents and such materials as gasoline, naphtha, benzol, etc., it is highly important that this be made part of the standard practice.

There are several methods of heating tank cars in order to thaw out their contents. The most general means is to apply low pressure steam to a set of coils which are contained within the tank itself. If materials are subject to crystallization or freezing enroute, careful shippers always select a car provided with the proper coils. Needless to say, all steam coils should be blown out with air pressure as soon as the thawing operation is complete.

In the case of acid tank cars it is not feasible to provide the car with interior coils to facilitate the thawing process, and resort must be made to a steam heated thawing shed to provide the necessary warmth.

Carloads of solvents and volatile petroleum products should always be tested by raising safety valve to indicate whether there is any interior pressure on the tank. Dome covers must not be removed if internal pressure exists.

Operators engaged in the loading and unloading of tank cars should be thoroughly familiar with any special precautions which should be taken. They should have the proper protective clothing, goggles, etc., and be provided with any special wrenches and similar equipment necessary. If samples are to be taken, special detailed instructions covering this should be furnished, and in the case of corrosive loadings it is highly desirable that sampling utensils particularly adapted for the product be furnished.

A shower bath provided with a deluge head and operated by a quick opening valve should be installed on the ground level close to the unloading platform, nevertheless at a safe distance. Some companies have arranged to have the shower water valve open when a man walks or falls on a treadle platform. This is a very valuable feature in cases of extreme emergency.

For the unloading of liquids, there are only three methods permissible. 1. By gravity flow; 2. By pumping; 3. By pressure displacement. Before attempting to unload any tank car, other than class 105A, care should be taken, by raising the safety valve, to see if there is any interior pressure in the tank. Dome covers must not be loosened or removed while such pressure exists. When such pressure is found it should be reduced by spraying the tank with water or relieved by raising the safety valve at short intervals, unless the material contained in the car is of a flammable nature. If it is, the car should be left closed until the following day, so that the lower temperatures existing during the night may assist in lowering the excess pressure. After pressure is released the car seal should be broken and the dome cover removed. The simple rules for the actual unloading process are very well known.

When storage tanks are above the tank car level or for other conditions where gravity unloading cannot be used and it is not desirable for some reason to use air, the contents of a tank car may be transferred by means of a suitable pumping equipment. The precautions mentioned under gravity unloading should be observed for bottom pump connections, and in case it is not desirable to utilize top discharge, it is merely necessary to connect the suction of the pump to the syphon pipe where it extends through the dome. It is always advantageous to have a valve on the suction side of any discharge line.

In general, air pressure is used to blow the contents of a tank car through suitable lines to the storage tanks, although under certain instances inert gases or even immiscible liquids are used for the purpose. Tank cars are hydrostatically tested at pressures sufficiently high so that the permitted pressure of 30 pounds is always safe, but it is generally found that lower pressures give practically the same results, except that a longer period is required to empty a car. Pressures in excess of 30 pounds should never be employed in unloading cars.

Dangerous loadings include corrosive, explosive, flammable and poisonous loads, and it should be realized that even under slightly varying conditions, nearly all

tank carloads of chemicals may fall into one or more of these classes. It cannot be emphasized too strongly that the purchaser of any product should be thoroughly familiar with the physical and chemical characteristics of the material he is planning to use and whether or not there are any particular hazards connected with it to the workmen or to his own or surrounding property. In addition, it is highly desirable that those directly responsible for the unloading of equipment should be thoroughly posted as to those unexpected difficulties which may occur under extraordinary conditions.

Corrosive materials may be subdivided into acids and alkalis, generally in a liquid state; and acids are also divided into two classes, organic and inorganic. The inorganic or mineral acids are the strongest of the two groups and comprise sulphuric, nitric, hydrochloric (or muriatic) and hydrofluoric. The organic acids are much weaker and as a class include such materials as acetic, lactic, formic, and the so-called fatty acids.

Acid cars are not equipped for bottom unloading and they are generally unloaded by the application of air pressures. In unloading cars which contain acids it should be realized that one of the principal by-products from the acid corrosion of a material is generally hydrogen, which when mixed with the correct proportion of air, forms extremely explosive mixtures. For this reason extra precaution should be taken to see that no lights or open flames are used in the vicinity of acid cars, whether full or empty.

In making air connections for the blowing of an acid car, it is always advisable to blow out the air line before connecting it to the car, in order to remove moisture. Needless to say, the operator during this operation should stand clear of the air line.

The principal alkaline materials are caustic soda and potash, soda ash, bicarbonate of soda, the modified sodas, ammonia and sodium silicate. Comments on the unloading of caustic soda solutions will serve as examples of methods to be recommended as satisfactory.

Caustic soda is generally shipped as a water solution containing from 50 to 70 per cent NaOH. Solutions of this strength deposit crystals of sodium monohydrate on cooling and in cold weather the entire contents of the tank may become a mushy solid. For unloading it is essential that the caustic liquors be thoroughly in solution and for this reason all cars used for the transportation of this product should be equipped with steam coils.

After arrival the car should be carefully inspected by removing the dome cover and feeling the sides and bottom of the car with a long rod for the presence of crystalline deposits. If solids are found, the solution is heated by passing low pressure steam through the heating coils until the outside of the car feels warm to the hand at both ends. The temperature of this caustic liquor should be at least 75 degrees F.

When the caustic is thoroughly heated, the exposed discharge fitting on the bottom of the car should be warmed by attaching a steam hose by a wrapping of burlap bags. (Blow torches or other flames should never be used.)

It should be remembered that strong alkalis produce disagreeable burns which often are difficult to heal and that both leather and wool are rapidly attacked. Rubber gloves and boots should be provided for the protection of the workmen's hands and feet and tightly fitting glasses or goggles should be worn at all times when handling caustic or other strongly alkaline solutions.

Liquid ammonia is shipped in high pressure heavy welded steel tank cars which have been tested to withstand a pressure of 300 pounds per square inch. Tanks of this class are equipped with a vapor proof dome or manway, under the cover of which are located four unloading valves, a safety valve, a gauge pipe and a sampling line. Inasmuch as the cars containing liquid ammonia are always loaded under pressure of approximately 70 to 80 pounds per square inch, it is only necessary in unloading to make suitable connections to the eduction pipe valve outlets to permit the liquid gas to flow to the storage tank or machine. Connecting lines from the tank car should be made of high pressure steel tubing, fittings and valves, capable of withstanding 300 pounds per square inch pressure and should contain

an expansion loop to allow a certain amount of line flexibility. Gas masks with the correct type of canister should be provided for all operators in case of emergency.

Liquid chlorine, although differing materially from ammonia, is shipped in the same type of tank car equipment. The domes are the same as used for liquid ammonia cars and carry under a substantial cover the two liquid chlorine valves and two for the discharge of gaseous chlorine. A 200 pound pressure gauge may be advantageously connected to one of the gas line outlets. Liquid chlorine is unloaded from tank cars by its own vapor pressure. In extremely cold weather when the vapor pressure becomes low, it is often necessary to warm the car by passing steam through coils provided for the purpose. Low pressure steam is introduced into one end of the coil and the other left open, so that no water may remain in the coils. When heating a car of liquid chlorine, the pressure gauge on the car should be carefully watched and as soon as there is an indication of pressure building up on the car the steam should be turned off. Steam should not be left on car coils unless the operator is present at all times. Suitable gas masks should, as in the unloading of liquid ammonia, be provided for each operator.

Sulphur dioxide, propane, butane and ethane are shipped in the same type of cars and are unloaded in a similar manner, special fire precautions being taken, of course, where the loading is of a flammable nature. For unloading propane, either reciprocating or rotary pumps are recommended. Butane, by reason of its lower vapor pressure, is perhaps best unloaded by the pressure of either air or natural or artificial gas. If steam is available it may be used on tank car coils external to the shell, with butane, to increase the vapor pressure and permit unloading in this manner.

For handling any flammable solvents, all pump motors should be of the explosion proof type.

Explosive and flammable loadings include practically all the commercial solvents, with the exception of carbon tetrachloride which is neither explosive nor flammable.

Many of these, such as gasoline, benzol, the naphthas, toluene and xylene have been shipped in the ordinary steel tank cars for many years. They are generally unloaded through bottom discharge openings by either gravity flow or by pumping. Care should be taken to see that workmen do not inhale the fumes of the volatile loadings, as nearly all have toxic effects.

In addition to general safety methods, particular attention should be given to eliminate all fire hazards and possible sources of sparks which might ignite the vapors. Vented manhole covers or air vents should be covered with wet burlap while the car is being unloaded. Tools and wrenches should be handled carefully to avoid the possibility of sparks being produced. All cars carrying volatile solvents and compressed flammable gases should be thoroughly grounded.

Report of the Nominating Committee

At this point the General Chairman called for the report of the Nominating Committee, and officers were nominated and elected for the ensuing year as follows:

General Chairman—A. L. Armstrong, Eastman Kodak Co., Rochester, N. Y.

Vice-Chairman in Charge of Program—H. L. Miner, E. I. duPont de Nemours & Co., Wilmington, Del.

Vice-Chairman in Charge of Engineering—C. L. Jones, Hercules Powder Co., Wilmington, Del.

Secretary—Ralph O. Keefer, Aluminum Company of America, Massena, N. Y.

News Letter Editor—E. L. Root, Celluloid Corporation, Newark, N. J.

Occupational Disease Committee Chairman—Dr. Leonard Greenburg, Yale Medical School, New Haven, Conn.

Membership and Publicity Committee Chairman—S. D. Kirkpatrick, Chemical and Metallurgical Engineering, New York, N. Y.

Statistics Committee Chairman—R. C. Stratton, The Travelers Insurance Co., Hartford, Conn.

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Members Executive Committee at Large—

F. E. Clancy, Jr., Mathieson Alkali Works, Inc., Niagara Falls, N. Y.
F. W. Dennis, Hooker Electrochemical Co., Niagara Falls, N. Y.
Ira V. Kepner, Pennsylvania Salt Manufacturing Co., Menominee, Mich.
E. F. King, Lever Brothers Co., Cambridge, Mass.
H. P. Lewis, E. I. duPont de Nemours & Co., Wilmington, Del.
John Roach, Deputy Commissioner of Labor, Trenton, N. J.
C. E. Sevrans, Merrimac Chemical Co., Inc., Boston, Mass.
John S. Shaw, Hercules Powder Co., Wilmington, Del.
Plummer Wheeler, American Cyanamid Co., Linden, N. J.
S. E. Whiting, Liberty Mutual Insurance Co., Boston, Mass.

Round Table Discussion

The final feature of the Chemical Section program was a general Round Table Discussion of the subject "Preventing Injuries to the Hands and Feet of Workers in the Chemical Industry," which was led by A. L. Armstrong General Supervisor of Safety and Fire Protection, Eastman Kodak Company, Rochester, N. Y. This was an informal extemporaneous discussion, and although interesting and of value to those who took part, no record is available.

ADJOURNMENT

**TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL**



Construction Section

Officers 1933-34

General Chairman—JOHN RUSSELL, JR., United Engineers & Constructors, Inc., Newark, N. J.

Vice-Chairman—W. G. WHEELER, Building Trades Employers' Association, New York, N. Y.

Vice-Chairman for Engineering Projects—P. R. MAKETTA, JR., Thompson Starrett Co., New York, N. Y.

Vice-Chairman for Utility Construction—C. H. BLACK, Stone & Webster Engineering Corp., Boston, Mass.

Vice-Chairman for U. S. Engineer Department—CAPT. ELLIOTT VANDEVANTER, C. of E., Office of the Chief of Engineers, Washington, D. C.

Secretary—ROBERT MCKINLEY, General Accident Fire & Life Assurance Corp., Detroit, Mich.

News Letter Editor—EDGAR N. GOLDSTINE, (State Compensation Insurance Fund of Calif.), San Francisco, Calif.

Engineering Committee Chairman—J. C. FORESTER, The L. E. Myers Co., Chicago, Ill.

Membership Committee Chairman—NORMAN WELLINGS, Booth & Flinn, Ltd., Pittsburgh, Pa.

Poster Committee Chairman—JAMES N. DOYLE, James N. Doyle Adjustment Bureau, Reg'd., Montreal, Quebec, Can.

Program Committee Chairman—R. J. REIGELUTH, C. W. Blakeslee & Sons, New Haven, Conn.

Publicity Committee Chairman—THOMAS W. WALTON, Henry W. Horst Co., Philadelphia, Pa.

Statistics Committee Chairman—W. A. SNOW, Associated General Contractors of America, Inc., Washington, D. C.

Members at Large—

W. F. AUSTIN, Detroit, Mich.

MISS E. S. GREY, McLaury Marble Corp., New York, N. Y.

W. R. RICHARDS, Bureau of Contract Information, Inc., Washington, D. C.

GEORGE WIDUA, Builders and Manufacturers Mutual Casualty Co., Chicago, Ill.

MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Construction Section was called to order by the General Chairman, John Russell, Jr., United Engineers and Constructors, Inc., Newark, New Jersey. Chairman Russell introduced H. A. Davis, Treasurer, The Lundoff-Ricknell Company, Cleveland, who made a brief address of welcome to the delegates on behalf of the City of Cleveland.

The opening paper on the program was General Chairman Russell's resume of "The Year's Activities" of the Section, containing an outline of the activities of officers and sectional committees. The report having been mimeographed, was distributed to the delegates present.

Statistics of the Construction Industry

By W. A. SNOW

Safety Director, Associated General Contractors of America, Inc.,
Washington, D. C.

"May I extend a most urgent plea to members of the Construction Industry to cooperate fully with the annual request of the National Safety Council for submission to them of statistics on construction accidents. Such cooperation costs nothing, consumes but little time and effort and if extended will enable the National Safety Council to submit a broader and more truly representative picture of the condition of our combined accident experience and accident prevention work, upon which present and future plans can be more accurately and efficiently formulated.

"In 1933, the records of 34 construction companies showed an average frequency rate of 76.5 as compared with 67.4 for 1932. In other words, they had in 1933 approximately 13.5 per cent more disabling injuries than they had in 1932. Since 1926 they had been experiencing a yearly decline in frequency but in 1933 something slipped somewhere. I suggest three probable causes for this accident increase:

- "1. Mandatory governmental regulations on many construction projects that force the contractors to use labor from relief rolls in a manner that prohibits the predetermination of the workers' qualification for the particular job. Under such conditions the trying-out or breaking-in period is hazardous, and experience shows that many accidents have occurred during this period.
- "2. Lack of interest and attention in accident prevention work on the part of the employer and employees.
- "3. Workmen, both new and inexperienced, in their anxiety to hold their job and produce the maximum results, work abnormally fast, concentrating on their particular task with slight regard to accident hazards.

"We have it within our power to eliminate the cause in number two and to at least partially, if not entirely, effect a cure in the case of number three. Cause number one still remains, though it has been modified over its original effect so that employers now have more latitude in selecting their men.

"There are some interesting facts to be noted, in the figures of our industry for 1933. Those general contracting firms totalling an average number of 3,086 employees experienced an average frequency of 69.9 and a severity rate of 6.89. Those firms totalling an average number of 702 employees had an average frequency rate of 52.56 and an average severity rate of 3.37; while in the case of the small contracting firms totalling an average number of 283 employees they experienced an average frequency of 127.27 and a severity rate of 6.14.

"These figures would seem to indicate that the general contractor engaged in small jobs tends to particularly watch his construction hazards. He experienced in 1933 just about double the number of accidents as did the large operator and in

severity his lost time was almost equal to that lost as a result of fewer accidents by the large operator. The best records for 1933 were obtained by the medium sized operator."

The Effect of Safety Activities on Compensation Insurance Rates

By CHESTER W. WRIGHT

Wright & Kreners, Inc., Niagara Falls, New York

The speaker said in part: We are all aware that of all industries reporting to the National Safety Council in 1930, out of twenty-five industries we stood twenty-fourth, kept out of the cellar position only by mining. We were twice as bad as the industry that stood twenty-third, and three times as bad as the average of all.

The record further shows that we made some headway with our frequency and severity rates from 1926 to 1931, but 1933 was much worse than 1932; and the last year was only saved from being an outright scandal by including in the construction statistics the river and harbor work under the U. S. Engineers Office. Leaving out of the record the Engineers' work just referred to, we would have, as I see it a frequency rate over the several years running like this: 1930—51.57; 1931—48.15; 1932—57.90; and 1933—76.86.

Will the statement that construction is a hazardous industry suffice as a complete alibi for this record? Do we contractors believe that as an industry building little houses as well as subways, one-story factory buildings as well as skyscrapers, that inherent in the work itself is a hazard equal to that in mining, twice that of quarrying, three times that of chemical manufacture, five times that found in steel mills? On the contrary, we know that it isn't so. We know that the hazard is less, much less than the record shows. It has been proved to my satisfaction that intensive safety work would bring our record down a-kiting.

If we are interested in an investigation of the problem of construction's bad record, might it not be worth while to marshal some of the facts that are pertinent and then, leaving out all sentiment and ballyhoo, and using the contractor's wonderful gift of plain logic, attempt to come to some kind of conclusion based on the evident facts?

Let's list as No. 1, that industry in general has made a consistently improved record in accident prevention over a long period of years.

2. The National Safety Council is made up of representatives of industries and groups of industries, many of which are enthusiastic, live, safety organizations, strong in membership, represented at the Congress by good delegations who have been sent here from plants that are organized for safety from the top down.

3. Construction's record is bad, has always been bad, and compares very unfavorably with the improvement shown by industry in general.

4. The Construction Section of the Council is very small in membership, and has existed mostly because a few devoted souls have willed that it shall live.

5. Contractors generally, as compared with industries generally, have very little interest in safety work.

6. The improvement in the safety record of industry came into its flower along with the schedule rate for elimination of hazards with credits given in the rates for such safety work in the plants.

7. There isn't, as far as I know, and my experience is confined to New York State, any schedule rating in construction.

8. Those contractors who have made accident records for safety, who have built up real safety organizations, are largely if not exclusively insured, under arrangements which return to the contractor or group of contractors, quickly, in dollars, the savings due to the safety effort. By way of illustration, the plan adopted in Detroit, where the General Contractors within their associations fixed their own rate of premium on the basis of their own experience.

9. The experience rating plan, which, we are told, was designed to place a premium on safe operations and a penalty on the careless, is so full of mathematical

computations designed to produce averages that it is able to perform exactly that function only. This may be a substantial help to the unfortunate individual who has a bad experience, but it is a tremendous deterrent to these contractors who, having run the good race and qualified themselves for the prize, find that the teacher is a good hearted soul who knows that it would have a very bad effect on the rest of us to let Johnny seem to excel to too great an extent. The experience rating plan quite effectively takes out from construction safety work the dollar incentive to excel.

10. I think this is the blackest fact I have to present. The experience rating plan instead of being used to reflect in the rates the approximate experience of the individual only, has been used to raise premiums by the selection of "factors" and "constants," etc., the use of which in the mathematical computation, results in the lowering of the experience credit of all insured. As the credit rating plan is an averaging computation, only one class of risks could lose in such an arrangement. Those were the boys with the good records.

As I read over this list of causes, I am satisfied that the amount of logic required to interpret them is small. It isn't necessary to go further to find the reason why people who are engaged in the construction business look upon safety work so differently, generally, than those who are engaged in manufacturing. The reason we can't get them after safety work in construction is because it doesn't pay well enough. And, please, let's leave the sentiment out. I am not even talking about that—willing to accept it as an axiom. I should like to stress the very simple proposition that in a business world we think along the lines of payment for the work that we do and the majority of us are willing to accept that payment only in dollars.

And, now, I find that my subject, "The Effect of Safety Activities on Compensation Rates," does apply, after all. In fact, it is the very key to the development of safety work in the construction business. It is a clear conclusion that safety in construction could be fostered and developed as it was in industry when the premium rate paid if it is affected enough by safety work to make the effort worth while. But here is the stumbling block. The usual method of insuring the risk, which is the only method open to the small contractor, is not one under which the premium rate can be so affected.

I am convinced that the evidence indicates that we might well consider a shift in the point on which we are focusing our safety attention. Our effort might well be expended to accomplish a greater result along another line of endeavor. If there is something that is extremely bad, the cause behind that effect ought to be just so much more apparent. If you agree with me that the matter of insurance rates and the method of computing the experience credits are probably or even possibly contributing causes of construction's bad record, wouldn't it be well worth all our while to have them changed?

Safety—A Challenge to Management

By FRED I. ROWE

W. L. Johnson Construction Company, Hicksville, Ohio

The speaker said in part: Accidents are an intangible tax on industry. In Ohio the tax rate for construction accidents is ten dollars, basic, per hundred dollars of payroll. For example, the direct labor cost on a construction project will approximate 40 per cent of the contract price. Assuming that we have a \$100,000 contract, the accident tax will be \$4,000 or a 4 per cent tax.

Under the Public Works Program with the 30-hour week and the present method of securing construction employees, the labor turn-over is high and thus the exposure is increased and the frequency rate is higher. The furnishing of construction employees by the Reemployment service and the restriction to employment of residents within the political subdivision where the project is located, creates a master problem of building company morale. The employee has no interest in company welfare for he knows that when the project is completed, regardless of

his interest in the company and the skill of his workmanship, he will not be given employment on the company's next project.

Under the old order of individual initiative and rugged individualism it was possible to say, "Men, if you expect us to compete for other jobs for you we must keep our accidents down, because the more accidents we have the higher our rates will be and, of course, we must add our accident cost to our other costs when we make up our bid." The employee thus had a financial interest in accident taxes.

However, accident tax reduction always has been more management's responsibility than that of the employee; but under the present set-up management has the full load to carry.

The rapid increase in accident taxes indicates that management has not met the challenge of emergency employment conditions. How can management meet the challenge? Not by regimentation. Not by a policy "Construction jobs for construction employees only." We must leave the gates open for new blood, new contractors, new carpenters, new masons, new steel workers, new finishers, and new equipment operators.

We must declare war on accident taxes. The public wants taxes reduced. It is the politician's battle cry. We must make it ours. Our plan of attack may be:

1. Appointment of a National Safety Director for each division of construction.
2. Set up a Construction Examiner's Board in each state for contractors, superintendents and foremen, accountants and timekeepers, and thus put the business on a professional basis.
3. Intensify publicity on accident taxes through conventions, the newspaper and the radio, the public is paying the accident tax bill.
4. Write requirements for safe construction practices into the specifications and make violation a cause for holding up estimates. The most important part of such a specification would be "Good Housekeeping on the Construction Site." We don't want more Government regulations but we will get them unless we do the job ourselves.
5. Provide cash penalties, layoffs and discharge of superintendents and foremen for careless construction safety practices and poor housekeeping.
6. Point out the sand traps, gullies, woods, and water holes to management, not to the employees who are really only the beginners in the safety game. Remove the hazards! Don't ask your men to play them.

WEDNESDAY MORNING SESSION

October 3, 1934

Upon calling the session to order, General Chairman John Russell, Jr., asked for the report of the Nominating Committee, and new officers for the section for the ensuing year were nominated and elected as follows:

General Chairman—E. N. Goldstine (State Compensation Insurance Fund of Calif.), San Francisco, Calif.

Vice-Chairman—C. H. Black, Stone & Webster Engineering Corp., Boston, Mass.
Secretary—Robert McKinley, General Accident Fire & Life Assurance Corp., Detroit, Mich.

Vice-Chairman for Engineering Projects—Thomas W. Walton, Henry W. Horst Co., Philadelphia, Pa.

Vice-Chairman for Road Construction—Fred I. Rowe, W. L. Johnson Construction Co., Hicksville, Ohio.

Vice-Chairman for U. S. Engineer Department—Capt. Elliott Vandevanter, C. of E., Office of the Chief of Engineers, Washington, D. C.

Vice-Chairman for Building Construction—Chester W. Wright, Wright & Kremers, Inc., Niagara Falls, N. Y.

News Letter Editor—Leo Westwater, Granite Construction Co., Watsonville, Calif.

Engineering Committee Chairman—L. K. Reinhardt, Industrial Accident Commission, San Francisco, Calif.

Membership Committee Chairman—Thomas Bentley, The A. Bentley & Sons Co., Toledo, Ohio.

Poster Committee Chairman—R. J. Reigeluth, C. W. Blakeslee & Sons, New Haven, Conn.
 Program Committee Chairman—W. A. Dearborn, Lumbermen's Mutual Casualty Co., Boston, Mass.
 Publicity Committee Chairman—W. R. Richards, Bureau of Contract Information, Inc., N. W., Washington, D. C.
 Statistics Committee Chairman—W. A. Snow, Associated General Contractors of America, Inc., Washington, D. C.
 Member at Large—
 R. G. Buchanan, Dravo Corporation, Neville Island, Pittsburgh, Pa.
 Past General Chairman—
 W. F. Austin, Detroit, Mich.
 John Russell, Jr., United Engineers & Construction Inc., 80 Park Place, Newark, N. J.
 George Widna, Builders and Manufacturers Mutual Casualty Co., Chicago.

Construction Safety on the New Jersey Emergency State Relief Projects

By JOSEPH N. DORSEY

State Safety Director for New Jersey

The speaker said in part: No director of safety was named in New Jersey until after thousands of men had already been put to work. Organization of a state-wide safety program, under these conditions, presented a picture not unusual to the construction industry. Some kind of action to safeguard the health and lives of those men who were working was a paramount issue. Before the end of the first day we began a safety educational campaign, through mimeograph bulletins and home-made posters, outlining what we thought to be the most effective means of eliminating the hazards which were already manifesting themselves.

While this educational program was operating, organization of personnel was going on fast. Naturally, our chief need was experienced safety engineers, and plenty of them. Only six experienced men were available. This meant that about 34 others had to be schooled along safety engineering lines, before their work could be made very effective. I was, however, fortunate in securing men with an engineering and construction background.

The inspection report form that we originated covered all phases of our work. This form was so made up that it pictured, as clearly as possible, the project in itself. In addition to details about location, number of men working, the name of the supervisor and foreman, it also showed the normal working days and the various operations, such as: clearing brush, cutting trees, grading, blasting, demolition of buildings, ships, paving, ditching, breaking up concrete, laying pipes or sewer, carpentry, painting, electrical, trucking, plastering, roofing, tool dressing and welding. Space was also provided for any special equipment used, such as: pile drivers, steam rollers, portable saws, stone crushers, etc.

Still further, this report pictured for us the safety precautions taken, such as: ladders, goggles, shoring, guard rails, road signs, scaffolds, good housekeeping, fire prevention, rubber boots, first aid kits, night lanterns, respirators, night watchman, and first aid attendant. Space was also provided for urgent recommendations and general comments.

Inspection of projects including machinery, cranes, trucks, or other operating equipment, should be made daily and copies of this inspection be sent to the County Works Manager and one for our files. Other pertinent forms, where provided, as in industry and on well managed construction jobs, for the reporting of all injuries.

All motor vehicles used on CWA and ERA jobs were inspected weekly and a report submitted, covering the most important points. In this weekly truck inspection many defects were revealed which were corrected, or if defective beyond repair trucks were eliminated from use.

We were confronted with a lack of men trained in the knowledge of first aid. Through the cooperation of the Red Cross, however, we organized classes in each of the counties and trained over 2,300 first aid attendants. In most cases these men took care of the first aid in conjunction with their other duties. We made up a number of bulletins on first aid in an effort to keep the first aid attendant informed of his opportunities and limitations. In New Jersey we purchased over 3,000 first aid kits which were distributed and maintained in proper order by our safety engineers.

To maintain interest in accident prevention on the job, we issued the interest compelling "Safety Flash" as the spirit moved us, which is a form similar to that used by the Western Union people. We used this form to call attention to existing hazards that confronted the men on certain jobs. We followed this up at more regular intervals by the "Safetygram" dealing at greater length with hazards and their correction, giving credit to particular jobs for their fine work.

It was necessary to use many tons of dynamite for blasting rocks—fortunately this work was done without a lost-time injury—but our responsibility did not end when the job was completed, for there was danger in storing dynamite as well as in handling. To protect ourselves from unforeseen trouble, instructions were given our safety engineers to investigate and submit a report showing where the dynamite was kept. These reports revealed, in a number of cases, the dynamite was being stored in the basement of the workers' homes and in one of the homes the dynamite was stored on a shelf built over a coal stove that was in use at the time. On another shelf nearby the caps were stored.

Safety meetings were held on most of the larger jobs, and wherever possible the men would be gathered together in a body and given a safety talk on the morning the job was to begin. I, personally, conducted safety meetings in all the counties, talking to engineers, supervisors, foremen, timekeepers, truck owners and truck drivers. In my safety talks I stressed the importance of getting all the men together on the day the work was started and giving them an inspirational talk on safety, to be followed by another address several weeks later. This meeting offered splendid opportunity to answer any criticisms that were made by the men with reference to safety goggles and other safety equipment.

We found that a great many of the workers did not wear goggles on jobs that required their use. When the foreman told me that "the men won't wear goggles"—or "I can't get them to wear goggles" my answer was this: "You don't want your men to wear goggles for if you did, they would wear them. Your responsibility does not end by telling the men to be careful but it is your duty to picture for them the misery and suffering as well as the financial distress suffered not only by the injured worker but by his family as well. The point to remember is that your men are only as safe as you want them to be."

Sixteen hundred "Men Working" signs were purchased and distributed, in addition to safety belts, respirators, snake bite outfits and other necessary safety supplies. One of the handicaps we encountered was the shortage of equipment and materials, which were not so easily obtained because of the bid situation.

In an effort to stimulate the safety enthusiasm and interest of our men, we had one man from each crew appointed as a "job safety inspector" and his duties were to report all unsafe conditions to his boss. This plan worked out satisfactorily in a great number of cases.

During the CWA there were 120,000 men employed. Our "lost-time accidents" were a trifle over 1,100. So far, under the ERA there are over 1,500 men employed and we have had about 180 "lost-time injuries."

What value will the CWA and ERA have for the construction industry in New Jersey? We believe we have trained more than 17,000 prospective construction workers to know something about safety; to appreciate safety and to expect the construction firm who may employ them—to use safe methods. If this is true, the construction accidents in New Jersey will be reduced below their present favorable figure and our work will have put cash in the pockets of the industry as a result of the stewardship of these forty-two safety engineers that have labored to this end under our jurisdiction.

Explosives in the Construction Industry

By S. R. RUSSELL

Technical Engineer, E. I. duPont de Nemours & Company, Wilmington, Del.

The speaker said in part: Many people are accustomed to associate explosives only with wars, bombs, destruction and disaster. But really the modern high explosive is an important agency of peace and construction.

In industry, explosives are divided into two general groups, viz.: military and commercial or industrial explosives. Military explosives, which include sporting powders, are mainly propellants such as smokeless powder used for cannons, rifles, shotguns, etc. Commercial explosives are all disruptives and consist of two classes, high explosives, typified by dynamite, and low explosives represented by black blasting powder or the common gun powder.

Black blasting powders cannot be used in wet work as the potassium or sodium salts are readily soluble in water. They can only be made in one strength and with little speed. They are mainly used in coal mining and then only in those mines which are free from dangerous mine gases or explosive dust. They are used occasionally in rock excavation and blasting in quarries where the material is not hard or where a slow heaving rather than a shattering effect is desired.

The velocity of detonation or speed of any explosive is an important factor in its execution. By this is meant the rate at which the evolution from the solid to the gaseous state takes place. With black blasting powders which are all relatively slow in action the variation in speed is gained by different sizing of the grains. But even the finest grain has only a velocity of about 1,000 feet per second and the powder must be tightly confined to produce that. On the other hand, it is possible to produce high explosives or dynamites with a great variety of speed. Velocities ranging from 6,000 feet to 25,000 feet per second or more are possible. Moreover, with this type of explosive we can vary the strength, temperature of explosion, products of combustion, control the fumes and other characteristics which cannot be done with black powder.

The active base dynamites of today consist of straight, ammonia and gelatin dynamites. Straight dynamites are the quickest, most shattering, but also the most sensitive. They are adapted for blasting in very hard rock where maximum fragmentation is desired. They are used more extensively in propagated ditch blasting in which class of work they are well suited because of extreme sensitiveness. They also find favor in subaqueous rock excavation which may later appear.

They are unsuited for underground work such as mines and tunnel driving as they have the most obnoxious fumes of all the dynamites. Because of their high sensitiveness many accidents have been caused by their use so that there is not nearly as much of this type dynamite used today as heretofore.

Gelatin dynamites consist of nitroglycerin in which is dissolved some nitrocellulose or gun cotton. This forms a jelly to which is added the other ingredients similar to a straight dynamite. The result is a gelatinous or putty-like mass, which makes this type of explosive highly waterproof. Gelatin has the especial virtue of having the least noxious fumes and therefore it is best suited for driving tunnels or in any close work where the ventilation is a problem. It is the densest of the dynamites and for that reason is best suited where concentrated energy or power is desired. It is much less sensitive than straight dynamite and safer to handle and transport. Because of its almost perfect water resistance, it is well suited for use in wet holes and in subaqueous rock excavation.

The so-called extra or ammonia dynamites are like straight dynamite except that part of the nitroglycerin is replaced by nitrate of ammonia. This is a very powerful and effective explosive but it will not stand water.

The important things to consider in selecting an explosive best suited for a particular job are strength, quickness, density, and water resistance. If a material is a hard rock a strong quick acting explosive such as gelatin is recommended. If softer material, such as limestone, shale, schist, etc., a lower strength and lower density like standard ammonia or one of the special ammonia types is perhaps best and more economical. If the work is under water, gelatin is best. Stability is an

important factor, of course, and the best assurance of this is the reputation and experience of the manufacturer.

The manufacture of high explosives is a hazardous business from the inherent nature of the product. It is essential that everyone handling explosives or in any way directing their storage and use, observe every precaution. Discipline in enforcing the obedience to these fundamental rules cannot be overdone.

These safety rules are printed in various forms. They are contained in leaflet form in every box of dynamite. Posters printed in large type and permanent form are distributed by manufacturers of explosives and should be placed where all those handling explosives can see and read them. On this poster is printed a list of more than fifty "Don'ts", that is, fifty things not to do with explosives, and applies to the use of explosives in general.

On construction work the explosives should be stored under approved conditions both as a protection to life and property and against deterioration of the explosive itself. Detonators should not be stored in the same magazine with explosives or transported in the same car or container. In the care and handling of explosives only responsible and experienced men should be employed. In most cities before a man is permitted to act as blaster he must pass an examination showing his familiarity with safety rules and method of using and then he receives a license to pursue his calling. Only men of cool temperament and good judgment and a fine sense of consideration for their fellow man should be employed in this work.

No explosive is safe in the hands of a careless man or one ignorant of its characteristics. It must be remembered that the function of an explosive is to explode but if the known rules are followed there is nothing to fear. They must be respected at all times. Carelessness, ignorance and a false idea of bravado in men are things to be avoided.

Safety Measures in the Construction of the San Francisco Bay Bridges

By E. N. GOLDSTINE

Safety Engineer, State Compensation Insurance Fund of California, San Francisco, Cal.

The speaker said in part: The world's foremost advances in bridge construction are found in the giant structures of the San Francisco-Oakland Bay Bridge, and the San Francisco Golden Gate Bridge, now being built at a cost of approximately \$100,000,000. In the terrific foundation difficulties to be overcome, in the tremendous distances to be spanned, and in the almost overwhelming magnitude of various portions of the work, these magnificent conceptions of the master minds of the world's greatest engineers surpass all previous records.

Realizing that it is possible to control or prevent most accidents, Mr. Timothy A. Reardon, Chairman of the California Industrial Accident Commission, in June, 1933, called two separate meetings, one for each of the San Francisco Bay Bridges, to consider a safety program. Representatives of the Industrial Accident Commission, Supervising Engineers from the Bridge District, the Contractors, and safety engineers from the insurance carriers were present. At this first meeting the proposed activities of various groups were carefully outlined. It was unanimously agreed that all concerned should work together for the common purpose of protecting from accidental injury the workmen building the bridges.

An Advisory Committee was formed which meets monthly. Accident figures are presented for the preceding month for each contractor. The data includes the number of injuries requiring medical attention, the number resulting in loss of time, the estimated days of lost time, the man hours worked, and the frequency and severity rates calculated by the standard methods of the National Safety Council. The cumulative figures are also charted, month by month, for the entire job. The figures are published in full in the monthly minutes sent to some fifty advisory committee members.

At some meetings complete lists of injuries to employees of each contractor are typed and distributed to those present. The outstanding cases are discussed by the contractor involved, with his recommendations for the action that has been or will be taken to prevent a repetition. In addition to the consideration of individual accidents, there is a tabulation by groups according to general cause classifications and by nature of employment.

Some meetings have been featured by the appearance of manufacturers of safety equipment to explain the merits of their products, and these included safety shoes, hard hats, safety goggles, life preserver vests, life belts, protective skin creams, etc. Other speakers talked about back sprains, silicosis and other topics of interest. Motion picture films of the work depict safe and unsafe practices. Members of the committee tell how their own organizations handle various problems. Investigation report forms, special means of safety publicity or information, and other material used by contractors and insurance carriers are presented and later distributed as a part of the monthly minutes. A tremendous amount of practical information has thus been disseminated through these meetings.

The Industrial Accident Commission has made regular and frequent inspections of the work, notifying employers immediately of unsafe conditions and the corrections to be made. L. K. Reinhardt of the Commission's Engineering Staff, acts as secretary of the Advisory Committee. Mr. Reinhardt deserves a large share of the credit for helping to maintain the active interest of the Advisory Committees through his broad knowledge of safety conditions. When special circumstances arise, the Industrial Accident Commission gives special study to determine what might and should be done. For example, when riveters working in enclosed cells of a bridge tower, become poisoned by the fumes of lead paint in the rivet holes, a thorough investigation of preventive measures was made and resulted in suitable action by the contractor and the Bridge District to improve the situation.

The Supervising Bridge Engineers have taken an active part in the program. They have attended meetings and contributed to the discussions.

The contractors have cooperated freely. They have supplied their accident data and all the facts concerning accidents; established first aid stations; provided the necessary safety equipment; maintained bulletin boards for safety posters; and in other ways have shown their desire to prevent accidents. The majority of the contractors belong to the Construction Section of the National Safety Council. Several have held safety contests for their men, one organization has a man devoting his time exclusively to safety inspections. Another has a surgical assistant taking care of all first aid treatments and supervising safety—all with notable success. Others have supervisors of First Aid with these general duties, which require only a part of their time. One contractor at the regular weekly meeting of foremen discusses safety measures with great thoroughness and the records show the benefit of the unusual interest taken.

The safety engineers of the insurance carriers have been quite active. They have attended most of the meetings of the contractor's safety organizations, and have assisted in drawing up safety rules, etc. One insurance company has had prepared an employee publication called "Bridge Builder" for the workmen on the bridges. It has a monthly circulation of 1,000 copies, and its distribution has made it much easier to obtain good housekeeping, prompt report of injuries by the men, installation of necessary safeguards, and friendly cooperation of foremen. Another insurance organization gets out a single page bulletin devoted exclusively to accident prevention that has been similarly helpful.

Hundreds of safety posters of the National Safety Council have been used. Several contractors mount safety slogans on the weekly pay checks. Safety signs are generally conspicuous. Workers' suggestions for safety are freely encouraged and many have been received and acted upon favorably.

What are the results? From the concrete laborer to the directing heads of the various organizations has developed a consciousness for safety never before so thoroughly realized. The figures for accident frequency and severity appear to show a constant improvement. During the past three months the severity rates have been less than one-tenth the average for all work done to date, and have held steady.

DISCUSSION

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Delivery, Taxicab and Bus Section

Officers 1933-34

- General Chairman*—C. H. RUTH, The Evening Star, Washington, D. C.
Vice-Chairman for Bakery Fleets—A. E. CAMERON, Pie Bakeries, Inc., Newark, N. J.
Vice-Chairman for Beverage Fleets—T. A. SCHENDEL, Premier-Pabst Corp., Milwaukee, Wis.
Vice-Chairman for Bus Fleets—City—LEONARD E. MANUEL, United Motor Coach Company, Des Plaines, Ill.
Vice-Chairman for Inter-City Buses—EARL HENSCHEY, Pacific Greyhound Lines, San Francisco, Calif.
Vice-Chairman for Dairy Fleets—A. E. LUNDSTADT, Bowman Dairy Company, Chicago, Ill.
Vice-Chairman for Ice and Coal Fleets—L. W. DAWLEY, Southern United Ice Company, Jackson, Miss.
Vice-Chairman for Laundry Fleets—P. G. WEITZ, Park Laundry Co., Jamaica, N. Y.
Vice-Chairman for Newspaper Fleets—W. F. BERR, The Canton Repository, Canton, Ohio.
Vice-Chairman for Petroleum Fleets—C. W. SMITH, Standard Oil Company, Chicago, Ill.
Vice-Chairman for Public Utility Fleets—H. N. GAINES, New York and Queens Electric Light and Power Co., Long Island City, N. Y.
Vice-Chairman for Retail Store Fleets—G. H. HANSEN, Wieboldt Stores, Inc., Chicago, Ill.
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Vice-Chairman for Inter-City Trucking—D. M. MOLES, Here Comes Meeks, Seven Mile, Ohio.
Program Committee Chairman—S. S. GREENBERG, Maxwell-Davis, Inc., Hartford, Conn.
Engineering Committee Chairman—A. D. PRENTICE, Hartford Accident & Indemnity Co., New York, N. Y.
Poster Committee Chairman—V. L. NOTLEY, Northwest Casualty Co., Seattle, Wash.

Statistics and Contest Committee Chairman—GEORGE A. MEYER, Southwestern Greyhound Lines, Inc., Texarkana, Ark.

Members at Large—

MARCUS A. DOW, Greyhound Management Co., Cleveland, Ohio.
ROBERT CLARK, Liberty Mutual Insurance Company, Boston, Mass.
DALE HARMAN, Yellow Cab Company, Kansas City, Mo.
C. V. WELLS, Pillsbury Flour Mills Company, Minneapolis, Minn.
B. C. SKIFFEN, City Ice Company of Kansas City, Kansas City, Mo.
C. C. ROSENBERGER, Market Service, Inc., Kansas City, Mo.
GEORGE WINUA, Builders & Manufacturers Mutual Casualty Co., Chicago, Ill.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Delivery, Taxicab and Bus Section was called to order by Mr. Clark T. McConnell, Chairman, Board of Directors, Great Eastern Stages, Inc., Cleveland, who presided. Chairman McConnell welcomed the delegates in the name of the Convention City, and then introduced the first speaker.

Maintenance for Safety's Sake

By G. E. WEAVER

Vice President, Weaver Manufacturing Co., Springfield, Ill.

The speaker said in part: In the automotive industry there is too much repair and not enough maintenance, and too many managers that don't know the difference between repair and maintenance. The repairer fixes very little but the maintainer uses every means to prevent repairs. Maintenance takes care of the little things instead of allowing them to accumulate into heavy repair bills, interrupted operations and expensive claims.

It has been authentically reported that many companies make it so unpleasant for their drivers when they report poor brakes, bad steering or other defects, that they hesitate to register complaints for fear of losing employment.

The problem of safe transportation on highways is not so much what a comparatively few safety-conscious, well-financed and managed corporations can do, but what can be done through regulation to enforce safety maintenance and promote safe thinking among all motorists and fleet operators.

The answer to this maintenance problem surely lies in state or city operated inspection bureaus, where all vehicles are required to appear at intervals for inspection.

Memphis, Tennessee, is successfully operating such a bureau where all motor vehicles are required to appear once in six months for inspection, and a fee of fifty cents is charged, which maintains the station and gives to the city a surplus to be used for further street and highway safety. It has resulted in a 25 per cent decrease in fatalities and casualty underwriters have reported a very substantial decrease in property damage claims.

This station provides standardized inspection by trained operators. No repair work is done, no attendant is permitted to recommend any repair shop. The motorist may go to any shop he chooses or, if capable, he may do the necessary correcting himself. If he wishes suggestions or advice on the safe maintenance of his vehicle, a competent supervisor experienced in automotive work is available.

Fleet operators, especially those national in their scope, having well managed maintenance departments, found little or no trouble at this inspection bureau. But those organizations having shops of the "fix-it-up" type, or no shops at all, found their equipment in great need of repair. This was particularly true of the owner-

driver type of truck which accounts for 76 per cent of all commercial vehicles. Many light trucks usually used for food delivery by the grocery store or other establishment, having one to ten trucks, showed a lack of maintenance in any form, and the dominating commercial vehicle traffic in any city is from such establishments.

The inspection bureau provides that any vehicle after having been certified may appear for re-inspection any time for six months without cost; this encourages the free use of the station and no motorist in the city can have any reasonable excuse for not knowing the condition of his vehicle. This feature is, of course, taken advantage of by every safety-conscious fleet operator. Some make a practice of inspecting their equipment once a month.

Summing up the advantages to fleet operators, municipal or state inspection can provide:

1. Either safe maintenance or removal from the highway of unsafe ramshackle vehicles.
2. Standardized inspection of all used vehicles before being sold or delivered.
3. Means of promoting safe driving education and dispensing safety literature.
4. Making eyesight or color blind tests.
5. Increased driver morale and discipline.
6. Safety testing facilities for the small fleet that can't afford a well equipped shop.
7. A check by the management on their shop mechanics.
8. Means of creating public good will.
9. Prolonged life of the vehicle.

During the first inspection period standards for brake equalization were set low, so as to avoid public disapproval by too many rejections and to give the shops an opportunity to train their help to adjust brakes even to this low standard. On the second period this standard was increased. This makes for fairness to those poorly equipped shops and helps them correct methods of brake adjustment to a higher plane. Even with the low standards there were 25 per cent of the vehicles that would not pass. Steering and alignment account for a very large percentage of accidents and while standards were not so high, they expect to be later. Such defects account for about 15 per cent of the rejections.

Special Problems of Highway Transportation

The next speaker was Mr. C. C. Rosenberger, safety engineer, Market Service, Inc., Kansas City, Mo., who discussed "The Special Problems of Highway Transportation Service." Since he spoke extemporaneously, however, and no record of his talk is available, it cannot be reported in these Transactions.

Report of the Nominating Committee

The report of the Nominating Committee was called for and new section officers for the coming year were nominated and elected as follows:

General Chairman—A. F. Lundsteadt, Bowman Dairy Co., Chicago, Illinois.

Vice Chairman as follows:

Bakery Fleets—C. S. Butler, Chairman of the Safety Council, Junge Baking Co., Joplin, Mo.

City Bus Fleets—F. McLenan, Jr., Safety Commissioner, Triple Cities Transit Corp., Binghamton, N. Y.

Inter-City Buses—Earl Hensley, Pacific Greyhound Lines, San Francisco, California.

Dairy Fleets—Virgil King, Sales Manager, Wholesale, Div., Louisiana Creamery, Baton Rouge, La.

Ice & Coal Fleets—J. Albert Green, Geyser Ice Co., Waco, Texas.

Laundry Fleets—H. C. Angland, Garage Supt., Troy Laundry & Cleaners, Minneapolis, Minn.

Newspapers—W. F. Burk, Traffic Manager, The Canton Repository, Canton, Ohio.
Petroleum Fleets—H. C. Waterhouse, Cities Service Oil Co., 3200 So. Western Ave., Chicago, Ill.
Public Utilities—J. R. Steele, Supt. of Safety, Oklahoma Gas & Electric Co., Oklahoma City, Okla.
Retail Stores—Oscar Hensler, Wieboldt Stores, 1279 Milwaukee Ave., Chicago, Ill.
City Trucking—L. Gusman, City Transfer Co., Ltd., Honolulu, Hawaii.
Motor Freight—C. C. Rosenbarger, Markel Service, Inc., Kansas City, Mo.
Beverage Fleets—B. McCounell, Ass't. to Transport Mgr., Coca Cola Bottling Co., 431 E. 165th St., N. Y.

TUESDAY LUNCHEON SESSION

October 2, 1934

After the luncheon, the meeting was called to order by Roy S. Bousib, Chief Safety Inspector, Standard Oil Company of New Jersey, New York City, who presided. The business announced by the chairman was the presentation of awards to meritorious unit companies who had achieved distinction in various safety contests.

The first feature was the presentation of trophies in the Cleveland Department Store Fleet Safety Contest. Judge Lee E. Skeel, President, Cleveland Safety Council, with many gracious words of praise for the good work of the winners, presented trophies to the following:

Winners in Division "A"

The May Company, which operated 362,881 miles with only four accidents, was the company developing the best record for safety.

Sterling & Welch Company, which operated 126,212 miles with only two accidents, was the company developing the best improvement.

Winners in Division "B"

Sears Roebuck Company, which operated 65,897 miles with no accidents, was the company developing the best safety record.

Fries & Schuele Company, which operated 39,753 miles without an accident, was the company developing the best improvement.

National Fleet Safety Contest

The second feature was the awarding of National Safety Council trophies to winners in the National Fleet Safety Contest. There were 471 fleets that competed in this contest, and 29,100 vehicles operated a total of 490,000,000 miles during the contest period ending June 30, 1934. For the sake of fair competition the fleets were divided into types of operation, and most of these subdivisions were again divided according to size. All divisions were rated on the basis of accidents per 100,000 vehicle miles. Vehicles enrolled in the contest averaged 2.35 accidents per 100,000 vehicle miles. Inter-city bus fleets had the lowest rate, averaging 0.92, and drivers of laundry trucks had the highest rate, average 7.07. In most groups small fleets had more favorable experience than the larger ones. The outstanding no-accident record was made by the Indianapolis Division of the Greyhound Lines—1,196,021 miles without an accident.

Trophies were presented to the winning fleets by Robert I. Catlin, Assistant Vice-President, Aetna Life and Affiliated Companies, Hartford, Conn., and Vice-President for Public Safety, National Safety Council. The winning units were as follows:

Inter-City Bus Operations:

Large Fleets—Greyhound Lines, Chicago.

Small Fleets—Pacific Greyhound Lines, Inc., El Paso, Tex.

City Buses and Taxicabs:

Large Fleets—Triple Cities Traction Corp., Binghamton, N. Y.

Small Fleets—The Duluth-Superior Transit Co., Duluth, Minn.

Passenger Car:

Large Fleets—Gulf Companies, Ft. Worth, Tex.

Middle-Sized Fleets—Shell Petroleum Corp., Pipe Line, Colorado and Texas. (Perfect record.)

Small Fleets—Utah Power & Light Co., Rexburg, Ida. (Perfect record.)

Honorable Mention, perfect records: Oklahoma Gas & Electric Co., Shawnee, Okla.; Utah Power & Light Co., Provo, Utah; Columbia Gas & Electric Corp., Binghamton, N. Y.; Long Island Lighting Co., Bay Shore, N. Y.; Cities Service Oil Co., East Chicago, Ind.; Charleston Oil Co., Charleston, S. C.; Community Traction Co., Toledo, O.; Shell Petroleum Corp., Arkansas City Refinery; Bridgeport Brass Co., Bridgeport, Conn.; Trexler Farms, Orchards and Merchandise Stock, Allentown, Pa.; Breen & Halliday Fuel Co., Grand Rapids, Mich.

Inter-City Trucking:

Large Fleets—U. S. Engineer Department, Gulf of Mexico Division.

Small Fleets—U. S. Engineer Department, Upper Mississippi Valley Division.

Dairies:

Bowman Dairy Co., Chicago.

Public Utilities:

Large Fleets—Oklahoma Gas & Electric Co., Shawnee, Okla.

Small Fleets—Utah Power & Light Co., Preston, Ida. (Perfect record.)

Honorable Mention, perfect records: Utah Power & Light Co., P. and T. Department; Long Island Lighting Co., Southampton, N. Y.; Utah Power & Light Co., Rexburg, Ida.; Long Island Lighting Co., Riverhead, N. Y.; Utah Power & Light Co., Bingham, Utah; Utah Power & Light Co., Park City, Utah.

Miscellaneous Manufacturing Plants:

Pittsburgh Steel Co., Monessen, Pa. (Perfect record.)

Honorable Mention, perfect records: Trexler Farms, Miscellaneous Operations, Allentown, Pa.; Trexler Farms, Springwood & Park Division.

Petroleum:

Large Fleets—Gulf Companies, Houston, Tex.

Small Fleets—Cities Service Oil Co., Western Ave., Chicago. (Perfect record.)

Honorable Mention, perfect records: Shell Petroleum Corp., Houston Refinery; Shell Petroleum Corp., East Chicago Refinery; Shell Eastern Petroleum Products, Inc., Southern District; Cities Service Oil Co., Elston Ave., Chicago; Shell Petroleum Corp., Arkansas City Refinery.

Bakeries:

Large Fleets—Pie Bakeries, Inc., Newark, N. J.

Small Fleets—Junge Baking Co., Joplin, Mo.

Newspapers:

The Canton Repository Co., Canton, O.

City Trucking:

Large Fleets—U. S. Engineer Department, Pacific Division. (Perfect record.)

Small Fleets—City Transfer Co., Ltd., Honolulu, T. H. (Perfect record.)

Department Stores:

Large Fleets—The Fair, Chicago.

Small Fleets—Wieboldt Stores, Inc., Chicago. (Perfect record.)

Beverages:

Large Fleets—The Coca Cola Bottling Co. of New York, Inc., Syracuse and Watertown.

Small Fleets—The Coca Cola Bottling Co. of New York, Inc., Valley Stream. (Perfect record.)

Honorable Mention, perfect record: The Coca Cola Bottling Co. of New York, Inc., at Binghamton and at Utica.

Coal and Ice:

Large Fleets—Philadelphia Coke Co., Philadelphia, Pa.

Small Fleets—Central California Ice Co., Turlock and Merced, Calif. (Perfect record.)

Honorable Mention, perfect record: Central California Ice Co., Visalia.

Laundries.

Large Fleets—Troy Launderers and Cleaners, Inc., Minneapolis, Minn.
Small Fleets—Seacrest Laundry, Inc., Elmhurst, L. I., N. Y.

WEDNESDAY MORNING SESSION

October 3, 1934

The session was called to order by D. M. Miles, General Manager, Here Comes Meeks, Seven Mile, Ohio, who presided. The Chairman welcomed the delegates and immediately introduced the first speaker.

Safety Promotion Through the Efforts of Operators

By S. S. GREENBERG

Maxwell-Davis, Inc., Hartford, Conn.

The speaker said in part: I can say without fear of dispute that we all willingly sponsor safety. It has assumed a place in business secondary to no other phase of conduct. There is also, to all of us, an understandable dollar and cents angle to this problem. This aspect should control the additional attention of every thinking operator as he studies the necessary problems of publicity.

Dr. Julius Klem, former Assistant Secretary of Commerce, treated the safety problem from a practical business viewpoint in one of his radio broadcasts. I heard him point out that the present dangerous traffic situation is costing, from a dollars and cents angle alone, the staggering sum of \$850,000,000 dollars per year. It is also stated from an authoritative source that unless this deluge of waste is checked by safety education, it will mount to at least the billion dollar mark. In addition to this outline of loss, the Government's Committee on Relief of Traffic Congestion reported that the congestion costs the people of the United States more than \$2,000,000 a year.

Accident investigation often fails to get results because committees are satisfied with finding the major cause only. There are always contributing causes, which, if known, would assist materially in preventing future accidents. In my research work I have statistical facts which point to the necessity for thorough and exhaustive investigation of all phases contributing to accidents. It is astonishing to know that accidents are the first cause of death within certain age groups. Last year 91,085 men, women and children were killed by accident.

I take it for granted that every man at this Congress renders a safe service in his community. I also assume that since you are public-spirited enough to attend these Safety Sessions, you tell your public of your attitude in the matter of safety. If you have not capitalized on your safety efforts, your record and your drivers' records, you are ignoring a sure shot possibility that builds preference, prestige and adds to the income of your employees, as well as yourself.

I have found that aggressive operators advertise and the more aggressive they are, the more progressive are their promotional efforts along these lines, and the larger are their profits. Experienced safety council is an asset.

How Fleets Can Cooperate in Community Safety

By JESSE T. SMITH

President and General Manager, Yellow Cab Co., Cleveland, Ohio

The speaker said in part: Some years ago I was driving along one of the main streets of a certain Ohio city, with my wife and daughter in the car, when suddenly, out of a side street, going at least thirty miles an hour, and totally disregarding the stop sign at the intersection, shot a delivery truck with a colored boy at the wheel. I swung the wheel instantly, and by good fortune was able to avoid all but a slight

accident; but the main thing I want to report here is the attitude of that colored boy when I climbed out of my car and started to tell him a few things.

"Why boss?" he said. "What's the matter, boss? Ain't you never been in no accident before?"

That colored boy's attitude toward accidents, his assumption that they were just part of the daily routine, his surprise that they should occasion wrath, was typical of the delivery truck driver's point of view in that city at that time. The driver took no pride at all in safe, courteous operation. He didn't own the truck, he didn't pay insurance premiums or repair bills, and if the boss was unreasonable about just a few accidents and fired him—well, he could always pick up another job driving for someone else.

Delivery truck operations were and still are in a great many places notoriously bad, because nothing was done to make them good. Nothing constructive was done to change the driver's point of view. Nothing was done—in Cleveland at least—until the Safety Council here started its Community Contest among department stores, to cut down the number of accidents, cut down accident costs, save good will for the stores that was lost every time a store's delivery truck crashed or nearly crashed some prospective customer's machine.

Let me give you some interesting figures:

In 1928, before the safety campaign really started, delivery truck drivers averaged only 5,856 miles to an accident. In 1929, with the campaign under way, they averaged 17,906 miles to an accident. In 1930, it was 28,644 miles; in 1931, it was 43,927 miles; in 1932, it was 46,764 miles; in 1933, it was 45,392 miles. And in the first six months of this year—1934—these drivers averaged 61,500 miles to one accident.

And remember that by an accident I mean anything reportable to an insurance company—anything at all, whether it was the driver's fault or the other fellow's.

What is the Community Contest conducted by the Cleveland Safety Council which brought these results, which saved the stores thousands and thousands of dollars in insurance premiums, repair bills and good will?

Well, the first thing to know about it is that it goes on all the time. It's perpetual. And let me suggest here that any contest which starts and then stops and then starts again isn't much better than no contest at all, for the driver, after each contest ends, feels the lack of incentive. The Cleveland Community Contest goes on all the time, with cups to the winning companies and individual button awards twice a year to the drivers.

All drivers for department stores are enrolled by the Safety Council in the contest. The driver who goes six months without an accident gets a button. The driver who goes a year gets a button. The driver who goes 18 months gets a certificate signed by Judge Lee E. Skeel, head of the Cleveland Safety Council. And drivers are proud of these buttons and certificates. They are more than proud, one operator of a fleet here explained. They use them to get out of scrapes when they are up before the judge for something that happened when they were driving their own personal cars, or to get other jobs.

Now, how can fleets cooperate in community safety?

First, I believe, every fleet operator should ascertain the facts of every accident in which one of his drivers is involved—age, general intelligence, health, eyesight, hearing, also all the facts about the machine, traffic conditions, etc. A thorough investigation of the accident would also make it easier to apply proper discipline.

Second I believe there should be a way to submit such accident data to some central agency, such as your local Safety Council, for tabulation and study. A record of accidents involving just the 15 or 20 drivers of one fleet may not have much practical value. A record of accidents involving a substantial percentage of all the commercial drivers in a city should reveal what causes the majority of accidents and provide a sound basis for developing preventive methods.

If the general accident record shows that a certain type of man, mentally and physically, is an accident-prone driver, we could eliminate that type by using standard mental and physical tests for driver applicants, by developing a standard instruction course in safe driving, by preparing a safe driving code and by improving methods of driving discipline.

Now, what about the machine? Our accident record—covering most of the accidents involving commercial vehicles in the city—should tell us something about the

accident-prone vehicle. It's size, it's speed range. It's brakes—their type and efficiency. It's ease of control. The comfort and ready vision it gives the driver. Also—and here is an important item—the ventilation in the driver's compartment. I think a lot of accidents are caused because the driver does not get fresh air enough to keep him mentally alert.

If we know the type of machine involved in most accidents, we can improve methods of maintenance and mechanical inspection on the basis of facts, not guesses. And we as commercial users can, as a group, insist that the car manufacturers improve the margin of safety for the public and our drivers and ourselves. Accident records should also show us to some degree the effectiveness of various types of traffic signals and signs.

Finally, we come up against traffic laws and their enforcement as a means of preventing accidents. Our accident record—and we could compare one community with another in this—should show us what type of regulation and what type of enforcement is the best accident preventive. Parking regulations would furnish us an excellent example. We might find that "No Parking" signs on certain downtown streets would help to stop accidents. We might find that such signs and all other traffic regulations are absolutely useless when 50 per cent of the traffic law violators never get a ticket, and a considerable percentage of those who do get a ticket have it fixed without paying any fine and without appearing in traffic court.

We have found here in Cleveland that every dollar spent to promote safety will bring back two dollars if it accomplishes its purpose. When we figure that department stores in Cleveland had twelve times as many delivery truck accidents in 1928 as they will this year, we can figure that they have saved thousands of dollars in insurance premiums, thousands again in repairs on equipment, thousands in possible hospital bills. And what about the good will? No matter whose fault the accident was, the commercial operator always gets the blame.

Mechanical Devices for the Safety of Commercial Vehicles

By R. C. HAVEN

Safety Engineer, Continental Baking Co., New York City

The speaker said in part: The following material is the result of a questionnaire sent to a number of the largest operators of truck and bus fleets in the country, as well as to several of the insurance companies who make a specialty of covering this type of risk. The answers received are both interesting and enlightening.

Rear View Mirrors. An overwhelming opinion prevails that the non-glare type mirror has a distinct advantage, especially in night driving. All agree also that the flat mirror is best, since it presents a truer rear view. The majority opinion is that the round mirror is best, especially when mounted outside the cab. The best place to mount the mirror depends, of course, upon the construction of the vehicle; but the opinion prevails that the mirror should be mounted on the left corner post of cab as close to driver as possible. The ball and socket type with thumb screw adjustment and short bracket to reduce vibration is preferred. As to the advantage of two mirrors, instead of one, the opinions were about equally divided.

Windshield Wipers. The additional safety to be gained by using a double windshield wiper is impossible to measure. "However," said another questionnaire, "we specify two windshield wipers on all truck equipment." An electrically operated wiper is the only one that seems to successfully maintain a constant speed. The best method of keeping frost from forming on the windshield seems to be a grid type heater attached to inside of windshield. One suggestion was to use kerosene or alcohol, and glycerine is also effective for a short time. Of course, all agreed that all vehicles should be equipped with windshield wipers.

Horns. The use of horns, it seems, is being assailed in some of the foreign countries, but most everybody will agree that there is a right and wrong time to use the horn. The standard location for the horn button seems to be at the top of the steering post. There seems to be no commonly used signal to indicate intention to back up, although one questionnaire suggested three blasts from the horn. The

adoption of some such signal, however, might well provide just another alibi for the accident-prone driver.

Bumpers. Bumpers vary in height, depending on the size and the model of the truck. However, it is suggested that a standard height of bumper would help to reduce collision costs. Generally speaking, it was agreed that large trucks should be equipped with bumpers for the protection of passenger cars. It would, of course, be very difficult to design a bumper for some of the large equipment.

Turn Indicators. As to the relative advantages and disadvantages of a wig-wag system and a lighted arrow, practically all expressed the opinion that the lighted arrow is the best. However, says one operator, "If the operator of a car fails to use hand signals, he will also fail to operate wig-wag system and lighted arrows." No successful way has ever been found to connect turn indicators to the steering gear of the car, so that they are entirely automatic.

Hand Grips. Hand grips in buses are usually best located immediately inside the front entrance door on the left-hand side. Fleet operators usually put hand grips on their trucks when the cab is high or design of the truck cab does not provide a good hand hold. Some kind of hand grip apparently is necessary from a safety standpoint.

Non-skid Steps. The type of non-skid treads used varies with the size and shape of the step surface to be covered and the amount of wear involved. There are a number of good abrasive metal plates on the market, as well as non-skid rubber and fabrics which seem to be used extensively.

Reflector for Limit Lights. One bus company said, "It is our custom to place two reflectors three inches in diameter, one each on the extreme sides of the rear fender on a level with the eye. We use lights instead of reflectors for the limit lights."

Power Brakes. The question of brakes is, or should be, first and foremost in the minds of all operators, drivers, maintenance men, safety engineers and public officials. Apparently, the most efficient brakes for small capacity trucks are those of the vacuum type. As to desirability of delay in brake action to prevent too quick stopping, one operator says, "We adjust our brakes with as little lag as possible and train our drivers in the proper manipulation of them." There is considerable danger, all agreed, from power brakes on trailers not taking hold as quickly as those on the truck. Power brakes on trailers can be and should be arranged to come into operation before the brakes on the tractor or truck.

Flares and Fuzes. Accidents are frequently reported where oncoming cars pile into other cars disabled or in collision along the highway. As a protection to both the parked and oncoming vehicle, many states are requiring flares or torches to be carried by trucks—especially those operating on rural routes elsewhere than in a city or incorporated village, and operating at night. As a matter of fact, many large fleet owners did not wait until compelled by law to protect themselves and others and make this a part of their regular equipment. Most of our replies indicate that flares are recommended and used, except when state requirements specify fuzes. Obviously, the oil companies object to using the open flame type due to the nature of their product. Regarding location of the flare on the vehicle, it should undoubtedly be located on the truck where the load cannot block access to it in case a flare is needed in a hurry.

Carbon Monoxide Elimination. No answer to the questionnaires provided information about devices intended to eliminate carbon monoxide. The best preventive, said one operator, is careful maintenance of exhaust and muffler systems, tight floor boards and efficiency of engine combustion.

Heaters. The belief is general that safety cannot be increased by using a heater for cabs and trucks. Heat seems to increase drowsiness. As to danger from carbon monoxide coming from a heater, this is obvious from the fact that all questionnaires recommended the use only of hot water or electric heaters. The exhaust type of heater is a constant source of danger, unless daily inspection is made to see that manifold exhaust connection is tight and there are no leaks otherwise.

Chains. Our first answer said: "We find the use of chains in certain of our territories necessary with any type of tire, due to snow and mud conditions. We

require all drivers to apply chains when driving conditions indicate the wisdom of their use." Another said, "Only in mud and heavy snow for traction. Chains are a very poor non-skid device. They are useless on icy pavements and, in fact, increase skidding." The third questionnaire added: "Chains should never be used for the sole purpose of preventing skidding. We try to get our drivers to consider them as aids only in getting under way on difficult roadways and not as a preventive of skidding."

Spot Lights. Everybody agreed that there is nothing to be gained from the standpoint of safety in equipping delivery trucks with spot lights.

Dash-Board Tell-Tales. The consensus of opinion as to their value for tail, limit and stop lights is that these are a safety feature worth providing. Attention was called to the many accidents being caused by the car in front being without these lights. The almost unanimous opinion is that tell-tale lights should operate separately from the dash lights.

Special Connectors. One answer said: "All trailers should be equipped with special connectors to avoid detaching due to vibration. Any locking device should certainly be positive and not a makeshift." One large oil company said: "We have designed special connections between trucks and trailers, so that they can be connected only in one way, thus avoiding any trouble with electrical circuits and assuring all lights and electric units on trailers will function properly."

Shatter-Proof Glass. The universal answer was that shatter-proof glass does not reduce or prevent accidents, but its use has certainly reduced the severity of results of accidents. As to the factor of deterioration sufficiently to mar the driver's vision, opinions were divided. However, another questionnaire said: "Shatter-proof glass properly sealed at time of installation does not deteriorate to any great extent."

Special Painting of Rear End of Car. One very large bus operator said: "We feel that marker lights and stop and tail lights are sufficient for the rear end of a bus." Another said: "Any painting scheme that would make equipment conspicuous is advisable, as it calls the attention of the approaching motorist to the vehicle." But another said: "Like reflectors, it depends on the efficiency of head lights of approaching vehicles."

Governors. To the question "Will the limiting of speed materially prevent accidents?" several said the speed should be governed by the nature of the load, capacity of truck or car, and length of haul. The speed limits generally recommended were from twenty-five to forty miles per hour.

First Aid Kits. Under what conditions should these be furnished the drivers? One bus operator said that all drivers are required to carry a first aid kit. Generally speaking, however, the answers reflect the belief that first aid kits are not necessary. The only conditions under which they would be recommended are where the driver has a rural route or drives a transport truck, or is on the road over night when first aid attention would be hard to obtain. It was indicated, however, that all work trucks should be equipped with first aid material. It was also recommended that where a kit is furnished, the driver should receive proper instruction in its use.

Fire Extinguishers. Most of the opinions expressed were that where a driver covers an isolated route in sparsely settled territories where assistance would not be readily had, or when valuable loads are carried, this equipment might be justified—although most of the questionnaires, including those from oil companies, reported that the frequency of fires would not justify the installation. It is a general practice of the oil companies to provide extinguishers for most of their trucks; as a matter of fact, in many of the larger cities this is required by ordinance.

Although this ends our very interesting list of questions and answers, it has seemed to me that spare tires and parts, as well as proper tools for quick minor repair jobs, should also be mentioned. Many breakdowns and repairs of flat tires have prolonged the hazard on the highway because of lack of these essentials.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Food Section

Officers 1933-34

- General Chairman**—T. A. SCHENDEL, Premier-Pabst Corp., Milwaukee, Wis.
Vice-Chairman—FRANK A. HASSE, Corn Products Refining Co., Chicago, Ill.
Secretary and News Letter Editor—RUTH E. CADE, A. E. Staley Manufacturing Co., Decatur, Ill.
Engineering Committee Chairman—PAUL GOODNOUGH, Quaker Oats Co., Chicago, Ill.
Membership and Program Committee Chairman—W. C. WASHBURN, Sheffield Farms Co., Inc., New York, N. Y.
Poster Committee Chairman—ROBERT FLEMING, Kellogg Company, Battle Creek, Mich.
Publicity Committee Chairman—C. W. TURNING, Gooddard & Heuschman, Minneapolis, Minn.
Statistics Committee Chairman—J. J. LYONS, John F. Jelke Co., Chicago, Ill.
Slides and Safety Kinks Committee Chairman—PAIGE LEHMAN, Pillsbury Flour Mills, Minneapolis, Minn.
Members at Large—
 WILLIAM F. BARRETT, Horn and Hardart Baking Co., Philadelphia, Pa.
 W. P. BELL, California and Hawaiian Sugar Refining Corp., Crockett, Calif.
 D. M. CLARK, Society of Grain Elevator Superintendents of North America, Chicago, Ill.
 MORRIS COHEN, Schultze Baking Co., Kansas City, Mo.
 C. W. DEMPSEY, Liquid Carbonic Corp., Chicago, Ill.
 ALEXANDER DIENST, The National Sugar Refining Co., Long Island City, N. Y.
 E. W. GREEN, Oahu Sugar Co., Ltd., Waipahu, Oahu, T. H.
 C. E. GRIFFIN, The Axton-Fisher Tobacco Co., Louisville, Ky.
 ELMER HEINBACH, Manager, Americus Hotel, Allentown, Pa.
 S. B. HORRELL, The Carey Salt Co., Hutchinson, Kansas.
 ROBERT McDONALD, Atlantic Sugar Refineries, Ltd., St. John, N. B., Canada.
 HENRY J. MINEUR, Borden's, New York, N. Y.
 ADOLPH PFEFFER, Adolph Pfeffer Rice Milling Co., Houston, Texas.
 R. E. PROUTY, Aetna Life Insurance Co., New York, N. Y.
 G. L. RHYS, John Morrell & Co., Ottumwa, Iowa.
 THOMAS STROBACH, Wagner-Taylor Co., Philadelphia, Pa.

WILLIAM A. SULLIVAN, Loose-Wiles Biscuit Co., Kansas City, Mo.
 VERN D. SUTTON, Postum Company, Inc., Battle Creek, Mich.
 R. W. URSHAW, Anheuser-Busch, Inc., St. Louis, Mo.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Food Section was called to order by General Chairman T. A. Schendel, Premier-Pabst Corporation, Milwaukee, Wisconsin, who presided. The chairman first introduced Mr. W. E. Carter, Branch Manager, Cleveland Plant, Kroger Grocery & Baking Co., Cleveland, who made a brief address of welcome on behalf of the Convention City.

Chairman Schendel then presented a "Resumé of the Year's Activities," outlining some of the work of the section officers and praising the accomplishments of standing committees. He then called for the report of the Nominating Committee, and new officers for the section were nominated and elected as follows:

General Chairman—T. A. Schendel, Premier-Pabst Corporation, Milwaukee, Wis.
 Vice-Chairman in Charge of Membership—C. W. Dempsey, Liquid Carbonic Corp., Chicago, Ill.

Vice-Chairman—S. B. Horrell, The Carey Salt Co., Hutchinson, Kansas.
 Secretary—D. M. Clark, Society of Grain Elevator Superintendents of North America, Chicago, Ill.

News Letter Editor—Frank A. Hasse, Corn Products Refining Co., Chicago, Ill.
 Engineering Committee Chairman—G. L. Gore, Bruce Dodson & Co., Kansas City, Mo.

Health Committee Chairman—Robert Fleming, Kellogg Company, Battle Creek, Mich.

Pasteur Committee Chairman—William A. Sullivan, Loose-Wiles Biscuit Co., Kansas City, Mo.

Publicity Committee Chairman—Ruth E. Cade, A. E. Staley Manufacturing Co., Decatur, Ill.

Slides and Safety Kinks Committee Chairman—G. L. Rhys, John Morrell & Co., Ottumwa, Iowa.

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 Vern D. Sutton, Postum Company, Inc., Battle Creek, Mich.
 Wilbur Thomas, Hage's, Limited, San Diego, Calif.
 Lionel W. Udell, United Fruit Co., Boston, Mass.

Theodore J. Van De Kamp, Van de Kamp's Holland-Dutch Bakers, Los Angeles, Calif.
 P. Silas Walter, International Salt Co., Inc., Scranton, Pa.

Know Your Fumigants

By PROF. W. C. O'KANE

Chairman, Board of Governors, Crop Protection Institute, Durham, N. H.

The speaker said in part: Certain basic factors ought to be taken into account by any owner of a property or a commodity who sets out to control insects by fumigation. No matter whether the owner uses fumigant A, or B, or C, he is necessarily dealing with fundamental considerations which apply to all fumigation.

Since fumigation involves the use of a gas, and since all gases tend to diffuse away from the point of origin, it follows that successful fumigation requires an enclosed space to hold the gas. Except in rare instances the space in which the fumigating is done is not really gas tight. At the best there may be small cracks through which a gas can slowly leak out. At the worst there may be a good many cracks or openings at the top, the sides, or the bottom of the enclosure. If these openings are too many and are extensive, successful fumigation may be impossible. Even if they are few, they need to be taken into account. This means that an excess of the fumigating substance must be used to offset leakage. It means, also, that a gas which diffuses with excessive rapidity will leak out more rapidly, and therefore such a gas may not be capable of successful use.

The temperature of the fumigating structure and its contents is highly important. If the fumigation depends on the ability of a liquid or a solid to pass into the gaseous state, that ability varies with temperature. As temperature goes up ability increases; as it goes down it decreases. In the second place, the susceptibility of insects to the killing effects of a gas falls off rapidly as temperatures decrease. Beyond a certain point it is practically zero. A fumigant may operate very well at 70 degrees Fahrenheit, but not at all at 40 degrees Fahrenheit, because at the former temperature the insects concerned are active and susceptible, whereas at the latter they are inactive and not susceptible. Fumigation may need to be timed, therefore, so as to kill the insects at the beginning of their increased activity.

The nature of the contents within a structure to be fumigated is important. If a material is tightly packed, diffusion of the fumigating gas is retarded. It may even give little or no results. Materials packed closely in bags offer a hindrance. Materials in cartons may offer still more hindrance. Thus, the ability of a gas to diffuse in spite of such handicaps is highly significant.

Means of access to a fumigating structure are worthy of thought. If the fumigant to be used is lighter than air or tends to diffuse upward, it cannot be introduced at the top of the structure concerned. On the other hand, if it is heavier than air introduction at the top may be feasible.

Here again, however, if a fumigant is released at the top, the height of the structure must be considered as well as the nature of its contents. One may expect too much of a fumigant if one provides merely for introduction at the top and makes no provision for release also at points farther down, so that its natural tendency to settle may be adequately re-enforced. In general, a gas that is somewhat heavier than air is advantageous as compared with a gas that is lighter than air, since frequently the best means of access to a filled structure is at the top.

Real knowledge of the insects that are to be killed is definitely helpful and may be essential, unless the fumigant is so potent that it will kill any insect that may be present. Too often a fumigant is tried out on two or three insects in such stages as happen to be easily available, and from the results thus secured broad claims are made that the material will kill "any form of insect life in any of its stages." These assumptions are unwarranted unless the manufacturer has provided for complete study by competent experts.

In this connection it should be noted that many of the pests for which we fumigate may be present in any one of four separate stages, not all of which are equally susceptible to a toxic gas. The common grain weevils, for example, are

familiar enough as the adult weevil. Most persons know them also in the grub stage. But in addition to these the weevil passes through an egg stage and these eggs may be present in large numbers in the material to be treated. Also the grub in its transformation to an adult spends some time in a resting state called the pupa. Both the pupa and the egg may be more resistant to a fumigant than are the adult and the grub. If eggs and pupae are present, as is likely to be the case, fumigation must kill them as well as the adults and the grubs, if it is to be completely successful. Other insects which pass through these four separate states are the meal moth, the flour moth, the saw-toothed grain beetle, the cadelle, and others.

The fumigant itself ought to meet certain definite requirements if it is to perform adequately, satisfactorily and safely.

First in these requirements I would place safety to life. Theoretically one might declare that any fumigant if used with sufficient safeguards can be made safe. Practically the case is far otherwise. Many materials that will kill insects will also kill human beings. Such a chemical may give adequate results so far as the insects are concerned, but if it costs the life of an operator the results are bought too dearly. Especially is this true if compounds are available which would not endanger anyone's life. The only gas that is really safe is an absolutely safe gas.

In a similar way safety as to fire or explosion is an important factor. Here, one may say that insurance takes care of the risk. But receipt of an insurance settlement may fall far short of offsetting loss from interrupted business. Furthermore, insurance covering the use of a flammable gas may be expensive. Under many conditions it is impossible to obtain.

The matter of residues remaining in fumigated materials after the job is finished is also to be considered. Some mixtures of gases stratify after application, giving definite separation of flammable from non-flammable gas. Where this takes place the resulting layer of explosive gas may become a definite hazard. Again, there is increasing indication that some materials such as grains may retain the explosive parts of a mixed gas and later, under favorable circumstances, as in the presence of dry dust, may suddenly become involved in fire or explosion. These facts the operator should become fully aware of and should take into account in choice of a fumigant.

Another important matter is the effect of a fumigating substance on foodstuffs. If a gas leaves a persistent odor its use is undesirable. If it imparts to the material fumigated a flavor that is distasteful, even in minor degree, it is decidedly open to question as a desirable treatment. Ideally, a fumigant should improve flavor, should tend to preserve the treated material, and may even freshen foodstuffs or other commodities which have acquired stale odors.

If the fumigation involves treatment of grain, such as wheat, barley, or rye, or treatment of flour or malt, the effect on subsequent use of these materials is to be considered. A gas should not harm the baking qualities of grain or flour. It should not interfere with germination. In the case of barley, for example, germinating capacity and energy should not be impaired.

Selling Safety to Food Store Personnel

By C. A. RIDER

Safety Director, Kroger Grocery & Baking Co., Cleveland, O.

The speaker said in part: It is sad, but true, that it often takes a serious accident to teach a man safety-consciousness. This method of education is too slow and costly for the individual, as well as for the company. We felt there must be a quicker way to teach every manager, clerk and helper impressive lessons on accident prevention. We realized these lessons must be dramatized directly and continuously and be correlated with sales.

Analysis of our store accidents revealed that approximately 95 per cent of these accidents were the result of carelessness or unsafe practices. We found, too, in certain stores that the cost of these accidents amounted to large sums of money. Accidents often wiped out the profits of the store for four or five months.

This analysis gave us the central cue for our educational campaign. We began

combating accidents from the sales angle, and started talking to operators, supervisors, managers and store help about the thousands of dollars in net profits that were wiped out every year on account of the high cost of accidents. When we talked in terms of dollars and profits they began to understand the importance of safety and increased cooperation was obtained.

This appeal was not enough to keep safety in the minds of our store personnel. We wanted our employees to think more about the causes and the results of accidents. We wanted them to do the things which would make accidents almost impossible. To accomplish this we established a safety program which embraced, among other things, the following features.

1. Each branch organized a safety committee, composed of the personnel manager and the branch operators, the purpose of which is to discuss accidents that occur and take definite steps to remove their causes. Problems of prevention are brought up at meetings of this committee for consideration and proper action.

2. Each manager is made to feel his responsibility in the matter of accidents, not only to himself, but to his fellow workmen. He is expected to make out detailed accident reports promptly, showing among other facts the cause of the accident and what could be done to prevent a similar occurrence. Copies of these reports reach all interested parties, including the office of the general manager.

3. The supervisors are held responsible for checking each manager's reports of accidents and in addition to the check-up we enlist the help of store auditors in the inspection of the physical condition of stores and operating practices. This includes a check of entrances, floors, displays, produce racks, stock rooms, meat departments, etc., as well as practices and habits of store help. A report of the auditor's findings is placed before the safety committee for action.

4. We distribute bulletins bi-weekly, using cartoons and pictures to dramatize our educational material, to get safety messages over to the employees. These bulletins are prepared in our General Office, and pertain only to our problems. The messages are brief and to the point, and therefore easily understood. A vein of humor in drawing cartoons and brief copy helps to impress the reader. One bulletin may show humorously how a meat cutter, through carelessness, may easily cut himself; another may show ludicrously, though realistically, why some people fall from step-ladders; another may picture the folly of doing the "strong-man" act when there are easier ways of handling bags of sugar or potatoes.

An analysis of our accidents revealed that there were certain predominating causes. We continuously bring these predominating causes to the attention of our employees in an effort to eliminate them altogether.

5. In our organization magazine we continually use human interest stories illustrating the causes of accidents and proper methods for their prevention. In similar articles we also stress the tremendous expense of accidents and the pain and suffering to employees, as well as the high cost to the company and the enormous amount of sales necessary to offset this operating expense.

THURSDAY MORNING SESSION

October 4, 1934

Some Facts About Women in the Food Industry

By BERYL ROGERS McCLASKEY

Director of Industrial Relations, National Sugar Refining Co., New York City

The speaker said in part: The last census showed that 22 per cent of the total labor force in the United States consists of women and girls—in other words, two out of every nine employees are women or girls. The states employing the largest numbers of women are New York, New Jersey and Pennsylvania; together they employ about one-fourth of all women workers. The five industries employing the greatest number of women are textile mills, with about one-half million women, clothing factories with about 350,000, food industries with 106,700, shoe and leather industries with about 98,000, and cigar and tobacco factories with about 75,000.

In 1920, 20.5 per cent of all women employed were under 20 years of age; in 1930 this number had dropped to approximately 15 per cent. In view of the present attitude toward child labor, this change is significant; since the individual worker is probably going to serve industry for a longer period of years, she is worth more to her employer and should, therefore, enjoy better working conditions.

The marital condition of gainfully employed women fifteen years of age and over is important. In the 1910 census, single women and those with status unknown, constituted 60.2 per cent of the total number employed and only 53.9 per cent of those employed in 1930; the married constituted 20.7 per cent in 1910 and almost 30 per cent in 1930; the widowed and divorced 15 per cent in 1910 and 17.2 per cent in 1930. In other words, of all working women, the proportion of those married, widowed, or divorced is increasing at a fairly rapid rate. This fact suggests some of the problems of continuous adjustment in family life necessary for these workers.

In 1932 Miss Mary Anderson, of the Federal Women's Bureau, stated: "A shorter work week is especially important for women in industry, the great majority of whom have had a schedule in excess of forty-eight hours. Over half of the working women studied in the Federal Bureau's recent investigation were working fifty or more hours a week while over one-fifth worked fifty-four hours or more." The working day has since been shortened in most industries under the N. R. A., but this is doubtless due to some extent to the stagger system. New York is the only manufacturing state employing factory women in any numbers which limits by law the hours of labor. This state permits a nine-hour day and a forty-nine and one-half hour week, counting in all legal overtime.

There is a good deal of evidence, especially in those industries employing women, to support the statement that by speeding up machinery or giving the individual worker more machinery to tend, many employers have reduced labor costs at a sacrifice to working conditions.

The great majority of women are in semi-skilled or unskilled work and a comparison of the pay of men and women in the same company shows different earnings for the same work, the women's ranging from 20 per cent to 70 per cent below the men's and averaging 41 per cent below. An interesting study of some of the ill effects of low wages of women workers was made during the Bryn Mawr Summer School for Women Factory Workers in 1929. The actual median wage for those attending this summer school was found to be 48¢ for the preceding year. These women, asked to list in the order of their occurrence the ways by which they cut expenses to meet their budgets, gave the following answers: 1. Less food; 2. Lower rent; 3. Additional lodgers taken in the family; 4. Mortgage increased; 5. Other forms of indebtedness; 6. Training in other work.

Another way that low-wage groups undoubtedly supplement their earnings is by public relief. It is a distasteful fact to contemplate, but probably a considerable number of women employed by the companies we represent here today belong to families receiving some form of public relief.

The effect of economic insecurity on the morale of women workers in industry is also certainly one of our serious social problems.

There are two distinct types of hazards to the health of the working woman: (1) Conditions not commonly considered within the jurisdiction of the individual employer, such as insufficient nourishing food, poor housing and other factors that undermine health and happiness; and (2) Conditions of work directly related to the job. Concerning these latter I shall take time to call to your attention two types: (1) Hazards caused by physical conditions of work such as poor light, bad or overheated air, cluttered aisles, dangerous or noisy machinery; and (2) Hazards related to the rules of work such as preventing women from going to the washroom, allowing infrequent or insufficient rest periods, insisting that all work be done standing, discouraging all conversation, and, most important of all, those rules resulting from the "speed-up" and the "stretch-out" methods of some factories.

Many efficiency experts have made studies demonstrating that output decreases after eight hours of labor but nobody has thus far measured the ill effect on the worker on speeding up his or her tasks in order to produce a ten-hour output in eight hours.

Strain and fatigue are at once the most dangerous and the most difficult hazards

to combat. Many medical authorities believe that strain is more exhausting than work, and to the strain of the work itself must, in many industries, be added the deafening noises of machinery. Fatigue is often a predisposing cause of disease. Dr. Irving Fisher has stated, "A typical succession of events is, first, fatigue, then colds, then tuberculosis, then death." Death rates for tuberculosis are higher for women than for men and the highest rate of all is among women under twenty-five, the group constituting the larger proportion of working women. For the age group 15 to 25, the death rate of women is twice that of men.

Industrial accidents among women are increasing with the greater speed of industry. Because so few states report accident statistics by sex it is impossible to give adequate figures, but each of the three largest industrial states showed a greater accident rate for women over the last three-year period in its study of accidents of women workers. In Pennsylvania, the State Department of Labor and Industry says, "Despite the declining trend of industrial accidents in general, an almost constant increase in accidents to women workers was noted."

The fact that younger workers generally have higher accident rates than older ones also tends to increase the accident rate of women because of their age distribution. Thus a special study of accidents to women in New York State showed a larger proportion of accidents among the young women than their age group formed of the total number of working women.

Accidents usually result in greater hardships to women than to men, not only because women's wages prevent the accumulation of savings, but also because in most states accident compensation is based upon wages and the amount of protection the women workers receive is therefore inadequate.

We of the food industry must not take too much credit to ourselves because our accident rate is lower than that of some other industries employing women. Legal restrictions have necessitated safeguarding machinery and the general raising of standards. I have a feeling that if we could measure fatigue and strain as accurately as we measure accidents, our industry would not be too proud of its record.

Experience Exchange

The final feature of the Food Section program was an "Experience Exchange," consisting of an extemporaneous discussion of certain accidents and the lessons learned from them. The discussion was participated in by W. A. Sullivan, Manager, Insurance Department, Loose-Wiles Biscuit Co., Kansas City, Mo., John Gidel, A. E. Staley Manufacturing Co., Decatur, Ill., and others. As the remarks of these gentlemen were entirely extemporaneous, however, and a summary is unavailable, it is impossible to include in these Transactions any information of value.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Marine Section

Officers 1933-34

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 JOHN WRIGHT, American Export Line, New York, N. Y.
 G. D. ZILL, Associated Oil Co., San Francisco, Calif.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Marine Section was called to order by General Chairman Frank H. Cogan, the Delaware, Lackawanna and Western Railroad Co., Hoboken, N. J., who presided. Chairman Cogan introduced Mr. Herbert C. Jackson, of the Interlake Steamship Co., Cleveland, who cordially welcomed the delegates in the name of the City of Cleveland.

Chairman Cogan then presented a brief review and preview of Marine Section activities during the past year, including the work of sectional officers and chairmen of committees. The chairman then introduced the first speaker.

The Economics of Accident Prevention in Handling Marine Cargo

By H. W. HEINRICH

Assistant Superintendent, Engineering and Inspection Division, The Travelers Insurance Co., Hartford, Conn.

The speaker said in part: According to data provided by the U. S. Department of Commerce, 342,489 tons of cargo valued at \$10,910,429,000 were handled for export and import in the United States in 1932. This includes cargo handled on the rivers and lakes as well as at ocean ports. The payroll required was \$188,000,000. Estimated payments for compensation and employers' liability claims and for medical and hospital services amounted to approximately \$14,000,000. In addition to this, the indirect costs of accidents in stevedoring work is approximately four times as much as the direct costs, or \$56,000,000.

From these data accident costs may be expressed in terms of tons and payroll, as follows:

Total cost per ton, 20c. Total cost per \$100 of payroll, \$37.

Part of total cost per ton not covered by insurance, 16c. Part of total cost per \$100 of payroll not covered by insurance, \$29.60.

It is fair to compare accident costs with other so-called overhead costs in handling cargo in order that a true picture of its relative importance may be had. Stevedoring operators in the Port of New York provide the following estimates. Overhead costs, .068; labor costs, .68; bid price, .90; profit, .13; accidents, .20.

From the above it appears that the cost of accidents is nearly twice the total profit and almost three times the amount of overhead, and about one third as much as labor. A reduction of accident cost to the extent of 50 per cent, which, by the way, is wholly reasonable and possible, would seem to be decidedly worth while. To the entire industry the saving would approximate \$35,000,000 annually.

A further interesting fact related to accident cost is that compensation insurance rates, which directly reflect the frequency and severity of accidents, are getting higher. From 1928 to 1932 the rates in the State of New York increased 22 per cent.

The relation of incidental cost of accidents to the direct cost is very well known; however, the following cases will serve as examples:

Case No. 1. An unboxed Lincoln automobile was being loaded into No. 2 hatch. The boom-head was not guyed far enough outboard and when the car was raised clear of the dock it swung against the ship's side with considerable force, smashing the front of the car. The car could not be shipped and had to be replaced from the factory in Detroit. Also when the car suddenly swung toward the ship, a longshoreman, who was holding the guy lines, was thrown violently to the ground, injuring his arm.

The direct injury cost to this man was \$6, the medical bill being paid by the insurance company. But the indirect cost of the accident included the following: Property damage to car, \$2000; tonnage loss \$20; labor loss \$10; freight loss \$300. The total indirect cost was, therefore, \$2330, or a ratio of 388 to 1. Obviously, however, this is not an average case.

Case No. 2. Oil cake was being loaded into a ship in Brooklyn. The injured man, a hatch tender, was standing by the ship's rail and had signaled the watch man to hoist the draft. He then walked from the rail to the hatch coaming and started giving instructions to employees in the hold to stand clear of the draft. The job was being worked with a low boom and the hatch tender was not standing clear of the draft, for when it swung it struck him across the shoulders and he was thrown into the hold. He sustained a broken collar bone, two broken legs and various other injuries. The medical bills amounted to \$800, and although the accident happened four years ago, the man is still receiving compensation for partial disability.

There was no property damage in this accident, but even so the employer found additional cost. Before the accident occurred, the boat was being loaded at the rate of 50 tons per hour, the men producing to capacity. The accident happened and immediately 20 employees stopped work. It was necessary to secure a rained goods skid to lift the injured man out of the hold. There was more delay until the ambulance patrol arrived and in all it was nearly one hour before the job got under way again. The first hour after the accident the men moved 35 tons, the next hour 40 tons, and the final hour of the day 42 tons. Thus, in the day's work, there was incidental accident cost due to a production shortage of nearly 60 tons, and the loss of an hour's payroll for the twenty men on the job, which was paid by the employer.

It has been established by careful research, therefore, that the cost of claims and medical and hospital care is but one-fifth of the total cost of an average accident. The remaining four-fifths must be paid by the employer and absorbed under other heads.

The prevention of employee accidents—and incidentally of accident costs—is not difficult once the elements of accident prevention are understood. Most accidents, fortunately, are of a preventable nature.

An accident can occur only because of the existence of one or both of two basic conditions: (a) The unsafe acts of some person, or (b) an unsafe physical or mechanical condition. These conditions must be found and corrected if accidents are to be prevented.

The unsafe physical conditions are usually obvious. They can be readily found and therefore should be the first to be corrected. The unsafe acts of persons can be determined by intelligent observation of the performance of men at work. Once it has been determined that a man is doing a job in an unsafe manner, he must be made to understand the right and safe way to do the job, and then it

must be seen that he does his work as instructed. The correction of unsafe acts requires only able supervision and management.

There need be no "red tape" in accident prevention. The simplest methods of detection and correction are usually the most effective. Meetings, posters, speeches and so on have value, but in every case this type of activity should be made incidental to the elimination of unsafe practices and conditions and should be tied in directly with the nature of the hazards on a particular job. In the final analysis, accident prevention must take place on the job, under the direction of the gang boss, hatch boss or supervisor, and with the full support of the employer.

Both unsafe acts and physical hazards usually exist because men fail to understand safe working methods or because they deliberately take chances. The foreman or job supervisor is paid to properly instruct workers and also to see that his instructions are obeyed.

Safe Welding in a Shipyard

By J. H. LOVE

Manager of Safety & Welfare, Federal Shipbuilding & Steamship Co.,
Kearney, N. J.

The speaker said in part: Safe welding problems are in our opinion as follows:

1. Teaching safety to experienced welders who have been accustomed to working in shops where hazards are not great and where safety is their last consideration.
2. Training the inexperienced welder in safety.
3. Teaching other employees, who work in the vicinity of the welder, the dangers from exposure to the ray and fumes resulting from this operation.
4. Providing proper safety appliances and seeing that they are used.

Our general plan of teaching safety to new employees and continuing the education of older ones is through the medium of Employee Safety Committees, posters, instructions from the foremen and Safety Department. Safety education begins at the employment office after a careful selection of employees themselves. They are given a brief talk on the attitude of the company toward accident prevention and informed that no employee is permitted to work in a manner that would create a hazard to himself or fellow employees. Each employee then goes to his foreman, where he is given instructions regarding the proper manner of doing his particular job. He is then placed under the supervision of the assistant foreman or "leading man," who starts him on his job and by frequent inspections determines whether or not he is working safely. Where possible, new employees are placed at work in the vicinity of those who are experienced ship builders and who have served on safety committees, and these men are requested to call the attention of the new employee to any conditions or practices which are dangerous.

Each employee, at time of employment, is examined by the doctor who pays particular attention to the eyes and the general physical condition of those assigned to welding work, and thereafter the welder is given an eye and general examination yearly. Welding helmets, or hand shields, provided with proper welding lenses are provided. Employees working in the vicinity of welders, who are not subject to eye injuries from flying objects, are furnished with goggles with shaded lenses for their protection; and those who must have eye protection against flying objects are provided with a hardened lens, also adequately shaded. In addition to the goggles, guards are placed around the welding point wherever it is possible. All men working in the vicinity of welders are examined every year by the doctor for possible eye or other injuries. During the past three years we have not had one lost time accident in the welding department, due to injury to eyes or lungs from the welding operations.

The protection of the employee from fumes, especially where covered rod is used on pulverized metal and a zinc fume results, is a good deal more difficult than any of the other problems in connection with welding. We have adopted the following methods for exhausting fumes:

1. The exhausting of fumes in confined spaces is accomplished by an exhaustor powered with a 5 H.P. motor 1200 R.P.M. and a fan speed of 2600 R.P.M.

with an air volume of 5500 cubic feet per minute at 4½ inches of water pressure. This exhaustor discharges into the open air and efficiently works 7 lines of metallic hose, 50 feet long and 3 inches in diameter. One objection to this type of protection is the carelessness of some employees in not keeping the intake close to the point of operation.

2. Where it is only necessary to have one man working in a compartment, a small portable fan with a 1/6 H.P. motor, 3450 R.P.M., equipped with a 3-inch metallic hose has been found efficient.

3. Airline respirators have been used successfully when the air is provided by low pressure blowers capable of supplying proper pressure directly to the mask. Where high pressure air is used, in spite of all the ways we have used to filter it, it seems to have a harmful effect on the operator.

4. The bag type, or cartridge type respirator is used successfully in the larger spaces where there is a chance for the fumes to dissipate rapidly.

5. In the open, or in large shops, where the fumes naturally dissipate rapidly for the comfort of the operator, a rather simple device is to have high pressured air discharged from a flat nozzle about three or four inches above the welding point directly against the fumes.

6. By the use of wind sails installed in compartments sufficient fresh air is secured so that those working in the larger compartments are able to do so in comfort.

What the Seamen Think of Safety and the Safety Movement

By DAVID BERMAN

Northwest Exterminating Co., New York City

The speaker said in part: The crew can be divided into two simple categories: licensed and unlicensed personnel. The licensed personnel, which includes the captain, mates, engineers, radio operator and steward, obviously have a greater interest in their occupations. Many of them make it their life work. Since they have more at stake, they manifest a greater interest in their job. They quickly understand the rules of safety laid down and eagerly follow them out. They realize the value of safety in their work and welcome the development of safety measures.

The unlicensed personnel, in which are found the sailors, A.B. and ordinary, bosun and quartermasters, oilers, wipers, firemen, mess boys and cook, are usually less willing to profit by safety regulations. One of the most outstanding reasons is the transient quality of their employment. Numbers of the men are a shiftless lot, completely lacking in ambition. Others, victims of the economic dislocation of our time, sign for a trip at sea as a temporary stop-gap. They are interested only in the wages involved, and with any possibility of a job on land, leave the sea. They have very little or no loyalty to the company, and often leave a ship for trifling causes, such as a dislike for the captain, mate or engineer.

There are, of course, exceptions to the general rule. You will find seamen content to remain bosuns or quartermasters, who have a love of the sea and of their ship. These men are loyal, willing to observe safety suggestions and maintain a pride in their work.

Necessarily, the attitude of the unlicensed personnel is vastly different from that of the licensed officers. The crew think less of safety because they aren't capable of thinking much about anything. They have very little at stake. In addition, they are inured to the thought of hardships, injury and disease, and have little or no imagination to visualize the results of an accident. When existence is reduced to the elements of food, clothing and shelter, plus a few dollars for periodical dissipation, life itself becomes void of meaning. They would just as soon take a chance in their work as not. As they think of their work solely in terms of remuneration, safety must be forced upon them.

Somewhat outside of these classifications is the old sea-dog who has been a sailor for twenty or thirty or forty years, and who simply cannot be taught any

safety rules. He insists on doing things his own way and is bitterly resentful of any change, even though the change is for his betterment.

On the other hand, regard for safety comes naturally to the licensed personnel. Before they get their licenses, they must have training, education, knowledge. The meaning of an accident or an injury, either to themselves or their ship, is impressed on their minds, since they have the responsibilities of the ship on their shoulders. They have their own responsibilities, too, and welcome anything tending to make their job safer. The task of transmitting the meaning and aims of safety to the crew lies, for the most part, upon them. But they can also wreck the meaning and aims of safety by being callous and not sufficiently insistent upon maintenance of safety rules.

The seamen can do a great deal for safety on their ships, and safety can do a great deal for them. They can be made to realize that the safety movement is for their protection and well being. Each seaman must be made aware of the fact that, although he is a very small cog in the operation of a ship, the lives of his fellow seamen depend upon his cooperation in safety measures.

I have seen sailors chip paint without the protection of goggles; walk along the side of the deck where cargo was being loaded and discharged; go on deck in bad weather without sufficient clothing; lie in filthy bunks because they were too lazy to clean them up, until at times I honestly wondered how they survived.

The company, too, has its responsibility toward promoting safety. In the present day of labor surplus, men with greater ability can be selected and undesirable eliminated. The company can raise the standards of acceptance and humanize itself by becoming more personal in its dealings with the men. It can also, without loss of dignity, become less formal. This is dependent upon the executives in charge who are in a position to insist upon proper safety equipment and its constant use. All these measures are conducive to loyalty and loyalty means that seamen think more of safety and work harder to promote its effectiveness.

Safety Activities Which Reduce Accidents in Building Ships

By STEWART LEE, JR.

Safety Engineer, New York Shipbuilding Co., Camden, N. J.

The speaker said in part: In June, 1931, the president of my company sent a personal letter on the subject of accident prevention to all officers and employees. He began the letter by saying: "Your management desires the assistance of every employee in a mutual effort for safer working conditions, less accidents, and less lost time. We are slipping in our records concerning safety."

He then went on to make a personal appeal to each employee to cooperate in a wide general plan for better safety conditions, which he announced was to be put into effect immediately.

Shortly thereafter a Safety Committee, comprising one or more representatives from each of our 26 departments, was organized and started functioning with its meetings weekly. Members of this committee are all of the supervisory force, some being foremen, while others are classified as leaders.

As part of the new policy laid down by the operating vice-president, a report of each accident must be filed, showing the causes of each accident and emphasizing the hazards which produced it. This report originates with the supervisor of the injured workman, then is reviewed by the division superintendent who takes such action as he deems necessary, the assistant general manager passes on the case and the report is finally filed with the safety engineer in the claim office after such steps as are necessary to prevent a recurrence of a similar accident have been taken. Reports of these cases involving loss of time by the injured workmen are reviewed by the operating vice-president at the end of each month.

Education is one of the most important factors in any safety program. Here we come face to face with human nature and there are many types of individuals

who work in a shipyard. This part of educating the workmen to eliminate accidents requires unlimited imagination, leadership, ingenuity, patience, and determination. We have used methods that have been consistent and substantial, but not spectacular nor flashy. Safety contests have proved quite helpful but we have used no safety drives unless we can call our program one continual drive to eliminate accidents.

A set of brief regulations of a general nature with a few specific warnings governs every workman in our yard. Posters are used and several bulletin boards tabulate the lost-time accidents for current months and help to maintain interest in these activities; while the honor roll posted every half year displaying those departments which have experienced no lost-time accidents keeps fresh a friendly spirit of competition.

The new employee is a difficult problem because frequently he has not been trained in the building of ships and does not recognize its inherent hazards. We pick our new employees carefully, trying to obtain those men who know something about the work and who show intelligence and ambition to work safely.

When dealing with a large group of individuals composed of many types and several races, we are bound to find some who do not want to go along with the parade, and for this small minority it becomes necessary to use discipline. For a time after beginning our safety program there were some "doubting Thomases," but we were slow to discipline them, preferring to convince them of the sincerity of the movement. I am glad to say that most of these men have been won over and have become ardent boosters of this safety program.

Maintenance of buildings and equipment plays an important part in accident prevention because of the great danger always present in defective plant and machinery. In a large yard, this question of keeping it in the proper state of repair to function efficiently and safely, requires the continuous services of a capable, competent, and reliable repair force, because if repairs to plant are slighted or put off, the problem of getting it back into proper shape for safe and efficient operation becomes herculean.

A careful check is made frequently to make sure the mechanical hazards such as driving gears, belts, chains, and power transmission devices are properly guarded and furthermore that such guards are kept in their right places. We keep a close watch during the cold winter months for ice and snow which bring slipping and falling hazards. Electric power and light, wiring systems as well as compressed air, steam, hydraulic and water piping systems need competent and careful attention to maintain them in safe condition.

The results achieved by our safety program will be readily apparent when I say that while our record in 1931 was 483 lost time accidents, causing a loss of 36,377 days, and a frequency rate of 44.4, with a severity rate of 3.34; these figures may be compared with the first half of 1934, which are: Lost-time accidents, 13; lost time, 160 days; frequency rate 47; and severity rate, .06. This is a reduction of 90 per cent in the frequency of lost-time accidents and a very large saving in days lost.

WEDNESDAY MORNING SESSION

October 3, 1934

Visualizing Safety

By HENRY J. HEIDORN

Personnel Department, Standard Shipping Co., New York City

The speaker said in part: What is the reason for the success of the average tabloid newspaper? Why do national advertisers expend millions of dollars annually in printing all types of billboard posters, newspaper advertisements and other media to catch the eye of the public?

Advertisers know from experience that the printed words which announce their

wares have tremendous force and play a great part in breaking down the public's resistance. These advertisers have not the least bit of doubt that these media render a material service in helping them to remove from their shelves the innumerable products which, as manufacturers and producers, they have to offer. It does not necessarily follow that advertising media need be pictorial in design. Some of the lettered posters are just as effective as those bearing illustrations. Color attracts the eye quicker, of course. Certain advertisers adopt slogans which are kept before the public constantly and these slogans frequently become part of the observers' colloquial vocabulary. In each respect, nevertheless, the public, whether consumer or not of the articles advertised, is "visualizing" the product which it sees advertised on the highways and by-ways.

Now, if it is true that we humans can visualize the news through mental images and can be made to dig down in our pockets because of the irresistible power created by attractive messages contained in advertising media, is it not equally true that safety-consciousness—the will to do away with all accidents—can be instilled in our minds by this same process?

There is no doubt that the majority of us agree that this can be accomplished. We believe that the employees of an industrial concern are bound to perform their work with a progressively lessening number of mishaps to themselves if they receive the proper kind of education in the science of accident prevention. This same compelling power which causes men, women and children to buy things which they see advertised will, in the opinion of every member of the Marine Section Poster Committee of the National Safety Council, influence the workmen in the manner desired. They are certain in time to take notice of the timely messages and cultivate a habit of working safely.

An individual will say to himself that this or that practice which he has been following for years is foolhardy. He will ponder inwardly, "I noticed somewhere, sometime, that some other man lost his leg by taking a chance, or underwent some terrible suffering, or perhaps lost his life and his family underwent the suffering, simply because he took the same chance that I am about to take." He will be restrained from taking that chance; he will become a more efficient worker because the visualization of the suffering of another man will make him more safety-minded. An accident and inefficiency often are partners. The attribute of safety-mindedness will eliminate the direct, as well as the indirect losses which follow all personnel accidents.

In order to show our line of reasoning and how indisputable it is that safety can be visualized by employees just as assuredly in the maritime field as in a factory, I am submitting for your inspection a sample bulletin board such as can be seen on each and every one of the 70 vessels of the fleets of the Standard Shipping Company and Pan American Foreign Corporation, which are in operation today. These boards are installed on the ships in places where they are ever conspicuous to members of the crew. A sailor would have to be blind not to see these boards frequently during the course of a voyage. The boards are adequately illuminated, and the ships' Safety Committees are directed to keep them neat and clean looking. They must be always "newsy," to excite curiosity. Sailors are naturally inquisitive; they are living in a small world, to themselves, so to speak, for weeks without anything save sparse radio news from outside civilization. In this way, appreciating that they may miss something worth while if they ignore the boards, they scrutinize them carefully. They are attracted to the boards almost involuntarily by their colorful appearance, and by their news articles, and "catchy" items which the Ship's Safety Committee makes it a business to post thereon. These committees vie with one another to present the best looking bulletin boards.

Now, what is being experienced on the vessels of these fleets, undoubtedly, can be repeated elsewhere in marine operations—on the docks where stevedores perform their duties, in the shipyards where vessels are under construction or under repair, on harbor and inland water equipment, and in every other conceivable marine activity. The theory is the same. Well illuminated bulletin boards, colorful posters and items of interest attract the workmen. Anything at all pertinent which is placed where the workmen are bound to observe the appealing safety messages embodied in the posters will produce the effect which the employer wishes.

Some men's minds, of course, are more sluggish than others in absorbing ideas of this nature; but safety can be visualized and is being visualized every day in almost every shop, plant, dock, ship and quarry in the country. It is being "sold" to the workmen through the medium of posters as certainly as by verbal instruction and every other means, such as the Safety Instruction Cards obtainable through the National Safety Council. It must be borne in mind, however, that the posters should not be allowed to become common-place.

Report of the Nominating Committee

At this point Chairman Cogan called for the report of the Nominating Committee, and new officers for the Section for the ensuing year were nominated and elected as follows:

General Chairman—E. W. Fiske, Jr., Scony Vacuum Co., Inc., New York, N. Y.
Vice-Chairman (in Charge of Posters and Slides)—Robert F. Hand, Standard Shipping Co., New York, N. Y.

Vice-Chairman (in Charge of Publicity)—Arthur M. Tode, Consulting Marine Engineer, New York, N. Y.

Vice-Chairman (for the Pacific Coast)—A. O. Woll, General Petroleum Corp. of Calif., Terminal Island, Calif.

Secretary—John S. Hunter, The Atlantic Refining Co., Philadelphia, Pa.

News Letter Editor—Henry Blackstone, United States P. & I. Agency, Inc., San Francisco, Calif.

Engineering Committee Chairman—B. C. Edwards, Consulting Engineer, New York, N. Y.

Membership Committee Chairman—E. C. Holden, Jr., United States P. & I. Agency, New York, N. Y.

Program Committee Chairman—Frank E. Ames, Lykes Bros.-Ripley Steamship Co., New Orleans, La.

Statistics Committee Chairman—Benjamin H. Self, Travelers Insurance Company, New York, N. Y.

Stevedoring Committee Chairman—F. C. Gregory, Waterfront Employers Union, San Francisco, Calif.

Members at Large—

W. P. Biggs, Navy Department Safety Engineer, Washington, D. C.
C. F. Blackton, Erie Railroad Co., Jersey City, N. J.
Frank H. Cogan, The Delaware, Lackawanna and Western Railroad Co., Hoboken, N. J.
F. P. Foisie, Shipping Federation of the State of Washington, Seattle, Wash.
J. M. Griser, Alabama Dry Dock & Shipbuilding Co., Mobile, Ala.
Wm. Groundwater, Union Oil Co. of Calif., Los Angeles, Calif.
Henry J. Heidorn, Standard Shipping Company, New York, N. Y.
Willard F. Jones, Gulf Refining Co., New York, N. Y.
W. P. Kain, Marine Surveyor, New York, N. Y.
T. F. Kavanagh, Grace Lines, Inc., New York, N. Y.
R. K. Kelly, Tide Water Oil Co., New York, N. Y.
Stewart Lee, Jr., New York Shipbuilding Co., Camden, N. J.
J. L. Luckenbach, American Bureau of Shipping, New York, N. Y.
Daniel J. Murphy, Murphy, Cook & Co., Philadelphia, Pa.
Carl E. Petersen, Newport News S. B. & D. D. Company, Newport News, Va.
Byron O. Pickard, Pacific American Steamship Assn., San Francisco, Calif.
H. W. Proom, Black Diamond Lines, New York, N. Y.
J. K. Robison, Sinclair Navigation Co., New York, N. Y.
J. C. Rohlf, Standard Oil Company of Calif., San Francisco, Calif.
Arthur R. Savage, Peninsular & Occidental Steamship Co., Port Tampa, Fla.
H. L. Seward, Yale University, New Haven, Conn.
A. J. Smith, Marine Office of America, New York, N. Y.
J. H. Tomb, Capt. USN Rtd., New York State Merchant Marine Academy, New York, N. Y.
E. Storm Trosdal, Jr., South Atlantic S. S. Line, Savannah, Ga.

Carl F. Vander Clute, Admiralty Attorney, New York, N. Y.
 Elliott Vandevanter, Capt., Officer of the Chief of Engineers, Munitions Bldg.,
 Washington, D. C.
 John Wright, American Export Line, New York, N. Y.
 G. D. Zelt, Associated Oil Co., San Francisco, Calif.

Combining Safety with Speed in Bulk Cargo Handling

By C. W. TURNING

Bridge Operators Engineering & Inspection Bureau, Minneapolis, Minn.

The speaker's lengthy paper contained the following summary:

1. The major portion of Great Lakes Commerce consists of bulk cargoes. The principal products handled are iron ore, coal and grain, with a considerable volume of limestone, sulphur, cement and petroleum.
2. Great Lakes vessels average about 8500 bulk cargo capacity, and are up to 600 feet in length. The peak year on tonnage was 1929, when lake vessels handled 297,182,061 tons of cargo.
3. The Lake Carriers Association carries on a comprehensive safety program which also includes port hazards—docking and leaving the dock.
4. The stevedoring codes as applied to ocean ports are not adapted to Great Lakes operating practices, where package freight is unloaded through side ports and where bulk cargo is handled with special equipment.
5. There is very good cooperation between the Lake Carriers and the Dock Companies which has had the effect of greatly reducing the hazard of loading or unloading bulk cargo.
6. Modern coal unloading equipment is now found at most ports. The average time for unloading a coal cargo is 30 hours.
7. Coal dock accidents are not very much different from the injuries occurring in the average industry, but they are likely to be severe. There is a fairly good safety organization on the average dock; but the accident rates are higher than in the average industry due to the small number of men exposed to a large amount of moving machinery. The frequency rate will run about 30.0 and the severity rate about 5.5.
8. At the iron ore shipping docks loading is done with great dispatch. In fact the steamer D. G. Kerr was loaded with 12,689 tons of iron ore in 1919 in 30 minutes. There are excellent safety organizations on the iron ore shipping docks and most of these docks have good safety records. Strict enforcement of safety rules has greatly helped to overcome ore dock hazards.
9. Grain elevator accidents are not frequent, but are likely to be severe, consisting largely of falls and machine accidents. Very few accidents occur when loading boats. The scraper device used for unloading boats on the lower lakes, causes a considerable number of foot accidents, which could be largely eliminated by wearing "hard toe" shoes.
10. Coal and ore handling bridges are quite vulnerable to wind storm damage and special safety devices have been perfected to hold them in high winds. The dock organizations have adopted special operating rules dealing with windstorm hazards.
11. Due to peculiarities of construction and isolated location, it is difficult for the city fire department to fight fires on such properties. Most of the dock properties are fairly well equipped with private fire fighting equipment; that on the coal docks being especially adapted for extinguishing coal pile fires.
12. Dock companies have been active in community safety work and dock workers are well represented at Industrial Safety Schools. At Duluth they have a separate section known as the "Dock and Elevator Section." At these sessions there is special opportunity to discuss special problems, and many interesting papers have been presented in the sessions of this school.

Accident Abatement in Iron Ore Unloading on the Great Lakes

By J. D. PROCTOR

Superintendent, The Erie Dock Company, Cleveland, Ohio

The modern bulk freighter of the Great Lakes is a product of its environment, with a service limited to seven or eight months of the year and cargoes requiring prompt and efficient handling. Ranging to over 600 feet in length, more than 60 feet in breadth, and with loaded drafts of 20 feet or better, these carriers have their propelling machinery and engineering quarters in the after end and the navigating equipment and quarters forward, the cargo hold between being a long tunnel unobstructed except for occasional screen bulkheads permitting diversified loading. For operations, this hold is exposed overhead by hatches, whose sectional steel covers slide each way from the center to telescope at the sides of the ship.

The ore unloading equipment in general is of two types, both having the common principle of a main structure spanning the loading tracks, with a cantilever at the back for storage purposes, and being moveable along the dock over front and rear tramways. The older of these types, a transition from the early pouncing efforts in mechanical unloading, has a man trolley carrying a rope suspended grab bucket of about seven tons capacity. The other type, individualistic in principle, has a high fore and aft walking beam mounted on a heavy upper carriage trolleyed forward and back on top of a bulky main structure. The rear end of this walking beam is counterweighted while from the forward end a stiff leg extends downward, carrying on its lower end a bucket rating a capacity of 17 tons, but capable of taking a ravenous bite of 25 or 30 tons of the heavier ores.

From a cab situated in the leg just above the bucket and with windows on either side, the operator controls all the movements of this giant machine, and riding into the hold of a boat he is directly over his work. Such are the speed requirements of the unloading that hardly are the boat's lines fast to the dock before the avaricious buckets are into the hold for a grab of ore and racing back to dump it into hoppers from where it is loaded into cars.

As the lighter but swifter rope-hung buckets rapidly hurl the ore back into the hoppers or the slower stiff leg machines carry back their mastodontic bites, steady streams of open top cars flow over the loading tracks beneath the machines. Kicked in empty at one end of the plant by a switch engine, they are picked up by electric driven shunts, spotted to the individual machines for loading and then shoved out to a waiting engine for distribution to the train tracks. Meanwhile, oilers, repair men and electricians clamber over the machines, servicing them, weighmen load out the ore from the hoppers and carders go along the tracks tacking on each car the directions for its forwarding.

Hazards most peculiar to the unloading operations naturally are presented chiefly to the labor aboard vessels. Access to the boats is generally gained over a ship's ladder set on the dock and leaned against the rail of the vessel clear of the machines. As the boat rises during the unloading this ladder presents an increasingly high steep climb. To overcome this condition some docks where physical conditions permitted have installed moveable towers on the front tramway carrying a swinging hand-railed stairway, weighted outward to rest against and maintain contact with the rail of the ship.

Entrance to the hold of the boats used to be generally made through manholes and down vertical ladders consisting of rungs fastened centrally on the bulkheads. These rungs at the lower stage were frequently badly bent if not entirely scraped off by the battering of the unloading buckets. The modern boat now provides stairways to the midway walks on top of the side tanks and non-batterable ladders from there to the hold floor, made by cutting stepholes in the back of a channel. To overcome the hazards of falls from ladders, it is common practice to have all tools handled up and down on hand lines. The most prevalent danger to workmen in the vessel hold comes from falling coal and ore, while the most dangerous hazard is presented by the moving buckets. No physical safe-

guards have been found feasible for these hazards, nor do they lend themselves to definite regulations. Rather is the safety of the man dependent mainly upon the alertness acquired by them through association with the work and a technique is developed between the operators and the hold labor governing the procedure to be employed in executing the work.

Under the man trolley machines, the bucket man is well situated to safeguard others in the hold. His job primarily being to signal and steer the movements of the bucket, he can see that the men working with him are in the clear. Sailors doing broom cleaning, however, present a less easily recognized and regulated hazard. With the stiff leg machines, the operator being directly over the bucket, is close to the work but handicapped by a vision limited to the side from which he is leaning. It is customary here for one of the older men to assume responsibility for warning the others and greater understanding and cooperation between the operator and the men are required.

On deck, men are maintained to shovel back into the hold the ore that spills on the hatch covers and deck. Precautions here require alertness against falling into the unobstructed hatch openings or being struck by incoming or outgoing buckets and care against shoveling down ore onto the man working below.

On the machines the usual mechanical hazards are encountered, rather multiplied and enlarged by the size and numerous moving parts of the unloaders. All the standard safeguards such as platform pick boards, safety railings, gear guards and cages about the high vertical ladders are employed and carefully watched. Cables receive regular inspection both as to physical characteristics and tonnage limits. Outside inspection of general conditions is had periodically to check possible nearsightedness of too close proximity.

Under the machines the usual hazards of moving cars are aggravated by those of ore bounding off the cars or dropping over the side of hoppers and by the movement of the machines to and fro along the runways, often in close proximity to each other. Safeguards include all overhead protection possible on the machines, roofs over the shunt, covered power rails and bridges for workmen crossing the front of the dock, to obviate the former practice of climbing over cars. Good lighting is an important factor in accident elimination, since operations are carried on extensively at night. Powerful reflector lights mounted on the machines above, amplify the dim vessel lights below and flood the hold as well as the deck of boats being unloaded. Full illumination is also provided under the machines and aloft at all points.

Safe access to the boats from dock entrances is generally a problem, the necessity for extensive trackage along the face of the dock presenting a handicap. The point of entrance being a determining factor, bridges sometimes are used to cross intervening ore piles and tracks, while in other cases walks are maintained along the dock front, the edge of the dock and any obstructive mooring posts being white painted as a precaution.

The ore unloading docks of the lower lakes are keenly alive to these truths. Safety is more than a catchword, it is an ever-present hard hammered consideration. Safety committees function, contests are engaged in, signs and bulletins bloom everywhere, and the majority of key men and skilled workmen are graduates of the Councils safety schools. The modern dock is indeed a far cry from its predecessor with its inefficient lighting, its almost inaccessible dock front and its myriad of hazards wide open.

Presentation of Safety Contest Trophies

The closing feature of this session was the presentation of trophies of the National Safety Council to winning units in the Marine Section Safety Contest, which had extended from January 1st to June 30th, 1934. The outstanding facts of the contest were presented by General Chairman Frank H. Cogan, briefly as follows:

Fifty-nine unit companies registered in the Marine Section Third Annual Safety Contest, as compared with 54 units in the second contest and 35 in the first contest. During the period 48,494 persons worked 50,890,163 man-hours. The average

frequency rate for the contest was 11.338, which is a 12 per cent decrease from the 1933 rate of 14.037. Twenty-nine units completed this 1934 contest with a frequency rate below the average, and seven completed the contest with a perfect safety record.

The handsome trophy plaques awarded by the National Safety Council to winners in this contest were then presented by President John E. Long to the ten companies finishing the contest with outstanding scores, as follows:

Lykes Dixie Mediterranean Line (*Liners Division*), New Orleans, La.
The Atlantic Refining Company (*Tankers Division*), Philadelphia, Pa.
Erie Railroad Company (*Harbor Equipment Division*), Jersey City, N. J.
Atlantic Coast Line R. R. Co. (*Harbor Equipment Division*), Norfolk, Va.
The Atlantic Refining Company (*Harbor Equipment Division*), Philadelphia, Pa.
Atlantic Coast Line R. R. Co. (*Harbor Equipment Division*), Port Tampa, Fla.
U. S. Engineering Dept. Tow Boat Group (*Harbor Equipment Division*), Pittsburgh, Pa.
New England Steamship Co. (*Stevedoring Division*), New York, N. Y.
New York Central R. R. Co. Marine Department (*Shipbuilding and Repair Division*), New York City.
Erie Railroad Co. (*Shipbuilding and Repair Division*), Jersey City, N. J.

THURSDAY MORNING SESSION

October 4, 1934

Oil Tankers—Safety Observations

By WILLARD F. JONES

Superintendent Marine Department, Gulf Refining Company, New York City

The speaker said in part: An analysis of accident cases covering a period of several years with our company does not reveal many instances where major hazards have figured; however, we are amazed at the end of the year to see how numerous lost-time injuries to members of our crew can be, and in a survey of the causes of such injuries we found accident percentages to be as follows:

Falls aboard vessels.....	34.5
Being struck by falling objects.....	8.4
Struck by flying objects (which includes eye injuries).....	7.9
Caught between objects (usually machinery).....	7.3
Lifting objects (sprains and hernias).....	6.6
Burns and flaresbacks.....	4.1
Heavy weather.....	3.9
Handling objects (mooring lines).....	.6
Galley accidents.....	.4
Miscellaneous.....	26.3

One of the wisest safety precautions that can be taken is that of starting a new man on his job "safety minded." An essential duty of a department head is to be painstaking in his instruction as to correct safety methods in the performance of the day's work. Yet ship departmental heads frequently fail to follow up the work performed by new men, and as a result preventable accidents occur.

A requirement that new men undergo a thorough physical examination, prior to being employed aboard ship, will go a long way toward preventing subsequent fraudulent claims for illness and injuries allegedly contracted during employment. It will also tend to procure the application for work by strong, healthy men, efficiently adapted for their jobs.

Common-sense safeguards to prevent slipping, tripping and falling accidents need only be mentioned to merit full realization of their logic. A seaman with rubber soles or heels slips on wet iron steps of a ladder and in most instances will fall because of his neglect to have one hand available to grab the hand rail. Men working on stagings should be provided with safety lines. A heritage from the

old sailing ship days was that no man should work overside unless equipped with a bowline around his body.

Many falls occur while men are working on portable wooden ladders, stools and improvised platforms. There is always a tendency for a man on a ladder to try to reach as far as he can on either side to avoid climbing down and moving the ladder, and this results in the ladder or stool slipping and throwing the occupant to the deck below. It is necessary, therefore, that all portable ladders be securely lashed before using. If not possible to lash the ladder, it should be held by another member of the crew. The rigging of gangways, stagings, pilot ladders and boatswain's chairs should be carefully supervised and all tackle tested, so as to prevent anything from carrying away.

All open spaces should be well lighted and protected by rope or other safeguard. Special reference should be made to the openings in the engine room flooring when plates are lifted and to tank covers or hatches when open on deck.

There is usually little excuse for injuries caused by falling objects. Tools left on a grating where they can be kicked off, throwing refuse overboard while men are working on a staging below, gear knocked into a tank where men are working, and buckets carelessly lowered without regard to men below, are some of the careless practices that can only be corrected by proper instruction and supervision of the ship's officers.

Another great hazard is the lifting of tank lids by hand. We urge that our men use a gantline or handbilly in opening up steel lids or covers; otherwise the inevitable injury, sometimes involving the loss of fingers, hands or arms, to say nothing of strains.

Accidents caused by flying objects usually involve injuries to the eyes and failure to wear goggles for protection. It is a standing safety rule and regulation aboard all our vessels that goggles must be worn in all cases involving possible eye injuries. No officer or department head can deviate from this mandatory requirement and they are charged with the responsibility to see that the orders are complied with. Strict disciplinary measures are imposed against all violators of these orders.

Strains and hernias are very often caused where men are overzealous in their jobs and fail to procure the necessary assistance when their physical strength is taxed. Often, too, they are not acquainted with the proper manner of lifting heavy objects. I think one of the best posters distributed by the National Safety Council is that illustrating the correct method of lifting a heavy load.

Burns and flarebacks are usually due to personal carelessness. Burners should be kept in clean and perfect working condition and a torch used for lighting the fire after it has been ascertained that there is no accumulation of oil in the furnace.

Accidents during heavy weather occur through failure to use the lee side of the vessel. The fore and aft bridge should always be used when seas are being shipped and life lines should be rigged where necessary. Too many masters rely on sea-legs of the old sailing ship days, instead of considering the present-day aspects of safety for prevention of accidents.

Accidents from handling objects are more important than our average shows. Officers in charge forward and aft, while a vessel is being made fast and let go, must see that men do not stand in the bight of mooring lines, that the lines are handled properly on the winches and that all lines are stopped off and belayed in shipshape manner. Every consideration and safety precaution must be extended to men while stowing anchored cable; extraordinary precautions must be taken to make certain that men are all clear of the chain locker before letting go an anchor.

Our ship masters and officers are expected to be familiar with the potential dangers of the cargoes carried by their vessels. These are often of a volatile nature at ordinary temperatures. The passageway doors on our vessels are closed and tightly dogged when cargo is being handled so as to prevent flammable vapors or liquids, in case of an accidental overflow, from passing into the galley, crew quarters, engine room, fire room, etc.

We have found that men will oftentimes put their heads in the hatch of, say, the pump room where a gasket has blown out and, without recourse to a gas-testing apparatus or chemist examination, descend to the position of the pump in the lower level of the compartment, only to be overcome by gas. We have heard of cases

where men have decided that sediment was not flammable because no odor could be detected, and again, where they have been working around gas and their sense of smell has become so inured to the presence of these vapors that they took unwarranted chances.

The greatest danger of explosion in cargo tanks of oil vessels is when they are empty, rather than when they are full, as it is then that the gas and air mixtures reach their most explosive state.

Tank cleaning is a very hazardous operation, unless skillfully conducted and supervised. Steam is probably the most commonly used method. Our officers are informed that the injection of steam into gaseous tanks neither neutralizes nor kills the gas, but with the hatches open it is partially carried off in the escape of the steam into the air and taken off with the pumping of slugs from the tanks. Men used in tank cleaning are usually the ship's own experienced personnel and should never be sent into the tanks without safety lines around their belts and without proper light to work in.

Some Notes on Safety in Navigation

By H. L. SEWARD

Professor of Mechanical Engineering, Yale University, New Haven, Conn.

The speaker said in part: Every marine disaster teaches us an important lesson. The most obvious recent lesson is the need for fire-resisting materials wherever possible. This is not a difficult problem for the designers nor for the manufacturers of suitable materials.

A far more important and difficult problem is that of handling passengers in an emergency or in possible danger. It is clear that the members of a ship's organization should be thoroughly drilled in their duties for every emergency. On passenger ships, however, there are obvious difficulties in performing these drills. The average passenger does not wish to be reminded of the possibility that the ship may have to be abandoned, nor do we wish to give him the impression of great danger on a ship. It is useless to inform him that it is for his best interests that he respond to an alarm, give up his recreation for the moment and go to a designated place, with everyone else, as part of a boat drill.

In the navy and the Coast Guard the detail of all such drills has been worked out to such a degree that nothing is overlooked. Drills are held with such frequency that the actual fire or taking to the boats is nothing more than another common experience. Our better merchant marine ships hold some sort of fire and boat drill on each trip, but it is probable that in most cases these drills should be held more frequently and be more thoroughly executed. It is clearly up to us to create the interest of the passenger in all drills and secure his participation, so that, for his own safety, he can in an emergency go to the right place and avoid confusion. The members of the crew must have more and better drills. There should be more instruction in the uses of various parts of equipment, duties of individuals and means of communication with those in charge. One of the first rules of good management is to be clear and definite in issuing instructions.

The part played by radio communication is immeasurably valuable. Information on weather, position of other ships, rescue work and the like all flow in for the use of the intelligent captain so that he runs less chance of meeting the unexpected than ever before. Our Coast Guard sends in the position of icebergs and dangers in navigation with promptness and accuracy. The master of one ship will radio information of probable interest and value to other ships. Radio communication has also aided ship morale by providing news bulletins and for exchange of messages between members of the crew and their families without which much uneasiness and worry would result.

Experienced practical navigators agree that one should not place too much dependence on radio bearings. Dead reckoning should still occupy the number one position in so far as dependency and accuracy are concerned. Radio bearings should supplement the dead reckoning. The navigator who steered courses about as on a previous trip and who plotted no position because he was sure he could

pick up the radio bearings on the other side certainly was placing his fate in the lap of the gods.

Nothing but praise can be said of those companies which have developed and installed such devices as the gyrocompass, metal mike, radio direction finders, fathometers, distance finders, fire detecting and smothering apparatus, water-tight door control and indicators. The thing that is lacking is a system of apprentice training which will produce a type of officer capable of getting the most out of all these devices. The present officers do very well where their companies have given them some of this apparatus, but in many cases they are not getting the most out of the equipment and they do not know what to do about false readings or correction factors.

Much progress has been made in recent years in methods of computing and plotting positions at sea. It is no longer an uncertain ceremonial procedure to work up sights and plot lines of position. Requirements of aviators for more rapid and expeditious methods have had their effect. Practically no new principles have been evolved, but the technique and computation and of plotting have been subjected to time-saving and labor-saving methods. The navigator may now, by judicious use of all the devices and methods at his disposal, come very close to knowing his position.

We still have the troublesome problem of navigating in fog, mist and falling snow. Experiments on the use of infra-red rays in a so-called "log-eye" and in a camera device may yield some hopeful results but we shall always have the need of the most superior type of personnel to provide the judgment and experience necessary to utilize the information presented by such devices.

We have hopes of achieving a better national knowledge of what the merchant marine is and what it needs. Our operators, like other business men, are in business to make money if possible, and must see a fair return on every investment. Successful operation of all equipment depends on trained personnel, especially on a ship with its many complicated functions and devices. Resourceful seamen with that inquiring turn of mind who can reason from effect to cause and devise a remedy when the occasion arises will always be needed. Every officer and man on a ship should be both a teacher and a student, a teacher to those below him and a student of those above him. There should be no further place for that type of officer who resents questions, refuses to explain things and discourages an ambitious learner. Due to the introduction of so much mechanization in industry, there is a natural tendency to dull the mental activities of attendants. This is especially true aboard ship where life is quite routine with its watch-standing and tendency toward monotonous existence, much of the time. While we like to make our occupations more comfortable and every man-hour more effective, we must give as much thought to the human side of the situation as we have to the creative design.

Expert Witnesses in Marine Injury Cases

By CARL F. VANDER CLUTE

Admiralty Attorney, New York City

The speaker said in part: After an accident occurs which results in personal injury, we frequently find the next step in the history of the accident to be the institution of an action for a vast sum of money. An accident is similar to a seed, for from it springs a number of possibilities similar to the many branches of a tree. One branch, we might consider litigation; and from that branch spread others—courts, juries, lawyers, expenses, witnesses, etc.

Although the testimony of the expert witness is only one of the minor details of the history of an accident, it may become of the utmost importance, especially when the expert opinions are based in part upon facts which have come within personal observation, or where they state precise facts as ascertained and settled, or necessary and unvariable conclusions which result from the facts stated. It frequently occurs that such opinions are indispensable in furnishing some guide for the determination of questions unfamiliar to the court or jury.

A case in this classification is that of the petition of Henry Henson for limitation of liability. In that case the petitioner owned and operated a small ferry which consists of a barge propelled by a motor boat. When the ferry arrived at a bank of the river, it was secured by a chain. The day of the accident, a motor truck with three occupants was being driven ashore when the chain broke. The barge drifted away from the bank causing the truck to fall into the river and the three occupants were drowned. The question involved was limitation of liability, which depended upon whether or not the owner of the ferry had used due diligence in making sure that the chain was proper and seaworthy. The chain had been manufactured by a local blacksmith by hand.

The court said: "The chain failed and the failing was due to an imperfect weld. If the testimony of the experts, who are wholly in agreement that such weld would have been disclosed by the hammer test, is to be believed, then the evidence of actual test by Woodward is certainly not to be accepted as conclusive in the face of actual result."

It was also brought out that the defective welding might have been discovered by the use of a magnifying glass or an acid test and that an approved method of testing welded links was by hammering them when cold. The experts here testified to known facts. Because of the failure of the petitioner to exercise the precaution of undertaking one of the tests, the right to limit liability was denied, and he was held at fault for the loss of the three lives.

The other class of expert testimony as opposed to that of the exact sciences and which we might class as "pure" opinion evidence, is based upon a set of facts in evidence. Such evidence does not call for testimony of an exact nature, such as perhaps a chemical or acid test. It calls for the expert's own idea, his own opinions. The testimony of an eyewitness is uncertain enough, for rarely will you find two such witnesses who tell an identical story. It is a notorious fact that experts of equal skill and ability are found in almost every important cause, testifying to directly opposite conclusions, and this illustrates both the fallibility of such testimony and the fact that a conviction for perjury based upon such evidence would be very difficult, in fact, practically impossible.

In marine causes, personal injury as well as others of any consequence, it is not uncommon to see experts whose testimony is diametrically opposed, testifying on both sides of the case. In marine cases, we have experts who will give their opinions as to the proper management of boats and vessels under given circumstances, the proper mode of loading vessels, what cargoes may be safely carried, the probable causes of collisions or the loss of vessels, the means of avoiding collisions or loss under given circumstances, the proper mode of repairing vessels and of raising them when sunk, the proper safety appliances which a vessel should carry, the proper methods in which a job should be done to avoid injury, and the relations between the master and the crew.

What remedy is suggested? As far back as 1900 a remedy was suggested by Judge Learned Hand in a paper printed in the *Harvard Law Review*. He suggested that there be a board of experts, or a single expert—not called by either side—who would advise the jury of the general propositions applicable to the case.

Marine Problems—Claim Prevention in Connection with Accident Prevention

By CAPTAIN E. C. HOLDEN, JR.

United States P. & I. Agency, Inc., New York City

The speaker said in part: Heretofore, many steamship executives have treated their marine insurance costs as sort of fixed charges. Almost without exception, ship's masters and officers have known nothing about the basic principles of marine insurance and were content to say: "Let the insurance company pay—it won't cost our steamship company anything," or words to that effect. In the meantime, claims increased and premiums mounted in proportion, much to the alarm of the steamship Directors who scanned the balance sheets carefully.

Possibly you have people like that right now in your own company; in any event, it may be well to make a careful checkup. We have found types like these who always resist the safety movement, fearing that it may produce situations which would reflect on their own operating efficiency as department heads. Such is the "human element" with which we must contend and educate in order to relieve mental hazards, suspicions and misunderstandings.

An intelligent accident prevention program must inevitably reflect itself in claims prevention. At the same time, the general ship efficiency improves. There is less damage to ship and cargo. Less of the ship's stores are wasted. Crew changes are cut down and the accident risk from new men is lessened. Cargo is better looked after, holds are inspected better, and a feeling of good will prevails that is missing in the "grouchy" organization and ship where everyone goes about with a chip on his shoulder.

Management therefore is justified in making safety an integral part of its entire organization. An efficiently administered accident program may be a decisive factor in claims prevention. Ways and means for the prevention of false and fraudulent claims are pointed out. Ship's safety committee meetings become forums for the discussion of both accident and claims prevention measures, accidents are immediately investigated, witness statements prepared, and the true facts of the case determined. In this manner the interests of the shipowners become fully protected. Otherwise, experience has proved that a certain class of so-called "negligence lawyers" will succeed in constructing circumstances involving possible ship liabilities which may not have existed originally, and to the manifest detriment of the owner's interests.

A well-known marine authority has accurately stated the case as follows:

"No self-respecting American shipowner objects to proper compensation for the employee who is injured in the line of duty when it can be shown that responsibility for the injury rests upon the owner. But the business of collecting damages has assumed such proportions that it seems the owner is justified in sometimes wondering whether he is working to support himself and his employees or for the benefit of that branch of the legal profession which, it is conservatively estimated, ultimately receives at least one-half of the more than a million dollars paid out annually by American steamship companies in court awards and legal fees in personal injury litigation."

Courts are supposed to be institutions where cases can be arbitrated. Theoretically they are, but in practice they are arenas where counsel for defense and plaintiff battle like gladiators for the causes of their respective clients. It is a game of wits, and frequently the negligence lawyer will resort to plain trickery in which the actual facts in the case are so distorted that they can hardly be recognized. The steamship owner fights for the protection of his interests. The lawyer for the plaintiff wishes to get as much as he can, supposedly for his client, but everybody knows that the larger the damages he is able to get, the greater is his own personal remuneration.

It may not be amiss to say, in view of the situation involving many claims that are going into litigation, that the steamship owners must give serious consideration to the amendment of the present laws or the adoption of compensation laws. The system as now existing is not only unfair to the employer, but grossly unfair to the employee. Allowing the system to continue is encouraging unethical practices among professional men and a waste of dollars and cents in business.

It is true that these arguments may have little or nothing to do with accident prevention as interpreted generally, but they have much more to do with the subject than could be suspected when and if carefully analyzed. This practice of obtaining money by the means indicated above encourages carelessness, encourages "fake claims," encourages accidents, and you will never be successful in having an organization fully safety-minded until you remove from the minds of the employees this supposed "pot of gold" at the end of the rainbow, which is painted for many seamen by negligence lawyers. Fighting this practice is a part of the safety program, because it is the very backbone of safety morale, and unless it is recognized the safety program will be bound to result in a sorry failure.

ADJOURNMENT



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MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Meat Packing, Tanning and Leather Industries Section was called to order by Vice-Chairman John Laucerman, Armour & Company, National Stock Yards, Illinois, who presided. The chairman introduced Mr. Elmore W. Phelps, General Manager, Cleveland plant, Swift & Company, who made a brief address of welcome on behalf of the Convention City.

Chairman Laucerman then presented a brief "Resumé of the Year's Activities," outlining the work of section officers and standing committees during the past year and commending the members for work well done. He then introduced the first speaker.

Physical and Mental Qualifications of a Safe Worker

By H. F. WILLHITE

Safety Supervisor, Brown Shoe Company, St. Louis, Mo.

The speaker said in part: In manufacturing there are two fundamental hazards of operation—machine failure and man failure. Of the two, man failure is by far the more important, because of the intricacies in the physical and mental make-up of the workers. If an accident can be prevented by a mechanical guard or by carefulness on the part of the operator, it is an axiom that the safeguard should always be provided. It is more economical to put on a guard than to be continually educating and supervising employees. However, we have found, to our sorrow, that the vast majority of accidents occur, not because of the unguarded machine, but because of the unguarded human being operating the machine.

The safe worker should, first of all, possess a body free from defects which will prove detrimental to his daily work. Probably of greatest importance is the eyesight. Clear vision is absolutely imperative when machine operation is involved. The safe worker should also be above normal as to hearing, his heart and lungs should be in tip-top condition, blood pressure normal, and he should not be suffering from disease.

As for the mental qualifications of this ideal employee, the man should be well balanced. By this we mean intelligence above the average, or the ability to learn, be able to analyze the situation, coordinate the working of his mind with the functions of his body, have the power of making a decision and the will-power to abide by it. He should be free from emotional disorders. He should have the power of concentration on the task at hand and the ability to develop defense mechanisms to prevent divergence of thought from his work.

One of the main safeguards that industry has for the protection of its manpower is in the proper selection and placement of employees. We have found that a certain percentage of our employees have more accidents than others. Our problem resolves itself into properly selecting the employee for the job. The pre-employment physical examination, if properly given and duly recorded, can eliminate possibility of old organic disorders of new employees being flaunted in our faces at a later date in the form of claims for injury or occupational disease. Another advantage of a physical examination is that it enables the employer to place the new employee in a position for which he is best fitted by his physical characteristics.

In testing applicants as to characteristics outside of the realm of the purely physical, general intelligence, perhaps, is of the most importance. We do not mean book learning, but the ability to commit to memory, adapt one's self to unusual situations, use common sense, be attentive and persevere. Innumerable tests have been devised for clinical study of intelligence, but as yet none has been perfected which is adapted to the selection of a group of employees from a mass of applicants. Thus far the procedure is too exacting, too cumbersome and too much a child of theory. But eventually we shall find a satisfactory method. What we are going to have to do is for each one of us to study the type of individual most

successful in our particular lines of work. This, necessarily, will involve a general job analysis in the same manner that is employed in fitting a shoe to the foot. What tests are necessary in our respective establishments is a problem which must be worked out by each of us independently. These tests need not be of great duration, nor of searching character. The all-round employee who ranks above the average in the majority of the tests, is the one to whom preference should be given, because he is most likely to succeed on the basis of his balanced mental life.

The emotional life of the individual is also important. This is a field which has opened up only recently and it is one which is being considered more and more by personnel managers interested in the proper placement of new employees. It is hardly necessary to point out the folly of exposing a highly strung or emotionally unstable individual around moving machinery. The emotional stability may be tested by requiring an applicant to perform certain simple acts, as previously directed, despite distraction of certain noises or flashes of light.

In the proper placement of an individual, another element must be considered. The employee should be able to withstand muscular fatigue, should have good reaction speed, and a proper judgment of space and distance. Tests to determine these abilities are of simple nature, but at the same time require accuracy in giving the tests and correlating the results. As an example, a system of weights may be devised for testing resistance to muscular fatigue. A string is attached to the finger of the subject, the arm is strapped to a table, and subject is required to lift a series of weights attached to the string which runs over a pulley. A fatigue curve can thus be determined. Reaction tests are simple and easily given by means of a system of lights, manipulated by switches. The subject is instructed to tap a key as soon as he sees a certain signal from the lights. The time between the flash and the contact established by the subject's key can thus be established and results obtained compared with those of other applicants.

Industry owes to itself and to its employees that no means be spared whereby a thorough understanding is established between the company and the worker. A new man comes into industry suffering from a series of misconceptions and full of fear of his ability to meet conditions. The accident liability of the new employee rests primarily on lack of skill and nervousness. He realizes both of these and unless he is put at ease immediately and helped to fit into the general scheme of plant operation, he is a hazard, not only to himself, but to fellow employees. He should be thoroughly trained in the operations for which he is employed, the hazards of the operation pointed out to him in each detail, and he must be made to realize that for a while he will make the same mistakes that all new operators make. His foreman can be either an aid or a stumbling block in his progress.

In general, we have been considering up to this point the employee and the best method for his selection. Let us now try to visualize the responsibility of the employer, once the man begins work in his plant. The employer's responsibility should extend to the point where he makes an honest effort to develop the human machine that he has set in motion, in the same way that he would bend his energies to the development of a fairly satisfactory, but not entirely efficient, piece of factory machinery. And in this development the foreman again can play a most important part. In addition to other responsibilities, he should be instructed to keep an eye on his employees, new and old, and to be ever watchful for decreased production and accident proneness. Generally, these last two factors go hand-in-hand.

There is something bothering the worker. He may be the victim of worry over home conditions, finances, lack of work, or improper treatment. None of us is a normal human being unless we are of the ultra-conservative type. The essence of normality seems to be that of a balanced condition which promotes controlled utilization of our temperamental mechanisms. We go from the low ebb of depression to heights of enthusiasm and vivacity. In some individuals the swing is much more pronounced than in others and unless the general emotional level is at a very low ebb, the more constant the emotional life the better. Employers must realize that workers are absolutely incapable of leaving outside of the factory each morning, all worries, fears, angers, and other emotional factors. They must, of necessity, carry these with them the greater part of the day, and as a consequence, they are placed at the mercy of their emotions. Dr. Rex B. Hersey, of the University of Pennsylvania, has aptly said that the man who is well adjusted in his

home and outside of it, and who possesses physical good health, is less apt to have those moments of mal-adjustment during which an accident develops.

In addition to inaugurating a constant supervision of his workers, the employer should go farther and endeavor to instill in them the thought that the company is interested in their welfare. First impressions are usually lasting and if a new man enters an atmosphere of safety where bulletin boards, safety rules, adequate guards, and proper supervision are present, immediately he is impressed with the fact that he is not being led as a lamb to the slaughter. His health and general welfare are being considered. He sees men about him doing their daily tasks with an eye ever to safety and receives from them a pat on the back and a word of friendly advice as to the operation of his machinery.

Report of the Nominating Committee

At this point the Chairman called for the report of the Nominating Committee, and new officers for the Section during the ensuing year were nominated and elected as follows:

General Chairman—John Lauerman, Armour and Company, National Stock Yards, Ill.

Vice-Chairman—Wilson Palmer, United Shoe Machinery Corp., Boston, Mass.

Finance Chairman—E. J. McCann, Jacob E. Decker & Sons, Mason City, Iowa.

Secretary—C. B. Magruder, The Wm. Schlumberger-T. J. Kurdie Co., Baltimore, Md.

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Statistics Committee Chairman—J. L. Nelson, Tanners' Council of America, New York, N. Y.

Members at Large—

N. L. Brainard, Swift & Company, Chicago, Ill.

H. L. Clover, International Shoe Co., St. Louis, Mo.

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Harry W. Ekins, Brown Shoe Company, St. Louis, Mo.

T. H. Jones, American Hair and Felt Co., Chicago, Ill.

W. F. McClellan, Armour and Company, Chicago, Ill.

A. C. Michener, John Morrell and Co., Ottumwa, Iowa.

Dean Moneymaker, International Shoe Co., St. Louis, Mo.

R. R. Ronch, Geo. A. Hornel & Co., Austin, Minn.

Preventing Accidents in the Meat Packing Industry

By CHARLES G. BARTH

Safety Engineer, the Industrial Commission of Ohio, Division of Safety and Hygiene, Columbus, Ohio

The speaker said in part: In the meat packing industry many dangerous machines are in use. However, they are being made less dangerous in recent years, due to advanced engineering efforts, both from a production and a safety viewpoint.

One of the most hazardous machines is the enterprise basher. Experience has taught that regardless of the size of the feed table around the hopper, which was designed to keep the operator's hand from coming in contact with the feed spiral, the operator will persist in standing on a platform, should he be permitted to do so,

where his hands may come in contact with the feed spiral when crowding meat into the hopper. There is, I understand, now on the market a new machine for this work, whose dangerous parts are so well enclosed that hazards are reduced to a minimum, and this machine is also provided with an automatic stop which operates upon very slight pressure. However, the safe manner in which the older type of machines should be operated is to give instructions to the worker not to crowd meat into the hopper, but to feed an amount constantly that will be sufficient to allow the free movement of meat by the feed spiral to the knives.

Mixers are another type of hazardous machine and I know of two cases where men met accidental death in them. In one case the operator attempted to clean the blades with a scraper while the machine was in motion. In the other case a mechanic who was making repairs on the machine failed to pull the fuse or lock the switch open as he had been instructed to do. In some undetermined manner the switch was thrown in and the machine started. I understand that in the newer types of these machines the mixers are now being equipped with a cover so arranged that when this cover is open the machine cannot be operated. All sausage stuffing machines should be equipped with steel safety rings, securely and rigidly bolted to the cylinder so as to prevent plunger from over-traveling and leaving the cylinder. All air control valves should be so placed in lines at stuffers that the worker cannot accidentally operate the valves when cleaning the plunger.

All revolving circular meat and bone cutters should be guarded with hoods to as great an extent as possible. The revolving cutters on the bacon slicing machine should be almost entirely enclosed, and visible cutting parts should be guarded with a transparent glass shield attached to the frame. Band saws in the meat cutting department should be guarded. All machines and equipment in use for maintenance work in and around the plant, such as machine tools in the machine shop, should be guarded, emery wheels should be hooded, and goggles provided for grinding operations. All woodworking machines, such as rip, crosscut and swag saws, jointers and other machines, should be guarded, and all temporary scaffolds should be safely and substantially erected.

Laundry installation in meat packing plants has been the means of a worker sustaining a serious injury when not safely equipped. Washing machines should be equipped with an interlocking device that will prevent the inside cylinder from operating when the outer door on the shell is open. It should also prevent the door from being opened while the inside cylinder is in motion. This, however, need not prevent the movement of the inner cylinder under the operation of an "inching device." Doors or covers on the inner cylinder and outer shell should also be provided with a means of holding the doors open while the washer is being loaded or unloaded. Extractors should also be equipped with an interlocking device, so that the extractor basket cannot operate when the cover is open. On old installations where this equipment is not possible, rigid supervision must be exercised and instructions given to employees not to insert hand or arm in the extractor when it is in motion. Extractors should be operated at no greater speed than that for which they were originally built and the basket should be evenly loaded for retaining balance.

Due to the wet conditions around a meat packing plant, electric hazards resulting in shock are many. Therefore all wiring should be in conduit and armored cable and all switches enclosed in safety switch boxes. Open knife switches should not be tolerated, and when wiring becomes exposed due to worn cable or insulation, it should be replaced with new wiring. Overhead rails should be provided with safety stops for open switches. Switches should be frequently inspected and kept in a safe condition.

Among the many safety problems confronting the meat packing industry is the very serious hazard of knife cuts, which are difficult to guard against. Experiments have been made with gloves, by having workers wear them for various operations; however, the worker in many cases discards the gloves for one reason or another. In my opinion, this is a matter of safety education, in which the human element enters to a very large degree. Many cuts to the right hand are caused by the knife slipping, due to greasy hands, or the point of the knife blade coming in contact with a hard object, such as a bone; or should the grip on the knife be relaxed the hand might pass over the knife blade or the knife point

strike the edge of a hot water box when dipping blade in hot water. Stub knife cuts usually result in serious injury and guards of various types have been devised to combat this class of accident. Workers should be instructed not to keep the knife in the hand while placing product on table, as many injuries are sustained by fellow workers as a result of this unsafe practice. When necessary for a worker to go from one department to another, he should not be permitted to carry his knife openly, but should carry it in a leather or canvas pouch.

Good housekeeping conditions are absolutely essential for the prevention of accidents, and the incentive for good housekeeping should come directly from the chief executive of the organization. When the head executive insists upon neatness and orderliness, you may then expect to find a neat and orderly plant. Rubbish, greasy rags, old paper, old shoes, and refuse in general should not be thrown around promiscuously, under benches, in dark corners, in locker rooms, or under stairways, but metal receptacles should be provided where these articles may be deposited. All material and stock should be piled in a safe and not too high manner. Ladders should be checked over and those which are broken or unsafe should be repaired or discarded. Stairways should be kept free and unobstructed, aisle space should be maintained of sufficient width to permit the safe passage of trucks and workmen, and no material of any description should be stored in aisle space, even temporarily. The general lighting facilities throughout the plant should be adequate, including all workrooms, stairways, cooling rooms, etc.

All meat packing plants should be provided with a first aid room adequately equipped to render such aid to an injured worker, and the room should be in charge of an efficient and capable person. A medium sized plant should have a full time nurse in charge of the first aid room, who can be either a graduate or practical nurse, and the larger plants should maintain an emergency hospital with a physician in charge.

WEDNESDAY MORNING SESSION

October 3, 1934

Preventing Falls and Strains in the Tanning Industry

By E. W. WHITE

Consulting Superintendent, A. C. Lawrence Leather Co., Peabody, Mass.

The speaker said in part: An examination of the accident records of a large tannery employing approximately 2,000 persons and handling light, medium and heavy skins and hides, shows that strains caused 16.5 per cent of the lost-time accidents and 4 per cent of the no-lost-time accidents. Falls cause 5.8 per cent of the lost-time accidents.

The following methods are carried on in one tannery to prevent accidents.

The plant Fire Marshal makes a monthly inspection of the entire plant for all kinds of hazards, such as unguarded machinery and poor condition of floors and stairs. A copy of his report is sent to each superintendent who is expected to correct all conditions in accordance with the marshal's recommendation.

A safety committee of employees and foremen is divided into groups of three. Each group inspects a section of the plant monthly, going into each room and taking all the time necessary to examine guards on machinery, machines, floors, stairs, methods of handling materials, lighting systems or anything else they may see. A copy of the report and recommendations of this committee is sent to the departmental superintendent. He is required to report in writing to this committee before the next inspection that all recommendations have been carried out, or give a good reason why he has not done so.

Whenever an accident occurs that may cause lost time the chairman of the Safety Committee is immediately notified and he calls the members together for a prompt investigation. A report with recommendations for improved conditions is made. A report of every accident, no matter how slight, must be sent at once to the Medical Department by the foreman.

Holes in floors, broken stairs, improper platforms, weak ladders, poorly drained floors, and poorly lighted rooms are frequent sources of accidents and may not be considered occupational hazards until the management has done all it reasonably can to correct them. All stairways or rooms that are naturally dark should be lighted, and burned out lights should be promptly replaced. It is good practice to paint the walls and stairways and cellars with white paint, as this helps to remove shadows and dark spots where one may trip or stumble.

High heels, or heels that are worn down on one side and loosely tied shoes may easily be the source of strains and falls, particularly on stairs. It is a part of every foreman's job to see that safe shoes are worn by men or women in his department.

Assuming that the management has removed the controllable sources of accidents by guarding the machines, having wheels of trucks oiled, keeping floors and stairs in good repair, proper lighting, good drainage of floors, a supply of good ladders, and in general by good housekeeping, there remain two methods by which we can help to eliminate falls and strains in the tannery.

The final and very important and perhaps the most difficult method is the education of the entire organization in the way safety measures should be applied and the need of their constant application. This refers particularly to walking over wet floors, going up or down stairs, and in the proper application of muscular exertion.

The size and weight of bundles of leather are generally governed by the amount one man or in some cases two men can handle. There is a right and a wrong way of lifting heavy objects. If one attempts to lift a bundle by the hand and arm muscles with the arms extended and the rest of the body nearly rigid, the effort is likely to be wasted or a back muscle strained. The knack of lifting a heavy load is in the coordinate use of the muscles of the arm, back and leg. This applies with equal force to pushing and pulling heavy loads. The foremen should see that new men are taught to observe these rules. The foremen should also see that no man is required to move an object that, because of its shape or weight, calls for the combined efforts of two or more men.

Point of Operation Accidents and Their Elimination in the Shoe Industry

By MAJOR C. T. CAHILL

United Shoe Machinery Corporation, Boston

The speaker said in part: Some years ago the most serious point of operation accidents in the shoe industry occurred in connection with those machines which were used for dinking, or dieing out, by means of dies. These are the machines which are used in cutting out the soles of shoes from heavy sides of leather. A heavy beam, constituting the upper part of the machine, is brought into operation on pressure of a foot treadle extending the entire length of the machine, the die being forced through the sole leather into the cutting block. This particular operation was prolific in the shearing off of fingers and thumbs and sometimes hands, due first in some measure to the nature of the die used at that time, and further, to mechanical defects by which the machine frequently repeated. In the machines now available for this purpose there has been a great improvement in the form of the die, it being deeper than the width of a man's hand and provided with a pronounced flange on the top. The mechanical defect in the repeating of the machine has also been overcome in the more modern types of dinking machines.

In some of the larger machines there is available the two-hand trip used in other machines in the industry.

Machines for cutting or stripping are provided with a barrier guard in which there is room for the material to be slipped under it but not sufficient room for fingers to come into jeopardy. As it is necessary that the material should be made of even thickness in order that the subsequent operations may be performed with accuracy, soles are brought to the required thickness either by means of a stationary

knife splitter--of which there is a variety of types--or a band splitter machine. For machines having the fixed knife, barrier guards have been very generally used, some of the stationary character, others revolving in which there is a guard wheel moving in the opposite direction to the feed of the machine, so that fingers or any other material seeking to enter the machine will be turned back by the action of this guard.

Skiving machines are used for leveling to a thin edge parts of a shoe upper. The machine most commonly in use has a revolving disc shaped knife with feed rolls of similar size and character immediately underneath it. This machine was at one time a prolific means of injury to the hands of operators. It has now been guarded, a circular guard entirely protecting the edge of the wheel, with the exception of the immediate cutting point.

Another machine has come into quite extended use for doing away with the skiving and folding of edges, a small heated iron being brought into contact with the raw edge of different parts of leather that form the shoe upper. In this machine the hot point of the machine is protected by a small guard above the feed with a projecting set screw that wards off any encroachment on the part of the hands of the operator.

For the edges of soles as well as heels ordinarily trimmed by means of knives of a rotary character there is a great variety of cutters. They vary with the thickness of the material, its shape and the character which the manufacturer wishes to get into the edge, such as beads and bevels. These knives revolve very rapidly. In the present heel trimming machine there is a wheel revolving with the cutter against which the toplift of the heel which is not trimmed, is placed, and this serves to establish the point of contact and keeps the shoe from slipping away from the knives. In the trimming of the forepart edges two discs on each side of the wheel keep the material in contact with the cutting edges and protect the hand of the worker if it should come in that vicinity.

There is a variety of machines used in the industry for the driving of tacks, nails, screws, pegs, etc. They were at one time a means of injury to operators through the flying of crippled nails and the breaking of drivers. This has been to a large measure remedied by more securely enclosing the driving mechanism so that accidents of this nature seldom occur. Until recently accidents used to occur in connection with the pulling of tacks. The tack has had a conspicuous place in shoemaking since the invention of machinery, especially in the lasting of shoes. In making the welt type of shoes the lasting tacks were driven but part way in so that they might be more readily removed. Machines are provided for the removal of tacks. In 1930 means were perfected for using little staples of fine wire, formed and driven by the lasting machines. They do not have to be drawn but are trimmed off with the surplus material. While the use of tacks through this means has been materially lessened, tack pulling machines are still used. The form of guard now provided with these is of glass interposed between the operator and the mechanism for drawing the tacks.

There are other machines, notably those for embossing, which present the possibilities of accident through either pinching or contact with hot dies. Danger of accident from this cause has been in a great measure removed by the installation of suitable barrier guards and teaching of better methods of operation.

In the more modern development of the machine for rolling leather, a barrier has been placed which is so adjusted as to allow the introduction of varying thicknesses of material and yet to bar the hands of the operator. A wide variety of buffing and scouring machines are used in the industry in which rolls are covered with abrasive material. Formerly the greatest objection to them was the resultant dust which undoubtedly was responsible for different forms of occupational disease. Happily now, in most of these machines, they are supplied with a suitable dust gathering device which removes all objectionable particles resulting from the operation.

It would seem that any further advance in eliminating the point of operation accident would be accomplished only through change in the mental attitude of the worker by teaching him the best and safest methods of operation. There can be but little question that the safety movement has made its greatest advance through

bringing definitely to the knowledge of manufacturers as well as operators the number of avoidable accidents which occur in the industry each year.

I have in mind especially the excellent work done by some of the shoe manufacturers of the country in organization of shop councils, the publication of bulletins containing in some instances a detailed statement of accidents, their cause and severity. Through this means operators have been aroused to that sense of personal responsibility in which the greatest care is taken to avoid the criticism of their fellow workers in any carelessness which results in upsetting the otherwise flawless record of their particular department.

The Human Side of Industrial Medicine

By DR. GEORGE S. GILPIN

Swift & Company, Cleveland, Ohio

The speaker said in part: The human side of industrial medicine embraces the fact that the corporation has employed a doctor to practice medicine with his fellow employees as patients, and that the traditions and ethics of the profession should hold good in the plant dispensary no less than in any other place where doctor and patient get together.

In order that the human side of an industrial practice may best assert itself, it is essential that the plant physician conduct himself in his daily work in much the same manner as the successful doctor engaged in a private competitive practice. Brusqueness, impatience, carelessness and indifference are as much out of place in the plant as they would be in the private consulting room. We must also admit that patients cannot be handled on a mass production plan. They are not automobiles on the assembly line, nor dumb animals on the processing floor of the modern meat packing plant.

Our fellow employees come to us principally for one of three reasons. They are injured, sick, or seek medical advice or information on some subject not directly connected with their work. In talking with my professional friends engaged in this work, I have learned that most of us are optimistic regarding our fellow employees as patients. I have learned as the years go by that the man or woman in the plant, shop or office does, in the great majority of cases, make a mighty good patient and one deserving of the best efforts on the part of the physician. It does not take a great deal to please these patients. Give each one a little time, ordinary courtesy and thoughtfulness, an implied and actual interest in their troubles, and they are satisfied. This must be qualified with the admission that not every one is satisfied. Some of the employees may have no particular confidence in their doctor in the plant, and a few may even dislike him, but if the physician conducts his work with due regard to its human side, he will usually enjoy a satisfactory average of friends. Everything else being considered, it is probably safe to say that the plant physician's value to his employers is in direct proportion to the informal and friendly confidence existing during the course of his professional contact with his fellow employees.

Let us consider the injured workman. Any one type of injury may be almost exactly alike and affect precisely the same parts of the bodies of a given number of patients. But an important lesson to learn is that each patient will have an entirely different reaction to this injury. One patient may be a veritable stoic and make light of a somewhat serious, painful and disabling injury, and the next may go into hysterics over a minor finger cut. The human equation in industrial accidents is a component part of the human side of our practice. We have always to bear in mind that what seems to us to be a trivial routine injury may be magnified a hundred fold in the mind of the patient. We have to lay aside our own reactions and bow to our patient's opinion in many of these cases. To practice industrial surgery humanely and humanely in the hurried atmosphere of the busy plant dispensary requires plenty of tact, human understanding and tolerance. The doctor can not treat the injury and ignore the patient. Gentleness and patience must go hand in hand with the mechanical side of our work, even in such routine matters as dressing a cut, removing a foreign body from the eye, or lancing a superficial

skin infection. Unnecessary roughness will cause unnecessary pain and both of these the patient will resent even though the injury itself be successfully treated from a scientific viewpoint.

In order that the proper confidential relationship may exist between the doctor and the injured employee, it is of the utmost importance that no suspicion of discrimination or unfair dealing arise in respect to the right to receive compensation and to have ample time for a proper recovery. Taking ordinary human nature into consideration, it follows that a certain amount of this suspicion is bound to occur. A few patients infer that because the doctor is paid a salary by the company he is going to seize every opportunity to discriminate against the employee and in favor of the company in compensation cases. There should be no just grounds for suspicious of this nature. The corporation rightfully expects the doctor to keep his eyes open for imposition and malingering, but is not looking for any unfair favors from the doctor to save a few dollars in compensation. If the corporation physician adopts an habitual hard-boiled and cynical attitude in these compensation cases, he will eventually be of no more use to his employers than to his patients, simply because he has cast away the human side of industrial medicine.

True malingering is extremely rare, which adds to our optimism. Exaggeration is occasionally met with. Most of this is unintentional and due to the patient's hypersensitive reaction to injury. The lower percentage of intentional exaggeration of an injury for the purpose of obtaining excessive compensation or prolonging the return to duty has to be handled firmly.

In discussing the human side of our work we consider next those patients who come to us for illness. In many respects this is possibly the most difficult and trying work that confronts us in the plant dispensary. Too much is expected of us in a large percentage of cases. We rarely have sufficient time for a thorough diagnostic examination, and we are often confronted with vague and obscure complaints which the private practitioner, who expects his fee, never sees. In many instances we see illness in a much earlier stage than does the family doctor, before some definite sign or symptom has developed, and it is difficult for us to tell the patient just what his complaints indicate or what they might develop. A few of our fellow employees are possibly rather too apprehensive about their various aches and pains, and I confess that it takes a certain amount of patient resignation to listen to these oft repeated complaints.

Our patients seek us, however, in good faith; they want and expect something from us, and unless we cling tenaciously to the human side and cast away the temptation of indifference or carelessness, some embarrassing or even tragic mistake might happen sooner or later.

Diagnosis, rather than treatment, must remain the essential part of our efforts for the sick employee. We must try to separate those who are really ill or about to become ill, from those who only suspect that they are ill. To an extent necessarily limited by our time and equipment, we must actually examine these patients. By taking advantage of an acquired judgment of human appearance and human nature, plus the use of eyes, hands, stethoscope and thermometer, we can be of some service in many of these cases.

As might be expected, our fellow employees quite often seek information and assistance concerning medical matters entirely aside from the routine company business. They come to us with an infinite variety of questions concerning not only themselves but also any member of the immediate family, other relatives and friends. An employee whose child needs a tonsil operation and who cannot afford the necessary expense, seeks our assistance to secure admission of the child into the tonsil clinic. The young husband asks us to recommend some physician to care for his wife in confinement. Someone else hurries down from his work and asks us to call the hospital and inquire about his mother who has just been operated upon. The human side of our work demands that we be ready and willing at all times to act as a medical information bureau to the best of our ability. All this comes to us because there is nothing formal about the plant doctor's office. It is usually not necessary to interview a secretary before the doctor can be seen. The door is open and the service is gratis.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Metals Section

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 J. K. STAFFORD, Mississippi Valley Structural Steel Co., Decatur, Ill.

MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Metals Section was called to order by General Chairman E. F. Blank, Jones & Laughlin Steel Corporation, Pittsburgh, Pa., who presided. Chairman Blank introduced Mr. Donald B. Gillies, President, Corrigan, McKinney Steel Co., Cleveland, who made a brief address of welcome on behalf of the Convention City.

General Chairman Blank then presented a brief "Resumé of the Year's Activities" of the Metals Section, giving in some detail the activities of officers and chairman of standing committees, whose work for the Section was highly valued. Chairman Blank then introduced the first speaker.

Practical Safety from an Operating Standpoint

By G. D. TRANTER

General Superintendent, Middletown Division, The American Rolling Mill Co., Middletown, Ohio

The speaker said in part: If we seek the solution of the accident problem by the same methods used for operating control, we will more quickly improve the plant safety record. For example, safety rules must be regarded in the same manner as operating rules and practice. Some years ago, safety gates had been installed in the rear of open hearth furnaces for the protection of men working on tap holes and runners in a certain plant. The safety appliance was not accepted wholeheartedly by the furnace men until a helper fell off the backstanding and was fatally injured. But after this accident, the gates were always in place.

Here is another case. A gas maker was seriously injured during the burn-out of a gas producer. Investigation of the accident disclosed that the man had previously received a number of minor injuries while working on this particular job. It further developed that he was unsuited to this type of work because of age and previous training. If this man's foreman had considered these minor injuries in the light of a danger signal and transferred the man to a less hazardous job, this accident would have been prevented.

Discipline in accident prevention as well as in operation should be resorted to only when other means fail. Men usually respond willingly to proper inspiration and leadership. In case of a violation of safety rules, a word from the superintendent to the person who committed the act goes a long way. In going about the

shop or department the superintendent may note a practice which has escaped the attention of the foreman. Unsafe practices should be handled at the moment and not allowed to continue. It is an indication of lax supervision when an accident occurs due to unsafe practice of long standing. Acting on safety violations only after an accident occurs is on a par with "locking the stable door after the horse is stolen."

Industry is now confronted with the problem of absorbing many new and inexperienced workers. Many former employees, who were re-hired, had lost their skill through months, and even years, of inactivity in their particular line of work. On the other hand, many young persons have been employed who were without any previous manual or industrial experience. Their desire to turn out a good day's work through fear of not rendering satisfactory service has often resulted in personal injury to themselves or their fellow workers.

We cannot simply throw the new men into the rapidly moving stream of production and expect him to carry on by sheer native ability. It is the job of the superintendent and the foreman to train these newcomers. The new man needs job training, not only in the manual performance of his work, but also job training from the standpoint of how to do the work safely. Job training and safety training are closely related subjects that apply not only to the newcomer, but also to the more experienced worker.

The question arises as to the best method for training the worker. (a) Individual instruction by the foreman, including a talk to the new man during which the hazards connected with his particular job will be pointed out. (b) Additional instruction by the skilled fellow worker, who will offer the new man the benefit of his long experience and conviction of the value of safety work. (c) The example set by the foreman himself, whose attitude and conduct with respect to safety rules have a great influence on the men. In addition, introductory meetings, in which groups of new men are called together, offer an excellent opportunity to impress the new employee with the importance of personal safety. Such meetings may be addressed by the Personal Service Director, Safety Supervisor, and a plant executive. In addition to the safety discussion, a talk on company policies, opportunities for advancement, and general information pertaining to the company's products will give the new member a broader perspective of his job.

When the new man reports for the first time, he should be thoroughly instructed as to the hazards and safety features of the work. As a reminder to the foreman, a printed slip or form may be given to the new man, stating that he has been properly instructed on safety. This slip should be signed by the foreman and returned to the Safety Department after the man has received the necessary instructions.

Training an organization cannot be accomplished over night. Months and years are required to develop a highly trained and skilled group of workers. Neither can training be accomplished by posting the works with a lot of printed "don'ts," in the expectation of stopping accidents. Effective safety training requires a more personal and direct appeal. Neither will books of published rules stop accidents. Men must learn to work in a safe manner instinctively, just as they learn to operate a machine or other piece of equipment. Small group meetings for the discussion of the various safety problems of the department, in which the new man is encouraged to take part and ask questions, is usually an effective method.

Safety campaigns are of doubtful value. While they serve to stimulate the safety movement, it is usually only temporary and there is a relapse shortly after the campaign is over. A consistent safety policy is the surest means to a satisfactory accident record.

First aid training should be a feature of the program. Resuscitation, handling of the patient after an accident occurs and how to stop severe bleeding should be taught to every employee. The various first aid methods should be reviewed frequently in order to keep the organization in proper training. A well organized first aid training program arouses considerable interest in all phases of safety activity.

Health plays an important role in the safety program. The man who is not up to par in this respect is a fitting subject for an accident. Health examinations, which can be made a part of the company hospital service, often disclose minor conditions which, if corrected in time, may prevent physical disability later. They

are also invaluable in placing men having certain physical impairments on the proper job.

Due consideration should be given to safety devices, apparel and equipment. Equipment should be provided with safety guards where necessary. Keeping guards in place has been a rather vexing problem. Machines will be repeatedly started after repairs with the guards left off. The only solution is to insist that replacing the guard is a feature of the repair, just the same as lubrication or giving bolts the final turn.

The entire burden for accident prevention cannot be saddled on the shoulders of the Safety Director. Plant management, superintendents and foremen must back the Safety Director up and act promptly on suggestions. The foreman's responsibility in accident prevention should be strongly emphasized. He should be held accountable for the personal safety of his men in the same proportion that he is accountable for the equipment and material within his charge. The foreman is not only the shop executive, but also the instructor. His effectiveness lies not only in his ability to direct the operation, but also his ability to properly teach and train his men. Since accident prevention is largely a matter of training, it falls directly into the category of the foreman's responsibility. Furthermore, the safety program lends itself to the daily routine of the foreman. In going about the shop, making his regular check on quality and production, he should display a like interest in the safety features of the work.

Every means should be used to sell the idea of accident prevention to the organization. The superintendent must be sold on its value and through meetings and personal contact sell the foreman. Likewise, the foreman must pass the idea along to the men. An effective means for communication of ideas more directly to the working personnel is through the medium of the Employee Representative Group. Safety can be made one of the topics of the various meetings between employee representatives and management.

Safety trophies presented to various groups, where a month is completed without a lost-time accident, are a good publicity plan.

Plant order and clean-up play an important part in accident frequency. Scrap, rubbish and debris allowed to accumulate in aisles and working areas present serious safety hazards. A clean and orderly plant is an inspiration to the personnel to turn out good workmanship. Occasional inspection of lockers and out-of-the-way places is effective in promoting good housekeeping in the shop.

Periodic safety inspections serve a very good purpose. The personnel of the inspection committee or group may vary according to local policies. An effective plan is to have a periodic inspection by a group consisting of the Safety Director, Company Physician, and the Works Police and Fire Chief. This group is augmented by a member of each departmental safety committee during the inspection of his particular department. In addition to the usual safety features, sanitary conditions and fire hazards are also included in the committee report.

The Foreman's Part in Accident Prevention

By M. P. GRADY

Foreman, Pennsylvania Railroad Shops, Canton, Ohio

The speaker said in part: Any average foreman will agree that he must be qualified as a manager, a cost analyzer, a diplomat, a humanitarian, an educator, a leader, and a student, in order to successfully carry on the duties of his position. If he is properly qualified and functioning in all these different lines, then he would enjoy a perfect or nearly perfect record in accident prevention. That he fails in one of these essential qualifications is evident in almost every case where the cause of an accident that happens in his department is thoroughly investigated.

Many times I have heard foremen say, "What must I do? How must I carry on to keep down or eliminate the accidents in my department?" If I were to say what I consider the most necessary qualification a foreman must have to get that smooth warm cooperation that is so necessary from the workers in his department,

I would say, first, "He must be a square shooter." A square shooter is a man who is primarily honest, not only honest with those with whom he comes in contact, but he must be honest with himself. And a second most important qualification for this foreman is that he shall be impartial. You may have known a foreman who was not impartial in the distribution of work, or who favored this man or that in order to boost the pay check of one man over another. But beating a man out of his pay check is not the only way he can be defrauded as his hire.

I firmly believe that the foreman who would not go the limit of his ability to give a man a safe and comfortable place in which to earn his living is just as guilty as the one who would steal a man's pay check.

Too many foremen become perfunctory in their work. They get in that well-worn groove of inefficiency which permits them to overlook details, wink at the violations of safety rules, etc. This recklessness on the part of foremen will roll up like a snowball, coming down hill, and when it hits him he will go down for the count.

A supervisor who works at a violation of a safety rule is playing with dynamite. A man who violates a safety rule is insubordinate. He takes the law in his own hands. He kicks over the traces, he secedes from the union of safe workers.

I believe in discipline for rule violators, because it is the means of saving men from being maimed or killed. I am, in a measure, responsible for one one-eyed man in this country. It happened back about seven years ago. He was a fine, big six-foot Irishman, at that time about twenty-three years old. He was a boiler-maker's helper and he didn't wear his goggles. I told him to wear them many times, and he'd wear them when I was around, but then he'd remove them when I was some other place. This was back in the days when we said to men, "Please wear your goggles," back when our backbone was only a wishbone as to following safety rules. So one day when they were cutting off some five-eighths inch rivets, one careened off and struck this man a direct hit. His goggles were in his back pocket and the rivet tore his eye out of his head.

In a few weeks he came back to work equipped with a hideous glass eye, and we gave him a broom to sweep up the shop. But bad times came along, and one day when I was walking through the scrap yard I found Jimmie sitting on a stool sorting scrap. He looked up when I tapped him on the back, and he said to me: "Mike, why didn't you fire me when I wouldn't wear my goggles?" I had no answer to make to him; but he is the last man who will ever indict me for permitting him to violate a safety rule. I am more human now; I fire them off the job and save their eyes and their lives when they won't obey the safety rules.

If I were to point out the place that most foremen are weak in accident prevention work, without hesitation I would lay my finger on his teaching ability. When a supervisor will miss this important function of his business, I am at a loss to understand. It has been my experience that most men want to do their work in a safe manner, but the philosophy of a safe operation has never been put across to them so they thoroughly understand why.

Safeguards on machinery are essential, but they can't think. Safety posters and rule books are necessary, but they can't feel. Foremen can teach, foremen can find the unsafe worker and get him on or off the job. The foreman should do this first, because that is one of the things he gets paid for doing; and if he is not doing what he is being paid for, he is receiving money under false pretenses. Second, he is a potential menace to life, and his term in office is a monstrous travesty on management.

Report of the Nominating Committee

At this point the Chairman called for the Report of the Nominating Committee, and new officers for the section to serve during the ensuing year were nominated and elected as follows:

General Chairman—J. A. Voss, Republic Steel Corp., Youngstown, Ohio.

Vice-Chairman—H. W. Darr, Bethlehem Steel Co., Johnstown, Pa.

Vice-Chairman—A. Berquist, The Youngstown Sheet and Tube Co., East Chicago, Ind.

Vice-Chairman in Charge of Health—Dr. R. C. Engel, The Corrigan, McKinney Steel Co., Cleveland, Ohio.

Secretary and News Letter Editor—C. M. Allen, The American Rolling Mill Co., Middletown, Ohio.

Engineering Committee Chairman—J. E. Culliney, Bethlehem Steel Co., Bethlehem, Pa.

Foundry Committee Chairman—F. G. Bennett, The Buckeye Steel Castings Co., Columbus, Ohio.

Membership Committee Chairman—E. C. Schultes, Jr., C. Hager and Sons Hinge Mfg. Co., St. Louis, Mo.

Poster Committee Chairman—M. W. Dundore, Beloit Iron Works, Beloit, Wis.

Program Committee Chairman—R. A. Chaffin, Continental Steel Corp., Kokomo, Ind.

Publicity Committee Chairman—Mell E. Traummell, Gulf States Steel Co., Alabama City, Ala.

Railway Car Builders Committee Chairman—P. J. Brand, Pullman Car & Manufacturing Corp., Pullman, Chicago, Ill.

Slides and Safety Kinks Committee Chairman—J. A. Oartel, Carnegie Steel Co., Pittsburgh, Pa.

Statistics Committee Chairman—Charles W. Hanko, Pittsburgh Steel Co., Monessen, Pa.

Members at Large—

E. F. Blank, Jones & Laughlin Steel Corp., Pittsburgh, Pa.

J. A. Coltrin, National Radiator Corp., Johnstown, Pa.

Irvin A. Brinkman, Macintosh-Hemphill Co., Pittsburgh, Pa.

H. M. Croghan, Inland Steel Co., East Chicago, Ind.

G. A. Davis, Illinois Steel Co., Chicago, Ill.

John P. Erb, Illinois Steel Co., Joliet, Ill.

E. A. Ellis, Wheeling Steel Corp., Wheeling, W. Va.

W. T. Filmer, The Youngstown Sheet and Tube Co., Youngstown, Ohio.

A. C. Gibson, Spang, Chalfant & Co., Inc., Pittsburgh, Pa.

O. F. Harvey, American Car and Foundry Co., New York, N. Y.

S. F. Hawkes, MacWhyrte Co., Kenosha, Wis.

H. G. Hensel, The Youngstown Sheet and Tube Co., Chicago, Ill.

W. J. Ireland, Kohler Co., Kohler, Wis.

W. A. Jarvis, The Chase Companies, Waterbury, Conn.

F. A. Lauerman, Republic Steel Corp., South Chicago, Ill.

T. H. McKenney, Illinois Steel Co., South Chicago, Ill.

D. V. Medalie, Interlake Iron Corp., Chicago, Ill.

W. F. Megraw, H. H. Robertson Co., Pittsburgh, Pa.

J. A. Northwood, Bethlehem Steel Co., Sparrows Point, Md.

C. E. Ralston, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

Robert L. Schmitt, Louisville Car Wheel and Railway Supply Co., Louisville, Ky.

J. K. Stafford, Mississippi Valley Structural Steel Co., Decatur, Ill.

WEDNESDAY MORNING SESSION

October 3, 1934

Hazards of Wire Mill Operations

By F. T. PULSE

Accident and Safety Inspector, American Steel & Wire Co., Chicago

The speaker said in part: The greatest single hazard in the wire business is the danger from the ends of wire and from snarls and loops of wire, which endanger the workers as wire is being made.

Most wire is drawn from round rods, the most common size being approximately

$\frac{1}{4}$ inch diameter, made from billets or bars. The wire rod when it leaves the finishing roll of a rod mill, goes onto a revolving reel hot and is coiled into a round bundle with an eye, say 24 to 30 inches in diameter, and the various strands are, of course, circular in shape and when cool have a certain amount of set or spring.

These coils or bundles of rods are cleaned of scale by suspending them in tanks of hot acid, are washed with water, and coated by dipping in tanks of hot lime water, and baked in ovens until dry. They are then delivered to the drawing room and placed on a reel that will revolve, the end pointed in a machine, passed through the hole in a die, fastened on a bench, and attached to a firm cylindrical flanged drum called a block, a foot or so away from the die. The block revolves on a perpendicular spindle or shaft by means of a jaw clutch; the block is started or stopped by means of a treadle connected to the clutch to throw it in or out. This revolving block winds the wire on itself, the rod unwinding on the reel. It is drawn on successive blocks, through smaller holes, until it reaches the size desired.

During all of these processes from the rod down, the two ends of the bundle are free, or may become free, and due to the curvature and spring in the strands, are apt to fly, especially the last end coming from the reel. We estimate that on an 8-hour turn in the Chicago District Mills there is a possible exposure to 400,000 ends of wire, in the tonnage handled by 1000 men involved.

This makes necessary the continuous wearing of goggles by 70 per cent of the 3000 men employed in these plants; 20 per cent of the employers must wear goggles part of the time; and this leaves only 10 per cent of the men practically free from the danger of eye injuries. The goggle worn has an oval metal frame with side screen of 16-inch wire, annealed or armor plate lenses, and is held on by temples. We believe that head bands afford too great an opportunity to wear goggles on the cap or forehead. The goggles and necessary eye examinations are paid for by the company.

The following results have been obtained by the use of goggles. During the six years, 1910 to 1915 inclusive, when the use of goggles was largely optional with the employees, the vision of 42 eyes was completely lost and 12 partly lost in the Chicago District Mills. During the six years, 1916 to 1921, when goggles were compulsory for part of the employees, 20 eyes were lost and 12 partially destroyed, some of the latter because of no side shields. For the five-year period, 1922 to 1926, during which the compulsory use of goggles was further extended, only eight eyes were lost, and there were no partially lost cases. During the seven years, 1927 to 1933, the continuous use of goggles was made compulsory in all occupations where there was continual danger to eyes, and only eight eyes were completely lost, and the vision of one eye partially destroyed.

The serious problem in this business is not the matter of providing mechanical safeguards and the protection of dangerous conditions, but the hazard that arises from the careless acts of the human element exposed, which has to be offset by education and supervision. Briefly, our organization for this purpose is headed by the Department of Employment, Safety and Welfare, connected with the office of the Vice-President in charge of operations. In the District it is represented by the District Accident and Safety Inspector, connected with the District Manager's office; in the plants, by the Plant Accident and Safety Inspector, under the direction of the Superintendent, and reaching the rank and file through the various department foremen and their department safety committeemen, composed of their assistants and some key men. In this way the responsibility for safety is that of the operating executives, with the help of the safety assistants. As safety must be a part of the operating routine, the above organization is both natural and logical.

Safety Publicity. There is what we call an accident score board at each gate where employees enter the plant, which shows the number of accidents, the days of lost time, and the average number of men at each plant in the district for each month of the current year, and the total for the previous year. There is also a bulletin board at each gate, and in each department, on which safety bulletins, notices, and literature are posted. Above the gate is a blue sheet metal pennant eight to ten feet long, bearing the words SAFETY in large white letters. If an accident occurs the pennant is taken down for a certain time.

Over the aisles of the departments are hung printed framed banners eight feet

long, containing safety slogans and reminders. These are changed from time to time. Also in each of the departments a banner or banners are hung over the aisles giving the date of the last accident in that department.

Each year there is a bulletin printed, framed under glass, and posted in each department, entitled "Safety Pays," showing the number of accidents, days lost, and average number of men for the past seventeen years, and the totals for that period, so that employees may know the progress made in accident prevention. By means of these comparative showings we have made a game of accident prevention, and the competition between the plants has resulted in a rivalry that has been of great value.

Inspection. Certain equipment is inspected periodically (in normal times, weekly) and reports are made on printed forms showing the parts to be inspected which are essential to its safe operation. A copy of each report is given to the foreman in charge of the equipment and a copy sent to the Safety Inspector. When defects are corrected the foreman returns his copy to the Safety Inspector showing date of correction, and this is filed. By this system the foreman is kept advised of the condition of his equipment and must see that repairs are made. A different mechanic inspects the various kinds of equipment and this results in a number of men being actually interested in safety.

In the Wire Drawing Department there are about 1000 wire drawing blocks, equipped with automatic stops, so designed that if an operator is caught by a loop of wire or by the revolving block he will be drawn against this stop and the block will stop at once. These stops are given an actual test by the wire drawers at the start of the turn, under the supervision of the foreman and his assistants, and a written report made showing any defects, so that these may be corrected as soon as possible. This test is a reminder to the operator of the necessity of keeping safety devices in good condition. If a man is found operating an unreported defective machine he must explain to his foreman.

In addition there are general inspections made by workmen's committees, committees appointed by foremen, the foremen, master mechanic, superintendent, and assistant superintendent, and of course, by the safety inspector.

Supervision. This is primarily the function of those in charge of operations. The foreman alone cannot see all unsafe practices or conditions, so there are deputized certain men in each department—those who assist the foreman, or lead men, as safety committeemen, who are instructed in this work and given a button to denote their appointment. The rank and file are told in safety meetings that these men are required by their jobs and appointment to report any unsafe condition or practice. The idea is to get as many men as possible actively interested. There is available in each department a supply of printed unsafe practice forms, on which all employees are asked to report any unsafe practice or condition.

Each safety recommendation, either of defects shown by inspections, unsafe practice reports, or from any other source whatever, is entered on a numbered card and a duplicate sent to the foreman of the department interested, which shows all the necessary facts. The foreman notes the disposition made and returns it to the safety inspector. During one year the Chicago District Mills made 3,719 recommendations, 10 per cent of which were unsafe practices, superintendents made 195, assistant superintendents 88, foremen 272, safety committeemen 968, and the rank and file 646.

Education and Discipline. The safety meeting is the school, and the safety rules the text book. The rule book for the mills and departments of the district contains some 700 rules. Each department foreman is supplied with several copies of the general rules and of the rules applying to his department, and there is posted under glass in each department a copy of these rules condensed to not more than two typewritten lines per rule. Under instructions of the District Manager, it is made the duty of the superintendent to see that the foremen teach and enforce these rules. When they were first put into effect they were read to the men, explained, and illustrated in the department safety meeting, with the machinery and the conditions to which they applied. It took monthly repetition over two or three years before it was thought everybody was sufficiently familiar with the rules, especially the non-English speaking. These have been in effect now nearly ten years and they are still being reviewed.

We did not think it good policy to give each man a copy of the rules as we feared that the foreman would rely on this alone and not assure himself that the men knew the rules.

Safety Meetings. A general foremen's safety meeting is held each month with the superintendent, assistant superintendent or District Safety Inspector as chairman, and sufficient material is received from the general and district offices, such as courts of inquiry of accidents in the mills or of the company, descriptions of accidents in other industries, safety talks and minutes of meetings in other mills, and the accident standings of the mills, districts, and the company as a whole, as shown by the monthly reports. These are read and discussed in preparation for their use later in department safety meetings.

Here are just a few of the results obtained by this system of accident prevention: One of the Chicago District plants operated from March 17, 1926, to April 19, 1932, six years and 34 days, amounting to 5,054,656 man hours, without a disabling accident.

One of the Joliet plants has operated since July 3, 1928, six years and three months, or 3,900,000 man hours, without a disabling accident, and still going.

Another larger works operated from March 30, 1932, to December 20, 1933, a total of 4,320,791 man hours, without an accident.

As a comparison of the number and severity of accidents now and 25 years ago, the accidental injuries that occurred at our largest plant in 1910, compensated at the present compensation schedule, would have amounted to a total of \$40,000, and there was no accident in which more than one man was hurt. In 1931 the total compensation was \$262.50, and in 1932 it was \$700. These are the extreme years of the last twenty-five.

Maintenance of Cranes

By FRANK W. CRAMER

Superintendent of Electrical Construction, Youngstown District,
Republic Steel Corporation, Youngstown, Ohio

The speaker said in part: When speaking of cranes, often the track of the crane runs on is not given serious consideration. For the same reason that modern railroads are so careful to keep their main line tracks in the best of condition, the crane runway should receive the same consideration. Engineers in designing the buildings for a new mill have often failed to take crane design into account until too late. A crane must have a certain minimum end clearance between the trucks and the columns. This end clearance is dependent on the distance between the runway rails and the column face. There are too many instances where crane builders have been forced to squeeze an end truck design into a narrow space and perhaps only a fraction of an inch clearance remained. Now, building columns and runway rails do not stay in perfect alignment and installations of this sort are the beginning of one form of crane maintenance that is expensive to correct.

There is another important dimension that should be referred to the crane designers before buildings that house cranes are fully designed. That is the height from the runway rails to the lowest point of the roof trusses. Here, again, we find many monstrosities in crane design where the distance has been reduced below the sensible minimum and the crane designer is forced to crowd the height of the girders and trolley so that it will clear the roof trusses. I have seen several examples where this clearance was so small that rivets in the cross bracing of the trusses had to be countersunk and the sag of the trusses caused trouble. There have also been cases where the knee braces or gusset plates supporting the trusses were such that full trolley travel was not possible.

Every crane should have bridge runway humpers at the ends of travel. These humpers limit the travel of the bridge and the extreme positions of the hoisting cable or crane hook is limited by the position of these humpers.

How many installations do you know of where a few more feet in bridge travel would allow for a straight lift on the last stand of rolls or some piece of equipment that has had to be located close to the end of a building?

The travel of the trolley is likewise limited by the bumpers on the bridge girders. In trolley design, one end of the trolley can be laid out so that there is a minimum distance from the columns to the center line of the hook. This is not possible with the other end as the drum location determines which is the maximum travel end. The result of not taking this into consideration often means the hook cannot be centered over a loading track and swing lifts are necessary to load cars.

The third of these troubles concerns the hoist travel. The height of the runway is often determined before the crane is purchased or the mill or warehouse design is complete. This sometimes results in the discovery that every possible inch of travel of the hoist is necessary. Now most crane girders are of the "fish belly" type, which means they are thicker in the middle than at the ends. Hence a load can be lifted higher at the ends than in the middle. There are cranes in operation today where loads have to be transferred to either end in order to gain a few inches in hoisting. A direct result of such a practice is an ineffective limit switch. Practically all steel mill cranes are equipped with some reliable type of limit switch that will prevent over hoisting. Any of these switches need a certain distance in which to operate and allow time for the upward motion of hoisting to be stopped, usually from 18 to 30 inches. If every inch of headroom is needed for lifts, the limit switch cannot function and sooner or later the hook block will be pulled into the sheaves or drum and cables broken, and the load, hook, etc., fall to the ground.

These facts are called to your attention because even before a crane is put to work it is entirely possible for conditions to be already set up that will cause high maintenance and, more important still, operating hazards that will be both expensive to correct and difficult to explain.

There is one more case to be mentioned in the general discussion, that is the installation of a new crane on an old runway. Modern cranes are much sturdier and heavier than the old timers. Usually the new crane will be of greater capacity than the old one. This means that greater wheel loads and end thrusts will be placed on the runway, and if it is one that had a narrow margin of safety in the first place with perhaps only 60 or 70 pound runway rails, maintenance on both runway and crane will soon be required.

Another phase of crane maintenance that is of interest is in the different types and ages of cranes. Most of us are associated with companies that have been in business for more than twenty-five years, and have equipment, particularly cranes, that date back that far. If we examine the apparatus of that vintage we will find riveted end trucks, perhaps track wheels with steel tires on cast iron centers, iron castings, everything bolted together and many parts overhung, with nothing between them and the ground. The trolley wires are on the sides of the girders, there is no floor on the trolley or foot walk along the bridge. It is an ideal setup for parts and bolts to work loose and fall to the ground and nothing to stop them if they do. This type of design has been the target of many safety meetings, but they are still with us and hard to eliminate.

Now, if these are contrasted with modern cranes we find steel end trucks either a one piece casting or welded; very few bolts and all steel castings; trolley bars instead of wire and mounted along a footwalk that extends to the girder; and the trolley usually a one piece casting floored over with only holes for the hoisting cables to go through. The old cranes have hundreds of parts to come loose. The new cranes have few parts to come loose or break and little chance of falling off the crane in case they should.

The type of electrical equipment also has its place in this discussion. Twenty-five years ago the modern crane and mill motor was not designed. We find the old motors have straight shafts and clumsy brakes on the main hoists of the cranes. Of the two, the old band brake with its solenoid gives the most trouble. Magnetic control was not far advanced so that drum controllers that worked in conjunction with brittle cast iron registers were used. Overload panels and safety switches were not in the market. Many other pieces of apparatus that are now common were not to be had. Practically all of them were equipped with trolley wire that snapped off in the winter and sagged in the summer, held in place by strain insulators of uncertain strength. All these things contributed to making these old patriarchs an eternal job for electrical maintenance and perhaps had a lot to do

with creating the impression that overhead traveling cranes need an army of men to keep them running. With this type of crane it is true.

They have one more defect that should be mentioned—that is the bearings. For many years bearing design was a neglected art. Most any cylindrical substance would make a bearing, and oil grooves were left to the whims of the machinist. Bearing pressures received little consideration and the net result was a continual process of changing bearings with frequent instances of being too late and halves of the bearing falling out and down to the ground. Happily the anti-friction bearings came into the picture about fifteen years ago and caused sleeve bearing advocates to concentrate on this item, so that modern cranes regardless of the type of bearing are practically immune to this trouble.

Another phase of this subject of extreme importance regardless of the type or age of the crane is the oiling of the parts. Any of us can remember when black oil was used for all purposes and poured all over the place under the guise of oiling the crane. Now we realize what an expensive operation this was and cranes today are as a rule properly oiled. It has been difficult during the last few years to carry out the oiling and greasing schedule, but those plants that kept their cranes oiled and greased saved both time and money in maintenance.

The same reasoning can be applied to inspection, for a crane running twenty-four hours a day, seven days a week, needs to be looked over and the small jobs discovered before they grow into big ones.

The last phase of this part of the discussion concerns the drums, the cables, the hook and the load. The old drums were iron castings, the new ones are of steel. The original drum was made for a certain size of cable, say $\frac{1}{2}$ inch. Often a larger cable, say $\frac{3}{4}$ inch, has been substituted. In most cases this is wrong as the grooves will pinch the larger cable and both maintenance and hazards increase. Another mistake that affects both of these is changing the reeving of the cable to make a faster hoist and doubling the pull on the drum. By reducing the number of "whips", the pull or load on the cable runs is increased and perhaps passes the point of safe loading. Hooks likewise should be designed, not just "made." It is seldom a hook breaks with overload. They are usually damaged then and sometimes later break with perhaps only a light load.

To round out this subject of factors entering into crane maintenance, two important ones remain. One of these is the crane operator. A crane must have care and judgment used in its operation just as any good machinery. These men have been given training on what to do and how to operate. Perhaps the biggest help they have is a book of rules on what to do and what not to do, sponsored by the Safety Department. The crane man is the most important factor in the amount of crane repairs. Keep careful, keen crane men, and the cranes will not be abused.

The last of these factors is the man on the ground who is looking on the lifts and directing the crane. He should be a partner with the crane man and not ask him to make unbalanced lifts, side pulls, swing lifts and many other things that are prohibited in the book of rules. The man on the ground can often prevent overhoisting by using a shorter sling, can eliminate a lot of spotty movements by good judgment in centering the hook, and can arrange his work so that the crane can be out of service at times to be oiled and inspected.

Safety Kinks in the Metals Industry

One of the most interesting features of the Metals Section sessions at each Congress is a group of lantern slides presented by Mr. John A. Oartel, Chief of Safety Bureau, Carnegie Steel Company, Pittsburgh, Pa. Through the year Mr. Oartel assembles these pictures of safety devices, as furnished to him by numerous plants all over the country, and before Congress delegates presents, with his own inimitable descriptions, a progressive picture of the progress in accident prevention. Unfortunately, these pictures cannot be reproduced in the Transactions, and it would be impossible to present word descriptions that would adequately explain their special features.

At this session of the Metals Section Mr. Oartel presented 66 individual safety

kinks. The first large group, 29 in all, were taken from the monthly pages of the *National Safety News*, as published in the "Safety Exchange" during the year. The remainder were taken from numerous companies, scattered over the country, including the following: Carnegie Steel Company; The Hubbard Spool Company, Chicago; Reading Coal & Iron Co., Pottsville, Pa.; American Steel & Wire Co., Cleveland; Wallingford Steel Co., Wallingford, Conn.; National Tube Co., Elwood City, Pa.; Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; Columbia Steel Company, etc.

THURSDAY MORNING SESSION

October 4, 1934

Facts and Figures from the Experience of the Metals Industry

By C. E. RALSTON

Safety Director, Pittsburgh Plate Glass Co., Pittsburgh

The speaker said in part: The 1934 edition of "Accident Facts" has placed before all of us much food for thought. While we are happy at the record of accident reductions, made as a result of carefully planned safety work, we are forced to realize the magnitude of the work which must be done before we can be satisfied that we have accomplished what we set out to do over twenty years ago. Although occupational deaths have decreased more than 54 per cent during the past twenty years, we are confronted with an ever-increasing death toll outside of the industry. There must be a more determined effort to reach the individual citizen and impress him with the great importance of safe thinking—acting—living.

During this period of depression, we must stand appalled in the face of our losses as a nation. While we may think of the loss by death of 14,500 industrial workers and serious injuries to 1,255,000 more as individual cases, there is the economic side of the picture which has a far-reaching effect. The cost of these cases is reported as \$550,000,000, which only covers compensation, medical expense and overhead insurance costs. To this should be added at least an additional \$100,000,000, to cover the indirect loss to industry. Most of this total is a direct waste which can be saved to industry and the nation through proper and efficient safety effort.

(Mr. Ralston then showed a group of lantern slides, depicting charts which illustrated in graphic form the high points of accident statistics in the various divisions of the Metals Industry.)

The foundry industry shows a consistent reduction on a severity basis since 1926. The year 1933 had the lowest rate of 26.8, or a reduction of 73.2 per cent. The frequency rate, while showing a 59.6 per cent reduction over 1926, is slightly higher than the low rate which was recorded in 1931. The 1933 rate is 40.4, while the 1931 rate was 40.1.

The steel industry reached its low severity rate in 1932, with a figure of 63.2 per cent, as compared with 72.4 per cent for 1933. The frequency rate was at its lowest point in 1931, with 38.7 per cent, as compared with a rate of 44.2 in 1933. The departmental severity chart shows the greatest losses as chargeable to the following departments: Bessemer, Open Hearth, Maintenance Foundries, General Labor, Coke Plants, and General Electrical. The comparative charts indicate that handling objects and machinery are the causes of most of our troubles.

The Non-Ferrous Metals Industry shows a severity rate lowest in 1931, of 61.2 per cent as compared with 84.3 per cent in 1933. The frequency rate of this division was also lowest in 1931, 38.6 as compared with 47.9 in 1933. The com-

parative chart again shows highest rates in comparison with handling objects and machinery.

The Metal Industry shows a severity rate comparable with the Machinery Industry, having reached their low rate in 1932, of 39.1 per cent, as compared with 54.4 in 1933. This is also true of the frequency rate, which was 56.3 in 1932, as compared with 60.9 in 1933.

The Machinery Industry, while not reaching the low rate of the foundries, also shows a fairly consistent severity rate reduction, having made a 48.3 reduction since 1926. This severity rate stood lowest in 1933, at 51.7 per cent; while the frequency rate reached the low point in 1932, with 38.6 per cent as compared with 50.3 per cent in 1933. Machine tools, agricultural machinery and implements, and construction, conveying and similar heavy machinery groups, show the highest rates, both on severity and frequency. The comparative chart, as in the foundries shows the highest rates are chargeable to handling objects and machinery.

Presentation of National Safety Council Trophies

General Chairman E. F. Blank presented the data on the 1933-1934 Safety Contest in the Metals Section. The contest ran from July 1, 1933, to June 30, 1934. A total of 169 unit companies were entered in the contest, and 219,148,000 employees worked during the 12-month period a total of 402,901,932 man hours. The average frequency rate for the contest was 10.328, which is an 8 per cent increase over the 1932-1933 rate of 9.534. However, 79 units completed the contest with a frequency rate below the average, and 13 per cent of those completing the contest finished with perfect records.

Mr. L. R. Palmer, Conservation Engineer, Equitable Life Assurance Society, New York City, and Past President of the National Safety Council, then presented the handsome trophies to the contest winners. The twenty bronze plaques were given to the following:

- The Corrigan-McKinney Steel Co. (Steel Mills Division—Group A).
- The Youngstown Sheet & Tube Co., South Chicago Plant (Steel Mills Division—Groups B and C).
- The Chase Companies, Inc., Brass & Copper Co. (Rolling, Finishing and Fabricating Division—Group A).
- Chapman Price Steel Co., Indianapolis, Ind. (Rolling, Finishing and Fabricating Division—Group B).
- Republic Steel Corporation, Grand Crossing (Rolling, Finishing and Fabricating Division—Group B).
- Union Drawn Steel Co., No. 1 Beaver Falls (Rolling, Finishing and Fabricating Division—Group B).
- Union Drawn Steel Co., Gary, Indiana (Rolling, Finishing and Fabricating Division—Group B).
- Steel & Tubes, Inc., Brooklyn, N. Y. (Rolling, Finishing and Fabricating Division—Group B).
- McClintic Marshall Corp., Buffalo, N. Y. (Rolling, Finishing and Fabricating Division—Group B).
- LeHigh Structural Steel Co., Allentown, Pa. (Rolling, Finishing and Fabricating Division—Group B).
- Republic Steel Corp., Unionville (Rolling, Finishing and Fabricating Division—Group B).
- Lycoming Manufacturing Co. Plants Nos. 2 and 3 (Iron Foundries Division).
- The Maryland Car Wheel Co. (Iron Foundries Division).
- Haynes Sellite Company (Steel Foundries Division).
- United Shoe Machinery Corporation (Heavy Machine Shop Division—Group A).
- Lycoming Manufacturing Co., Plant No. 1 (Heavy Machine Shops Division—Group B).

C. Hager & Sons Hinge Mfg. Co. (*Heavy Machine Shops Division—Group B*).
 Chase Companies, Inc. Noera Mfg. Co. (*Heavy Machine Shops Division—Group B*).
 Emisco Derrick & Equipment Co., D. & B. Pump & Supply Co. (*Heavy Machine Shops Division—Group B*).
 Pittsburgh Steel Co., National Steel Fabric (*Heavy Machine Shops Division—Group B*).

"Your Hour"

The final feature of the program was the annual event entitled "Your Hour", led by T. H. McKenney, Supervisor of Labor & Safety, Illinois Steel Co., South Chicago, Ill. Mr. McKenney presented a number of questions in his characteristic manner, and a general discussion ensued which was participated in by all the delegates. The discussion was, of course, extemporaneous and no record of it is available.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Mining Section

Officers 1933-34

General Chairman—P. M. ARTHUR, American Zinc Company of Tennessee, Mascot, Tenn.
Vice-Chairman in Charge of Membership Coal Mines—FRANK B. DUNBAR, Pickands, Mather & Co., Mather, Pa.
Vice Chairman in Charge of Membership Metal Mines—J. W. ALT, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.
Vice-Chairman in Charge of Engineering—WM. G. METZGER, Hudson Coal Co., Scranton, Pa.
Secretary and News Letter Editor—DANIEL HARRINGTON, United States Bureau of Mines, Washington, D. C.
Entertainment Committee Chairman—J. T. RYAN, Mine Safety Appliances Co., Pittsburgh, Pa.
Poster and Slide Committee Chairman—J. J. FORBES, United States Bureau of Mines, Pittsburgh, Pa.
Program Committee Chairman—R. N. HOSLER, Coal Mine Section, Pennsylvania Compensation Rating & Inspection Bureau, Harrisburg, Pa.
Publicity Committee Chairman—M. R. BUDD, Explosives Engineer, Wilmington, Del.
Statistics Committee Chairman—W. W. ADAMS, United States Bureau of Mines, Washington, D. C.
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 W. H. COMINS, National Lead Co., St. Francois, Mo.
 M. F. FAIRLIE, The Mining Corporation of Canada, Ltd., Toronto, Ont., Canada.
 C. W. GIBBS, Harwick Coal and Coke Co., Pittsburgh, Pa.
 H. C. HENRIE, Phelps Dodge Corp., Bisbee, Ariz.
 THOMAS E. LIGHTFOOT, Koppers Coal Co., Pittsburgh, Pa.
 LEE LONG, Clinchfield Coal Corp., Dante, Va.
 GEORGE MARTINSON, Pickands, Mather & Co., Hibbing, Minn.
 D. D. MOFFATT, Utah Copper Co., Salt Lake City, Utah.
 M. W. PRICE, Jeddo-Highland Coal Co., Jeddo, Pa.
 L. T. SICKA, St. Joseph Lead Co., Bonne Terre, Mo.
 HOWARD I. YOUNG, American Zinc, Lead & Smelting Co., St. Louis, Mo.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Mining Section was called to order by General Chairman P. M. Arthur, American Zinc Company of Tennessee, Mascot, Tenn., who presided. Chairman Arthur introduced Mr. W. E. Newberry, Superintendent, Ohio & Western Pennsylvania Dock Company, Cleveland, who welcomed the delegates on behalf of the convention city. The Chairman briefly presented a "Resume of the Activities" of section officers and standing committees during the last year and praised them for their good work and devotion to duty. He then introduced the first speaker.

Annual Report of the Secretary

By DANIEL HARRINGTON

United States Bureau of Mines, Washington, D. C.

The speaker said in part: Although final figures are not available, it is known that 1933 set an all time low fatality rate in coal mining, the tentative fatality rate per million tons of coal produced being 2.68, the best previous record having been made in 1931 with a rate of 3.31. Tentative figures indicate that 1,013 persons were killed in our coal mines in 1933, which is far better than the 2,500 or more fatalities which occurred annually for many years. Both anthracite and bituminous coal mining acted in unison to bring about the new all time low rate in 1933, the tentative bituminous rate of 2.39 (782 persons being killed) as well as the tentative anthracite rate of 4.68 (231 being killed) both being the lowest rates of the respective industries on record.

In fatalities from gas and dust explosions, 1933 established new low records: there were only 39 deaths from this source or 3.8 per cent of the fatalities for the year, against an average of about 14 per cent for the past ten years. The vast improvement in the occurrence of gas or dust explosions in the coal mines of the United States is readily seen by the fact that in the 5-year period 1906 to 1910, inclusive, (or just before the United States Bureau of Mines began to function in active safety work) there were 84 coal mine major explosion disasters or about 17 per year (a major disaster resulting in 5 or more deaths); in 1933 there was but one major explosion disaster and in it 7 lives were lost. During the 5-year period 1906 to 1910, inclusive, an average of 478 persons were killed annually by explosions in the United States, while in 1933 but 39 lives were thus sacrificed.

Definite data are not yet at hand as to accident occurrence in the non-coal mines of the United States in 1933, though such fragmentary data as are available appear to indicate that the relatively few of our non-coal mines which worked in 1933 recorded slightly rather than advanced in safety achievement.

In figures given out by the American Petroleum Institute, it appears that in the petroleum industry there was a slight increase in accident frequency and a very slight decrease in accident severity. It was also shown that the petroleum industry has participated very definitely in the downward trend of accident occurrence in the past several years, accident frequency falling as follows: from 31.15 in 1927, to 27.33 in 1928, 26.78 in 1929, 18.05 in 1930, 14.14 in 1931, 12.38 in 1932, and 13.00 in 1933; and the accident severity fell from 2.65 in 1927 and 2.09 in 1928 to 2.49 in 1929, 2.37 in 1930, 2.36 in 1931, 1.91 in 1932, and 1.90 in 1933.

Various factors are responsible for the excellent safety record in mining in the years 1931, 1932 and 1933, and unquestionably the various activities of the United States Bureau of Mines have had their effect. During the past seven years, approximately 520,000 persons in the mining and allied industries have been given the Bureau of Mines course of training in first aid and it is now definitely proved that persons who take this course are likely to become safety conscious, hence tend to take more definite precautions against occurrence of accidents to themselves and to fellow workers. It is now known, also, that as a direct result of prompt

and effective administration of first aid by those of the mining and allied industries who have taken this course of training, at least 200 lives are saved annually. The rock dusting of coal mines has also been a factor; and although rock dusting is frequently not done efficiently, and many mines still disregard the precaution, during the past six or seven years rock dusting has saved an average of at least 200 lives annually by preventing the wider spread of explosions in our coal mines. Numerous other activities of the United States Bureau of Mines, among them the Joseph A. Holmes Safety Association Awards and the Holmes Safety Chapters, also have had a hand in helping to bring about conditions under which lives and limbs of our mine workers have been conserved.

For the first six months of 1934, the fatality rate per million tons of coal produced in the United States was held to a gratifyingly low figure, being but 2.24 in bituminous mines, against 2.29 for the first six months in 1933; and but 4.36 in anthracite mines in 1934 as against 4.33 in 1933. Moreover, for the first six months of 1934, there wasn't a major explosion disaster in any coal mine in the United States, although there was one coal mine fire causing five deaths; subsequent to July 1, 1934, however, available data on coal mine accident occurrence do not look so favorable and it seems that safety in our coal mines is now being allowed to slip back at least to some extent.

The opening of hundreds of small mines or parts of mines was one of the consequences of the depression which had a tendency to prevent progress in the reduction of the accident rate; with the higher prices of gold and silver, there has also been a rush to open or to re-open small mines, and as a rule these small operations are conducted with minimum regard for safety, even when the only employees are the owners or their relatives. The unsafe features are usually intensified because in many states the state inspection forces have no jurisdiction unless a certain number are employed, 5, 6 or 10 on a shift, and this leaves safety wide open which usually means forgotten.

About ten or twelve years ago a few cement plants and metal mines announced that they had operated for a year or more without a lost-time accident; at present, it is probable that a complete list of metal mines with operation of a year or more without a lost-time accident would show at least 100 such operations; and in the past eleven years (up to January 1, 1934) 103 out of approximately 160 cement plants in the United States have operated one or more years without a lost-time accident—one plant operating for more than seven years consecutively without a lost-time accident.

For several years coal mining people brushed aside as "visionary" or "out of the question" the possibility of operating a fairly good sized underground coal mine for a year or more without a lost-time accident. However, there is now available a list of more than 20 fairly good sized underground coal mines in eleven different states which have operated a year or more without a lost-time accident; one of these mines has worked almost three years without a lost-time accident, and in that time has produced nearly half a million tons of coal in addition to hauling to the surface more than 200,000 tons of rock. Some mines have produced far more than a million tons of coal without a lost-time accident (or a fatality) from a fall of roof or coal; others have worked more than one million man-hours without a lost-time accident from a fall of roof or coal; and one mine has hauled over 1,250,000 tons of coal without a lost-time haulage accident.

What of the Cause of Safety?

By HARRY GANDY, JR.

National Coal Association, Washington, D. C.

The speaker said in part: The big hue and cry in accident prevention work has long been for safety-consciousness on the part of higher officials and I am glad to report that the bituminous industry realizes the necessity of such consciousness. Partially, of course, this safety consciousness has been inspired by humanitarian considerations, but there is certainly another side. Recent studies have shown that cost of accidents reaches such a figure as to make accident prevention a

decided economic responsibility of management. These studies have shown that for bituminous operating companies, the direct cost of accidents, including compensation, hospital fees and other charges, varies from 3 cents to 10 cents per ton. Moreover, the estimate of an official of one of the large life insurance companies shows that the indirect cost of an accident is four times its direct cost. It will be seen, therefore, that the total direct and indirect cost of accidents amounts to a staggering total. Accident cost, in fact, is in many instances the deciding factor between profit and loss.

From an accident prevention viewpoint, the last three years have been outstanding in the history of the bituminous industry, with the past year by far the best of the three. There are, of course, many factors which contributed to bring about that gratifying result, notable among them being the awakening of several states to their responsibility for safeguarding the lives of miners. The new mine laws in Kentucky and in New Mexico are instances of this. There has been an increase in the number of chapters of the Holmes Safety Association, and this has aided materially in advancing safety in coal mining. The program of the National Safety Council also has helped. The activities of this organization reach into remote places where the story of safety might not otherwise be told. If these safety efforts should succeed in saving the life or limb of but one individual, they would be very much worthwhile.

Regrettable as it may seem, experience has shown that there is a distinct relationship between minor compensable accidents and economic conditions. Scanning the accident records of many companies, one notes that the ratio of such accidents is higher during a period of low running time. This in itself presents a serious operating problem. In many localities the drought increased the bituminous coal mine fire hazard, and this situation is being studied and preventive measures are being taken. Studies have also shown that eye-efficiency makes for the elimination of miners' accidents. Management should make mandatory the testing of eyes and the wearing of corrective glasses. While on the subject of eyes, it is not amiss to mention goggles. Many bituminous coal companies have required, and all companies should insist, that every employee whose eyes are exposed to flying coal or rock be equipped with goggles. Wherever necessary, such goggles should have corrective lenses.

This brings us to the subject of enforcement of safety regulations. Doubtless in most instances safety rules are adequate for safe operation, but all of the rules in the world are worthless if there be lax enforcement. That is a direct problem which mine officials must meet. Many methods have been tried, including fines, loss of work time, discharge, and many others. It should never be forgotten that the most effective observance of safety regulations can be secured only where there is active cooperation of the men themselves. In any event, the operating officials should always set the example by scrupulously obeying all safety rules themselves.

Coal Mine Ventilation

By H. M. JOHNSTONE

Superintendent, Sayreton Coal Mine, Republic Steel & Iron Co., Sayreton, Ala.

The speaker said in part: Unfortunately, coal mine ventilation is often considered a necessary evil, and even of secondary importance, by many mining men. The fact remains, however, that it should be considered a most important factor, not only to insure safety, but from a cost of coal output standpoint. Every cubic foot of air unnecessarily handled by the ventilating unit is increasing cost just that much.

There are at least eight reasons or causes for inefficient ventilation. The responsibility for allowing bad conditions to occur and to exist lies primarily, of course, in the lap of supervisory forces. Improper ventilating equipment produces inefficient ventilation and at increased power consumption. Improper coursing of air is certain

in many cases to result in inadequate or inefficient ventilation. Restricted airways include those driven or built with insufficient area and those that become choked by debris, or falling roof, and either situation is an expensive one. Leaky stoppings and doors, for some unexplainable reason, are often ignored by the management, but the cost sheet at most mines would show a decided reduction if such ventilation evils were given proper attention. Auxiliary fan drives are necessary for each ventilating unit, on account of power interruption, whether driven by steam, air, oil, or electricity. The volume of air required by law is another important factor, and in making ventilation inspections, you are often confronted by hazardous problems that require action conflicting with obsolete state mining laws. Finally, there is the gas content of the mine atmosphere to be considered.

After the mine becomes inefficiently ventilated from any one, or a combination of the above causes, how should the evils be determined? This procedure should be systematic and thorough, leaving nothing undone that would enter into the final analysis. We have been guided by the following routine: (1) fan tests; (2) intake and return air reading at fan; (3) inside water gauge readings; (4) inside air readings; (5) methane readings; and (6) recommendations.

Fan tests should be made to determine the efficiency of the ventilating unit within itself, and for bad conditions brought about by inadequate or adverse conditions in the mine. These tests are simple, and anyone of the above conditions can be proved by the following: Size of fan, actual water gauge reading, volume of air handled by fan, horsepower input to fan.

Manufacturers design and build fans to fit the exact requirements of any particular mine. For instance, let us assume a fan, installed years ago to produce 150,000 cubic feet of air per minute, water gauge of three inches, and speed of 212 revolutions per minute, and actual tests after installation gave these results. Suppose today, the actual tests of this fan showed the volume of air at fan reduced to 93,000 cubic feet per minute, water gauge of three and one-half inches, and speed of 230 revolutions per minute. What do these figures indicate? Inefficiency somewhere, and this inefficiency has increased the power cost, and at the same time, produced less air.

Low mechanical efficiency in a modern fan indicates that the fan is not suited for the particular mine under the existing conditions. A thorough ventilation inspection should then be made to determine the causes producing this inefficiency and the condition remedied.

The volume of air at intake and return should be accurately measured, allowing for anemometer corrections. Some mining men think it is only necessary to measure either the intake or return, depending on which is the most accessible. By measuring both, it gives an accurate check, allowing for difference in temperature and gas content accumulated during air circulating through the mines. Any excess difference in the two readings should be promptly checked. This excess air handled by fan not only increases ventilation cost, but may deprive the working faces in the mine of the increase in air volume necessary to reduce high methane content.

Pressure or water gauge readings should be taken at intervals of not over 2,000 feet, closer if necessary, on main slope, and at each main split. These readings will show accurately the drop in pressure, whether natural or excess, and indicate where to expect the greatest evil. The water gauge readings will give you the necessary information relative to conditions of airways, but if not normal additional information should be secured by inspection of airways, as to whether the restricted area is general or from local falls. Also it may be possible to eliminate these chokes by changing the coursing of the air current.

Regular air measurements in mines are absolutely necessary for two reasons: first, to determine the amount of air circulating along working faces; second, to determine the loss in volume, due to leaks through stoppings and doors. These measurements should be taken not only on return of each split, but in the last open cross-cut in each entry; regardless of what returns show, the working faces may not be efficiently ventilated, due to leakage.

A mine may be efficiently ventilated from a mechanical and power consumption point of view, and air readings at working faces may indicate adequate ventilation.

but the true facts as to the safe conditions of a gassy mine cannot be ascertained without the knowledge of methane content of mine atmosphere. These methane readings should not only be taken at return, but in the last open cross-cut in each entry, and if possible, at all working faces.

Let me now outline briefly the preventives for ventilation evils. These are three in number: (1) competent supervision; (2) ventilation inspections; (3) ventilation reports and charts.

The efficiency of coal mine ventilation depends entirely on the ability and willingness of supervisory forces. Competent ventilation men know what effect any depression from the natural laws governing ventilation, or leaky stoppings and doors, or restricted areas and improper coursing of air, has on ventilation efficiency. With this knowledge and experience, they are able to combat any tendency to ventilation evils.

In formulating ventilation data for new openings, there are four factors that should first be considered: duration of operation, height and cleanliness of seam, roof condition, and whether gassy or not. With this information at hand, the future plans can be readily worked out.

The ventilation plans for developing a new mine should show not less than two intakes, and two returns; and if the life of the mine is to be of long duration, three main intakes and four main returns, with solid pillars between them insure greater efficiency. Some mine owners think this is a waste of money, but in reality it pays for itself tenfold over during the lifetime of the mine in ventilation savings alone.

Sufficient area for air to travel means low velocity, which in turn affects pressure and power cost. For instance, if it is found necessary to double the volume of air, which varies directly, as velocity, the pressure would be increased four times, and the power eight times. By these facts, the importance of low water gauge with unobstructed airways of sufficient area is evident.

In driving main airways, recesses should be cut in ribs at regular intervals and of sufficient area to gob the restricted areas caused from roof falls.

Stoppings should be built substantially, of fire-proof material, and as far as possible leaks eliminated. Leaky stoppings not only deprive the working faces of air, but cause the fan to handle an excess quantity of air which being short-circuited through these stoppings, naturally increases power cost. The only positive way of eliminating leaky stoppings is to maintain solid pillars as far as possible between main intakes and returns.

Doors in coal mines should be eliminated as far as can be done, but when it is absolutely necessary to use them, they should be rigidly constructed, self-enclosing, where possible air-tight, and in pairs, creating an air lock between.

Overcasts should be constructed of fire-proof material, and approach should allow easy flow of air. The area should not be less than the connecting airway.

Line brattices, whether built of wood, curtain or metal, and used to conduct air current to working faces, should be so constructed as not to interfere with free air movement. In either case, leakage is extremely high, even in the best constructed brattices. In erecting line curtains, a board at roof and bottom, fitting as snugly as possible, should be nailed to timbers, and then the curtain tacked to board. To serve this purpose, some mines are using galvanized roofing nails on timbers lengthwise, and lapped sufficiently to minimize leaks.

Cross-cuts should be of sufficient area to allow free passage of air. In most mines, even in large seams, they are driven too narrow, and often the gob further reduces the area.

Splitting the air is of vital importance, and requires knowledge and experience. There are many mines in which the air current is conducted around the working faces, from intake to point where it is discharged on surface by one continuous route. Splitting the air is imperative to efficient ventilation, for several reasons. First, the velocity of air current can be kept low; second, each section of mine is ventilated independently, eliminating any smoke and gases generated in one section and carried into another.

WEDNESDAY MORNING SESSION

October 3, 1934

Chairman Arthur called for the report of the Nominating Committee, which was presented by Chairman J. T. Ryan, Mine Safety Appliances Company, Pittsburgh, and officers for the ensuing year were elected as follows:

General Chairman—Wm. G. Metzger, Hudson Coal Co., Scranton, Pa.

Vice-Chairman in Charge of Membership—J. W. Ault, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

Vice-Chairman in Charge of Engineering—C. W. Gibbs, Harwick Coal and Coke Co., Pittsburgh, Pa.

Vice-Chairman in Charge of Health—A. J. M. Ross, Homestake Mining Co., Lead, S. D.

Secretary and News Letter Editor—Daniel Harrington, United States Bureau of Mines, Washington, D. C.

Entertainment Committee—R. N. Hosler, Coal Mine Section, Pennsylvania Compensation Rating & Inspecting Bureau, Harrisburg, Pa.

Poster and Slide Committee Chairman—J. J. Forbes, United States Bureau of Mines, Pittsburgh, Pa.

Program Committee Chairman—J. T. Ryan, Mine Safety Appliance Co., Pittsburgh, Pa.

Publicity Committee Chairman—M. R. Budd, Explosive Engineer, Wilmington, Del.

Statistics Committee Chairman—W. W. Adams, United States Bureau of Mines, Washington, D. C.

Members at Large—

P. M. Arthur, American Zinc Co. of Tennessee, Mascot, Tenn.

W. H. Cumins, National Lead Co., St. Francis, Mo.

M. F. Fairlie, The Mining Corporation of Canada, Ltd., Toronto, Ont., Canada.

H. C. Henric, Phelps Dodge Corp., Bisbee, Ariz.

Thomas E. Lightfoot, Koppers Coal Co., Pittsburgh, Pa.

Lee Long, Clinchfield Coal Corp., Dante, Va.

George Martinson, Pickands, Mather & Co., Hibbing, Minn.

D. D. Moffat, Utah Copper Co., Salt Lake City, Utah.

M. W. Price, Jeddo-Highland Coal Co., Jeddo, Pa.

L. T. Sicka, St. Joseph Lead Co., Bonne Terre, Mo.

Howard I. Young, American Zinc, Lead & Smelting Co., St. Louis, Mo.

Accident Prevention at the Harry Taylor Mine

By CHARLES DORRANCE

President, Penn Anthracite Collieries Co., Scranton, Pa.

The speaker said in part: The Harry Taylor Mine is located in the northern anthracite coal fields at Scranton, Pa. The coal lies at an angle of approximately 15 degrees. The available coal consists of two beds separated by an interval of approximately 100 feet of rock. The coal is reached by means of a rock slope driven on a pitch of 25 per cent in the center of the coal area. The first bed consists of an average of 30 inches of comparatively clean coal, and the roof formation consists of from 3 to 8 feet of soft slate, over which is a good sandstone bench. The second bed consists of an average of 36 inches of coal with an 8-inch band of slate near the top of the bed. The roof formation consists of a band of bone varying from 6 to 18 inches over which is a good sandstone bench.

The room and pillar plan of mining has been adopted, using 60 foot centers with a 30 foot chamber and 30 foot pillar. The development work is driven to the pitch and the chambers are driven parallel to the strike of the bed. Pillars are extracted immediately upon completion of the chamber.

All the coal is undercut, using the conventional low vein shortwall mining

machine with variable speed, two power drum feed. The transportation system is unique, in that coal is carried from the working face to the railroad car by means of a series of flight, chain and belt conveyors; thereby eliminating the use of the track and mine car system of transportation. This conveyor system is reversible, allowing material and supplies to be carried to the working faces. Supplementary to the conveyor system, track and car have been installed in both the main and inside slope to facilitate the movement of heavy machinery.

The mine is non-gaseous and open lights are in use. Ventilation is accomplished by means of a two speed, blower type fan, 100,000 cubic feet per minute capacity, utilizing a shaft as the intake and exhausting through the main slope. Compressed air is used for drilling.

Attention is called to several distinct features that are of special importance in accident prevention work at this mine. First, the continuous flow from the face to the railroad car; second, the fact that the coal is 100 per cent undercut; third, the mining is concentrated in a very small area; fourth, the mining plan entails the minimum and easiest movement of machinery; fifth, the treatment of power distribution system; sixth, the enforcement of standard safety practices and finally, the method of handling the operating personnel.

The installation of the continuous flow conveyor system in lieu of the car and track system has removed the hazard of handling and dumping run of mine. Trolley wire, unless, danger of derailments and failure in slope haulage equipment have been entirely eliminated. The hazard of handling material and supplies has been noticeably reduced; however, new potential dangers have arisen, especially the hazard of moving machinery.

Every effort has been made by the manufacturer to provide chain, sprocket and gear guards to protect the worker from getting caught in moving parts. Colliery regulations in force do not permit the operation of any machinery without the guards being in proper place. Infractions in the proper use of guards are subject to disciplinary measures.

Retarding devices and buffers have been built and installed at the colliery to prevent coal from rolling down the belt on the conveyors carrying coal down the pitch. Wooden hand rails and steps are provided at strategic points to enable the employees to cross moving conveyors with safety. Wooden walkways are provided to insure proper footing on pitch manways.

Electric lighting has been provided along the main slope and the gathering conveyors.

Interlocking controls are provided on all conveyors so that if any conveyor stops for any reason, all conveyors from that point to the face will stop automatically. Each conveyor must then be started individually to resume operation, thus insuring against the possible hazard of a conveyor being set in motion at some remote point while men are working on the conveyors. Stop buttons are placed at intervals along the conveyors so they can be shut down in case of trouble.

The use of undercutters in producing the entire output of coal is a distinctive feature in the Anthracite fields. This procedure has a tendency to reduce the shooting hazard. With former practices it would be necessary to use from twelve to sixteen drill holes, each containing from four to six cartridges; with the coal undercut, the same work is accomplished with five drill holes, each containing $2\frac{1}{2}$ to 3 cartridges.

Each working place is provided with an undercutting machine, thereby eliminating the hazard of moving the machine from chamber to chamber.

The operation of undercutting on the pitch varying from 14 degrees to sometimes as great as 20 degrees made necessary several precautionary measures to prevent the machine from sliding back from the face while cutting was in progress. In driving up the pitch the machine is reversed after each operation and stabilized alternately on the right and left ribs, thus eliminating the hazard of recrossing the face after it has been undercut. In cutting across the 30 foot face it was found necessary to change the position of the pulling jack frequently, advancing approximately 5 feet for each change. All changes in the jack positions are made with the rope of one power drum in tension. An auxiliary screw jack is also provided with each machine, being placed between the machine and the roof during each

change in the position of either the pulling jack or the holding jack and also being put in place when the machine is stabilized on the rib, the end of the jack being placed in a hole drilled into the roof. In this operation it is necessary to regulate the position of the men, it being mandatory that no men are working below the machine on the lower rib side while sunning and cutting is in progress. Tailings are removed from the cutter bar, only while the machine is stopped.

Interlocking devices have been provided on the drum and cutter chain controls to prevent accidental starting of the cutter chain. To further insure against the inadvertent starting of the cutter chain, a cutter bar lock is provided for use on each machine, consisting simply of a heavy piece of iron with both ends bent down, being placed over the cutter bar near the body of the machine.

Due to the severe conditions under which these machines operate, the drum ropes are given special attention. Only the best obtainable steel wire rope is used. These ropes are inspected daily and renewed at an average interval of two weeks, the used rope being relegated to less severe working conditions. After a short period of operation it was found that only 2 inch, extra heavy steel jack pipe would give any length of service and as a result, this type of pipe has been made standard at this operation. At regular intervals the feed drums are inspected and cleaned to insure ease and safety of operation.

The fact that this form of mining is a highly concentrated operation has several advantages. Supervision is localized and it is possible for the foreman to visit each place several times daily and keep in direct contact with the section under his jurisdiction. The maximum number of working places under the charge of a foreman has been limited to eight units.

The mining plan adopted provides for the minimum and least difficult movement of machinery. The time element of progress is so regulated that after the initial installation, all chamber equipment, consisting of the undercutter, face conveyor, and chamber conveyor are not removed from the place until it has been driven 1,000 feet and the pillar extracted. All the chamber equipment is then removed to a new location and the procedure is repeated. The plan provides for the least possible movement of equipment up and down the pitch.

The distribution of current for the operation of undercutting and conveying equipment made it essential that precautionary measures be taken to prevent any possible injury from electric shock. Power is transmitted into the mine through a lead covered, steel armored, varnished cambric insulated cable to two separate transformer substations. From these points the power is distributed to the motor driven equipment. This main cable is provided with disconnecting switches at either end and protected at the source with an overload tripping device.

All distribution cables are triple conductor, stranded copper wire, rubber insulated, jute filled, encased in a heavy impregnated spiral weave cover, suspended from the roof on large porcelain insulators. These distribution cables are especially made by the cable manufacturers with the ends of each conductor fitted with a lug, for ease of connection. This arrangement eliminates the possible protrusion of individual strands of the copper cable through the tape at the joint. The ends of the cable are staggered so as to permit the joint to be properly taped and painted, and the conductors to be well insulated from each other. All distribution circuits are protected with fused, approved safety switches under lock and key, opened only by designated authorized persons.

Cables leading from safety switches to all equipment are rubber covered, encased in a solid rubber covering and insulated for 1,500 volts. Each cable is made up of four flexible insulated conductors, three being for power transmission while the fourth (colored for identification) serves as a ground wire. Control cables are of similar all rubber construction.

Splices in all rubber covered cables are made in every instance in a special vulcanizing machine. This insures that the insulation at the splice is made watertight and possesses equally good insulating qualities as the original cable.

To be assured of a satisfactory circuit to ground in the event an electrical failure occurs in motors, undercutters, safety switches, control boxes, each and every piece of electrical equipment is connected by copper wire to a #4/10 bare stranded copper conductor. This is brought direct to the surface and connected to a very care-

fully constructed charcoal and salt ground, embedded in moist earth near the mouth of the main slope. All maintenance men are trained and educated to treat the ground connection as a piece of equipment of equal importance to that of the power circuit; discipline resulting from failure to connect the ground circuit on a newly installed or transferred piece of equipment.

All shot firing is electrical, being accomplished by means of a plunger type 50-hole capacity blasting machine. Firing lines are standardized, using #14 insulated wire. This firing line is carried on props near the roof, being placed on the opposite rib to the power cables. During the loading and firing operation all power in the face is disconnected, each face unit being provided with a suitable rubber covered plug and receptacle connector. Permissible power is used, powder and detonators being stored in individual wood boxes under lock and key. The mine is 100 per cent equipped with powder carrying bags, thereby eliminating the accumulation of flammable material in the working places, the use of improper tools in opening the powder boxes and the danger of protruding nails in discarded boxes. Powder is stored on the outside and a supply sufficient for one day's work is taken into the mines daily. Blasting supplies are not permitted to be carried to the face on the conveyors as are other supplies.

Standard minimum timbering practices are in use. Timbering is carried out in a systematic manner, with rows of props set at regular intervals and equally distant from adjacent rows. The maximum distance between any props is six feet. In this type of work it is essential that the conveyors be kept absolutely in line. In setting the conveyor line is used as a base and the miners are instructed to set each prop at a specified distance from the center of the conveyor line. The result is a series of straight rows of props which present a neat and orderly appearance. This practice has a tendency to make the miners keep other details of his place in a workmanlike manner. To date the number of roof fall accidents at this mine is far below the record of hand mining in similar conditions at our other operations.

All employees are required to wear protective head gear and spectacle type goggles.

Another important item is the fact that a determined effort has been made to keep the entire property in a clean, orderly shape. Each conveyor junction man is assigned his responsibility. The results of this effort are gratifying both in appearance and in the fact that the travelways offer no obstacles under foot and reduce the hazards of tripping and falling or stepping on protruding nails.

Probably one of the most important phases in the accident prevention measures at this operation is the treatment given the personnel. The management, realizing the radical departure from the usual mining practices in this locality, made every possible effort to select the most intelligent type for the key men in this undertaking.

It was necessary not only to teach these men how to operate and maintain these machines, but also to instill into their minds and practices, the ideas that make for safety. Speed of production was neglected until it was felt that the men were entirely familiar with both the operation of the machinery and the natural physical conditions encountered. The next step was to bring the machines up to their rated productive capacity. These steps were taken with the closest supervision possible, both by officials of the company and by representatives of the manufacturers of the mining and conveying machinery. After it was felt that the desired results were forthcoming, these key men were given new men as understudies and gradually the working force was expanded until the desired production had been reached. Efforts toward safety did not stop at this point, constant effort being made to prevent and reduce accidents.

Discipline is administered regularly for any infraction of safety regulations. Safety literature is distributed at frequent intervals to all men and interesting posters are placed in an illuminated bulletin board to confront the men as they enter and leave the mine.

Safety inspections are made at regular intervals by the Safety Engineer and Colliery Superintendent both underground and on the surface. Further it is the duty of the General Maintenance Foreman to periodically inspect all machinery with the objection of detecting worn and defective appliances.

Consistent with the policy of the company at all its collieries, the supervisory force at Harry Taylor Mine has been given a course in "Safety in Foremanship" and is the recipient of various safety literature at regular intervals. Through co-operation of the United States Bureau of Mines every employee, including the entire supervisory force, has had complete first aid training.

In formulating the original mining layout at the Harry Taylor Mine, the subject of hazard elimination and accident prevention was of major importance. Every step in the development of the working plan was taken only after it was carefully considered from a safety standpoint.

Safety in the Lead Mines

By CLINTON H. CRANE

President, St. Joseph Lead Co., New York City

The speaker said in part: Accidents and bad health are expensive, because steady operation is interfered with, and you must remember that the incidental cost of paying claims is the smallest loss in unsafe and unhealthy conditions. It has long been recognized that high turnover interferes with efficiency. A new man who must learn his duty not only is not able to produce as much as the old experienced worker, but he absorbs the time of others during the period when he is learning his job. I do not think it would be an exaggeration to say that each severance resulting in a new employee, costs directly at least one week's extra wages and in many cases an entire month's. The indirect costs are hard to measure, but I believe that they are even greater in dollars than the direct costs.

What can be accomplished in reducing labor turnover is conclusively demonstrated by the percentage figures of our Missouri Division. This percentage is obtained by dividing the number of separations in one year by the number of men on the payroll. In 1919, before our "Safety First" program and the other safety measures became truly effective, the turnover was 233 per cent. This was reduced to 22.1 per cent in 1928, and during the following year it was further reduced steadily until in 1933 it was 4.4 per cent.

Probably the most important single requirement for a successful safety campaign is for the management to realize at the first and to never forget that safety work is teaching work.

At the start of our safety work, we immediately realized that the foreman was the key man in industry, the leader of his group, and the one to whom his men looked for instructions, orders and advice. He, better than anyone else, is able to educate his workers in accident prevention right on the job. However, for him to be better able to serve as an efficient leader and maintain the necessary enthusiasm for safety, he himself must be supplied with effective material. We supply this through specially prepared communications and periodic foremen's and executives' meetings, when a wide variety of subjects allied to safety is brought up for discussion. Accident statistics, covering each accident in detail, with a recommendation as to how a similar one may be avoided, are studied. Such matters as employment, labor turnover, hiring, firing, disciplining and training work receive careful attention. In our organization, a foreman cannot fire a man; he is sent to the head of the Employees Service Department, who investigates the circumstances, and if the difficulty is merely one of personal misunderstanding, the man is shifted to some other location under another foreman.

We, of course, have the usual safety bulletin boards, as by their proper use a contact is established with the individual employee. The first requisite of a successful bulletin board campaign is neatness, attractiveness, and proper location. Regular periodic changes of material are necessary if the reader's interest is to be maintained. We have developed a series of weekly letters called "Chats by the Chat Pile Philosopher," which contain anecdotes and stories emphasizing safety and cooperation. Personalized bulletins have a most important place in this educational work, and a kodak picture of a workman or a sketch drawn by some one of our employees, together with a write-up of an accident or near accident which has been

experienced, have proved most successful. Posters from the National Safety Council are also extensively used.

However, bulletin boards may lose a great portion of their effectiveness, in spite of regular changes of materials. We felt that a new method should be tried, and the moving picture with sound reproductions was adopted. We now have four or five underground theatres, equipped with permanent benches, a ten foot screen, and electric lights. Notices of scheduled shows, which are held before the men start their shifts, are posted a day or two in advance, and as the men enter the mine they are greeted with music amplified from phonograph records placed on an ordinary turn-table equipped with an electric pick-up. Lively marches and popular pieces are played as the men gather at the theatre.

The first film is usually a comedy which makes for a feeling of good fellowship and creates in the group a responsive mood for the discussion of safety, health, or other similar subjects. To illustrate or clarify some accident, stereoscopic slides are extensively used. Following the safety reel, a second comedy or educational film that might fit in is usually given. The entire program takes about 35 to 40 minutes. It has been noted that all employees, whether engaged in underground or surface work, make every effort to be present at these shows.

Through this method of publicity and education by sound movies, it has been a great deal easier to sell the idea to the men of the desirability not only of individual personal safety, but also the necessary cooperative spirit for a well rounded program of watching out for the safety of fellow workers. All of our underground men now use safety hats and shoes, and our statistics show that since the adoption of these two devices, many accidents to the head and feet have been eliminated entirely and others greatly reduced in severity.

Having once obtained the cooperation and confidence of the employees, many suggestions for making operations more safe have been volunteered by the men. Accidents on the haulage lines at one time occurred in frequent numbers, but one by one they have been eliminated, as have the serious accidents caused by falling rock. A great part of the credit is due to the individual employee, but do not forget that results would not have been obtainable if management had not awakened his interest and his desire to have for himself and his associates a safe place to work.

That our Missouri safety program is successful from a money point of view is shown by the total costs, including the Safety Department expense, of \$2.39 per \$100 of payroll, and it is believed that from a human point of view we also have a right to be very pleased, as the comparative numbers of lost-time accidents and deaths prove. In 1928 we had 320 lost-time accidents and five deaths; in 1929, 438 lost-time accidents and no deaths; in 1930, 304 lost-time accidents and two deaths; in 1931, 174 lost-time accidents and two deaths; in 1932, 123 lost-time accidents and one death; and in 1933, 70 lost-time accidents and no deaths.

In many small cities and towns throughout the United States, one of the large American companies may be the sole employer, and if so is usually the principal taxpayer. When such conditions exist, it is just as important to consider the safety of the community as it is to improve the safety of the individual employee. The management, therefore, must take an active interest in the general welfare of the locality. In the lead belt of Missouri the St. Joseph Lead Company is the principal employer, and in order that the communities in which the men and their families live might have the benefit of pure water, it has constructed an extensive system whereby the chlorinated mine water is delivered to the house and stores. The company has also built a dairy or pasteurizing plant, for the purpose of supplying a sufficient quantity of pure milk for the people, especially for the children. 63 per cent of the local real estate and property taxes have been used for building and maintaining schools, and in this way the primary and secondary schools in the lead belt have been developed until they are today among the best in Missouri.

With the assistance of the company, a local health unit was organized on July 1, 1922, in order to demonstrate the efficiency and economy of adequate health service for the prevention of disease and the promotion of public health. The group life insurance plan that was adopted by the company and given to its employees in 1919, and the formation of a definite pension program in 1914, have also proved valuable aids in the safety program, as they have aided in reducing the labor turnover.

It is also to be realized that a safety program or method that is suitable for one company or location may not be desirable for another company. For example in our two New York state mines, which have the same regulations regarding safety hats, shoes, goggles, etc., and where the primary rule is also enforced that each and every man is responsible for his own safety and for the safety of his fellow worker, great emphasis is placed on housekeeping or cleanliness about the mines and mills. Each department of the two divisions has a metal sign, ruled in three columns: one being for the month of the year, while the other two are for the housekeeping rating and lost-time accidents. If the conditions are good, a gold star is placed on the sign; if only fair a green star is awarded, while for poor cleanliness a red star is given. A gold star counts ten, a green five, and no score is given for red. These scores are posted monthly on the bulletin board, and the basis of comparison between the two mines is thereby made possible. If a score is not perfect, or at a reasonably high figure, the department which is negligent receives considerable adverse publicity. If there are no lost-time accidents, a gold star is placed in the accident column.

The results of our New York safety program are reflected by the achievement of operating 162,912 man-hours with only one lost-time accident (which incapacitated a worker for two days), and this record resulted in the 1932 award of the "Sentinels of Safety Trophy."

THURSDAY MORNING SESSION

October 4, 1934

The Dust Problem in Mining Operations

By D. E. CUMMINGS

Assistant Director, The Saranac Laboratory for the Study of Tuberculosis, Michigamme, Michigan

The speaker said in part: Refuge can no longer be taken under the shelter of ignorance that the prolonged inhalation of dust may lead to serious disease, for the medical, technical and lay press is filled with accounts describing the dangers associated with breathing certain dusty atmospheres. What, then, should be the proper course to pursue in meeting this problem and dealing with it in a satisfactory manner?

Both industrial and laboratory studies prove that only certain dusts are dangerous when inhaled, and that quartz or other forms of pure crystalline silica are most dangerous, constituting a specific tissue poison. Where men are exposed to a sufficient quantity of very fine pure crystalline silica dust only, a true hazard always exists. The dusts of silica in combination with other elements generally give rise to pulmonary reactions which differ in many respects from those caused by pure silica, and which vary rather widely among themselves in their harmfulness. As a class, and with the notable exception of asbestos, silicates are less dangerous than pure crystalline silica. Not only are certain dusts apparently incapable of producing a specific harmful reaction when inhaled by themselves, but when associated with silica favorably modify the usual response to this dangerous dust. The effective size range of particles causing disease is now regarded as three microns and smaller, while the qualities of hardness and sharpness are no longer regarded as of significance. The term pneumoconiosis is intended to describe the changes arising out of the prolonged inhalation of any dust, harmful or otherwise, and does not necessarily imply the presence of disability, nor a predisposition to pulmonary infections. The term silicosis refers specifically to the disease which results from the prolonged inhalation of harmful silica dust, and is characterized by a generalized nodular fibrosis in the lungs and pulmonary lymph nodes, and increased susceptibility to pulmonary infections. Pure silicosis should be regarded as a genuine occupa-

tional condition, but it should also be understood that uncomplicated silicosis is seldom disabling to any significant degree. Disability usually results from pulmonary infections, generally tuberculous, which the silicotic contracts or reactivates more readily, and handles less successfully than the normal person.

Every effort should be made to prevent silicotics from contracting infectious which will later prove disabling, and to protect those who have pulmonary infections from being dangerously exposed to harmful dusts. In order to determine which workmen in a hazardous industry have silicosis or pulmonary infections, all employees should have a thorough physical examination including the taking of a complete occupational history and satisfactory stereoscopic roentgenograms of the chest.

Since the rate at which silicosis develops depends upon individual susceptibility and the degree of exposure, it follows that these factors should be determined as accurately as possible. Individual susceptibility to a dust hazard can be estimated fairly accurately from a single examination, and can be defined quite exactly by repeating these examinations at regular intervals. The degree of exposure for each individual should be evaluated by determining the length of service, and the concentration, size distribution, and composition of the dust suspended in each working place during each operation. The method generally used to enumerate dust particles is that accepted as standard practice by the U. S. P. H. S. with the addition of dark field illumination as suggested by Fehnel and Cummings. Size distribution studies can be made by any of the several satisfactory techniques. The composition of the dust can be studied by the usual quantitative analysis, supplemented by petrographic and rational chemical analysis to determine the amounts of free and combined silica and the other minerals.

A medical and technical survey should be supplemented by an analysis of the mortality records in and about the locality under study, and by the information obtained from carefully performed post-mortem examinations on employees who have been exposed in the industry and who have died from any cause. If these procedures for recognizing and defining a hazard are carried out under the supervision of an organization competent to deal with the many complex and confusing aspects of the problem, the investigation will be worth while regardless of the conditions which are discovered. Where the findings of such a study fail to disclose a significant hazard, both the employer and employees will gain the protection which this knowledge affords; and if a health hazard is discovered, the original investigation will serve as a guide to the program which should be inaugurated to overcome the dangers disclosed.

The most severe dust hazards in mines or in plants can be reduced as successfully as were accidents by the Safety First program, and the chief requisite to success lies in establishing adequate control procedures. The physical condition of all the employees must be determined at regular intervals, and well interpreted roentgenograms provide a most satisfactory control procedure. Men applying for work should not be hired until they have passed a thorough physical examination, including chest roentgenograms. Reliable records should be established to show the exact time, place and duration of employment for each person working in hazardous positions. Policies of employment should be worked out for each mine or plant, based upon an accurate knowledge of the physical condition of each employee, so that all of the workmen may be protected from contracting occupational disabilities. Occupations should be selected which are compatible with the physical condition of the employee. Care should be taken to protect the silicotic from infection, or the case of infection from harmful exposure to silica, or the normal individual from contracting either silicosis or pulmonary infections.

Engineers should be especially trained to recognize and deal with dust hazards in mines or plants, and it should become accepted practice, where a hazard exists, to maintain a constant check on the amount of dust present in the working atmosphere. The method of dust counting accepted as standard by the U. S. P. H. S. should be adopted by all industries having a hazard, not only to determine the amount of dust in the air, but more particularly to maintain a control over the effectiveness of the procedures adopted to reduce the dust. Records should be kept which will disclose the amount of dust present in each working place, and the preventive measures which are in use.

Shortly after the inauguration of a program designed to control a known dust hazard, it will become evident that marked improvements can be effected without incurring an impractical expenditure. Personnel problems will arise, due to the reluctance of labor to accept new procedures, and in the end, these problems must be dealt with by educating workmen to recognize the necessity for introducing methods to control dust hazards. The question of what men should be told regarding their physical examinations should follow the practice adopted by any reputable physician in dealing with individual cases. As industry becomes more familiar with this problem, it will discover the serious need for further research.

Since silicosis is a true occupational disease, disability resulting from or attributable to it should be compensable in the same manner as other injuries sustained as the result of employment. Only the intelligent cooperation of industry will bring about the formulation of reasonable occupational disease legislation and its fair administration.

Silicosis from the Operators' Standpoint

By G. C. BATEMAN

Secretary, Ontario Mining Association, Toronto, Ont., Canada

The speaker said in part: It is important to know what causes silicosis, but unless a knowledge of the cause leads to a cure, it is not nearly as important from the operators' viewpoint as the knowledge of how to reduce the incidence. With all the research work that has been going on throughout the world for many years, we still do not know the cause and we still have no cure, but we have learned a lot about how to reduce the incidence.

The silicosis provisions of the Ontario Mines Act and the Compensation Act were passed in 1926. These provided for the examination of all men employed in positions in mines where they were exposed to silica dust, for all such workers to be the holders of medical certificates certifying as to freedom from tuberculosis of the respiratory organs, and also for compensation to men affected by silicosis.

This legislation was introduced as a result of a survey in Northern Ontario mining camps which indicated that silicosis had made alarming progress among the miners. There being no reason at that time to question the results of this survey, the operators agreed to do all that was asked of them and cooperated fully with the Government in the steps considered necessary to meet the situation.

When this legislation was first introduced in Ontario, we were advised that men with a moderate degree of silicosis, while not physically disabled, were better out of the industry and that they should be paid a lump sum which would assist them in rehabilitating themselves in some other occupation.

We were further advised that if we took active steps to clean up the situation then existing, pension the more serious cases and remove men in the early stages of silicosis from underground, the situation would be well in hand, the first expense would be the heaviest, and that from then on our liability would be practically limited to the anteprietary cases as they developed.

When the 1926 Amendments were approved by the mines it was our understanding that men in the anteprietary stage had suffered no impairment of working capacity and that the \$500 payment was a compassionate allowance for rehabilitation and not for disability. We further understood that with the payment of \$500 to these men our responsibility in respect to them would be practically ended. It developed, however, that the legal position was different. The Compensation Board cannot make an award except for disability and where disability has once been established the claimant can come back for review on evidence of further disability. It is generally accepted that silicosis predisposes a man to tuberculosis. It followed, therefore, that with secondary silicosis as defined in the Act, if any anteprietary silicotic at any future time and from any cause whatsoever developed tuberculosis, his condition was considered to be the result of his original disability and he was entitled to total disability compensation at an average cost of \$12,000 per case.

When, therefore, an award of \$500 was made the Compensation Board immediately set up a prospective reserve for progression of an additional \$11,500, with the result that we had an estimated liability to the end of 1932 of several million dollars, most of which was outstanding.

With the passage of time it also became apparent that the removal of the men from underground employment in the early stages of silicosis did not have the results anticipated. The payment of a lump sum award did not in most cases serve the end expected. As a general rule this money was expended for other things and the men made little effort to rehabilitate themselves. A certain number of men classified as silicotic continued in their underground employment and we found practically no difference in the rate of progression in those who continued as compared with those who were taken out of the mines. Some of this may have been due to the altered economic status, but even if the economic status had remained the same, we were forced to the conclusion that there was little if any benefit to the men by removing them from underground work, unless of course, there was evidence of an onset of tuberculosis.

It should, of course, be understood that during this time active efforts were made by the mines to improve ventilation and to allay dust. Without this the above statement would not hold true. Steps were also taken by the mines to provide that men in the early stages of silicosis were placed where the conditions underground were most favorable.

Our experience also indicated that the early stages of silicosis do not necessarily mean an impairment of working capacity. This is all the more important on account of the difficulty of diagnosing silicosis in its early stages, as there is no sharp line of demarcation between the pre-anteprietary and the anteprietary, or between anteprietary and primary stages, and as a matter of fact, we believe that there is a great deal more uncertainty in the diagnosis of silicosis than the medical men are willing to admit. The determination is largely a matter of personal judgment and therefore subject to error.

A great deal of what may be read into an X-ray film depends upon the technique in taking the film. Certain other diseases and chest conditions will also give in the film an appearance simulating that of silicosis and we believe it is safe to say that without a definite knowledge of occupational history the diagnosis of silicosis in its earlier stages would be practically impossible.

In view of these conditions, it was felt that the industry was carrying an unfair burden and in 1933 the Act was amended. The anteprietary and primary classifications were deleted, compensation was made payable only for disability, which means actual impairment of working capacity, men with a moderate degree of silicosis were allowed to continue underground work and the industry was relieved from unlimited liability in respect to progression by providing that the claimant must make and establish his claim for disability within two years of leaving the employment at which he was exposed to dust, to entitle him to compensation.

As I said before, silicosis is essentially an employer's problem. It is in many places an important item in his cost of production and to a considerable degree it is a controllable item of expense. If the employer simply leaves the matter in the hands of the doctors, he will have no one to blame but himself over what it costs him. The opinion of the ordinary practitioner and even of the roentgenologist and expert chest and lung man may be of little value. Only the opinion of those doctors who have had special training in the diagnosis of silicosis from both clinical and X-ray examinations should be accepted, and even those opinions cannot be accepted in all cases.

We do not say this with any intention of criticizing the members of the medical profession, but where the matter is so important and costly to industry, where so little is actually known about the disease, and where there is still an element of uncertainty in the diagnosis of silicosis in its earlier stages, too much care cannot be exercised, and the closest scrutiny by industry which has to pay the bills is most necessary. The best results can only be obtained by the employers and the doctors working together, but the employer must consider it as one of his particular problems.

I have also stated that in the absence of any cure it is much more important

to know how to reduce the incidence than to know the cause. We believe the chief preventive measures are as follows:

1. Improvement in fundamental working conditions in the matter of ventilation and allaying dust.

2. A rigid initial examination to keep out of the industry those men whose physical condition would indicate a type most susceptible to silicosis and tuberculosis.

3. Control of tuberculosis not only among employees, but also among those with whom they come in contact.

It goes without saying that if silicosis is caused by the inhalation of dust, the removal of dust will remove the cause. This means ventilation and lots of it, and where possible the wetting down of dusty places. In mining operations the chief source of dust is believed to be from blasting, therefore the time interval before men return to a blasted face is important.

Ventilation and water will remove the visible dust from the air, but it is not the visible dust that causes the damage. It is the dust that ranges between one-half and five microns that is dangerous and is so difficult to remove, and the quantity in the air can only be determined by some method of sampling.

We would consider it a mistake to have either the type of sampling apparatus or the permissible dust count defined by law. This may be all right on the Rand in South Africa where conditions are more or less standard, but it is not advisable in the United States or Canada, where conditions vary so greatly. For one thing, we do not know what constitutes harmful dust and there is no standard practice for the treatment of dust sample slides. The untreated slide of a sample taken near a carbide lamp in an otherwise dust-free atmosphere, would show an apparent very high dust count. Dust sampling, however, should be a part of the regular routine, using the type of apparatus best suited to the particular conditions, and this will show whether the atmosphere is good, fair or poor.

Next to ventilation and the laying of dust, the most important measure is to carefully select the type of men to be allowed to work in the industry. This requires a rigid initial examination which should include a complete physical examination and X-ray. By this means men with the type of chest which would indicate their susceptibility to tuberculosis and silicosis can be eliminated. The complete physical examination should also have a beneficial effect on the accident rate.

Uncomplicated silicosis is not a big problem, but silicosis and tuberculosis combined represent a very real problem. The measures for the control of tuberculosis are well known. Particular care should be taken that men with tuberculosis be withdrawn from the industry and given proper care and treatment. Places where the employees live should also be supervised to see that they are not exposed to tubercular contacts.

Some Aspects of the Silicosis Problem

By DR. H. H. MOORE and DR. M. J. KELLY

Medical Staff, Hollinger Consolidated Gold Mines, Ltd.,
Timmins, Ontario, Canada

The speaker said in part: In 1928 the Ontario Mining Act was amended to provide physical examination on employment and yearly thereafter, or twice yearly if indicated, of all underground men. To be employed the workman must hold an official certificate good for twelve months, stating that he is free from disease of the respiratory organs. This certificate must be renewed at each annual examination. In the meantime, an amendment to the Workmen's Compensation Act provided for the appointment of medical officers working under the supervision of the Compensation Board to conduct these examinations. Cases of silicosis arising at these examinations are submitted to the Workmen's Compensation Board if the total exposure to silica of five years in Ontario mines is verified. In addition to this routine with silicosis, there is a close check kept on the possible undue progress in the fibrosis in any case and if necessary steps are taken to remove such a case from harmful contact with silica.

The act in its present form was passed in 1933 and served to clear the situation which had become involved by the tie-up of large sums of money in reserve funds against possible future claims by men adjudged silicotic previously, but who had since been lost sight of or who were carrying on at work showing a minimum or no disability.

From the workman's point of view, the new act is a great step forward, as it allows a man to continue at his usual duties underground as long as he is able to work without any serious degree of discomfort. Previously, a workman was advised to quit underground work when a certain stage of fibrosis had been reached, regardless of his ability to carry on, and sacrificed his rights to compensation if he continued to work.

In the X-ray examination of the chests of the 2007 men employed at the Hollinger mines during 1933, determinations are graded as follows: *Normal* is a chest showing little or no fibrosis, where the condition of the lung is better than the average for the age. *M. F.* or "More Fibrosis" is a chest which is normally found in the average adult at the age of the miner under consideration. *M. F. P.*, "More Fibrosis Plus" is a chest showing slightly more fibrosis than normal for the particular age. *M. F. P. P.* or "More Fibrosis Plus Plus" is a chest showing considerably more fibrosis than normal and is a pre-silicotic stage. Silicotics are that group which show a great deal of fibrosis and taking into consideration the mining history and consequent exposure to silica, are thus termed. Admittedly, disability may or may not be present. This last group ranges from the early silicotics with a minimum of disability to the late complicated or secondary cases with marked disability and tuberculosis. It must be added that a large number of men at the commencement of employment at the Hollinger, and without previous mining experience or contact with silica, show chests of *M. F. P.* rating. Following are the results of this examination:

Normal	33	1.4%
M. F.	920	40.8%
M. F. P.	932	41.4%
M. F. P. P.	98	4.3%
Silicotics	24	1.1%

Average contact with silica of men working and *M. F. P. P.*.....12 years.
Silicotic.....15 years.

Next is an analysis of the changes in chest rating in 1933.

Normal	to M. F.	11
Normal	to M. F. P.	3
M. F.	to M. F. P.	207
M. F. P.	to M. F. P. P.	9
M. F. P. P.	to T. B.	1
M. F. P. P.	to A. P.	1
A. P.	to P.	231
M. F.	to Normal	11
M. F. P.	to M. F.	231
M. F. P. P.	to M. F.	1
M. F. P. P.	to M. F. P.	20
T. B. ?	to M. F.	1
T. B. ?	to M. F. P.	1
A. P.	to M. F. P. P.	1
P.	to A. P.	266
		Total 497

These figures cover approximately 500 men in whom there was some change in chest rating during the year, and the direction of the change. The remaining 1500 men show no change from the previous year. It will be observed that 231 men showed an increase in fibrosis rating, while 266 show chests which are improved. The explanation given for the group which shows improvement is, in the first place, that some concurrent bronchial or upper respiratory infection had complicated the picture at the previous annual examination and so caused a more

advanced rating to be given. The second explanation is that constant improvement in radiological technic is making diagnosis more accurate.

It would seem, therefore, that on the whole the situation is showing considerable improvement from this viewpoint. During 1933 no case progressed from the pre-silicotic to the silicotic stage. In the years up to 1933, 120 men had been rated silicotic and the total cost to the Hollinger involved a sum of \$915,950, which figure includes the progressive and contingent funds set aside to cover future costs and possible future claims.

Two objects have been kept in mind during the many years of study of the dust problem at the Hollinger Mine.

1. The collection of complete data regarding the nature of air breathed by workmen in different occupations, its chemical composition, temperature, humidity, dust content and rate of flow.

2. Working tests of all practical methods of improving the condition of such air.

In searching to adapt a method for the determination of air dustiness, it was realized that no instrument has been devised which would measure the dust content of the air with scientific precision. Furthermore, it was felt that the principal object of making determinations was to ascertain if the dust count of the air was undesirably high, and if such a condition was found, to devise a method of reducing it. Hence, for practical purposes, the instrument which possesses a high efficiency in the range of desirable concentrations and gives a quick indication of dangerous quantities of dust is most desirable. The circular Kouimeter, invented by Sir Robert Kotze and introduced to the Miners' Phthisis Prevention Committee of South Africa in 1916, has therefore been used in the Porcupine District for the past eight years.

A summary of our investigations along this line may be given as follows:

1. About 900 of the underground force are engaged in work which will produce dangerous dust if measures of control are not applied.

2. Of this number a little over 400 are engaged in shoveling broken ore into cars and the average dust exposure does not exceed 300 particles if the muck piles are kept thoroughly wet and blasting carefully restricted.

3. The remaining 500 men are engaged in drilling and blasting operations and are subjected to severe potential hazard. Men engaged in stopes who do not have to return to the working faces have an average exposure of about 1200 particles, while using the ordinary type drills. It is felt that the use of the "dustless" type of drifter will reduce the concentration of dust to somewhere near 300 particles.

4. The men engaged in development drifts are exposed to the same concentrations of dust, namely, 1200 particles. Where possible, two development drifts are worked simultaneously by the one crew, so that the men do not have to go back through the dense dust after blasting the cut. There are only a few exceptions to this rule and when necessary to go back to load the remaining holes, the men are provided with the special respirator.

5. The high dust concentrations in the vicinity of stopers we hope to deal with by the use of compressed air masks. Also the practice of driving adjacent raises simultaneously has reduced the hazard after blasting.

With the constant improvement and maintenance of general health conditions kept always to the fore as most desirable and necessary in aiding in the solution of the silicosis problem, the men at the Hollinger Mine are cared for under a contract medical system. The facilities and service at mine, office and hospital are most complete and efficient and in combination with the annual or semi-annual check made by the medical staff of the Compensation Board, health of the workers is under constant supervision.

Men who report with such conditions as non-tuberculous or non-silicotic chest trouble, with focal infection in teeth, tonsils, sinuses, etc., are singled out and treated and observed and where necessary changes in occupation are made or rest and vacation periods advised.

At the mine, constant improvements have been made and at present the following is the routine. A worker coming off shift removes all his mining clothing, usually wet, and racks them on a set of hooks attached to a chain and pulley. These wet clothes are pulled up to a height of 15 to 20 feet and hang thus in a hot, dry

atmosphere for 14 to 15 hours, during which they are thoroughly dried. After undressing the miner passes through a series of shower baths of temperatures varying from hot to cold. After drying he proceeds to his locker where he has placed his street clothes before the beginning of the shift.

With a view to reducing the infection of silicotics with tuberculosis, a clinic has been established in Timmins. An experienced public health nurse is employed full time and it is her duty to visit all tuberculosis suspects and patients, all contacts with these cases and contacts with silicotics to arrange for their examination and supervision and if necessary for treatment. Weekly clinics are held at which such patients are examined clinically, radiologically and by bacteriological and biological tests.

Since January of 1933, approximately 30 dangerous cases of tuberculosis have been removed from the district to a sanitarium and many more less severe cases placed on bed rest at home or on restricted activity. It is felt that by removing these cases from contact with silicotics, that within a comparatively short time tuberculosis will be moderately well controlled and since tuberculous infection is necessary to precipitate secondary silicosis, this movement, it will be appreciated, is an excellent one.

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W. A. GLEASON, Hammermill Paper Co., Erie, Pa.

JOHN LUNDGREN, International Paper Co., New York, N. Y.

W. J. PEACOCK, Northern Paper Mills, Green Bay, Wis.

J. J. PLZAK, Consolidated Water Power and Paper Co., Wisconsin Rapids, Wis.

SAMUEL PRUYN, Finch-Pruyn and Co., Inc., Glens Falls, N. Y.

B. D. ROGERS, Bird & Sons, Inc., East Walpole, Mass.

F. H. ROSEBUSH, Nekoosa-Edwards Paper Co., Port Edwards, Wis.

MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Paper and Pulp Section was called to order by General Chairman H. C. Gilson, Oxford Paper Company, Rumford, Maine, who presided. Chairman Gilson first presented a paper entitled "Our Section's Activities—Past, Present and Future," in which he sketched briefly the Section's history, and dwelt especially on the good work performed by officers and standing committees during the past year. He then introduced the first speaker.

Accident Prevention and the New Industrial Economy

By ERNEST W. CORN

Field Safety Counselor, F.E.R.A., Washington, D. C.

The speaker said in part: The conservation of human beings and materials has always been the safety objective. I don't believe there is any man that is true to his real colors in accident prevention who has not kept before him continuously that he can make his department a paying department, and yet he has not overlooked the fact that he can send men home whole; that he can bring them back to work the next day relatively as good as they were the day before, that longevity and regularity of employment have been chief considerations of the accident prevention plans.

I was in one of the greatest printing establishments in the United States a few years ago with a young lad with whom I used to like to visit. After dinner together, he took me down to the printing establishment, and I spent a lot of time walking about those immense multicolor printing presses, which you find in an establishment of that kind. But one thing struck me most forcibly. They had a lot of easy chairs and all the employees in that big department were sitting in those easy chairs, some here and some there alongside the presses, but they were all reading magazines, or the evening papers, or doing just what they pleased—in fact everything excepting work.

Now, I was accustomed to seeing men work, and I said to my friend Jack, "This is an awfully busy looking crowd around here."

But he said to me, "Let me tell you, Mr. Corn, you know in our plant we have a slogan which says: 'When these boys work, we lose money.'"

I have an idea that you men feel the same way about a paper mill that has cost a half million or more dollars; you do not object to seeing employees just idling around and letting the blooming thing run. When they work, the corporation is losing money. There are, of course, lots of ways to stop the machine from rolling. You might run a man through it and stop it; you might run a monkey wrench through it and stop it; you might, by some maladjustment, run it to pieces. The thing the management, the foremen and the safety men all want is the consistent, hour by hour, precise production that is making a profit for the corporation.

Out in one of our western states a short time ago I met a safety man who is one of my many friends. He told me about being invited to visit one of the greatest contracting companies of that vicinity. They wanted him to look over their maintenance plant. It was a company that had always had many nice things to say about safety, but didn't really do very much about it.

My friend was reluctant to visit them, but he did go with the definite understanding that he would come and point out the hazards as he saw them, and then he would go away and they could do what they pleased about remedying them. So he went through the plant and made a list of the hazards he discovered, and he told me that he pointed out seventy-four distinct hazards which he observed on his visit. The big boss was somewhat flabbergasted when he got through this list, but he had the maintenance man and the production boss with him, and they were ordered to make the necessary changes.

The day I arrived on one of the big jobs of this same concern, a faulty drag

line that had been condemned swung a bucket against his foreman who had been with him for sixteen years and crushed him to death instantly. Three days later I passed within a short distance of one of the other big contracts of this same concern, and the head of the department of safety of that state, at the request of the president of this contracting concern, had called the head of the department of safety of the next adjoining state to make a thorough investigation of this very large contracting job for the PWA, to see that no unnecessary hazards were left uncorrected in that particular job.

If there was a connection, isn't it really too bad that a foreman who was the father of five children, fifty-two years of age, who had been in that man's employment for sixteen years, had to have his life snuffed out before he had the intestinal fortitude to put into effect the thing that he knew was fundamentally sound? Yet there isn't a single one of you men who cannot point to just such experiences as that. It is happening today all over this country.

You men of the paper industry have made a remarkable accident prevention progress over a period of years in two ways. You have taken an industry out of the woods, so to speak, within the last ten or twelve years, and have built it up until now it has become the proper thing to be safety minded in the paper industry. Along with that, you have built your own technique, and there is hardly a man among you who has been in this business for a period of years but who could write a special manual definitely and specifically fitted to the hazards of the paper industry.

You are part of an industry that presupposes immense financial background, and it has been my experience that when you get into the aristocracy of finance, you get into an environment where men think and where very frequently much more humanity is demonstrated than in some of our less important groups financially.

If you will take the paper companies of this country by and large, you will find them in a few cities, in a large percentage of instances. You might close up a paper industry of 500 men in the city of Cleveland, and it wouldn't cause a ripple in normal times, perhaps, because those men would be reabsorbed in industry without any great disturbance. But if you throw 500 men out of work in a town of 1,500 or 2,000 or 3,000, you have brought a calamity on that community, and for that reason the paper industry has a very definite social significance in many of its seats of operation, and that obtains in the woods as well as at the plant.

So you have a very definite social obligation to impart to the management, and as I have said so many times to other safety groups, fundamentally you are salesmen. You must sell the man at the machine and you must also sell the man in the executive office. You have sold safety in the past on the basis of economy; but you will sell it more essentially in the future on the basis of humanity and the fact that it fits in and is a perfectly legitimate part of the new industrial economy. So if we properly meet the challenge before us, we will recognize our sales obligations and aside from doing a good safety job, we will lead employer and employee alike by the hand out of the twilight of confusion and uncertainty into the new day when through safety we will work together in reasonable union for social and community welfare.

TUESDAY MORNING SESSION

October 2, 1934

Let's Teach Safety's Teachers

By W. J. BRENNAN

Safety Engineer, Maine Department of Labor and Industry, Augusta, Me.

The speaker said in part: The educators of the world have found the classroom and laboratory methods reasonably effective in teaching "Young America." It follows that safety meetings are logical classrooms for "Supervisory America"; and before someone rises to ask the question, "Are not safety meetings about 100 per cent educational now?" I will touch upon this matter.

First of all, I would say that too much of the safety taught is by the "hind-sight method." I. e., reviewing hazards after victims have been claimed. Because injuries, like lightning, rarely strike in the same place consistently, our meeting set-up should include a definite period for the development of one specific phase of safety as educational material. By this I mean teaching a subject by lecture or demonstration, using blackboard, asking questions, and issuing an abstract of the subject for future reference.

Naturally, matters of general educational interest should be chosen for such meetings, and the topical matter is easy to find. Oxy-acetylene hazards may concern but few committee members, but such subjects as dermatoses, ladders, scaffolds, stairs, chains, ropes, lighting, infection, psychology, economics of safety, electricity, and protective equipment are of universal interest.

The supply of such material is practically unlimited. You pay a plant physician for treating your cases; do you use him as a lecturer to tell of infection, sacroiliac strains, and hernia? You have, or a neighboring plant has, a chemist. Do you use him in your meetings? The same goes for mechanical, civil, and electrical engineers.

Each year a wealth of information is offered by speakers at the Annual Safety Congress, and at dozens of state and sectional meetings. You would like to have all of your foremen attend these sessions, yet it is obviously impossible. Why not cull over the programs and bring certain papers to your own meetings room? The National Congress program in itself offers more than enough material to supply your meeting needs for a year.

In working with safety directors in mills, I plan to ask the question, "How familiar are your foremen with the subject matter on posters displayed in their departments?" Only rarely do I find one who has had a preview, so to speak. Those who have been shown the posters of the month and had their details explained are more prone to parade their new-found knowledge than those who are not quite sure of their ground.

Frankly, I do not see how safety work can succeed without an adequate supply of educational and warning displays. You know and I know that the poorest cigarette on the market can be made to outsell all others in a short time, if it is advertised more than its competitors. Posters, strategically located and well displayed, represent to me persuasive-voiced announcers standing here, there, and everywhere throughout the plant, twenty-four hours a day, giving instructions against chafed rope, hemlock in scaffolds, and the thousand and one hazards ever with us.

For teaching such phases as will interest certain groups only, we have the special or group meeting, and in some plants safety directors are holding one such session each week with some group. The supervisors and their assistants are required to be present; crews are frequently instructed as well. These sessions dispense with all formality and in a very few minutes cover one specific topic, answer questions, and adjourn.

The grinding wheel salesman has a story, as has the saw representative. Of particular merit are the lectures by salesmen from manufacturers of goggles, respirators, and gas masks. One of the most popular salesmen coming into Maine has had a world of training as an officer in the New York Fire Department. His ability to interest and teach, together with his complete repertoire of anecdotes to illustrate his ideas, makes him ultra valuable in the role I suggest.

In preparing to discuss the advantages of a complete utilization of safety literature, I invariably recall that hot summer day when, it seemed, every hazard I encountered demanded a sketch and every foreman's desk added a little more soot and grease to my coat sleeves. The interest and gratitude of these supervisors well repaid me, but the blow that rocked me back on my heels was to see, at the close of my tour in the safety director's office, a complete file of the *National Safety News*, from whose pages had been taken all the ideas sketched that afternoon. Here before me stood the originals, none of which had ever seen the desks of the men most concerned!

Safety literature should be analyzed, route sheets attached, and circulated. Those having read their assignments initial the route sheet, and it moves to the next. At safety meetings the chairman sometimes calls for a report—this more for psychological purposes than for any other reason.

Not only should literature be distributed, but a safety library should be accumulated by each supervisor. A loose-leaf notebook to accommodate blueprinted sheets has worked out well. One day a table of chain strengths comes to our attention, to be reproduced notebook size and delivered to interested parties. Another day we submit a print showing ramp, stair and ladder angles, tread and riser dimensions, etc.

It is surprising how those notebooks grow and how forceful the information becomes when presented by itself, shorn of all extraneous matter, on standard sheets. The National Safety Council, with its Instruction Cards, published monthly in the *Notes*, is doing what some of us have been doing for years with our notebook memoranda. Certainly there is no better way to cover the special hazard field, next to actual classroom.

What does it profit us, in the last analysis, to devote hours and hours of time to the instruction of supervisors, that they may first know and secondly teach, only to have the benefit cut in half by a poor presentation or a tactless approach? Why diminish the yield of fertile brain-soil by a poor job of sowing? It is my belief that we must give our supervisors elementary chemical training with which to combat chemical hazards, engineering fundamentals as a defense against material failures, and an appreciation of psychology with which to forestall the disaster which threatens us always as the result of an inadequate safety consciousness.

Report of Accident Experience Exchange

By ERNEST AUGUSTUS

Safety Director, Mead Corporation, Chillicothe, Ohio

The speaker said in part: The following is a brief summary report of the accident experience exchange and attempted study of paper mill accidents, volunteered by certain members of the Pulp and Paper Section of the National Safety Council following the 22nd Annual Safety Congress.

During the ten or twelve months covered by this report a total of 300 lost-time accidents were reported more or less in detail by 46 separate units or plants. All plants participating in the contest reported a total of 1,408 accidents, resulting in a loss of 102,145 days of time. Time lost as a result of the 300 accidents included in this study amounted to 32,674 days. Included with the 300 accidents covered by this study were four fatalities, seven finger amputations and one loss of an eye.

With all plants on a full-time operating basis, it would naturally be expected that Monday would be the day most prolific of accidents. Figures reported in connection with the 300 accidents included in this study, however, show Tuesday as being the day on which most accidents occurred, with Thursday next in line. This tabulation is as follows: Sunday 10 accidents; Monday 47 accidents; Tuesday 70 accidents; Wednesday 46 accidents; Thursday 55 accidents; Friday 41 accidents; and Saturday 31 accidents.

The period of greatest fatigue is shown to be three or four hours after the individual has started to work. Where rest periods are provided, these peaks may vary, but generally speaking, just before the lunch period and just before the quitting period in the afternoon or at the end of a trick are the times when men tend to grow most careless.

A segregation of the accidents to show the number of years those injured had been employed on a particular job reveals the following statistics:

Employed on the job less than one week, 14 accidents; one week to one month 15 accidents; one to six months 62 accidents; six months to one year 30 accidents; one to two years 16 accidents; two to three years 10 accidents; three to four years 15 accidents; four to five years 16 accidents; five to six years 12 accidents; six to seven years 20 accidents; seven to eight years 14 accidents; eight to nine years 10 accidents; nine to ten years 5 accidents; ten to eleven years 6 accidents; eleven to twelve years 8 accidents; twelve to thirteen years 5 accidents; thirteen to fourteen years 3 accidents; fourteen to fifteen years 3 accidents; fifteen to sixteen years 7 accidents; sixteen to seventeen years 6 accidents; seventeen to eighteen years 1

accident; eighteen to nineteen years 2 accidents; nineteen to twenty years no accidents; twenty to twenty-one years 3 accidents; twenty-one to twenty-two years 3 accidents; twenty-two to twenty-three years 1 accident; twenty-three to twenty-four years 1 accident; twenty-four to twenty-five years no accidents; twenty-five years and over 1 accident.

The following tabulation shows the various jobs on which injured workers were employed at the time the accident occurred: Laborers 33 accidents; wood handlers 31 accidents; millwrights 26 accidents; machine tenders 17 accidents; backtenders 14 accidents; heater helpers 14 accidents; fourth hands 12 accidents; heater operators 9 accidents; third hands 8 accidents; rewinder operators 7 accidents; cutter-press men 7 accidents; calendar operators 6 accidents; carpenters 6 accidents; truckers 6 accidents; firemen's helpers 5 accidents; pipefitters 5 accidents; roll-tenders 4 accidents; calendar helpers 4 accidents; laboratory and sample boys 4 accidents; rewinder helpers 4 accidents; miscellaneous 71 accidents.

A grand total of 130 different machines, tools or appliances were listed on the reports as having been connected with the 300 accidents reported. Those in connection with which three or more accidents were recorded are given in the following table: Calendars and super-calendars 15 accidents; cores, collars, shafting, pipe 16 accidents; winders and rewinders 13 accidents; roll-pulp, baled paper, waste 11 accidents; hand-books, picaroons, poles 11 accidents; pulp wood 11 accidents; hand trucks 8 accidents; electric trucks 8 accidents; conveyors 7 accidents; belts 6 accidents; wet floors 6 accidents; paper machine dryers 5 accidents; tables and benches 5 accidents; 4-wheel wagons 5 accidents; tanks 5 accidents; valves 4 accidents; steam and hot-water hose 4 accidents; I-beams and iron or steel bars 4 accidents; ladders 4 accidents; hammers and hatchets 4 accidents; boards, heavy timbers 4 accidents; knives 4 accidents; coils of loose wire 3 accidents; wrenches 3 accidents; cutter-presses 3 accidents; paper machine reels 3 accidents; paper machine felts and felt rolls 3 accidents; broken boxes 3 accidents; heaters 3 accidents; director blades 3 accidents; and miscellaneous 176 accidents.

Following are the accidents reported under various classifications coming under the heading "Nature of Injuries Sustained": Bruises, contusions, abrasions 91 accidents; fractures and amputations 69 accidents; sprains and strains 47 accidents; lacerations and cuts 41 accidents; heat burns, scalds 16 accidents; crushed or mashed parts 14 accidents; puncture wounds 10 accidents; foreign bodies in eyes 7 accidents; chemical burns 5 accidents; electric burns 2 accidents; concussion 2 accidents; heat prostration 2 accidents; ivy poisoning 1 accident; dislocations 1 accident; frost bite 1 accident.

The last and probably the most important tabulation in connection with this study of 300 accidents has to do with the answers given to the question "proximate cause of the accident." This question was wrongly stated and should have asked for "Cause of the injury." However, the replies as gathered from the reports on the 300 accidents are as follows: falling or slipping material and objects 66 cases and 7,375 days of lost time; falls from a height 18, and on the level 29 cases—total of 47 cases, and 1,268 days of lost time; hand tools (hooks, pikes, wrenches, etc.) 28 cases and 377 days of lost time; lifting, pulling, pushing, prying 27 cases and 199 days of lost time caught in revolving rolls 24 cases and 6,932 days of lost time; handling material and objects 19 cases and 410 days of lost time; caught in gears, belts, etc., 19 cases and 7,501 days of lost time bumped by or run over by moving loads, objects, etc., 10 cases and 52 days of lost time; struck by flying objects 10 cases and 85 days of lost time; caught by or jammed between objects 7 cases and 72 days of lost time; splashing liquids 6 cases and 38 days of lost time; stepping in holes or on objects 6 cases and 42 days of lost time; miscellaneous 5 cases and 130 days of lost time; striking and bumping against things 4 cases and 77 days of lost time; burns and scalds—acid, caustics, etc.—7 cases and 7,914 days of lost time; bursting hose 3 cases and 31 days of lost time; explosions and explosive actions 3 cases and 52 days of lost time; foreign objects or substances in eyes 2 cases and 7 days of lost time; extreme hot or cold weather 2 cases and 17 days of lost time; fumes and gases 2 cases and 20 days of lost time; loose clothing caught in machinery 2 cases and 65 days of lost time; bursting grinding wheel 1 case and 20 days of lost time.

Safety Methods Adopted by the Consolidated Paper Corporation

By J. H. TURNER

Director of Safety, Consolidated Paper Corporation, Ltd., Grand Mere, P. Q., Canada.

The speaker said in part: The following brief table showing the frequency rate of accidents in the various divisions of our company, from 1929, which was the year prior to organization of our safety work, up to and including 1933, will indicate our accident prevention progress.

Frequency Rate for Divisions by Years 1929-1933

	1929	1930	1931	1932	1933
Belgo	30.53	16.29	10.95	13.27	
Laurentide	8.11	9.81	5.96	3.04	13.96
Port Alfred	79.15	40.37		14.65	35.59
Wayagamack	45.02	18.84	8.02	4.19	9.31

We feel that the hopes we entertained in 1930 of a reduction of lost-time accidents throughout the mills have been fairly well satisfied, although in 1933, probably chiefly on account of the economic and social upheaval, there was an increase in accidents.

In general our safety service is organized as follows:

General supervision in all mills is carried on by the director of safety, who is directly responsible to the chairman of the operating committee. The director of safety systematically visits each mill to organize safety committees, inspect the plant from an accident prevention and sanitary standpoint, and suggests ways and means of correcting dangerous working conditions. He conducts publicity campaigns and generally furthers the educational work in connection with all accident prevention activities, scrutinizes accident records, compiles comparative statistics of lost-time accidents each month, deals with all correspondence with outside parties in connection with contests, requests for statistics and all criticisms of the safety first service. While visiting the individual mills, he has the closest cooperation of the mill manager, the safety inspector and the mill physician.

In each of our mills a safety inspector, generally the employment supervisor, and an understudy have been appointed by the mill manager. He accompanies the director of safety upon his periodical visits of inspection, and together they reconstruct as far as possible each lost-time accident and potential lost-time accident as well as near accident, with the parties concerned, with the view of adopting prompt measures to prevent a recurrence. Individual accident folders are kept for each lost-time accident.

The first aid nurse is responsible directly to the mill physician who in turn is responsible to the medical director. The first aid nurse is expected to cooperate with the safety inspector by reporting to him immediately all major accidents and minor injuries which in her opinion should be investigated.

In order that the corporation has accurate and comparable statistics of mill accidents, a "Monthly Accident Statistical Statement" is compiled by the director of safety, from data furnished him by the safety inspectors. This statement covers the data about lost-time accidents in great detail, including, for example: number of working days lost, frequency and severity rates, number of first aid primary dressings and re-dressings, total wages lost by injured employees, etc. Opportunity is then taken to give the greatest possible publicity to these statistics.

Our safety work was started very slowly, but we had the essential backing of our executive officers, and the first step was the organization of a central safety committee in each of the mills. The committee's personnel consists of the mill superintendents and the representative foremen from each of the major departments, selected by the safety inspector with the superintendents' sanction. These foremen members serve for a period of from one year to one and one-half years, and the various members are rotated.

Meetings of this committee are held fortnightly under the chairmanship of the safety inspector. At each meeting all lost-time, minor and near accidents that have occurred since the previous meeting are fully discussed and recommendations made to prevent a recurrence. The accident statistics are explained and the accident experiences at our other mills are reported and applied to conditions in other units. Suggestions for safeguarding and safer methods of operation are considered and necessary recommendations made.

Safety sub-committees also function at each mill who report to the central safety committees. These sub-committees are under chairmanship of their departmental representative to the central committee; they meet once fortnightly at time and place selected by the members. The object of these sub-committees is to give the mill men the opportunity of discussing their problems amongst themselves without fear or restraint occasioned by the presence of their superintendent. All suggestions submitted by individuals on the sub-committees are considered by the central committee of each mill and finally passed upon or approved by the mill management.

Sanitation and lighting conditions in the mills have constant attention and many improvements have been effected. In this connection, within recent months, cleanliness committees, consisting of from three to six superintendents, have been appointed by the respective mill managers, who make a special inspection of the plant once each month and report conditions found with regard to safety, cleanliness and general conditions. The idea has been instrumental in educating employees to report poor conditions and a notable response has been made.

The fullest cooperation with the Medical Service is maintained, particularly in respect to educating employees to avail themselves of the first aid service. To stimulate use of this first aid service, bulletin boards have been installed showing the departmental distribution of the plant, the number of lost-time accidents sustained by each department since the first of the year, another column showing the names of employees off on account of an accident, and a further column designated "Unsafe Workers" where the names of men are given who have met with an accident which also caused injury to a fellow worker. In this last column, too, appears the names of workers who failed to properly report to the first aid office for any minor injury that they had sustained. Obviously, no man wants to see his name classed as an unsafe worker, and this method has proved of great value in furthering an attitude of safety mindedness throughout the mills.

Naturally, in the early days of our safety service, a great deal of attention was given to the safeguarding of machinery and eliminating hazardous conditions about the mills. At one time this was considered almost the whole function of the accident prevention program. But now, with all known physical conditions adequately safeguarded and correctly maintained, we realize that this phase does not continue to be the most important. Our chief problem is concerned with the employee in directing his mental attitude away from thoughtless, careless and negligent methods of working.

In this program, safety signs, posters and bulletins play just as important a part as advertising does to a commercial concern in promoting a maximum sales production. To obtain best results, we design or select our signs, posters and bulletins, first to attract the attention of the readers, and then to urge his definite action by creating a desire to carry out the message they convey. Proper placement of posters is also important. Those pertaining to a specific hazard in condition or practice are placed right at the machine or other hazardous places, usually where dealing with generalities are put up at other advantageous places, usually where workers congregate. This latter type of poster is rotated from one department to another, while those dealing with specific hazards are removed when the condition to which they refer has been corrected.

The abusive use of signs and bulletins is not tolerated; that is to say, we never use them as a makeshift excuse for not installing guards or making proper correction, nor with the idea that if anything happens we will be cleared and the fault will rest with the victim.

The mental attitude of the employee is most important and we make an opportunity to talk with them individually about their working conditions. One result of this is that the men now pay more attention to the footwear and clothing they

wear on the job. We have greatly reduced the number of accidents previously caused through the wearing of unserviceable shoes, loose and ragged clothing, and employees no longer feel that any cast-off clothing is good enough to wear while at work. It is false economy to increase the hazard of accident by wearing unsafe clothing.

TUESDAY LUNCHEON SESSION

October 2, 1934

After spending a pleasant luncheon hour, Chairman Gilson announced that the principal purpose of this meeting was the formal bestowal of trophies won by unit companies in the various contests conducted during the year among paper mills. He called upon Mr. A. Scott Dowd, Editorial Director, the *Paper Industry Magazine* of Chicago, Chairman of the Contest Committee, to present the "Data on the 1933-34 Safety Contest," as follows:

In the Paper Industry Annual Safety Contest, which extended from July 1, 1933, to June 30, 1934, 105 paper and pulp mills participated. During the contest, 34,132 employees worked a total of 71,463,322 man hours. They suffered a total of 1,402 disabling injuries which occasioned 102,099 days of lost time. The average frequency rate of the contest was 19.626, and the average severity rate was 1.429. Fifty-six of the mills completed the contest with a frequency rate below the average. Out of the total, 6 mills went through the contest with perfect safety scores.

Chairman Gilson then introduced C. B. Auel, Manager, Employees' Service Department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania, and past president of the National Safety Council, who presented the handsome trophy awards to the eight winning companies in the contest. Mr. Auel congratulated the entire section membership on its good accident prevention efforts, and called particular attention to the fact that it was the Paper and Pulp Section which first instituted a Sectional Safety Contest—an innovation to be taken up later and followed successfully by other sections. With a few well chosen and complimentary remarks, Mr. Auel presented trophies to the following companies:

International Paper Company, Hudson River (winner in Division I—Group A): 7 disabling injuries, 258 days of lost time; frequency rate 3.598 and severity rate .133.

St. Croix Paper Company (winner in Group B): no disabling injuries.

Bryant Paper Company, Paper Division (winner in Group C): 1 disabling injury causing ten days of lost time; frequency rate 1.973 and severity rate .002.

Bird and Son, Inc., Chicago (winner in Group D): no disabling injuries.

International Paper Company, Riley, Maine (winner in Group E): no disabling injuries.

Hollingsworth and Whitney Company, Abenakis, Maine (winner in Group F): no disabling injuries.

Container Corporation of America, Natick, Mass. (winner in Division II): no disabling injuries.

Southern Container Company (winner in Division 2): no disabling injuries.

Following the presentation of the Council trophies, the special trophy awarded by the *Paper Industry Magazine* to the one outstanding paper mill for safety accomplishment during the year was presented to the St. Croix Paper Company, Windland, Maine, by A. Scott Dowd, representing Mr. E. B. Fritz, publisher of the *Paper Industry Magazine*.

Report of the Nominating Committee

Chairman Gilson then called for the report of the Nominating Committee, and new officers for the Section for the ensuing year were elected, as follows:

General Chairman—H. D. Baatz, Hobers Paper and Fibre Co., Green Bay, Wis.
Vice-Chairman in Charge of Membership—E. E. Grant, The Crystal Tissue Co., Middletown, Ohio.

Secretary and Program Committee Chairman—F. L. Irvin, St. Croix Paper Co., Woodland, Maine.

News Letter Editor—T. L. Christensen, Continental Paper & Bag Corp., Marinette, Wis.

Engineering Committee Chairman—T. H. Turner, Consolidated Paper Corp., Ltd., Montreal, P. Q., Canada.

Statistics Committee Chairman—A. E. Winslow, Hollingsworth & Whitney Co., Waterville, Maine.

Poster Committee Chairman—J. J. Hastings, Port Huron Sulphite & Paper Co., Port Huron, Mich.

Contest Committee Chairman—A. Scott Dowd, The Paper Industry, Chicago, Ill.

Health Committee Chairman—Dr. E. W. Paine, Hollingsworth & Whitney Co., Waterville, Maine.

Members at Large—

George J. Adams, International Paper Co., New York, N. Y.

W. J. Brennan, Maine Department of Labor and Industry, Augusta, Me.

Kenneth L. Faist, The Champion Coated Paper Co., Hamilton, O.

W. A. Gleason, Hannum Paper Co., Erie, Pa.

M. G. Hoyman, Kimberly-Clark Corp., Neshanic, Wis.

W. J. Peacock, Northern Paper Mills, Green Bay, Wis.

Samuel Pruyn, Finch-Pruyn and Co., Inc., Glen Falls, N. Y.

J. J. Plzak, Consolidated Water Power and Paper Co., Wisconsin Rapids, Wis.

WEDNESDAY MORNING SESSION

October 3, 1934

This session was devoted to a special discussion entitled "Safety Exchange Round Table." It was called to order by the Conference Leader, H. T. Randall, Works Engineer, The Champion Coated Paper Company, Hamilton, Ohio, who presided. Although the subjects discussed were presented informally, and the general discussion was participated in by numerous members who presented their ideas from time to time as the discussion developed, the following has been prepared as a concise summary for these Transactions:

Trimmer Accidents. A trimmer can sometimes be tripped by bumping it. Several accidents and near accidents have been caused in this way. Guards properly placed, however, can prevent this type of accident. Several mills have installed an electrical device to control the tripping action; there are two push buttons and both hands must be used to push the two buttons at the same time in order to trip the machine. To protect the helper also, who is behind the machine, rigid instructions have been issued that he must keep away from the machine—not only his hands, but must not even lean against the machine while it is in operation.

Several years ago a special committee was appointed by the Section to investigate trimmer accidents and possible safety devices to prevent them. The investigation showed that a number of mills were cutting small stock and they objected to any device which kept both of the operators' hands upon the operating buttons or levers during the entire time of operation. They said the operator had to withdraw his hands and hold them against the small stock to prevent the knife from tipping over the piles. The Nekoosa-Edwards Paper Company manufactured for itself a safety device which necessitated the hands of both operators being busy during the time of operation. It was a lug on the cross bar and a lever which tripped into place the moment the bar was thrust back, to avoid any repeating of the knife's operations. With such a device, however, there is nothing to prevent the operator, after he holds the safety lever up so that he can trip with the other hand, releasing this and reaching under the knife. No safety device seems to be universal in its application. The main thing is to recognize the hazard and take any possible steps to correct it.

Cleaning Drier Pits. Several accidents have been caused when men went into the drier pits to clean the rolls while the machine was running, being caught in the rolls and almost instantly killed. It is common for paper to wind around a roll and the temptation is often great to remove it without stopping the machine. However, there is only one safe way to remove this hazard, and that is to permit no one to

enter the drier pits until the machine has ceased running. Some mills have a standing rule that before a man goes into the drier pits he must lock the drier press with a chain and padlock and take the key with him.

Compensation, Payments. In the case of a fatal accident which resulted from a violation of rules, what about compensation payments? If the case resulted fatally in Ontario, Canada, it wouldn't make any difference whether it was deliberate carelessness, deliberate neglect or violation of the rule. If it is a fatal accident, compensation follows. In a non-fatal case, it doesn't necessarily follow. If they consider the violation of the rule is sufficiently flagrant, they can disallow the case completely on the grounds that the man was not acting in the course of his duties, he was acting contrary to rules. In Ohio, however (it was stated), the employee can do nothing in the way of neglect that will preclude his right to collect compensation for an accident. In Quebec, however, the opposite is again the case and the employee can collect (or his family can collect) compensation payment. Their law was founded on the Ontario law.

Compensator Fires. What is the proper way of putting out a fire in a compensator box? In one mill the instructions are to let the box burn, get away from it, get a fire hose and, staying at least 20 feet away, squirt the fire down with the hose. This mill is convinced that an operator of a two-and-one-half inch fire hose, twenty feet away from 2300 volts, even with his feet grounded, will not be shocked. The mill, however, instructs its men to let the box burn until the thing blows up, and then turn the fire hose on, because by the time it is blown up, it kicks the main breaker in the generator room, so that the lines are dead. Definite instructions have been given to all men that they are not to touch the safety box or compensator box when it is on fire, because the chances are it is stuck. When a man touches the safety box it will blow up in his face. It is important to educate all employees in the well known standard rule or practice to operate compensators with the left hand and always keep the face away from the front of the compensator. It is the only way to get away from serious burning accidents in electrical equipment.

Safety Switches. The following experience is quoted verbatim: "It has been our experience that some so-called 'safety switches' are the most dangerous pieces of equipment in a paper mill. It might be well for you to go back and look over your safety switches. If they are of the same type as ours, it would be well to take the steps we have taken. Most safety switches have a cross bar that operates the phase knives. That cross bar is fastened on with a little linkage. If the little linkage mechanism should break, all three phases will be short circuited. We have had that happen several times. We have corrected it by insulating the cross bar with bakelite tubes, and, in addition, welding an angle inside the box, so that if the linkage mechanism breaks, the handle can't be thrown far enough to short circuit the phases with the cross bar."

Goggles. What are mills doing to enforce the use of goggles? Nothing but continual harping on the subject will make a man realize that his eyes are invaluable property to him. Discipline for violation of the goggle rules frequently includes a layoff for one or two weeks. The Pullman Company follows the rigid rule of making everyone in the shop, whether messenger, worker, or the president of the company himself, wear goggles while in the shops. A similar plan is followed by the Kalamazoo Vegetable Earchment Company, Kalamazoo, Michigan, the goggles being fitted to each individual by a capable optician. Experience shows that to enforce such a rigid rule requires the thorough support of the supervisory force. Goggles of many types are required, to fit the individual to the job and the job to the individual. In short, no single type of goggles can be used throughout the plant or throughout the department. There is a certain adequate type of goggle for each occupation.

Safety Rules Enforcement. Whether the problem is enforcement of the rule about the wearing of goggles, or some other safety rule, it is of the utmost importance that management back up an adequate enforcement of the rules. In one case, after posting of and ordering that a ten-day lay off would be given to any man who was found working on a dangerous machine without his goggles, the next day the foreman of the department was found working on a grinding wheel without goggles. In this case, as in all others, the management, if it is sincere, must enforce

the rule. It is often well in making safety rules, to give the workers an opportunity to assist in their formulation. In one case workers in a department were given a number of types of goggles and asked to wear them and express their private opinion as to their serviceability. In this case the workers picked out a certain type of goggle of the wide vision kind and no trouble was found in getting them to wear them. When management has thus carefully covered the situation, decided upon the necessary rules to be followed, and considered the comfort and perhaps even the opinions of the workers, then there is no reason why the enforcement of the rules should not be regularly carried out. Although rules and regulations may not wholly solve the problem of safety, they have their importance in convincing the workers that the management is sincere and that it is going to back up the safety program 100 per cent.

THURSDAY MORNING SESSION

October 4, 1934

Trend of Occupational Diseases and Compensation

By A. G. CRANCH, A.B., M.D.

National Carbon Co., Inc., Cleveland, Ohio

The speaker said in part: The view that Workmen's Compensation represents the recognition of a social principle is probably generally accepted today, and forms the basis upon which such laws are administered and should form the basis for further amendments. This social principle, that the consumer pays the cost of production, involves charging the costs resulting from payment of compensation back on the product and therefore such costs should be kept low. This should be done not primarily through lowered payments as such, but through more efficient prevention and treatment, therefore amendments should insure especially more adequate safety work, and shortening of disabilities through improved medical care. But during the years of changes in these laws, we find too often that most amendments have been the result of compromise between two groups, one trying to keep down costs by limiting all payments to the lowest figures, and the other trying to increase the coverage and cash returns to workers injured. Too little attention would seem to be paid to simplified administration, preventive work, and more adequate medical care.

Today the really interested parties are the various Labor Departments with their boards of commissions who must administer the law, the employers, the employees and the medical profession. In addition to these there are two groups who are injecting their influence into this field—propagandists for various forms of "social legislation" and the legal profession. The first of these seem anxious to engraft upon the compensation system increased coverage which would make of it practically a general health insurance. As for the second, many of its members seem anxious to develop methods of administration such as might require a great increase in legal services; this notwithstanding the fact that one of the essential features of the system was to make it possible for the injured workman to receive payments without necessity for expense of litigation. Unfortunately, as already mentioned, changes in these laws are too frequently brought about, not on their merits or in the real furtherance of what seems generally recognized as the basis of the law, but through compromise between two groups striving with one another over many measures which may be before the legislature.

The trend ever since these laws came into effect has been toward increased liberality. Cash benefits have been increased for temporary and permanent disabilities, and for death claims; "waiting periods" have been reduced; periods during which medical care is given, and amounts available therefore, have been increased; coverage has been increased, and in twelve states occupational diseases, as well as accidental injuries, have been made compensable in one way or another.

This trend toward liberality up to the time of the depression was largely reflected in the administration of the law. As the chairman of the Commission in one of our States said publicly a few years ago—"I consider the fund a fund created for the benefit of the workman, and if it is humanly possible to make a payment to a claimant without direct violation of the law, it should be done." The result of this attitude, which at the time seemed not at all unique, was that many claims were awarded on what seemed to be entirely insufficient evidence, and for conditions so remotely connected with the alleged cause as to be almost grotesque. Payment of claims based on the theory of "aggravation of a pre-existing condition" was common, and often seemed very far fetched.

In prosperous times it was possible to carry on with these extremely liberal interpretations. With the depression the picture changed. Reduced employment brought reduced collections for the funds and this in spite of frequent increases in premium rates. Reserve funds became "frozen" and banking conditions played havoc with such funds as were supposedly entirely available. Although employment fell off and with it the number of accidents, this was far from true with claims—at least as to size and frequency in proportion to the number of accidents. Today there is a flood of "not allowed" claims, because baseless, also many old claims are being revived, but all claims of this sort must be investigated, greatly increasing administrative expense and delaying the work of the boards and commissions. Then, too, many absences from work have become noticeably disproportionate in length for the apparent severity of the injury. Appeals from adverse decisions are far more frequent and in states where appeal to a court can be made, juries are making awards in many cases on what seems insufficient grounds. The result of these trends has been greatly increased cost of insurance, and in some cases actual threatening of the financial stability of the insurers.

Present trends in compensation may then be summed up as follows:

In claims—far more groundless and "harder lived" claims are being filed, apparently in an effort to stretch the coverage of these laws to include what might belong to health or unemployment insurance laws.

In administration—an increasing tendency to make use of legal services in presenting claims; more appeals; more complication in procedure and delay in payments; a marked tendency to interpret the law more strictly.

In scope—a steadily growing tendency to include coverage for occupational diseases as well as accidental injuries.

In spite of its ancestry, I believe we will agree that Workmen's Compensation is now recognized generally as based on a sound social principle. Costs of the care of injured workers are legitimately part of the cost of the product. If this is true in the case of accidental injuries, it is only logical that diseases directly resulting from occupation should also be compensable. This was recognized in Europe fifty years ago by some governments, and inclusion of occupational diseases is now very general in European compensation schemes. In this country practically all our compensation laws, when first passed, wholly ignored occupational diseases. Usually coverage was limited specifically to accidents. In some states only the word "injury" was used, so claims for injury due to disease and not accident were presented. This called for court rulings and in this way rather than through any apparent intention in the law, occupational diseases were included. In some states by amendment the wording was changed so as to allow compensation for disease in this way. In other states amendments were adopted providing compensation for certain scheduled diseases. The movement for inclusion of diseases under compensation began some fifteen years ago, but even after this lapse of time they are compensable in one way or another in only twelve states, and also by the Federal Government and three territories.

Along with the definite trend toward inclusion of occupational disease, has always been some considerable argument as to scope and method of coverage. Theoretically, just as any accidental injury arising out of and in the course of employment is compensable, so should any disease. This idea is reflected in the legislation where the act applies to "injury" and may so include any disease as well as accident. This is the so-called "blanket coverage." The other method is to adopt a schedule of disease recognized as occupational, making them compensable but excluding others. This limited coverage is known as the "schedule" method. There are valid argu-

ments for and against each method. To present these briefly and with as little bias as possible, would summarize as follows:—

"Blanket Coverage" while theoretically sound and the method presumably most just to the workman, presents so many practical difficulties in administration that it may often fail to give the protection desired. It is also far more likely to be abused if liberally interpreted, until it could in effect become almost general health insurance for workmen. If any illness attributable to a man's work is supposed to be covered, almost any illness may be the basis of a claim. To determine the occupational connection would often become a highly complex medical question. Already under this system so much litigation is often required, and court rulings must be followed, that the purpose of the law in aiding those disabled is not infrequently defeated. The "schedule" method was the first method tried and has stood the test of half a century's practice in some European countries. The schedule should be carefully prepared to cover the outstanding recognized occupational diseases apt to occur in the state. It should not follow blindly some earlier schedule which may include many diseases never likely to occur, and possibly omitting others quite likely to be found. It should be limited to recognized conditions known to be of essentially occupational origin and capable of definite diagnosis. Provision should be made for some form of competent medical board of review, officially connected with the body administering the compensation law and the decision of this board should be final on medical matters. Provision should also be made for inclusion of additional occupational diseases as experience indicates. With a properly prepared schedule and proper administration, certainly 90 per cent of occupational diseases should be covered.

In extending compensation coverage to occupational diseases it must be recognized that whatever method is pursued, we are dealing with a much more complex subject than with accidents. Expert medical information is essential in administration and must be available from an impartial source to the board or commission responsible. The ultimate cost of such coverage is also quite a problem. Some ridiculously low figures have been given from time to time in comparison with the premium figures for accident coverage, but so far the surface has only been scratched. We know that costs have steadily increased for coverage of accidents, despite the presumed clear cut nature of an accident. We can only guess what the relative increase in costs would be for occupational diseases when such coverage becomes more general and information regarding its possibilities is more widespread. This is especially true if "blanket coverage" is attempted. No insurance company or state fund knows how to estimate the cost. As an illustration of this we have only to cite the present appalling situation with regard to silicosis, and this same problem of silicosis shows the vital need for a special set up in dealing with occupational disease as compared with accident. To attempt to do justice to the silicosis problem by including it as an "injury" and dealing with it through present laws designed only for accident coverage would be almost impossible.

Compared with accident compensation our experience with occupational disease coverage is small indeed. The first compensation laws were often very poorly framed, precedents were often too blindly followed and basic needs seemed only partially appreciated. This is largely true of our first efforts to include occupational disease, but a new trend is noticeable, and I believe further advance in this field will show a better appreciation of the important features of such legislation. In Pennsylvania and Massachusetts, for instance, some outstanding studies have been made by well qualified commissions. The report of the Pennsylvania Commission contains one of the most masterful analyses of the problem of compensation for occupational disease so far published. Through such studies it should be possible to draft a law accomplishing its purpose with essential justice and with the possibility of efficient administration.

To sum up the trend in the field of compensation for occupational disease, I would say that there is a definite increase in recognition of the justice of such coverage; that haphazard methods of approach are giving way to intelligent study of the problem; that such study seems to show clearly the value of a schedule method rather than blanket coverage, and that there is increasing recognition that a different set up is required for efficient administration with provision for adequate medical advice in handling claims.

At present two tendencies are very noticeable—one toward broader coverage, the other toward a return to methods of administration involving more legal aid and the courts. The first might lead to inclusion under a compensation law of much that should not be covered in such laws. The real purpose of the law should always be kept in mind and the law administered accordingly or else the whole scheme may be endangered through excessive costs. The second seems likely to defeat two of the important features of the law, namely, to make it possible for an injured workman to obtain payment for his disability without the added expense of legal aid, and without the hampering technicalities of court procedure.

In closing this review we might list as objectives which could well be considered in further amendments the following:

1. Carefully considered provision for occupational disease coverage, with special coverage for silicosis.
2. Better recognition of the essential medical features of such laws, especially as affecting occupational disease coverage, through the formation of non-political, non-partisan, competent medical boards with official status and with power of final decision in medical matters.
3. Provision for more effectual preventive features.
4. More recognition of the value of high grade medical treatment, as compared with cash payment for disabilities.
5. Simpler methods of administration, requiring less legal service and court procedure.
6. Provision for final decision of claims by the boards or commissions charged with administration.
7. Adoption of some method for more just handling of claims involving "aggravation of preexisting condition," as in two states now, through apportionment of amount of resulting disability, logically attributable to the "aggravation."

Putting Safety Engineers Under the Microscope

By W. GRAHAM COLE

Director of Safety, Metropolitan Life Insurance Company, New York City

The speaker said in part: Aside from the responsibility of a safety engineer to a given industrial property, safety engineers generally have the responsibility to emphasize the need of organized effort wherever human beings are employed. They are also in a position to stimulate the active leadership of the employers of small plants in their communities, because of the general effect of all types of occupational accidents upon the national rate and upon insurance premiums.

In the industrial plant which, because of its size or interest of management, has been fit to employ an individual to serve as safety engineer, either on full or part time, this individual becomes the pivot man in the resulting safety program. Upon him rests a direct responsibility to develop policy, leadership and organization which will result in a reduction of accidents and a decrease in the waste and inefficiency, incident to the occurrence of accidents.

When the need of safety work was first accepted among industrial employers, the prevention of accidents was considered very largely in terms of mechanical safeguarding. The safety engineer was frequently selected because of his knowledge of mechanical engineering, for ability to foresee mechanical hazards, and to design and build proper safeguarding devices. Experience soon indicated, however, that only a relatively small percentage of occupational injuries resulted directly from mechanical imperfections, and that, on the other hand, personal habits of the employees resulted in the larger percentage of accidents. At this step in the evolution of safety engineering as a profession, considerable attention was given to the need of training employees and of stimulating their continual interest in accident work. The work of the safety engineer then became very largely that of a promotional or educational agent.

In this regard safety committees were organized to interest employees and obtain their cooperation in discovering and correcting unsafe conditions and practices.

Safety rallies were held to stimulate group interest. Contests were conducted to encourage the production of improved accident records of departments or entire industrial units. In some instances, a form of bonus was paid for the accomplishment of exceptionally good records. Advertising principles were utilized and attempts were made to develop interest through various publicity methods. Bulletin boards were erected and used to display safety posters and at times to present special messages from the local manager. Cautionary and instructive signs were placed at important places to attract attention to a probable hazard, or to present safety advice. Pay envelopes and other means were used to distribute pamphlets and other printed messages about safety.

These various promotional activities were, in most instances, designed to reach the employees as a group or, in other words, they followed the line of mass approach. The results of these efforts were apparent in many industrial properties and marked reductions in accidents were noted. Several years ago it became apparent, in some industrial organizations, that the ultimate in accident prevention could not be obtained entirely by mass appeal to all employees. It was appreciated that this type of appeal would have considerable effect upon certain groups of employees but that there were, in practically every industry, other groups who would not react to general educational activities, even though they had the same opportunity to come in contact with these activities.

The appreciation of this fact led to the adoption of more direct methods of reaching certain groups of employees. Disciplinary measures were found necessary in some cases. In others, it was considered advisable to study the individual habits and characteristics of certain employees and to take individual steps to overcome lack of interest or indicated accident proneness. Increasing attention was given to a review of applicants' fitness for the work to which they were to be assigned, to the study of the actual requirements of specific jobs from the accident viewpoint, and to the need of closer supervision and special training for certain jobs.

During this period also, the position of the executive and the supervisor in the program was given greater emphasis and increased attention was given to the need of convincing managements of their responsibility in the safety program. Methods were also developed to emphasize the importance of the supervisor, and in some instances foremen's safety conferences were organized and conducted.

The recent period of business depression in the United States presented a means of measuring, to some extent, the results of organized safety activities in industrial organizations. To be sure, the numbers of industrial fatalities or serious accidents show a decline during this period, but it is doubtful that this decrease was as great as the decrease in employment or, in other words, as the decrease in exposure. In some outstanding instances, industrial safety programs have been continued during the depression, diminishing only to an extent comparable with the decrease in industrial activity and employment. In many other instances, however, the industrial safety program suffered materially, even to the extent of the total elimination of safety departments or the coordination of the duties of the safety engineering with those of some other executive.

The experience during a number of years prior to the depression has emphasized, by many studies which have been made including specifically a study conducted by the Engineering Council, a definite relationship between accident prevent and plant efficiency. Those who have had the privilege of close contact with safety work realize that the frequent occurrence of accidents is a measure of inefficiency, and that safety programs are an essential phase of economic operation. Based upon this fact, it is reasonable to suppose that industry would not decrease its safety activities during a period when it was suffering from business depression but rather would increase its interest in those activities which aided to decrease wastage and to overcome inefficient and uneconomic operations.

It is apparent, therefore, that the diminished interest in safety evidenced on some properties, was but an indication of the fact that the management of these properties had not been sold effectively to the value of safety work from an economic as well as a humane viewpoint. This statement should not be construed entirely as a criticism of the safety engineer of these specific projects, but rather as an indication of the failure of the safety engineering profession as a whole to reach and impress

business executives with the value of safety activities and their responsibility for the conduct of prevention programs.

For more than a year, steps have been taken by the National Government designed to aid American business to overcome the depression. In this recovery program it seems very probable that the profit making organization will be the one which is able to produce, distribute and sell its merchandise in an economic manner. This will require the elimination of wasteful and uneconomic practices which involves, in very large part, the elimination of those conditions which are productive of accidents.

In the past, accident prevention was considered very largely as a humane responsibility and accidents were considered usually as those incidents which resulted in human suffering. Recent studies have indicated, however, that industrial accidents also result in the destruction of property, the damage of machinery, the spoilage of raw and finished product, and the loss of valuable and trained workers. In many instances these conditions result where no personal injury is experienced. The prevention of all types of accidents would thus serve to decrease many forms of waste and in a number of instances will mean the difference between loss and profit on the annual balance sheet.

We have thus reached a step in the evolution of safety management never before reached, when the safety profession has an outstanding opportunity to indicate its proper place as a part of economic industrial management. In this position, the safety engineering profession is aided by the National Government which has required the insertion of a clause in the various industrial codes and has called upon organized industry to develop definite safety programs.

Furthermore, the government has shown an example and taken the leadership in developing organized safety work among the thousands of individuals who have been added to government payrolls through C. W. A., P. W. A., T. E. R. A., and other large governmental recovery activities.

The safety engineer who will, therefore, capitalize upon his present opportunities is the one who will take active steps to analyze the reasons executives have not been, in many instances, thoroughly sold on the advantages of safety programs. In doing this, he will analyze the past activities of the safety profession and will endeavor to develop himself and his safety program as an essential to the conduct of the industry. It has been easy for the safety engineer to present perhaps an alibi, and to presume or say that better results could have been obtained if it had been possible to secure the more active leadership of the higher executives, and the criticism that management had, in many instances, not visualized the importance of safety procedure. On the other hand, he placed the responsibility for this lack of interest directly upon the safety engineering profession. He emphasized the fact that executives were responsible for many other activities and that unless their attention was continually and forcefully called to the need of their personal participation in accident prevention work, they were prone to lose sight of this responsibility.

If it is granted that accidents are a form of economic waste and that the prevention of accidents is an economic necessity, it can be assumed that the entire responsibility for the safety program is one that naturally rests on the chief operating executive, and further, that the safety program should not be considered purely as a welfare activity but as a phase of industrial management and supervision. With this conception, the safety engineer is not an independent force attempting to instill safety consciousness and prevent accidents through his own ability. On the other hand, he becomes an assistant to, not a substitute for, the operating head of the business. In this position, it is his responsibility to keep the operating head thoroughly advised of the accident problem and as a representative of the operating head, to see that the safety policy of the company is carried out. In following such a procedure, the department supervisor or foreman naturally is the man held responsible for the prevention of accidents among his particular group of employees. The safety engineer has the responsibility, not to prevent accidents in a department, but to aid the department head to visualize his responsibility and to develop and carry out necessary activities. In this capacity, the safety engineer is in a position to coordinate the activities of the various departments.

The departmental supervisor requires the cooperation of the men who are work-

ing for him. To accomplish this it is necessary that he impress his workers, both by example and conversation, with his sincere interest, and encourage them to aid him in the conduct of plant activities, unmarred by either personal injury or non-personal injury accidents. The appointment of certain employees on safety committees will undoubtedly aid the supervisor in meeting his responsibility, if the committee is organized with this purpose in mind. Too frequently in the past committees have been organized wholly for the purpose of securing insurance premium reductions. In many instances, these committees have been effective on paper only, and in some cases they have resulted in a group of men authorized to criticize defects in safeguarding and in operating procedure. To be sure, there may still be conditions in industry where safeguarding is essential. On the other hand, there are many instances where accidents can only be prevented by the personal actions and practices of the employees. The effective safety committee is one which recognizes the entire situation and serves as a means of securing employee cooperation with the safety program.

In summary, therefore, may we emphasize the fact that the safety engineer has, at the present moment, perhaps the most opportunity he has ever had to analyze the defects in past procedure and to develop himself as an integral part of the operating procedure of his industry, and as a real assistant to the chief operating executive.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



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TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Petroleum Section was called to order by General Chairman R. W. Black, Standard Oil Company of New Jersey, Elizabeth, N. J., who presided. He introduced Mr. W. C. Holliday, President, Standard Oil Company of Ohio, Cleveland, who made a brief welcoming address to the delegates on behalf of the Convention City.

Chairman Black presented a brief resumé of the activities of the Petroleum Section during the past year, outlining the work of officers and praising the work of standing committees. He then introduced the first speaker.

The Statistical Picture

By J. W. MYERS

Secretary, Annuities & Benefits Committee, Standard Oil Co. (N. J.) New York City

The speaker said in part: The study I have just completed of experience in the petroleum industry shows the following significant facts:

(a) While the general trend in frequency has been downward for all industries, the petroleum industry reduced its frequency in relation to that of 1926 at a slower rate during the years 1927, 1928 and 1929 than all other industries.

(b) In 1930 our rate of improvement in relation to 1926 was accelerated to the point where we almost equaled the rate of improvement for all other industries.

(c) During 1931 and 1932 our rate of improvement in relation to 1926 not only was further accelerated, but our rate of improvement exceeded the rate for other industries.

(d) In 1933 the petroleum industry, in common with all other industries, reversed the trend of its accident frequency but we have lost relatively less ground than other reporting industries.

(e) As a result of the downward trend of our accident frequency, and particularly as the result of the relatively favorable showing during the past few years, our industry in 1933 ranked thirteenth in frequency, whereas we ranked twenty-first in 1932 and forty-first in 1927. When we consider that our industry is engaged in the production, distribution and sale of flammable material, we can be proud of our rank in the business of saving life and limb, even though much room for improvement remains.

In explanation of the reversal in the trend of accident frequency in our industry four recent developments may be cited:

(1) The adoption of the petroleum code, together with the problems in connection with its administration, as well as other difficulties incident to the Government program, has required so much of the time of the executive and supervisory forces as to have resulted in a relaxation of management pressure against accidents. It is especially significant in this connection to note that the upward trend in accident frequency has been apparent for about one year.

(2) The emphasis given to collective bargaining under Section 7-A of the Recovery Act has led to labor unrest—a fact which, no doubt, has in some degree diverted the mind of the working man from the safe performance of his daily tasks.

(3) A moderate degree of recovery may possibly have speeded up the business processes, and hence, diverted a certain amount of attention which has been given to the work of accident prevention during the earlier years of the depression.

(4) The adoption of the code and the moderate recovery in the volume of our business has resulted in the employment of new personnel. This may have contributed to the increase in accident frequency, especially in those units which do not make it a practice to give serious safety instruction to new employees. Another phase of this situation is the fact that the recent working schedules cause more moving between jobs and more frequent change of shift.

Of the four factors, the first and second are the most important. To counteract the first factor we need at every opportunity to remind our managements that to relent in our accident prevention efforts for even a few months means an increase in accidents, with consequent loss of life and limb and its concurrent financial loss. To overcome the second factor is admittedly difficult. It might not, however, be out of order to suggest that certain conditions demand, as never before, a well-considered program of friendly cooperation with employees, and that one item of such a program might well be to give our wage-earners a vital part in the program of accident prevention.

My study of the trend in severity of accidents shows that in the years 1927, 1928 and 1929 accidents in the petroleum industry tended to increase in severity while other industries were making a moderate improvement as compared with 1926. Beginning with 1930, our industry, in common with others, evidenced a continuing decline in the severity of accidents. This decline has been somewhat greater in our industry than in all other industries. As a matter of fact, during 1933, you will note that while the severity rate for all other industries remained unchanged in relation to 1926, the rate for the petroleum industry showed a further slight decline, notwithstanding the 10 per cent increase in frequency. Nevertheless, the petroleum industry ends this seven-year period with a severity rate of 1.89 as against a rate of 1.54 for all other industries.

In my reports of previous years I have expressed the conviction that the severity rate is a better indication of the control of the inherent hazards of an industry than is the frequency rate. We know only too well that our industry presents serious accident hazards which are not common to other industries and which justify, at least, in part, the higher severity rate which we experience. We also know, on the other hand, that fluctuations in the frequency rate are very apt to record increases or decreases in those cases of man-failure which are more or less common to all industries. It would seem, therefore, that our picture is not necessarily discouraging for we know that the recent increase in frequency can be controlled and that we are still moving in the right direction in the control of those inherent hazards which produce the serious injuries and the high financial losses.

This does not mean, however, that we can afford to divert our attention from those hazards peculiar to our industry which produce the serious injuries. Obsolescence of equipment and processes is extremely high in our industry and with the use of each new process and material we find ourselves confronted with new and special hazards which require prompt and adequate control if we are to make further progress in the prevention of serious injuries. This word of caution applies particularly to the refining division of our industry.

The Industrial Physician's Place in the Accident Prevention Program

By DR. JAMES M. ADAMS

Medical Director, Standard Oil Company of La., New Orleans

The speaker said in part: The principal methods used by the Medical Department in accident prevention may be said to be:

1. Selection of new employees by physical examination to exclude those who, from a physical standpoint, cannot work safely.

2. Periodic examination of employees to discover increased accident hazards in the individual worker arising during his employment.

3. Care of minor illness and injuries to prevent their causing more serious accidents.

4. Care of injured workmen to shorten the period of disability and minimize permanent disabilities.

5. Study of the employee's environment to eliminate conditions predisposing to the development of accidents.

The financial waste in industry resulting from the acceptance of all applicants for work without physical examination has been estimated at more than half a billion dollars. Some of the sources of waste are: 1. Labor turnover; 2. Increased liability

to accidents; 3. absenteeism due to accidents; 4. liability to long disability compensation.

To successfully conduct the employment examination the physician should be as familiar with the duties of the position to be filled as the employment manager. Practically all disabilities have either a direct or an indirect bearing on the accident hazard and the degree of the hazard varies in the same individual with his occupation. A large, old, complete inguinal hernia in a man of fifty wearing a well-fitting truss and employed as an engineer is much less of an accident hazard than a small, recent, incomplete hernia in a man of thirty employed as a laborer. High blood pressure in a rig builder would be more hazardous than for a pumpman. A man with one eye is much more likely to be injured as an oiler around moving machinery than as a fireman.

Among the disabilities presenting accident hazards, visual defects cause the most accidents. About 70 per cent of our muscular activities are initiated in response to impulses induced by our sight sense. Focal infection resulting from infected teeth and tonsils often cause slight sprains and strains to result in prolonged disability. Defective hearing may be a grave hazard in working with gangs using cranes or similar machinery. A deformity of the limbs may not be hazardous in a pipe line laborer, but he very dangerous for a rig-builder helper. Diseases of the heart and high blood pressure which may cause spells of dizziness or even unconsciousness are dangerous in most jobs. These individuals are also more liable to heat prostration. There is hardly any place in the petroleum industry where an epileptic may be safely placed. Results of injuries to persons with latent syphilis are usually much more serious than to healthy individuals.

Physical examination of an applicant should include the whole body. The applicant is entitled to privacy during the examination and only the doctor and the man to be examined should be present in the examining room. It is usual to have the applicant present himself completely stripped. However, even the lowest have a sense of modesty with strangers and in order to avoid the resentment that will be felt by many, it is preferable to have the applicant enter with only his trousers on. Taking a medical history is of little value because the information the applicant gives cannot be depended upon. Above all it is necessary to make accurate records of the findings. Especial care should be taken in estimating the applicant's vision.

Physical examinations are usually made of applicants for regular employment and persons employed for temporary construction and repair jobs are usually not examined. From an accident prevention standpoint, it is surely as important to examine a man for a short period of employment as it is for permanent employment because an injury to a man working one day costs just the same as if he had been on the job ten years. The cost of these examinations is small in comparison to the compensation costs in a single case.

It has been estimated that 90 per cent of accidents are due to individual workers and that 90 per cent of these workers have physical impairment or defects ranging from moderate impairment to serious defects, and that 75 per cent of these defects can be cured or benefited.

There has been a trend in the last few months on the part of the medical profession to cast doubt on the value of periodic health examinations. Their worth in industry has been and is daily being proved and they are especially applicable in the field of accident prevention. Many of the objections being raised by physicians to make them as short as may be consistent on account of expense and the time lost from work. It is possible, however, by the development of a routine to make a satisfactory examination of all regions of the body including a urine examination and brief advice, in twenty minutes. This will suffice in 90 per cent of the cases and the other ten per cent can be called back for further investigation and advice.

It is questionable whether an examination of every employee annually is a justifiable expense. A checkup of employees under the age of forty every two or three years is probably sufficient; from forty to fifty every one or two years; from fifty to sixty every year, and above sixty every six months. Employees with disabilities should be checked over at periods varying with the nature and extent of the disability from one to twelve months.

There is the additional problem in making periodic examinations of placing those

employees presenting serious accident hazards in occupations where the hazard is greatly reduced or absent. Most of the work in the petroleum industry is either laborious or technical. There are enough duties among the non-technical jobs, however, which do not require much physical strain or activity to make it possible to group them in separate light and moderately heavy duty jobs which may be utilized for these handicapped men. In large plants it is advisable to have a survey made and such light tasks segregated from existing jobs. This does not mean the creation of new jobs—only a redistribution of the duties of existing jobs. A tank wagon salesman with a serious visual defect which could not be corrected was transferred to a position as tank wagon filler. A rig builder with beginning heart failure was given work in his own craft where he has no climbing or severe strains.

In addition to the periodic examination of employees, all men transferred to other occupations should be examined. As previously outlined, a disability which presents a minor hazard in one job will become a major hazard in another.

The personal qualifications of the plant physician are as important as his professional competence. He must be able to inspire and maintain the absolute confidence of the management, the supervisors and the workmen. He must be an idealist and a diplomat. He must have executive ability and good judgment in business affairs. He must be non-partisan, but must have the employees' welfare truly at heart and must be ready to do battle for them and for the individual workman when necessary to secure justice. He must be capable of judging when suggested reforms are compatible with the interest of the company and when the costs and other considerations are too excessive to expect reasonable returns from the investment. He must know when to follow red tape, when to go direct to the general manager and when to the supervisor to get the most satisfactory results.

First impressions are the most lasting and repetitions deepen these impressions. If the new employee is told by the employment manager that an important part of his duties is to work safely, and if he passes from the doctor's examining room to the Safety Department, the doctor can also help to fix in his mind the ideal of safety. Safety posters in the doctor's waiting room will be read while awaiting examination and the doctor should mention the importance of working safely, the importance of first aid treatment for minor injuries and explain to the employee the services offered by the Medical Department. By the time he is assigned to his job and is instructed by his foreman in the safe way of performing his work, he should be thoroughly impressed with the company's policy that it is just as important to do his job safely as it is to do it accurately.

On the first visit of the employee to the emergency hospital for service he should be received courteously as an individual and not as just one of a mob. It is advisable that the doctor see every man applying for treatment no matter how trivial the condition may be. When inquiring into details of an accident he can often slip in a word of warning or advice which may help to prevent another accident. No effort should be spared to secure the employee's complete confidence.

At the time of the periodic examination, accidents since the last examination should be reviewed. If the employee is accident prone, and especially if he is subject to a particular type of accident, a thorough search should be made for a cause either in his physical or mental makeup or in his environment. If the type of accident is common in his department the cause is environmental and a job for the safety director. If it is peculiar to the individual, it is a physical or mental cause and should be determined by the doctor. It is often a case of a square peg in a round hole and the only remedy is transfer to other work until his meter is discovered.

No opportunity should be lost to impress on the employee the importance of first aid treatment immediately for every injury, however trivial. He should be given definite instructions when to return for further treatment and called in if he fails to report. Infectious will become almost unknown and minor injuries will not develop into major ones.

In the treatment of injuries involving lost time much can be done by the plant physician to shorten the disability period. The best hospital and surgical attention is usually the most economical. It is desirable, though not essential, that the plant physician do his own surgery. The morale of the patient must be maintained at all

costs and the injured man returned to work in his own department as soon as it is safe, even though his services may be non-productive for a period.

First aid training is, in my opinion, the most potent means we have for safety education. A chart covering a period of years in one refinery showed a consistent drop in the accident rate during and immediately following periods of first aid training. I believe it is a wise investment to give all employees this training. In the plant, treatment by these laymen trained in first aid is limited to strictly emergency measures but in the field the treatments themselves are of inestimable value. Details of the training are usually conducted by the Safety Department, but the Medical Department is responsible that abuses are corrected, that the training given is correct and that the trainees understand thoroughly that their instruction covers only first aid treatment and not the general care of injuries.

Every employee returning to work from an absence due to either sickness or injury should be examined by the plant physician before being permitted to resume his duties. Many will thus be kept from positions where their continuing disability might result in injury to themselves or others. Many new chemicals are being introduced into the refining industry. Many of these have poisonous qualities and employees who are not in robust health are more susceptible to the poison effects than the healthy. All employees engaged in handling such materials should have a preliminary examination by the plant physician and thereafter be examined at regular intervals.

The industrial nurse is an invaluable aid to the plant physician. She can help maintain more frequent contacts between the disabled employee and the busy doctor than can the doctor alone. She adds the ever acceptable woman's touch to the care of the injured man. She helps maintain his morale and, equally as important, that of his family. The wife will ask questions of the nurse that she would hesitate to ask of a doctor and the reassurance the nurse can give will be of great service. She can instruct the wife in the art of caring for the invalid and she can often detect domestic situations that interfere with the patient's progress and which may be hidden from the doctor.

Treating the injured employee, rather than treating only the employee's injury is as important in getting the man back on the job as it is in keeping his mental status satisfactory. Too often the surgeon's interest is in the technique of treatment of the injury and a satisfactory mechanical result and too little attention is paid to the early rehabilitation of the individual.

Until recently the employers' interest in accidents has been in prevention, compensation and adequate medical care. Lately they are concerned also in the rehabilitation of the injured employee and his return to productive work, not as a cripple, but as an individual who may be suitable for only certain types of work. The medical care and support of injured workmen was forced on employers by compensation boards but is now accepted willingly as a justifiable expense. The existence of our social order and the welfare of industry demand that handicapped workmen may return to gainful occupations and not be set adrift as helpless derelicts to be cared for by voluntary charity or by the state. These handicaps sometimes result in actual increase in the value of the workman's service to his company, and in the large majority of cases the handicapped individual can be retained in service and given work which will produce a greater profit to the company than may be expected of a new employee after the cost of his training has been considered.

Rehabilitation should begin at the time of the injury by building an atmosphere of hope and encouragement around the patient, thus maintaining a good morale. Hours of idleness breed discouragement and resentment and some form of occupational therapy should be instituted as soon as possible. As soon as he is able to do any kind of work safely he should be returned to duty. The physician should discuss with his foreman the injured workman's disability and be sure that he understands the limitations of his ability. There are some injuries in which it is not advisable to return the patient to the job early—such as head injuries, fractures of the bodies of vertebrae, fractures of the foot, severe injuries to the chest and abdominal injuries.

After his return to work the disabled workman must be followed up closely on his job. Reports from the foreman should be secured frequently. As soon as im-

provement has progressed sufficiently, additional duties should be assigned to the disabled man. This will be concrete evidence to him that he is improving. Just as soon as he is able he should be returned to his regular job. The foreman and the personnel man can be of great assistance at this time in encouraging him. It is often necessary to enlist the cooperation of his fellow workmen, not to help him in work, but to encourage him and to report if there are any operations among his duties that the patient cannot successfully perform or are carried out with too much effort.

The surgeon's responsibility ends only when the patient has attained maximum improvement, compensation has been satisfactorily adjusted and paid, the patient has been rehabilitated and has at least a satisfactory mental adjustment to his job as before the injury. There is danger in insufficient follow-up and there is danger in too prolonged care. A happy medium must be sought.

Organizing Federal Relief Projects for Accident Prevention

By E. D. MURPHEY

Safety Engineer, Mid-Continent Petroleum Corp., Tulsa, Okla.

The speaker said in part: Immediately after the inception of a national C. W. A. safety organization, I was asked to take over and direct the safety program for the state of Oklahoma. My company, the Mid-Continent Petroleum Corp., patriotically acceded to this request and gave me leave of absence to organize safety on Federal projects in the state. I attended the conference of some fifteen safety directors at Chicago on December 26, 1933, where we pooled our ideas and experiences, and received our instructions.

Returning to the state, we established safety headquarters in the Federal Building in Oklahoma City and immediately proceeded to appoint eight District Safety Engineers, these appointments being made from professional men who were available and who were experienced industrial or insurance company safety men, or who were practical and experienced mechanical and construction engineers.

Because of the rapidly mounting toll of accidents over the nation and in Oklahoma the work of organizing was made an emergency measure and the safety staff literally worked day and night, Sundays and holidays, for one month to get the very best organization in the field possible.

With the cooperation of County Administrators and District Safety Engineers, part-time Safety Inspectors were appointed on every project employing ten or more men. These part-time men were to put in at least one hour per day on the job, inspecting the job frequently for safety, and had the additional duties of giving first aid treatment to all injuries immediately after the accident occurred. Problems of safety in transportation of those working on C. W. A. jobs were taken care of; an accident reporting system arranged for; safety posters distributed and posted on every job; rules and regulations for handling and usage of explosives promulgated; first aid supplies delivered to every job; first aid training of hundreds, and even thousands of workers was soon started under the joint sponsorship of the American Red Cross and other agencies; rules and regulations on such subjects as excavations, gravel pits, hospitalization were put under way, in a very short time.

In the latter part of January a health program for C. W. A. workers was promulgated from Washington. Some of the principal items of this program were sanitary conditions at camps, providing safe drinking water, adequate toilet facilities, and mosquito control; protecting workers against poison ivy and poison oak; seeing that men were properly clothed during cold or wet weather; protecting men against frost bites, sun stroke and heat exhaustion; that workers were instructed in the proper manner of lifting heavy weights to avoid back strain; to isolate workers having contagious diseases; seeing that men with physical defects were placed on proper jobs according to condition; and seeing that sick men were not allowed to work.

In the larger counties it was soon necessary to appoint full time County Safety Inspectors where large quotas of men were at work. Oklahoma's quota alone in January, 1934, ran as high as 114,000 men at one time. All kinds of trades and

occupations and classes of work were represented in the personnel and the projects which were operated.

Within four weeks of the inception of the safety work in Oklahoma, results in reduced accident rates began to be apparent to a very satisfactory degree. For the week ending January 11th, 179 lost-time injuries were reported with 94,768 men working, giving a rate per 100 men of .1889. For the following week ending January 18th, 119 lost-time injuries were reported with 106,622 men working; a rate of .1116 per 100 men. The following week ending January 25th, we had 101 lost-time injuries with 112,181 men working; a rate of .0900. These rates ran still lower in March.

As a result of C. W. A. safety work and later extended into the E. R. A. of Oklahoma, the state now has from ten to twelve thousand trained first aiders and from eighty to one hundred thousand inoculated with the safety idea, who would, perhaps, otherwise never have come in contact with these two important phases of work-a-day life.

Other Experience on CWA Jobs

Mr. R. E. Donovan, Chief Safety Engineer, Standard Oil Company of California, San Francisco, Calif., also gave an outline of experience in organizing safety work on the CWA jobs in the Southwest and on the Pacific Coast. Mr. Donovan had been drafted for this work in a manner similar to that described by Mr. Murphy, and his experiences were quite similar. He spoke extemporaneously and no record of his remarks is available. He placed considerable emphasis on the good that the CWA safety work did in advertising safety to foremen who had never known that there was such a profession as safety engineering.

WEDNESDAY MORNING SESSION

October 3, 1934

A Practical Safeguarding Program for the Field

By H. B. HECOX

Standard Oil Company of California, Taft, California

Speaking extemporaneously, Mr. Hecox called attention to the fact that mechanical safeguarding was the first step undertaken in organized safety work. In the years following the inception of the safety movement, safeguarding has continued to be an all-important feature of any accident prevention work, and its importance has been accentuated by the aid of State Industrial Accident Commissions and the willing cooperation of many companies, who have sought to make their physical plants safe places in which employees may work.

He emphasized that while mechanical safeguarding has come to be only a small part of the usual accident prevention program in any progressive industrial plant, it continues to play an important part in that program. Not the least important phase is the fact that where a well organized safety program is carried out, safeguarding is conclusive evidence in the minds of employees that management is sincere in its desire to stop all accidents. When safeguarding is thorough throughout the plant, it is usual to find the employees sincerely cooperating in their part of the safety program.

We conceived, said he, that the first safety step in our organization was the establishment of standards to be followed in all construction work. Before these standards could be established, a study had to be made of the operation of various mechanical equipment in field use, and particularly the relation of the work it performs in the hands of the employee whose duty it was to operate it. After months of study, two manuals were prepared and printed. One of these was a manual of safe rules for the guidance of Design Engineers; and the second a manual of information for Construction Engineers and Construction Foremen.

(The speaker then, with the aid of lantern slides, showed some thirty-six pictures on the screen, illustrating types of safeguards and mechanical devices, as well as many safe practices followed by his company in carrying out their practical program of safeguarding employees in the field.)

Report of the Nominating Committee

At this point the Chairman called for the report of the Nominating Committee, and new officers for the section were nominated and elected as follows:

General Chairman—C. O. Lockwood, The Empire Companies, Bartlesville, Okla.
Vice-Chairman—R. B. Rooper, Humble Oil & Refining Co., Houston, Texas.
Chairman Atlantic Division—W. R. Murphy, The Atlantic Refining Co., Philadelphia, Pa.
Chairman Great Lakes Division—H. L. Hershey, The East Ohio Gas Co., Cleveland, Ohio.
Chairman Mid-Continent Division—J. H. Savage, Mid-Continent Petroleum Corp., Tulsa, Okla.
Chairman Rocky Mountain Division—B. V. Osborn, Standard Oil Co. (Ind.), Casper, Wyoming.
Chairman Gulf Division—A. W. Breeland, Lone Star Gas Co., Dallas, Texas.
Chairman Pacific Division—R. B. Hecox, Standard Oil Co. of Calif., Taft, Calif.
News Letter Editor—C. H. Martin, Phillips Petroleum Co., Bartlesville, Okla.
Engineering Committee Chairman—W. P. Raymond, Jr., Standard Oil Co. of Louisiana, Baton Rouge, La.
Health Committee Chairman—Dr. J. M. Adams, Standard Oil Co. of Louisiana, New Orleans, La.
Foster Committee Chairman—J. L. Manes, Sun Oil Co., Dallas, Texas.
Program Committee Chairman—R. W. Black, Standard Oil Co. of N. J., Elizabeth, N. J.
Publicity Committee Chairman—H. J. Wilson, Associated Oil Co., San Francisco, Calif.
Statistics Committee Chairman—J. W. Myers, Standard Oil Co. of N. J., New York, N. Y.
Past General Chairmen—
 R. W. Black, Standard Oil Co. of N. J., Elizabeth, N. J.
 R. S. Bonsib, Standard Oil Co. of N. J., New York, N. Y.
 V. R. Currie, The Texas Co., Houston, Texas.
 R. E. Donovan, Standard Oil Co. of Calif., San Francisco, Calif.
 C. L. Hightower, United Gas Co., Houston, Texas.
 Geo. F. Prussing, Union Oil Co. of Calif., Los Angeles, Calif.
 E. J. Senne, Socony-Vacuum Oil Co., Inc., New York, N. Y.
 C. W. Smith, Standard Oil Co. of Ind., Chicago, Ill.
 D. J. Wallace, Sinclair-Prairie Oil & Gas Co., Tulsa, Okla.
 Secretary—H. N. Blakeslee, American Petroleum Institute, Dallas, Texas.

Reconditioning Oil Pipe Lines

By H. J. HANLON

Safety Inspector, Standard Pipe Line Co., Inc., Shreveport, La.

The speaker said in part: The pipe upon which our work has been done is of the screwed coupling type, 8 inches and 12 inches in diameter. The lines are from 10 to 25 years old. In the past two years we have reconditioned about 42 miles of 8-inch and about 40 miles of 12-inch pipe. Practically all of our reconditioning is done with pipe under pressure ranging from a few pounds per square inch to 600 pounds per square inch. The 12-inch pipe is worked at pressures under 400 pounds per square inch.

Practically all of our work has been done in flat land country. The general

depth of the pipe lines will average about 36 inches to the bottom of the pipe. Excavation to the top of the pipe in flat country presents no unusual hazards, but where the pipe line crosses rivers, bayous, railroads and highways, and under circumstances of uncontrollable soil, or when the depth of the ditch reaches four feet or more, serious hazards are encountered.

At such crossings excavation is done by hand. We have found that it is the safest practice to shore all ditches having a depth of four feet or more. Especially is this true where the ditch is adjacent to any vibratory source such as a railroad. We consider ditch depths in excess of four feet as unusual excavation and extremely hazardous regardless of whether the soil looks self-supporting or not. For this work we use our most careful and experienced foremen and laborers.

Stripping of the line is done by hand and is the process of preparing the pipe to be raised out of the ditch. No exceptional hazards are met with in this process. When the line is exposed, it must be loosened and prepared to be raised in such manner that no undue strain will be placed on the collars. The line is stripped on one side only. For this work long-handled shovels, sharpshooters, and mattocks are used.

In this process colored workers are employed and the most troublesome hazard to overcome is the poor shoes worn by the strippers. It seems to be the colored man's failing to neglect his footwear. By patient and close supervision we have almost entirely overcome this objectionable feature in the colored worker. Poor shoes, however, have had their redeeming features, for they have made us broken-glass and nails-in-boards conscious. It is our habit now to remove nails from all boards, box tops, barrels and the like at the time such nails are exposed or found. Bottles or glassware found about the job are deposited in a safe place before they are broken.

Strippers are provided with shoe plates to avoid jar and bruising of the foot. All tools and equipment used for the work are inspected daily. Shovels and sharpshooters with split tops or in otherwise unsafe condition are thus detected and are repaired or scrapped as the case may require. When not in use all sharp edged tools are placed well out of the passageways along the ditch and their sharp edges laid flat or buried or otherwise placed in such a manner that workmen will not stumble over them or fall on them.

One hazard encountered in both excavation and stripping work is that of heat exhaustion. It is our opinion that heat exhaustion in practically every case is due more to faulty elimination and temporary poor physical condition than to the foremen driving their men or otherwise overworking them. But since such cases are charged to the safety record when they occur, we have provided some safeguards to prevent them. Green hands are slowed down below normal until they get a little experience. Sodium chloride tablets for the workers are hauled by the water boy, and some supervision is exercised over the quantity of water consumed and the temperature of the water. Extremely cold water is not provided. Prevention of faulty elimination is left to the workers and they are informed of the dangers of improper elimination.

Close supervision is needed in stripping work as in all other work where casual workmen are used. The proper spacing of the men in the ditch, the proper selection of lead hands and many other items familiar to all pipe line men are in constant need of direct attention of the foremen.

After stripping, the line is raised by easy stages and placed on skids over the ditch for cleaning. The hazards of machine or hand cleaning of pipe are controlled almost entirely by the use of mechanical safeguards. On the cleaning machines we have a small mesh screen guard over the revolving heads to control flying objects. Cleaning machine operators and their helpers are provided with clear lens goggles and respirators. In hand cleaning all men so engaged are required to wear goggles with high strength clear lenses and sidewall protection, and to wear canvas gloves.

Our actual welding operations in reconditioning assume five distinct phases: 1. Pit welding. 2. Solid welds of two inches square and over. 3. Patch welding over places too deeply pitted to weld solidly. 4. Collar welding on line that has been turned, and collar welding that has formerly leaked and which may or may not have been caulked. 5. Welding sleeves over collars which are in such shape that they

cannot be welded. The General Foreman is the sole judge of what type of weld to use.

We have not adopted a standard welder's face shield, but are using two types. One is the conventional shield found in most electrical welding shops, and which protects the sides of the face and the ears. The other type is a round $\frac{1}{4}$ inch flat wood piece with a built-in eye piece to fit snugly about the eyes of the welder, and is kept on the head by a large elastic band.

Ordinary workmen's clothes are worn by the welders. Folds in the clothing that may retain sparks are avoided and no oily garments are permitted. High top shoes are worn and kept laced, and all parts of the body from the neck down are covered by clothes or gloves to avoid undue skin absorption of the dangerous rays.

For welders' helpers, we supply regular goggles with side walls equipped with plain dark shade lens. These lenses admit 35 per cent visible light while absorbing 100 per cent ultra-violet rays and 92 per cent infra-red rays. Foremen, machine operators and other employees working in close proximity of electric arc flashes, but not as close as the welders' helpers, are supplied with regular goggles with side walls equipped with plain light shade lens. These admit 53 per cent visible light while absorbing 100 per cent ultra-violet rays and 80 per cent of the infra-red rays. The truck drivers are equipped with wide vision type goggles without side protection, fitted with plain light shade lenses of the same protecting qualities as just mentioned.

The explosion hazard has been practically absent in welding about our oil pipe lines under pressure. Our greatest concern is for an unexpected break in the pipe line and a resultant fire.

Before any welding is attempted, all line strain is relieved, all men removed from the bell hole and bell hole tested for gas with a lighted torch. Torches used are long enough to reach any part of the bell hole from a safe distance.

Turning the pipe possesses the possibilities of extreme danger when done while the lines are under pressure. We always turn straight joints, in some cases only one joint at a time, in other cases as many as twenty-five at a time. In turning the pipe one end of the line is being screwed into the coupling and the other end is being backed out. If either coupling should be in a strain, or if any other collar in the line being turned should have some concealed weakness, or if we should turn a weak cross-threaded joint, the line would probably pull in two and a serious situation result. Our foremen inspect every collar before turning and if there is any evidence of weakness, the collars are welded before turning. We have welded several thousand collars without a pull apart or other serious consequences.

While the turning operation is in progress, welding machines nearby are shut down and the turning tractors are placed as far away from the line as possible.

Safety in connection with replacing the line and backfilling goes hand in hand with the good condition and the proper handling of the tools used. The lines are lowered in stages, from skids down on blocks and then slowly to the bottom of the ditch. The tractors used in this work must be handled by skilled operators. All cable, pulleys and grabs are inspected daily. The laborers who put the grabs on the pipe must know what they are doing. The man down in the ditch who removes the blocks must be careful not to get bound between the line and the ditch wall. All men are out of the ditch when the line is in motion. Backfilling is done both by hand and with the aid of tractors. Tractors and the marmion board with cables constitute the mechanical means of backfilling. Men guide the marmion board while the tractor pulls it by the cables. These cables are inspected daily. The men are warned not to stand on the board or in front of the handles of the board to weight it down while it is in motion. Close supervision will take care of most hazards in this process.

Our pipe lines follow a main highway through Louisiana for quite a distance. We have done considerable welding adjacent to this highway and through small communities. Protection of the public becomes necessary when we have the highway blocked and in connection with our welding operations. In case of blocking the highway we have two flagmen on each side of the blocked point. Two are quite a distance from the work to enable high speed cars ample time to come under control. The other two flagmen are nearer the work in case the other flagmen are ignored. No work is done on the highway without this precaution. In cases of

flashes from the electric arc, we rely on signs, "Do Not Watch Flames," and the alertness of the supervisors to warn the curious.

Safety meetings are held each month by each of our two main line districts. The services of the National Safety Council and The American Petroleum Institute are being used and have proved valuable allies in preventing accidents.

Practically all of our supervisors have had the U. S. Bureau of Mines first aid training. Our foremen and regular men have been familiar with accident prevention methods since 1927, and while we are safety conscious, we still find new ways to do old traditional methods with greater safety.

We have equipped our trucks with removable seat boards to haul men. Only one man is allowed in the seat with the driver, and no one is permitted to ride on trucks with his feet hanging over the sides or ends nor is fender riding permitted. No mobbing of the trucks to get a seat is allowed, and loading and unloading are done in an orderly manner under supervision. For a night breakdown emergency each truck is equipped with a set of three kerosene torches.

Accident prevention is handled by us as a normal operating problem. The sustaining influence behind our safety program is lodged in the engineering division, with a safety inspection of the system made twice each year by the safety inspector.

Since June, 1932, we have had 500,000 man-hours experience in all phases of reconditioning work, 43,000 of which were worked by the welders. We have had no disabling injuries from our welding operations, and but few disabling injuries in the other processes, only one of which was of serious import. Our frequency rate so far this year for our system is about 3.00, while the severity rate is about 0.05, which makes a reduction of about 90 per cent in both rates since 1930, the year our safety efforts began to bear fruit.

Investigation of Accidents

The final feature of this session was a Group Conference on production and pipe line problems, led by Mr. L. K. Coville, State Supervisor, Trade and Industrial Education, Oklahoma. The problem selected for analysis was "Investigation of Accidents." Since the discussion was extemporaneous throughout, no report is available; but the feature served to acquaint many with the conference method of analyzing problems.

THURSDAY MORNING SESSION

October 4, 1934

Controlling the Fire and Explosion Hazards in Refineries

By GLENN BYERS

Safety Director, Shell Petroleum Corporation, St. Louis, Missouri

The speaker said in part: Annual statements of fire losses for all departments of our organization show substantial reductions each year since 1929. The experience for the first six months of this year (1934) shows a reduction of 76 per cent compared to the experience for the year 1929. And for the entire year of 1933, we show a reduction of 77 per cent compared to the year 1929.

The success of any program to control fire and explosion hazards depends considerably upon the interest displayed by management. The refinery manager should let it be known that he will not countenance hazardous conditions or unsafe practices and he should make it quite clear to all supervisors that it is their responsibility and one of their chief duties to see that hazardous conditions are remedied and unsafe practices abolished. The interest of plant officials must also be apparent to the rank and file employees. This can be done through the medium of memoranda posted on plant bulletin boards and by the plant manager and his immediate assistants taking an active interest in fire drills, etc.

Many serious fires and explosions can be attributed to errors on the part of operators. These may be due to failure of the supervisor to properly instruct the operator in the correct operating procedure, or through neglect on the part of the operator to follow instructions. Safe operating procedure and precautions to be taken should be determined by the management and issued in writing to all operating employees. These instructions should be available for reference at any time. A loose-leaf binder might be provided for each operating unit. The instructions and precautions so issued should include the proper procedure for operating the unit under normal and emergency conditions, together with general safe practices and instructions pertaining to special hazards which may be encountered.

Some of the fire and explosion hazards, together with precautions that should be taken, are as follows:

1. Water admitted to high temperature, high pressure units, such as a cracking unit, may rapidly change to steam and create excessive pressures. Therefore, water should be frequently drawn from all charging stock tanks, and no tank should be pumped to the units until the per cent of water has been determined by tests to be within the prescribed allowable.
2. Wherever feasible, valves, fire doors, etc., should be so arranged that they can be remotely controlled in the event of an emergency.
3. Before lighting fires in combustion chambers following a shut down, the furnaces should be purged with steam.
4. Gas lines to burners should be provided with caps or plugs to be used in closing these lines when burner assemblies are removed. The valves in these lines should not be relied upon.
5. The carrying of strike-anywhere matches, or smoking within a refinery is hazardous and should be strictly prohibited.
6. Before permitting a mechanic to cut into or break any line about a unit, the unit operator should carefully check and satisfy himself that work may be safely performed and then issue a permit to the repairman indicating that the line may be broken.
7. Gas leaks and oil spills should receive prompt attention. All fires in the immediate area should be extinguished and the area policed until the repairs or cleanup are made. Daily inspections should be made of trenches to insure that no oil or gas leaks are present.
8. Operators frequently use steam hoses for thawing lines or for playing steam on a gas or vapor leak. As a precaution against static, all steam hoses should be wire wrapped, with a good contact between the wire wrapping and the hose connections, or have a suitable ground wire between the hose connections. Static is increased with higher velocity of steam, or the amount of steam discharged from the nozzle; in using steam to dissipate vapors or gas, therefore, the steam valve should not be opened wider than necessary.
9. Electrical equipment should be installed and maintained in accordance with the National Electrical (Fire) Code.
10. Portable electric lanterns should be provided for use by operators when power service is interrupted, and for gaugers in the gauging of tanks. Such lanterns should be of a type approved by the Board of Underwriters.
11. When there is an indication of a tube rupture in equipment operating at high pressures and temperatures, operators should not investigate at the furnace peep holes until the fires have been "cut" and the feed reduced.
12. All employees should be thoroughly instructed in the use of fire extinguishers and the location of each, so as to be prepared to act correctly and promptly in an emergency.
13. The use of light distillates as a cleaning or scrubbing agent should be prohibited.
14. It has been determined by laboratory tests that woolen clothing is very slow to ignite in comparison with cotton clothing, and employees should be urged to wear woolen clothing while at work for the greater protection afforded.

It is important that a definite system of equipment inspection be developed and that records of such inspections be maintained. First in importance is the inspection of equipment of processing units. Men performing this work should be made to realize the responsibility vested in them. They should have a knowledge of metals

and how they react to high temperatures, pressure, and corrosion. At our refineries, we have an inspection department consisting of a head inspector, assistant head inspector, and field men. The head inspector and his assistant are graduate engineers; the field men are usually men having practical experience as mechanics.

Methods of inspection should consist of visual, hammer, and drill tests. When a hammer test gives indications that a piece of equipment may be weak or thin, the weakest point should be located, drilled, and measurements taken to determine its condition and thickness. Corrosive limits, beyond which no equipment is permitted to remain in service, should be definitely established. The A. P. I.—A. S. M. E. Code on unfired pressure vessels for petroleum liquids and gases should be followed.

During each shut-down period a definite procedure should be followed in making inspections, and a standard form used on which to record the condition of the equipment. This form should be filed and become a permanent record. The inspections should include lines, valves, vessels, tubes, heat and pressure recording instruments, pumps, etc.

An inspection chart or record should be maintained on all vessels and lines subject to severe corrosive action. This chart should show the date the unit was installed, original specification, renewal limits, last inspection date, type of inspection, and condition or measurements of each individual piece of equipment. Having established definite corrosive limits for the various pieces of equipment and by properly maintaining the inspection chart or record, the inspection department should be able to determine definitely the rate at which the equipment is deteriorating, and thus establish an approximate renewal date.

Visual inspections with the aid of flash lights should be made of the entire length of tubes to determine that no coke deposits have remained following tube cleaning. Such deposits remaining in the tubes may cause failure due to overheating and oxidation of the metal as a result of poor heat transfer. Tube cleaners should never be held stationary in the tube, as this may result in the wearing away of the metal and weakening of the tube.

Tank conservation vents and flame arrestors should be inspected at intervals of not less than one month by mechanics trained in this work. More frequent inspections are often advisable. The valve mechanisms in the conservation vents should be inspected carefully to see that they actuate properly in the vacuum and pressure control of the gas space within the tank. The flame arrestor elements should also be inspected for any foreign matter or corrosion.

In addition, a tank inspection should be made by the safety inspector in company with a boilermaker at least every three months. The condition of tank roofs should be determined by hammer testing if necessary, and accumulations of oily rags, paper, or anything that might create a fire or safety hazard should be disposed of.

The safety department should make a detailed inspection of all departments monthly. Fire and safety hazards should be reported in writing to the department concerned. Good housekeeping conditions, which are of vital importance, in the prevention of fires, should receive consideration during these inspections. Unfavorable conditions should be immediately called to the attention of the department officials.

Before inspection or repair work of any nature is permitted on any equipment containing or having previously contained flammable vapors or gases, the vapors or gases should be dissipated, following which tests should be made to determine whether or not it is safe to enter and perform the work required.

Fractional towers and chambers of operating units should be purged with steam and cooled with water just prior to the cleaning period. This completely frees the units of gases and vapors; however, to prevent the possibility of hot oil, gases, steam, or vapors entering the chambers or towers after workmen have entered, it is advisable to disconnect such lines and blank them by the use of blind flanges or blind gaskets, thereby completely isolating the unit. Disconnecting lines or the closing of valves does not afford adequate protection. Blind gaskets and flanges should be fashioned of material strong enough to withstand any pressure to which they may be subjected, and should be so fashioned that they are conspicuous when installed. The responsibility for the installation of blind flanges or blind gaskets should be definitely assigned to a responsible individual and there should be a definite time established for their installation and removal.

Storage and run down tanks containing crude petroleum or its products should be made gas free, and so isolated by the use of blind flanges or blind gaskets that they will remain so, before entrance for cleaning or repair work is permitted. The general practice is to steam the tanks, ventilate thoroughly and then make tests with an approved gas indicator before permitting entrance. Tests should be conducted at frequent intervals during the cleaning process to assure that a flammable vapor-air mixture has not formed. All supervisors of tank cleaning operations should have a thorough knowledge of the contents of the A. P. I. manual on "Cleaning Petroleum Storage Tanks."

It is very important that small containers such as drums, floats, hollow castings, etc., be made gas free before repair work is started, as explosions, producing painful burns and severe injuries, may occur from this source. All hollow castings or other hollow metal objects, which are to be subjected to heat in connection with repair work, should first be drilled to permit purging and draining of liquids or gases which may have accumulated.

In maintenance work, to assure that our craftsmen comply with all safety precautions, we have a permit system whereby written permits must be obtained before doing certain kinds of work at certain locations. Permits are issued in triplicate by the Fire Inspector or his assistant. The original copy is held in the office of the general foreman of the craft represented; a duplicate copy is issued to the individual performing the work or in direct supervision over the work. If there is more than one workman involved, each should sign or initial the permit. The third copy is retained by the inspector issuing the permit. This permit states specifically the type of work that is to be performed and the time at which the permit expires.

Before fires of any description (except customary fires under boilers, etc.) can be lighted and before welding equipment can be used on refinery property, a permit must first be obtained. Permits must also be secured before driving automotive equipment into certain areas, before entering tanks or vessels, and before using power tools in certain areas.

The Fire Inspectors should make inspections of the area or equipment where the work is to be performed, and issue instructions if necessary regarding the precautions that must be taken before the permit is issued. When permits are issued to craftsmen to perform work around an operating unit, the stillman or operator of the unit should be required to initial the permit held by the craftsman to assure that he knows what work is being performed.

Permits should also be issued to pipefitters by stillmen or operator in charge before the pipefitters break into any line about a unit. The permit should state that the line can be safely opened. Upon completion of the work the pipefitter should indicate that the line is ready for service by writing his O. K. on the permit, initialing same and returning it to the operator or stillman.

At refineries, especially in the metropolitan areas, which are subject to stray D. C. current, the spark hazard of breaking line connections is ever present. For example, at one of our refineries, there is approximately 150 amperes of current flowing to the refinery proper which is passed to the tank bottoms or to our pipe line system. The management of this refinery has issued instructions that all lines be bonded together around any joint which is to be broken, to eliminate to a large extent the possibility of a flash from the spark hazard which exists when the lines are broken. This hazard is also being eliminated by installing insulated flanged joints in the piping, and by installing insulated rail joints on spur tracks adjacent to electric railroad systems, or by the use of ground plates.

While the prevention of fires and explosions is of first importance, adequate and proper fire extinguishing equipment should be provided and the personnel must be thoroughly schooled in the locations and uses of the equipment. The foam system is of indispensable value in fire extinguishment. In addition to a permanent foam system, we have portable powder units and portable mixing towers which can be connected to the foam solution lines and raised to the tops of floating roof tanks or any tank not "hooked up" with the permanent foam system. In addition to the foam system, hand extinguishers should be distributed about the plant in accordance with probable hazards to be used in the extinguishment of incipient fires.

A rigid inspection system should be maintained to assure that this equipment will be in proper operating condition. Our policy is to inspect all mixing chambers

monthly. A hydrostatic test is placed on all foam and water systems every three months. A weekly test is made of foam and water pumps for (1) slippage, (2) pressure release, (3) capacity, and (4) pressure gauges for accuracy. Foam solutions are tested weekly by a chemist to maintain the proper strength of the two solutions, to produce a uniform, stable high quality foam. A monthly inspection is made of all hand extinguishers.

The training of the operating personnel in the use of extinguishing equipment and the organization of fire fighting crews within the ranks of the personnel is of much importance in assuring prompt and efficient extinguishment. Proper operation of hand extinguishers and the characteristics of the chemicals used should be explained thoroughly to employees in small groups until all are familiar with the equipment. Fire fighting crews should be organized among the operating personnel to handle the foam and water system, etc., for all major fires.

Eliminating Accidents in the Marketing Department

By J. L. RISINGER

Manager, Accident & Fire Prevention Department, Magnolia Petroleum Company and Magnolia Pipe Line Company, Dallas, Texas

The speaker said in part: The Marketing Department occupies a peculiar place in a company. Its personnel is charged in its regular operations with dual responsibilities. In retail marketing especially, the primary object is to sell, and the organization, from its manager down to the man on the driveway, is kept in a high state of enthusiasm on selling. In a majority of cases, the service station salesman is efficient in how to tin his cap and in what to say to the customer, but not so efficient in the operation of the equipment in his station.

The elimination of accidents requires a constant and intensive campaign, demanding the interest, enthusiasm and thought of every individual at all times. Every member of the supervisory force must keep uppermost in his mind the safety of his employees and the public. He is provided with information and regulations with which he is to comply and enthusiastically transmit to and put into practice with those under his supervision.

Thus, two highly intensive campaigns with the same group of employees must be carried on at the same time and both cannot be successful. If carried on separately, one will drop out of the picture insofar as results are concerned.

The combination of these two campaigns into one is the solution. The elimination of accidents to employees and the public, to be effective, must become a major item in the campaign of sales and delivery of gasoline, because of the loss in good will and customers as well as the direct economic cost to the company and the suffering of individuals. The sales campaign should be an occasion for intensive efforts on accident prevention work.

In our company, group managers, salaried agents and supervisors in marketing are organized along the same lines as in other departments, and although scattered over a wider territory, are placed on the same basis as superintendents and foreman. They are being trained to quality in leading conferences with their employees, to analyze and determine the cause of an accident, instruct in First Aid, hold general meetings and to lead and train those under their supervision in all phases of accident and fire prevention.

The regular operating organization is used for the training of the supervisory force and the employee. They receive their training through five main sources:

First: Group meetings, held at the office by the District Manager, at which all phases of marketing are studied, including accident prevention in each operation. A representative of the Accident Prevention Department is usually present and takes a part in the program.

Second: Standards, safe practices, regulations, special communications and operating manuals are furnished, the provisions of which the supervisor must study and teach to those under his supervision.

Third: American Petroleum Institute and National Safety Council manuals and

pamphlets and the department's monthly bulletin are provided. The department's bulletin provides definite information to be carried each month by the supervisor to the employees.

Fourth: Accident prevention is a part of the regular sales training course carried to the supervisory force and employees by the regular educational division of the Marketing Department.

Fifth: A representative of the Accident Prevention Department goes out with each supervisor into the inspection of his property, assists him in holding his meetings and, in general, gives the supervisor the value of his training and experience in accident and fire prevention.

Our methods of training the worker in accident prevention and providing him with instructions in safe practices may be outlined briefly as follows:

1. Due to the fact that the Marketing Department covers a wide territory, training of the worker is done principally by the supervisory force, using the program, standards and regulations provided. The manager of a group of service stations is charged with the training of his service station men. The supervisor over a group of commissioned agents and responsible for the accidents to them or caused by them is responsible for their training. A salaried agent is responsible for the training of truck drivers and others under his supervision.

2. The Accident Prevention Department trains instructors in each district, and at points where a number of employees are located, in First Aid, the use of protective equipment and other facts to be carried to employees. These instructors, in turn, carry this training to all employees of the location or district.

3. The retail marketing school carries training to every employee in retail sales, a part of which is accident and fire prevention.

4. The group manager holds a meeting of his service station managers once each month, likewise the salaried agents of their employees.

5. Accident prevention manuals are studied by employees under the direction of the supervisor.

6. Rotating employee committees meet once each two weeks and offer suggestions on hazards and unsafe practices. At these meetings accident prevention is also studied.

7. Cards are issued to drivers of vehicles for one year's record without being involved in an accident. Certificates will be issued to any supervisor's group that works one year without a disabling injury.

Group Conference

The last feature of this session was devoted to a group conference on refining and marketing problems. It was led by Mr. J. K. Coville, State Supervisor, Trade and Industrial Education, State Department of Vocational Education, A. & M. College, Stillwater, Okla. The time available for the conference was very brief, and since all discussions were extemporaneous, no record is available.

THURSDAY LUNCHEON SESSION

October 4, 1934

The chief business of this luncheon hour was the presentation of National Safety Council trophies to the winning companies in the Petroleum Section Safety Contest. Data on the achievements of the Contest were presented by Harry N. Blakeslee, Secretary, American Petroleum Institute, Dallas, Texas.

The contest extended from January 1 to June 30, 1934. One hundred seventy-eight units participated in the contest, 249,958 employees working a total of 266,570,727 man-hours. During the contest period 3,388 disabling injuries were suffered, and the average frequency rate for the contest was 12.710. Thirty units completed the contest with perfect safety records, and 96 units completed the contest with frequency rates below the average.

The National Safety Council trophies consisted of handsome bronze plaques, and these were presented to the winning companies by D. D. Fennell, Industrial Con-

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sultant, Chicago, and member of the National Safety Council Executive Committee. Mr. Fennell, with a few gracious words of appreciation and praise, awarded the trophies as follows:

Manufacturing Department Group A

Socony-Vacuum Oil Co., Inc., New York, N. Y., 1,957,616 hours, 5 injuries.

Manufacturing Department Group B

Colonial Beacon Oil Co., Inc., Everett, Mass.; 505,978 hours, no injuries.

Lincoln Oil Refining Co., Robinson, Ill.; 361,180 hours, no injuries.

Wadhams Oil Company, Milwaukee, Wis.; 214,590 hours, no injuries.

Texas Pacific Coal and Oil Co., Fort Worth, Texas; 209,352 hours, no injuries.

Pasotex Petroleum Company, Texas; 87,184 hours, no injuries.

Stanolind Oil and Gas Co., Tulsa, Okla.; 62,938 hours, no injuries.

Marketing Department Group A

Union Oil Co. of California, Los Angeles, Cal.; 4,322,073 hours, 13 injuries.

Marketing Department Group B

Texas Pacific Coal and Oil Co., Fort Worth, Texas; 854,672 hours, no injuries.

The Ohio Oil Co., Findlay, O.; 297,056 hours, no injuries.

The Derby Oil Co., Wichita, Kansas; 111,280 hours, no injuries.

Wint Franklin Petroleum Corp., Ardmore, Okla.; 110,268 hours, no injuries.

Producing Department Group A

Continental Oil Co., Ponca City, Okla.; 1,816,824 hours, 4 injuries.

Producing Department Group B

Hope Construction & Refining Co., Pittsburgh, Pa.; 347,840 hours, no injuries.

Natural Gasoline Department Group A

Union Oil Co. of California, Los Angeles, Cal.; 149,857 hours, no injuries.

Ohio Oil Co., Findlay, O.; 137,552 hours, no injuries.

Natural Gasoline Department Group B

General Petroleum Corp. of California, Los Angeles, Cal.; 128,732 hours, no injuries.

Shell Oil Co., San Francisco, Cal.; 120,110 hours, no injuries.

Hope Construction & Refining Co., Pittsburgh, Pa.; 106,950 hours, no injuries.

Lone Star Gas Co., Dallas, Texas; 66,801 hours, no injuries.

Mid-Kansas Oil & Gas Co., Tulsa, Okla.; 54,834 hours, no injuries.

Continental Oil Co., Ponca City, Okla.; 51,648 hours, no injuries.

Pipe Line Department Group A

Lone Star Gas Co., Dallas, Texas; 735,869 hours, 1 injury.

Pipe Line Department Group B

General Petroleum Corp. of California, Los Angeles, Cal.; 334,044 hours, no injuries.

Ajax Pipe Line Company, Tulsa, Okla.; 151,278 hours, no injuries.

White Eagle Oil Corp., Wichita, Kan.; 61,217 hours, no injuries.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



Power Press Section

Officers 1933-34

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W. J. GRAVES, Michigan Mutual Liability Co., Detroit, Mich.

E. J. SMITH, Western Electric Co., Chicago, Ill.

MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Power Press Section was called to order by General Chairman A. L. Kaems, Milwaukee, Wis., who presided. Mr. Kaems first introduced Mr. Lincoln R. Scafe, General Manager, Fisher Body Company of Cleveland, who welcomed the delegates in the name of the Convention City. He then presented Mr. F. J. Smith, Western Electric Company, Chicago, who, under the title heading, "Our Section—Its Past, Present and Future," gave a resume of the activities of the Section, especially dwelling upon the work of officers and chairmen of standing committees during the past year. Chairman Kaems then introduced the first speaker.

Trend of Power Press Accidents

The first feature of the program was entitled "Trend of Accidents in the Power Press Section," and was presented by J. D. Lyle, Personnel Director, Fisher Body Cleveland Division, General Motors Corp. Mr. Lyle illustrated the trend of accidents by showing a series of lantern slides depicting machinery and mechanical devices with outstanding safety features. He accompanied the slides with pertinent descriptions of the safety features. Since he spoke extemporaneously, no record is available for these Transactions.

Report of the Nominating Committee

Chairman Kaems then called for the report of the Nominating Committee and new officers for the ensuing year were nominated and elected as follows:

- General Chairman*—T. O. Meisner, American Can Co., Chicago, Ill.
Vice-Chairman—E. J. Wallman, Great Lakes Forge Co., Chicago, Ill.
Secretary—R. M. Zelder, Edison General Electric Appliance Co., Chicago, Ill.
News Letter Editor—H. C. Howsam, Hubbard Spool Co., Chicago, Ill.
Engineering Committee Chairman—Louis Boraks, Liberty Mutual Insurance Co., Boston, Mass.
Exhibit Committee Chairman—G. H. Berry, Western Electric Co., Chicago, Ill.
Health Committee Chairman—Dr. R. M. Kelly, Western Electric Co., Chicago, Ill.
Membership Committee Chairman—A. J. Holmes, Cutler-Hammer, Inc., Milwaukee, Wis.
Poster Committee Chairman—E. C. Schuites, Jr., C. Hager & Sons Hinge Manufacturing Co., St. Louis, Mo.
Program Committee Chairman—B. E. Rockhoff, Detroit Steel Products Co., Detroit, Mich.
Publicity Committee Chairman—C. E. Libby, Scintilla Magneto Co., Sidney, N. Y.
Statistics Committee Chairman—G. S. Thompson, Gnau & Company, Detroit, Mich.
Slides and Safety Kinks Committee Chairman—J. D. Lyle, Fisher Body Company of Cleveland, Cleveland, Ohio.
Members at Large—
 J. B. Gibson, Western Electric Co., Chicago, Ill.
 W. J. Graves, Michigan Mutual Liability Co., Detroit, Mich.
 J. W. Henning, Automatic Electric Co., Chicago, Ill.
 A. L. Kaems, Employers Mutual Liability Insurance Co., Wausau, Wis.
 G. A. Kuecheumeister, Dominion Forge and Stamping Co., Walkerville, Ont., Canada.
 V. G. Pendleton, West Lynn Plant, General Electric Co., West Lynn, Mass.
 S. H. Slaymaker, Fairbanks, Morse & Co., Beloit, Wis.
 E. J. Smith, Western Electric Co., Chicago, Ill.
 H. I. Vits, Aluminum Goods Manufacturing Co., Manitowoc, Wis.

Training the New Power Press Operator

By HARRY L. SAIN

Special Representative, Industrial Commission of Ohio, Columbus, O.

The speaker said in part: In the training of a new employee it seems to me that we should consider three most important factors, namely: 1. The responsibility of management; 2. the responsibility of the employment department; 3. the responsibility of the foreman.

It is apparent that in any type of an organization, whether military, religious, fraternal, industrial or commercial, the attitude of the man at the head is reflected throughout that organization. Show me a plant, and I will tell you just about the type of man you can expect to see at the head of that plant. Show me any department in that plant and I will tell you the type of foreman you can expect to see in charge of that department. In short, the employee reflects more or less his surroundings and immediate environment; and the type of foreman above him and the type of management over the entire plant will indicate pretty closely the kind of training he will receive and the kind of employee worker he will eventually become.

Now, the quickest way anyone can demonstrate that another can follow him in advantage is to be of help to him. The desire of any new employee to do well in life is as basic as life itself. The man you pick for foreman should be quick to put himself in line with this basic impulse, and the quickest way for a manager to help his foreman is for him to really prove himself a good manager.

This means, undoubtedly, that he should provide his foreman with: 1. an orderly plant; 2. proper lighting; 3. proper machinery; 4. proper materials; 5. proper instructions; and 6. proper supervision. It is unnecessary for us to go into details to indicate how these factors influence the plant spirit, emphasize safety, and help radically to train the new employee to be a good worker.

It seems to me that of all places in an industrial establishment where the "spirit of the plant" should be exemplified, it certainly should be in the employment office. For some unknown reason, however, the employment offices of the country are filled with sophisticated, self-opinionated individuals who would cause any new employee to gain a false impression of the company's sincerity. All one should expect of the new employee under such circumstances would be antagonism to his foreman and unlimited trouble upon the least provocation. In many cases the perversity of the workers and many labor troubles have arisen out of the discourteous treatment received in the employment department. The spirit of the plant is such a vital subject that I hope all of our industrial managers will realize what mighty things can be done by spirit and how little can be done without it.

Teaching in a certain sense is done in the hope that we can develop the new employee's mental equipment, teach him to understand the management's attitude on safety, on the use of mechanical guards, the necessity of reporting all minor injuries at once, and the right way of performing the operation because the right way is always the efficient and the safe way.

Then, after he has the right way of doing the work firmly embedded in his mind, he naturally forms a habit which in my mind is developed by constant training or repetition. After all, don't we all do things because of habitual performances, learned responses, acquired reflexes—habits—otherwise the allotted time we have each day to do our work would not suffice.

I wonder how you stack up on this question. "How do you get along with other people?" There are some general signs that will give us the answer. Here is one and I think it is almost infallible. "If there are a few people whom you cannot get along well with, maybe it is their fault; but if there are many people whom you cannot work well with, it is always your fault."

I know safety engineers and foremen who are outstanding as to their knowledge of machinery, tools and equipment; they seem to have a perfect knowledge of all the modern safety appliances, and they can design and make a safety device to take care of almost every hazard. Still, in their plants, they have a very poor safety record.

Your value to your company is measured almost entirely by the amount of safety you accomplish. You may have some splendid ideas, but as long as you are unable to sell them to the employee they do not amount to much. The following six things, I find, keep a foreman from selling his ideas or knowledge to others: 1. A nasty disposition. 2. Talking too much. 3. Finding fault. 4. Egotism. 5. The wrong job. 6. Laziness. My experience has proved to me that many of our safety directors and executives are past masters on several of the things mentioned here.

How, then, can foremen best approach this problem of training the new employee? I am sure we must first consider our relations to those about us. We might say our industrial relations, for industrial relations are just simple human relations in the plant.

Every foreman should ask himself these two questions: 1. "Is my department a place where people like to work?" 2. "What does my department mean to my men aside from the pay envelope?"

How many times have you been a guest at some party, everything perfectly appointed, all set for a good time, but which fell flat because one or two people were disagreeable? Again, perhaps you were in the woods in an old shack, no conveniences, and yet you had a wonderful time because everybody around you was agreeable.

This may explain to us a good deal how the new employee feels when he comes into your department. You can set this down as a positive fact that unless the atmosphere of agreeableness is in your department, men are not going to want to be there, and the first element necessary for good work has been destroyed.

The foreman must treat all with whom he comes in contact in an agreeable manner. A mood or attitude is handed down through an organization just like a production order—sometimes more speedily. Of all arts involved in human behavior or in making the new employee feel that someone is interested in him, agreeableness ranks among the highest, and yet, because of a confusion of ideas regarding it, we rarely find it in our workshops.

Why are so few foremen thoroughly agreeable? The answer is probably found in the fact that so many of them think that if they are agreeable they will show themselves weak and wabby and if they are disagreeable and haughty they show their strength.

You will find that in the training of the new employee, agreeableness is one of the fine arts and must be practiced by all. It must become an actual policy of the plant. Any foreman who gives this fundamental sufficient thought must come to the conclusion that agreeableness is one of the most constructive forces that can be set to work in his department, and that disagreeableness is one of the most destructive forces that can be found anywhere and represents one of the greatest wastes in industry. The psychology by which people are being moved to do the things we want them to do is becoming such a common property that it is reasonable to conclude that this knowledge will be used in countless activities of life, including the training of the new employee.

Handling and Piling Sheet Metal

By G. S. THOMPSON

Gnau & Company, Detroit, Mich.

The speaker said in part: After contacting some twenty manufacturing concerns, I find that there are few, if any, standard methods of handling and piling sheet metal. I do find, however, many excellent suggestions; and it is fair to assume that if a method has for a period of years been productive of no accidents, while other methods have an accident record, then the method with a clear record is at least worthy of consideration.

I do not want to be misunderstood, as I do believe an effort has been made by many concerns to reduce the hazards of handling and piling sheet metal as much as possible. Let me pay tribute at this time to a paper by Mr. Ditman of the Westinghouse Manufacturing Co., of Pittsburgh, who made an address before this

body some years ago. In his plant they even protect the corners of the stacks with an angle iron guard which prevents those nasty lacerations, caused by striking the hands against the uneven edges of the stacks, when men are passing down the aisles.

What, briefly, are some of the fundamentals to consider? First, we must have space because I find material stored everywhere. Why? Well, as you know, the old order of things is all changed. It used to be common practice for the manufacturer to order 25 or 50,000 tons of sheet metal and release as needed, now the steel mill does not care to "hold the bag," and if the manufacturer is to get the price he must also take the stock when it is finished by the mill, which means he must in the future provide the space required to store this material when it is received.

Second, we must have equipment for handling this stock, and it must be by crane, or some sort of hoist, with the required fittings, such as chains, cables, frames, etc.

But our troubles have only begun, as we must not only provide space and equipment, we must also sub-divide our material, for if we are to have uniformity of methods, we cannot afford to have equipment for one size of stock and not for another; we must provide for stock received in bundles, which is shop practice in the steel mill; also we must again sub-divide, as we find some bundles are fitted with skids and some are not; then again, we enter into difficulties as some stock is narrow and some is wide, some is long and some is short. Then our problem is also made more difficult because we must handle narrow stock put up in bundles.

I have arbitrarily set up the following division: 30 inches or less we will call narrow—32 inches or more we will call wide.

Space should be light, with even floor and lots of both. A good concrete floor is preferred. Hardwood over concrete is good but not as good as reinforced concrete.

As for equipment, overhead crane is best. We can use a hoist and tram car, or if we must a factory tractor or highlow. But to my mind, a most important factor is the appliance used for contacting the load. I have divided these into three types, namely:

Rigid—which means frames and lazy hinges.

Semi-rigid—beam and hooks which are commonly used in steel mills.

Flexible—chains—cables—straps or a combination of both.

It has been found that all of these have failed at some time or another, so I present what in my mind is a happy medium, and that is chains for unloading from box car or gondola, and a combination of a hook with a spreader bar and chains for handling loose sheets.

I have found that while cables, both single and braided, have their place and are made for their purpose, the severe bend that is ever present and the strain imparted at the corner of the bundle is conducive to crystallization of the strands in the cable and failure is bound to occur. Recently a steel merchant who used cable slings was stacking some material and swung a lift to make the top of the pile. The cable slings failed, the bundle struck the top of the pile and the material slid, taking out the rear of the building, crossed an alley, cutting out the foundation wall of a dwelling across the alley, and it cost over \$8,000 to repair the property damage that ensued.

In using chains, the links provide a hinge action, the rod from which the link is made is heat treated and made to stand severe usage, so I can feel more security and safety in using them; also, as we are handling a compact body or steel sheets, if we use ordinary precautions in the application of our load, we will have a reasonable factor of safety.

Inasmuch as there are no real standards of height established, I suggest that bundles be stacked if skidded 4 bundles high, assuming that the bundles are at least 24 inches high over all; if they are not skidded and are approximately 24 inches high, 5 bundles would be safe. This does not apply, however, to loose sheets, particularly if they are oiled sheets, as this material so treated presents an entirely different hazard, and one that must be handled in a different manner.

Now, we must consider aisles, spacing and cross spacing. These are also problems for our consideration. We must bear in mind that we are going to put this material into production and these bundles are going to be opened, not on the

ground, but up on top of the stack, and we must provide a safe amount of space for men to operate in. Hence, we will provide not less than four foot main aisles with three foot intercepting aisles or back aisles. This will give the man a chance to work freely, and also to get away from a falling stack if this should occur. Solid stacking it to be looked upon with disfavor and should be avoided if at all possible.

What, then, are we going to do with open bundles and loose stock? I suggest that these be stacked with spacer bars for every 12 inches of height. These spacers to be placed one in the center and one for every three feet of sheet measuring from the center and the piles or stacks to be not over four feet high.

If stacks are made secure, men will be more efficient, as it makes the work easier. Also, if we use the chains and hooks with a spreader bar, spaced stacks are very easy to get at and move not only full bundles but also any part of a bundle.

When transporting loose sheets on truck or trailer, please chain them to the body of the vehicle; log chains are cheap, much cheaper than broken legs and lacerated feet and hands.

TUESDAY MORNING SESSION

October 2, 1934

Joint Session with Automotive and Machine Shop Section

Methods Other than Commercial Safety Devices for Preventing Power Press Accidents

By R. A. SHAW

Safety Supervisor, The Murray Corp. of America, Detroit

The speaker said in part: I suggested this subject to our Program Committee for the simple reason that it is easy to obtain a good no-accident record when power presses are supplied with all possible safety devices; but during the past few years many of our companies and corporations have not been able to appropriate the usual amount for safety devices, due to a falling off in dividends. If a good no-accident record is to be obtained, therefore, the immediate problem before the Safety Engineer is how?

Let me first cite some of the experiences of The Murray Corporation of America in its accident prevention work. Our corporation's activities include general stamping operations, auto body building and manufacturing of beer barrels; also the work of a large rough and finish wood mill in Memphis, Tenn. We also operate an auto frame stamping plant at Ecorse, Michigan, and another factory manufacturing seat springs. A heavy loss in fingers was noted in 1929. This was reduced by 50 per cent in 1930, and in the next year the 1930 experience was reduced by 74 per cent. Still another reduction of 30 per cent was accomplished the following year. However, last year, 1933, our finger accidents increased three times the number of the previous year, due possibly to the necessity of putting inexperienced men on punch presses, and working three shifts.

There are several important factors that have to do with the prevention of such accidents. First, safety designing on all prints of dies should indicate the proper clearance at the sides and especially near the guide pins. It should show the casting edges rounded off instead of the usual sharp square corner. Chain slots should also be drawn in and holes in corner lugs directly over the guide pin section into which the leather guards are installed.

The second important phase of this activity is the educational. I refer to Safety Committee Reports on hazards about the machines; also warning cards hung on each press, with framed instructions on safe operation placed directly in front of the operators as a constant reminder. Such educational features also have their psychological effect.

On all large presses where groups of three or four are employed the operator is made responsible for the safety of the group. In our plant we also make a cash payment each month to those who produce the best improvement on the die which will assist in removing the work from the die and thus eliminate the necessity of putting hands between the dies. Our Safe Housekeeping Charts and the publicity given to our Safety Contest help materially in keeping safety constantly before the minds of our employees.

The last factor is the mechanical, and has to do with all mechanical additions. There is a certain standard position for all hand levers so that they may be reached quickly in case of emergency. Guards over foot levers, the use of pliers and tweezers, a safety block chained to each press, installation of leather low bridges attached to each corner of the die about the guide pins, are all suggested features.

In our plant on each press we have an instruction card outlining definite rules for safety operation, and the operator and helper are expected to follow these rules closely. The card is enclosed in a metal frame attached to each press, and on the large presses the card is placed on both front and rear, where all operators can constantly see it. In other words, instead of safe operation rules being carried in the workman's pocket, they are placed in a position where he will be constantly reminded of safety.

I remember reading the opinion of a certain editor who stated that safety education is sometimes thought by management to be cheaper than mechanical safeguarding. He says that in the end it will be less expensive to install safeguards. When joining our corporation some five years ago, \$10,000 was appropriated for safeguarding, and instead of devices for power presses only, we provided guards for open gears, conveyors, pulleys, etc. I can testify from experience that it is a gigantic problem to keep the educational plan effective and also a big job to keep the safety devices added to the power presses in proper working order, especially in these days of reduced budgets. I am of the opinion that the greatest results can be obtained in safety by not using *hurry-up* methods; instead, it is quite possible to *speed up* both production and efficiency by showing the operator how to eliminate useless and wasteful motions. This, you will find, is a very opportune subject for time study, as well as for foremen and superintendents.

I am still a firm believer that our machinery and especially our power press manufacturers should so design their presses that all the safety features will be incorporated when designed. Building greater safety into the machine will become increasingly more important as time goes on.

Supervision and its Relation to Accidents

By A. D. BYLER

Vice President and General Manager, Edison General Electric Appliance Co., Chicago

The speaker said in part: Perhaps an approach to the underlying causes of accidents may be made by giving thought to the attitude of mind of the worker, varying from alert to inert, and from attentive to thoughtless; from an active interest in what he is doing to a dreamy reverie; from last night's party to tomorrow's installment on the family debt; from an aching corn to an itchy nose; from the hope of a raise to the fear of the loss of his job.

Hopes, fears, likes and dislikes, hatreds, jealousies, envies, ambitions, sense of duty and loyalty, all struggle for a place in his mind.

Someone has aptly said that the best safety device is a careful man—but how can we have careful men?

Let us grant at the outset that a shop is equipped with all reasonable safety devices. You must still deal with the human factor, the same weaknesses which cause bath tub, cellar stair, and step ladder accidents—worries, absent-mindedness, lack of judgment, awkwardness or what-have-you.

Supervision cannot rectify all the inherent human faults which lead to accidents but supervision can and should foresee their possible culmination when certain courses are followed. Supervision can educate by precept and example, by kind

words of caution and, to a marked extent, by suggestions of which the worker may not be wholly conscious.

In the South we have heard the negroes singing at their work and by the very rhythm of the song knew just when the hoe was raised and when it struck the ground. This developed an automatic movement of bodies and muscles which, though possibly not efficient, was at least of such uniformity as to be wholly dependable—thus the minds and muscles were coordinated.

The singing mind is usually a happy mind imparting to the muscles a rhythm free from such nervous twitches and spasms as are often disastrous. The foreman who can help his worker to create and maintain a happy mind has made his first major step in creating that best of all safety devices—a careful man. Let us, then, consider the attributes of supervision by which conscious or sub-conscious safety mindedness may be imparted to the worker.

THURSDAY MORNING SESSION

October 4, 1934

Safety in Forge Shop Operations

By E. J. WALLMAN

Safety Engineer, Great Lakes Forge Company, Chicago

The speaker said in part: In analyzing the injuries at our plant, we found the following general causes of accidents.

Handling objects and steel, 35 per cent; machinery, 20 per cent; flying objects, 11 per cent; heat, 11 per cent; falling objects (other than machinery), 9 per cent; falls from tripping, 8 per cent; and miscellaneous, 8 per cent. These figures include all cases, both lost-time and no lost-time.

In considering safety for all types of hammers, the following seven rules should be followed:

1. Goggles should be worn by everyone in the forge shop.
 2. Treadle guards.
 3. Scale blowers and oil swabs.
 4. Scale guards in back of hammers to catch all flying pieces.
 5. Blocking for hammers when changing or repairing dies.
 6. Proper tools should be supplied, so that the operator's hands need at no time be placed under the ram.
 7. Screens above hammerman's head to protect against falling material.
- Every steam or air hammer should have a sufficient steam or air cushion or an equally effective spring head to prevent the piston from striking the top cylinder head. This is necessary in case of rod breakage or should rod leave ram. Power control valve should be placed in a position so that power can be turned off at once should something go wrong with the valve.

All board drop hammers should be equipped with the following guards:

1. A substantial board guard attached to machine or better still to building above the hammer.
2. Covering to prevent man from putting hand in between rolls.
3. Means should be provided so that if front rod clamp adjusting or friction adjusting rod on rear of hammer should break, they will not fall to the floor.
4. Hammer treadles should be guarded so that they cannot be accidentally tripped.
5. An expanded metal screen should be overhead to prevent operators from being struck with falling parts.
6. A scale guard should be in proper position at all times, when hammer is operating. Board hammers need constant attention and inspection. Operators must be instructed not to run the hammers unless they themselves have personally inspected such parts as roll releasing lever, clamps, tie rods, boards, keys in dies, etc. Hammers and guides should both be warmed up in cold weather to prevent breakage.

Besides the operator's inspection, regular inspectors should be detailed to inspect

each operating hammer not less than twice daily to insure proper working condition, because the constant vibration will loosen the bolts, screws, keys, and general operating mechanism.

The work is heavy and hot and care must be taken when plant is laid out that proper spacing of machines is observed, and placing of furnaces is also important. Buildings should be so constructed as to afford the best possible natural lighting and ventilation.

Heat exhaustion is one cause of accidents in the forge shop, and natural ventilation should be augmented by other suitable means to keep the air in motion about the workmen in extremely warm weather. At such times workmen should also be supplied with 10-grain sodium chloride tablets; six tablets should be taken during an eight-hour shift.

Fatigue is another contributing factor toward accidents. Much can be done in eliminating fatigue by proper spacing of machines, proper equipment with which to set dies, and air tools to tighten dies in ram and sowl block. Do not have hammer crews make any repairs whatsoever during the operating time.

Since the work is dirty and greasy, clean and well-ventilated lockers and shower rooms should be provided, and each forge shop employee should take a brisk, hot and cold shower and change all clothing after each shift. Shower and locker rooms must be kept separate from toilet rooms. Both places need constant policing, and inside of lockers should be cleaned not less than once a month with an exterminating solution.

Heavy and Light Press Operations

By G. F. OLIVER

G. F. Oliver, Factory Manager, J. W. Murray Mfg. Co. Division, The Murray Corp. of America, Ecorse, Mich.

The speaker said in part: Press operations in the majority of cases, are like the fellow who tries to beat the train to the crossing. If the train and the man arrive simultaneously it is just too bad for the man. If the punch and the operator's hand arrive at the die at the same time, it is also just too bad and maybe it is the loss of a couple of fingers or a hand.

Of the smaller types of presses, a number of safety devices are on the market and do in a great many ways prevent the operator from getting caught; but on the larger crank presses, single and double crank, there is not, to my knowledge, a satisfactory device yet devised that will protect the operator 100 per cent from getting hurt if he tries to beat the train.

One of the simplest safety devices, one of the least expensive, one that accomplishes the most, and one that really starts the ball to rolling in a safety campaign is a good housekeeping drive. But when we start a safety campaign, I wonder how many of us start from scratch? Putting on a safety drive and starting from scratch is none other than first putting your own house in order.

To illustrate my point, I will tell you about a safety and housekeeping drive—not a contest—but a real cleanup campaign, that we started and finished last spring or early summer.

One of our press rooms is 650 feet long and 60 feet wide and has a crane way the full length. We fabricate mostly hot rolled steel and do our own pickling of materials. The steel yard is on the far end of the press room. The material is brought in from the steel yard, goes through our pickling room and finally lands in the far end of the press room. Bringing the material from the steel yard to pickle room and then to the press room is all handled by electric cranes.

Early last summer several hundred dies were shipped to us and we had to fabricate about a hundred or more different parts that had anywhere from four to twenty-four operations. The runs were small, which necessitated considerable die setting or die changing. Heavy demands were placed upon us and we were obliged to run three shifts. Handling the material soon became a problem. Crane service was holding up production—we couldn't get through with electric trucks—our costs began to mount, the operators' wages began to drop.

Late one night I located our superintendent behind a pile of stamping, and I said: "Ed, the first thing tomorrow morning I want you to line George up and I want an eight-foot aisle-way the whole length of this press room. I want you to cut some strips three inches wide by 3/4 inch thick. Mark out the aisle and fasten these strips to the floor and paint the strips bright orange. Move all those small presses out of the center. Move the racks back, move those wiring machines around parallel to the crane way. I want it all done in the next forty-eight hours."

"Why," Ed said, "do you realize that to take eight feet by 650 feet out of this press room you are taking out over 5,000 square feet? Where will I put all this material?"

However, within the next forty-eight hours Ed had carried out my instructions, and, to make a long story short, here is what happened. Our operating costs started to go down, and our men's earnings went up. We cut off one night shift. Our minor accidents were less and everybody was happy. And the thing that pleased me most was this. Ed came to me one day shortly afterwards and said: "Do you know that we have more room than we had before. And the way we have things lined up now, it is a much safer place to work for the men and for myself."

That's fine, I told him. Now let's see what we can find to make it a still safer place to work. We put up signs on the presses, put our safety notices up in more conspicuous places. The spirit seemed to take hold of everyone. We stressed the point that the change was being made to make our plant a safe place to work in. We painted all of our electric trucks bright orange. A few weeks ago I had our company photographer down and had him take a picture of the press room. We placed that up on the bulletin board and attached the following notice below it:

This is a picture of our press room.
The view was taken from the layout department.
Notice how far you can see, way out to the steel yard.
The distance is nearly 700 feet.
Notice how clear the aisle is shown.
Notice how clean and orderly everything is.
It is a pleasure to work in a plant where the whole spirit
is for GOOD HOUSEKEEPING.
It makes for a safer place to work.
Let's keep this plant looking just like this all the time.
Notice no one in the aisle, although this picture was taken
during working hours.
It is evident that everyone was at his position.
Keep your position clean and in order.
The aisles are marked by steel lines—as you know—
Therefore Boys—

"HOLD THAT LINE"

This whole safety business isn't altogether a lot of talk, meetings, papers and posters, but it is a job you must tackle with the spirit that something must be done. And then go and do it.

The first thing is a general cleanup, remove persons if necessary, and clean up thoroughly. After this is done you will be surprised how much interest will be shown throughout your organization. Previous to this cleanup in our plant, we thought for the class of work we did we had a pretty nice place.

Everybody must work in unison. Education to safety needs criticism. Or else we all get in a rut and the first thing we know we are greeted by untidy appearances. From untidy appearances, we have real obstacles and then accidents. We must invite criticism. We are all searching for a way out of accidents. We need the vision and suggestions of all employees from the president down to the sweeper. It is the problem of all and not the problem of just one person—the safety engineer.

Now, the pieces that our men handle in and out of the dies weigh all the way from a few ounces to 150 pounds each. The handling of the light pieces is very similar to the handling of all small stampings. The parts or pieces are brought to the press in steel barrels or steel boxes by hand or electric trucks. Placed in a

position adjacent to the press so that the man has sufficient room in which to work and at the same time does not have to reach too far.

The handling of the larger pieces is somewhat different. The heaviest pieces, such as blanks for a truck frame side members, weigh approximately 150 pounds each, are stacked up either at the end of the press or in front and are slid into the die and likewise are slid out after being formed, etc. This stacking is a very important job. As the sheets of steel or blanks are oily, and if not stacked evenly, are liable to slide and cause serious injury.

On our largest size presses, 2500 ton, we employ a man who does nothing else but operate the clutch that starts and stops the press. On these larger presses it usually requires from five to seven men to feed the blanks into the die and remove the formed members. After the members are formed they are placed into steel racks. These racks hold about 75 formed members. Materials and racks weigh better than 5 tons. This load is then transferred to a storage place. The racks are designed so they will stack one above the other, four high.

In the handling of all heavy material where an overhead crane is necessary we employ a man we call a hooker-on. His duties are to direct the crane operator from the floor. He sees to it that the material to be picked up has the proper sling around it, directs the crane operator to where the material is to be placed. In fact, the hooker-on is really a traffic man. All lifts made by the overhead crane are moved up and down this eight-foot aisle way. The hooker-on has a whistle and the crane operator has a siren.

One safety advantage in having a wide aisle-way in a large press room is, you can transfer all heavy objects from one end of the room to the other and only lift the object a few feet off the floor; you are not carrying anything over the heads of your workers. The men like this because they feel safer. It is that feeling of safety that makes for safety. Let me repeat that. It is that feeling of safety that makes for safety. When you feel safe you are safe.

The pieces which weigh anywhere from seven to 37 pounds are handled from press to press on metal chutes. The material is placed at the die at the front of the press and removed from the die at the back of the press and is placed on a metal lined chute which is built higher on one end and with a slight push the piece slides down the chute to the next press. At the last operation the formed pieces are trucked away to storage or to the assembly lines. We also transport considerable material from the press room that is directly from the presses to the assembly room or storage by overhead conveyors.

In setting dies, the smaller dies are brought to the smaller presses on high lift electric trucks, but the larger dies are handled to and from the presses by the overhead cranes. This is a dangerous operation but can be made safe if the proper equipment is used.

In setting these larger dies, the press being empty, a steel horse is placed in front of the press, same height as the bolster or bed. The crane brings the die to the press and the die is lowered until it rests one end on the horse and the other end on the bed of the press. Press beds are usually wider than the ram, thereby forming a ledge.

Two slings are around the die to bring it to the press after the die is placed one end on the horse and the other end on the bed of the press, the two slings (which, by the way, are chains) are slipped to the outer end of the die. The hooker-on or the die setter then signals to the crane operator and a slight lift is made causing the die to be lifted off the horse. The steel horse is then moved out of the way. Then the die setter and helper and perhaps the hooker-on together push the die into the press until over three-fourths of its length is resting over the press bed. The die is lowered and the slings or chains are removed. The swinging around of the die to its proper location in the press is left to the die setters. They accomplish this with steel bars.

ADJOURNMENT

· TWENTY-THIRD ANNUAL SAFETY CONGRESS
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TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Public Utilities Section was called to order by General Chairman F. M. Pepper, Illinois Bell Telephone Company, Chicago, who presided. Chairman Pepper gave a brief resume of the activities of the Section during the past year, dwelling upon the work done by officers and standing committees, which he praised highly. He then introduced Charles E. Henderson, Public Relations Department, Ohio Gas Company, who welcomed the delegates on behalf of the Convention city. Chairman Pepper then introduced the first speaker.

Electric Shock

By W. B. KOUWENHOVEN

Professor of Electrical Engineering, The Johns Hopkins University,
 Baltimore, Maryland

The speaker said in part: The number of accidents due to electricity is apparently increasing and this is particularly true of those caused by contact with low voltage circuits. MacLachlan, in 1930, and again in 1934, published excellent summaries of cases of electric shock. His results show that accidents reach their peak in the summer months, and that the current path through the body is usually from the right hand to the feet.

In every case of electric shock there are certain factors that influence the resulting injury. These are the type of circuit, its voltage, current and resistance, the points of contact with the circuit and the duration of the shock.

In a series of experimental studies carried out at the Johns Hopkins University, in which the author was associated with Dr. O. R. Langworthy of the School of Medicine, and Dr. D. R. Hooker of the School of Hygiene, three types of circuits have been used: namely, continuous or direct current circuits, alternating currents of commercial frequencies, and the discharge of an impulse or surge generator. Constant voltage circuits were used wherever possible because they are the ones found in both industry and the home.

The individual is subjected to less chance of injury in making contact with a 110 volt direct current circuit than with an alternating current one of the same voltage. In fact the speaker has only been able to learn of one authentic case of death on a 120 volt direct current circuit. In this instance a man was working inside of a Scotch marine boiler at a temperature of 112 degrees F. He had with him a defective portable light supplied from a 120 volt direct current circuit. In Italy there is on record a case of a man who was electrocuted on a 46 volt alternating current circuit. Experiments using 110-220 volt alternating and direct current circuits on rats gave similar findings.

At higher voltages, 1,000 volts or over, the direct current shocks produce greater injury than the alternating current ones, particularly if the brain or nerve centers lie in the path of the current. A comparison of the two commercial frequencies shows

that the 25 cycle circuit has less effect upon the heart than circuits of 50 or 60 cycles.

Most of the resistance that the human body offers to the flow of electricity lies in the contacts with the skin. When the skin is dry the contact resistance is very high; when the skin is thoroughly wet the resistance drops. Once the current penetrates the skin the resistance of the body is relatively low. The fluids are the best conductors. Bone, however, has a high resistance and does not conduct current readily. Another factor not always recognized is that the resistance of the body varies with the size of the animal. The larger the animal the smaller the resistance that it offers to the flow of electric current.

The sensitivity of persons to electricity varies greatly, some being able to detect a current of less than 1 milliamperes, others require three or four times that amount to produce sensation. A current of 12 to 15 milliamperes through the hands and arms will stiffen the muscles; however, the subject can still release his hold. An increase of the current to 19 or 25 milliamperes will produce a complete tetanus of the muscles and the individual can no longer clear himself from the circuit. A 60 cycle current of one-tenth of an ampere flowing from the hands to the feet will probably result in the death of the individual.

The current, however, is not the only factor; the path of its flow through the body, the current density, and the duration of the contact are also of great importance. A fat individual can carry a greater current without injury than a thin person. Although a small current may cause death, it is not safe to conclude that a much larger current of several amperes will make death more certain. The effect of the current upon the heart depends to a large extent upon its value.

The position of the points of contact with the circuit determines largely the pathway of the current through the body and the resulting injury. Once inside the body, the current spreads out in a more or less uniform shape, assuming uniform resistance of the tissues.

A number of experiments were made with rats to determine the resulting injury for various current paths through the body. The circuit voltage was 1,000 volts and no animal recovered when the brain was included in the circuit. When the brain contact was removed to one fore-leg 42 per cent of the animals recovered. With the contacts on both fore-legs no animal survived, but when the contacts were placed on the hind-legs 86 per cent recovered immediately.

This series of experiments demonstrated clearly that the injury is less severe when the path of the current does not involve nerve structures and vital organs.

In industrial accidents the current usually flows from the right hand to the feet, and it is scarcely possible that any appreciable amount of current passes through the brain. Both the heart and the lungs, however, lie in the path. A series of experiments were carried out to determine the amount of current that passed through the heart for various current paths, the dog being chosen as the experimental animal. It was found that when the current flows parallel to the axis of the body approximately ten per cent passed through the heart. When the current path was from fore-leg to fore-leg, that is transversely through the thorax, approximately three per cent passed through the heart. When the current path was from hind-leg to hind-leg, no current could be detected flowing through the heart.

In general, the longer the time that a man makes contact with a circuit, the less is his chance of recovery. Fortunately, high voltage circuits usually throw the victim clear and the duration of the contact is very short. On the other hand, in the case of low voltage accidents, the victim often cannot release his hold. In such cases the current may flow for a considerable period of time. Artificial respiration should be started promptly; as the greater the time that elapses, the less is the chance of a successful recovery.

In accidents where contacts are made at two points on the same leg or arm, none of the current flows through the brain. Such shocks, however, give rise to nerve stimuli which are transmitted to the brain. When these are very strong they may produce a condition of shock to the nervous system akin to that caused by severe major operations or injuries.

Ureghart has demonstrated clearly that the passage of an electric current through the body may cause a block in the nervous system and inhibit respiration. If artificial respiration is promptly applied and continued for a sufficient time, the respiratory

centers may recover their functions and set the lungs again in normal operation. Our experiments confirmed these results, and also emphasized the fact that an animal is not out of danger when breathing is first started. In many cases it ceased after a few breaths and artificial respiration had to be applied a second time. In some cases repeated applications of artificial respiration were needed to save the animals.

A few of the injuries that resulted from the electric shock experiments are discussed briefly below:

In a number of the animals hemorrhages were found in the medulla oblongata and in the fourth ventricle of the brain. Similar hemorrhages are found in cases of electrocution. Also in many of the animals, bleeding following the shock was observed in the eyes due to the rupture of blood vessels in the conjunctiva, and in a few cases when artificial respiration was started there appeared some blood and frothy liquid at the nose or mouth of the animal.

Priapism was noted in many of the male rats shocked with the high voltage direct current circuit and also in some of the alternating current tests. Emissions were very common among the males subjected to the alternating current. It was found not only at the higher voltages, but occurred in about one-fourth of the males subjected to a two-second shock at 15 volts 60 cycles alternating current.

In only rare cases do individuals who have recovered from an electric shock show any evidence of a permanent disability. Extensive burns may require a long time to heal and nerve ends caught in the scar tissue may cause a lasting irritation. Cataracts of the eyes are reported in a few instances. This latter phenomenon was noted in only one of our experimental cases. Some individuals are nervous for a considerable time. However, it is difficult to say just how much of this is due to actual nerve cell damage and how much should be ascribed to a wish for compensation.

In electrocutions and also in accidental cases of electric shock, the fact has been definitely established that the human heart may be thrown into ventricular fibrillation. The human heart seldom recovers automatically from this state, and death ensues. Some observers of electric accidents believe that the majority of deaths are caused by this type of injury.

A weak current will throw the heart into ventricular fibrillation, while a large current will inhibit the action of the heart and hold it quiet as long as the current flows. Several observations were made with the thorax of the animal open and the heart exposed. Electrodes were applied directly to the heart and it was found that a current of seven to ten milliamperes was sufficient to produce fibrillation of the ventricles; while a current of approximately one ampere would bring the ventricles to rest and that the heart would resume normal beating when this circuit was broken. This latter current has been called the "counter shock" current.

A number of experiments were made using intact animals whose hearts were first thrown into ventricular fibrillation by the application of a 110 volt alternating current shock. After waiting the desired length of time a countershock of 6 to 7 amperes was given by means of electrodes on opposite sides of the chest. The duration of the countershock was approximately one second. Following the countershock the ventricles were quiescent for a brief period. Then contractions began, feeble at first but quickly increasing in vigor and the circulation was re-established if fibrillation had not continued too long.

It is well known that the heart and respiratory center in the medulla are particularly susceptible to injury from electric currents. It is evident from the report of electrical accidents and our experimental studies that death may occur from a number of causes. Death by asphyxiation may be caused by the prolonged contraction of the muscles during the passage of the current or by the failure to start artificial respiration promptly. Another cause is the fibrillation of the ventricles of the heart, as under this condition the circulation ceases. Death may be due to the destruction of nerve cells of the respiratory center incompatible to life. The Joule effect of the current flow may raise the body temperature to a value above the safe limits. Burns and other complications may also result in death. Nevertheless it should always be kept in mind that in the majority of electrical accidents death is often only apparent. Artificial respiration should be started immediately after the victim is cleared from the circuit, and it should be continued either until the patient recovers or until the cessation of life is an actuality as evidenced by the onset of rigor mortis.

The next program feature was a paper by Dr. William P. Yant, Supervising Engineer, Pittsburgh Experimental Station, U. S. Bureau of Mines, Pittsburgh, in which he discussed "Poisonous Gases and Their Effect." Dr. Yant spoke extemporaneously, and there is therefore no record of his talk available for these Transactions.

Report of the Nominating Committee

Chairman Pepper at this point called for the Report of the Nominating Committee and new officers for the ensuing year were nominated and elected as follows:

General Chairman—E. J. Kreh, Philadelphia Company, Pittsburgh, Pa.

Vice Chairman for Telephone and Telegraph Interests and Program—D. W. Wait, The Bell Telephone Co. of Pennsylvania, Pittsburgh, Pa.

Vice Chairman for Gas Interests—John J. Barada, Laclede Gas Light Co., St. Louis, Mo.

Vice Chairman for Electric Interests—Roy M. Godwin, Philadelphia Electric Co., Philadelphia, Pa.

Secretary—H. W. Lueck, Commonwealth Edison Co., Chicago, Ill.

News Letter Editor—E. P. Durice, Hamlin & Company, New York, N. Y.

Engineering Committee Chairman—W. H. Mulligan, Hydro-Electric Power Commission of Ontario, Toronto, Ont., Can.

Health Committee Chairman—Dr. Hart E. Fisher, Chicago Rapid Transit Co., Chicago, Ill.

Membership Committee Chairman—W. H. Brown, Northern States Power Co., Minneapolis, Minn.

Poster and Film Strip Committee Chairman—H. E. Shedd, Appalachian Electric Power Co., Bluefield, W. Va.

Publicity Committee Chairman—Ray A. Edwards, San Diego Consolidated Gas and Electric Co., San Diego, Calif.

Statistics and Contest Committee Chairman—C. H. Dinsmore, Wisconsin Power & Light Co., Madison, Wis.

Special Representatives:

W. A. Buchanan, Appalachian Electric Power Co., Welch, W. Va. (E. E. I.)

W. G. Clevenger, Northern Indiana Public Service Co., Hammond, Ind.

A. A. Klinge, Public Service Co. of Colorado, Denver, Colo.

H. A. Ptolemy, Public Service Co. of Northern Illinois, Chicago, Ill.

C. L. Hightower, United Gas Co., Houston, Texas

Councillors:

E. S. Beaumont, The Peoples Gas Light & Coke Co., Chicago, Ill.

C. B. Boulet, Wisconsin Public Service Corp., Milwaukee, Wis.

B. B. McCulloch, Bureau of Safety, Chicago, Ill.

F. M. Pepper, Illinois Bell Telephone Co., Chicago, Ill.

H. F. Webb, West Penn Electric Co., Pittsburgh, Pa.

H. M. Webber, Illinois Bell Telephone Co., Chicago, Ill.

THURSDAY MORNING SESSION

October 4, 1934

General Chairman F. M. Pepper, opened the session with some brief remarks on the general subject "What Lies Ahead." He described briefly something of the progress that has been made in the safety movement during recent years, and basing his ideas upon this progress, anticipated a much more rapid advance for all accident prevention effort in the near future.

Behind the Scenes

(Dramatized)

This very novel feature was introduced by the General Chairman with a statement that it was planned to take the place of the usual general discussion on types of accidents, their causes and remedies. It was really a playlet, participated in by numerous members of the Section, who were introduced in groups over "The Loud Speaker," as they were apparently overheard discussing matters of mutual interest in their hotel rooms. The inference to be drawn was that during the conference many delegates loitered in their rooms and hotel corridors to talk over many matters of real safety interest that should have been brought to the sessions and discussed there for the benefit of all delegates.

This "Behind the Scenes" playlet, therefore, was frequently humorous in character, and presented a highly typical group of the accidents that are common in many plants. The playlet had been written by H. F. Webb, of the West Penn Electric Company, Pittsburgh, Pa., in collaboration with E. J. Kreh, the Philadelphia Company, Philadelphia, and D. W. Wait, Bell Telephone Company of Pennsylvania, Pittsburgh, Pa.

The various sketches in dialogue were presented through the cooperation of the following delegates:

John J. Barada, Laclede Light Company, St. Louis, Mo.
H. F. Webb, West Penn Electric Company, Pittsburgh, Pa.
Paul R. Kuhn, Pennsylvania Central Light & Power Company, Altoona, Pa.
Roy W. Godwin, Philadelphia Electric Company, Philadelphia.
R. P. Buchman, The Ohio Bell Telephone Company, Cleveland.
L. E. Ostrye, Peoples Natural Gas Company, Pittsburgh, Pa.
C. B. Boulet, Wisconsin Public Service Company, Milwaukee, Wis.
W. A. Buchanan, Appalachian Electric Power Company, Welch, W. Va.
J. F. McCabe, Duquesne Light Company, Pittsburgh, Pa.
D. W. Wait, Bell Telephone Company of Pennsylvania, Pittsburgh, Pa.
H. M. Weber, Illinois Bell Telephone Company, Chicago, Ill.
J. B. J. Anderson, Illinois Bell Telephone Company, Chicago.
W. H. Mulligan, Hydro-Electric Power Company, Ontario, Can.
H. W. Lueck, Commonwealth Edison Company, Chicago.
W. H. Brown, Northern States Power Company, Minneapolis, Minn.
J. L. Vandergrift, Chesapeake & Potomac Telephone Company, Washington, D. C.
G. H. Shaw, Ohio Edison Company, Akron, O.

Fire Prevention in the Public Utility Industry

By T. ALFRED FLEMING

Supervisor, Conservation Department, National Board of Fire Underwriters,
New York City

The speaker said in part: The first and major subject for consideration is the construction of our buildings, the general layout of groups, and the relation of each unit to others. Your largest operations are concentrated in groups of closely related buildings. Danger to one structure almost always means danger to all. When a utility burns, hundreds perhaps thousands of men are thrown out of work, and whole communities are without light, heat or transportation.

We should plan all building operations in an effort to control the origin of fire as well as its spread. Group plans should be laid out so as to avoid internal exposure. Segregate hazards so as to control flames at the point of origin for at least five minutes. The first five minutes are most important. All large fires and conflagrations are determined in that period of time.

Construction of fireproof material is not only desirable from a standpoint of fire, but offers the best known resistant against tornado, windstorm and earthquake which may seriously affect continuous and unbroken service. Good designing requires pro-

vision for proper zoning so that total destruction of large properties may be avoided. Open spaces of at least fifty feet should be maintained between structures. Window protection should be supplied for openings in exposed walls, and satisfactory fireproof cutoffs where buildings join.

Processes which are known to be extra hazardous should be isolated or separated by standard fire walls so as not to endanger other sections. In rooms containing large amounts of oil or other flammable liquids, ample sills should be provided to prevent oil flowing into other sections of the building in an emergency. Good drainage to the outside and proper ventilation are essential.

It is frequently found that utility properties well constructed and supplied with interior protection are subjected to dangerous exposure from nearby buildings. This becomes a serious problem when the location must be maintained in congested city districts, in manufacturing areas, and near such hazards as lumber yards, oil stations, etc.

The protection supplied by public fire departments and water works systems deserves careful consideration. Frequently, for plants in outlying districts, special arrangements have to be made. Water mains and hydrants must be carefully located so as to be readily available, with adequate volume and pressure. A fire alarm system with auxiliary boxes should be so maintained as to be efficient for both the employers' fire brigade and the public fire department. Trained guides should meet the outside fire department at the gateway of the property so that no time may be lost in passing through yards, or near hazardous sections, in making their layout.

In the purchase and location of private fire extinguishing agencies, it is wise to consult the rating bureau having jurisdiction. Choice of extinguishers must always be made, having in mind the inherent danger involved. The question of location of these, when chosen, is of paramount importance.

The operation of an automatic sprinkler system with the American District Telegraph service is, of course, vital, particularly in certain types of construction and occupancy. In all cases we should use our heads for sometimes a few bags of sand are more valuable than a standpipe, and neither of these will take the place of a hand extinguisher when it is needed.

Utility companies are obliged to carry extensive stocks of equipment parts and reserve supplies in their storehouses. Sometimes available buildings of inferior construction are used for this purpose. Unless very careful supervision is maintained a serious fire possibility may exist. Frequently these storehouses have large unbroken areas giving the fire an opportunity to spread and involve very valuable stocks. Prompt fire fighting and control may be greatly hampered unless adequate aisle space has been maintained. When general repair work is conducted in these buildings, it is wise to have distinct separation between storage and repair. Fire damage might be minimized if sturdy fire walls were erected to confine fire to reasonable areas. Automatic sprinkler systems apply particularly desirable protection for these storerooms, which are seldom attended at night.

A few years ago we knew very little about so-called dust explosions, but we are learning fast. A few weeks ago a captain of the Buffalo Fire Department and his men answered a call from a certain brewery. When the door was thrown open there was an immediate explosion, killing the captain and sending fourteen of his men to the hospital. The cause of the fire was said to be a dust explosion. Three small fires took place in the exhaust conveyor of a plant employing grinders for polishing aluminum products. Here static electricity was the cause, with insufficient or improper grounding. An explosion of wood dust in a chair factory in Cleveland last March resulted in the death of two workmen. A dust explosion in a St. Louis grain elevator in May caused the death of seven workmen and injuries to a number of others. An explosion of aluminum powder in a factory in Painesville, Ohio, resulted in the death of five men and extensive property damage.

Another very serious cause of industrial fires is spontaneous ignition and combustion. There are many types of spontaneous ignition. Sometimes it is present in the storage of coal. Sometimes in the contact of wooden material with heating or power pipes, and it frequently originates from paint or oil products on overalls, and cleaning or rubbing rags.

The danger from faulty installation of heating and power systems is of paramount consideration. We all understand the importance of having the operations

confined in buildings constructed of fireproof materials with adequate venting surface and with standard fire walls cutting off dangerous sections. The complete separation of boiler and generator room has frequently proved the saving of costly equipment. The use of pulverized coal for fuel with its crushing, drying and storage processes, has developed both a fire and explosion hazard which did not previously exist in utility boiler plants. Many plants depend on oil burning devices for heat which develop danger from storage supply tanks and piping. The high pressure steam temperatures now so widely used make possible the ignition of oil which may frequently come in contact with steam mains and valves.

Doubtless you have noticed a prevalence of fire caused by the careless handling of electricity. I want to emphasize that the cause is "the careless handling of electricity." The National Electrical Code contains the regulations found effective in making the electrical industry safe for those who use it. Less than four per cent of the fires having their origin from electrical hazards are found to be in buildings wired in accordance with the National Electrical Code. It is plainly evident that the main cause of electrical fires rests with the individual who uses this power agency.

The Bureau of Fire Prevention of a certain city decided to make a careful check of all electrical installations under their jurisdiction to determine the condition of the fuses of each circuit. In a few days they had collected enough bridged fuses to fill several peck measures and had to their credit over four dollars in pennies, nickels and dimes, chiefly pennies. These were removed from fuse boxes. The public seems unable to comprehend the fact that the fuse of any electric current is nothing but the safety valve of that power line and, when tampered with, is liable to short-circuit at any time.

In reviewing the fire losses in electric industry, we find 55 per cent of the fires involving transformers, generators, oil switches, and circuit breakers. The chief causes were breakdown of insulation, lightning, external short circuits, breakdown of coils, oil and water leaks, and faulty maintenance. Thirty-nine per cent of the classified fire causes involved oil-filled devices. Improvement of equipment in recent years has brought results. The installation of large capacity oil-cooled equipment outdoors is a step in the right direction. Twenty-five per cent of the classified fires are attributable to lightning.

The question of maintenance or housekeeping is always of greatest importance—"A clean house seldom burns." You can usually tell the safety of an industry by its general appearance.

Proper watchman's service during the night is very essential. Fire losses increase in frequency about 35 per cent after the closing time of the plant. A careful watchman would have caught many of the hazards which later resulted in fire. The watchman is responsible for not only the industry itself but the pay checks of the workmen. The superintendent is a valuable man but if he has no plant to work in because of a fire loss, he will be of no particular value. The one man standing between the production, the pay checks and the future of the organization is the watchman.

Development and Research and Their Relation to Accident Prevention

By H. D. BENDER

Engineer, Outside Plant Development Department, Bell Telephone Laboratories, Inc., New York City

The speaker said in part: In our work, accident prevention is primarily associated with the operating activities of the working forces engaged in constructing, installing and maintaining the plant. The apparatus, materials and tools involved in this work are the product of development and research studies, and they are made available through the issuance of specifications which cover the requirements for their purchase and manufacture.

It appears to me that a specification embodies three important considerations

which influence accident prevention. The one has to do with design, the next with material requirements, and the last, but by no means the least important, is the matter of quality control. Through the careful consideration of design it is frequently possible to develop new items or to provide special features on products that will eliminate known accident hazards or failures in operation or to effect improvements that will facilitate the work of installing and maintaining plant. In a similar manner, the selection of proper materials together with their general requirements offer an equal opportunity for the elimination of service failures and for improvements in operating performance. I believe we will all agree that perfection in quality cannot be realized due to the variables in the materials and human efforts that enter into the manufacturing processes. Therefore, if we wish to promote safety, it is essential that the specifications for the different items of supply include suitable limits for the control of their quality. In this connection, a great many different kinds of tests have been developed to assist in evaluating the quality of the workmanship and of the materials in manufactured products.

Time permits only a brief presentation of a few of the development and research problems. Therefore, it is planned to limit our discussion to those activities which are most closely associated with the construction, installation and maintenance of the outside plant.

We offer the following illustrations as typical examples of development problems in which the solution has an influence on accident prevention.

I believe that all of us are familiar with the work and duties of a lineman and know that his safety is dependent, to a large extent, upon certain tools such as climbers, body belts, safety straps, rubber gloves, etc. In the Bell System, all of such tools are custom built under complete specifications and they are carefully inspected to safeguard our workmen against defects which might be the cause of service failure.

Linemen's climbers are subjected to a bend test to insure that the materials used in manufacture have the desired bending properties or that these properties have not been destroyed by the manufacturing processes. Such a test will detect brittle steel. Rockwell hardness readings are taken to check the uniformity and the degree of heat treatment that is given to the gaff and leg iron of the climbers. Too much hardness is indicative of brittleness while the other extreme may cause excessive bending. In general this kind of a test has a very wide application wherever the hardness or the heat treatment of metals is involved. A drop test is given to every climber for the purpose of detecting any hidden defects in the gaff. In making this test the climber is clamped to the free end of the beam and the beam is allowed to fall of its own weight from a vertical position to practically a horizontal position, where the gaff strikes a metal anvil. A fatigue test for climbers involves apparatus for supporting a climber by the gaff and leg iron and a motor actuated arm which applies a predetermined and repeated load to the stirrup. The loading and method of support approximate closely the actual service conditions. This test is a reliable means of checking different design features or determining material requirements.

A drop wire reel was made available several years ago to facilitate paying out and recovering the wire used for the subscriber's service connection. There are two design features which are particularly important from the standpoint of operation. The reel performs satisfactorily when the wire is removed in almost a vertical direction. Furthermore, the reel is provided with an adjustable brake to prevent the wire from sagging excessively when it is being paid out over highways having heavy traffic or trolley lines. With the adoption of light trucks for installation work it was found desirable to mount the reel permanently on the top of the body immediately back of the cab. Experience with this arrangement developed several objectionable features from a safety standpoint. It was difficult to service the reel at this location, the reel partially obstructed the view from the rear window of the cab and it could not be used at locations which were inaccessible to the truck. In order to overcome these objections the reel was completely redesigned. It is mounted on the side panel of the truck body where it is easily serviced and does not obstruct the vision from the cab. It is readily demountable and is so designed that it will operate satisfactorily in either a vertical or horizontal position.

Several years ago the operation of unloading poles from flat cars was given careful consideration from a safety standpoint. As a result of this study a number of special tools and a method of procedure were made available which resulted in important advantages from an accident prevention standpoint. The first step in the unloading job is to install the binding line and the safety stakes on the unloading side of the car. The binding line is then adjusted at the rear of the load and pulled tightly. The guy ropes of the safety stakes are next anchored at the ends of the load. After the tools are in place the lower tie wires are cut in proper order, following which the stakes are cut off immediately above the stake pockets. With all hands clear of the load the guy ropes are released and the safety stakes are allowed to fall free of the car pockets. The line is slackened off slightly and the load breaks or is made to break and, as the poles roll off the car, the binding line keeps them under control. This operation, from beginning to end, is carried out completely from the ground without any necessity for climbing on the load or poles.

A cable suspension hook was developed to facilitate the construction and maintenance of cable plant involving long spans of the catenary type of construction. Laboratory tests for checking designs and material requirements are resorted to frequently in such developments. In the early type of catenary construction, the method of attaching the vertical linkages to the lower suspension strand interfered in riding the strand and cable with a cable car. The use of the cable suspension hook in the vertical linkages, permits the construction and maintenance forces to ride the strand and cable in a cable car without the need of maneuvering around the vertical supports in the span.

A number of new hardware items were developed to effect improvements in the methods of dead ending cable suspension strand and guys to poles. Laboratory tests were made for checking their behavior under different service conditions. One method of dead-ending strand and guys is known as the wrap method. The wrap method still has its place in the plant but the eye-bolt method provides the maximum practicable separation on jointly used poles between suspension strand and vertical runs of electric light wires, power wires, or ground wires.

Although of relatively infrequent occurrence, it has been found that the atmosphere of a manhole may be contaminated by foreign gases. In such occasional instances, the type of hazard involved is dependent upon the source and extent of the contamination. The atmosphere may be explosive due to the presence of a sufficient amount of combustible gas, it may be poisonous due to toxic constituents such as the carbon monoxide in manufactured gas or it may be suffocating because of the deficiency of oxygen. This problem was given considerable attention from a development and research viewpoint and resulted in making available equipment for the detection of these hazards in the underground atmospheres and thereby determining when ventilation is necessary before entering the system for work.

A carbon monoxide detector is intended for the detection of carbon monoxide in territories where manufactured gas is distributed. It consists of a cotton covered ampoule and a color chart. The ampoule is made of a sealed glass tube filled with a chemical solution. The test is made by crushing the glass so that the cotton becomes saturated with the solution. The ampoule is then lowered into the atmosphere of the manhole and if carbon monoxide is present it reacts chemically with the solution and discoloration of the cotton results. The degree of discoloration is a measure of the concentration of the carbon monoxide in the atmosphere. This amount is determined by matching the color of the ampoule with the calibrated color card. The chemical reaction between the ampoule and carbon monoxide is retarded by low temperatures. A chemical heater was developed and made available to facilitate making the tests during cold weather. The oxygen deficiency indicator is provided for detecting combustible gas in natural gas areas or for detecting the deficiency of oxygen in any system. This device gives its indications in a manner similar to a miner's safety lamp in which the behavior of the flame is the important indication. A mirror on the side of the lamp facilitates observing the action of the flame when the atmosphere to be tested is forced into the combustion chamber by the aspirator in the hose line.

In order that first aid may be promoted on an effective basis, a variety of materials and supplies are made available in convenient form for the use of the field

forces. These different items are packed in such a manner that adjustments and substitutions can readily be made to fit in with local field conditions.

As the final example of development and research activities, we have selected a problem that was undertaken with the idea of developing an improved joint for line wire. The twisted sleeve illustrates the type of line wire joint which has been used for years in the telephone plant. The joint is made by inserting the ends of the wires to be joined into the bores of a double tube sleeve and the sleeve is then twisted the proper number of turns by means of these tools. The free ends of the wire at the joint are trimmed and bent back. The difficulties encountered with this joint were both mechanical and electrical. This type of joint did not develop the full strength of the wire and troubles were encountered from the development of high resistance joints in the line. To overcome this latter feature it becomes a quite common practice to solder the wires to the sleeves in the more important circuits. As a result of the development study a single tube sleeve and a tool for rolling the sleeve on the ends of the wires was made available. The joint is made by inserting the ends of the wires to be joined into the sleeve which is provided with a notch at the midpoint in order that the wires are properly centered. The rolling tool is then placed on the wire with the sleeve opposite the proper size of groove and by cranking the handle the rolls pass over the sleeve and roll it down to make an intimate union between the sleeve and the joint. Several years of plant experience with this joint indicates that the shortcomings of the twisted joint have not developed in the new type of joint. Approximately the same working conditions and effort are involved in making both types of joints. However, the rolled joint is more compact and the cut ends of the wire are protected by the sleeve. The joint develops the full strength of the wire. This factor tends to reduce service failures and maintenance work in restoring service. The line wires do not overlap in this joint, therefore in repairing breaks or in making changes in existing circuits the wires may be spliced without inserting an additional length of wire and making an additional joint. Soldering of wires is not necessary with this joint. Since the new joint eliminates certain work and simplifies other work operations, which are mainly performed aloft and frequently under emergency conditions, the advantages from a safety standpoint are obvious.

The Public Utilities Section Safety Contest

The final feature of this program was the bestowal of trophies by the National Safety Council to the winning units in the Public Utilities Section Safety Contest. The data on the contest were given by W. H. Brown, Director of Safety, Northern State Power Company, Minneapolis, Minnesota, as follows:

The contest continued from July 1, 1933, to June 30, 1934, a full year, and 124 unit companies participated. In all, 112,346 employees worked a total of 243,313,164 man-hours. During the period they suffered 1,818 disabling injuries, the average frequency rate for the contest therefore being 7.472. Two contest units completed the entire period with perfect safety scores, and 63 units completed the contest with frequency rates below the average.

The handsome bronze trophies awarded by the National Safety Council were presented to the winning companies by General Chairman F. M. Pepper, as follows:

COMBINATION GAS & ELECTRIC DIVISION—GROUP A

Central Illinois Light Co., Peoria, Illinois; two disabling injuries while working 1,895,710 man-hours; frequency rate 1.055.

COMBINATION GAS & ELECTRIC DIVISION—GROUP B

The Connecticut Power Company, New London, Connecticut; no disabling injuries, while working 417,376 man-hours.

Panhandle Power & Light Company, Borger, Texas; no disabling injuries, while working 326,993 man-hours.

Michigan Gas & Electric Company, Northern Division, Ashland, Wisconsin; no disabling injuries while working 168,000 man-hours.

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Superior Water, Light & Power Company, Superior, Wisconsin; no disabling injuries while working 159,504 man-hours.

Eastern Oregon Light & Power Company, Baker, Oregon; no disabling injuries while working 146,446 man-hours.

Marysville Electric Light & Power Company, Marysville, Missouri; no disabling injuries while working 114,013 man-hours.

Moncton Electricity & Gas Company, Ltd., Moncton, N. B.; no disabling injuries while working 110,017 man-hours.

ELECTRIC DIVISION—GROUP A

The Toledo Edison Company, Toledo, Ohio; five disabling injuries while working 2,553,754 man-hours; frequency rate 1958.

ELECTRIC DIVISION—GROUP B

Nebraska Power Company, Omaha, Nebraska; no disabling injuries while working 1,207,530 man-hours.

Fall River Electric Light Company, Fall River, Mass.; no disabling injuries while working 432,569 man-hours.

Mississippi Valley Public Service Company, Winona, Minnesota; no disabling injuries while working 358,838 man-hours.

Gloucester Electric Company, Gloucester, Mass.; no disabling injuries while working 159,039 man-hours.

Worcester Suburban Electric Company, Uxbridge, Mass.; no disabling injuries while working 156,539 man-hours.

Houghton County Electric Light Company, Houghton, Michigan; no disabling injuries while working 143,869 man-hours.

Lower St. Lawrence Power Company, Rimouski, Quebec, Canada; no disabling injuries while working 126,685 man-hours.

Citizens Power & Light Company, Council Bluffs, Iowa; no disabling injuries while working 123,418 man-hours.

GAS DIVISION—GROUP A

Hope Natural Gas Company, Pittsburgh, Pennsylvania; three disabling injuries while working 3,065,169 man-hours; frequency rate .979.

GAS DIVISION—GROUP B

Reserve Gas Company, Pittsburgh, Pennsylvania; no disabling injuries while working 317,912 man-hours.

Peoples Gas Company, Port Arthur, Texas; no disabling injuries while working 144,753 man-hours.

ADJOURNMENT

**TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL**



Quarry Section

Officers 1933-34

General Chairman—OTTO M. GRAVES, The General Crushed Stone Co., Easton, Pa.

Vice-Chairman—WILLIAM H. BAKER, J. E. Baker Co., York, Pa.

Secretary and News Letter Editor—V. P. AUREAN, National Sand and Gravel Association, Washington, D. C.

Poster Committee Chairman—H. F. YOTTER, The General Crushed Stone Co., Easton, Pa.

Publicity Committee Chairman—J. R. BOYD, National Crushed Stone Association, Washington, D. C.

Statistics Committee Chairman—W. W. ADAMS, United States Bureau of Mines, Washington, D. C.

Members at Large—

NORMAN G. HUGH, The National Lime Association, Washington, D. C.

H. V. OWENS, Eastern Rock Products, Inc., Utica, N. Y.

JOHN PRINCE, Stewart Sand and Material Co., Kansas City, Mo.

A. L. WORTHEN, The Connecticut Quarries Co., Inc., New Haven, Conn.

WEDNESDAY MORNING SESSION

October 3, 1934

The opening session of the Quarry Section was called to order by John Campbell, Director, Bureau of Inspection, Pennsylvania Department of Labor and Industry, Harrisburg, Pa., who presided. This was scheduled to be a joint session with the Cement Section. Chairman Campbell introduced P. A. Mori, Works Manager, Cleveland Quarries Company, Amherst, Ohio, who made a brief address of welcome to the delegates on the part of the city of Cleveland.

In lieu of the annual report of the general chairman Otto M. Graves, who was unable to be present, a lengthy wire was read from him expressing his regrets. Chairman Campbell then introduced the first speaker

The Dust Hazards in Industry

By DR. R. R. SAYERS

Medical Officer in Charge, Office of Industrial Hygiene and Sanitation,
United States Public Health Service, Washington, D. C.

The speaker said in part: Realizing the importance of the dust problem in industry, the United States Public Health Service in cooperation with the Bureau of Mines began its first study of the health of workers in dusty trades in 1914, in the mines of Joplin, Missouri; and later, in 1923, the Public Health Service inaugurated a series of dust studies. These later studies were all conducted in the same manner in order to permit as detailed a comparison as possible between the different investigations.

Briefly, these methods of study may be divided as follows: (1) examination to determine the general physical condition of the workers under observation; (2) special physical examination to determine the prevalence of specific diseases of the respiratory system and the lung pathology resulting from exposure to the particular dust hazard; (3) record of the nature and severity of the disabling illnesses; (4) analysis and detailed study of the occupational environment; (5) occupational mortality statistics relating to the specific dust; and (6) autopsies.

The first six intensive investigations carried out by the Service dealt with the health of workers exposed to dusts in a cement plant, granite cutting industry, anthracite and bituminous coal mining, silverware manufacturing plant, cotton cloth manufacturing, and in municipal street sweeping. Brief studies were later conducted in certain slate, granite, marble and talc quarries, while more recently a rather extensive study of the health of anthracite coal miners was completed.

These six dust studies showed that the workers in the granite cutting plants who were exposed to the highest dust concentrations were found to suffer from an excess of pulmonary tuberculosis after 15 years or more of exposure and developed silicosis from 2 to 10 years. In the group exposed to a lesser amount of dust, silicosis developed only after prolonged exposure, with an excess of tuberculosis. It was found that a close relationship existed between the degree of dust exposure and the extent and severity of the pulmonary damage. Anthracite coal miners suffered from dyspnoea and other signs of pneumoconiosis and experienced a high rate of respiratory sickness; in addition, an excessive mortality from influenza-pneumonia and possibly tuberculosis was found. Bituminous coal miners experienced a generalized fibrosis of the lungs and an excess mortality from influenza and pneumonia. Cement workers showed some signs of early pneumoconiosis with an excess of diseases of the upper respiratory tract. On the other hand, workers in the cotton cloth and silverware manufacturing plants and municipal street sweepers were negative for respiratory conditions and other illnesses when compared with the general industrial population.

Rock Drilling. For five years, the United States Bureau of Mines studied lead and zinc miners in the Tri-State District, Oklahoma. The ore here is high in free silica. Of the 7,722 men examined, a group of 1,647, or 21.3 per cent, was definitely diagnosed as having silicosis, not including those diagnosed as having tuberculosis. All the men diagnosed as having first-stage silicosis had worked an average of 13 years, but those men starting in the mines after 40 years of age worked an average of only 8 years.

The work of rock drilling in subway and tunnel construction in New York City is in some respects similar to that of some of the activities in the hard rock mines, at least in so far as the manner in which dust is evolved, the type of dust and the resultant hazard. Recently the result of a study of rock drillers, blasters and excavators was reported by the New York Tuberculosis and Health Association. An examination of 208 rock drillers, blasters and excavators showed that 118, or 57 per cent of the men had silicosis in various stages of progression. The exposure of most of these men (75 per cent) had been for 20 years or more.

Sandblasting. No study of the health of sandblasters has been reported in the United States; however, a study of the dust exposure of sandblasters was recently completed by the United States Public Health Service in cooperation with the

National Safety Council. This investigation indicated that, judged by the nature of the dust and degree of the exposure, a real hazard exists in this occupation. This study also brought out the fact that it is possible to conduct sandblasting with safety, provided properly designed and well maintained equipment is used.

Diatomaceous Silica Workers. Most of the data on silicosis have been gathered from studies made both in industry and experimentally on dusts containing free silica in the form of quartz. Such studies have been made in the granite industry, pottery trades, hard rock drilling, etc. There are other free silica minerals in existence that are not crystalline in nature but of an amorphous composition. In Santa Barbara County, California, there exists the largest and purest diatomaceous silica deposit in the world. This substance consists of about 85 per cent free silica. Recently an examination was made of 108 workers selected among those employed less than 1 year, 1 to 2 years, 2 to 5 years, and more than 5 years. All of the workers were Mexican laborers and the examinations consisted of x-ray determinations, social and medical histories, and clinical examinations of the chests. Dust determinations were also made but these were not reported. The outstanding feature revealed by the examination was the splendid physical condition of the men. Eighty-four per cent of the workers were reported in excellent physical condition. It was found that 60 men showed signs of early pneumoconiosis; 15 were in the moderately advanced stage and 6 in the advanced stage. This latter finding was among workers with a history of exposure of more than 5 years.

Dust Hazard in the Granite Quarry Industry. It is a common belief that granite quarrying is not so dangerous an industry as granite cutting in enclosed sheds; quarry work is done outdoors and hence may not be attended with very much dust exposure. However, certain quarry operations require the use of pneumatic tools, which are usually associated with the formation of considerable quantities of dust. It was thought that a study made in a representative granite quarry might cast some light on our problem. Accordingly, a study of a clinic-radiographic nature of 63 quarrymen was made and occupational dust exposures were also obtained. The dust determinations show that nearly 38 per cent of the workers (drillers) were exposed to many times the amount of dust considered safe at the present time. Drillers were the only persons showing pathologic lung changes. Half of these workers with an exposure of 5 to 10 years had silicosis, and 4 of the 5 men with more than 20 years of such trade life showed this condition. This study suggests that quarry drillers may experience as high a death rate from pulmonary tuberculosis as do pneumatic-tool workers in granite cutting sheds.

Effect of Inhaled Marble Dust. The pulmonary fibrotic changes due to the inhalation of marble dust appear to be slight in comparison with those caused by stone dust containing a high percentage of silica in the form of quartz. A recent study made by us among marble workers showed that although marble dust, when inhaled in concentrations averaging about 25 million particles per cubic foot of air, produced a mild bilateral, linear fibrosis in a certain number of the 80 men examined, no serious lung changes were noted and there was no disability due to the dust, even after many years of exposure (more than 40 years in some cases). The marble dust under consideration consisted of 98 per cent calcite and 2 per cent dolomite, with no silica present.

Dust Hazard in Abrasive Industry. Artificial abrasives are widely used in industry and for this reason the effect of the inhalation of dusts produced in the manufacture or preparation of these products is of great importance. In 1925, 1929 and again in 1931, Dr. Clark of the Norton Company at Worcester, Mass., made investigations of workers exposed to aluminum oxide and silicon carbide dust produced in the manufacture of grinding wheels, which showed that during a period of 13 years there were proportionately twice as many cases of pulmonary tuberculosis among those working in the abrasive dust departments as in departments where no abrasive dust occurred. In 1931, Kessler, of New Jersey, reported the occurrence of over 100 cases of alleged silicosis in the abrasive powder industry, in which the dust consisted of 99 per cent free silica.

Exposure to Silicate Dust. It has been the belief that the inhalation of dusts composed of silicates (combined silica), in comparison with silica (free silica in the form of quartz), was innocuous. Of recent years many investigators have become cognizant of the hazards of silicate dust exposure. Asbestosis, a fibrosis

of the lungs caused by the inhalation of asbestos dust, has already been described both in its clinical and roentgenographic manifestations by investigators in other countries, but to date no studies have been reported in the United States. Cement dust, which contains about 22 per cent combined silica, has been studied, and the effects of the inhalation by workers has been discussed here. In March, 1933, Dreesen, of the United States Public Health Service, reported the results of a study conducted among tremolite talc and slate workers. The slate dust to which these workers were exposed consisted mainly of silicates, there being less than 3 per cent of quartz in the dust. The talc was a hydrous calcium-magnesium silicate, being 45 per cent talc and 45 per cent tremolite, with no quartz present. The results of the study seemed to indicate a relationship between the amount of dust inhaled and the effect of this dust on the lungs of workers.

Statistical Studies. Recently, Lanza and Vane estimated that there are some 500,000 workers engaged in the mining, quarrying and manufacturing industries in this country in which an exposure to silica dust to a harmful degree is entailed. Their analysis of mortality experience of twelve life insurance companies for the period 1915-1926 showed that the actual mortality from respiratory tuberculosis among the silica exposed persons was about three times that of a non-silica dust group. If one considers their data for certain occupations in metal mines and granite and sandstone quarries, occupations known to be exposed to high concentrations of hazardous dusts, then the comparison is more striking, since the actual deaths among these workers was found to be ten times that of the expected deaths. More detailed statistics on occupational mortality as reported by the Registrar-General of England and Wales (1921-1923), and summarized by Britten, show the high rate of 1,886 per 100,000 for tin and copper miners, while the rate for "all occupied and retired males" was only 150. Other occupations with silica exposure showed an excess.

From the evidence just presented concerning the injurious effects produced by the inhalation of certain dusts, it is apparent that a knowledge of the properties of a given dust which determine its capacity to produce pulmonary pathology is essential. Numerous investigations of the industrial dust problem indicate that these properties are the chemical and mineralogical composition of the dust, its concentration in the industrial atmosphere, and its particle size.

In an earlier portion of this discussion evidence was presented which indicated that a close relation existed between morbidity and mortality rates from various respiratory diseases and the exposure to certain dusts in industry. In the study of the dust hazard in the granite cutting industry, it was definitely proved that there is a direct relation between the magnitude of the dust exposure and sickness and death resulting from tuberculosis. It is quite evident, as a result of these studies, that the remedy of the dust evil lies in the effective removal or suppression of the dust to concentration considered safe. However, no set rules may be established for the mechanical protection to be instituted in an attempt to control industrial dust. Specific conditions encountered in a plant will determine the type of protection to be employed.

The protection of workers against certain dusts known to be toxic may at times be accomplished by the substitution of a non-toxic material for the toxic one. One example of such a procedure is the possible use of a metallic or other type of artificial abrasive for sand in the sandblasting process in those operations in which it is not essential to use sand, a substance high in quartz content. Again, the mechanical enclosure of the dust-creating process also serves to protect the worker. An excellent illustration of this type of protection is afforded by the modern sandblast barrel used in the cleaning of small objects. Sometimes it is possible to protect the worker by the substitution of wet for dry processes, as wet drilling instead of dry. In one instance, in the granite cutting study previously mentioned, an operator using a diamond point tool worked the stone wet; the resulting dust amounted to 22 million particles per cubic foot. The same operator was then requested to work the stone dry; as a result, the amount of dust reached the high figure of 45 million particles per cubic foot. In the weaving of asbestos cloth it has been possible to reduce the amount of dust in the air by wet weaving to one-fourth of the amount present when the process is conducted by dry methods. Another example of this procedure in allaying dust is the use of a spray of water

in leyner and jack-hammer drilling in hard rock, although the new type of Kelly dust trap is now finding much favor for this kind of work.

The Kelly trap consists of a metal chamber designed to enclose the drill steel at the rock surface. No attempt is made to secure a mechanical seal with the rock or between the trap and the drill steel. The dust is removed by an air stream and is carried into an exhaust system connected to the trap. Escape of dust particles through openings between the uneven rock surfaces and the trap is prevented by the air seal produced by the flowing air. Tests made on this trap under actual working conditions show that the dust concentration at the worker's breathing zone may be kept down to less than 10 million particles per cubic foot with a 60 cubic foot per minute rate of air flow through the hood. This trap is a step forward in the program of dust removal; however, in underground work, such as in mines and subways, there is still the need to solve the problem of compact dust disposal equipment.

In certain cases, such as in the sandblasting of large castings in sandblast rooms, the practical safeguard to the worker is to provide him with a mask or helmet of the positive air pressure type. In the sandblast investigation previously mentioned, it was found that when from 5 to 6 cubic feet of practically dust-free air per minute are supplied to the helmet, the worker receives ideal protection. However, one must always bear in mind that the ultimate criterion of protection should be the dust determination of the air within the helmet during blasting and not the quantity of the air supply itself.

In most dusty processes, however, the most effective means of dust elimination are by the use of properly designed exhaust ventilation systems. Since in many instances it is difficult, costly, and at times an unnecessary procedure to remove all the dust in the vicinity of a worker, we need first to determine the minimum amount of a certain dust which the worker can apparently tolerate with impunity. Such information can be made available by the type of studies carried out by the Public Health Service. For example, in the granite study already referred to, it dust at the breathing level of about 10 million particles per cubic foot (35 per cent free silica).

Studies of dust removal devices used in granite cutting plants at the time this work was conducted showed that a linear velocity of 1,500 feet per minute as measured by an anemometer at the face of the dust-removal hood, would keep the dust at the breathing level to an amount less than 10 million particles per cubic foot.

A word should be said concerning personal respiratory protection against dusts. It has already been shown that in the use of positive pressure respiratory devices in sandblasting, it is important to have a well-designed device supplied with about 6 cubic feet of dust-free air per minute to give full protection to the worker. With reference to respirators of the filter type, there is still much to be accomplished in the design of an efficient and comfortable mask for continuous use. Of great value are standard methods for the testing of the efficiency of respiratory protection devices. Drinker advocates testing a device against the particular dust which the respirator is to encounter, these tests to be made both in the laboratory and under actual industrial conditions. He further suggested that some impartial agency should conduct such tests and certify the devices for industrial use, the work being done on a cost basis. The U. S. Bureau of Mines has prepared such a schedule for testing and approving respirators.

I wish to stress the importance of good housekeeping in the effort to combat the dust hazard. Good housekeeping should not only imply the removal of accumulated dust about a workroom but should also embrace efficient maintenance of dust removal devices and respiratory protective equipment. Systematic inspection of all dust suppression equipment should be an axiomatic principle in every dusty industry rather than the casual attention which it now receives in many instances.

Report of the Nominating Committee

The chairman called for the report of the Nominating Committee at this point, and new officers for the section to serve during the ensuing year were nominated and elected as follows:

General Chairman—William H. Baker, J. E. Baker Co., York, Pa.
Vice-Chairman—William E. Hillard, New Haven Trap Rock Co., New Haven, Conn.

Poster Committee Chairman—H. F. Yotter, The General Crushed Stone Co., Easton, Pa.

Publicity Committee Chairman—J. R. Boyd, National Crushed Stone Assn., Washington, D. C.

Statistics Committee Chairman—W. W. Adams, U. S. Bureau of Mines, Washington, D. C.

Members at Large—

V. P. Ahern, National Sand and Gravel Assn., Washington, D. C.

Norman G. Hough, The National Lime Assn., Washington, D. C.

O. M. Graves, The General Crushed Stone Co., Easton, Pa.

A. L. Worthen, The Connecticut Quarries Co., Inc., New Haven, Conn.

The Foreman's Duties and Responsibilities in Preventing Accidents

By GLENN GARDINER

Forstmann Woolen Company, Passaic, New Jersey

The speaker said in part: On my first job in the clay pit of a brick works, I witnessed a disastrous cave-in which so injured one of my fellow workers that he was totally disabled for life. The accident was so plainly the fault of the foreman in charge that he was discharged for his carelessness. That accident made an indelible impression upon my mind, and let me understand as nothing else could what the responsibility of the foreman is in accident prevention.

The foreman who is responsible for getting out the work is also responsible for the control of those conditions immediately surrounding the worker on his job. He has an unexcelled opportunity to observe his workers and their habits. If he is a competent foreman, he can detect those working habits which may result in accidents. He should come to know his workers so well that he will understand when worries and outside problems are taxing their minds and powers of concentration. He may not be in a position always to do much about the outside problems, but he can, at least, govern conditions on the job.

The foreman is the one who is most likely to set up conditions on the job which cause job anxieties for the worker. He can do much to ease the worker's mind by keeping him informed about conditions which affect his job and the steadiness of employment. He can help to reduce the fatigue his men experience and in so doing directly influence accidents which are related to fatigue.

Every intelligent foreman realizes the importance of the safety functions, and that safety should be put upon the same plane of importance as the other duties his job includes.

If the worker is indifferent to safety, it is usually merely a reflection of the foreman's attitude. On the other hand, if the foreman will stand for nothing but safe working habits, the worker will proceed very rapidly to develop safe working habits. Of course, I recognize that certain workers have an attitude of recklessness and bravado about them which makes them slightly contemptuous of the dangers of the job. But it is up to the foreman to puncture this attitude and bring such workers down to earth.

A recent study of a company employing 6,600 workers indicated that 48 out of the 6,600 had had 10 per cent of all the lost-time accidents for the entire organization. The accident frequency among these 48 men was fifty times as great as that of the average for all workers.

The record also indicated that those men having the largest number of minor accidents were also the same men having the largest number of lost-time accidents. Thus minor accidents are of real significance to the observing foreman because they point out to him the men who will most probably have the lost-time accidents.

Foremen have the duty and the responsibility of enforcing safety standards. Failure to do so increases the number of accidents, and the same laxity that increases accidents lowers efficiency. We can almost judge the general efficiency of a foreman's department by an examination of his safety record.

Here are some points at which every foreman should check his own methods of enforcing safety standards. Let each foreman ask himself these questions:

1. Are safety standards clearly and completely understood by each and every one of my workers?

2. Do I give careful safety instructions to every man I hire and to every man whom I put on a new job?

3. Do I conscientiously attempt to assign the least hazardous job to those workers who are most accident prone?

4. Have I ever attempted to sell safety standards to my workers by arousing their pride on the basis that the safest worker is also the most efficient one?

5. Do I rigidly enforce the regulation that each worker should report every accident, no matter how slight?

In the last analysis, however, management itself is responsible for the attitude of its foremen on the safety question. Just as the indifference of the worker can be traced to the indifference of the foreman, likewise the indifference of the foreman can most often be traced to a certain indifference on the part of the top management with reference to this important safety and accident prevention function.

The Value of Competent First Aid

By DR. W. J. FENTON

American National Red Cross, Washington, D. C.

The speaker said in part: The definition of First Aid as given in the Red Cross First Aid Text Book, is "First Aid is the immediate temporary treatment given in a case of accident or sudden illness before the services of a physician can be secured." This definition, in itself, immediately disproves any thought whatever that a First Aider can ever take the place of proper medical attention. A further study of the definition, it appears to me, should impress upon the mind of any thoughtful person the necessity of proper First Aid training being given to just as many people throughout the country as is humanly possible.

Remember, that the medical man is not sitting around at the scene of the accident with his equipment handy, waiting for a chance to do something. He is either busy with his practice or may be in his office or laboratory studying out some baffling case, and many miles from the scene of trouble. In case of severe bleeding, fatal results may follow unless some qualified First Aider appears at the scene and immediately applies proper methods of control, long before the physician can be secured. Imagine a crowd at a scene of an apparent drowning, or standing around the lifeless form of some victim just removed from a gas filled room or garage—but only standing there and looking on.

There is seldom any excuse in this day and age for anyone finding himself or herself standing helplessly about in such a predicament, because for years now throughout the length and breadth of our land there have been First Aid Courses taught, First Aid demonstrations given to literally thousands of audiences, and in each demonstration as well as in the standard courses simplified methods of emergency first aid have been shown so that all who saw and all who heard might be able to render competent first aid at the scene of an accident.

I wonder how many of you really know the proper way to summon your physician in case of accident or illness? Remember it is always well to tell the physician who it is that is calling, giving definite location where the patient is and what you think is wrong with him, as well as what materials might be at hand that a physician may use; and last but by no means least, it is always advisable to tell what is being done to relieve the patient and also ask the physician to advise you what further to do while awaiting his arrival.

Another thing I have learned in my travels throughout the country is this, that it is highly important if you are calling an ambulance to tell them how many victims they are expected to care for; and also if sending a patient or patients to the hospital it is wise to give the hospital a little advance notice, if possible, as to the number being sent in and something about the condition of the patients. This will often prevent delay at the hospital in getting the injured to bed and under proper treatment.

Should you or some member of your family develop quite suddenly a pain in the abdomen, would you know what to do while waiting for your physician? I fancy I hear you say, "Oh yes, I always know what to do; I would take a physic immediately and then if I do not show improvement within a few hours I will phone my physician for advice."

Do you realize that if you pursue that course you are running a very good risk of being the principal party to the next funeral in your neighborhood?

It is true, the case may be nothing more than green apples. But if you ever have to give advice for a sudden pain in the abdomen, my strong opinion as a First Aider is, to put your victim to bed at once, give him no food, give no laxatives and call a physician at once.

A great many of us who have been in the first aid and safety work for a number of years, those of us who have given a great deal of time and study to it, have long since arrived at the conclusion that the prime object of first aid instruction should be to prevent the accident. I can imagine some safety supervisor saying to himself at this point, "Now, Doctor, you are beginning to talk along the line of my thoughts. We have a fine safety organization in our plant and we have a doctor and a graduate nurse and a well equipped miniature hospital, and we do not need to train our folks in first aid. If we do, then the First Aider will try and show his stuff out in the plant and our employees will soon cease coming to the First Aid Room."

I might agree with you in those last few words: "Our employees will soon cease coming to the First Aid Room." We have abundant evidence to show that where first aid training has been incorporated in the safety program of large industries, the employees who have the standard fifteen hour course in first aid training have fewer accidents than the untrained employee, and if there is no injury, then why come to the First Aid Room unless it is merely a visit.

Neither we of the Red Cross nor any other sane person, would ever attempt to lay claim to the fact that first aid instruction alone can ever entirely rid industry of accidents; but there is accumulated evidence now on hand which does prove that first aid training, when given by well trained instructors who follow standards and teach from texts that have been prepared by men who know their field, will materially assist any organization in a more efficient safety movement.

It has been demonstrated time after time that the well trained First Aider does develop that "safety consciousness" which we hear so much about, and the fact is self-evident that he is a safety man, though he may not be the safety supervisor, or even he may not be a member of the Safety Committee.

ADJOURNMENT.

For the record of the joint session with the Cement Section, held on Thursday morning, October 4, turn in this volume to the general division entitled Cement Section.



Refrigeration Section

Officers 1933-34

General Chairman—L. W. DAWLEY, Southern United Ice Company, Jackson, Miss.

Vice-Chairmen—

T. A. ADAMS, Union Terminal Cold Storage Co., New York, N. Y.

CARL C. CLEMENTS, National Dairy Products Corporation, New York, N. Y.

W. S. WILCOX, E. B. Higley & Co., Mason City, Ia.

Secretary—EDWARD H. FOX, Chicago, Ill.

News Letter Editor—W. O. HAM, Southern Ice & Utilities Co., Dallas, Texas.

Engineering Committee Chairman—EMERSON A. BRANDT, National Association of Ice Industries, Chicago, Ill.

Membership Committee Chairman—COL. P. A. WEATHERED, Houston, Texas.

Poster Committee Chairman—B. C. SKERN, City Ice Company of Kansas City, Kansas City, Mo.

Publicity Committee Chairman—O. J. WILLOUGHBY, Refrigeration Publishing Co., Atlanta, Ga.

Statistics Committee Chairman—HERMAN HILLENBACH, American Ice Company, care of Knickerbocker Ice Company, New York, N. Y.

Members at Large—

A. J. AUTREKRIETH, Chicago, Ill.

A. H. BAER, Carbondale Machine Co., Carbondale, Pa.

GEORGE B. BRIGHT, George B. Bright Company, Detroit, Mich.

G. H. GINGER, The City Ice & Fuel Co., Cleveland, Ohio.

J. ALBERT GREENE, Geyser Ice Co., Waco, Texas.

H. F. HIRSCHFELD, Wisconsin Ice & Coal Co., Milwaukee, Wis.

E. G. HITT, American Associated Mutual Insurance Co., Atlanta, Ga.

H. I. LINCOLN, The Union Ice Co., San Francisco, Calif.

L. T. MCARTHUR, Peoria Service Co., Peoria, Ill.

R. B. McCULLOCH, Bureau of Safety, Chicago, Ill.

JOSEPH MOUDRY, Chicago Ice Producers Mutual Liability Co., Chicago, Ill.

J. F. NICKERSON, American Institute of Refrigeration, Chicago, Ill.

W. M. O'KEEFE, American Warehousemen's Association, Chicago, Ill.

GARDNER POOLE, American Institute of Refrigeration, Boston, Mass.

H. L. TRASK, United States Cold Storage Company, Kansas City, Mo.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Refrigeration Section was called to order by Acting Chairman H. B. Harper, treasurer, the Southern United Ice Company, Jackson, Miss., who presided. He introduced Mr. H. C. Miller, executive secretary, Ice Distributing Committee, Cleveland, who welcomed the delegates in the name of the city of Cleveland.

Chairman Harper spoke briefly on the subject "Our Sectional Accomplishments," crediting the officers and standing committees of the Section with good work and many safety accomplishments during the past year. He then called for the report of the Nominating Committee, and officers for the section for the ensuing year were nominated and elected as follows:

General Chairman—Carl C. Clements, National Dairy Products Corp., New York, N. Y.

Vice-Chairman—T. A. Adams, Union Terminal Cold Storage Co., New York, N. Y.

Vice-Chairman—A. W. Oakley, Merchants Refrigerating Co., New York, N. Y.

Secretary—Edward H. Fox Ice and Refrigeration, Chicago, Ill.

News Letter Editor—W. O. Ham, Southern Ice & Utilities Co., Dallas, Texas.

Engineering Committee Chairman—Emerson A. Brandt, National Association of Ice Industries, Chicago, Ill.

Membership Committee Chairman—L. T. McArthur, Peoria Service Co., Peoria, Ill.

Poster Committee Chairman—Hurley G. Hust, City Ice Co., of Kansas City, Kansas City, Mo.

Publicity Committee Chairman—K. D. Knoblock, Federal Public Service Corp., Chicago, Ill.

Statistics Committee Chairman—Herman Hillenbach, Knickerbocker Ice Co., New York, N. Y.

Members at Large—

G. D. Allman, United States Cold Storage Co., Chicago, Ill.

A. J. Aulburteth, Consulting Engineer, Brownsville, Tex.

C. A. Bowen, Cutler Ice Co., Binghamton, N. Y.

George B. Bright, George B. Bright Co., Detroit, Mich.

L. W. Dawley, Southern United Ice Co., Jackson, Miss.

G. H. Geiger, The City Ice & Fuel Co., Cleveland, Ohio.

E. G. Hitt, American Associated Mutual Insurance Co., Atlanta, Ga.

Guy W. Jacobs, The Steubenville Ice Co., Steubenville, Ohio.

S. R. Kallins, C. Hoffberger Co., Baltimore, Md.

H. L. Lincoln, The Union Ice Co., San Francisco, Calif.

J. F. Nickerson, American Institute of Refrigeration, Chicago, Ill.

W. M. O'Keefe, American Warehousemen's Assn., Chicago, Ill.

Gardner Poole, American Institute of Refrigeration, Boston, Mass.

W. H. Senvard, Louisiana Power & Light Co., Algiers, La.

Harold M. Tombs, Armour & Co., Chicago, Ill.

Where and How Accidents Happen in the Cold Storage Industry

By H. M. TOOMBS

Armour & Company, Chicago, Illinois

The speaker said in part: The cold storage industry is in unique contrast to most other occupations, 95 per cent of the work being manual. The bulk of the labor is performed under low temperature to which the men are necessarily exposed over prolonged periods. Protective clothing is naturally cumbersome and reflects in the speed of all operations. Alternate exposure from cold to hot temperatures, especially during summer loading operations, precludes the employment of any other than those of unusually sturdy physically.

On the other hand, owners of cold storage warehouses are at all times faced with the necessity of good preservation of their physical properties. This fact eliminates the hazard of the so called accidents, caused by abbreviated maintenance schedules. Floors must be repaired. Deterioration of concrete exposes reinforcing bars to the action of frost and ice which rapidly disintegrates the structure.

Arbitrarily setting up a classification of cold storage accidents, reveals the following: Falling objects, 30 per cent; scratches and shivers, 28 per cent; trucks, 12 per cent; slipping and striking objects, 12 per cent; handling objects, 10 per cent; falls to different levels, 4 per cent; frozen extremities, 2 per cent; other accidents, 2 per cent.

The first class, falling objects, covers a large group of accidents to the toes and feet. Frequently employees let boxes or cartons slip from their hands and because the material is frozen and non-resilient it will readily crush a toe. Frost adheres to the metal and makes packages slippery. The packages are piled four high and unloaded from storage space onto trucks. Special precaution must be used and insistence is made that men wear approved types of safety shoes as a preventive of accidents in handling.

Scratches are the result of nails protruding from wooden or fibre boxes. Here the shipper can materially aid the warehouse man by proper attention to nailing of barrel heads. Both the checkers and the foremen should be coached to insist that all projecting nails be removed. Wire bound crates and strap-iron boxes present a serious hazard because infection acts in quickly following a puncture wound. Most such accidents are directly traceable to defective box production or loose box inspection by inexperienced shippers. The use of heavy gloves or gloves that are not worn threadbare is a good preventive. One employer furnishes his men with heavy pliers so that nails and wires can be knocked out or cut off when the goods are received.

Slivers are picked up from wooden boxes and bin bracing. A good grade of lumber should be used. Knotty stock is discarded. Standard sizes surfaced four sides may not be the cheapest, but it is the best for handling by the employee.

While many accidents appear minor, most of the trouble develops by not reporting them promptly to the doctor's office and before infection has had time to set in.

Slipping and striking objects produce common injuries on days of high humidity when stairs become wet. Dirt rapidly accumulates on them and forms a slippery mush. Men clad with wooden soled shoes are apt to slip. Stairs should be swept clean and kept as dry as possible through liberal application of sawdust or salt.

One of the common causes of accidents on platforms is the use of faulty bridge plates. They are often made from a flat piece of boiler iron and of insufficient length to properly cover the necessary space, especially on curved docks. They easily become a stumbling hazard, and if not correctly fastened, they may slip out of place, the result being an overturned truck and sometimes a serious injury to the employee. Bridge plates should be constructed of sufficient length to overlap 6 inches at each end and with angle guards or stiffeners at the sides. Special racks should be constructed to hold car plates in an upright position when not in use.

In operating trucks, one very dangerous practice is that of standing on the truck and reaching for overhead loads without bracing the wheels. The worker may slip, be thrown off balance and sustain a nasty fall. Sprains and wrenches are quite common from this cause. Hands are sometimes pinched between truck handles and door jambs or in elevator cages. Employees should be instructed to keep their hands from the edges of push rails and the sides of loaded packages. Trucks must be regularly inspected if they are to be kept in condition. Frequent oiling is necessary.

Handling objects causes many accident. Crushing injuries fall into this classification. Hooks slip from boxes. Throwing of frozen hams into trucks causes them to bounce onto helpers; there is no cushion when the material is frozen. Careful and experienced men are needed in eliminating these accidents.

Slipping and falling to a different level is usually caused by the worker falling from the tops of piles, and is most easily prevented by forbidding men to unload in that fashion. Falls from platforms or loading docks occasionally occur. The surface of the dock must be kept in a good state of repair, not permitting depressions.

Cleanliness and orderliness are important here. Broken staves, refuse and racks must not lie around promiscuously. Good housekeeping is the order of the day.

The engine room also contributes its share of hazards. Calcium brine is the cooling medium in most large houses, the brine being carried 22 degrees below zero. Ammonia is used for cooling the brine, being expanded into shell-coolers and compressed with ice machines. The engines are amply safeguarded with proven devices. They afford automatic mechanical protection and it is the duty of the engineer to know that they will function correctly under emergency conditions. Ammonia leaks invariably present a hazard. Gas masks are as important to the engineer as his gauges. Each man should be provided with his own mask, as they are not readily interchangeable for all faces. Masks should be prominently displayed and in a serviceable condition. Nothing cuts off the breath quite as quickly as does a strong whiff of ammonia gas. Bad leaks are approached only with the aid of a water hose, as the water readily absorbs the fumes. Contact with the liquid on the bare skin will produce serious burns. Over exposure to the eyes will cause temporary blindness.

The use of standard ladders and step ladders is highly recommended for climbing around condensers and reaching out-of-the-way valves. Homemade ladders should be scrapped, as they are generally defective in construction. Money spent for safe ladder equipment will prevent bad falls and possible permanent injury.

Elevators also come in for their share of attention. They are in constant use. Accidents with this type of equipment are frequently fatal. Safety doors properly latched at all times will prevent falls down the elevator shaft.

A Study of Experience in the Ice Industry

By J. L. SPEERS

Safety Engineer, City Ice and Fuel Company, Cleveland, Ohio

The speaker said in part: In considering how and where accidents happen, let us start at the beginning, the engine room. Here good housekeeping is at a premium. A stumble or a slip, perhaps in a pool of oil, may precipitate a man into moving machinery, into an open switchboard, or in falling he may forcibly strike a machine base or some other solid and substantial object and be very severely injured. Guards should be erected around all moving machinery and if such guards are mere railings a center rail and a toe board should be used to complete the guard. Where the moving parts of machinery are close to a walkway, the guards should be solidly constructed of woven wire or expanded metal.

The engineers at one of our plants had standing orders to shut down the compressor when they had occasion to feel the end of the shaft to determine if its bearing was running hot. This was strictly observed by all except one man. He attempted to feel the shaft by thrusting his arm in quickly and jerking it out again while the connecting rod was down, thus avoiding the ascending arm of the connecting rod by the speed with which he moved his own arm. In fact, he did this several times successfully; but one night he was not quite fast enough, and the result was a finger mashed between the rod and the rim of the fly wheel. Infection developed and in four days the man was dead.

Most of our engine room injuries have been received in connection with the use of electricity. Up to a few years ago, not a season went by but that two or three men were burned by electric flashes. Investigation showed that the flash usually occurred while the men were testing fuses, and it was found that they and others were using a light or series of lights (common ordinary electric light bulbs) as the resistant unit to test these fuses. We recommended and all our engineers have equipped themselves with a variable type fuse tester, good on all circuits from 110 to 660. Needless to say, this has greatly reduced our flash burn cases.

Going into the tank room, we begin to run into the hazard of slippery walking surfaces. Tank tops are usually wet and there is not much that can be done to remedy that condition, except have the tank covers fit solidly so that the walking area is level. Have the ice puller walk behind the pull rather than in front of it. Have core sucking hoses and other movable objects or materials kept out of the regular walkway paths. A number of injuries are received each year by the ice

puller, caused by broken wires in the crane cables. These, especially where they are fastened on to the single tree or double tree, or can hook, should be wrapped with tape.

I have always been afraid that some day an ice puller would step or slip into the dip tank, but so far this has not occurred. We have all our dip tanks equipped with toe boards, which while they will not stop the man from falling in, at least will check or stop his slipping in.

We have found that we get more economical and safe operation out of our scoring machines when they are located just in front of the slide leading to the storage. Having them here keeps employees away from them, permits them to be operated in above freezing temperatures, and gives more light around them. We have had fewer breakdowns and our records fail to show the case of a single accident from this source since the scoring machines were moved. In former days, injuries were received quite frequently. For those scoring machines which are in their old locations, we have installed tunnels at either end so that it would be practically impossible for a person ever to intentionally get a hand or a foot anywhere near the saws.

The storage room presents hazards distinctly different from those of the engine room or tank room. Lighting conditions are far from satisfactory. Therefore, good housekeeping is at a premium. Ice chips and spawl ice must be kept off the floors. Floors polished by sliding blocks of ice are bad enough without having their slipperiness enhanced by ice chips and snow.

In handling ice in storage, most operators find it necessary to store the night pull of ice in end to make room. In the ending and lowering of these blocks, we have what we believe to be the most distinct hazard of our entire industry. A slipping foot, a dull tool, a cracked block or one with a corner broken off, will permit a block to slip quicker than you can wink your eye, and when it starts slipping, falling or turning, nothing can stop it. Steel toed safety shoes are the only answer to this hazard, and all storage men should be required to wear them. To prevent the falling of ice blocks, we should insist that no defective blocks be ended, and that all tongs should be kept sharp, but it only takes one slip to break a toe, so steel toed safety shoes are the answer.

I regret to say that three employees have lost four fingers on ice cubing machines. During the holiday rush for ice cubes, one of our employees, after working all day, wanted the job of making cubes that night. Along about midnight, just before he was to be relieved, it is supposed that the mechanical repetition of his actions had dulled his reflexes. For some reason or other, he attempted to flick a cube off the platform, his glove hit the horizontal saw, and immediately he was without a finger.

Some five months later, on this same machine, a driver, while waiting for some cubes to be sawed, could not be inactive. For no good reason at all, he reached up into the snow discharge chute and was pulling the snow out, when suddenly the bottom of the vertical saw caught his glove, and presto a finger was lost.

In Detroit, the cubing machine operator slipped and fell so that his hand went into the saws. Two fingers were lost.

We are trying at this time to put safeguards on our cubing machines, and some of the guards may prove to be practical. One device is a tunnel arrangement at the discharge end; another, a counter weight to keep the covers over the saws at all times; another a back railing to prevent slipping—but even at best they are only makeshifts. There is a wonderful opportunity for some concern to put together a bunch of saws and have them so protected at all times that the employees of our ice industry need not be exposed to these maiming injuries.

I want to devote a few minutes to railroad car icing operations. We operate some 57 of these stations and are quite proud of the record our men have established. In 1928 and earlier years their frequency record was over 50 lost-time accidents per million man-hours. Of recent years this has been decreased until it is now usually under 20, and in 1932 it was as low as 15 and a fraction. The credit for this improvement should all be given to the Safety Committees and the superintendents of the various plants. They have only one motto and that is, "If new employees are properly taught and older employees are constantly cautioned, our plant will be a safer place in which to work."

Hazards here are perhaps more apparent than in any other branch of our industry. Working on platforms 20 feet or so from the ground, or on car tops 12 feet from the ground, where a slip or an uncontrolled tool or block of ice may cause the man to fall to the ground, is no sinecure, especially when they are out at all seasons of the year and in all kinds of weather. Our Safety Committees have adopted certain rules, each one of them an outgrowth of accidents that have occurred. For example:

1. No man shall board a cut of cars while it is moving, nor shall the train be given the signal to start up while a man is on the car tops.
2. Do not walk close to the conveyor.
3. While working on an ice bunker, stand with back facing the rear corner of the car.
4. Buggies are to be pushed, not pulled.
5. If ice is dropped onto the ground, the man or men who caused or permitted it to fall must see that it is brought back up on the platform after the train pulls out.

When we first started our safety work with this group, we had a number of men injured by trains bumping the cars while our men were working on them. This has been practically stopped by the placing of white and blue lights on either end of the platforms. Blue to a railroad engineer is what red is to us. It means stop, and when the blue light is on while our men are on the car tops an engineer would no more touch or cause that cut of cars to move than you would crash a red light with a traffic cop twenty feet behind you.

THURSDAY MORNING SESSION

October 4, 1934

Safety in Ice Delivery

By GUY W. JACOBS

General Manager, The Steubenville Ice Co., Steubenville, Ohio

The speaker said in part: Essentially, safety in ice delivery is dependent upon the exercise of identically the same care and caution as is safety in any other branch of the ice industry. However, I want to make the unqualified statement that unless the management of an enterprise is vitally interested in accident prevention, the experience along this line will be anything but satisfactory.

Now, what are some of the hazards peculiar to the delivery of ice? Really, most of the common ones are of a minor nature and therefore difficult to guard against. It is also very difficult to have the employee thoroughly understand the serious consequences that may result from the neglect of a so-called minor injury. The majority of accidents to an ice deliveryman will fall in one of the following groups—cuts, scratches, bruises, and sprains. The tools used—ice picks and tongs—account for many of the cuts and scratches. At the very best, they are dangerous tools in the hands of a careful workman, and when placed in the hands of a careless man, they become instruments of torture and death. When in use, they should be sharp and otherwise in good condition. When not in use they should be properly guarded—the picks in sheaths or scabbards and the tongs in a closed position at the side of the body—never over the shoulder.

Another source of cuts and scratches is often the equipment into which ice has to be placed—loose latches on the doors, exposed sharp edges of the metal lining of the ice compartments, as well as broken and splintered wooden racks in the larger boxes. Bruises result from many different causes. Extreme care should be exercised by deliverymen in loading the ice into the delivery equipment at the platform and he must be equally careful in transferring the ice from the wagon or truck to its place of ultimate consumption if he would guard against mashed and bruised toes and fingers. Good shoes, equipped with the very best of box toes, are an aid in preventing this form of accident. Sprains and strains are quite common,

too. The loading platform or dock should be kept clean, so that good solid footing may be had by the man who has to drag or otherwise handle the cakes of ice when loading them into the wagon or truck. The ice should always be handled by tongs and never with the feet or bare hands. If ice cakes have to be stood up on end or laid down, they should be grasped securely and firmly with the tongs and the body of the man allowed to move with the ice so that there will be no straining of the back muscles.

But personal injury accidents are only one side of the picture. Another form of accident that should be given equal consideration is that to the customer or some other member of the public. Accidents of this kind are always very embarrassing to the ice company and always difficult to settle or adjust. Children are quite often the victims and this makes the accident all the more regrettable. Every ice deliveryman should be taught that children are not responsible and that he should therefore be doubly cautious when they are around. An unbeathed ice pick, exposed tong point, scale hook, or any other sharp tool or piece of equipment is a source of potential trouble. Children should not be permitted to ride or latch on to any piece of delivery equipment. This cannot always be prevented, but the efforts of the deliveryman to this end should never be relaxed.

In the home and places of business where ice deliveries are made, no spawls or water should be permitted to remain on the floor after the delivery is completed. In fact, the delivery should be made in such a way that the only evidence of the visit of the ice man is the ice itself in the proper compartment of the refrigerator. No ice should be piled up against the door or otherwise placed so that it might become dislodged when the door is opened. In this way, and only in this way, are you fully guarding the public against accidents. The ice delivery bag, while not generally thought of as a safety device, is one nevertheless, because when properly used it prevents all water drip and furnishes a means of removing all spawls and broken pieces from the refrigerator, so that the new and larger piece of ice may be placed on the bottom where it rightfully belongs. In other words, a clean delivery is a safe delivery.

Street accidents are becoming more numerous because of the increasing number of vehicles and the speed with which they move. No piece of equipment should be allowed on the street unless it is in first-class condition. From a safety standpoint, good brakes are more important than a good motor, and figuratively speaking, a set of brakes in the head of the driver are of more value than the set on the truck.

Cleanliness and safety go hand in hand. Show me a neat, clean-looking ice deliveryman, properly uniformed and equipped with good tools, one who takes pride in himself and his work, and I will show you a careful worker. Likewise, show me a superintendent or route foreman who insists on the equipment under his supervision being clean and in good condition, and I will show you an organization whose accident experience is among the best. On the other hand, a dirty plant, slovenly methods of doing things, dilapidated equipment, poor tools or no tools at all, a devil-may-care attitude on the part of the management, and many other things that go to make this picture complete are natural breeders of accidents.

Refrigeration Industry Accidents and Their Prevention

By W. O. HAM

Southern Ice and Utilities Company, Dallas, Texas

The speaker said in part: An analysis of the accident injury rates in the refrigeration industry for the year 1933, as published by the National Safety Council, indicates that our record, as compared with other industries, is satisfactory although there is still much room for improvement. The unhappy feature of it is that our frequency rate increased for the first time in five years. Nevertheless, the happy feature of the record is that although our frequency rate increased, our severity rate decreased materially. We are, therefore, making progress in reducing the more serious injuries, but in order to continue to reduce them, management must give

more study, not only to the causes and the placing of responsibility, but at the same time analyze the effects of accidents.

In order that our past experience may be a guide for future activities, let me call attention to those types of accidents most common to our industry. According to experience and averages over a period of years, it is found that more than 90 per cent of all types of accidents in the refrigeration industry can be brought under seven classifications: 1. Handling objects, 35 per cent; 2. Falls, 21 per cent; 3. Machinery, 9 per cent; 4. Using hand tools, 4 per cent; 5. Falling objects, 6 per cent; 6. Stepping on or striking against objects, 5 per cent; and 7. Electricity, explosives, heat, etc., 9 per cent.

It will be seen that 56 per cent of all our accidents occur on account of the handling of objects and falls. Let me discuss the specific causes of a few of these accidents.

1. Employee was dismantling the vat and coils no longer in use. In removing the coils from the vat, the coils slipped and the sharp edge of the agitator blade caught the employee's hand between the coil and the top of the vat, severing two fingers and cutting the third. Result, 350 days of lost time.

This accident could have been avoided had the blades on the agitator been removed first and the coils taken out later.

2. Employee slipped on steps inside office leading to rear door, falling from second or third step to office floor, and breaking left arm twice and bruising left thigh badly, also spraining left thigh. The steps were wet as a result of men passing in and out of the office after a heavy rain. Result, 302 days of lost time.

This accident could have been avoided had the treads been kept dry, or had some kind of anti-slip plates been placed over them. Safe Practices Pamphlet No. 2 of the National Safety Council on "Stairs and Stairways" gives complete information as to how steps, stairs and stairways are to be kept safe.

3. Employee was trying to pull loose a cake of ice which was hung in an ice scoring machine. His foot slipped, and the side of his leg hit the saw while running. Result, 56 days of lost time.

The guard had been removed from this saw to make an adjustment and had not been replaced. The employee, rather than go around on side of scoring machine and open guard gate to loosen block of ice, squeezed in between wall and scoring machine where he did not have room to work. He should have shut off the current on the machine and pried the ice loose with a bar, instead of trying to get it loose with hooks while the machine was running. He had been cautioned about this practice not more than two weeks before.

4. Employee was putting the purger in operation and when he tried to open the valve and let the foul gas escape, the valve stuck. When it did release, of course, it opened a little too wide, letting a large amount of gas out at one time. This gas is bubbled off in a vessel of water to absorb the fumes of ammonia, but the vessel of water had been in use for some time and the water had become heavily saturated with ammonia. The sudden gust of gas caused water to be blown into the face of employee, striking his eye, nose and mouth; the most serious injury being to his left eye. A small spot was burned on the eyeball and under the lid.

An employee should use a large mouth vessel for purging, having it located so that he will not be over it when adjusting valves; and the water should be changed regularly so that it will not become saturated with ammonia.

5. A vault door closed abruptly as an employee was coming out of the vault with ice for a customer. The door struck him, causing a near rupture. Result, 35 days of lost time.

This accident occurred, no doubt, because of a spring being attached to the door. The cause of the accident would, therefore, be ascribed to "haste."

6. Employee was repairing leak in boiler holding SO₂ gas, and in order to repair the boiler was pumping gas from boiler into receiver. He was standing over the liquid line valve when receiver at valve end exploded, and a full charge of the gas hit him in the face, severely burning him about face and eyes and all over the upper region of his body. Result, 25 days of lost time.

In this instance the employee had a gas mask but had failed to put it on.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Rubber Section

Officers 1933-34

General Chairman—H. W. Low, Miller Rubber Products Co., Inc., Akron, Ohio.
Vice-Chairman in Charge of Program—B. F. GERPHEIDE, The Goodyear Tire & Rubber Co., Akron, Ohio.

Secretary—A. M. DIETZ, Pennsylvania Rubber Co., Jeannette, Pa.

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Engineering Committee Chairman—W. L. SCHNEIDER, The B. F. Goodrich Co., Akron, Ohio.

Health Committee—

DR. W. S. ASH, United States Tire Co., Inc., Detroit, Mich.

DR. J. NEWTON SHIMLEY, Hood Rubber Co., Inc., Watertown, Mass.

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Publicity Committee Chairman—R. W. MORSE, The Firestone Tire and Rubber Co., Akron, Ohio.

Statistics Committee Chairman—JOHN J. LOGE, The General Tire and Rubber Co., Akron, Ohio.

Slides and Safety Kinks Committee Chairman—H. A. WALKER, The Goodyear Tire and Rubber Co., Akron, Ohio.

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C. F. HORAN, Hood Rubber Co., Watertown, Mass.

J. T. KIDNEY, The Goodyear Tire and Rubber Co., Akron, Ohio.

M. A. QUINN, Samson Tire and Rubber Co., Los Angeles, Calif.

CHARLES F. SMITH, U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Rubber Section was called to order by General Chairman H. W. Low, Miller Rubber Products Co., Inc., Akron, Ohio, who presided. The chairman gave a brief resume of the Rubber Section activities during the past

year, outlining the work of officers and especially praising the work of chairmen of standing committees. He then introduced the first speaker.

Safety Progress in the Rubber Industry

By J. J. LOGE

Employment Manager, The General Tire & Rubber Co., Akron, O.

The speaker said in part: The Rubber Industry had an unsatisfactory accident record during 1933. The frequency of disabling injuries rose 11 per cent and severity was up 42 per cent over 1932, according to records from 46 companies reporting to the National Safety Council for both years. The entire industry averaged 11.71 for frequency and 1.09 for severity in 1933, on the basis of records from these 46 plants that worked over 116 million man-hours during the year.

The frequency of each type of injury rose over 1932, and the only type to show improvement in severity was temporary disabilities. Fatalities were up 75 per cent in frequency and permanent partial disabilities rose 25 per cent in frequency and 75 per cent in severity.

While the 1933 rates of the Rubber Industry compare favorably with rates in other industries, the changes in rates from 1932 to 1933 were worse than average. Rubber companies, in comparison with 29 other major classifications, ranked 12th in frequency and 10th in severity. The industry's frequency rate is 20 per cent below the average of 14.56 for all industries and the severity rate is 31 per cent below the general average of 1.59.

The increases of 11 per cent in frequency and 42 per cent in severity do not compare favorably with the rise of 7 per cent in frequency and a decrease of 6 per cent in severity for all industries. The improvement in the all-industries severity rate is due entirely to better experience with fatalities, in contrast to adverse experience with this type of injury in the rubber industry.

Plants manufacturing rubber footwear had the best safety records during 1933, averaging 6.56 for frequency and 0.90 for severity, in comparison with rates for the entire industry of 11.71 and 1.09. Manufacturers of mechanical rubber goods excelled tire plants slightly in frequency, but averaged 1.65 for severity against 0.98 for the tire plants. Large units made the best records during the year 1933. Small units, by averaging 1.13, were only slightly worse in severity, but their frequency rate is 26 per cent above large units.

Unsettled working conditions during the year were probably instrumental in retarding our progress. These statistics disclose that handling objects and machinery caused a total of 60 per cent of our accidents. Very probably the influx of new men during the rush season contributed largely to these accidents.

Safety in Rubber Mill and Calender Operations

By W. W. STEPHENS

General Foreman, The Goodyear Tire & Rubber Co., Akron, O.

The speaker said in part: Recent statistics indicate that approximately 90 per cent of accidents in industry today are due to three causes: first, unsafe practices; second, violation of safety rules; and third, chance-taking and indifference on the part of the workmen. These statistics also emphasize the necessity of education and discipline, and one efforts therefore must be concentrated on the educational training and instruction of the employee.

This can best be accomplished in three ways: first, by a study of the safety requirements of the job itself; second, by a plan whereby the man is taught how to fulfill the job with the greatest safety and efficiency; third, by absolute discipline, so that in the course of his training the best and safest way of performing the job becomes a habit with him.

To insure success in a movement of this kind there must be instilled in the employee a feeling of self-interest and self-protection. This is possible only through his own efforts—explaining to him that it may be his own person or that of a fellow worker who may be injured. If he can be made to understand that it is his individual duty to report dangerous practices and conditions, the greatest incentive for the continuation of safety will be recognized. The supervisor should be made to realize that it is their responsibility to prevent accidents and that it is an important part of their duty to see to it that all unsafe practices and violations of safety rules are avoided.

Discipline has an important place in the safety program. Supervision should never allow an unsafe practice or a violation of safety rules to get their approval by ignoring it. The attention of the employee should be called immediately to the violation of any safe practice and he should be adequately warned against doing so in future. To pass up a violation of this kind always gives the stamp of approval. Suitable penalties should be provided for continuous violations.

We at Goodyear have attacked the accident problem from this angle. We have appointed safety committees. These committees are composed of members of the supervision, staff, and an industrial assemblyman. These committees meet monthly. In addition to this, we have weekly inspection committees, composed of piece workers, assemblymen and one member of supervision. It is by constantly keeping the subject of safety in front of the men that we have prevented a lot of serious injuries, as well as a multitude of minor ones. We make a special effort to see that all of the machinery is guarded as well as it can be guarded and that our men are familiar with all of the safety rules.

Changing Industry and Its Problems

This address by Mr. J. T. Kidney, Employees' Service Division, The Goodyear Tire and Rubber Company, Akron, O., discussed some of the changes industry may expect; emphasized the importance of management learning something about compensation for accidents since industry must bear its burden; and pointed out the important part education plays in the prevention of accidents. Mr. Kidney, however, spoke extemporaneously, and there is no record available for these Transactions.

Dust Problems in the Rubber Industry

By DR. J. NEWTON SHIRLEY

Arrow Mutual Liability Insurance Co., Watertown, Mass.

The speaker said in part: It might be assumed that workers in the rubber industry are exposed to the dusts of dangerous materials in large amounts; but this is scarcely true. A very small number of employees are exposed to materials which are dangerously toxic. In the following paragraphs the term dust will be applied to the finely divided particles of materials which arise when a substance is handled or when machinery or air currents may stir it up.

The first place we encounter dust is in the receiving departments. The materials come in various types of containers and arrive in freight cars or trucks. The containers are subject to damage with loss of materials and the opportunity is present for the handlers to inhale the dust from such materials. If these materials are at all toxic, the employees may develop symptoms. Exposure is variable, usually sporadic, and is of importance only in a casual way. In some plants considerable filler materials, such as Fullers Earth—Stoughton Earth—clays—infusorial earth—rotten stone, etc. are used in large quantities. Most of these materials contain a fair amount of free silica and cannot be overlooked as a source of silicosis. Such workers should be protected by the proper use of respirators. Silicosis is a condition rarely considered as an occurrence in the rubber industry but one case is on record in Massachusetts as a compensable condition. To be sure tuberculosis was

year, outlining the work of officers and especially praising the work of chairmen of standing committees. He then introduced the first speaker.

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By W. W. STEPHENS

General Foreman, The Goodyear Tire & Rubber Co., Akron, O.

The speaker said in part: Recent statistics indicate that approximately 90 per cent of accidents in industry today are due to three causes: first, unsafe practices; second, violation of safety rules; and third, chance-taking and indifference on the part of the workmen. These statistics also emphasize the necessity of education and discipline, and our efforts therefore must be concentrated on the educational training and instruction of the employee.

This can best be accomplished in three ways: first, by a study of the safety requirements of the job itself; second, by a plan whereby the man is taught how to fulfill the job with the greatest safety and efficiency; third, by absolute discipline, so that in the course of his training the best and safest way of performing the job becomes a habit with him.

To insure success in a movement of this kind there must be instilled in the employee a feeling of self-interest and self-protection. This is possible only through his own efforts—explaining to him that it may be his own person or that of a fellow worker who may be injured. If he can be made to understand that it is his individual duty to report dangerous practices and conditions, the greatest incentive for the continuation of safety will be recognized. The supervision should be made to realize that it is their responsibility to prevent accidents and that it is an important part of their duty to see to it that all unsafe practices and violations of safety rules are avoided.

Discipline has an important place in the safety program. Supervision should never allow an unsafe practice or a violation of safety rules to get their approval by ignoring it. The attention of the employee should be called immediately to the violation of any safe practice and he should be adequately warned against doing so in future. To pass up a violation of this kind always gives the stamp of approval. Suitable penalties should be provided for continuous violations.

We at Goodyear have attacked the accident problem from this angle. We have appointed safety committees. These committees are composed of members of the supervision, staff, and an industrial assemblyman. These committees meet monthly. In addition to this, we have weekly inspection committees, composed of piece workers, assemblymen and one member of supervision. It is by constantly keeping the subject of safety in front of the men that we have prevented a lot of serious injuries, as well as a multitude of minor ones. We make a special effort to see that all of the machinery is guarded as well as it can be guarded and that our men are familiar with all of the safety rules.

Changing Industry and Its Problems

This address by Mr. J. T. Kidney, Employees' Service Division, The Goodyear Tire and Rubber Company, Akron, O., discussed some of the changes industry may expect; emphasized the importance of management learning something about compensation for accidents since industry must bear its burden; and pointed out the important part education plays in the prevention of accidents. Mr. Kidney, however, spoke extemporaneously, and there is no record available for these Transactions.

Dust Problems in the Rubber Industry

By DR. J. NEWTON SHIRLEY

Arrow Mutual Liability Insurance Co., Watertown, Mass.

The speaker said in part: It might be assumed that workers in the rubber industry are exposed to the dusts of dangerous materials in large amounts; but this is scarcely true. A very small number of employees are exposed to materials which are dangerously toxic. In the following paragraphs the term dust will be applied to the finely divided particles of materials which arise when a substance is handled or when machinery or air currents may stir it up.

The first place we encounter dust is in the receiving departments. The materials come in various types of containers and arrive in freight cars or trucks. The containers are subject to damage with loss of materials and the opportunity is present for the handlers to inhale the dust from such materials. If these materials are at all toxic, the employees may develop symptoms. Exposure is variable, usually sporadic, and is of importance only in a casual way. In some plants considerable filler materials, such as Fullers Earth—Stoughton Earth—clays—infusorial earth—rotten stone, etc., are used in large quantities. Most of these materials contain a fair amount of free silica and cannot be overlooked as a source of silicosis. Such workers should be protected by the proper use of respirators. Silicosis is a condition rarely considered as an occurrence in the rubber industry but one case is on record in Massachusetts as a compensable condition. To be sure tuberculosis was

a predominant picture in that one case. Ordinarily labor turnover in these departments is sufficient to prevent such a condition developing.

There has been in my experience cases of marked dermatitis of these laborers when exposed to the dust from coal tar pitch while unloading this material from a box car when shipped in bulk. This material is brittle and chips readily when shoveled. The dust produced causes a marked erythema of the skin which increases in intensity for some twelve hours after the exposure. Along with this erythema, the men develop a marked conjunctivitis which causes intense pain in the eyes with loss of sleep. Such employees have frequently been unable to work the next day. In 24 hours the reaction has fairly well subsided. In an attempt to prevent such a condition, the work was done at night and some success has been noted. The use of goggles and respirators has not entirely prevented such reactions. It has become a practice, where this is done, to work the men only half a shift on this work and distribute the work over a larger group of men. Previous to starting the work, the men cover all areas of exposed skin, other than the hands, with a cloth hood which is fastened about the neck. They are required to thoroughly wash up after completing the job. The eye reaction is only equalled, in my experience, by the reaction noted in eyes where a man has been improperly protected from the electric arc used in electric welding.

The next place noted in exposure to dust is in the compound room. Here the various materials are weighed out for use. The highly toxic materials are usually found among the accelerators, coloring materials and anti-oxidants. Usually these materials are weighed out in small quantities under very satisfactory working conditions and placed in individual paper bags so that there will be no loss. The type of workman on this job is usually above that of the ordinary laborer. He is told to use care in weighing out his material and appreciates the dangers if he is slack. The materials here are primarily organic compounds and dermatitis is the condition found. Since the use of hexamethylene-tetramine, safex and aniline or aniline oil has been largely discontinued; toxic conditions in the weighing out of accelerators have largely disappeared. There is one material, formerly used in large quantities, which has always given the industry a bad name—litharge. Lead symptoms among men weighing out litharge have always been common. Use of respirators, adequate ventilation and rotation of workmen have become accepted practices. Adequate washing facilities should be provided and the men made to use them previous to lunch hour and previous to going home from work. Periodic check-up of compound room men exposed to lead or its salts should be made for physical signs or symptoms of lead absorption.

The remaining work in the compound room consists of weighing out the more bulky materials. These materials are stored in bins and weighed out, as a rule, into batch cans or pans. The amount of dust produced depends upon the technique of the operator. These dusts are practically non-toxic but dirty and annoying to the workman. Long time service in this work does not appear to have any effect on the health of the men exposed. Note should be made of certain fillers which contain small amounts of silica and some day we may find evidence of exposure in this work which has produced symptoms of silicosis. An improved method used at times is to deliver the material to the mixing machine or mill in its original container, if a heavy paper bag, thus requiring only the one opening operation. This is a very common practice in handling lamp black.

We should not forget the sweeper in the compound room. His job is particularly dirty and dusty. He is exposed to all materials used. I was very much interested last summer while helping in the silicosis study made in Massachusetts, to note that two janitors showed more evidence of dust changes in the chest than many of the workmen X-rayed.

In the mill room we find a very much improved condition over what we saw ten years ago. Formerly, the various compounds were dumped unceremoniously onto the mixing mill with a great cloud of dust arising and no adequate ventilating hood to remove it. This dust contained all types of materials being compounded. Today most mills are equipped with efficient exhaust hoods which remove the dust raised and the various materials are added somewhat apart. Masticators have replaced mixing mills in most plants and in feeding these masticators large amounts of dust are created at times. Exhaust hoods should be installed close to the openings of these masticators to remove this dust which usually is noted when the bursting

gum raises this dust. This is not the easiest task when one realizes how little space there is for such a hood.

The mill room has been further improved by the elimination of the old dusting bags used to prevent sticks or cuts of stock from sticking together. The present method of dipping the cut into a tank of supersaturated chalk solution or spraying with such a solution has eliminated practically all dust. This has been the cause of good improvement in the working conditions in the mill room. The credit belongs to the chemists, as the use of the faster accelerators has required quicker cooling of compounded rubber when removed from the mixing mill.

Stock or storage bins for storing compounded rubber require the free use of cloths or dusting powders, whiting, talc or chalk. The employees in this work are exposed to large amounts of dust, usually harmless in nature. There is a chance that this dust may be sufficiently contaminated with toxic materials to constitute a hazard. This was once claimed to be the source of a case of lead poisoning. Dermatitis from this dust in days of hexa was not unusual.

In the cutting room, numerous spots are found where considerable dusting powder is used. Well can I remember what I thought when I first saw the operator of the Parsons Cutter dicing out parts of filter materials and reinforcement stays; he was covered from head to foot with dust. Improved processes have reduced the dust in this part of the work. Such dust is only toxic from contamination but a man with chronic rhinitis is uncomfortable and he may have to give up such work. The only control is by local exhaust located on the head of the cutter and care on the part of the lay-out man in not using an excess of dusting powder. The use of wax paper between layers of stock has eliminated this dust in stock wherever such could be done to advantage.

Passing on to the manufacturing process, we invariably find cloth books or liners used to store and transport cut stock from one process to the next. These books or liners may become dusty from the dusting powders used or the sulphuring out of the stock in the book. Protection of the stock booked generally requires frequent cleaning of these books by compressed air hose. Dermatitis used to be a frequent occurrence among the employees handling these books or liners. One of the most stubborn cases of dermatitis I ever saw occurred in a man repairing these liners.

There is a last place where dermatitis can show up—the packing room. Here the finished product may have dusting powder which drops off or a slight sulphuring out reaction which gives rise to a toxic dust. This incidence is rare today because of the elimination of the toxic accelerators. One of my prize patch testers on dermatitis was once so sensitive to a certain accelerator that he could not sit at a desk having a small desk pad of this material without breaking out with a rash in the sensitized area.

This to a large extent covers the dust situations peculiar to the rubber industry, as I know them. Several other processes may occur. For some work, hard rubber dust is a necessary ingredient. This dust is explosive and where handled in large quantities, special precautions must be taken. The manufacturing process requires the use of carbon dioxide fumes to prevent fires or explosions.

Several processes are found where abrasive wheels or belts are used in the manufacturing processes. This dust may be toxic or non-toxic but is very objectionable and good practice requires its removal. We find such processes as buffing canvas shoes before cementing—buffing overflow from tire beads and similar moulded products—buffing hard rubber products—buffing air bags used in curing tires, etc. All these processes should be provided with local exhaust ventilation and dust collectors. Perhaps the more common danger is the fire hazard when a spark or over-heated piece of material ignites such dust when it lands in a pocket in the duct. The air-current makes a forced draft burner.

For a while sand-blasting was used for cleaning metal bases on which rubber was to be vulcanized. I refer to the process of sand-blasting the solid tire rims. Such work requires enclosure in a sand blast chamber such as is found in any sand-blasting operation. The introduction of steel grit and the improvement of the sand blast chamber have removed most of the chance of silicosis. Good health supervision required periodic examination and X-rays of all men operating or working around sand blast machines.

There is one further dust situation which comes to my mind, lead oxide fumes found over the lead pots which some manufacturers have used to clean iron or steel molds. These lead pots are frequently heated to 650-750 degrees F. at which temperatures the lead is volatilized and the fumes are a ready means of acquiring lead poisoning. Such lead pots should be adequately exhaust ventilated.

In this connection, the use of lead in rubber hose manufacturing is not without danger. Cases of lead poisoning have occurred from the dust produced by the conveyor which returns the scrap lead to the melting pot. The rubbing of the lead fragments against the side of the conveyor produces a fine dust which falls through the cracks of the conveyor and may be circulated around in the air breathed by the operators. These men should be subject to periodic checkups.

Dust Problems in the Rubber Industry

By DR. W. S. ASH

Plant Physician, United States Tire Co., Detroit, Mich.

The speaker said in part: I am going to take the position of being a bit of a skeptic about all this alarm over the dust question. The health pendulum in industry swings to the extremes, like so many other things. At one time industry didn't care a rap about the health of the worker; he was easily replaced. Now sometimes we go so far as to exercise a kind of paternal jurisdiction over him until he sits back and expects us to make out his entire health program. Industry should not be permitted to sidestep any real responsibilities in health matters; a healthy and sanitary workshop should be maintained according to accepted standards; but beyond that it should still be an individual matter—the worker should be sufficiently interested in his livelihood to want to preserve his health without our cramming too much "do this," or "do that" down his throat.

You can easily see that I want to be the optimist of the party. I want to go on record as saying that, as far as I have been able to observe, we have no serious dust problem or hazard on our hands. Take it or leave it; that is my conviction. Opinion is certainly not unanimous one way or the other. This can be easily verified by getting together a half dozen safety engineers and some public health men and then mention dust. But the more research work that is being done, the more definite expressions of opinion are we getting. I am looking at it from the health standpoint only. Dust has been a problem ever since Adam and Eve shook the dust of the Garden from their feet. Explosive dusts can make quite a mess of a human being and spoil his health permanently. Dusts are harmful to equipment and to stocks, and they are eyesores just to look at when you have a nice accumulation. Dust storms have taken their toll, and I believe that somewhere in the bibliography on dust someone has brought forth the theory that the cliff dwellers of our southwest vanished from the earth because of rampant silicosis.

In this complex life that we live today I sometimes wonder just how we are to determine the exact part that dust plays in the industrial life of the worker. He works thirty or forty hours a week in the shop and the remainder of his time is put in elsewhere—and don't tell me he isn't exposed to dust elsewhere! He is surrounded with dust and fumes. In traffic, on the street car, at home, in the parks, everywhere he goes the dust particles are after him. You may say that after he leaves his work he is not exposed to sufficient dust concentration to do him any harm; but how are we to determine whether even this mild but continued exposure predisposes him to dust disease if these diseases are so prevalent? On the other hand, if light exposure develops an immunity, why should we assume that every tuberculosis or pneumonia case has its inception in a dusty job? And if you think that fumes play no part in the health picture, let me mention an article by Dr. Mortland in a recent issue of the *Journal of the A. M. A.* under the heading "Carbon Monoxide Poisoning." In Connecticut and Massachusetts 250,000 cars were stopped at random and checks made on the gas content inside the car. Sixty per

cent had measurable quantities of carbon monoxide present and 7 per cent had it in sufficient quantities to cause collapse in four hours or more.

Again, if you think you are not exposed to plenty of dust and dirt when away from the shop, listen to this: The city in which our plant is located certainly is not classed as the dirtiest city in the country, but here is what careful measurements brought out. Several years ago the dust and dirt precipitation was 140 tons per square mile per year. That is a lot of dirt, whether it is harmful or not. The city Safety Engineer got busy and they reduced it finally to 62 tons per year. Then, along came the era for economizing in everything, and as a result, the estimated precipitation is now twice what it was at its worst; in other words, we have about 280 tons per square mile now.

Now, let us look at it from the disease standpoint, if it means anything—and it must mean something because dust is almost always mentioned in the same breath with tuberculosis and pneumonia. The average death rate in our city is around eight per thousand, although the general urban death rate for the state is over nine. On this basis, we should have had at least 360 deaths in our plant in ten years. Actually we had 156.

The average death rate from pneumonia over this period was 1.04 for the city at large. We should have had at least 45 deaths; actually we had 26. The average death rate from tuberculosis over this period was .85. We should have had around 38 deaths; we actually had 13. We have had only one death from tuberculosis in the last three years, and only two cases on hand now, both being rated as "making satisfactory progress."

In our state females have a higher death rate from tuberculosis than males in the age brackets from 20 to 30, but from there on the males increase and the females decrease. We have about 15 per cent females in our employ, but have had only three deaths in the ten years and all three were office employees. During this period in which we were losing 13 from tuberculosis, we were losing 15 from automobile accidents and 25 from heart trouble. In that time we had only 4 compensable deaths, one of which occurred while giving an anesthetic for the removal of a simple ganglion on the wrist. We had only one other lung death and that was classed a cancer.

Of the pneumonia and tuberculosis deaths combined, nine were in the mill and calender department, but there were five in the offices. Of the males, 30 were white and 6 colored, showing the higher rate among the negroes. Our greatest number of deaths was in the 20 to 40 age bracket, which corresponds with the general picture of the state at large where about 40 per cent of the deaths occur in this age limit.

Now, if I have seemed to draw the herring across the trail of dust in our industry, I don't want you to get the impression that we are so pure and undefiled that we can sit back and make faces at other industries. If I have seemed to deal lightly with the subject, I don't want you to feel that my slogan is "Let the Dust Fly." Not by a long shot. If for no other reason than good housekeeping, we must be after dust and dirt like the figure on a nationally known cleanser. A clean working place means a better worker and a better product, just as the well-groomed man gets an easier hearing when he sets out for an interview.

Instead of taking a random pot shot at our dust, let us go at it in an orderly manner. Sit down and follow your manufacturing through from raw material to finished product. You may be surprised at the places you find dust and dirt a factor.

Is your receiving room a dark, cobwebby, dirty place? Are your dusty substances stored in such a way that every time some of it is requisitioned there is a cloud of dust stirred? Are these substances packaged in such a way as to lessen dust in the handling? When they are used in the manufacturing process, are they handled in such a way as to keep dust at a minimum, or are they just dumped helter-skelter? Do you continue to use dusty processes when an emulsion, or solution, or tank conveyor might be used? If you dust a tire, for instance, do you scatter the dust all around and cover everything within dusting distance, or have you figured just about how much powder you need and use it accordingly? If you must use a powder, even though it is not rated as dangerous, do you ventilate, or use suction or provide your worker with a respirator? Do you place an employee with a dusty

job right in front of an open window where all the dust will blow back on him? Is your general housekeeping as good as it might be in dusty sections of your plant? Have you places where you avoid escorting visitors because the place is untidy and unsightly? Do your windows get so dirty and dusty that the cost of extra illumination becomes a factor? Do your window sills slant, or are they flat to catch more dust? Take a look at everything from this dust point of view. What kind of dust is it? Is it dangerous to health? Is it a constant feature of the manufacturing process, or an occasional one? Is one worker at it all the time, or are they rotated? Whatever its nature, plan some means of elimination or lessening its concentration.

I have said nothing about silicosis, asbestosis, anthracosis, etc. I am not denying that they are definite entities in the disease picture. They certainly are, but the picture is not yet complete enough for me to feel that they present a hazard in our particular industry. Let me quote two investigators who seem to voice the majority opinion that a definite material and a definite concentration must be present to make a dangerous combination.

Public Health Report, Vol. 48, pp. 1398-1400, Nov. 1933:

"The physical examination and X-ray findings in this series of studies clearly indicate an association between the amount and character of dust in the working atmosphere and the effect on the health of the exposed worker. Serious physical impairment was noted only where the workers were exposed to large amounts of dust containing a high percentage of quartz. Where the dust concentration and the quartz percentage were relatively low there was found only a mild fibrosis which could not in most cases be regarded as due to the particular dust."

Dr. Leroy Gardner, Journal of the A. M. A., Vol. 103, No. 10, pp. 743-748, Sept. 8, 1933:

"It is no longer reasonable to maintain that all kinds of dust are equally dangerous to the lungs. A very convincing array of clinical, statistical and experimental observations has demonstrated that dusts composed, in whole or in part, of silica are capable of exciting a characteristic, progressive, nodular fibrosis of the lungs and that at the same time these organs become abnormally susceptible to the tubercle bacillus. All the other types of dust that have thus far been investigated can apparently be inhaled almost with impunity for long periods of time."

"Nonsilicaceous dusts localize about the lymphatic trunks and some of them excite the proliferation of small amounts of loose cellular connective tissue. They apparently do not increase susceptibility to tuberculosis."

"Nonsilicaceous dusts inhaled in combination with silica modify the actions of the latter, altering the anatomic characteristics of the lesion and apparently decreasing the susceptibility to tuberculosis."

TUESDAY LUNCHEON SESSION

October 2, 1934

This session, after a pleasant luncheon, was devoted to the bestowal of trophies to winning companies in the 1934 Safety Contest of the Rubber Section. The data on the Contest was given by Chairman H. W. Low, as follows:

The Rubber Section Safety Contest extended from January 1st to June 30, 1934. Twenty-eight unit companies registered in the contest and 52,492 persons worked a total of 47,276,101 man-hours. The average frequency rate for the contest was 6.430, which is a 33 per cent decrease from the 1933 contest rate of 9.636. Fifteen of the competing units completed the contest with a frequency rate below the average, and five unit companies went through the contest period with perfect safety records. During the contest there were 304 disabling injuries.

The handsome trophies awarded to the winning companies by the National Safety Council were presented by G. T. Hellmuth, General Claims Attorney, Chicago, North Shore & Milwaukee Railroad Co., and Vice President for Finance of the National Safety Council. Mr. Hellmuth, representing the Executive Committee of the Council, presented trophies to the following companies:

Group A and B (monthly exposure of more than 125,000 man-hours).

The Goodyear Tire & Rubber Co., New Toronto, Canada; two disabling injuries while working 1,251,290 man-hours, frequency rate of .598.

Group C and D (monthly exposure of less than 125,000 man-hours).

Dunlop Tire & Rubber Corp., Buffalo, N. Y.; no disabling injuries while working 660,000 man-hours.

The Goodyear Tire & Rubber Co., Bowmanville, Canada; no disabling injuries while working 337,754 man-hours.

Van Cleef Brothers, Chicago, Ill.; no disabling injuries while working 137,273 man-hours.

The Goodyear Tire & Rubber Co., Reclaim Plant, Akron, Ohio; no disabling injuries while working 111,928 man-hours.

Fabric Fire Hose Co., Sandy Hook, Conn.; no disabling injuries while working 48,512 man-hours.

WEDNESDAY MORNING SESSION

October 3, 1934

The Hazards of Rubber Cement Churns and Storage Rooms

By E. W. BECK

Supervisor of Safety, United States Rubber Co., New York City

The speaker said in part: Let us assume that we have a well-designed cement churn room, and I will confine my reminders to what goes on within the room.

A designated person with a proper knowledge of all the hazards involved should be in charge of each shift and be held responsible for the safe practices of all employees working under his supervision, as well as proper inspection and maintenance of all equipment. He should not be allowed to leave his quarters for any great length of time. Definite instructions regarding safe practices should be posted within the room.

Each employee should know all the hazards and just what to do in case of emergency. They should be posted as to where the proper shutoff valves are and where the steam valves are located for flooding the room with steam. It should be a rule that the employees shall not carry matches in their working clothes. Lockers should be of the fireproof type placed outside of the cement churn and cement storage rooms. No person should be permitted to take any material from the cement room without permission from the person in charge. The use of gasoline, naphtha or benzene to clean clothing, such as overalls, aprons, gloves, etc., should not be allowed.

Chains, pulleys, belts and chutes operating in these rooms should be grounded and it should be the duty of the electrical department to test periodically—at least once a month—the grounds on all shafting and churns, submitting written reports to be filed in the office of the safety supervisor. The electrician should inspect monthly all lighting and wiring equipment. Only properly installed vapor-proof lights and switches with ample capacity should be used. Switches and fuses should be located outside the building or room and solvents should be handled through permanently installed pipe lines.

The cement house should be inspected daily by foremen and a rigid monthly inspection should be set up by the safety supervisor and the superintendent. Rigid machinery inspections should be made by the mechanical department and frequent inspections should be made of the exhaust system in this room to see that it functions properly. It is advisable also, periodically, to invite the local fire department to make an inspection of the plant, more particularly the cement churn room.

Every fire and accident within the department should be reported to the supervisor of safety without delay, so that the proper investigation can be made and

measures taken to prevent a recurrence. Records of all tests and inspections, including hygrometer readings, must be filed for periodic inspection.

Cement churns should be kept covered at all times except when being filled. All other vessels in the room should have covers and be kept covered in order to reduce the amount of evaporation. Churn lids should be equipped with fusible links.

A reliable recording hygrometer should be installed in the churn room to indicate the relative humidity of the air and be read at least hourly. The relative humidity should be maintained above 40.

Explosion-proof windows, doors and ceiling openings, where necessary, are to be properly maintained and kept in operation in the event of an emergency. Windows should be scraped and painted annually.

A gravity supply of naphtha or gasoline should not be permitted. Pumps should always be used. Switch and pump locations must be outside of cement room. The control valve on gasoline supply line should be of the self-closing type. A first requirement for efficient ventilation is the provision of adequate air inlets. In extremely cold weather employees often close all doors and windows, which in a tight room or building brings about a very hazardous reduction in the exhaust ventilation. It is advisable that the inlet and exhaust be at opposite ends or corners of the room so that the air movement will effectively traverse the area. In addition, the exhaust should be taken principally at locations close to points where vapors may be expected, so that the removal of flammable vapors may be as effective as possible and employees will be working in an atmosphere practically free from naphtha vapors.

When filling gasoline cans at the gasoline pump, the cans should be grounded to the pump prior to filling. This can be done by hanging a chain from the pump touching the can or placing can on a grounded plate. It is recommended that a securely fixed pipe line be run from the gasoline pump to the churn; and it is a good plan to adopt definite approved standard pipe colors, so that what each pipe line contains can be known from its color.

Exhaust motors should be kept running at all times and under no circumstances should electric welding, cutting or burning take place in any cement churn room or cement storage room or in the vicinity of areas where cement and gasoline are being used. Ground wire brushes should be used on belts to remove charges of static electricity.

Provide a trap floor drain at least four inches in diameter in each room, so arranged as not to be easily obstructed by floating material. These drains should discharge to a dry well or some safe point in the yard.

Under no circumstances should electric trucks or motor equipment of any kind be permitted to enter or operate within the room. Cans should not be dropped from trucks or racks to the floor, nor should they be dragged across the floor. All transportation trucks and racks should be grounded.

Fire protection might be classified in three divisions: 1. Portable first aid equipment; 2. A special fixed system such as foam, carbon dioxide, etc.; 3. General protection which can be counted on for the last line of defense; namely, automatic sprinklers.

Regarding portable protection, foam or carbon dioxide can be used for such hazards as rubber cement and for naphtha where the exposed liquid area is rather small. For larger areas foam has a decided advantage over carbon dioxide. For fixed special systems, foam or carbon dioxide is good. I believe the extinguishing effect of foam is more lasting. Carbon dioxide has proved its use when properly installed in the right quantities, and there is an advantage in the negligible damage by the extinguishing agent itself which tends to offset in a large measure the more lasting characteristics of foam. Where the systems are backed up with automatic sprinklers it is believed that one is probably as good as the other, but without automatic sprinklers many people favor foam extinguishers in this connection.

Only approved safety cans should be used when transporting flammable liquids to other parts of the plant. Gasoline and cement used throughout the plant should be handled with care and so far as possible approved safe receptacles should be provided. The flow of gasoline through a metallic line can produce a certain amount of static charge. It is for this reason that gasoline hose nozzles are of non ferrous

metal and when used should make a perfect ground contact before commencing the flow of gasoline.

The housekeeping in this department should be of the best—a place for everything and everything in its place. The floor should be kept clean of all cement, gasoline and other solvents. In the event of spillage, it should be cleaned up immediately. Nothing should be kept or stored within the department except the material necessary to carry on the operation of the department. All materials and compounds should be stored in metal bins, drums or metal barrels.

All tools used in the cement churn room and cement storage room should be of non-ferrous metal in order to eliminate the sparking hazards. All other tools should be removed from these rooms. Shoes with non-ferrous metal nails should be worn. Only hard-wood paddles and hard-wood sticks should be used for stirring the cement. If metal is necessary, then non-ferrous stirring and scraping sticks should be used.

The mine type of vapor-proof flashlight should be used. Employees should not be permitted to use their own flashlights while on the job. Do not permit the use of portable extension lamps or fixtures of any kind in rooms where flammable liquids are handled. Regardless of initial precautions in the way of vapor-proof globes and mechanical guards, even the best of portable cords will deteriorate in use, so that if inspection and maintenance are not of the very best a short conductor can be expected sooner or later.

"Safety Kinks"

This feature consisted of a collection of so-called "Safety Kinks," presented by Mr. H. A. Walker, Safety Division, the Goodyear Tire & Rubber Co., Akron, Ohio. Mr. Walker had collected pictures of these safety devices from four rubber companies affiliated with the Rubber Section of the National Safety Council. They were exhibited as 29 lantern slides on the screen, and were accompanied by appropriate remarks and descriptions by Mr. Walker. Since, however, the pictures cannot be reproduced here and Mr. Walker spoke extemporaneously, the feature cannot be recorded in further detail.

How Should the Foreman Train the Worker?

By G. C. A. HANTELMAUN

Instructor, Goodyear Industrial University, Akron, O.

The speaker said in part: Several years ago the Goodyear Tire & Rubber Company introduced a safety program which has brought successful results. The supervision was requested to attend a series of 12 lectures offered by the management through its educational division. The response was an active indication of supervisory interest in a subject which has been allowed to become commonplace, instead of being a vital, motivating force in our lives.

These lectures did not deal exclusively with the problems of the industry, they acknowledged the broader fields which have so direct a bearing on safe workmanship. The following general topics were discussed:

1. Historic background of safety;
2. Searching the mind for accident sources, including the study of the psychology of accidents;
3. The common cold and respiratory diseases;
4. Foods and vitamins;
5. Fatigue and its consequences;
6. Infections, their sources, characteristics and prevention;
7. Quacks and patent medicines;
8. Bacteria and parasites;
9. Fires and fire prevention;
10. Accidents of the home and highway;
11. Gas hazards and explosives;
12. Occupational diseases;
13. Industrial accident analysis;
14. Social diseases;
15. Compensation; and
16. Direct and indirect costs of accidents.

The home was included, since innumerable accidents have been traced to the pre-occupied mind of the worker, concentrated on some member of his family who has

been the victim of one of the numerous home accidents, or illnesses, which are so common.

In speaking of the mental hazards, the following groupings were discussed:

1. Familiarity with work or equipment; 2. Over-confidence; 3. Carelessness; 4. Lack of proper co-ordination, which may be the result of (a) mental fatigue or (b) physical fatigue; 5. The accident-prone type; 6. Matching wits and the consequences, or disregarding rules of safety; 7. Uncontrolled emotions (anger, temper, hatred, excitement); 8. Worry (brooding and morbidity); 9. Fears and phobias; 10. Split-attention (scatter-mindedness and lack of concentration); 11. Lack of observation.

These eleven mental hazards, in the classes, were illustrated with accounts of actual occurrences taken from our own accident files, or further illuminated with the analyses of accidents reported in the daily papers. It is, of course, important to stress throughout the avoidability of accidents and to trace in every instance the cause of the accident and point out whether physical or mental.

Of course, practically every group which is taught contains a certain element that feels that a certain number of accidents must happen and that, no matter what measures are taken, they cannot be prevented. These "alibi-officers" must be made to realize their error, or if not they should be removed from the company.

A further complication which has arisen during the depression years is the employment of men long idle who are physically and mentally under par. Patience and continued attention are required to restore these men to the ranks of safe workers.

Statistical quotations do not lend themselves readily to safety education; they have a value only when frequency of similar types of accidents is studied. Posters offer concrete advice; slogans lose their value, because words are spoken thoughtlessly, or repeated unintelligently; campaigns are temporary stimulants; the really permanent and practical approach is the continuous safety education. This education must be given by foremen who understand the mental processes of the worker, the requirements of the particular job, the importance of safe work and working conditions, and apparent and hidden costs of accidents, the art of approaching the worker on his own level, and who, themselves, are entirely and completely safety-minded.

After a twelve-week course, more than 350 unsafe practices in the homes were eliminated, almost 1000 unsafe practice observations were reported, accidents showed a 37 per cent decrease and the momentum gained towards safer workmanship was a reflection of the enthusiasm the study received.

Report of the Nominating Committee

At this point the chairman called for the report of the Nominating Committee and new officers were elected as follows:

General Chairman—H. A. Walker, the Goodyear Tire & Rubber Co., Akron, Ohio.
Vice-Chairman in Charge of Program—A. M. Dietz, Pennsylvania Rubber Co., Jeannette, Pa.

Secretary—J. M. Kerrigan, U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y.
News Letter Editor—W. H. MacKay, Dunlop Tire & Rubber Corp., Buffalo, N. Y.

Engineering Committee Chairman—D. G. Welch, Hewitt Rubber Corp., Buffalo, N. Y.

Health Committee—Dr. W. S. Ash, United States Tire Co., Inc., Detroit, Mich., and Dr. J. Newton Shirley, Arrow Mutual Liability Insurance Co., Watertown, Mass.

Membership Committee Chairman—E. W. Beck, United States Rubber Products, Inc., New York, N. Y.

Poster Committee Chairman—Oliver Hopkins, United States Rubber Products, Inc., Providence, R. I.

Publicity Committee Chairman—John J. Loge, The General Tire & Rubber Co., Akron, Ohio.

Statistics Committee Chairman—Paul Van Cleef, Van Cleef Brothers, Chicago, Ill.

Slides and Safety Kinks Committee Chairman—R. W. Morse, The Firestone Tire & Rubber Co., Akron, Ohio.

Members of Large—

F. C. Bishop, The Richardson Co., New Brunswick, N. J.

J. C. Brown, The Gates Rubber Co., Denver, Colo.

R. A. Bullock, Corduroy Rubber Co., Grand Rapids, Mich.

John L. Grider, American Hard Rubber Co., Butler, N. J.

C. F. Horan (Past General Chairman), Hood Rubber Co., Watertown, Mass.

J. T. Kidney (Past General Chairman), The Goodyear Tire & Rubber Co., Akron, Ohio.

H. W. Low (Past General Chairman), Miller Rubber Products, Inc., Akron, Ohio.

H. T. Martin (Past General Chairman), The Fisk Rubber Co., Chicopee Falls, Mass.

M. A. Quirk (Past General Chairman), Samson Tire & Rubber Co., Los Angeles, Calif.

M. L. Russel, E. M. Smith Co., Los Angeles, Calif.

W. L. Schneider (Past General Chairman), B. F. Goodrich Co., Akron, Ohio.

Charles F. Smith (Past General Chairman), U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y.

Lessons Learned from Serious Accidents

By A. M. DIETZ

Secretary, Safety Division, Pennsylvania Rubber Co. of America, Inc., Jeannette, Pa.

The speaker said in part: In every accident, minor or serious, there is a lesson to be learned—every minor accident is a potentially serious one. The hazard associated with the accident governs the seriousness of the injury, therefore to accidents causing serious injury we give immediate attention. After the hazard is recognized, guards are installed for prevention, and so a hazard has been eliminated and accidents cease from this operation. But it is too bad that we have to have an accident before the hazard is recognized and eliminated.

In our rubber industry serious injuries are usually confined to specific operations, such as mixing mills, calenders, punch presses, internal pressure vessels, cement mixing rooms and tire curing departments. The entire industry has suffered from accidents occurring in these occupations. But our safety engineers have worked together, passing along their ideas, and eventually we have perfected safety devices that have practically eliminated accidents in these hazardous occupations.

Although this cooperation has put our industry among the leaders and made it fairly safe, yet there remains much to be done before we shall have a wholly safe industry. A careful analysis shows that some of our accidents are caused by conditions over which we seem to have no control. Mental and physical weaknesses are often caused by outside influences, such as sickness in the home, financial loss, changing environments, over indulgences, the loss of sleep and fatigue. All these conditions dull the mind and weaken the power of concentration, and it is this lack of concentration which is the cause of many of our accidents.

A Serious Accident and the Lesson Learned

By R. A. BULLOCK

Employment Manager, Corduroy Rubber Co., Grand Rapids, Mich.

The speaker said in part: The accident files at one of our plants contain the following item: Calender accident—right hand amputated at wrist—age 19 years—two weeks on pay roll—known cost, compensation, hospital, medical, \$3000.

It happened in 1929. The calender crew were getting ready to start the calender for the next run. A young man was unloading a truck of shells and liners and was wearing gloves. The operator rang the signal for the helper to guide a new bank of

stock around the rolls, and the young man did so, but he neglected to remove his gloves. While guiding the stock around the roll, his right glove became entangled with the stock and his hand was drawn in between the rolls. Becoming panic stricken, he forgot all about the safety device which was within easy reach, and tried to pull his hand out. Finally his yelling attracted other workers and the calendar was stopped, but not until his hand was crushed to the wrist.

Our investigation of this accident showed that the young man had been given all the instructions that went with his job, including the usual follow-up, and he had been especially instructed about the safety stopping devices, and had even been allowed to stop the calendar several times by use of the safety. Moreover, he had been instructed that he should positively not wear gloves while working on the calendar. Our investigation, therefore, led to the belief that the direct cause of this accident was the wearing of gloves in violation of the rules.

Some time after this accident happened, however, it was realized that there was something more important than a pair of gloves to be considered as the entire cause, and that was this: That it is all wrong to put any man, young or old, on a hazardous job when we know practically nothing about him. It is just as important to make sure that a man, if placed on a calendar job, will follow instructions and keep a level head, as it is to make sure that a new cashier is honest.

Some will say that it is the foreman's job to see to it that a new man will follow orders. This is quite true, but I believe you will agree that it is not possible for the foreman or anyone else to be constantly following a new employee, and that there is a certain probation period before a new man can be qualified or disqualified.

The conclusion is, that if a man qualifies on a trucking or minor job—and by qualifying we mean that he will do as he is told—that he is apt in learning, that he is able to reason things out for himself, as well as doing a day's work and the other things expected of a man nowadays—then there is not much question in our minds but what he is a safe man to place on a calendar and we could be reasonably assured he would not have an accident. It is a good policy to take men who have made good on lesser jobs and promote them to more important jobs. This practice has been recognized to a certain extent, but it is even more important from the safety point of view. If a man is careful in following safe practices on the minor job, he should be considered all the more for a better job, particularly if it should be a more hazardous one.

Serious Accident in a Mill Room

By R. W. MORSE

Safety Department, The Firestone Tire & Rubber Co., Akron, O.

The speaker said in part: In this accident the operator's hand was caught by the rolls of a "warming-up" mill. These men on mills soften the compound rubber so that it can be used in further processes, such as calendaring or tubing. The operator is inclined to protect his hands from the heat of the soft warm rubber by wearing gloves. Gloves, however, are dangerous, for the operator is often not able to get his hand out of the sticky mass and is caught between the steel rolls of the machine. These machines are equipped with a safety bar for stopping the machine in case of accident.

After this man's hand was pulled into the machine he pulled the safety bar which stopped the machine—this sounded an alarm which brought other operators with emergency equipment. They first spread the rolls by use of a lever, so that the hand could be removed. But the glove on the hand was so thoroughly imbedded in the rubber that they had to cut the rubber away from the rolls.

In this particular case it was necessary for the surgeons to remove the hand.

Let us discuss for a moment whose responsibility it was to prevent this particular accident. The company had posted about the Mill Room rules forbidding the use of gloves by the operators. Inspectors and supervisors are responsible for seeing that this rule is obeyed. Upon investigation we found that one of the supervisors had been lax in the application of this rule. He admitted that he had seen this man wearing gloves but did nothing about it.

We come now to the point as to what the company's real responsibility is. The case in question shows beyond doubt a lack of appreciation by the supervisor of the importance of following the safety rules laid down by the company.

Although the accident would indicate that the department had been lax in its educational program to impress upon the workers and supervisors the importance of safety rules, nevertheless another factor entered into the accident cause. The night had been extremely hot, and the day so stifling that the man was unable to get proper rest and came on the job in a fatigued condition and was not mentally alert in handling his job.

Description of a Serious Accident and the Lesson Learned

By D. G. WELCH

Safety Engineer, Hewitt Rubber Corporation, Buffalo, New York

The speaker said in part: Since we all are, or soon will be, faced with hiring new men who are either inexperienced or stale, the experience of our company with one man should present an interesting problem.

We hired this man, age 19, inexperienced, high school senior and just out of school on his first job, and placed him in our Wrapped Hose Department stripping.

I talked to this man myself in detail about the necessity of reporting through his foreman to First Aid, reporting unsafe machinery and plant conditions, and unsafe working methods, as seen from the point of view of an outsider. He was then told that the way we instructed him to do his work was not only the safest, but the one which experience had shown was the quickest and would, therefore, earn him the most money when he learned how to do it. The point was stressed that he should be careful to learn every detail of each operation shown him, and that he should not hesitate to ask questions if he did not understand any part of an operation.

He was then made acquainted with his immediate associates and turned over to a lead man for instructions on the details of the work. Within one hour, he had been to the First Aid Department for skinned and bleeding fingers of both hands. Investigation showed that, although he had been instructed properly, his hands had become tired and he had disobeyed instructions by using his own method of stripping hose.

He was then put on other work—reeling wire. As we had several new men in this department, I had circulated through there several times and had just left the department after observing the new men, when he was injured again.

Investigation showed that although he was performing details of the operation of reeling, he was under an experienced operator's guidance. In getting ready to put up a new reel, the lead man stated he told the injured employee to wait while he got the crane to lift the reel (634 pounds). The man again disobeyed instructions by attempting to get the reel into position alone. As he could not get behind the reel on account of the location of the building column, one foot was behind the reel as he attempted to roll it up over the crosspiece of the reel stand. One side of the reel struck the stand crosspiece first, unbalancing the reel, which then toppled over on the arch of his left foot. In pulling his foot from under the reel, the reel slid off the arch onto the great toe, resulting in three fractures of the foot.

We have replaced this stand by one which is much sturdier, being made of heavy metal and so designed that the reel can enter the stand through a gradual incline tapering up from the floor. The upper sides of the stand are also tapered to accommodate the reel supporting arbor. The top is level and has a semi-circular cavity for locating the arbor. The crane is still used, however, this stand simply being considered the proper type for the job.

In a departmental safety talk and before the Executive Safety Committee, our plant superintendent stressed that actually the underlying cause of this accident was the fact that everyone was "too busy" with his own work to see to it that new men were properly instructed. New men were, in fact, simply taught enough to enable them to get by and not sufficient time was taken by the instructor to make sure that the details of the work were understood. Since all men do not make good instruc-

tors, supervisors must discontinue the habit of turning new men over to others and dismissing the subject. The responsibility is still the foreman's.

This particular accident caused a loss of 40 days, and incidentally broke the record of 2390 days without a lost-time accident in this department.

We were laboring under the false impression that we had been doing a good job, but this accident certainly showed us that not only was our equipment faulty in this instance, but we had all fallen down on the job of instructing this man properly, being "too busy" to see that the man understood, that he was assigned a competent instructor, that the foreman realized his responsibility, that the new man's knowledge of the job was checked by watching him perform the operations being taught, and we had all failed to take account of home conditions.

Another important lesson to learn from this and nearly every serious accident was also touched upon by our factory manager, that is, that there actually is no difference in cause between a so-called minor injury and a major injury—the difference being in results only. For example, if this reel had stood six feet away and fallen to the floor without injury to the worker, it commonly would not even have been classed as an accident. We should profit by our narrow escapes and correct the unsafe practice and condition before it results in an injury. This is the greatest point to learn from any accident.

Special Report on Accident Hazards in the Rubber Industry

Presented at Annual Meeting of Rubber Section

October 5th, 1934, Cleveland, Ohio

In October, 1933, Mr. John D. Nolan, General President of the Shoe Workers' Protective Union, presented a brief of about 30 pages supporting a proposal suggested by the Shoe Workers' Protective Union for inclusion in the Code of Fair Competition for the Rubber Manufacturing Industry at public hearing in Washington, D. C., on October 25th, 1933.

Inasmuch as Mr. Nolan made a number of distorted statements in his brief, which is now a matter of public record in Washington, with no way of repudiating the statements, and as he used quotations from the proceedings of the National Safety Council to bear out his arguments, the Executive Committee of the Rubber Section appointed a Committee to review the safety chapter of his brief and submit a report to the Rubber Section at the annual meeting in Cleveland, October 1st to 5th, 1934. This report will be published in the Minutes of the annual meeting of the Rubber Section at the Congress and will correct some of the distorted statements.

On page 6 under MINIMUM WAGES Mr. Nolan states as follows:

"Moreover the Rubber Industry in all its divisions is a hazardous trade. Under the best conditions occupational diseases take toll of the worker's health and reduce his income both temporarily and, in extreme cases, permanently."

Also: "Moreover, in most states these laws make very inadequate provision for occupational disease disability which is the chief hazard in our industry."

The following is taken from a talk given by E. W. Beck, Supervisor of Safety of the United States Rubber Company, for eight years a member of the Executive Committee of the National Safety Council, and for two years Vice President in charge of Industrial Safety:

"Years ago the rubber industry was considered as being a very hazardous business, and perhaps this was true because at that time the safety movement was young and many of our present safety devices were not in use. During the last few years, due to the splendid efforts on the part of the National Safety Council in accumulating industrial accident statistics, we are able to prove conclusively that the rubber industry is not now a hazardous industry."

"In 1931 the rubber industry stood 10th best in frequency and 9th best in severity among 28 of the leading industries. The only industries having a better combined severity and frequency rate were the textile, printing and publishing, machinery and glass industries."

"In 1932 the rubber industry was 9th best in frequency and 6th best in severity among the 31 leading industries of the country. The only industries having a better combined severity and frequency rate than the rubber industry were the tobacco, laundry, printing and publishing, and textile industries."

At the bottom of page 6 of Mr. Nolan's report, reference is made to the expert testimony of Mr. Paul Van Cleef of Chicago, Vice-President of the like-named rubber company, who spoke at the annual meeting of the Rubber Section of the National Safety Council in 1927. In the discussion of Mr. Van Cleef's paper he stated that at the time of his talk—September, 1927—his plant employed less than 150 people. He also stated, under Remarks, that the larger companies are well organized in safety work and doing a good job but the thought was developed that the smaller companies were responsible for the poor reputation and bad experience. This talk of Mr. Van Cleef's was given seven years ago, before the rubber industry drew up the standard code.

Mr. Van Cleef is an enthusiastic safety advocate. For years he has taken an active interest in the safety movement and at one time he was president of the Chicago Safety Council. He is also a member of this Committee.

The Shoe Workers' Protective Union, as stated by Mr. Nolan, states that occupational disease disability is the chief hazard of our industry. This is a misstatement of facts, as the accident cost in large rubber companies over a period of 10 years, shows that much less than 1 per cent. of the total expense is paid for occupational disease including chemical hazards.

The brief also states, on page 17, that the health hazards in the rubber industry are brought at a *terrific price*. This statement is not substantiated with figures to justify such a remark, especially when we refer to the National Safety Council's Annual Report of 1932, Accident Statistics, and note that the only industries having a better combined severity and frequency rate than the rubber industry were the tobacco, laundry, printing and publishing, and textile industries; and practically the same condition existed in 1931, according to these impartial accident records.

On page 15, the brief refers to safety regulations formulated under the auspices of the Federal Government in 1927. This reference, we believe, applies to Bulletin No. 447 printed by the Bureau of Labor Statistics and known as the Safety Code for Rubber Mills and Calenders, June, 1927. A member of this Committee was secretary of this Code Committee and has the complete files in his office. The Code was formulated by the united efforts of representatives of large rubber manufacturing companies. Only one state official showed an active interest and the only part the government played in the entire code was to cause a long delay in approving it, and later they did volunteer to publish it as a bulletin of the Bureau of Labor Statistics. The members on the Committee representing organized labor did not attend any meeting or furnish any information for the Code. The personnel of the Committee which developed the Safety Code for Rubber Machinery is shown on the first page of the code. It is to be noted that 17 members of this Committee were associated with rubber manufacturers or rubber machinery manufacturers. The Chairman and Secretary were associated with a large rubber manufacturing company.

Reference is made on page 15 to Vice-President Van Cleef's talk before the Rubber Section of the National Safety Council in 1927 when he spoke on the attitude of employers toward the hazards of the industry. "Yet some factories are indifferent to it. Some feel that the insurance company will take care of their losses. Some believe accidents inevitable. Some give the matter no thought at all. They don't sense the importance of the modern trend."

This same statement might be made of practically any industry as there are always some factories that are indifferent, and it must be kept in mind that Mr. Van Cleef, as previously stated, is an enthusiastic safety advocate, a past president of the Chicago Safety Council, and when he spoke he represented a small rubber plant of 150 people.

Reference is made to a dry orange-yellow powder under the name of Safex. Criticism is made of Dr. Shirley's test on 15 people using Safex. It must be kept in mind that Dr. Shirley's tests of Safex were applied direct to the flesh of volunteers (his associates) and adhesive tape was placed over the samples. A skin rash was all that developed. Dr. Shirley states on page 793, volume 2, 1929, of the

National Safety Council's annual proceedings: "When the sample had been allowed to stand from 24 to 48 hours we had a little reaction. Safex itself was very satisfactory but its compounded condition, with a little age, caused dermatitis." Members of this Committee personally saw Dr. Shirley with a sample of Safex on his arm under a piece of adhesive. It had been there for 4 days. He showed the naked arm and it had only a little rash as stated by him. The test (as made by Dr. Shirley) of fastening samples of Safex and Safex compounds to the flesh for days at a time would not be a parallel condition to employees working with any such compounds.

Reference is made in Mr. Nolan's brief on page 19, to the hazard of x-rays. This hazard might take place in any industry and is not peculiar to the Rubber Industry. In fact there are very few rubber industries equipped with an x-ray machine. The Committee knows of no rubber company where x-rays are used other than in the Medical Department and under the operation of skilled technicians only. Therefore, this illustration, as mentioned by Mr. Nolan, is far-fetched and should carry no weight in this brief as applying to the rubber industry.

Signed: W. L. SCHNEIDER, B. F. Goodrich Co., Akron, Ohio.
J. T. KIDNEY, Goodyear Tire & Rubber Co., Akron, Ohio.
R. B. MORSE, Firestone Tire & Rubber Co., Akron, Ohio.
E. W. BECK, United States Rubber Co., New York, N. Y.
PAUL VAN CLEEF, Van Cleef Bros. Co., Chicago, Ill.

October 1, 1934.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Safety Section, A R A - Steam Railroad Section, N S C

Chairman—C. L. LAFONTAINE, Great Northern Railway Co., St. Paul, Minn.
First Vice-Chairman—H. A. PARISH, Chicago & North Western Railway, Chicago.
Second Vice-Chairman—W. H. FAILING, Central Railroad of New Jersey.
Secretary—J. C. CAVISTON, American Railway Association, New York City.

A complete report of these sessions is published by the American Railway Association in a booklet entitled, "Proceedings of the Fourteenth Annual Meeting of the Safety Section, Cleveland, Ohio, October 2-4, 1934." Copies of the booklet are available from the Association of American Railroads, N. Y. C. The following is a condensed record.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Safety Section, American Railway Association—Steam Railroad Section, National Safety Council was called to order by Chairman C. L. LaFontaine, Great Northern Railway, St. Paul, Minnesota, who presided. The invocation was delivered by L. G. Bentley, Chesapeake and Ohio Railway. The report of the Secretary, J. C. Caviston, New York City, in which he outlined briefly the activities of officers and standing committees during the last year, was read and approved. The Chairman then presented his annual report.

Annual Report of the Chairman

By C. L. LAFONTAINE

Great Northern Railway, St. Paul, Minn.

The speaker said in part: Let us go back for a moment to the resolution adopted at our annual meeting in 1924, which set a goal calling for reduction, based on the 1923 record, of 35 per cent in casualties to employees on duty, Class 1 railroads, by

the end of 1930. Many thought at that time that such an achievement would be difficult. What occurred has long been history. The railroads actually brought about a reduction in the casualty ratio of almost double that asked for. Consequently, those who had to do with the making of the goal set in 1931, calling for 33 per cent reduction in employees injured by the end of 1933, felt it highly desirable that they set the goal high enough to tax the maximum efforts of all railroads. Approximately forty railroads accomplished this goal, but the Class I railroads as a whole made a reduction of 26 per cent in their casualty ratio. While the safety officers may have a feeling of disappointment at this result, we should be encouraged by the fact that the railroads were able to bring about a reduction in the casualty ratio to employees on duty per million man-hours worked of 26 per cent in a three-year period, which followed a reduction of 7 per cent in the casualty ratio during the previous seven years.

The Committee of Direction now gives you a new mark at which to aim. It is a new goal, calling for a 5 per cent reduction per year in railway employees' injuries during the next six years, 1934 to 1939, inclusive. We feel that this goal will be far exceeded by the railroads now having the higher accident ratios, that it is possible of attainment and will be accomplished by the railroads having lower accident ratios.

The statement furnished by the Bureau of Statistics of the Interstate Commerce Commission, covering accidents reported by steam railways for the first five months of 1934, shows an upward trend in casualties to employees on duty. While I do not deem this increase as particularly alarming under the circumstances, it has provided a warning as to what may be expected with any material additional increase in business, unless effective preventive measures can be adopted by the respective railroads.

The injuries which have brought about this upward trend in our casualty ratio are principally non-train accidents. This is due, in my opinion, to the unusually large increase in the man-hours worked in this branch of the service during the first half of this year, rather than to any inactivity on the part of the railroads in accident prevention work. The railroads were asked to carry on an extensive program of track and equipment maintenance, to purchase rails, cars and engines, or rebuild if the circumstances require. This made necessary a sudden and large increase in the forces, resulting in either the employment of new men or the return to service of men who had been inactive in railroad service for some time. The work that was required of these men in most cases was of a more hazardous nature. For example, in the maintenance of way department the increased man-hours were consumed largely in construction work, relaying of rails, bank widening and ballasting tracks—heavier work and more dangerous than that of ordinary track maintenance, which has been carried on more generally for the last two or three years. This is also true in the maintenance of equipment department, stripping and rebuilding and steel-underframing cars and heavy locomotive repair work, with large gangs of men, newly organized.

I think we had a right to look forward to a momentary increase in the casualty ratio, but I believe this condition has since adjusted itself and we will be able to bring back our accident ratio to a lower level than it was for the year 1933.

The responsibility for the promotion of safety is essentially a function and problem of management. The success with which it is promoted on any railroad seems likely to be pretty closely in proportion to the attention given to it by executive and operating officials of all ranks, and the enthusiasm for safety they are able to arouse among employees. Never before in the history of railroads have railroad executives and officers given so much thought, time and effort to accident prevention as at the present time. Safety officers should feel greatly encouraged by this fact. Another source of encouragement for safety officers is the pronounced trend toward greater recognition, particularly by persons and agencies which take the lead in moulding public sentiment, of the accident problem. It is probably still true that the gravity of this problem has not been brought home to the average citizen with sufficient emphasis so that he makes it a matter of personal concern, but there are clear indications that the efforts of the National Safety Council and other agencies dedicated to accident prevention will carry forward our fight against accidents in marked strides.

Report of the Committee on Education

By L. G. BENTLEY

General Safety Agent, The Chesapeake and Ohio Railway, Richmond, Va.

The speaker said in part: The Committee on Education was organized soon after the setting of the 35 per cent goal, and the purposes of the committee have been three-fold, all educational. In the first place, it was the intent of the committee to educate officers and employees as to correct methods of work and as to unsafe methods of work, undertaking never to set out an unsafe method of work without showing in comparison the safe way of doing that job.

There is another purpose of the committee, and that is to inform railroad men and others throughout the country, and even throughout the world, of the progress of safety work on American railroads.

Then there is the inspirational poster that always commands a better sale than any other class of poster because it appeals to the hearts of men. Every man really down in the bottom of his heart wants to do what is right, and if the mind runs along with the heart, the hand will soon begin to form the habit of traveling in the same company.

I have chosen for discussion from this year's posters a few of the most important, illustrating hazards which have caused more deaths and more injuries and more suffering than the other classes of railway employee injuries. (Mr. Bentley then described at considerable length the following posters:)

"Safety Demands a Firm Grip and a Safe Foot-hold."

In 1932 there were 220 train service employees killed in all classes of train service accidents, and of that number 105, or 48 per cent, were killed in falling from engines or cars or while getting on or off engines or cars.

We sold 6,600 copies of this poster to about half the railroads of the United States. That was the equivalent of furnishing one poster for each 30 railroad employees in train service throughout the country. We also sold 34,000 copies of the circular dealing with the same subject, and that was a number equal to one for each six train service employees in the United States. However, they were most all sold to a few of the railroads.

But what has been the result of our campaign for the last ten years during which we have been driving on this particular kind of accident?

The number of train service employees exposed to this particular hazard decreased 37 per cent. The number of employees killed in this class of accident decreased 47 per cent, and the number of employees injured decreased 74 per cent.

"Mishandled Material Means Many Maimed Men."

We distributed this poster in the hope that it would reach the supervisors and foremen and that it would make them more careful and more diligent in supervising the handling of material. We felt, too, that by getting it to the attention of the men, they themselves would get the idea that for the last ten years on an average fifteen thousand of their number had been injured on American railroads while handling material. That is more than were injured last year in all classes of railroad accidents. 5,000 copies of this poster were distributed.

In 1932 there were seven employees killed and 3,787 injured while handling material. That constitutes 5 per cent of the deaths and 38 per cent of the injuries in all non-train accidents on American railroads.

"Please Sir, Look Both Ways."

There are one million railroad employees in the United States subject to the dangers that this poster is trying to cure. In 1932, 128 out of a total of 367 train service accidents, or 35 per cent of all the deaths in train service accidents, were the result of being struck or run over by engines or cars.

I consider this the most difficult problem in connection with railroad men. Not only train service employees, but shopmen and trackmen, station employees, officers from headquarters, every man who works for the railroad is subject to the danger of being struck or run over by engines or cars. It is for this reason that the Committee on Education has produced more posters and more illustrated matter

on this problem than on any other class of accidents. Because every time you have two train service employees injured by being struck or run over, one of them is killed.

A later poster on the same subject was entitled "What a Whale of a Difference a Few Feet Make!" It illustrated the vast difference from a safety point of view that a few feet can make when a man chooses to cross a track quite close to the end of a standing box car, behind which an engine may be approaching, and the same man doing the same thing at such a distance from the box car that he can readily see down the other track whether or not an engine is approaching.

Address

By WILLIAM BUSHNELL STOUT

Member of the Society of Automotive Engineers, and of the
Detroit Aviation Society

The speaker said in part: When we start any new engineering development we get great punishment for our ignorance. In fact, I sometimes think there is only one sin in the world and that is ignorance, because we do get punished for it, and very quickly. And when we start a new industry of which we know nothing, when we are trying to find out what it is we are trying to do, we are in a very dangerous period of development. Then as we begin to realize and recognize those dangers, and use our intelligence to get around them, we get to a point of development where it is not dangerous any more, only hazardous. Then as we study further and acquire experience we come to a point where that industry by the application of intelligence and study becomes a safe and practical thing.

When we started in on aviation it was dangerous. There is no question about that. As we look back now we know just how dangerous it was. We knew nothing about what we were trying to do. We knew nothing of the stresses in the air. We had an idea that flying wouldn't require any particular strength; if you would just make something that was light enough it would go up in the air. So the first airplanes were made of very flimsy materials, put together with stove bolts, and with under-powered engines. They would just barely get off the ground and we knew nothing about flying. When a man got up and happened to pull the stick back and climbed too steeply so that he lost his speed and by losing his speed lost his lift and fell down, we called that a "nose dive" which was a very fatal thing.

Then we came to the idea—and it was forced on us very emphatically—that airplanes had to be strong. Our airplanes today are built to stand tremendous velocities. I was up in a ship yesterday that cruises at two hundred miles an hour, which is four times the stress that was felt in the Miami cyclone, and yet this ship sails along without any trouble or interference and is a thousand times safer than the first airplanes that would only go forty miles an hour.

This development was brought about by means of a whole lot of structural analysis. It required a good deal of experimental work to take the guess-work out of the building of the structural part of the airplane.

In the past, while we were learning what was going on, many wings came off. We started in with structures that were designed for flying loads and with a factor of safety of three or four times the flying load. At slow speeds, we got away with it. Then we began to step up the speeds. We got up to around 150 miles an hour and then, without any warning, and with no apparent reason, all of a sudden a wing would stay behind in the air and the airplane would dive ahead.

When one particular accident occurred that was given a great deal of prominence at the time, a very thorough investigation showed the trouble to be compression cracks in spruce spars. In other words, we had been making airplanes of wood and they were perfectly satisfactory at slow speeds because the stresses on the wood weren't sufficient to bother us, but when we got to high speeds the compression cracks began to develop, and after awhile the spar would fracture just like a fatigue crack. Immediately wooden airplanes were dropped from all air lines.

All of these developments have a very direct connection with safety. The newer things bring higher speeds, and on account of the higher speeds they must bring

new methods of stopping, new methods of grade crossing control, new methods of control of the automobile driver, who isn't always as smart as he might be, and a whole lot of other things.

On the air lines we find that the greatest handicap is the human element and undoubtedly we have the same difficulty as is indicated by these posters. In the early days when we first started flying on our lines in Detroit, we had about four instruments on the dash. We had pilots with pretty good training—probably a couple of hundred hours in the air, the best available in that day.

Those pilots would take those planes and fly them. If there was a fog, they would land. They didn't know anything about flying blind. If they got into a fog they didn't know whether they were upside down or rightside up, and no man in the world could tell.

Today, however, things are different. Yesterday in Detroit I rode in a ship at a speed of 200 miles an hour which had about \$6,000 worth of instruments on the dash. The dash is a small area and it is just full of instruments of every kind. The pilot who has flown for many, many years can fly blind even better than he can fly when he looks out of the cabin. He has a radio beam on which he flies accurately as on a string from one town to another. When he wants to land, he can pull down his flaps and land in a space the length of a good sized room.

As part of his training, every six months the pilot goes out with a Department of Commerce man. He is put in the cabin and everything is shut up so he can't see a thing. They take him out for an hour and lose him. He doesn't know what direction he is going. The instruments are covered. At the end of an hour's time they pull the covers off the instruments and tell him to find out where he is. He has to go through a number of maneuvers first, right and left turns, etc. Then he has to find a certain city and tell the instructor, or the man who is examining him, when he is over the airport.

Suppose they leave from Pittsburgh and fly in the direction of Detroit. They fly for an hour. Well, this other chap doesn't know but what they are down in Washington, because he can go a long distance in an hour, at 200 miles an hour.

At the end of that time, he is turned loose and told to take the Department of Commerce examiner to the airport at Cleveland. He feels around, until he picks up a beacon. He listens to the beacon until he locates it and finds out what beacon it is—between which two cities it is. That gives him his clue as to where he is. Then he takes a compass course until he picks up the beacon running into Cleveland, follows the beacon into Cleveland, and when he gets over the airport, by the landing signal on the beacon, he signals his examiner. If he does that successfully he can fly for another six months or until his next examination.

You will see that we go to the greatest extremes on everything connected with the air lines to insure the safety of passengers because undoubtedly air transportation, to the man in the plane, and everyone else, is the most hazardous type of transportation we have developed as yet. For that very reason, it can be made the safest, because we have to take these safety precautions, whether we want to or not.

Progress and Possibilities in the Prevention of Injuries to Railroad Employees

By T. H. CARROW

Superintendent of Safety, Pennsylvania Railroad, Philadelphia

The speaker said in part: In the year 1924, the Committee on Statistics concluded that the bulk of all injuries to employees were chargeable to the human element and that "by improved training, supervision and discipline," which implied the formulation and enforcement of safety rules, a 5 per cent reduction in the casualty rate could be effected each year, which, by the end of 1930, would be equivalent to 35 per cent, which figure was established as the safety goal. It is important to bear in mind that up to 1924, discipline, which was mentioned in the committee's report as a primary means of improving the employee injury record, had not been invoked to any appreciable extent by very many roads.

The concerted effort on the part of all railroads to reach the safety goal gave a tremendous impetus to safety activities. Then began the publication of great quantities of statistical information showing graphically the standing of the respective roads and many railroad executives, seeing their properties lagging on safety, revamped their safety organizations. Those that were already well organized intensified their activities. During the years following the setting of the safety goal, something happened that was unprecedented, and that was a continuous downward trend in the employee casualty rate for ten consecutive years. I do not know of a single railroad that did not make substantial gains for safety during that period.

You will remember that the rate dropped from the peak of 31.15 in 1917 to a low of 24.84 in 1921; that the rate then rose to 30.89 in 1923, and from that date on showed a continuous drop each year down to and including 1931; in which year the rate was 7.52 or 76 per cent under 1923. Nothing like this was ever accomplished for safety before.

Fatal injuries to employees of Class I roads actually dropped from 1,866 in the year 1923 to 488 in 1933. Non-fatal injuries dropped from 148,146 to 14,126. On a man-hour basis, that is, making due allowances for fluctuations in the number of employees in the service, the reduction in employees on duty killed in 1933 under 1923 was 42 per cent and the reduction in injured was 78 per cent.

We have for some time been in a period of marking time in safety, so to speak, preparing for what I believe will be a more intensive and effective campaign during the coming years. In this respect the history of the accident situation is analogous to the history of many other aspects of railroad operation. All through the years in which the railroads were so wonderfully developed there were periods when improvements in locomotives, cars, rolling stock, signalling systems, shop machinery, and methods of operation, respectively, were at a temporary standstill, but in due course and in every direction we find a revival of activity and subsequent improvement.

We therefore come to the question as to the extent of improvement in the accident record of the American railroads it is reasonable to expect. That it is possible to further improve the record is obvious. On this head, the president of the American Railway Association recently stated:

"The employee casualty rate has been reduced 77 per cent during the last ten years. A large reduction in casualties to passengers has also taken place. Notwithstanding this reduction in employee casualties, there is still quite a spread between the high and the low rates among railroads of the same class, indicating that further improvement is possible in the accident record. For example, among the larger carriers (reporting 100 million or more man-hours), the lowest rate in 1933 was 1.68 employee casualties per million man-hours, while the highest was 10.02. Among the smaller carriers (reporting less than two million man-hours), the spread is between 1.01 employee casualties per million man-hours, and 43.97."

One prominent railroad executive believes that accidents can be prevented "to the point of almost total elimination." Safety men probably have different opinions about the matter. It is a fact, however, that can be readily proved by the causes of accidents, that the bulk of all injuries being sustained by railroad employees today, as in former times, result from causes over which the officers, supervisory forces and employees, individually or collectively, do have control; that is, from man failure.

What are the general preventives of man failure? The first preventive is to select the right men for the job. In times past, this was not always possible because the supply of applicants was frequently inadequate. This, however, is not likely to be the case in the near future, so our troubles in this direction should be at an end for a long time at least.

The second preventive is right thinking and right acting. A man must first think how he should act to be safe and then he must act as he thinks. The difficulty comes in getting people to think and act as they should. Now, the way to get people to think and act as they should is as old as civilization; it is by training. A thought we have come to express in the phrase, "training, supervision and discipline," although supervision and discipline are merely two of many phrases of training.

Now, what is the first requisite to training? Knowledge of the subject on

which one is to train another. In safety, it is knowledge of safe practices. These are shown by the causes of accidents and by job analysis. When safe practices are reduced to writing they are usually called rules, or at least they are equivalent to rules. Therefore, if all safe practices in any occupation were reduced to rules and if complete obedience to such rules were secured, it would insure complete immunity from accidents from man failure. This means that the first step in safety is to provide adequate rules; the second step is for local officers and supervisors (the teachers) to know and understand the rules; and the third step is to see that the employees know, understand and obey the rules. In consonance with these observations, the following items are presented for the consideration of the Safety Section as some of the essential elements in an effective safety program:

1. A comprehensive set of safety rules outlining the safe ways of working.
2. A practical, working understanding of the rules or safe practices by all local officers, supervisors and employees, to be assured by suitable examinations.
3. Invariable obedience to all rules, violations not resulting in accidents representing the same degree of culpability as when accidents do result from such violations.
4. Definite and not perfunctory observations by local officers and supervisors to detect violations of safety rules and formal report of violations detected as a requirement of management.
5. Formal disciplinary action on proven violations, with entry on disciplinary record covering every case.
6. A monthly and cumulative record of the violations of rules or unsafe practices detected by each local officer and supervisor, and a monthly summary by departments for divisions and system.
7. All accidents, regardless of how trivial, shall be reported and investigated promptly to determine cause, responsibility and disciplinary action to be taken where responsibility is shown.
8. Investigation should invariably develop an answer to these two questions: (a) Was accident due to the violations of a rule? (b) If not, should a rule be provided?

TUESDAY AFTERNOON SESSION

October 2, 1934

The "Green Book"

By LEW R. PALMER

Secretary, Committee of Award, Railroad Employees' National Safety Contest and Conservation Engineer, Equitable Life Assurance Society, New York City

The speaker said in part: The year 1933 ended the ten year period of the Railroad Employees' National Safety Contest as set up by the National Safety Council and recorded in the respective issues of the "Green Book."

A constant study of railroad safety contest records during a period of ten years has established what I believe to be a fundamental fact: that it is necessary to break down our entire Class I railroad exposure into a sufficient number of competing groups so that there will not be too wide a variation between the man-hour exposure of the largest group contender as compared with the man-hours of the smaller contenders in the same group; otherwise, the larger unit, with its more uniform casualty rate, will be handicapped by the more widely fluctuating rates of the smaller contenders; for it is generally recognized that under normal conditions the greater the man-hour exposure the more uniform the casualty rates are year by year.

For that reason, the revised plan suggested for the 1934 Railroad Employees' National Safety Contest includes six groups for standard Class I railroads and two groups for switching and terminal roads, it being a matter of record in connection with switching and terminal roads that a great deal more interest has been developed in our annual contest since these roads were given what was considered a fighting chance for competitive honors.

There is one change that has been under consideration on several occasions; that is, the weighting of employee fatalities in our Railroad Employees' National Safety Contest; and it is a subject that I believe should be given serious consideration. Possibly others have noted that in one or two cases small Class I railroads have reported a single employee casualty for the year and—as recorded—that one casualty happened to be a fatality. Other small roads with two or three injuries and no fatality naturally felt that their somewhat larger total casualty rate represented, in reality, a better safety record. On the other hand, we are confronted with a situation which has been recognized by many; that the longer we can keep the respective contenders working hard for first honors, the more accidents will be prevented, and when a fatality occurs on the small road and is weighted by five or ten that road's chances of winning an award have been eliminated. Furthermore, if fatalities were to be penalized through weighting we would find instances where it would be necessary to charge heavily for an accident carrying no violation of rules as against an unweighted injury due to flagrant violation of safe practice. It must be remembered that a fatality, in many cases, is such by virtue of a fraction of an inch or a fraction of a second, or by a number of other uncontrollable variables.

After serious consideration of these phases of the situation it was deemed inadvisable to weight employee fatalities in our Railroad Employees' National Safety Contest, for it was generally conceded that the way to prevent fatalities is to eliminate accident causes, and that too much emphasis on fatal cases might tend to discount the real importance of reportable injuries and the need for investigating the causes of minor injuries and even the near accident that might reveal a serious hazard.

This leads up to another important principle. Years ago it was discovered that the one-day lost-time case was the "lowest denomination" that could, with ultimate safety, be utilized in an employee safety contest.

Report of Committee on Train Accidents

By G. H. WARFEL

Chairman of Committee, and Assistant to Executive Vice President,
Union Pacific System, Omaha, Nebraska

The speaker said in part: A train accident is one with or without casualties, arising in connection with the operation or movement of a train, locomotive or car, which results in damage to equipment or other railway property in excess of \$150 (including cost of clearing wreck and local expense of transferring lading, but not damage to the lading).

The outstanding features revealed by the 1933 statistics on train accidents are:

1. A slight increase in frequency of occurrence, particularly derailments.
2. Several accidents with an unusually large number of persons hurt, notably rear end collisions.

3. A greater number of casualties than in any year since 1930, resulting in a casualty rate per million train miles 5 per cent above 1930, instead of the 33 per cent reduction hoped for.

5. Train accidents accounted for 22 of the 48 passengers and travelers killed and 65 of the 468 employees killed (on duty) in accidents on Class I railroads.

The year's total of 3,623 train accidents of all kinds occurring on the road and in the switching yards is the smallest number ever recorded in any year. It includes 1,219 collisions, 3,291 derailments, 478 locomotive breakdowns and 635 miscellaneous accidents. There were 153 persons killed and 1,252 injured, exclusive of trespassers, both figures being higher than in the preceding year.

When these accidents are classified by causes, we find: 1,713 due to negligence of employees; 2,324 due to defects in or failures of equipment; 656 due to defects in or improper maintenance of way and structures; 930 due to miscellaneous causes.

The forms of negligence most disastrous from the standpoint of human casualties in 1933 were: first, disregard of fixed signals; second, excessive speed in violation

of restrictions; third, failure to properly protect by flagmen; fourth, overrunning meeting points with other trains; fifth, switches set in wrong position.

While the frequency rate of train accidents showed a small increase in 1933 as compared with the remarkably low figure of the preceding year, the rate of 7.22 accidents per million train miles run remains much lower than for any year prior to 1932, and represents a reduction of 63 per cent under the base year of 1922. The frequency rates of collisions and derailments are slightly higher in 1932, while locomotive and miscellaneous accidents attained a new low frequency of 1.43 per million train miles.

However, when we look at the figures for human casualties in train accidents, we find there has been a disturbing increase in both fatal and non-fatal injuries, the total casualty rate for 1933 being higher than for any year since 1929. This increase in casualties was due almost entirely to the unusual number of persons killed and injured in four or five accidents occurring on different roads. There were 83 persons legitimately riding on trains killed in train accidents in 1933, including trainmen, persons carried under contract and passengers, as compared with 61 the preceding year. Moreover there were 1,099 trainmen, persons carried under contract and passengers, injured in train accidents in 1933, as compared with 779 in 1932.

The 1,219 collisions, which involved 42 passenger trains, resulted in 32 fatalities and 630 injuries exclusive of trespassers. Certainly, the imperative necessity for taking all possible practical measures for the prevention of collisions must be obvious to every officer, supervisor and employee on American railroads, when it is realized that more than 200 casualties resulted from a single accident of this character last year. The conclusions of the I. C. C. Bureau of Safety investigators in each of the major rear-end collision cases reads almost the same: "Failure of an engineer to properly to obey signal indications and stop at signals of a flagman."

In many other reports of similar accidents with a smaller toll of casualties, the conclusions reveal violations of rules by various employees as well as engineers, and in several cases referred specifically to failure of operating officers to properly enforce observance of rules.

The press and public usually ascribe such occurrences to "human fallibility," and place the onus of responsibility almost entirely on the shoulders and conscience of the erring employee. Without any desire to minimize the employee responsibility, candor compels us to point out that there are occasional cases in which the greater degree of responsibility properly rests upon the management and operating officers of the railroad involved, for their failure to utilize methods which have been found highly effective for prevention of such accidents. We refer to the inauguration of continual bona fide surprise tests, carefully arranged to assure the surprise feature, made by men who truthfully report every detail of the actual performance of all members of the crew, and followed by severe and unrelenting discipline for failure or negligence in any detail of performance. These vigorous measures must, of course, be preceded by a thorough campaign of education and examinations to assure that the operating rules are fully understood, not only by the rank and file of employees, but by dispatchers, trainmasters, road foremen of engines, superintendents and supervisors in mechanical and maintenance of way departments.

Preventing Collisions and Derailments Due to Negligence of Employees

By C. H. LONGMAN

Assistant to General Manager, Chicago and North Western Railway Company,
Chicago

The speaker said in part: An analysis of the collisions and derailments on my own road shows that 88 per cent of the collisions and 25 per cent of the derailments can be traced to the failure of employees to observe the rules or special instructions.

One of the most serious derailments which we have had was due to the failure of the engineer to properly control the speed of his train on a four degree curve,

which resulted in the death of an engineer and a fireman and injury to other members of the crew. He endeavored to negotiate that curve at 55 miles an hour, while the maximum speed permissible for passenger trains was 25 miles.

In order that we might prevent accidents due to excessive speed the Division Officers as well as the Safety Officers are required to make checks to see that the speed restrictions are complied with and a report of these checks is made to the General Superintendent each month. The train sheets in the dispatchers' office are checked to see that the speed restrictions are not exceeded, and this also serves as a check on the train dispatchers to determine whether or not they are permitting excessive speed in speed-restricted districts. The division engineer from time to time also checks the elevation of the curves to see that the proper super-elevation is maintained.

The only method that we know of preventing accidents due to the disregard of fixed signals by engineers and trainmen is to make periodical checks each month. This is done by the division and Safety Department officers to see that the men observe the indication of signals.

Failure to provide proper flag protection is covered in Rule 99. On our road we require the general officers as well as the division officers and Safety Department officers, when riding trains, whether freight or passenger, to make it a point to check and see that Rule 99 is complied with in every respect. This is in addition to the assigned number of checks which are made each month by the division officers and reported to the general superintendent.

Failure of engineers on second and third class trains to properly control the speed of their trains within yard limits is covered by Rule 93 of our operating book of rules. The only way that this can be controlled is for the division officers and local officers in the yards to observe the speed at which the second and third class trains move at all times. Violations are promptly investigated and disciplinary action taken.

Collisions and derailments due to switches being set wrong occur mostly in yard limits, so far as our own road is concerned, and the only way in which this can be rectified is for the general yardmasters and yardmasters to see that the switches are properly lined up. Failures on the part of employees to properly line switches back are investigated and disciplinary action taken. Another thing is to check your engineer and fireman and switchman to see that they are looking in the direction they are going so that they will observe a switch that is set in the wrong position.

It has been many years since we have had an accident due to the improper handling of a train order, and this can be credited to the fact that our management has instituted and maintained a systematic check of train orders and train dispatchers.

In my estimation failure to keep proper lookout has been the cause of more accidents than any other one thing. This is particularly true of yard collisions. It was not so long ago when the first thing that a locomotive fireman on a switch engine, working nights, would do would be to look for the "hay board." If the engineer was the sleepy one he would take the fireman's place on the "hay board," and the fireman would run the engine. Today our division officers, including yardmasters, make checks in yards to see that the engineers comply with the rule which requires them to keep a proper lookout at all times.

Preventing Failures of Car Journals, Wheels, Trucks and Couplers

By W. B. MOIR

Chief Car Inspector, Central Region, Pennsylvania Railroad

The speaker said in part: How can we best prevent failures of car journals?

First, by careful machining and inspection at our wheel shops where the axle is prepared for mounting. A magnifying glass may be used to advantage. Numerous journals have been found with hair-line detail fractures which could not have been discovered with the naked eye, and which if permitted to be returned to service under a car are nothing more or less than potential accidents.

Second, the care and attention given to car journals in the transportation yard in the way of proper lubrication. Many failures of car journals are caused by lack of proper lubrication. Another potential failure of car journals is the sudden cooling of a red hot journal with water. Train crews should not throw water directly on a red hot journal, as the sudden cooling of the outside surface sets up internal stresses which in many cases cause a seam to develop on the surface of the journal, with the result that after the journal is trued and replaced under the car, this seam will develop into a progressive fracture.

The failure of wheels is an intensely interesting problem. Prevention of wheel failures can best be accomplished by careful workmanship at the wheel shops where the wheels are bored and mounted. It is important that the bore be true and the mounting pressure correct.

In the transportation yards, I have found that the average car inspector, through long experience, is highly qualified to pass on wheel defects. There are two general classes of defects. First, those which are liable to cause accidents such as cracked plates, seams and loose wheels; the other defects are in extreme cases liable to cause trouble but not as serious as those listed above, and are chipped rim, worn through chill, shell outs, slid flats, etc.

Train crews should also be on the alert for defects in the case of brakes sticking, and should by all means refrain from throwing water on a hot wheel, as such treatment will result in thermal cracks on tread and flange, as well as cracked plates. Defective brakes on equipment are in many cases the cause of wheel failures, and it is very important that the air brake equipment be kept in good working condition. A careful check should be made of wheels when cars are on the shop tracks to detect defects which are liable to result in an accident.

In the case of multiple wear wheels under passenger cars, we have found that by white-washing the back of the wheel plate and rim, cracks in plate and under side of rim were discovered which could not be detected with the naked eye.

When a car is cut out of service for periodical air-brake attention and after being placed on shop track, a very careful check is made of the trucks, and in the case of arch bar trucks the arch bars are inspected at all bends, front and back, to detect any cracks that may have developed. A mirror is used to examine the back side of the arch bar. Incidentally, this mirror inspection is made on all cars equipped with arch bar trucks, irrespective of whether they are shopped for periodical air brake attention or not. All brake beams are dropped and examination made of the hangers; limits of wear have been established and gauges provided for checking the wear. The same procedure is followed with respect to brake hanger pins and key bolts, all cotter keys and split keys which show evidence of excessive corrosion are renewed.

The same procedure is followed with respect to couplers and draft attachments, the couplers are dropped; yoke and couple examined for cracks at vital points; loose rivets in coupler yokes renewed; couple cross keys checked for wear; all cross keys, if not equipped with A. R. A. cross key retainer, are removed and a modified cross key applied; the distance between stops is checked and corrected, if necessary; loose rivets in coupler stops renewed.

Preventing Derailments Due to Defects In Track, Bridges and Roadway

By A. H. PETERSON

Chicago, Milwaukee, St. Paul & Pacific Railroad, Chicago

The speaker said in part: Among the forces of nature which it is necessary for us to combat are those of temperature, precipitation, wind, and fire. The sudden changes of temperature common to many parts of our country render it extremely hazardous to surface track out of face. Raising should, whenever possible, be done during the cooler parts of the day, and all raised track should be tamped and back-filled as quickly as possible. Rails should be securely anchored, ordinarily in the direction of traffic, but sometimes in both directions.

During the summer months open joints may be loosened, bars tapped lightly with a maul, and again retightened. Similarly, in cold weather, tight joints may be opened up. Special care should be taken with points where steel has been laid adjoining rail of lighter section, as there is a constant threat that the light rail may suddenly give way against the thrust of the heavier, more rugged track structure.

Heaving track is a familiar phenomenon to most trackmen in the colder climates. Drainage will go a long way toward eliminating this possibility. There is scarcely a man in track work who does not know that the various soil components, some of which are more retentive of moisture than others, cause track to heave both laterally and vertically. Such points must be watched carefully, especially when the frost is going out, as the track does not always settle back into position uniformly.

Under the head of precipitation comes snow and rain. Both are a bane to the trackman and supervisor. Heavy and unexpected rain has been responsible for many a derailment. Only last year, on one of our middle western railroads, there occurred a cloudburst, during which five and a half inches of rain fell in a period of three hours. A bridge under which there had not been more than three feet of water for twenty years was forced to withstand the onrush of a fifteen-foot flood.

Heavy rainfall is no respecter of railroad property and adequate flow-ways must be provided. Narrow track shoulders should not be neglected. Wooden bridge ends subject to wash should be ripped.

A careful system of bank widening should be carried forward yearly. Refuse at the end of cuts should be eliminated and the eroded material dug away. Adequate drainage in all cases by means of proper sewers or ditches must be provided. Ditches in all cases must be deep enough and with sufficient gradient not only to carry away the surface water rapidly but to drain as much as possible of the sub-soil as well.

Water-pockets in fills constructed of clay materials offer another danger, due to slides. Usually, due to a strata of porous material surrounded by denser, more impervious soil, the water is held from escaping properly. The supporting top ballast is thereby weakened and many derailments have occurred because of the track structure at such points suddenly giving way under the wheels of a train. The bottom of these water-pockets must be tapped by the proper method of drains. Slopes may be sodded to prevent sliding. Various types of vines—alfalfa or Bermuda grass—not only serve to prevent sliding, but also arrest considerable drifting snow.

Windstorms have caused many train derailments, due to blowing cars off sidings onto main lines of other tracks, or blowing trees, telegraph poles, or other obstacles across the rails. Derails must be provided for at all dangerous points, especially on descending grades. Trees should be cut back to a safe distance from the track wherever possible. In some sections of the southwest, winds are an especial hazard due to the light, sandy top soil drifting. The placing of sand fences, oiling of sandy soil adjacent to railroad tracks, and the planting of resistant vegetation are some of the more common preventives of such accidents.

Wooden trestles on our important lines are rapidly giving way to steel but on our less important lines they will probably be with us for a long time to come. In some cases the tops of wooden trestles have been covered with sheet metal to prevent their ignition from engine coals. Vegetation should be carefully cut away from wooden abutments and inspections carried on systematically to see that this item is not neglected. Weed burners should be carefully followed and all fire in ties carefully put out. If this is not done, all or a portion of the ties in a single panel of track may be consumed, permitting the rail to rush out of gauge or to depress under traffic, and thus lead to a costly train accident.

Nor is the highway crossing free from its hazards. Planks should be taken up before freezing weather begins and all dirt on top of the ties and underneath planks cleaned out.

Flange-ways should receive especial consideration and all ice, snow, or other material cleaned out carefully. Too many derailments have occurred due to snow and ice in flange-ways.

On gravel or dirt ballasted highways there is an added danger due to vehicles dragging stones or dirt upon the crossing and into the flange-way. Here it com-

pass under traffic, as more and more is deposited, until eventually the wheels of a passing train are lifted up and over the rail. Highway repairmen operating road scrapers are sometimes careless or ignorant of these dangers. Track foremen should make it their duty to advise all such persons of the possible consequences of this dangerous practice.

So far very little has been said about inspections. It is, however, by regular and careful track inspections that incipient dangers may best be found and corrected. The trackmen, the foremen and the supervisors should train most carefully the men upon whom they are to rely. With sections rapidly becoming longer and longer, it is not always possible for the foreman to supervise his gang and also patrol his track. The track inspector therefore becomes the first line of defense. He must be able to think clearly and rapidly in whatever emergency may arise, always remembering that the safety of the train service rests in his hands.

Moreover, the foreman himself must be ready at all times of high wind, heavy rain, or any unusual weather conditions to patrol his track, and to him is given the power to preserve the lives of passengers and trainmen, and to him is given the privilege of speeding up the wings of transportation.

WEDNESDAY MORNING SESSION

October 3, 1934

Report of Committee on Prevention of Highway Crossing Accidents

By H. A. ROWE

Manager, Claims Department, Delaware, Lackawanna and Western Railroad, New York City

The speaker said in part: The report of this committee for the year 1933 again shows a slight reduction in the number of accidents and fatalities at railroad highway crossings and a substantial reduction in the number of injuries for the fifth consecutive year since the year 1928. The record is as follows:

Year	Accidents	Fatalities	Injuries
1928.....	5,800	2,568	6,667
1933.....	3,235	1,511	3,697
Reduction	2,565 (44%)	1,057 (41%)	2,970 (44%)

Casualties during the four months of June, July, August and September in the Careful Crossing Campaign, compared with the same period, 1928 to 1933, inclusive, were as follows:

Year	Accidents	Fatalities	Injuries
1928.....	1,799	858	2,092
1929.....	1,827	749	2,140
1930.....	1,371	640	1,505
1931.....	1,103	496	1,196
1932.....	899	432	1,022
1933.....	990	491	1,124

It will be noted that automobile registration in 1933 was 23,827,290, and represents an increase of 1.4 per cent over the preceding year; this is quite comparable with the number of automobiles registered in the peak year of crossing accident casualties.

Gasoline consumption, which is a fair barometer of automobile use, was 16,025,562,000 gallons during the year 1933; which is an increase of a trifle less than 2 per cent over the preceding year. The increasing use of smaller cars with greater mileage per gallon of gasoline, indicates that the traffic over and across railroad tracks was fully equal to that of 1932.

More than 92 per cent of all railroad-highway crossing casualties involved the operation of automobiles. The remaining 8 per cent included persons in animal-drawn vehicles, bicyclists, pedestrians, etc.

To the credit of the automobile driver, and the activities of the railroads, attention is called to the increasing number of automobiles actually in use, at highway crossing, the figure now being one death to 15,769 automobiles. Crossing accidents, resulting in injuries, are also favorably reflected, as during the past year there was but one crossing injury to each 6,443 automobiles operated.

Illustrative of the thoughtlessness of some motor car drivers, it is interesting to note that in 1933, again, motor vehicles colliding with the sides of trains accounted for a large number of all crossing accidents; namely 28 per cent of all accidents, 17 per cent of the fatalities, and 40 per cent of the injuries.

Your committee earnestly recommends that the individual railroads particularly stress the necessity of their train crews and others giving adequate and timely warnings to the public of the approach of trains to a highway crossing. The committee is also unanimous that warning from engine should be continued until the crossing is definitely reached.

That suitable standardized methods of protection be employed, where necessary, at crossings, to facilitate uniformity and the public understanding of the signals.

That crossings be periodically inspected and maintained in sound travelable condition.

Your committee also recommends that greater advantage be taken of the opportunity of presenting the crossing safety subject to school children throughout the nation, in similar fashion to the way this work is being conducted by some roads, particularly the Atlantic Coast Line. It is also recommended that officers or suitable representatives of railroads present the crossing accident situation at luncheon clubs and other places where men gather, this work often reaching those who are employers of drivers of motor car vehicles.

Summary of Conditions and Practices Involved In Certain Accidents

By W. J. PATTERSON

Director, Bureau of Safety, Interstate Commerce Commission

The speaker said in part: It is difficult to discuss the subject of railroad accidents without appearing to take a more or less critical attitude concerning the existing situation. Obviously, there would be no such accidents unless defects existed, rules were violated, or someone failed to think or act in a safe manner.

Last fall the Commission investigated a rear end collision on an eastern railroad in which 14 persons were killed and 32 injured. The accident occurred on a double track line equipped with automatic block signals and an automatic train stop device. The engineer of the following train received a calling-on signal indication at the entrance to the block in which the accident occurred; this signal authorized him to proceed at "restricted speed," which was defined in the book of rules. The engineer operated a forestalling lever of the automatic train-stop device and entered the block at a low rate of speed; at that time he knew the block was occupied by another train, having been following it when it entered the block, but he assumed that it would keep moving and consequently allowed the speed of his own train to increase with the expectation of proceeding as far as the next automatic signal; however, the preceding train, which was out of sight around a curve, stopped short of that automatic signal on account of switching operations ahead. The engineer of the second train was looking across the curve in order to pick up the indication of the automatic signal and failed to see the rear of the standing train or its flagman until too late to avert the accident, although he had a view of the standing train for a distance of about 900 feet. The rule under which his train was proceeding was simple and easily understood. It was evident that the employees did not have a clear and correct understanding of what was meant by the term "restricted speed" and that proper effort was not made either to observe or enforce the requirements of the rule.

Shortly before the accident above referred to, there were two other accidents which were of an unusually serious nature. One occurred in the southwestern section of the country and was caused by a flood resulting from a cloudburst having washed away the fill supporting one of the abutments of a bridge, permitting it to collapse under a train; while the other occurred on an eastern railroad and also involved flood waters, the center pier of a bridge having been undermined. In the first of these two cases not only did it appear that the washing away of the fill could have been guarded against by rip rap or other protective measures, but the need of such protection had existed for two years. In addition, rains earlier in the month had resulted in the bank of the stream and also the toe on the slope of the fill supporting the abutment, being washed sufficiently to direct attention to the need for protection. Local residents using the highway had observed the condition and recognized the possibility of danger to the railroad bridge but no representatives of the railroad had made sufficient inspection to discover the condition. One of the functions which must necessarily accompany the safe operation of a railroad has to do with the taking of protective measures before actual danger develops.

In the second case involving flood waters, the undermining of the center pier of the bridge permitted it to settle under a passenger train, resulting in the derailment of the entire train, the death of two persons and the injury of twenty others. The piers of the bridge had been built on a gravel foundation, no provision being made to guard against scouring, because it was stated that the gravel was too compact to permit the driving of piles. American Railway Engineering Association rules covering inspection of bridges provide in part that the inspection of foundations should include an examination for indications of scouring or undermining, and that when necessary, soundings should be taken for this purpose. The evidence of this case indicated that the company had made no underwater inspection nor taken any soundings for the purpose of detecting possible scour at any time subsequent to the erection of the bridge 29 years previously.

Speed has been a factor in a number of the accidents which were investigated. One of these involved the derailment of a passenger train due to excessive speed on a sharp curve, the evidence indicating that the engine turned over from centrifugal force, without marking the ties between the rails, while traveling at a speed estimated to have been from 50 to 65 miles per hour, although the speed of passenger trains on the curve where the accident occurred was restricted by slow board to 30 miles per hour. The other accident in which speed was a factor involved failure properly to control speed in an occupied block; this is a frequent cause of accidents. This accident occurred on a single-track line, trains being operated under a manual block-signal system. The first train had 115 cars with a helper behind the caboose, while the second train had 127 cars with two engines on the head end and a helper behind the caboose. After passing the last block office the first train had been stopped and shortly afterward was struck by the following train. More or less fog had prevailed, and it was very foggy in the vicinity of the point of accident. Investigation developed that the second train passed the last block office 41 minutes behind the first train, made no stop en route, and had proceeded at an average speed of about 23 miles per hour, whereas the maximum permissible speed for freight trains with helper engines was only 25 miles per hour and under the rules a following train in an occupied block was required to be operated under such control that it could be stopped short of a train or obstruction.

The brief references I have made to accidents investigated by the Bureau of Safety during the past year do not represent unusual conditions. Accidents of this kind are encountered in our work year after year and are detailed in our accident investigation reports made public from time to time. Many railroads are availing themselves of the information contained in these reports to aid in discovering and correcting dangerous or undesirable conditions and practices on their lines before they result in accidents.

Certain railroad officers devote their entire time to safety work, yet they are seldom found at the scene of a train accident or in the investigation room. A train accident is a serious matter. It may and frequently does result in a considerable number of deaths and injuries, and large property loss. Surely the fundamental idea of safety applies to train operation and the methods and practices followed in

connection therewith, yet the duties and responsibilities of safety officers do not appear to include operating conditions and practices which vitally affect the safe handling of trains and the maintenance of the track and equipment involved. In the case of each of the accidents to which I have referred, there was not a single recognized safety officer present at the investigations.

In connection with the non-observance of rules which was involved in some of the accidents I have mentioned, there is one matter which I desire particularly to call to your attention. Frequently an investigation indicates that employees have been doing or have been failing to do certain things in violation of the rules until it develops into an established practice and this practice finally results in an accident. Under these circumstances the employee usually is held at fault. Rules and instructions governing the operation of trains are based on years of experience and are the result of careful deliberations of the best minds among experienced railroad operating officers; yet there are occasions when these important rules are not enforced, violations being overlooked as a matter of expediency. An operating officer assumes a grave responsibility if in his desire to expedite the movement of traffic he permits violations of the rules to go uncorrected. The rules of various railroads differ, but all of them have the same ultimate object in view, namely to insure that signals are displayed behind a train to provide adequate protection. In many instances however, it is common knowledge that in order to avoid delay the flagman is not expected or required to comply with the rules. On some roads the flagman starts back promptly and continues for a proper distance or until recalled. But on others he loiters around the rear end or is not expected to go back any great distance; when those things are observed frequently the natural inference is that the employees are reflecting the attitude of those charged with enforcement of rules on the particular railroad involved. Another example of rules being frequently overlooked has to do with speed. I venture to say that violations of speed restrictions or rules governing speed are among the most common rule violations on the railroads of this country. Out of 87 accidents investigated by the Bureau during the fiscal year ended June 30, 1934, excessive speed was involved directly or indirectly in at least 17 cases.

To avoid accidents, there are two essential principles to be kept in mind; first, rigid enforcement of and obedience to rules so that as a result of instruction, training and practice the employee will, in case of emergency, instinctively do the right thing; and secondly, thorough investigation of all accidents for the purpose of ascertaining not only the immediate causes but also the underlying factors leading up to the immediate causes, and then applying the proper remedies or preventive measures.

Report of Committee on Train Service Accidents

By D. G. PHILLIPS

Superintendent of Safety, Wabash Railway, St. Louis, Mo.

The speaker said in part: Our record of train service accidents shows that in 1933 a total of 4,398 persons were killed and 15,107 persons injured. Confining the figures to employees on duty, we find that a total of 329 were killed and 6,032 were injured. Of these 209 trainmen were among the killed and 120 were other employee fatalities. And among the injured, 5,468 were trainmen and 564 other employees on duty.

The relative importance of train service accidents as compared with accidents of all classes becomes evident when you note that out of a total of 500 employees killed on duty in 1933, of these 329 were classed as train service accidents, while of the 15,583 employees injured in 1933, 6,032 were injured in train service accidents. When major injuries alone are considered, the proportion of those injured in train service accidents is much higher. Another thing that makes the matter of train service accidents of great importance is that nearly all of these accidents are preventable; in other words, hundreds of employees are killed and thousands injured unnecessarily.

The causes of accidents of this class and the remedies to prevent accidents of

this class are just what they were a year ago, and just what they were four years ago. The task before us therefore is not to discover causes of accidents and not to discover what the remedy is, for these have both been made apparent years ago. The important thing before us, then, is what to do, or rather how to get the remedy applied. Let us look, then, at some of the outstanding types of these accidents.

Coupling or uncoupling cars or locomotives. The Interstate Commerce Commission figures show that in 1933, 12 persons were killed and 246 injured; and that of these 9 trainmen were killed and 238 injured, and 3 other employees were killed and 8 other employees injured. This type of accident is the one in which speed seems to be accountable for most of the injuries but in reality they are the result of violation of rules.

Those in supervisory capacity should see to it that men in this class of service, as well as all others, fully understand that a request for work to be done in less time is not in any way to be considered as permission or invitation to violate safety rules to accomplish the task.

Operating hand brakes. Of the 15 persons killed and 514 persons injured in 1933 while operating hand brakes, all were employees on duty. All those killed and 511 of the injured were trainmen. While there was an increase of 25 per cent in fatalities when compared with 1932, the number injured decreased 13 per cent. There has been a steady improvement in the total number of casualties, the figures for 1933 showing a reduction of 55 per cent under 1930.

In studying the causes of these accidents, we find considerable evidence of lack of forethought and care on the part of the men.

It is recommended that a definite educational program be instituted with concentration on the following suggested subjects: the importance of first sizing up the job quickly and thoroughly from all angles; the different types of hand brakes, method of operation; brake clubs, examination for strength and proper use of; position of feet on brake platforms and manipulation of the pawl; importance of secure footing, particularly in winter; importance of having a firm grip; precautions taken with brakes that are set too tightly; precautions to be taken when on a moving car or on a standing car.

Getting on or off cars or locomotives. The total number of persons killed in this manner in 1933 was 516, while the total injured was 3,785. Of these 15 employees were killed while on duty and 1,345 injured; 11 of the killed were trainmen and 1,266 injured, while other employees killed numbered 4 and 79 injured.

This tabulation shows progress. When compared with 1930 the total casualties to employees on duty decreased 52 per cent including a reduction of 67 per cent in fatalities. There was a decrease of 19, or 56 per cent, in the number killed and a decrease of 204, or 13 per cent, in those injured as compared with 1932.

The chief causes of accidents under this classification are falling, either due to slipping or tripping, getting on or off cars or locomotives while in motion, and stepping down on uneven roadbed or on obstructions. Many of these accidents occurred at night or during inclement weather and some were due to defective equipment. Most railroads have safety rules in effect which, if complied with, would have prevented a great many of these accidents. The greatest progress can be made by rigidly enforcing the rules and applying suitable discipline in individual cases of rule violations.

Operating locomotives. In 1933, 5 persons were killed and 834 persons injured while operating locomotives, all of them being employees on duty.

Accidents under this classification are generally due to the failure of engineers to comply with the operating rules of the railroad, as well as the safety regulations established for their protection. Many improvements can be made in the method of cleaning fires, handling coal, as well as the methods of using fire tools, and it is recommended that safety officers give particular attention to this subject.

One of the outstanding causes of serious and fatal injuries under this classification is the taking of water at water plugs in all kinds of weather, and in a great number of instances the inefficiency of operation is due to the lack of proper maintenance of these water plugs. The unexpected movement of the locomotive plays its part in the serious phase of injuries under this cause, and proper cooperation by the men on the locomotive is essential to eliminate this type of accident.

The operation of stokers and power reverse gears, squirt hose and other me-

chemical equipment call for constant education and training to eliminate them as potential accident hazards.

Operating switches. Although none were killed in this manner in 1933, 176 persons were injured, all of them being employees on duty. Of these 165 were trainmen and 11 other employees. The reduction of casualties due to operation of switches has shown a very marked decrease over 1930, 2 killed in 1930 against none in 1933, 378 injured in 1930 as against 176 in 1933. This indicates that employees are exercising more care while handling switches.

Of the causes leading to these injuries we would enumerate the following as the most important: insecure footing; haste in attempting to throw the switch; improper position of man throwing the switch; switch hard to throw; and unsafe conditions around switch. The first three of these causes might all come under the single heading "haste."

Before attempting to throw the switch a man should be sure his footing is secure, that his body is free of the movement of lever, and he should never take it for granted that the switch will be easy to throw; because of variable weather conditions, the switch that is easy to throw today will be hard to throw tomorrow. A man should never undertake to jerk the switch lever over; because if he jerks on the lever with the expectation that it will move easily when for some reason it is hard to move, injury is apt to result. He should always take a firm hold and throw the switch over with a steady uniform movement, being sure that there is no obstruction that will catch his hand in the movement of the switch lever. Those whose duty it is to keep the switch in good working condition, and to keep the vicinity of the switch clear of unnecessary obstructions, should see that this duty is performed. Switches need frequent inspection.

Struck and run over not at public crossings. The total persons killed in 1933 numbered 1,792 and 958 persons injured. Among employees on duty 101 were killed and 146 injured; of these 32 killed were trainmen and 74 injured, and 69 killed were other employees and 72 injured.

The reduction of employees killed on account being struck and run over not at public crossings is very marked, 231 having been killed in 1930 as compared with 101 in 1933. I think this good showing has been largely brought about by the special attention given to the elimination of the causes of such accidents.

An examination of casualties under this heading classifies nearly all of them as due to one of three causes: (1) failure to look both ways before stepping on the railroad track; (2) walking on the railroad track or foul of the track when possible to walk elsewhere, and (3) walking too close to the end of a car in a live yard.

Practically all of these injuries are easily capable of being eliminated. The remedy is apparent and may be briefly stated as follows: (1) always look both ways before stepping on the railroad track; (2) never walk on the railroad track or foul of the track when possible to walk elsewhere, and (3) never go within ten feet of the end of a car in a live yard.

Getting On or Off Cars and Engines and Operating Hand Brakes

By E. A. MEYER

Manager, Safety and Fuel Departments, Chicago, Milwaukee, St. Paul and Pacific Railroad, Chicago

The speaker said in part: Accidents resulting from the operation of hand brakes show an increase of 3, or 25 per cent, in fatalities during the past year. In all there were 15 killed and 514 injured. You can plainly see that here is a field for some intensive work to cut down these injuries that are so unnecessary. Very few of these accidents were caused from faulty equipment and a great many were due to falls, losing hold, slipping or losing balance. I believe that we could cut down

these accidents to a minimum if an educational program were carried on among employees.

I am happy to call your attention to the fact that accidents due to getting on or off cars or locomotives show a decrease, only 15 employees being killed instead of 34, a decrease of 56 per cent. Instead of 1,949 being injured, there were 1,345 injured or a decrease of 31 per cent.

All of these accidents due to getting on or off cars or locomotives were due to the following unsafe habits: uncertain hand or footholds, attempting to get on or off when not competent to do so, inability to see where they were alighting, and alighting on rough, uneven or slippery surfaces or on frogs or switches, or carelessness.

Before we had safety rules, men were getting out of gangways of locomotives facing outward and performing other hazardous stunts, trusting to luck that they would alight like a cat, on their feet standing up. These were unsafe habits and it has been hard for some of the older men to break themselves of such habits.

One of our master mechanics had a habit of getting down out of the gangway of an engine when facing outward. He realized it was a dangerous practice and that he was setting a bad example for his men. One day he did this as I happened along and he remarked to me: "I am going to break myself of that habit." So he deliberately got on and off the engine several times in the proper manner until he felt sure of himself; and then he remarked to me: "That is the last time I am going to bungle the job of getting off an engine." Moreover, he stuck to the good habit. In other words—he crowded out a bad habit with a good one.

Coupling and Uncoupling Cars and Engines and Air and Steam Hose

By D. A. KLUMPH

Supervisor of Safety, Pere Marquette Railway, Grand Rapids, Mich.

The speaker said in part: In the coupling and uncoupling of cars and locomotives, we were able to show a reduction, comparing 1933 with 1930, especially to trainmen,—and they do most of that work.

A comparison of the injuries to employees from this cause, for the past four years, shows conclusively that it is not rules alone that will stop these injuries because if there is any one thing that is adequately covered by the rules it is this kind of work. To quite an extent, it is the older employee who is injured in performing this work, and it seems to be due to his opinion that because of his experience in the old link-and-pin days he can still go between moving cars without injury. But in most cases he will not allow a member of his crew to do it because of the danger involved.

Because all injuries of this type are caused by violation of rules, it is within the power of the operating officials to stop these accidents through rigid enforcement of rules.

Coupling and uncoupling air or steam hose: we find that comparing 1933 with 1930, we have had more fatalities and fewer injuries in 1933.

The principal cause of these injuries seems to be failure to reduce the air brake pressure before endeavoring to uncouple the hose, and perhaps a more rigid rule in regard to this might be introduced with good results.

Another cause for many of the serious accidents is failure to protect the workman with blue signals or otherwise in compliance with the blue flag rule. These violations in many cases are too often caused by the desire on the part of someone to gain time at the expense of safety.

As to the rule situation, which is my pet hobby, because I have been pretty closely connected with it for a number of years, I feel that we can have too many rules. It seems to me that the more rules we have, the greater number of violations to rules occur. It is a good deal the same with rules as with our laws. We have so many that the average man doesn't know he is violating the law in what he is doing.

Struck or Run Over—Not At Public Crossings

By D. G. PHILLIPS

Superintendent of Safety, Wabash Railway, St. Louis, Mo.

The speaker said in part: Last year, out of 500 employees killed on the railroads of the United States, 101 were killed because of being struck and run over, not at public crossing—almost one-fifth of the total number.

Nearly all fatalities and injuries due to being struck and run over can be classified under three heads: first, stepped on the railroad track without first looking in both directions; second, stood or walked on the railroad track when he could have walked some place else; third, walked too close to the end of a car in a live yard.

All railroad employees and other persons know, without anybody telling them, that those three things are dangerous and unsafe. They know they shouldn't do them and they don't want to get hurt or killed. Then why is it when all of them agree on those things, that 101 railroad employees were killed in that way last year? That is the answer that you and I must find out. The answer is, in an offhand way, supervision. But you have said nothing, you have solved no problem when you say, "supervision." When you say "supervision" you must include that course of conduct on the part of supervisors that secures the cooperation of the men.

There are a good many things that are done in the exercise of supervision. In one of our shops not long ago, the shop superintendent found a man without goggles doing what is known as "goggle work." He promptly suspended him for five days and sent him home. That is supervision—one kind of supervision, or, rather, a part of supervision. It had a wonderful effect, especially on the other fellows.

A few days later, this shop superintendent heard that the man's family was in very destitute circumstances. We were only working about 6 days a month at that time, and he lost five days of the six on account of not wearing his goggles. The shop superintendent went out to that man's house. He had five little children, two of them under five years of age, and the only food of any kind in that house was one-half loaf of bread. This was in the winter time and all they had was one stove, a cook stove.

The superintendent was so moved that he came back to the shop and took up a collection of about \$20 and presented it to this man's wife.

A short time afterward, when the man came back to work, he thanked me with tears in his eyes for the money we had given him. I told him that we had not given the money to him, but that we had given it to his wife.

"Well," he said, "I will tell you one thing, Phillips: you will never find me guilty again of doing that kind of work without my goggles on."

And the question with me, gentlemen, is which had the strongest influence on that man's action, the five days' time which he lost, or the help that was given his family in a time of need?

Here is some more supervision. Mr. Cole told me this story the other day. He went down to his shop round-house, and found a man who was not wearing goggles when he should have been wearing them. He called him down off the engine where he was at work. He knew the man's circumstances, that he was just about ready to get his home paid for. I don't remember what the fellow's name is, but Cole said, "George, you have violated the goggle rule."

George knew it. He said "George, you have a little girl in your home, eleven years old, who has never, because of infantile paralysis, been able to put her feet to the floor. You have a wife who is already worn out with the care of that invalid child. George, if someone would go to your home and tell your wife that you have been blinded in both eyes, how would you feel, knowing that you were no longer able to help care for that little invalid and to help her mother in the struggle to keep things going?"

George had stood with his head down while Mr. Cole was talking to him. He looked up with tears in his eyes. He said, "Mr. Cole, I have never been talked to about safety in that way before. I have always thought there was a lot of hokey

in this safety movement. But I now realize what it means to me, and you can rest assured that never again will I do that kind of work without my goggles on."

That is some more supervision. Notice the results. Don't think for a moment that I am deprecating punishment for non-enforcement of rules. Safety rules should be adopted and they should be rigidly enforced by whatever methods are necessary to cause the employee to comply with them. But enforcement is only a part of supervision.

Here is some more supervision that brought good results. On the Wabash Railway this year we laid 60 miles of new 110 pound steel. We had a gang of 115 or 120 section men engaged in that work. About the time they started this work we happened to have a division safety meeting within four or five miles of where this camp was. The supervisor, a Mr. Watkins by name, loaded his fellows up and brought them in to the safety meeting.

I was there and I told them just how to do their job without anybody getting hurt. About three months later, they completed that job, and not a single man had been injured.

WEDNESDAY AFTERNOON SESSION

October 3, 1934

Interesting Employees in Looking After Their Own Safety

By J. CLYDE MIXON

Chief Clerk to General Superintendent, Northern Division,
Atlantic Coast Line Railroad Company, Savannah, Ga.

The speaker said in part: One of our South Carolina philosophers, Rob Quillen, once said: "If we would pray more often for common sense, we would not have to pray for rain." Expand that thought for yourselves. Safety is common sense in action.

"Interesting employees in looking after their own safety" is but another way of saying, "Sell the idea of safety to your men." Before one can sell anything to someone else one must sell oneself. You may be sure that in a section where there is a poor safety record it is primarily the result of the indifference of a supervisory officer, or the result of his inability to sell the idea to his men and keep them sold on it.

We must keep everlastingly at this proposition of safety. A wise man who lived in the Orient once said: "Nothing is ever definitely finished among men, for each thing stops only to begin again." We can put that down as a law of nature. It has been said that "eternal vigilance is the price of safety", and that is quite true. We must constantly drive home the doctrine of safety mindedness.

If the supervisor is indifferent, there isn't anything to do about it but "decapitate" him, and the sooner the better, because it is an indication not only of narrowness but of his unworthiness to be a leader of men and a representative of enlightened management.

It should not be difficult to get men interested in looking after their own safety. The first law of nature, the law of the jungle, the law of self-preservation, is or should be invoked by every worker. It requires some time, however, for men to be sold on this idea—that they must look after themselves. There is also, of course, the appeal to a man's higher nature, the duty he owes to his family, then to his fellow workers and the public whom he serves.

But I want to approach this subject largely from the angle of responsibility and the opportunity of the supervising officer. It thrills me sometimes when I think of the opportunities the supervising officers—the foreman, the master mechanic, the trainmaster, the superintendent—have if they exert themselves as the leaders of the men working under their supervision. What an opportunity this man has to accom-

plish something worth while in this brief span of life, where we are all put here for a purpose, and where true happiness is derived from doing something to help our fellow man.

Men can be led. We see evidence of this every day. We see men being led by unscrupulous leaders and demagogues into destructive paths. Unfortunately the vast majority of men, it seems, like to have someone else to do their thinking for them. This trait of human nature should be capitalized by the supervisory officer not only in his efforts for better safety but in aiding him to carry on all the activities for which he is responsible. After all, safety is really a synonym for efficiency. Where there is a poor safety record there will also be found a state of inefficiency.

The supervisory officer must, therefore, so sell himself to his men as to become their leader, their authority, their guide, their teacher. It has been done, it can be done, and it must be done if the supervisor is to live up to his responsibility in this age of ever advancing progress and complexity, and if he is to maintain his right to hold a supervisory position. This angle—the opportunity of the supervisor—has been neglected in the past. The supervisor can and should be made a development agent for loyalty. Someone has wisely said that "an ounce of loyalty is worth a pound of cleverness."

Our discussion naturally leads us into the question of discipline, highly necessary in any organization where large numbers are employed. However, the chief meaning of this word discipline is not "correction" or "chastisement" or "punishment"; but the foremost definition is this: "the treatment suited to a disciple or learner; education; development of the faculties by instruction and exercise; training, physical, mental or moral."

Education is a potent factor in this business of safety, just as it is in any worthwhile undertaking. We have our established channels of education and instruction in this safety movement. We have our committees. We have our organizations. However, these orthodox methods are not always sufficient. Interest sometimes lags. It is your job and my job to see that interest is sustained.

Education of the right kind must come largely from personal tutelage. Here again, the responsibility and the opportunity of the supervisor must be stressed. An employee does not reach perfection when he has passed an examination, or when he has been promoted from one rank to another. It is a constant, unending process of evolution and development. Our scheme must be fitted to meet the needs of the hundreds of ever-changing personalities with which we have to deal.

Someone has said that the standard rule book is the railroad man's Bible. This leads me to mention a practice on our road that may not prevail everywhere. Attendance at our safety committee meetings is not compulsory, though they are usually well attended. We find, however, some disinterested, unloyal (perhaps rather than disloyal), workers who do not receive the benefit of what transpires at the safety meetings. Attendance at our rule meetings, a series of which is usually held semi-annually, is compulsory. Our trainmasters, who usually conduct these rule meetings or schools, invariably devote a period of time to a lecture on the first rule in the book: "Safety is of the first importance in the discharge of duty." Moreover, in discussing all the rules, the safety aspect is not forgotten and is stressed.

This question resolves itself to a great extent into a study of the science of personnel management. It is a big subject. Some railroads and many other industries have personnel departments, but those in charge of such departments act only in a general way. The immediate supervising officer is the keynote of the success of healthy personnel relations in any establishment, and great indeed is his responsibility as well as his opportunities.

I would like to close my talk to you with these words from that great soul, Elbert Hubbard, whom I am fond of quoting: "The man who is worthy of being a leader of men will never complain of the stupidity of his helpers, of the ingratitude of mankind, nor of the inappreciation of the public. These things are all part of the great game of life, and to meet them and not go down before them in discouragement and defeat is the final proof of power."

Report of Committee on Non-Train Accidents

By C. F. LARSON

Superintendent of Safety, Missouri-Pacific Lines, St. Louis, Mo.

The speaker said in part: The report of our committee (which has been distributed to all delegates) shows that there are greater numbers of injuries occurring in non-train accidents than in train and train service accidents combined. You might get an erroneous impression from this, that there is a higher casualty rate in that type of occupation than in train and train service occupations. That is not true. It is because there are more men working in those two occupations—maintenance of way and maintenance of equipment—than in the others. Therefore, there is more exposure to injury and more accidents occur.

I have taken some figures from the I. C. C. reports with respect to the casualty rate among non-train employees and I find that under the head of maintenance of way and structures in 1933, in Group A, the larger railroads, the average was 6.03 as against 12.04 in transportation; in Group B it was 5.68 in maintenance of way as against 13.03 in transportation. The ratios in Group A were from 1.48 to 13.99 in maintenance of way.

To give you many of these classifications would take too much time. However, in Group D we find a peculiar situation. These ratios per million man-hours under the head of maintenance of way start with none (not a single reportable casualty on one road) and run up to 34.26. Under maintenance of equipment for your mechanical men, in Group A, the average was 5.88 as against 12.04 in transportation. In Group B, the next largest railroads, the average was 6.03 as against 13.03 in transportation.

So it would appear that while we have been worrying about the greater number of accidents prevailing under the head of non-train occupations, we are making a better record than they are in the transportation department.

Falls of Persons and Handling Materials and Tools

By ALBERT A. MILLER

Engineer, Maintenance of Equipment and Structures, Missouri Pacific Railroad, St. Louis, Mo.

The speaker said in part: In the maintenance of way departments of our railroads, between 90 and 95 per cent of the men engaged are handling materials or tools when they work. They are ordinarily doing things under the direction of someone who has been delegated to accomplish certain definite results with men, materials and tools. These men are subject to orders and will do that which is a reasonable demand upon their efforts. Where direction is proper and the results to be obtained are discussed and made plain, men ordinarily perform in an orderly and harmonious way.

Where men, materials and tools together are involved, only one of the three has intelligence. The other two—materials and tools—have no intelligence, no thought and no ideas. They move or are moved entirely without any power within themselves. Men are not at the mercy of matter; material and tools are not masters but servants; they can be controlled and made to answer thought whenever and wherever man wills it so.

But men do have weaknesses that should be adequately covered by a factor of safety. Some of the weaknesses of men are fear, timidity, lack of capacity to concentrate, lapses in clear thinking brought about by the jarring testimony of the senses, thinking beyond the act instead of synchronizing a clear thought with the act.

These weaknesses are the unseen fractures in thought. Why is it not just as logical and just as reasonable to overcome these weaknesses of thought by adding more thought as it is to overcome the weaknesses in matter by adding more matter? Should we not expect almost like results?

Based upon experience and the best thought that could be brought to bear upon

the matters involved, we have provided rules which, we say, if thoughtfully and conscientiously followed should prevent accidents,—not only those of a kind involving men falling on account of the handling of materials and tools—but most accidents of all kinds.

When accidents do happen, we investigate to determine, if possible, the underlying causes. Information brought together following such investigations is broadcast in order to give others the benefit of the conclusions.

There is, I believe, a very much stronger tendency and a more lively disposition to dig down and uproot underlying causes now than obtained a few years back. Just to superficially examine into an accident is dangerous, if it is expected to use information so collected for giving out to others; if the examination into the underlying causes is exact and complete, then information from such analysis sent out to others will surely bring some worth while results.

Assume that all men read the rules which should govern them and that they understand them; assume that they hear and comprehend the proper words of advice and direction as they come from sources of dependability and seasoned thought; assume that the thought of self preservation is generally as strong in one man as in another; and further assume that clear thinking during the processes of ordinary functioning is as available to one man as to another—would there then be as many falls of persons due to handling materials and tools as now obtain?

Then why do we continue to have such accidents, and why don't we do those things which will prevent them?

The real reason why we continue to have such accidents is that we are persistent law breakers; our weaknesses manifest themselves; clear thinking is then submerged in a sea of confusion with the result that some law, rule or regulation is violated and the result is usually disastrous.

The reason that we don't do those things which will prevent these accidents is that supervision has not yet made up its mind. When supervision definitely and courageously sets itself to the task of finding and providing an adequate factor of safety for men, then the weaknesses of men will be as impotent to do harm as the weaknesses of material—shackled as they are by a factor of safety.

Falls of Objects; Motor Cars—Care and Operation

By G. B. FARLOW

Division Engineer, Baltimore & Ohio Railroad, Pittsburgh, Pa.

The speaker said in part: The usual accident from falling objects consists of track employees being struck by falling stone in cuts, or from coal or other lading falling from passing cars, and such accidents in the bridge and building department as dropping of tools from overhead, dropping of blocking or other materials from bridges, buildings and structures on employees working underneath.

The majority of these accidents are preventable—those involving trackmen by the observance of the general rule of properly clearing all running tracks at the approach of trains; and in the other crafts, largely a matter of discipline in the gang. Well organized gangs, properly supervised, can so regulate their tasks that it will not be necessary for men to work directly above one another, where they might be struck by objects falling.

The cure is obvious: give the employee the proper training, insist on the proper discipline, and this class of accidents, in a large measure, can be overcome.

The subject of "Motor Car Care and Operation" is one that is of major importance in the maintenance or way department. The care of the motor car is primarily the responsibility of the employee in charge. It is his duty before placing the motor car on the track for movement to determine by careful inspection, that it is in safe operating condition. It is important that supervisory officers frequently check condition of cars assigned to foremen, signal maintainers or other employees authorized to use them. It is the supervisor's duty to so impress his subordinates that they will take no chances by operating a car with defective brakes, operating equipment, running gear, safety railing or deck.

It is, however, the railroad's responsibility to furnish cars of safe construction.

There is still in operation on a number of railroads the type of car which is not safe to run. My opinion is based on a number of personal encounters, as well as the sad history of unfortunate accidents to others. This type of car is known as the "side load car." It consists of a frame, the engine and seating arrangement being placed directly over one rail and equipped with one or two wheels on opposite rail of lighter construction in the form of an outrigger. The design of this type of car is fundamentally a hazard due to the fact that the center of gravity is not over the center of wheel bearing but carried over one rail.

There are many improvements that can still be made to lighten the weight of rail motor cars used for inspection service and those for medium and heavy duty. There is a crying need for improvement in the manner in which tools are carried on such cars—a source of potential accidents. I can think of no more severe casualty than that which would result from tools falling off a motor car while traveling at maximum speed permitted by the rules. Tools falling from the car might easily cause a disastrous derailment, and men on the car in such a catastrophe would have no opportunity of avoiding injury.

Safety rules have, therefore, been designed to overcome such a hazard. They consist usually of a cautionary admonition to place the tools and material carried on such cars in a secure position and remind the foreman or other employee in charge that he is responsible to see that tools are in a secure position; but I ask you, in all fairness to these men, whether the provisions made for carrying necessary tools by track gang or bridge gang on a motor car are such that they can be placed in a secure position?

I believe that the method of carrying tools on a motor car could be improved upon; the motor car can be so designed that a suitable receptacle under the seating arrangement of the car can be provided and designed to fit tools normally required, and when such tools are placed within this receptacle entirely encased on both sides, ends, bottom and top, that such class of accidents can be prevented. Until such improvement is made in the design of motor cars, it is important that supervisors frequently check their gangs to determine if the necessary tools are placed as securely as possible and the responsibility of watching them definitely assigned to individuals in the gang.

Eye Protection and Safe Clothing

By J. C. MILLER

Shop Superintendent, New York, Chicago & St. Louis Railroad, Conneaut, O.

The speaker said in part: Eye injuries happen so suddenly and without warning that even the safest worker cannot avoid them without the mechanical protection of goggles. How far this protection should be carried, I have not personally decided. There are few places where it would be unsafe to wear goggles constantly, and yet sometimes they should not be worn, that is where the head room is not sufficient and the vision is obstructed by the goggle.

We have had some bad head cuts from wearing goggles in such locations. However, on the whole, to prevent eye injuries every employee should be provided with proper fitting goggles, and compelled to wear them when doing any work that may result in injury to the eye, or when in close proximity to work that might result in flying particles.

In considering safe clothing, it is an established fact that any loose sleeves, neckties or other apparel should not be worn around moving machinery. Safety shoes, leggings, etc., are very helpful. In a large organization, where stock can be carried subject to purchase by the employees, such protection readily available can reduce the number of accidents by their use.

In allowing gloves around drill presses, boring mills and lathes to place and remove material, employees should be educated that these gloves must not be worn during the actual time any of the machines are in motion. Any infringement of this requirement should remove the privilege of wearing gloves to handle the material at all, even at the expense of a few scratches and cuts. There is not a more dangerous job than wearing gloves around moving or rotating machinery.

In the repair yards we have augmented our blue flag protection with lock switches and flags equipped with a derailing device in many instances. Too much stress cannot be placed upon carefulness at all repair yards. The car repair tracks should be locked and the blue flags placed by a man or men carefully selected for this job. When the time for removing the locks and flags to allow the tracks to be switched or other work to be placed arrives, the greatest possible care should be taken to warn everybody along the repair tracks of the move contemplated, and equal care must be given to the relocking and placing of flags when switching is done.

On our road, we do this by whistling and by personal warning to each employee before the engine is allowed to come onto the track. Any violation of the blue flag rule is severely dealt with, and yet with all our precautions, we have had one fatal injury in the car repair yards during the present year.

It has been my experience that men are very seldom injured on any job where the danger is apparent, that is on work that is inherently dangerous. Injuries and hurts generally occur on jobs where one would think, at first glance, no danger was present. It stands to reason that if every employee had someone standing over him to warn him of the hidden dangers in the work he was doing, no injury would occur. But this method of preventing accidents is of course impossible.

Substitution for such a procedure was built up to a certain extent in the mind of one employee by the association of ideas. For instance, if a man would associate safety with his hands, and every time he noticed his hands, think of safety, or every time he thinks of safety, look at his hands, in a short time, such a workman whose work is done by his hands, would so establish this thought in his mind that as soon as he started to work and his hands came into view he would naturally look around to see what hidden dangers there may be in the vicinity of the job he is starting, and in a very short time this process of thought would become mechanical, the same as driving an automobile or any other physical effort in which we engage that is somewhat complicated, and in which the movements are done subconsciously when perfected.

Falls of Persons and Objects

By L. M. GRANGER

Tool Room Foreman, Erie Railroad, Hornell, N. Y.

The speaker said in part: Of the thousands of men injured on American Railroads, every third man has received his injuries in connection with a fall or falling object. Some of the conditions which lead to injuries from falls and falling objects are as follows:

Poor condition of floors, platforms and walks; aisles not kept open; material carelessly piled; poor ladders and scaffolds; poor lighting; material falling from cranes, cars, engines, trucks, skids, etc.; window glass becoming loosened by vibration of cranes, steam hammers, etc.; poorly maintained counter shafts, line shafts, pulleys and belts; poor tires on trucks; oil and grease on floor, platforms, cranes, etc.; failure of cables or brakes on traveling cranes; material leaning against walls; flying rivet heads and chips; coal falling from tanks; insecure footing and hand holds; stepping over loose material; slipping on rails; ladders slipping; getting on and off moving locomotives; cars, trucks, turn tables, etc.; throwing material from cars, engines; loose clothing, greasy gloves.

A modern railroad shop is a busy place. Exposure to possible injury menaces the workman from all sides and from above and below. The traffic density through the main aisles of the shop often equal that of the main streets of our towns. We do not have the service of traffic lights or officers to direct it.

In our shops we mark the aisles with white lines and strive to keep them open at all times, the power trucks move in prescribed directions and as far as possible follow regular routes. All material is moved on skids or tote boxes to eliminate excess handling. Skids are carefully loaded under the supervision of foremen to minimize the danger of parts falling or jarring off.

Each department has available a hand lift truck with which to move the skids in

or out of the department without waiting for a power truck, which leaves no aisle for having the department cluttered up with material on which no work is being done. Each power truck driver tries out his brakes and horn at the beginning of the day's work. Trucks are inspected, greased and oiled at regular intervals and all necessary repairs promptly made. Where the load overhangs the body of the truck a workman precedes the truck to clear the way.

Electric traveling cranes are carefully inspected and repaired each thirty days by a competent machinist and electrician who give special attention to brakes, cables, limit switches, hand rails, etc. A record is kept of these inspections to fix responsibility for any oversight. Each crane operator tries his brakes, horn and limit switch at the beginning of his trick.

Crane operator will not move crane or hoist load except by signal from the floor nor will he move any load if the hitch does not appear safe to him. Endless rope slings are used for moving light material with smooth surfaces to prevent slipping; endless steel cables and load chains are used for handling heavy material. Special slings are provided for handling bundles of flues or units, which wrap entirely around the bundle to prevent dropping any part of the load. All chains used for lifting are annealed each month; the length of chains adjusted and hooks reshaped if necessary. A record is kept of this inspection. The floor space under cranes is illuminated by flood lights, high overhead. Each crane has a spot light for use of the operator.

Line shafts, countershafts and overhead belts are rapidly being eliminated by installation of individual motor-driven machines. That portion which remains in shop is inspected daily. All ladders are equipped with safety spikes. All hose and handle tools are repaired under supervision of the tool room and are inspected when issued.

To assist in checking on all these conditions and the enforcement of safety rules, we have a group of our Safe Practice Committee make a weekly inspection of the entire property and render a written report of all physical defects and all violations of rules. This committee has authority to remove from service at once any defective equipment found, also to stop any unsafe practices they observe. They dismiss from their minds everything except safety and concentrating on the one object, they accomplish much that might otherwise be overlooked. We also have a committee of supervisors who make a weekly inspection of all departments, whose duty it is to observe and report on housekeeping conditions and place two prominent signs, one reading "Dirtiest Department in the Shop" and one "Cleanest Department in the Shop." The unwelcome sign never remains in the same department a second week.

With all our precautions, we still have injuries due to falls and falling objects. I have yet to investigate a case that was not primarily due to carelessness or thoughtlessness, not always carelessness on the part of the victim but carelessness on somebody else's part. In my opinion three things are essential to safety:

1. A safe place in which to work.
2. Safe tools and equipment.
3. Intelligent and alert workmen.

There is no place in industry for the careless workman. He is and should be eliminated. The employee who is injured through carelessness is a marked man and had better watch his step. We do not however believe in discipline as punishment for violation of safety rules. Discipline as education is a valuable weapon. Most men will react favorably to a frank discussion of their faults.

We of the Safe Practice Committee try to study each man who is injured or who violates the safety rules through carelessness to determine why he failed to think, what occupied his mind to the exclusion of his own welfare, how to wake him up, and consider all methods fair that attain results. If the offender is an old man, we remind him that an accident might end his career of usefulness to his employer, that his advanced age would automatically keep him out of further employment elsewhere. The fear of a dependent old age haunts every working man beyond fifty years. The middle aged offender is reminded that his carelessness might seriously interfere with his ambitious plans for the education of his children.

A different appeal is needed for young men and boys. Old age and its attendant problems are a dim and distant picture to them. If they have given any thought at all to marriage and family life, it appeals to them only as a glorious adventure, but they do think of sports. When we remind them that an accident might slow them up on the baseball diamond or the football field or might cramp their style on the dance floor, we talk their language and get their attention. We draw upon all our store of patience, all accumulated knowledge of human nature gained through years of experience, to get our safety message across.

Station and Warehouse Accidents and Their Causes

By J. ROMANOFF

Supervisor of Freight Operation, Erie Railroad, Cleveland, O.

The speaker said in part: A freight station, freight house, or transfer is only as safe as the agent wants it to be.

Investigation of accidents generally reveals that the real causes are carelessness, thoughtlessness, failure to comply with safety rules, lack of experience, and indifference to unsafe practices on the part of supervision.

This latter cause is, as a rule, directly or indirectly responsible for the following unsafe conditions or practices around freight stations: the gang plank that is not secured; the supposedly empty carbox; poor housekeeping; the container or material temporarily placed on platform or aisle; lack of sufficient help on heavy shipments and truckloads; improperly balanced truckloads; improper stowing, piling or loading; the heavy shipment loaded on two-wheel truck when dolly should be used; the slippery platform that has not been salted or sanded; defective equipment; the handling of sheet steel, threaded valves or other freight with sharp corners or edges without gloves; the trucker who is careless in his trucking in and out of cars.

The responsibility for the prevention of accidents rests with the agent, and his attitude is reflected in the actions of his supervision. Accidents cannot be eliminated without intelligent direction and the active cooperation of every employee. Cooperation depends entirely on the attitude assumed by the supervision and their ability to point out to employees in a diplomatic and impressive way what the results from unsafe conditions and practices are.

Here are a few safety suggestions supervision might well follow:

1. Be safety minded, wholeheartedly and enthusiastically.
2. Conduct safety campaigns with the same thought and intelligence that they conduct their station operation.
3. Eliminate all hazardous conditions and practices.
4. Secure the confidence and respect of all employees in order to get the necessary cooperation.
5. Consider the character of the person they are talking to and in selling safety make it personal. Be interested in the employee and his family. Make him realize that safety is of vital importance to him, to his employer, but also to those dependent upon him.
6. A new employee should be properly instructed on how to do his job safely and efficiently, and during the period of his apprenticeship should receive special attention from his immediate supervisor, who should see that he is coupled during his training period with a safety-minded employee.
7. Supervision should prevail upon employees to report any and all unsafe conditions and practices regardless of how minor they think they may be.
8. An injured employee should not be permitted to return to work until authorized to do so by the doctor. The employee returning to work before he is able to perform his duties properly is only a hazard to himself and to his fellow employees.
9. A supervisor should make intelligent use of safety pamphlets, bulletins, circulars, slogans, and rules.
10. Supervision cannot sit back and be satisfied with past activities on safety. The job will not be finished until all accidents are eliminated and all circumstances making accidents possible are wiped out.

Report of Committee on Non-Train Accidents

By C. F. LARSON

Superintendent of Safety, Missouri Pacific Lines, St. Louis, Mo.

The speaker said in part: Your attention is again directed to the fact that non-train accidents exceed both train accidents and train service accidents combined. According to the records of the Interstate Commerce Commission, 118 persons were killed in non-train accidents in 1932, representing 22 per cent of the total killed; and 9,417 were injured in non-train accidents the same year, representing 58 per cent of the total injured.

It would seem that the main effort against non-train accidents should be carried on in the maintenance of way and maintenance of equipment departments, since they produced 77 per cent of all railway employee accidents outside of train and train service classification. This 77 per cent is divided between the two departments as follows: 36 per cent maintenance of way, with 3,436 casualties, a casualty rate therefore of 7.78; 41 per cent in maintenance of equipment and stores, with 3,940 casualties, a casualty rate of 6.94.

In planning a campaign on non-train accidents it is the thought of this committee that particular attention should be directed to the four principal classes of accidents in the departments affected. These classes are as follows:

- Falls of persons, 25 killed and 1,654 injured, a casualty rate of 17.6.
- Handling tools and materials, 5 killed and 2,949 injured, a casualty rate of 31.0.
- Falls of objects, 7 killed and 968 injured, a casualty rate of 10.2.
- Hand and Motor Cars (care and operation non-train only), 25 killed and 730 injured, a casualty rate of 7.9.

All other classes of accidents, 56 killed and 3,116 injured, a casualty rate of 33.3.

Your committee again calls attention to the fact that eye injuries are not set out in the Interstate Commerce Commission's statistics, but are undoubtedly included among other causes and should not be under-rated. Injuries to the eyes are among the most serious casualties that industry must grapple with and, therefore, rules governing the use of goggles in all hazardous occupations must be enforced. Frequent check-up with track forces should be made by roadmasters to know that section and extra gangs are supplied with the requisite number of goggles. Mechanical department supervisors should be held to a strict accountability for observance of the goggles rule.

In conclusion, your committee would suggest the following "Ten Point Program for Safety Work" to be a part of the daily thought and activity of every supervisor and safety leader:

1. Set a safe example, and otherwise show by word and deed an interest and belief in accident prevention, and a will to get results in this feature of the work.
2. Act promptly on every correctible and removable unsafe condition observed by or reported to you.
3. Let no unsafe act or practice go unchallenged, but seize the opportunity to prevent the inevitable result.
4. Make it a part of the daily game to find and counsel or correct the uninformed, thoughtless, indifferent, careless or reckless ones—outlining safe methods of work and giving specific warnings of hazards and methods of meeting them to both old and new men.
5. Search out the cause or causes and responsibility for every personal injury, and after finding the defect in man, method, material or condition, use the information towards preventing another similar accident.
6. Plan and oversee every unusual job and the more hazardous kinds of regular work.
7. Foster the widest possible spread of interest in accident prevention.
8. Keep the safety bureau informed of safety ideas and measures adopted by you which might be extended over a larger territory.
9. Raise the standard of physical and mental well being wherever practicable, as one of the greatest factors in safety efficiency.
10. Check up constantly your own safety work and that of your associates.

Report of Resolutions Committee

The report of the Resolutions Committee was then called for and it was presented by Robert Scott, Chairman, Director of Department of Insurance and Safety, Atlantic Coast Line Railroad Company, Wilmington, N. C.

"Be It Resolved by the Safety Section of the American Railway Association in Fourteenth Annual Convention assembled at Cleveland, Ohio, October 2 to 4, 1934, inclusive, that the thanks of the Association be extended to:

"Mr. Lew R. Palmer, Conservation Engineer, The Equitable Life Assurance Society, for valuable work in the preparation of railroad employee casualty statistics, covered by 'The Green Book';

"Mr. William J. Patterson, Director, Bureau of Safety, Interstate Commerce Commission, for his presentation of 'Summary of Conditions and Practices Involved in Certain Accidents Investigated by the Bureau of Safety,' also for his presence and offer of continued association and cooperation of the Bureau of Safety in furthering the work of Accident Prevention on the American Railways;

"The retiring Chairman, Mr. C. L. LaFontaine, General Safety Supervisor, Great Northern Railway, for ably guiding the affairs of the Section during his term of office;

"All other officers of the Section for their faithful and energetic services during the past year;

"Mr. F. M. Metcalfe, Superintendent of Safety, Northern Pacific Railway, for his intelligent and untiring efforts as Chairman of the Program Committee, thereby contributing largely to the success of the Fourteenth Annual Convention;

"All other Committees for their zealous work in such a commendable cause as the conservation of human life and limb;

"The Management of the Hotel Cleveland for their contribution to the well being and comfort of our membership and guests;

"Be It Further Resolved: that these resolutions be spread upon the records of the Section and that the Secretary transmit a copy to all of those recognized herein."

The report of the Resolutions Committee was duly accepted, and passed by the delegates in the usual way.

Report of Election Tellers

The Chairman then called for a report of the tellers on election of officers for the Section during the coming year, and this report was presented by H. S. Corbin, Chairman of Committee, Atlantic Coast Line Railroad, as follows:

Chairman, T. H. Carrow, Superintendent of Safety, Pennsylvania Railroad.

First Vice Chairman, W. H. Failing, Claims Attorney, Central Railroad Company of New Jersey Reading Company.

Second Vice Chairman, C. F. Larson, Superintendent of Safety, Missouri Pacific Lines.

Members of the Committee of Direction:

Eastern Territory: H. R. Cole, Assistant to Vice President, Erie Railroad; and Chas. E. Hill, General Safety Agent, New York Central Lines.

Western Territory: L. F. Shedd, Superintendent of Safety, Chicago, Rock Island and Pacific Railway.

Southern Territory: D. H. Beatty, Superintendent of Safety and Sanitation, Southern Railway.

Committee on Nominations: Isaiah Hale, Safety Superintendent System, Atchafson, Topeka & Santa Fe Railway, Chairman; C. H. Blakenmore, Superintendent of Safety, Norfolk & Western Railway; D. A. Klumph, Supervisor of Safety and Examiner of Rules, Pere Marquette Railway; H. C. Murphy, Superintendent of Safety, Chicago, Burlington and Quincy Railroad; J. C. Yocum, Manager, Safety Department, Chicago, St. Paul, Minneapolis and Omaha Railway.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Textile Section

Officers 1933-34

General Chairman—CHARLES H. EAMES, Lowell Textile Institute, Lowell, Mass.
Vice-Chairman in Charge of Program—IGNATIUS MACNEELY, 81 Wallace St., Malden, Mass.

Vice-Chairman—M. W. HEISS, Proximity Manufacturing Co., Greensboro, N. C.

Vice-Chairman—B. R. BROWN, Columbia Mills, Inc., Chicago, Ill.

Secretary and News Letter Editor—E. E. PLACE, American Mutual Liability Insurance Co., Boston, Mass.

Engineering Committee Chairman—PAUL W. VILES, Plymouth Cordage Co., North Plymouth, Mass.

Membership Committee Chairman—E. G. PASCHY, North Carolina Industrial Commission, Raleigh, N. C.

Poster Committee Chairman—FRED W. SEEL, Actua Life Insurance Co., Hartford, Conn.

Statistics Committee Chairman—J. T. TROJANER, American Benberg Corp., and American Glanzstoff Corp., Elizabethton, Tenn.

Members at Large—

ARTHUR BARLOW, Armstrong Cork Co., Lancaster, Pa.

RUSSELL T. FISHER, The National Association of Cotton Manufacturers, Boston, Mass.

WALTER HUMPHREYS, National Association of Wool Manufacturers, Boston, Mass.

TUESDAY MORNING SESSION

October 2, 1934

The opening session of the Textile Section was called to order by Acting Chairman E. E. Place, American Mutual Liability Insurance Co., Boston, Mass., who presided. Chairman Place introduced George Richman, Secretary, Richman Brothers Company, Cleveland, Ohio, who made a brief welcoming address to the delegates on behalf of the Convention City.

Chairman Place then presented a "Resume of the Year's Activities," dwelling on the work performed by officers and standing committees of the Section and commending all for their activities. He then introduced the first speaker.

Relation of Accident Prevention to Production

By H. B. SPENCER

Manager, Industrial and Public Relations, Mishawaka Rubber and Woolen Manufacturing Co., Mishawaka, Indiana

The speaker said in part: The accidental injury rates reported for the year 1933 indicate that for several years the frequency of accidents in the Textile Industry has gradually been falling, while the severity rate goes irregularly up and down. Nevertheless, accidents throughout our own industry, as well as all other industries, continue to occur with discouraging frequency.

Now, it is not necessary to prove that industrial accidents are pure waste and that they cost somebody money. In addition to the direct costs which are measured in compensation payments, medical and hospital fees, and loss of wages to the employer, there are a multitude of indirect expenses, borne principally by the employer, which total in the aggregate several times the direct costs. If we consider only the wage losses, medical expense, and the overhead cost of compensation insurance, the National Safety Council has estimated that the annual economic cost of these industrial accidents is not less than 550 millions of dollars.

We are engaged in the stupendous task of trying to cut down these losses by preventing the accidents that cause them. It is, of course, self-evident that if by preventing accidents we avoid the costs of accidents, we shall save for production purposes the waste that accidents entail.

I have no intentions here of entering into a long discussion of the relation of accident prevention to production efficiency. But I will cite one or two examples.

We have recently had a very good example of the production benefits that may result from a mechanical design. An assignment was made to develop a guard for a foot pedal gronometing machine that would definitely prevent the operator from being injured. Our engineer was able in a short time to design a simple metal guard and gauge which not only prevented the fingers of the operator from being caught, but also allowed the stock to be centered more rapidly; as a result we accomplished a better return in production from that equipment, and it also gave the operator an increase in wages. We are expecting to adapt this same principle to other machines, and we consider the incident a very good comment on the point under discussion. With the fear of accident removed from the mind of the operator, and with the work made both quicker and easier, both safety and production were advanced materially.

Accident prevention, however, is not accomplished wholly by changes in machine design or other mechanical or safeguarding improvements. There is an important educational phase to accident prevention. In the July issue of the *National Safety News* I remember reading an article by Walter Dietz, of the Western Electric Company, which impressed me considerably. He described the system of first aid instruction in that company and outlined at some length the beneficial results obtained among the employees by this instruction. Quite generally, there was a better all-round performance of production duties by the employees who had had such first aid training. Those instructed were more interested in the condition of the human body and in keeping it sound. The resulting improvement in physical condition had its direct effect in increased production.

The records of the safety movement over a long period of years are filled with the experiences of companies which have vastly improved their condition by systematic safety organization for the prevention of accidents. In every case where the toll of accidents has been cut down, waste has been eliminated and production benefited. The history of these companies shows conclusively that such things as good supervision, proper equipment and working conditions, good housekeeping, etc., are good settings for both safety and efficiency, and that the things that interfere with one make the other impossible.

Let us consider for just a moment the problem of good housekeeping as an example, and see how in your own business the proper control of this problem will improve the chance of good production, as well as a good safety record. Good housekeeping is one of the primary requisites in the accident prevention program; it calls for the following: 1. Proper condition of work places; 2. Equipment and machinery kept in proper condition; 3. Piling and storage of stock, materials, supplies and finished products in a minimum space; 4. Clear aisles and passageways; 5. Receptacles for waste and scrap; 6. No dirt or grease accumulations on floor or machines; 7. Thorough attention to fire prevention.

Report of the Nominating Committee

The Chairman at this point called for the report of the Nominating Committee, and officers to serve during the ensuing year were nominated and elected as follows:

General Chairman—Charles H. Farnes, Lowell Textile Institute, Lowell, Mass.

Vice-Chairman in Charge of Program—M. W. Heiss, Proximity Manufacturing Co., Greensboro, N. C.

Vice-Chairman—B. R. Brown, Columbia Mills, Inc., Chicago, Ill.

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Statistics Committee—J. T. Trolinger, American Bemberg Corp., and American Glanzstoff Corp., Elizabethton, Tenn., Chairman; Frederick Flatner, Jr., Boott Mills, Lowell, Mass.; and R. A. Julia, Crown Mills, Lewiston, Maine.

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A. C. Boyd, Langdale Mill, West Point Mfg. Co., Langdale, Ala.

George Heiberger, Eddystone Manufacturing Co., Chester, Pa.

Ignatius MacNulty, 81 Wallace Street, Malden, Mass.

William A. Fedler, Acadia Mills, Lawrence, Mass.

J. H. Smith, Limerick Mills, Limerick, Maine.

A New Safety Code for Cotton Mills

By CHARLES FORSAITH

Superintendent, Jackson Mills, Nashua Mfg. Co., Nashua, N. H.

The speaker said in part: A new safety code is being written for the textile industry by a committee of which I happen to be Chairman. The need for a new code is found in the fact that much of the machinery and the methods of operating it have distinctly changed since the previous code was written. It is the aim of the committee to produce a code that will be as clear and concise as possible, for an industry as complicated as the operation of a cotton mill.

I use the word "complicated" without reservation, because in addition to the actual manufacture of the finished goods from raw materials and all this involves, there are the problems arising out of maintenance of plant and machines, generally involving a machine shop; the production of power from either water or steam, which means boiler rooms, generating plants, sub-stations, etc.; watchmen's service, and outside help for handling incoming and outgoing shipments. Each of these

departments contains safe practice problems, and we hope to have our code deal with them all, thus avoiding the need of referring to some other code which may not be at hand.

In an analysis of nearly 29,000 cotton mill accidents, the American Mutual Company found that the causes of over 77 per cent of these accidents were non-mechanical. This important fact seemed to show our committee where we should put forth our best efforts in this code, namely on non-mechanical accidents. It also seems to show that, on the whole, cotton mill textile machinery is well guarded. This is, of course, absolutely true of new equipment, but we are not overlooking the fact that many mills still have old equipment, and if our code is going to be effective it must cover the old as well as the new.

The form suggested for this code is as follows:

1. Foreword, which states the purpose of the code.

2. (a) Management's responsibility; (b) Overseer's responsibility; (1) Worker's responsibility.

3. General employee rules.

4. A description of each machine in each process giving its function, operation and particular hazards to be guarded against.

5. Concluding with hazards in connection with Motive Power, Fireman, Watchmen, Machine Shop, Outside Help.

The committee is holding monthly meetings, and as soon as the first draft is ready, we have planned to submit it to the National and American Association of Cotton Manufacturers, for their suggestions, recommendations and approval.

THURSDAY MORNING SESSION

October 4, 1934

Maintaining Interest in Safety Programs

By R. S. PAYNE

Director of Engineering, Cluett, Peabody & Company, Inc., Troy, N. Y.

The speaker said in part: Accidents occurring in our plants are usually of two classes: falls as a result of improper footwear, and needle injuries. Our chief difficulty, of course, is the education of the worker to report accidents to the infirmary soon after they occur in order to cut down the possibility of infection. This educational program is carried on primarily through the supervisory staff, and by means of posters and other bulletins of the National Safety Council.

Under the supervision of the Service Agency we have a Rotating Safety Committee of three superintendents and foremen who accompany the Safety Inspector on his monthly trips through the plant. The men serve three months at a time, one being replaced each month. The plant departments are rated by the gold, green and red star method by the Safety Committee, and following each monthly trip, we call all of the Supervisory Staff into conference under the direction of the Safety Inspector from the Service Agency. At this meeting the inspector reviews all of the accidents which have happened in the plant during the past month and calls attention to anything of an outstanding character. He compliments those departments which have received gold stars, and gives constructive criticism to departments not so fortunate.

In addition, the inspector submits a typewritten report covering the committee's trip, and within a few days one of the assistants in the Engineering and Industrial Relations Department takes this report and visits each department for consultation with the department head. Any reported hazards are usually given prompt attention. We also have what is called a "Safety Reviewing Committee," consisting of the maintenance superintendent and two other supervisors, who visit the scene of any severe accident immediately after it has been reported.

Our plants are equipped with infirmary facilities. The main plant uses the services of a physician morning and afternoon, as well as two registered nurses.

Our Industrial Relations Department has as a member of its staff a visiting nurse whose duty it is to check up on absenteeism, and through this channel we occasionally find a worker who has not reported for work due to an unreported accident.

One of the important features of our safety program is the Annual Safety Campaign, conducted under the auspices of Associated Industries of New York State.

Safety in Rayon Manufacturing

By N. E. GOODE

Safety Director, American Enka Corporation, Enka, N. C.

The speaker said in part: While it is true that the rayon industry is not basically hazardous, and accident prevention activities must be directed toward such general plant hazards as power transmission machinery, handling materials, slips, falls, repair work, etc., there are certain inherent or special hazards not generally found in other lines of manufacturing.

One of these is the hazard while operating shredders. These machines vary in size and in structural detail and are comparable to dough mixers such as are used in bakeries. Briefly, they consist of a steel bowl or tank which, when in upright position will permit the introduction of material which is ground into fine crumbs. The machines are usually fitted with a pair of spiral "blades" having serrated edges which grind the material between the teeth on the blades and special teeth which are fixed to the inside curved surface of the bowl. Power is usually supplied by individual motors ranging anywhere from five to twenty-five horse power, although the machines are sometimes belted to a common counter-shaft. Regardless of how driven, should an operator be caught while the machine is running under power, there is every possibility of a fatal injury.

Like the conventional dough mixer, the bowls of these machines can be tilted so as to discharge the crumbs of material into suitable trays. Sometimes wooden paddles or rakes are used to remove crumbs which remain in the bowl after it is tilted. It is also sometimes necessary for operators to climb into the bowl or to reach in while in a tilted position, for the purpose of removing crumbs which have become lodged in the teeth of the blades or in other crevices.

Machines of this type should always be provided with tight-fitting covers which are interlocked with the power control mechanism in such manner that the machine cannot be started until the cover is on and when the bowl is in its normal upright running position. This arrangement will prevent any person from reaching into the bowl while the blades are in motion. Provision should be made for introducing material into the bowl without jeopardizing the safety of the operator.

Provision should also be made for protecting the operator from coming in contact with the revolving blades while the bowl is being tilted and after it has reached the dumping position. The most satisfactory means of accomplishing this is to provide either a mechanically or electrically operated remote control device which will only permit the blades to be rotated under power, and while the operator is standing in a remote position from the shredder. Removal of his hand from the control device will automatically cause the blades to cease rotating.

In the steeping room, operators should be adequately protected against the splattering of caustic soda solution. Rubber gloves should be generally worn and face protectors provided.

Openings in the floor through which cellulose sheets are dumped down into the shredder room should be properly guarded with railings and toe boards, if these openings are sufficiently large to permit a worker to fall through.

All monorail tracks for the transshipment or transportation of racks containing aging cans should be equipped with safety switches to prevent trolleys from running off.

In the carbon bisulphide room, where there are high potential possibilities of serious explosions, only bronze or other non-ferrous tools and metals should be employed. About the same precautions should be taken here as are employed in a powder plant, even to the extent of prohibiting the wearing of shoes having iron nails in the soles or heels.

All gauge glasses on acid tanks or vessels containing caustic solutions should be located away from passageways and aisles where, in case of breakage, there might be a possibility of injury to passing workers.

In the spinning department, special care should be used to keep floors free from viscose or other solutions. Rubber gloves and aprons provide a measure of safety in this operation.

Safety in Garment Manufacturing

By A. C. HOFFMAN

Factory Superintendent, Richman Brothers Company, Cleveland, Ohio

The speaker said in part: We know that safety education is a very important factor in accident prevention work, and we know that safety education must begin at the top, not at the bottom. The executives and management of any industrial organization must be sold on the idea first, if the workers themselves are to be impressed with a solid front. The foremen must be imbued with the idea that accidents are wasteful and have no place in a well-run shop. Employees' organizations also can aid in safety work. Workers can be trained to use the dispensary to avoid serious results of smaller injuries.

Also, many accidents can be prevented by proper selection of employees. This work is being done now in many industries, but I believe very little in the textile industry, especially in that end of it which has to do with the cutting trades.

In our own plant we have found that the first consideration before employing the applicant is good eyesight, for poor eyesight leads to many accidents and weak eyes do not improve with age. We have also found that left-handed people are handicapped in most operations. Experience has taught us that certain operations require large, strong persons, while others require small, active people. Selection plays an important part in the entire set-up. Physical examinations seem to be in ill repute in some quarters, but will be required again in well ordered factories.

Another important factor is placement after selection. Certain jobs do not appeal to certain individuals and they become careless about their work, which leads to accidents. Some workers thrive on monotony, others detest it. It is always important that the new worker be watched to see that the job is to his liking.

Next we come to the subject of buildings and building maintenance. Of course, we all cannot have new buildings, but we can attempt to keep the ones that we have in first class sanitary condition at all times. Proper lights, ventilation, cleanliness, all have a bearing on accident elimination and where we do this work properly, we fill the worker with real pride in keeping our record clear of personal injuries.

Mechanical guarding is extremely important. Most of the states today have passed strenuous laws compelling the employer to guard machinery and all other places where the operations are such that accidents are likely to occur. We can all cooperate in this without much trouble. I was told recently that here in Cleveland in the least hazardous of industries, many of the accidents occurred on elevators. The city of Cleveland has taken cognizance of this and has added many compulsory features to eliminate this trouble.

Most of the larger plants in industry and even some of the smaller ones have provided dispensaries and medical service. They have become a very large factor in the modern factory. First aid service is always available and a great many serious results have been prevented by the training of employees to visit the dispensary at the first sign of trouble. Physicians on full time or part time have helped to keep down the accident hazard.

Fortunately, the clothing manufacturer's accident troubles are not as plentiful as those in the heavier industries. However, many small injuries become very troublesome. For example, many operators, through carelessness, sew their fingers and in a great many of these cases part of the needle remains in the finger, and unless immediate attention is given to this, infection is liable to set in. Cuts and bruises are frequent; and it is the first aid attention to all these little things that has kept down the seriousness of injuries to where it is today.

ADJOURNMENT

TWENTY-THIRD ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Transit Section

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MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Transit Section was called to order by Ralph C. Bush, Transit Mutual Insurance Co., of Boston, Mass., who presided. Chairman Bush introduced Mr. R. W. Emerson, Vice-President and General Manager, the Cleveland Railway Co., who welcomed the delegates on behalf of the Convention City. The Chairman presented a brief résumé of the activities of officers and standing committees of the section during the past year, praising their work. He then introduced the first speaker.

Physical Examination in Accident Prevention

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

Chief Surgeon, Chicago Rapid Transit Company

(The speaker was accompanied by two assistants and a full equipment of apparatus, with which he demonstrated his procedure, and spoke in part as follows:)

The technique of our examination is so arranged that each step follows in sequence, so that very little lost motion is had and the course of the examination proceeds smoothly and quickly. First comes the examination of the eyes as to their visual acuity, both for distant vision and near vision. No one will deny that good vision is an essential prerequisite to safe work performance, and more imperative is good sight in the transportation industry. It is important to detect evidence of eye strain, which undetected may produce headaches, dizziness, fatigue, blurring, which in itself may distract the attention of the employee away from his work and produce an accident. Examination is also made of the chambers of the eyes to detect any change through insidious disease that might interfere with the man's vision in the performance of his duties. Also a test is made of the mobility of the eyeball to determine if the eyeballs rotate together in all directions and that there is no divergence or convergence of the eyes (cross eyes). The pupils of the eyes are also tested as to their reaction to light and accommodation and if there is an insidious disease of the nervous system there it will be revealed.

Examination of near vision is important in train service employees, as well as those working about moving machinery. Those so afflicted find it difficult to efficiently and safely perform work close at hand. An employee whose work requires close and constant attention will suffer eyestrain unless his eyes are normal or his error of vision corrected. You must bear in mind the fact that glasses are a hazard to the man working in a shop about machinery due to fogging, blurring if not clean, and the danger of breaking the glasses from flying objects. Glasses are often lost or left at home and the employee is handicapped without them.

Up to this point you have seen what usually is considered sufficient to approve a person's eyes as normal for the work he is to perform; but here is where we rest in false security, for the test as described may show normal vision, and other tests are essential if we are to have more than a reasonable doubt as to the perfection of one's visual apparatus. The two most important tests yet to be made are those for the detection of depth perception which determines the man's ability to properly judge distance, speed and space. The other is the determining and graphically plotting of the fields of vision of the employee. This latter test reveals those persons who, on account of narrowed fields of vision, are unable to see approaching objects from the rear or the side and as a result an accident occurs. Failure to properly see objects approaching from the rear or side is very often the direct cause of many

automobile accidents upon the highway; persons so afflicted see as through a tube, although they may have normal acuity of vision.

We must then, in addition test the employee to see if he has normal or perfect stereoscopic vision, that is, binocular vision, instead of monocular vision. Persons with monocular vision, or one-eyed vision, lose all idea of depth perception. In fact, those thus afflicted, and their number is great, may have fair sight, but are unable to properly judge space, distance, or estimate speed of moving objects. The motorman may see an object which seems one thousand feet in front of him, but, due to lack of depth perception, it may be in reality only one-half that distance. His eyes deceiving him, he fails to retard the speed of his train and a crash may ensue. This is also the cause of many of the otherwise unexplained causes of automobile accidents upon the highways; the chap who tries to beat the train to the crossing may be so afflicted, and should he indulge in liquor this perception ability is greatly reduced.

Next is the problem of adequate hearing. Many accidents that occur about moving machinery could be avoided if the employee had not been deaf. He would have been able to foresee the accident by hearing some unusual noise or vibration in an otherwise smoothly operating machine had no defect been present. An employee who is deaf usually speaks in a loud voice, and if he suddenly addresses a fellow worker in this manner, he is likely to startle the man so that he may act impulsively with danger to himself. All drivers of moving vehicles should have perfect hearing, as it is essential to safe operation.

The doctor then examines the applicant for his perception of colors, using a series of five tests: Hologren worsteds, Thompson stick, Williams test lantern, Ishihara test, and the self-recording test of Jennings. We use five tests because this gives us added security that our employees are normal in color detection. It prevents fraud by those who have defects in their color sense, but who have trained themselves to pass one or more of the common forms. Color blindness is present in from four to six per cent of the male population, and in from one to two per cent of the females. It is quite important, of course, that normal color sense be had by those driving automobiles, as they are confused by the traffic lights unless they have become accustomed to which lighted signal means stop and which go.

Our next step is to examine the nasal passages, then the mouth, teeth, tongue, tonsils, and the posterior part of the throat for evidence of past or present disease. Infected tonsils or teeth are predisposing factors both as to disease and possible accident. If allowed to go undetected or untreated they may cause rheumatism, arthritis, stomach ailments, nervous conditions and will be the cause by their presence of man failure, due either to distraction from the work at hand or from accompanying pain and discomfort and cause the employee to let go when he should be free to perform the work at hand. The doctor also examines the glands of the neck for evidence of enlargement and infection denoting disease. He examines the thyroid gland for possible goiter, as disease of this organ causes numerous heart conditions, reduces the person's vitality, increases the blood pressure, which are all predisposing causes to man failure due to their weakening effect or accompanying distress upon exertion.

Next the chest and its contents, the lungs, are carefully examined, the doctor using his fingers or a small hammer to percuss the lungs for evidence of pathology. He makes use of the stethoscope to listen to the sounds within the lungs. Disease of the lungs, if present after injury, is very apt to lengthen convalescence or produce undesired complications to an otherwise trivial injury. Measurement of the chest both in expiration and inspiration is to determine the ability of the employee to expand his chest and give an indication of the capacity of the lung for aeration of the blood and other organs. It is needless to go into the details of the hazards of employing men with defective lungs, as they are poor insurance risks, are frequently absent from work due to illness, are inefficient in their work, and as they are weakened by their respiratory disease, they may become unsafe employees.

The doctor next examines the heart to determine its freedom from defects that, undetected, might reduce the employee's efficiency and safe performance of his work. At this stage of the examination the temperature is taken and is always a valuable procedure in any physical examination. Many times we find the person is unaware

of having a temperature and it may be the first symptom of a chronic disease that later may bring complete disability.

Defective hearts undetected are always a potential hazard to the employee, both at his work and to his life. Shortness of breath, dizziness, and sudden attacks of weakness at the slightest exertion are apt to precipitate an accident. Then, again, there is the hazard of falling from high places to consider, and if the period of weakness occurs while one is on trains, a fall may produce a mutilating injury, if not death itself.

Persons with abnormal blood pressure are prone to have attacks of light-headedness or dizziness, and if on ladders or high places or moving machinery, they are liable to be injured while in one of these attacks. All men above forty-five years of age should have their blood pressure taken, as this is often the first symptom of grave disease. In our company we take the blood pressure of all employees regardless of age. Laborious and continuous physical effort will induce rupture of blood vessels with resulting apoplexy if the arteries are friable and the pressure high. These men are poor insurance risks, as their high blood pressure may be the sign of heart, kidney, or other organic diseases, which, from the lowered vitality and sudden weakness, may result in accident. Anything that will cause worry or increase an employee's emotions may be the cause of a stroke while at work. Low blood pressure may likewise be the forerunner of serious organic disease and makes the person unfit for efficient or safe work.

The abdomen is palpated and thoroughly examined to detect deformity and presence of pathology of such organs as the stomach, liver, spleen, kidneys and intestines. Any disease of these organs handicaps the employee and as a sick man he is an unsafe man and becomes a potential accident maker. The doctor examines the inguinal region also for evidence of hernia. A man with a rupture is a great risk in industry and this is even true if the hernia is supported by a truss. He is unable to perform heavy lifting or strenuous work without causing the hernia to become aggravated, with the resulting claim for damages.

The doctor also makes an examination of the glands in the groin for the detection of enlargement or infection for the same reason as he examines the glands elsewhere. Examination of the genital organs is made to determine the presence or absence of venereal disease, hydrocele, varicocele, which in themselves are productive of man failure while at work, both by lowered vitality, muscular activity, and distraction of mind from work due to pain and discomfort.

Standing erect, the patient's upper extremities are examined for deformity, freedom of motion and palpation is made of the glands in the axillary region. Needless to say, safety in industry depends upon the free use of the extremities so that in time of emergency we are not handicapped by impairment of our limbs for getting out of danger. Testing the mobility of the vertebral or spinal column on the pelvis through all planes is done for the same reason as the upper extremity examinations, as we cannot use any worker who has impairment of the spine. Notice, also, how the doctor has the employee hold out the hands to test the tremors of the fingers and how he secures coordination between the muscles of the arms by having the patient reach for his ears, nose, and touch his outstretched fingers together. The lower extremities are also tested for mobility of all joints and that motion is unrestricted through all planes. Feet are examined to determine a flat foot, with its painful weight bearing handicap. Presence of this condition along with varicosities of the lower leg are painful and become a distracting factor in disturbing the employee's mind and muscular effort when danger confronts him.

The employee next walks the chalk line to determine his gait and sense of coordination and equilibrium, so as to detect incipient nervous disorders that might be a factor in accident causation.

For the past ten years we have been conducting psychological examinations of all employees in train operation with the sole idea of detecting the accident-prone man. Our tests are not used for employee selection, but the findings for each age group are determined with a "norm" which we correlate against the employee's past operating performance.

To determine the accuracy, precision, and steadiness of the employee's movements, we use the Bryan and Whipple Tracing Board. On the top of the baseboard mounted on a glass plate are two converging strips of metal connected at the point of closest

separation and covered almost to the inner edge with wooden strips, one of which is graduated in millimeters. The board is connected to an electric counter. The employee attempts to run the stylus in the path between the converging strips of metal without touching the sides. As soon as he makes contact, it is recorded on the counter. The depth to which the employee penetrates the "V" shaped path is a measure of his steadiness of movement. The tapping board is also used to test the employee's dexterity of movement. The speed with which he taps the board has been used to secure an index of voluntary motor ability, an index of right handedness, and an index of fatigue.

There are several types of reaction, namely: simple, discriminate, choice, controlled association, free association, etc. In simple visual reaction for example, the time measurement includes the time required: 1. For the subject's eye to respond. 2. For the sensory nerve current starting from the eye to reach the brain. 3. For the current to transfer from the sensory to the motor centers. 4. For the action currents to discharge into the muscles of the hands. 5. For the muscular movement of the hand itself.

Simple reaction time is the most rapid type of voluntary response, because the pathways are cleared for action. It is used for a basis of comparison with other kinds of controlled thought time. The visual reaction time ranges from 0.151 to 0.225 of a second. The speed with which we react, i. e., perform the necessary act called for in a given situation, is very important and often determines the safety of life and limb.

In our examinations we test our employees for visual, auditory, and tactile stimulation. We determine the length of time in 1/1000 of a second, or sigma, the time that it takes for the employee to put his muscles into action to do a given thing. Many persons receive danger signals either by sight or by hearing, but due to slow reaction time they are too late to prevent accident occurrence. This condition may be aggravated by disease and many accidents on the streets from moving vehicles are due to this delayed reaction time.

Qualifications for Trainmen and Bus Operators

By R. W. EMERSON

Vice-President and General Manager, The Cleveland Railway Co.

The speaker said in part: The physical examination has become a standard part of most employment procedures, but other aids have been approached with great caution. Realizing that the established methods of the interview and physical examination are not sufficient data for determination of an applicant's qualifications, the Cleveland Railway Company has gradually introduced other aids.

First, it is desirable to know the applicant's ability to assimilate instruction. The test used is the Otis Self Administering test especially designed for business institutions. It was found that most of the men whom we had difficulty in training had a rank of below 75 per cent. In using an intelligence test it was not felt that the results would correspond closely with various degrees of success on the job, but it was felt that a critical score could be determined below which the chance of success would be small. Our results indicate that 75 seemed to be that score, although if it were used as an absolute determiner it would do an injustice, no doubt, to a very small per cent of the applicants. The results indicate, however, that the error would be in favor of company efficiency and would be overwhelmingly better than chance results. It is felt that the intelligence rating should not be used as the *one* determining factor of selection, but that if an applicant has passed the other requirements and has a 75 percentage rating he is a good risk as an employee; if he has a rating below 75 he should have outstanding characteristics of industry and personality to qualify for the job.

One of the important problems in selecting motormen and bus operators is to select the applicant who can be trained to avoid accidents. Does the intelligence test satisfy this requirement?

All accidents were classified and those which might possibly have been prevented by a more skillful or diligent operator were credited against the man. No accurate

correlation was worked out, but the men were classed as good and poor in accidents. Those classed as "good" had an intelligence rating of 84.5 per cent. Those classed as "poor" had an intelligence rating of 80.1 per cent. Thus, although the more intelligent seem to be a little safer the difference in the scores is not enough to have much selective value. The psychologists have said that mechanical intelligence must be measured in a different manner than that of abstract intelligence.

Again the job of motorman and bus operator was analyzed a little closer to see what kind of mechanical ability or qualifications were necessary to success on the job. It was decided that the operator must pay constant attention to the changing panorama before him, to moving automobiles, children playing in the street, traffic policemen, switches, circuit breakers, and to many other objects in the field of vision. There are involved in this such mental abilities as persistence of attention, alertness and span of memory, and the ability to grasp in one moment of attention a number of distinct and variable stimuli. The operator must also foresee possible movements on the part of traffic and pedestrians and be prepared to meet these changing conditions. The most serious and most costly accidents in street railway operation grow out of the unexpected. For example, a motorman's attention is diverted from the street for a moment, and when he looks back a child who was not in the field of vision before his attention was distracted is crossing in the path of the car, or an automobile, which has been proceeding in front of the car, suddenly stops for some cause. These are unexpected dangers requiring an immediate response. In the great majority of these instances there is neither time nor occasion for a conscious choice—for the exercise of judgment.

In considering the creation of emergency situations, the matter of temperamental differences must be considered. An individual who is capable of avoiding accidents may be careless, even reckless. A man who has all the qualities of attention, foresight and control may find pleasure in being reckless and thereby run into accidents. Recklessness on the part of even competent operators is doubtless responsible for a certain proportion of accidents, and must be considered in selection. Stability of employment is another factor to be considered. The man who remains in the employ of the company for a relatively long period is to be preferred to the one who leaves shortly after employment. This is of particular importance in view of the influence of experience upon accidents.

To try to measure some of the above qualifications, a mechanical motor ability test was designed and built by the Cleveland Railway Company. In the design great care was taken that it should be mechanically self-administrative and accurate, eliminating as much subjective data as possible. Most of my audience are familiar with this equipment. We are interested just now principally in results.

The men whom the instructor rated as "good" had 19 accidents per revolution on the two-car test. The ones whom he rated as "fair" had 28 accidents per revolution, while the ones he rated as "poor" had 44 accidents per revolution. In other words, in fifteen minutes the test predicted fairly accurately what the instructor decided after the complete training period. The distinction between the good and the fair was not as good on the signal reaction test in considering only the errors. The men rated as poor, however, had an outstanding number of errors. One item which was thought to be very important was reaction time. This reaction time is the average of 25 reactions. The average reaction time of the good men was .964 seconds, of the fair men 1.012 seconds, and of the poor men 1.075 seconds. This does not seem to be a great difference in fractions of seconds, but if translated into distance at street car speeds it means a considerable difference in feet in stopping the car, which may cause or prevent an accident.

An important question in which this group is interested is, are these mechanical factors the qualifications necessary to prevent accidents? Because of business conditions the last few years, it has been impossible for us to get this answer for new men. But it is undoubtedly true that the men who have accidents because of lack of mechanical ability would be eliminated by this test. What, however, about the men who have been with us for some years and are accident-prone, and have become that way after many years of successful service?

One hundred and forty accident-prone men have been given the test. This is a very narrow, selected group, but in comparing the test scores of these men with their accident rating, for the average of the entire group there was found to be little rela-

tion. The test has been very valuable in many individual accident-prone cases in verifying the follow-up man's observation of weaknesses and in proving to the man himself that he has slow reaction time or other weaknesses, but for the entire group of older accident-prone men it is not the lack of mechanical qualifications which causes them to be accident-prone.

In the classifications worked out in our original accident-prone study, many of the items are not mechanical factors at all. Faulty attitude, impulsiveness, irresponsibility, failure to keep attention constant, nervousness and fear, defective vision, organic disease, high blood pressure, old age, worry and depression, and fatigability, adding up to 62 per cent of the total causes, are certainly not due to lack of mechanical ability to do the job.

There is still another broad classification which seems to be a very important cause of accident proneness which we have not measured, and I am not sure that it can be accurately measured, but we are now making an attempt to do so. That is the emotional qualifications of the operator's job. To determine a man's emotional qualifications we must see how he acts in emotional situations. It would be almost impossible to create emotional situations for all new applicants and watch them perform, but we do the next best thing. We list a number of emotional social situations in which almost everyone has been placed at one time or another and ask the applicant to tell us which of certain types of responses he has made to the problem in the past. For example, here are a couple of situations with typical responses:

1. While driving along the highway you catch up to a road hog of your own sex who will not move over to let you pass although you sound your horn. Do you—

a. Do nothing about it, but become tense and excited, can't decide what to do?
b. Wait for a chance to pass, refuse to waste your energy fighting with such a moron?

c. Sound your horn continuously, feel "mad" clear through, crowd him over when you do pass, even if you may smash a fender?

d. Laughingly say to your friend, "He's probably deaf anyway?"

2. You have a definite appointment to meet a friend of the same sex on a matter of business. After 30 minutes the friend has not come. Do you—

a. Walk up and down nervously undecided what to do?

b. Feel personally insulted and angry with the friend?

c. Don't take it seriously. Be ready to tell him that you have qualified as a waiter?

d. Wonder what is keeping him, try to locate him on the telephone, or just wait, supposing that there will be a good explanation?

In the first preliminary study of this method of measuring social behavior we had only forty men, but if we had said that all of the men who had indicated that they were more belligerent than the average would be high accident men, we would have been correct in 75 per cent of the cases. Of course, a man can lie about his past behavior if he knows it was wrong. It seems, however, that many of the belligerent type of individuals believe that they are right in their method of correcting the situation.

The disadvantage of this questionnaire method is that the clever boys who know better but don't do better, may tell us what they know they should do rather than report their actual past performance. We found this to be true in testing some of our furloughed men when they came back into service. Thus, although this questionnaire method will point out some of the emotionally unstable, we are in need of a test which the applicant or accident-prone man cannot pass fraudulently.

Another method of measuring emotional changes in experimental laboratories is to measure the changes in skin resistance by means of the changes in galvanometer deflections. There is still some debate as to whether this is caused by added sweat during excitement or to generated voltages due to muscle tensions. Regardless of the cause it seems to have a close relation to emotional tensions.

In giving an applicant or accident-prone man our mechanical test, we have tried to watch such things as breathing, sweating, bodily movements and external signs of excitability and the examiner has incorporated them in his judgment of the men, but as yet we have no accurate measures and no means of comparing man to man. We

are considering the adoption of one or a combination of more than one of these new techniques in trying to measure the excitability, as we feel that it is a major factor in accident-proneness.

Applied Safety in Transit Operations

By L. P. BAURHENN

Director of Personnel, Public Service Coordinated Transport, Newark, N. J.

An efficient training program is an essential factor among transportation companies and on almost every property there is to be found a competent supervisor in charge of an instruction school, as well as a staff of efficient instructors and follow-up men. In Public Service Coordinated Transport, the following training program is employed for operators of bus and car service. Upon arrival at the instruction school, the student operator is taken in hand by the supervisor of instruction and given a thorough course in training, which embraces the classroom, the road and the shop.

In the classroom he learns the various parts and functions of the equipment from a skeleton vehicle, either car or bus, and by means of demonstrative talks, he is thus shown the methods, right and wrong, of operation. Here he begins to learn the importance of safety in operation, also courtesy to the public in general and particularly to the other users of the highways. On our property, all bus and car operators are designated as "salesmen" which has its effect on the public as well as on the man himself.

The actual instruction road test is first confined to an isolated territory where the man is trained in the handling of the equipment in his charge, and this is followed by actual experience on various lines under competent instructors and under all conditions of traffic and operation, both day and night. He must here satisfy the instructors on his ability to handle the equipment properly, to operate according to state and local traffic regulations, and demonstrate the training he has received in the matter of safe and practical operation.

Following this training period, which usually embraces from eight to ten days, he is then returned to the school and is given a final road test in traffic, followed by a written examination covering every phase of the training he has received. He is then qualified for active duty and is sent to the location to which he has been assigned, to enter active service on a probationary period of three to six months. During this time his work is closely observed and checked by traveling instructors attached to the school. At the school, a careful record of these follow-up observations is kept in order that this department may be in constant touch with every man and his performance. At the end of the probationary period, the man again returns to school, where the supervisor of instruction goes over the reports of his various performances and discusses with him any matters of operation required.

The education of operators should not end with the period of actual training and since eternal vigilance is the price of safety, there is no better application of this theory than by means of further education and constant follow-up. There are many methods whereby this continued education may be carried on: such as by safety bulletins, periodical get-together meetings with safety talks, and the projection of safety educational motion pictures or such other demonstrations as will keep the thought of safe operation constantly in the mind of every man. Close check on the performance of new men by competent instructors is essential.

When an accident occurs, no matter whether serious or only slight, the first thought of operating officials is directed to the cause. Wherein did the failure lie? What was the reason? Was it negligence and if so what was behind that negligence? Was it a physical or a mental failure?

Another measure of great advantage in the work of accident reduction is the organization and service of active safety committees. These committees not only meet to review accidents that have occurred, but by becoming intimately familiar with usual as well as unusual operating conditions, are quite often in a position to prevent the occurrence of an accident. Thus, the important advantage of the well

organized safety committee is the opportunity to continually follow up the operating habits on the line or at the depot or in the division and keep a close check on safety practices.

The personnel of our safety committees is not confined to men of the supervisory rank, but includes operators of our buses and cars as well as a representation from the track and line and mechanical departments. This latter group has proved an important asset on every safety committee, as the exchange of ideas and the opportunity of closer touch with those responsible for the dependable working of the equipment, will very often eliminate the possibility of a mechanical failure in a time of emergency.

Safety Trends in Design of Public Transportation Vehicles

By GUY C. HECKER

General Secretary, American Transit Association, New York City

The speaker said in part: Between 1917 and 1932 the number of motor vehicles registered in our country increased from approximately five million to twenty-four million. During the same period, fatalities from traffic accidents on our public streets and highways increased from 15,000 to more than 31,000. It is with some pride, therefore, that we can look back upon our safety record. While fatalities from all traffic accidents increased 106 per cent between 1917 and 1932, the fatalities charged to the operation of our vehicles decreased 60 per cent.

Behind that record of accomplishment lies the determination of transit management to provide the safest possible transportation. Careful selection and training of employees, safety contests with awards for conspicuous performance, studies of accident causes, analysis of the accident records of individual employees and scientific tests of those showing accident-proneness are among effective measures used by management generally to promote the safety of passengers, the public and the employees themselves. And let it be recorded that employees have responded willingly and have cooperated heartily with management in the common effort to guard against accidents.

Throughout the years, management also has sought improvements in the design of its vehicles and in the equipment for controlling their operation which would provide the highest degree of inherent safety. The substitution of steel and other metals in body construction, closed platforms with doors controlled by the operator, improved braking equipment, lower floor levels, floor materials having non-slip characteristics, improved lighting particularly at entrance and exit, special design of windshields to prevent reflected glare, windshield wipers, sun shields, safety glass, rear vision mirrors, side window guards and improved headlighting equipment have demonstrated their value in all types of public transportation vehicles. In electrically operated vehicles, such as the street car and the trolley bus, platform doors have been interlocked with the control so that the vehicle can be started only when the doors are closed. Improved types of motor control located underneath the floor have replaced the old-style platform controller and eliminated the alarming, though usually not serious, consequence of that type of electrical display known as a controller blowout. The so-called "dead man" feature of the modern controller automatically cuts off the power and applies the brakes in case the operator becomes incapacitated.

Within recent years specifications applying to the construction and equipment of motor buses have been prescribed by various state regulatory bodies, primarily for the promotion of safety. Unfortunately, such specifications are not uniform, but in general they provide guides to what is considered safe practices. Uniformity is greatly to be desired since many of these vehicles are operated in interstate service. Although attempts to secure uniformity have not been conspicuously successful, there is today widespread recognition of the desirability of a single national specification dealing only with essential standards of safety and permitting as much freedom as possible in design and equipment utilized to meet those standards.

The promotion of safety in the design of public transportation vehicles is not only fully justified from a humanitarian standpoint, but also from the standpoint of

sound business policy. Therefore we may assume that the vehicles of the future will have incorporated in them every design feature and every device which will contribute to their safe operation.

Higher rates of acceleration than were heretofore considered feasible without subjecting passengers to dangerous overbalancing forces have been achieved by the development of new types of control. Improved braking apparatus, instantaneously responsive to the operator's lever or pedal and capable of positive stopping under all kinds of rail conditions in shorter distances than the conventional braking equipment would permit, have been successfully developed and applied.

Conventional braking equipment depends solely upon adhesion between wheel and rail. Experience has clearly shown that with the best conventional equipment a most careful operator could not always prevent wheel slip under unfavorable rail conditions. Consequently an automatic device has been developed and applied to each axle of one of these cars which is equipped with air brakes of an improved type. If for any reason the wheels on any axle begin to slip, this device will reduce the braking force on that axle to the amount required to insure maximum braking force without slipping. Furthermore the device will automatically reduce the brake cylinder pressure as the car comes to a stop and then will apply full pressure for holding purposes as soon as the car has actually stopped.

Another car has been equipped with three different braking systems, consisting of eddy current brakes, magnetic track brakes, and hydraulic brakes. The control of the braking devices, regardless of their number or nature, is through a single lever or foot pedal. The duties of the operator, therefore, are in no way complicated. He knows nothing about the functioning of the different devices. The further he moves the brake lever or pedal the greater is the braking force exerted. As he moves it in the opposite direction, the braking force is reduced correspondingly.

Other safety features of these cars consist of "dead man" control, sensitive edge exit doors, door interlocks and automatic exit treadles. The slope of the front window and the interior illuminating system combine to prevent reflected glare. The floor is at a low level throughout and an extra step is used at doors to give reasonable step heights. Stanchions, rails and hand holds have been located so that there is no place within the car at which a standing passenger cannot reach some form of support without moving. Safety glass has been used throughout the cars. Ventilation and heating are so designed that uniform conditions should exist throughout.

WEDNESDAY MORNING SESSION

October 3, 1934

Upon calling this session to order, Chairman Bush asked for the report of the nominating committee, and new officers for the ensuing year were elected as follows:

General Chairman—H. V. Schrieber, Capital Transit Co., Washington, D. C.

Vice-Chairman—W. A. Brown, Tennessee Electric Power Co., Nashville, Tenn.

Vice-Chairman—Harold F. Webb, West Penn Electric Co., Pittsburgh, Pa.

Secretary—A. E. Parker, Winnipeg Electric Co., Winnipeg, Canada.

News Letter Editor—Ernest G. Cox, Chicago North Shore & Milwaukee Railroad Co., Highwood, Ill.

Engineering Committee Chairman—E. L. Greene, York Railways Co., York, Pa.

Health Committee Chairman—M. W. Bridges, Chicago Rapid Transit Co., Chicago, Ill.

Membership Committee Chairman—R. A. McArthur, Public Service Coordinated Transport, Newark, N. J.

Poster and Slide Committee Chairman—Paul Hodson, East St. Louis Railway Co., East St. Louis, Ill.

Program Committee Chairman—H. M. Keyser, Capital Transit Co., Washington, D. C.

Publicity Committee Chairman—C. J. Long, United Traction Co., Albany, N. Y.

Statistics Committee Chairman—E. E. Grover, The Columbus Railway, Power & Light Co., Columbus, Ohio.

Members at Large—

Ralph C. Bush, Transit Mutual Insurance Co., Boston, Mass.
R. W. Emerson, The Cleveland Railway Co., Cleveland, Ohio.
Ray A. Finch, Bureau of Safety, Chicago, Ill.
H. C. Foss, Savannah Electric & Power Co., Savannah, Ga.
G. C. Hecker, American Transit Association, New York, N. Y.
G. T. Hellmuth, Chicago, North Shore & Milw. R. R. Co., Chicago, Ill.
E. J. Kreh, Philadelphia Co., Pittsburgh, Pa.
B. G. Noah, Duluth Superior Transit Co., Duluth, Minn.
Samuel H. Reid, Dimer-Dugas Fire Extinguisher Corp., Chicago, Ill.
A. P. Schendorf, National Pneumatic Co., Rahway, N. J.
Glenn H. Shaw, Ohio Edison Co., Akron, Ohio.
George R. Whitmore, Illinois Power & Light Corp., Peoria, Ill.

Municipal Traffic Problems from a Transportation Viewpoint

By M. W. COOKE

Superintendent of Traffic & Transportation, Pittsburgh Railway Company, Pittsburgh, Pennsylvania

The speaker said in part: Congestion as a major traffic problem is most noticeable in the business districts of our cities. It is only natural that a larger volume of traffic should use the streets in the business sections, but congestion seems to arise more from parking than from the volume of traffic. Its most noticeable effect is the forcing of all moving traffic into a smaller number of lanes where mutual interference further reduces the capacity and increases the hazard of street use.

The reason it is tolerated seems to be chiefly its advocacy by business men who say that they think business is benefited, if not directly then indirectly, by its continuance. The direct benefit to the merchants arises from purchases made by customers who come by automobile. These customers have been counted at different times and in different places, and their number has been determined as ranging between 15 per cent and 12 per cent of the total customers counted. Apparently no effort has been made to determine the value of the purchases. The indirect benefit seems to be based on the opinion that congestion is good for business, and this in turn on the observation that business is best when congestion is greatest. Another reason advanced is that congestion causes traffic to move slower and encourages pedestrians to cross streets they wouldn't attempt to cross if traffic moved freely at higher speeds.

It is difficult to answer arguments of this kind, but it is interesting to speculate about the effect on business in main business districts, if not only all parking were eliminated but all moving vehicles were detoured around the district and the streets given over exclusively for pedestrian use during certain hours of the day as though the district was a huge arcade.

This speculation is induced by the concern of business men and property owners in the older established business districts about the decentralization of business and the growth of remote secondary business districts. The remedy frequently proposed is the construction of new highways or the improvement of existing streets to make access easier to the affected districts. The possibility that a business district becomes less attractive through the inconvenience and hazard of congestion does not appear to be given much consideration.

With the exception of the boulevards, which have been built in recent years for exclusive use by automobiles, practically all of the principal streets leading into primary and secondary business districts are those upon which street cars have operated for years. It has been the convenience of street car service that has made them principal streets. Business of one or another sort, supplementary to the main business district, has occupied these streets. They are usually parked tight and nearly always congested. Double lane loading or unloading of merchandise is common, and

under the conditions probably necessary. This brief discussion of parking is for the purpose of re-emphasizing that it is a condition affecting not only a limited number of streets or local area, but that it exists as a source of delay and accident in not only the great central business hubs but also on the arterial streets which, like spokes, radiate out and in the outlying districts as well.

Until the necessity for dealing with parking on a comprehensive basis is recognized by municipal authorities, the expenditure of public funds for street improvements and the efforts of traffic engineers and safety specialists are doomed to at least partial failure. The factories can turn out automobiles even faster than the public debt can be increased to provide street capacity for their storage.

Any comprehensive plan to expedite traffic movement and increase street safety must start with the peak hour elimination of parking on both sides of the principal business streets, particularly those on which the street cars operate, and from one side of the arterial streets to increase capacity in the direction of the prevailing movement. This will have the effect of giving to moving traffic, at the time of heaviest demand, the benefit of whatever capacity the streets have. This regulation will not have any important detrimental effect on business, because it will be in effect before and after the active business hours. It could be lifted from 9:00 or 9:15 in the morning and remain off until about 4:30 in the afternoon. It could again be lifted after 6:15 in the evening. The hours of application would probably have to be adjusted in the different sections of the city. It seems to be a sort of mass silliness for a community to permit a few automobiles to stand during the period of greatest traffic demand on one of its busiest streets in front of a cafeteria restaurant, the overwhelming percentage of whose patrons do not arrive by automobile. Next in importance to the parking problem is probably that of finding some way of employing those devices and plans which have been developed to reduce or overcome the conflict between moving vehicles. On those streets on which street cars operate, the most useful device to expedite movement is the loading zone. The street cars of necessity stop frequently to take on and discharge passengers, but in doing so stop all of the following traffic. The impatience of motorists, intent on getting to some remote destination, leads to attempts to beat the car past the stop if there happens to be room on the right, or to cutting around on the left if the right side of the street is blocked. The frequent result of these driving practices is injury to alighting street car patrons if the motorist passes on the right, and head on collisions with opposite bound traffic if he passed on the left. The loading zone provides a by-pass which permits automobiles to pass the standing street car, and by the constant bleeding of some of the automobiles around the car at each of its stops, reduces congestion, delay and accidents.

The usefulness of loading zones is often admitted, but it is urged that they cannot be installed in four lane streets. An installation has been made in the Pittsburgh district, under plans of Mr. Burton W. Marsh, which has been in service about five years. It is on one of the heaviest traveled highways and has been successful in relieving the former intolerable congestion. It was made possible by reducing the number of street car stops and moving the remainder to locations where it was convenient to cut back the curbs. During the rush hours, street cars are scheduled to operate on a one and one-half minute headway, and practically all cars make every stop. Counts have been made of the number of automobiles which got around each car every time it stops, and the average was seven automobiles. There are five zones in a distance of about 4,500 feet, so that applying the average of seven automobiles passing the one zone to each of the five, a total of thirty-five automobiles were able to pass one street car with safety to car passengers and other traffic in a distance of about four-fifths of a mile.

Difference in the speed of various classes of vehicles is an important source of traffic conflict. Street car speeds have been increased on a number of railway properties. On one large property which, through vigorous safety efforts, has sharply reduced its number of accidents, a comparison of the reduction on its higher speed lines with that of its slower speed lines is favorable to the former, although the higher speed routes operate on the heaviest used streets. The combination of loading zones and fast street cars is an important contribution to the reduction of delay and congestion. The benefit of this combination would be enhanced by a more liberal use of through-stop signals in favor of the main street.

Mr. Burton W. Marsh, Traffic Engineering Department, American Automobile Association, Washington, D. C., also took part in this session, discussing "Municipal Traffic Problems from a Municipal Standpoint." However, he spoke ex-temporaneously; and no record of his remarks is available for these Transactions.

Report of Employee Accidents—Electric Railway

By E. J. KREH

Manager, Accident Prevention, Philadelphia Company, Pittsburgh, Pa.

The speaker said in part: Your program committee has recognized the apparent lack of progress on the part of electric railways to improve their performance with respect to reducing the frequency and severity of employee accidents. Charts which I have prepared give a graphic picture of the employee accident situation since 1926. They indicate that contrary to the experience of other industries, there has been no improvement made by this group.

Many causes can be assigned for this condition, among which may be considered these factors: The economic distress suffered by the industry during the past decade, causing deferred plant maintenance, and delay in the training and development of men; the extensive public liability accident problem, with its high cost, diverting the attention of management. In my own experience in street railway work, I have found that employee accident costs appear to be relatively unimportant, whereas in plants where there is no public accident cost, employee accidents take the center of the stage and command greater attention.

Street railways usually are not insured for public liability or compensation. They maintain a claim department and the accident costs of both public and employee claims are lumped into one expenditure, paid out of operating revenue, and labeled "accident costs"; thus, employee accident losses remain hidden from the watchful eye of the executive. May I urge that separate accounts be maintained and that all executives, down to the rank of the foreman, be made acquainted with the facts. They should also be informed of the indirect losses due to accidents, which authorities estimate reach five times the compensation cost. We should gather data and submit proof that employee accident control improves employee morale, reduces public accidents, and improves the general overall efficiency. With proper reflection, it will be seen that adequate training of operators to guard their own safety will be reflected in better performance as far as safety to the public is concerned. That is equally true of maintenance men. We should be able to show that properly directed effort will stimulate further training of men, improve supervision, and create higher standards of maintenance at lower cost. We should have management recognize that there is a supervisory fault for every accident, and that when accidents occur, there is unmistakable evidence that management has failed in one of its important functions—the proper control of men.

My frequency chart comparison for the electric railway industry shows that in 1933 the railways rate increased almost 6 per cent over the 1926 rate. The trend since that year is rising. On the contrary, public utilities, comprising telephone, electric, gas, and water services, made consistent declines, so that the percentage of reduction in 1933 over 1926 was more than 70 per cent. While the rate of public utilities was almost twice as high as that of street railways in 1926, by 1933 the public utilities had reduced their rate to less than half the rate of electric railways. In short, the frequency rate for electric railways in 1926 was 18.32, and in 1933 it stood at 19.40. Compared with this, the frequency rate of public utilities in 1926 stood at 34.42, and in 1933 the frequency rate was reduced to 8.70.

Comparison with the average for all industries is almost as unfavorable. All industries' average has shown consistent declines in frequency since 1926, and by the end of 1933 the average frequency rate was 25 per cent lower than the 1933 rate for street railways. The frequency rate for all industries in 1933 stood at 14.56.

The severity rate of street railways has likewise showed no improvement. From a rate which was less than half that of public utilities in 1926, it has maintained its

severity, while public utilities reduced their severity almost 66 per cent and are now lower than street railways. In short the severity rate for electric railways in 1926 stood at 1.90, and in 1933 at 1.67. The severity rate for public utilities in 1926 stood at 4.51, and in 1933 was reduced to 1.53.

Similar unfavorable comparisons exist when we look at the average severity rate for all industry since 1926. All industry has improved more than 36 per cent, while the severity rate of railways has remained practically stationary. In 1933, street railways stood twentieth in frequency rank and nineteenth in severity rank.

Electric line men in several large power companies now enjoy a frequency rate which is 30 per cent lower than the average national rate for train operators and 75 per cent lower than the rate for street railway track maintenance crews. Surely we cannot lay claim to hazards greater than high tension line work; neither may we excuse ourselves on the basis of the argument advanced by the mining, lumbering, and construction industries, the former admittedly hazardous and difficult to supervise, and the latter two most composed of floating labor. Railways, generally, are made up of long service and experienced employees.

Cause and Control of Employee Accidents in the Transportation Department

By S. A. MATTHEWS

Altoona and Logan Valley Electric Railway Company, Altoona, Pa.

The speaker said in part: We believe that the cause of all employee accidents can be attributed either to laxness on the part of the employer or the employee. Let me cite three examples:

1. Operator ran over red signal in fog and had head-on collision, no one being injured. Front ends of both cars were badly caved in but both cars were still able to move under their own power. Operator moved his car to terminal, a distance of 1,000 feet. Upon arrival he discovered the switch controlling air compressor was burning and grasping the register rod he reached up to turn off switch. Upon contact with switch there was a bad arc which burned his hand so severely that for a time it looked as if two fingers would have to be amputated.

On the face of this accident we would decide that if the employee had not run over the red signal in the first place and had removed his trolley from the wire before touching any switch in the second place, there would have been no personal injury. Surely a case of employee's negligence. But let us go back over this man's record. We note that he was employed in June, 1926; in April, 1927, he had a rear end collision with another car due, as he said, to a slippery rail. In July, 1929, he was removed from a high speed division for running through a fixed passing point, and in February, 1930, he had the collision referred to in this case. We believe that the employer was lax in that the operator was allowed to continue to operate in the face of his record. Had he been removed at the time of his first collision the lost-time accident would have been averted. The man was not mentally competent to operate under present day conditions.

Case No. 2. Car washer shifting cars in barn yard stepped between two cars about 18 inches apart and placed trolley on wire. Controller was set on first notch of power and employee was crushed between the cars. This accident was directly chargeable to the laxness of the employee in that he deliberately disobeyed the company rule of checking controller before placing trolley on overhead line. Of course, with modern equipment, this accident would not likely have happened, unless someone had previously cut out the air operated door. However, the car in question did not have safety equipment.

Case No. 3. Car operator arriving at terminal went to rear end of car to change trolleys and automobile skidded and pinned operator against the trolley car, breaking his leg. This looks like an unavoidable accident as far as employee or employer was concerned, but upon investigation it was found that the operator left his car ahead of three passengers and the three passengers crossed in safety after the automobile had skidded. In short, if this operator had allowed his passengers to alight

first the accident to himself would not have happened. Certainly, courtesy would require that passengers be allowed to leave the car first.

Control of employee accidents may be classed under two headings: (1) Discipline and (2) Education. Much has been said about discipline for employee accidents and doubtless each railway company has its own policy.

By education we mean teaching the employee to do his job efficiently. If his job is done efficiently it will be done safely. We get our best results from group meetings (call them safety meetings or what you will). Foremen are generally chairmen of the meetings and the proceedings of each meeting are recorded by some employee acting as secretary. Minutes are written of all meetings and sent to the general manager of the property.

Employees are classified in groups according to the type of work they are doing and thus each man is assured when he is called into a meeting that he will know what it is all about. Meetings are never allowed to run over one hour and are often made shorter. Program for each meeting is planned monthly for one year in advance and a schedule of dates and topics submitted to the general manager. Discussion is encouraged and in the small group can be very easily controlled, whereas an open discussion in a large general meeting becomes bedlam.

The foundation a man receives when first employed as a car or bus operator makes him a success or failure in this line of work. We have a very stiff course of training consisting of the following:

(1) Intelligence examination; (2) physical examination; (3) general instruction from superintendent; (4) training to conduct; (5) training to motor; (6) examination by car dispatcher and car starter; (7) training at car barn or garage; (8) examination by master mechanic; (9) final interview with superintendent.

This is quite a severe course of training and takes considerable time, but it pays big dividends. The more an employee knows about the equipment he is operating the less likely he is to be injured in its operation.

We have used the group meeting plan for the last four years and in that time have reduced our employee accidents in all departments 83 per cent and in transportation department 90 per cent.

Cause and Control of Employee Accidents in the Way & Structures Department

By CURTIS B. BENNETT

Assistant Superintendent, Way Department, The Cleveland Railway Company

The speaker said in part: In our industry more than one-quarter of all injuries are caused by vehicle of one type or another and slightly less than one-quarter of all accidents are caused through the handling of objects. The remaining 50 per cent come from hundreds of different causes and conditions.

In the control of accidents in our company we have taken the following steps which I will mention briefly. New employees, including all former employees who have been off the pay roll during a winter or longer, are first approved by their prospective foreman. After similar approval by the supervisor of employment, they are given a careful physical examination. In this examination for labor, the applicant is checked carefully for rupture, hernia, hydrocele and varicocele. Any indication of weakness eliminates the possibility of doing heavy work. Men working in the street must also have good eyesight and hearing. Defective eyesight may be corrected with glasses, but with the correction must test 20-30. Men with defective color vision are not permitted to operate equipment in the street. The heart is also carefully examined, particularly for blood pressure. Truck drivers, in addition, are given the motor ability test.

This year 783 men have been examined, 24 per cent being rejected for physical disabilities, as follows: Rupture 6 per cent, hernia 5 per cent, high blood pressure 4 per cent, poor vision 8 per cent, miscellaneous 1 per cent.

On our jobs we locate detour, rerouting and men working signs around all

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work. We place rails and ties along the outside of the areas under construction to protect our employees as well as to warn the public. Flagmen to direct traffic are stationed continuously at the end of our work. At night both red lanterns and torches are used to warn the public and again protect employees.

Our machinery is equipped with guards around all moving parts. Electric welders surround themselves with shields to protect the eyes of other employees. Rubber boots are supplied men working in green concrete. Goggles are worn by laborers using pneumatic tools, especially blowers.

All our foremen have had training in first aid work and are supplied with a small first aid kit

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TWENTY-THIRD ANNUAL SAFETY CONGRESS
NATIONAL SAFETY COUNCIL



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Membership Committee Chairman—E. G. PADGETT, North Carolina Industrial Commission, Winston-Salem, N. C.

Poster Committee Chairman—ROBERT A. SHAW, Murray Body Corp., Detroit, Mich.

Program Committee Chairman—J. A. PURDY, Michigan Mutual Liability Co., Detroit, Mich.

Statistics Committee Chairman—W. H. CULVER, Klise Manufacturing Co., Inc., Grand Rapids, Mich.

Members at Large—

R. C. BARR, Lumbermens Mutual Casualty Co., San Francisco, Calif.

E. ROSS FARRA, Grand Rapids Safety Council, Grand Rapids, Mich.

HARRY GUILBERT, Pullman Company, Pullman, Chicago, Ill.

ROLAND JONES, The Surtz Manufacturing Co., Inc., Chicago, Ill.

W. S. PAYNE, Aetna Life Insurance Co., Hartford, Conn.

F. A. POLLOCK, Lumbermens Mutual Casualty Co., Chicago, Ill.

E. K. PRICHETT, Prichett-Powers Co., Grand Rapids, Mich.

MONDAY AFTERNOON SESSION

October 1, 1934

The opening session of the Wood Products Section was called to order by General Chairman Louis W. Kerberg, Mengel Body Company, Louisville, Kentucky, who presided. The chairman introduced Mr. D. L. Sampson, Superintendent,

Wood Division, Fisher Body Cleveland Division, General Motors Corporation, who welcomed the delegates on behalf of the convention city.

Chairman Kerberg presented a brief "Resume of the Year's Activities" of the Section, dwelling upon the work of the Section officers and standing committees and praising them for good work. He then introduced the first speaker.

The Relation of Home Safety to Industrial Safety

By E. ROSS FARRA

Manager, Grand Rapids Safety Council, Grand Rapids, Michigan

The speaker said in part: Those of us who have been married for a considerable time will readily admit the vast influence of wives on nearly every phase of our lives. Why do we persistently stick to our job and try to improve our earning capacity? Why do we try to keep up nice homes and plan and scheme ways to purchase a home? Why are we—most of us, at any rate—men of fairly good habits and character? Certainly it is not always due to our own inherent goodness.

If our wives can influence so many different sides of our active lives, why can't she influence our lives for safety? I know from an experience of twelve years as an industrial safety engineer in large industries that she not only can, but she will if properly shown the necessity and how to go about it. And this influence of the wife will continue considerably longer than the influence of any safety meeting of employees that you can hold.

There are three ways in which this influence of the wife, and even that of the children, may be used to good advantage for industrial safety. The first way is to have meetings for industrial accident prevention, and invite the wives and children of all your employees to attend them. Now, right away, I hear someone saying to himself: "We can't do it in our industry because we have so many different nationalities and so many different types of people." Oh, yes, you can. I know, because I have done it.

I was at one time personnel manager in a plant in New York City employing around one thousand men and women. We had twenty-seven separate nationalities. Twice every year, while I directed the safety work in that factory, we hired a theatre and held a safety meeting of all the employees and their families. We sometimes had two thousand five hundred or more in attendance. We did not at that time compel the attendance of the employees, but if I had it to do over again, I would advise each employee that unless he did attend the meeting we would consider his absence an indication of his lack of interest in our safety program. I would make a record of this absence on his employment record card.

We secured the family's attendance by mailing a personal invitation to the wife and children. We held these meetings on Sunday afternoon, because our factory operated twenty-four hours a day; but today, I would hold the meetings on Friday evening. I would use Friday because most plants only work half-days on Saturday and some do not now operate on Saturday at all. The children can better attend on Friday evenings because they do not have to study lessons nor attend school on Saturday.

At these meetings we always had music, singing, speakers, and usually had the wife or child of some employee furnish instrumental music or a solo. I remember one of the best numbers we ever presented was a negro quartet who sang Southern melodies; it went over big. All our programs were, of course, thoughtfully and carefully planned. Sometimes we gave the children some cheap little souvenir. We told the families, as well as our employees, the causes of the accidents in our plant. We called special attention to the causes of the minor injuries, because we knew that, sooner or later, the fellow have minor injuries would have a real accident causing a major injury.

We explained to the wives and families the necessity of sending each employee from his home in the morning in a happy mood. We informed them about the accident risk a man sustained who had had a fight with his wife before leaving

home. We suggested to them that they talk to husbands and fathers about co-operating with the plant in its accident prevention program. We even offered them an opportunity to visit the plant during certain hours of the day to see their men at work.

If we were holding these meetings in that plant today, I would also use some time in impressing the employees with the serious hazards they would have to meet each day on the streets and highways. Many industrial plants are discovering that what is popularly known as "After the Whistle Accidents" are as costly to the industry as accidents occurring in the plant itself. A recent survey made by a plant of considerable size showed that 239 accidents had occurred to their employees over a period of six months; but mark you this, only 36 of these accidents occurred in the plant itself—203 of the accidents happened to their employees outside of the plant.

I can truthfully say that for three or four months after each one of our safety meetings of employees and their families, our accident curve went down. Someone here is undoubtedly thinking that these meetings must have cost us a lot of money. They did cost us from \$150 to \$200 each. The larger portion of this sum was spent for the use of a large theatre. But if we prevented just one lost-time accident by each one of those safety meetings of employees with their families, we saved considerably more than the cost of that meeting in compensation costs, doctor bills, and hospital expenses, for it does not take much of an accident to cost either the industry or the insurance company more than two hundred dollars.

Before you can expect to get results from such family safety meetings, however, you must have a well defined safety program in your plant. You must have a proper director or committee in charge of your safety program, and you must be willing to tell the truth to the employees and their families about accidents occurring in your plant. If there was a lack of foresight on the part of the company that caused a certain accident, be honest and say so, and tell what you are doing to prevent a recurrence. If you will do this, you will secure the active cooperation of a considerable majority of your employees and their families, and they themselves will do more to prevent accidents in your industry than any trained safety engineer can possibly do.

A second method to secure the influence of wives and families in the safety program, would be to have two or more plants hold a safety meeting for the benefit of employees and their families on a cooperative basis. When I was in Wilmington, Delaware, back in 1923, we had such a meeting with the employees and families from five plants. Two of these plants employed over 1,000 men each, and the other three were small plants of less than 200 employees each. In Grand Rapids during October of this year the Grand Rapids Safety Council is sponsoring an evening meeting for employees and their wives and sweethearts of about sixty industries. This is the second meeting of this type we have held. The first was a big success. We will have a safety meeting from 7:30 to 9:00 o'clock, followed by a dance. This meeting not only helps us to put over an industrial safety program, but the Safety Council also has an opportunity to talk about motor vehicle accidents, child accidents, public and home accidents as well, and secure a very wide interest in all those programs as sponsored by the Council, in addition to industrial safety.

A third and last method to put over industrial safety to the families of your employers is through a home safety program. This type of campaign attempts to do two things: (a) to interest the family in accident prevention generally, by securing their interest in home safety; and (b) by reducing accidents in the homes of your employees, they will come to work with a freer and clearer mind and be better able to keep their thoughts on the work they are doing, and moreover will be less liable to accidents in the plant.

Generally speaking, the same types of accidents occur in the home as occur in industry. This similarity makes it very easy for the industrial safety engineer to find out how these various types of accidents are occurring in the homes and suggest ways of preventing them. This may be done either by the printed page or by occasional meetings. Home accidents are increasing yearly, until now they number almost as many as motor vehicle accidents, and nationally about twice as

many deaths occur from accidents in the home as from industry. In Grand Rapids the ratio is even greater. In the last three years in Grand Rapids five times as many accidents causing deaths have occurred in homes as have occurred in the industries.

WEDNESDAY MORNING SESSION

October 3, 1934

Teaching Safety to the Industrial Worker

By HARRY L. SAIN

Special Representative, Ohio Industrial Commission, Columbus, Ohio

The speaker said in part: In teaching safety to the industrial worker we must consider three important factors: 1. The responsibility of management; 2. The responsibility of the employment department; 3. The responsibility of the foreman.

Show me any plant and I will tell you just about the type of man you can expect to see at the head of that plant. Show me any department in that plant, and I will tell you the type of foreman you can expect to see in charge of that department. Certainly there will not be much enthusiasm shown by the employees in any company policy—least of all in accident prevention—if the man at the head of that company does not show his deep and intelligent interest in that policy. Unless both the big boss and the little boss are completely sold on safety, you cannot expect the workers to be much interested.

Too often management in picking men for foremen, or for safety director, do so from the applicant's mechanical and academic experience, and pay little or no attention to his knowledge of human behavior. You will agree with me that a sale depends largely upon the person making the sale. The success of any business depends largely upon the man at the head of that business, and by the same token the success of the worker depends largely upon the type of foreman who is selected to teach him. I would not invest a dime in any concern that did not carry on some research work on their product, and by the same token I would not expect much out of a group of foremen where the company does not carry on some type of foreman training work. My first suggestion in teaching safety to the worker, then, is to pick that type of person for foreman who not only has a technical knowledge of the product, but one who can work well with others, one who has a kindly feeling for his fellow man, one who has good judgment and one who is a leader.

Now, the quickest way anyone can demonstrate that another can follow him to advantage is to be of help to him. And the quickest way for a manager to help his foreman is for him to really prove himself a good manager. This means that he should provide his foreman with an orderly plant, in which there is proper lighting, proper machinery, proper materials, proper instructions, and proper supervision. It is unnecessary to outline all these factors in detail. They are fundamental in any plant where the maximum in efficiency is required, and they will be found in every plant where production and safety are partners.

Of all the places in an industrial establishment where the spirit of a safe plant should be exemplified to the worker, it is in the employment office. For some reason, the employment offices of the country are filled with sophisticated, self-opinionated individuals who often cause the worker to gain a false impression of the company's sincerity. There is no better place than the employment office in which to begin teaching safety to the new employee. The spirit of the industrial plant is such a vital subject that I hope all of our industrial managers will realize what mighty things can be done by spirit and how little can be done without it.

The foreman should supply the employment department with complete job specifications, as to the age, height, weight, experience and education of the men wanted. The employment manager should in turn set up certain intelligence quiz tests to determine the worker's fitness for the job. I would suggest that the em-

ployment manager visit the foreman and get a true picture of the nature of the work which would in turn give him a better picture of the type of man required. All the way through to this point, let us not lose sight of the fact that our most important job is to sell the worker on the fact that every person with whom he comes in contact is willing and ready to help him do well.

Any company who does not see fit to have a physical inventory of their workers is certainly dealing with an unknown quantity. The physical and mental fitness of a worker should be determined by the medical department, and as in the employment department, we should be very particular about choosing our medical personnel. I have known doctors with an outstanding knowledge of medicine and surgery who failed miserably because they were short on personality.

It is not my intention to attempt to discuss the specific movements in teaching safety to the worker. My experience in the past twenty years in accident prevention work has taught me that there are two ways of preventing accidents. The first of these is by mechanical guards. In my opinion, mechanical guards will prevent only a very small percentage of the accidents in any plant. But do not misunderstand me. I think that in the installation of a piece of machinery or equipment, just as much consideration should be given to the mechanical safeguards as is given the electricity that runs the machine. In fact, if a company wants to show their interest in the welfare, happiness and safety of a worker, they cannot ignore the necessity of mechanical guards. The task for the foreman is to see that these guards are properly adjusted and used at all times.

The second factor in the teaching campaign is safety education. Education as a means of preventing accidents is fundamentally and economically sound and has become one of the most potent forces in the reduction of accidents. To carry on the safety education process, we have enlisted our foremen in the category of educators or teachers.

It seems to me we should try to distinguish the difference between teaching and training, if there is a difference. Teaching, in a certain sense, is done in the hope that we can develop the new employee's mental equipment, teach him to understand the management's attitude on safety, on the use of mechanical guards, the necessity of reporting all minor injuries at once, teach him the right way of performing the operation because the right way is always the efficient and the safe way.

Then, after he has the right way of doing the work firmly imbedded in his mind, he naturally forms a habit which in my mind is developed by constant training or repetition. After all, don't we all do things because of habitual performance, learned responses, acquired reflexes—habits—otherwise the allotted time we have each day to do our work would not suffice.

But when we become bundles of habits, when we get cock-sure and say we know, when our minds are made up and nothing can move us, we are through. I object to so much training that the new employee gets to act like an automaton; no mere automaton ever makes a great performance.

There has never been a time in the history of our industrial world when there has been such a crying demand for men who know men as there has been in this most unusual time of depression. I wonder how you stack up on this question: "How do you get along with other people?" I know some safety engineers and foremen who are outstanding as to their knowledge of machinery, tools and equipment; they have a perfect knowledge of all the modern safety appliances; they can quote safety slogans and rules by the score; and still in their plants they have a very poor safety record.

How do you account for this?

Your value to your company is measured entirely by the amount of things you accomplish. You may have some splendid ideas, but as long as you are unable to sell them to the employees they do not amount to much.

How, then, can foremen best approach this problem of teaching safety to the worker? We must first consider our relations to those about us—we might say our industrial relations, for industrial relations are just simply human relations in the plant.

The laws that govern human relations are very simple, the same the world over. There are two fundamentals involved, agreeableness and helpfulness. Unless we keep these in mind in trying to teach the worker, we will find ourselves lost

in a maze of ideas and may possibly be far from the goal when we think we have completed our task.

Every foreman should ask himself these two questions: 1. "Is my department a place where people like to work?" 2. "What does my department mean to my men aside from the pay envelope?"

You will find that in the training of the worker, agreeableness is one of the fine arts that must be practiced by all. It must become an actual policy of the plant. Any foreman who gives this fundamental sufficient thought must come to the conclusion that agreeableness is one of the most constructive forces that can be set to work in his department, and that disagreeableness is one of the most destructive forces that can be found anywhere. It represents one of the greatest wastes in industry. The psychology by which people are being moved to do the things that we want them to do is becoming such a common property that it is reasonable to conclude that this knowledge will be used in countless activities of life, including the teaching of safety to the worker.

Safety in Grand Rapids Industries

By ROBERT W. IRWIN

President, Irwin Furniture Company and Member, NRA Furniture Code Committee, Grand Rapids, Michigan

The speaker said in part: The most important problem that the furniture industry had to face was not guarding and protecting of its machinery. Thanks to the splendid work of David Van Schuack, there was ready very early a painstaking study of woodworking machinery and its possible safeguards, which served as a textbook for superintendents and safety engineers wherever furniture was made. The machine builders in this, as in every other manufacturing line, accepted the problems and practically all machines have integrally incorporated in them the best safety devices that the ingenuity of their makers could devise. Squareheads on the jointers gave way to cylinder heads; shaper guards and saw guards appeared; gears were enclosed; belts and belt shifting gave way to motors—motors operating individual machines, or at most, small groups of machines.

However, our furniture factories still found that their accident ratio was too high and learned that the machine room hazards represented but a small part of the industry hazards. In an analysis of sixteen deaths in furniture factories of the Furniture Mutual Insurance Company of Grand Rapids, it was found that but one was directly attributable to an operation performed in furniture manufacturing. The kick back from a saw is undoubtedly a hazard of the industry. All the others, however, might have occurred to men working in paper mills, foundries, machine shops or mercantile establishments. Each one of them was perhaps preventable, but certainly not by the use of safeguards, with the possible exception of one man who was burned. Moreover, in a canvass of injuries where death did not ensue, in the records of the same insurance company, we find that the accidents are scattered pretty evenly throughout the plant.

So we were forced to the conclusion that the safety problem in the furniture plant was primarily that of inculcating in the plant personnel a regard for safety as a matter of efficiency. Singularly, there is not much appeal, particularly to young men, in pointing out the distress and disadvantage of a laceration, a bruise or a broken bone. There still lies in very many of them the small boy feeling that there is something shameful in being afraid to be hurt. We met this first, when, after the enactment of the Workmen's Compensation Law, we insisted that every accident, however slight, be given first aid treatment and thereafter be treated by the doctor. Curiously enough, there sprang up a tendency to conceal minor injuries, rather than accept first aid treatment. Gradually this was overcome, but it was not until we based our work with the men squarely upon the ground of efficiency that we began to get measurable results.

In the furniture plants these ideas had to be infiltrated, rather than taught di-

rectly. The major plan was to try to get the individual safety-conscious and let him analyse his own methods in the light of that consciousness.

For this particular kind of safety work it is fortunate for the safety of the furniture industry that, generally speaking, we find them grouped in centers. In Grand Rapids it made possible the organization of a local insurance company, writing Workmen's Compensation, and incidental thereto, taking over the general direction of the safety work of the group. The plan was adopted of carrying some matter of live interest into the plants at each trip. In this particular group, there were between forty and fifty factories making furniture, using practically the same machines and the same methods throughout the plant. The inspector's plan was, therefore, in visiting the plants to note some outstanding method or device promoting the safety of the worker, and then to carry this idea to all of the other plants—in other words to endeavor to bring to all of the plants the best safety ideas and methods found in any of them. This gave his trips to the plants a punch; and while he was carrying this message, he would incidentally do his routine inspection work.

Another method, somewhat unorthodox, of our safety engineers was that of going through the group like Paul Revere, announcing severe or unusual accidents. Whenever an accident occurred which had unusual aspects from a safety point of view, was difficult to understand, or novel in our experience, the inspector dropped all else, made a careful analysis of the accident, its causes, the methods the injured operator was using, the type of machine—or if not a machine, other circumstances connected with the accident—then made a trip through the factory to discuss with the superintendent or safety engineer this particular accident. This could be done with profit, because, generally speaking, the same operation was being performed in each of the furniture factories. It was a matter of live interest; it was fresh; it was true, it was actual.

The grouping of the furniture industry, particularly as it exists in Grand Rapids, affords also opportunity in the matter of medical aid. For twenty-two years this furniture group has employed the same industrial surgeons, the original ones having been succeeded by later partners, to be sure. This has given us a continuity of service and has given the surgeon a thorough understanding of the nature of accidents that come to them from the furniture factories. The volume of business has been sufficient to enable them to maintain a very complete emergency receiving room, and they are known to practically all of the workmen in the city. Under our law, the employer is required to furnish medical aid, and if he tenders reasonable medical aid, he may choose his own physician. An injured workman may go elsewhere, but having been tendered surgical aid, he must, if he refuses it, pay the doctor of his selection. Our surgeons are paid upon a fee basis for each case, so that the workmen will understand that it is to the doctors' advantage to give him as complete care as may be serviceable. This arrangement has enabled us to work out a satisfactory interchange of reports and records between the doctor's office and the insurance office; and in controversial cases, gives us dependable medical advice and competent expert testimony.

The Grand Rapids Safety Council is still operating actively. It assists our industry in accident prevention work, not only through the activities of its Industrial Division, but also through its traffic work, and its safety work in the homes, all of which tends to make employees more thoughtful as to their own safety while working. Many of our furniture factories are organized in the interplant safety contests of the Council, and through this rivalry between factories the interest is maintained in accident prevention by these groups. The Safety Council also carries on round table discussions once a month, through which men doing like jobs in the various plants are brought together to discuss accident problems and from this source carry back to their industry much valuable information.

Report of the Nominating Committee

The chairman at this point called for the report of the Nominating Committee, and new officers for the Section were nominated and elected as follows:

General Chairman—F. W. Braun, Employers Mutuals, Wausau, Wis.

Vice-Chairman—E. G. Padgett, North Carolina Industrial Commission, Winston-Salem, N. C.

Vice Chairman—William Haggerty, Edward Hines Western Pine Co., Hines, Harney Co., Ore.

Secretary—M. C. Goodspeed, General Electric Co., Erie, Pa.

News Letter Editor—J. A. Purdy, Michigan Mutual Liability Co., Detroit, Mich.

Engineering Committee Chairman—F. A. Pollock, Lumbermen's Mutual Casualty Co., Chicago, Ill.

Membership Committee Chairman—Robert Ormsby, B. F. Huntley Furniture Co., Winston-Salem, N. C.

Poster Committee Chairman—Robert A. Shaw, Murray Body Corp., Detroit, Mich.

Program Committee Chairman—Harry J. Kelley, American Seating Co., Grand Rapids, Mich.

Statistics Committee Chairman—E. K. Pritchett, Pritchett-Powers Co., Grand Rapids, Mich.

Publicity Committee Chairman—P. J. Brand, Pullman Car & Manufacturing Corp., Pullman, Chicago, Ill.

Members at Large—

R. C. Barr, Lumbermen's Mutual Casualty Co., San Francisco, California.

E. Ross Farrar, Grand Rapids Safety Council, Grand Rapids, Mich.

Harry Guilbert, Pullman Company, Pullman, Chicago, Ill.

Roland Jones, The Surtz Manufacturing Co., Inc., Chicago, Ill.

W. S. Paine, Aetna Life Insurance Co., Hartford, Conn.

Leons W. Kerberg, Mengel Body Co., Louisville, Ky.

Compensation and Medical Problems

By L. J. CAREY

Michigan Mutual Liability Company, Detroit

The speaker said in part: The distressing economic situation of the past few years has had its effect on the situation already existing in the administration of workmen's compensation laws. While the mechanization of industry has in many instances shortened work time and reduced fatigue, it has on the other hand resulted in the speeding up of production, so that in all cases where the hazard depends largely, as in wood working, upon the actual amount of material handled, the exposure to accidents has been greatly increased. Lack of employment has induced, or perhaps forced, many a man previously injured to request a reopening of his compensation claim. His financial position, with a needy family on his hands has forced him to stoop to means and methods to recover such additional compensation that he otherwise would never have considered. Unscrupulous lawyers have been glad to aid him in his endeavors and sympathetic boards and commissions have felt bound to look none too harshly upon his exaggerated and often illegitimate claims.

Practically every year the state legislatures of many states act upon bills introduced for the purpose of amending workmen's compensation laws, and in the majority of cases these amendments are for liberalization and increasing the benefits provided by such laws. During 1933 alone, the legislatures of thirty-one states amended their laws. To realize what burden has been placed upon industry, you may bear in mind that it is estimated that during the three years from 1930 to 1932 inclusive, more than three hundred million dollars was paid in benefits to injured employees and their dependents, and millions more expended during the same period for medical and surgical care. The underwriting losses in a large group of companies on workmen's compensation in the past four years alone have exceeded \$75,000,000, while their losses during the last ten years are in excess of \$140,000,000. That these losses are directly due to the ever-increasing average cost of compensation payments can be verified by the fact that the records of insurance

companies reveal that the average cost of compensation payments for every \$100 of payroll has increased about 35 per cent in the last eight years.

The increasing knowledge of and interest in occupational diseases has added a further problem to this question. Since 1925, thirteen states have amended their occupational disease provisions in their compensation laws for the purpose of liberalizing them. In some states these diseases are enumerated in the laws, while in others provision is made for compensation for every injury resulting from employment, including diseases, either by express words to that effect or by omitting the requirement that the injury must be by accident. In states where recovery cannot be had for occupational diseases under the compensation law, great activity has taken place in connection with claims for such occupational diseases and recovery is being forced in the common law courts, before a jury, for damages.

One of the striking evidences of economic unbalance, present during the past few years, has been the relationship existing between the compensation provisions of the statutes and the wages actually received by the employees. Compensation laws originally designed with maximum and minimum weekly rates were gradually enlarged over a period of years as to the maximum amount, and in many cases as to the percentage of the wage that was to be paid as compensation in case of injury. During the period of depression and even under the present period of recovery, with N. R. A. codes in effect, men were working two, three and four days a week rather than five or six. Yet such compensation laws were not elastic. It was compulsory to base compensation payments upon the original provisions of the laws, and in some cases such payments were equal to or greater than the amount which the employee would actually earn if he were able to work.

Compensation laws, therefore, originally designed to operate as a substitute for the common law liability of employers for accidental injuries, have now by the effect of these liberalizing forces, been converted into payments against loss through ill health, however originating, and with particular reference to occupational disease wherever originating, to insure a high percentage of wage loss and in some instances full wages throughout disability originating from industrial accidents, to insure against consequences of neglect of industrial injuries by the injured, and just now, most extensively, to operate as unemployment insurance covering the inability of the injured employee to obtain re-employment even after recovery from his industrial injury.

With this gradually mounting increase in the cost of compensation paid in relation to man-hours worked, we have the same, or perhaps an even greater, rising trend in the medical cost for the hospitalization and medical care of such injured or claimed to be injured employees. From 1920 to 1930 it is shown that the pure medical premium of insurance companies has increased in New Jersey by 100 per cent, in New York by 71 per cent, in Texas by 65 per cent, in Colorado by 73 per cent. The national experience, while unadjusted to law changes, shows that during the same ten-year period pure medical premiums have been increased by 64 per cent and the medical loss ratio by 62 per cent.

Of utmost importance in the control of this medical cost is a genuine spirit of cooperation between those at the plant who have contact with compensation work and the claim and legal and medical departments of the company, or of the insurance company carrying the risk. Some of the causes of the lack of control of medical costs are as follows:

- (a) Delayed notices of accidents
- (b) Failure of assured to cooperate in referring cases to the staff doctors appointed by the insuring company.
- (c) Failure of the insuring company to properly educate the assured with reference to proper medical treatment and the effect of medical cost.
- (d) The activities of professional clinics and doctors in soliciting medical work from the assured, assured's agents and employees, and claim managers and other company employees.

Hospital charges have also been a cause of the rising trend in the cost of this medical care, as there is an ever-increasing tendency toward charging for extras and so-called "routine" laboratory examinations, regardless of need. There is an increased period of confinement in excess of need, and particularly an accommodation not necessary in convalescent periods.

It is no simple remedy to cure this ever-increasing cost, and the solution of it lies with the individual companies and their efficient handling of very fundamental facts. There seems no immediate possibility of any material change in this trend toward the super-liberalization of compensation laws and compensation benefits all down the line. But the return of prosperity, with higher wages, more definite employment, a greater number of regular working days, all should have a tendency to make a more favorable ratio between the payments made by industry and man-hours of work produced by labor. Men will be more anxious to return to their employment and stay on their jobs, and with the return of more regular employment, there will be less reopening of old cases on rather exaggerated claims of injury.

But this lies far in the future. The only immediate answer to the employer's problem seems to be diligence, intelligence and persistence in the work in which your people are so vitally interested—accident prevention. If the accident can be prevented, then all of these other problems will never need be solved.

We realize, of course, that the elysium will never arise, but certainly the very remarkable work that is being done in accident prevention must be keeping the compensation and medical problems from becoming an unbearable cost to industry. When we find individual plants, over a short period of years, reducing accidents from 75 to 90 per cent, many of them with several million man-hours without loss time accidents, when we find steam railroads cutting accidents among their employees 60 per cent during the past eighteen years—when a group of leading steel concerns have a 90 per cent reduction in plant accidents during the same period—when forty-five large cement plants finish a recent year without a single lost-time accident among their thousands of employees—when we find the plant of an electric company with 28,000 employees reducing accidents in 1925 by 92 per cent—we realize what you men and women have accomplished, and feel that perhaps it is possible for accident prevention work to actually solve some of the most distressing problems that arise in the administration of the workmen's compensation law.

However, in connection with your accident prevention work, you can accomplish much in obtaining a proper administration of the Act and in correcting some of the glaring evils that exist. For one thing, you can keep constantly in your own mind and impress upon those about you the fact that this law is not an unemployment insurance law—that it is not designed for that purpose and should not be prostituted to obtain that end. You can also spread the gospel to those about you that there are health and sickness insurance policies designed to cover the illnesses that one may be subject to, outside of accidents, and that the compensation law was designed only as a compensation for actual loss of wages due to actual injuries arising out of the employment itself.

ADJOURNMENT

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