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The Council is not responsible for the views expressed in the Papers submitted at the Congress nor in the discussions thereon. These manifestly are the product of individual opinion.

NOTE

Volume III of these Transactions, containing the Street and Highway Traffic sessions, Traffic School, Child Education Section, Home Safety, and Statistics Section, is being mailed automatically to members who are believed to be interested. Any other member of the Council may receive a copy of Volume III by requesting it.

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20 North Wacker Drive, Chicago

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party. Is it possible that the average citizen still holds the ancient idea that an accident "is a visitation of the Lord?"

While this awful record has been climbing up on the highways of the Nation, it is impressive and encouraging to note that in the industries represented by the delegates here present, there has been, through an adoption of safety appliances and the dissemination of propaganda, a gratifying decrease in the number of deaths and injuries. This achievement is the result of intelligence, persistence and sacrifice. This is familiar to all of you and it is to your everlasting credit that you are not satisfied with the results of your pioneering, but through conventions of this character, and in every other way, are constantly seeking appliances and methods to conserve the lives of your fellow humans.

It occurs to me that you have sensed the real spirit of responsibility. You appraise responsibility not as a simple knowledge of a condition but as an obligation for the conclusion of a task. I do not believe that your determination in this regard was materially advanced by the enactment of the so-called Employers' Liability Statutes by many of the states. In fact, unless I am incorrectly advised regarding the history of your organization, your pioneer work for the safety of your employees antedated the enactment of these laws by practically any of the states. Your executives have demonstrated a vision and courage as well as a cooperation which, particularly in these days of tribulation, should be appreciated by your workmen. It may be, however, that most of them take it for granted that your thoughtfulness for their safety is coming to them anyhow, and appreciation may consequently be lacking.

There isn't a doubt, under this financial depression through which we are attempting to struggle, that conditions have become the more perplexing. Economic conditions are very much out of joint. It takes the right spirit of humanity to continue your endeavors and keep trying to find some additional means whereby you can more fully conserve the lives of those who are in your employ. This spirit of looking after the other fellow—this really human impulse which all of you express—should be an inspiration to those who otherwise, because of lack of work, might be disheartened and discouraged.

I presume it is a practice with the various units of your organization to, at least occasionally, have "Safety First" talks with your men, in which they are reminded of your interest in them and urged to extend similar consideration to their fellows. It should mean much to these men, in these days of unemployment, to know that they are not only in a position of employment, but that every safeguard possible is placed about their work so that their employment may continue and that the members of their household need have no fear while they are at work, and may confidently look forward to their return to their domiciles at the conclusion of their day's work.

I was much edified recently in reading the speech of the head of a great industry in our country, advocating measures for the permanent employment and protection of men, not only in his industry, but in the great industries of the Nation.

His suggestions were courageous and patriotic, and I am hopeful will come into full fruition. If so, we need have no fear of the future.

Communism and its principles will not have its present more-or-less fertile fields of operation, and will be exiled as a force of influence in the community for all time to come.

This splendid program will necessitate that same degree of mutual consideration and cooperation which has distinguished the National Safety Council from its inception. This is one of your great opportunities.

It is inconceivable that Legislative enactments will build up the consideration of the average man for his neighbor. We are often reminded that you cannot legislate morality into the people.

It would be a far better and more useful program if this principle could be brought more strongly to the attention of our school children in their early youth. Something along this line is undoubtedly being accomplished in many communities, but if the

youth of the land is sternly taught to accept responsibility if injured, or at least until he can prove himself innocent, it may do much to instill a sentiment of caution and a willingness to give the other chap a break.

It is, perhaps, all right to offer this suggestion in a general way, but if we are to get anywhere it must be through intelligent unselfish leadership. The leadership must come primarily from your organization. You have pioneered the field: you have done much. Your example should prove a stimulating encouragement to those really concerned for the safety of others. In the hustle and strife of our day and age, we are prone to forget everything but self. Nothing but the everlasting keeping at it will count. Through the ramifications of this organization it is possible for you to reach members of the legislature, executives of municipalities, school boards and every other agency through, and by which, safety propaganda can be disseminated.

The Golden Rule should enjoy a renaissance and be made the great stimulating force to bring back to all men the "Spirit of brotherhood of man and the Fatherhood of God."

CHAIRMAN HENSEL: We owe Mr. Sweitzer a vote of thanks for bringing this wonderful inspirational talk to us and the Metals Section can assure him that we realize our responsibility and that we are going to take renewed interest and go ahead with greater effort than ever to prevent accidents.

We continue with the subject, "Metals Section Statistics for 1930" and a friend of mine and of this Section has agreed to give us a brief report.

T. A. Schendel, safety director for the Caterpillar Tractor Co., Peoria, Ill., will address us.

Metals Section Statistics for 1930

By T. A. SCHENDEL

Safety Director, Caterpillar Tractor Company, Peoria, Ill.

I know you will all be glad to hear that the Metals Section had, during 1930, one of the safest years in its history. Excellent records were made by many members, with the steel industry low with 11.99 lost-time injuries per 1,000,000 hours of work. They thus rank fifth in frequency among 28 major industries, included in the Council's annual report.

The foundry industry shows the other side of the picture—high frequency of 32.11. Smelting, refining, fabricating and non-ferrous metals had a more favorable experience. Their average frequency was 17.14. Combining the experience of these three groups shows 15.86 lost-time injuries per one million hours of work, or 14 per cent lower than the rate for all industries.

As to severity—not so good. Lost-time injuries per 1,000 hours, 2.38 for the Metals Section compared to 1.97 for all industries. Steel had the highest severity rate, 2.47, with foundry crowding them at 2.23, and the non-ferrous metals coming in with 2.03. Of course, our high severity in contrast to low frequency, shows a high ratio of serious injuries to temporary disabilities. Fatalities alone are responsible for 1.37 days per 1000 hours work, or 58 per cent of our total severity rate, and that should give us all reason to pause and consider that figure. It is serious, gentlemen.

The elimination of serious injuries is one of the major problems which confront industry. The records of over 1500 establishments that have reported in each of the last three years show that, while frequency decreased 28 per cent in comparison with 1928, severity was down only 8 per cent. The reason for the comparatively small decrease in severity is found in the decline of only 10 per cent in the frequency of fatalities, and a slight increase in the frequency of permanent partial disabilities. The records of plants reporting for five years also indicate a pronounced decrease in the frequency and severity of temporary disabilities but much less success in

eliminating serious injuries. Notable exceptions to this general situation are found in the public utility industry which has reduced fatalities 25 per cent and permanent partial disabilities 20 per cent during the last two years, and in the paper and pulp industry.

It is well known that periods of rising employment necessitate the training of new men, shifting of employees from one job to another, and other actions which are apt to be unfavorable from the standpoint of safety, whereas, during periods of reduced employment, many of these adverse conditions disappear. Industry has demonstrated, however, that all injuries, excepting permanent partial disabilities, can be reduced regardless of changes in industrial activity.

From 1928 to 1929, working time in 1500 industrial plants increased 11 per cent but the average fatality rate decreased almost 5 per cent and the frequency of temporary disabilities about 4 per cent. A decrease in working time of 17 per cent from 1929 to 1930 was then followed by a drop of 24 per cent in the frequency of temporary disabilities and a 5 per cent drop in fatalities.

The experience of our section has, in many respects, been similar to this. The records of 162 plants in our section that have reported in each of the last three years show a drop in frequency of 35 per cent from 1928 to 1930; most of which was made during the last year. Severity in these plants, however, rose about 21 per cent from 1928 to 1929 and decreased about an equal amount from 1929 to 1930. Variations in the frequency of fatalities largely account for the fluctuations in our severity. While the frequency of permanent partial disabilities has been up and down during this period, the severity of these injuries has steadily decreased, particularly during 1930.

The most consistent improvement in the section during the last two years is in the steel industry. Among 71 foundries the total frequency rate increased from 1928 to 1929, but was down sharply during 1930. The frequency of fatalities and permanent partial disabilities has increased steadily since 1928. Consequently, severity has risen from 1.51 to 1.88, and, in 1930, to 2.28. Although injury rates for similar establishments in the non-ferrous metallurgical industry were very high during 1929, 1930 rates compared quite favorably with 1928.

Seventy-three plants in the steel industry, on the other hand, decreased frequency 39 per cent and severity 15 per cent in comparison with 1928. Severity was higher in 1929 than in either 1928 or 1930 but frequency declined in each year of the period. The industry's fatality rate was highest in 1929 and lowest in 1928 but the frequency of permanent partial disabilities declined in each year of the period, the total decrease being 20 per cent.

This improvement was general throughout the various departments of the steel industry. Departmental records, available from 1929 and 1930, only, show that, out of 22 departments, frequency dropped in twenty and severity in eleven. The reductions in frequency and severity by structural and rail mills, seamless tube mills, plate mills, tin plate mills, and general mechanical departments were particularly outstanding because improvement was shown in both rates for each type of injury. On the other hand, departments that have particularly high fatality rates for 1929 and 1930 such as blast furnaces, general labor and coke plants showed no appreciable improvement in this type of injury.

Only seven departments in the steel industry with frequency rates higher than average, and of these, sheet and tin plate mills, open hearth, and seamless tube mills are most important because of their large exposure. These departments also have higher than average permanent partial disability rates, but, with the exception of the open hearth, low fatality rates. Fatalities, on the other hand, occur most frequently in open hearth, coke plants, blast furnaces, general labor, and general mechanical departments. In fact, these five departments account for over 50 per cent of all fatalities that occurred in the industry during 1929 and 1930, although their combined exposure is only slightly more than one-third of the total for all departments.

Permanent partial disabilities, however, are widely distributed. In proportion to man-hours worked, structural and rail mills, merchant mills, rod and wire mills, blooming and billet mills, transportation, open hearth, and seamless tube mills, have had the largest number of injuries of this type. Furthermore, those with the highest frequency rates for these injuries also have the highest severity rates.

You have noticed that the open hearth appears frequently in the high rate group, yet, some of our members have demonstrated quite conclusively that open hearth operations can be made as safe as any others in the industry. Sixteen of these departments, in 1930, had frequency rates below 10.0 and of these, all but four had severity rates below 1.0. In other words, the plants with the high frequency rates for this department are having the serious injuries.

You have no doubt noticed that a great deal of this report is given over to the steel industry, and in this connection, it may be in order to mention that the next year will no doubt see a system of departmental reports carried on into the machine industry, where I believe it will be a big help to all of us who are connected with that phase of the Metals Section. No doubt, most of us have a system of our own in our individual plant, but are not able to bring it out into a more detailed report.

It is a matter of general belief that accident experience in the Metals Section during 1931 will be even better than the past year. Operations, on the whole, have been low, but one of these days business will pick up, production schedules will be increased, then again will come the possibility of higher injury rates. Therefore, now is the time for plants and departments with records that are below par to look around, find their difficulties and correct them.

CHAIRMAN HENSEL: We are all very grateful to Mr. Schendel for reading this report and for giving us some sidelights on it. Have any of you noticed how the various departments of the steel plants have been split up in the annual report published by the Council? Have you any questions or any suggestions on the way the entire report has been handled?

G. G. GRIEVE (The National Safety Council, Chicago): The National Safety Council wishes all members of the Council to send in their 1931 accident reports. The number has grown each year and the increase should be continued in spite of the depression and hard times. Information on accidents in many industries is becoming more reliable. This is partly due to the increase in the number of reports.

MR. SCHENDEL: What is being done about getting accident records in the machinery industry by departments?

MR. GRIEVE: We are working on that. The idea is to enable members to compare the records of their entire plant and also records in the individual departments. For example, those with forge departments can check their records by comparing with other forge shops. The idea as applied to the machinery division seems a good one.

The first year the method was used in the steel industry we received departmental reports from about ninety-five percent of those reporting, which was exceptionally good. Last year the idea was followed out in the electric railway industry; we had a large increase in the number of reports and approximately seventy-five per cent covered experience by departments.

CHAIRMAN HENSEL: During the past year I showed various department heads where they stood as compared with some fifteen or twenty similar departments of other companies. Some of those fellows were surprised to find that they stood near the top and others that they stood near the bottom.

D. E. SHANNON (Fort Pitt Malleable Iron Company, Pittsburgh, Pa.): I suggest the report be given in chart form to give us a chance to take notes.

CHAIRMAN HENSEL: I think that is a good suggestion. It will be taken up with the program committee of another year.

The next paper will be delivered by C. P. Waite, assistant supervising engineer, the Travelers Insurance Company, Chicago.

doesn't know the thing he should know, it is not the safety department's fault; it is his foreman's fault. We take minutes of those meetings, but we do not take the men's names. The foreman, superintendent, and general manager gets a copy. Once each year those employees come back for that same quizz, and we do not try to tell them what will happen. We show them by actual demonstration. I can't go into that now because it would take too long.

If it is possible to educate a man, without going to all that expense, in some other way I would certainly like to know how it can be done. Personally, I have the feeling that is the only possible way to let the employee realize you are absolutely in earnest. Those fellows come back once a year and spend a couple of hours, or two hours and a half with the safety department, and we get very valuable information in regard to conditions which exist in the plant of which we have had no knowledge, and a great many times of which the foreman has had no knowledge.

ADJOURNMENT

Thursday Morning Session
October 15, 1931

JOHN ROACH, Chairman

Deputy Commissioner of Labor, State of New Jersey, Trenton, N. J.

The last session of the Chemical Section convened with Vice-Chairman John Roach presiding.

CHAIRMAN ROACH: The first order of business will be a report on the trend of accidents in our industry, by Mr. Kepner.

Accident Experience in the Chemical Industry in 1930

By IRA V. KEPNER

Chairman, Chemical Section, Statistics Committee

While it is very difficult to find something new about accident statistics, it is a topic of vital importance and never-ending interest to those of us who believe complete, permanent and reliable records and statistics are a necessity in the conduct of present day successful accident prevention work—which, more and more, is leading us into fields of science, experiment and research—all of which is eminently worth while, for it is by just such development and progress that many organizations in the Chemical Industry have not only made new accident records, but reduced accidents to almost the vanishing point.

Your Statistics Committee and sectional officers were very much pleased by the excellent response of members to requests for 1930 accident records. Through your cooperation the 1930 accident experience is based upon the largest number of plants ever to report, and gives, therefore, a more reliable picture of the accident situation in the Chemical Industry than has been indicated by reporting companies in any previous year.

During 1930 your Statistics Committee received reports from the following establishments:

- 15 plants manufacturing carbon products
- 26 plants manufacturing explosives
- 11 plants manufacturing industrial gases
- 15 plants manufacturing acids
- 13 plants manufacturing chlorine and alkali products
- 9 plants manufacturing dyes
- 16 plants manufacturing paints and varnishes
- 15 plants manufacturing pharmaceutical and fine chemicals
- 16 plants manufacturing soap
- 9 plants manufacturing and distilling coal tar, and
- 66 other plants not classified.

This makes a total of 211 establishments reporting, in comparison to 172 for 1929; hours of exposure, however, were slightly less in 1930, as was the case in most of the other industries, the figures showing a decline of about 17 per cent from 1929 to 1930. The increase in the number of reporting plants, I believe, is ample evidence of the interest which many members have in their accident records, and in the efforts of our section to develop reliable statistics.

According to the man-hours worked, operations in chemical plants during 1930 did not decrease as much as in some other industries. But in spite of the recent depression, and a drop below a full schedule, the chemical industry had a good year. Our lost-time injuries averaged 15.50 per million hours worked in comparison to 18.47 for all industries. This rate gave us a rank of tenth in a list of 28 major

American industries. However, we cannot overlook the better records of the cement, steel, and machinery manufacturing industries, whose operations involve many hazards as great as our own.

Our showing from the standpoint of severity of lost-time injuries was not quite as good as for frequency. Lost-time averaged 1.94 days per thousand hours worked; our severity rate, consequently, was slightly lower than the rate of 1.97 for all industries and our standing among the 28 industries was fourteenth. Even this rate, however, was considerably less than for steel, cement, and machinery manufacturing.

Injury rates in different branches of our section vary widely. Plants manufacturing carbon products had the lowest frequency rate, 5.05, whereas coal tar distillers had the highest, 44.72. Paint and varnish manufacturing establishments, pharmaceutical and fine chemical manufacturing plants, and soap factories were other branches of the Section to have higher than average frequency rates. Serious injuries, however, occur more frequently in other divisions. Dye manufacturing and acid plants, with better than average frequency rates, have permanent partial disability rates exceeded only by soap manufacturing. Explosives plants, also with very low frequency rates, have the highest severity rate, due, of course, to the unusual hazards of their operations.

The experience of our own as well as other industries shows that small plants usually have higher frequency and severity rates than larger ones. In general, as plants increase in size, their injury rates decrease. The average frequency rate of 78 chemical plants employing less than 100 people was 26.94, in comparison to 13.04 for 17 plants with over 1000 employees. The difference in their severity rates was equally striking; these rates being 3.72 and 1.63 respectively.

Some good records have been made, however, by small plants in all branches of the industry. A tar refining plant with 36 employees went through 1930 without a lost-time injury; this plant had a frequency rate of 33.65 and a severity rate of 0.58 for 1929. A record of two-years without a lost-time injury was made by a plant producing carbon products and employing 64 people. Also, our smaller establishments have made, in many instances, much better records than larger ones in their division. For example, a small plant employing 39 people led the explosives division with a no-accident record during 1930. These are only a few of the illustrations that can be cited to prove that safety can be achieved in small plants.

In discussing our injury experience during 1930, I have indicated where we should look for improvement in the future. Many of us are particularly interested in comparing our 1930 records with those of previous years because of the business depression. We have 106 plants in our industry with an exposure of approximately 145,000,000 man-hours that have reported in each of the last three years; the records of these identical establishments most accurately measure our improvement during this period. The 1930 frequency rate of this group was 20 per cent below their rate for 1928—a reduction which was, however, somewhat less than the decrease of 28 per cent for over 1500 identical establishments in all industries. This reduction in frequency included a decrease of 34 per cent in our fatality rate during 1929 and 1930 in comparison with 1928, but, unfortunately, the frequency of permanent partial disabilities has risen steadily in the past two years. The decrease in our general frequency rate is largely due to the decline in the frequency of temporary disabilities. While the decline in the fatality rate of our identical plants is much larger in many other industries, our experience with other types of injuries is much the same.

The rise in the frequency of permanent partial disabilities during 1929 and 1930 was largely responsible for holding down our decrease in severity to only 6 per cent. The reduction in this rate was less than the 8 per cent decrease made by all industries. The permanent partial disability rate doubled during 1930 in comparison with 1928 and 1929. The large drop in the frequency of temporary disabilities, on the other hand, resulted in a decrease of 25 per cent in the severity of these injuries.

Several explanations have been advanced in the Council's Annual publication on "Industrial Accidents" to account for the large difference in the reductions of temporary disabilities and the more serious injuries. It is thought that an undue proportion of effort may have been devoted to minor hazards with the result that the more serious ones may have been neglected. Also, the increasing use of machinery may have eliminated some minor accidents but introduced new hazards with more serious consequences.

It is also possible that more accurate reporting tended to increase rates, particularly for permanent partial disabilities with their arbitrary scale of time charges. More liberal compensation awards in recent years may have had the effect of increasing time charges for a permanent partial disability; and furthermore, an injury which may have been a temporary disability several years ago might now be considered a permanent partial.

We need, therefore, to give special thought to the reduction of our serious injuries. The importance of knowing the frequency and severity of accidents which are happening in our industry each year is apparent to anyone seriously interested in safety. The fact that we have never been able to ascertain these figures from all the members of our Section is regrettable. We have yet to get the most out of the use of statistics in the work of preventing accidents. The more they are understood and studied the better are we able to apply protective and corrective treatment. Statistics to a safety man are just as indispensable as the compass is to the mariner. They give him the range and scope of the hazard. They eliminate the guess work and a great amount of time ascertaining for himself that which statistics can give him at a glance.

Several industries follow the practice of exchanging full details on fatalities and other serious injuries. Many such cases result from accidents whose causes are unusual and difficult to control. With this plan, however, there is no good reason for a similar accident occurring from the same cause in other plants.

In conclusion, I desire to emphasize the value of reporting your annual accident records to headquarters. In spite of the steady growth of plants reporting from year to year, and our particularly good showing this year, we are getting accident reports from only slightly over one-half of our members. Every member should take advantage of this opportunity to check up on his accident experience from year to year and then compare it with other plants in his industry. A good record is always gratifying and stimulating to the officials and employees of a plant. An organization whose record makes a poor comparison with others in its division should certainly learn the reason for it and take necessary steps for improvement.

Furthermore, every safety man should feel it his personal responsibility to contribute his accident experience for the benefit of the Section. Our non-reporting members are certainly not supporting the efforts of our Sectional Officers to advance the development of full information on the problems and progress of our Section in accident prevention work. Our Section is exactly what we make it, and we get out of it in proportion to what we give, and the growth of the Chemical Section statistics depends on the support from its members.

In closing I wish to take this opportunity to thank the National Safety Council Staff, the Sectional officers, members of the Chemical Section Statistics Committee, and all members reporting, for the help they have given me in making this report possible.

CHAIRMAN ROACH: That was a very excellent report, and I certainly hope that during the next year the other half of our membership that has not contributed accident experience will do so. I know of nothing more stimulating to the interest of the safety committee and men interested in accident prevention than a correct listing of accident experiences. I know of nothing that causes more enthusiasm on the part of all of us who are interested in this human conservation work than to learn

of splendid plant records, covering hundreds of thousands of man-hours without injury to anybody.

P. W. GUMAER (Consulting Engineer, New York City): I would like to ask the author if there have been any statistics compiled concerning industrial poisoning cases, particularly chronic poisoning? I contend that there is scarcely any chronic poisoning in the chemical industry; that in firms manufacturing chemicals, cases of acute poisoning occur occasionally. Those statistics would be of extreme value to the chemical industry of the country, and I was wondering if they have not been compiled if there was any possibility of securing them in the future.

Mr. KEPNER: None have been compiled, to my knowledge. We are very fortunate to get the number of accidents, even if we do not get the details of the accident. The name of the company in all cases is kept absolutely in confidence, and we have no way of knowing what causes the accidents or what the accidents were. I do not know of any way we could do that. It could be arranged between ourselves in the Chemical Section, if the firms would sanction it; but I doubt very much if the firms would care to do so. I know the National Safety Council has no records at all as to the cause of the accidents.

MR. GUNDAK: There is no thought of getting the names of the firms; just the total number of the accidents in industry during the year.

MR. KEPNER: They do not report what the accident was at all. It would be nice if they would do it, as a matter of statistics, but they are not available that I know of.

CHAIRMAN ROACH: I wonder if the chairman of the committee had ever called upon the Industrial Health Bureaus of the several states for that kind of information?

MR. KERNER: Not to my knowledge. The best information you get is that some have died by poisoning. That does not have statistical value.

CHAIRMAN ROACH: I think in most of the states they differentiate between cases of that kind. It may be their statistics might not be very accurate. I am inclined to think the chemical industry has nothing to be ashamed of, so far as health conditions go, in comparison with other sectional groups. Probably if we really knew the truth of the matter, there is very much less poisoning in the chemical industry than was the opinion some years ago. When we do have poisoning cases of course they attract attention. It may be the thing is over-emphasized, but if you are to compare the toll paid by workers from industrial poisoning and that paid by industrial accidents in the chemical industry, I think all of us would be more or less surprised.

C. L. JOYCE (Hercules Powder Co., Wilmington, Del.): The thought you expressed a while ago opens up a possible avenue for discussion. Take your own state, for instance; are the files of the Accident Commission open to the general public or the persons interested in compiling statistics, such as Mr. Gumaer thinks of?

CHAIRMAN ROACH: I think they are. We would be very glad to give any information that is there. As a matter of fact, at the end of each fiscal year there is a report printed of compensable occupational disease cases. That probably only covers a part of the cases that might be reported, because many of them would not be contestable; but it gives you some idea of the sickness in the chemical industry.

Mr. JONES: In other words, a review could be made of all such cases that occurred and with sufficient detail?

CHAIRMAN ROACH: I think we could get our statistician to throw out the cases that might be charged against the chemical industry, once we could determine the limitations or the extent of the industry. Just what industries are to be included as chemical would be one of the difficulties.

MR. KEPNER: See what Pennsylvania does. Mr. Ainsworth was here a moment ago. I wondered if they had any special statistics.

DR. ELIZABETH B. BRICKER (Pennsylvania Department of Labor and Industry, Harrisburg): Pennsylvania's workmen's compensation law does not cover occupational diseases. There are a few cases reported in conjunction with the accident reports that come in, but they would not give a fair idea of what is occurring. I am sure, and I do not think they ought to be used.

A. L. ARMSTRONG (Eastman Kodak Company, Rochester, N. Y.): I think the difference in the compensation law makes that almost impossible. When you take the states where compensation covers occupational disease and compare that with states that do not, it is unfair, and you get reports that are not at all consistent in statistics. I think perhaps that is why some of our Pennsylvania concerns make such good records.

CHAIRMAN ROACH: Mr. Armstrong, you are a brave man to make that statement here.

The next on the program will be a paper by Dr. Elizabeth B. Bricker, of the Pennsylvania Department of Labor and Industry, Harrisburg, Pennsylvania.

Volatile Solvents—Their Health Hazards

By DR. ELIZABETH B. BRICKER

Chief, Hygiene and Sanitation Section, Pennsylvania Department of Labor
and Industry, Harrisburg, Pa.

The past ten years have witnessed a new interest in a certain group of solvents. I refer particularly to those solvents having rapid volatilization as one of their properties. A number of causes have contributed to arouse this interest. But if one factor were to be singled out as being the most significant, it would undoubtedly be the introduction and the adoption, in many processes, of nitrocellulose lacquers. The accompanying economic necessity for the development of better, cheaper, and more universal solvents and diluents in the manufacture of these lacquers led naturally either to the introduction or to the widened application of these same volatile solvents for other purposes. In addition to their use in lacquers, enormous quantities of solvents are employed in the manufacture of artificial silk, in the production of artificial leather, in the dry-cleaning industry, and in many other branches of business where, though possibly not used in large quantities, they play an essential part in the process of manufacture.

Unfortunate experiences involving explosions and disastrous fires first directed public attention to the necessity for careful handling of these products. Before methods for control of the fire hazard had been universally agreed upon, illness in some of the persons exposed to these compounds was being discovered. The far-sightedness of the Chemical Section of the National Safety Council in sponsoring the study of the health hazards in the use of benzol was an early and an outstanding demonstration of the fact that industry is interested in more than its product and its property; and that the health of the men and women who produce the output of a factory should receive the same careful consideration as does their safety.

Knowledge of the effects of volatile solvents on health may be acquired in two ways: by laboratory investigation, involving controlled experiments on animals and on man; and by the study of workers who have become ill while using these compounds.

In the past much of this work has not come to the notice of industry, as the reports have, for the most part, appeared in medical journals and other scientific publications closely allied to medicine. A departure from this procedure has appeared, however, within the past few years. Many companies are now appropriating funds for the study of the physiological effects of their products, and in a number of instances have published the results of their investigations. This information may reach the industrialist through popular presentations in the newspapers or in non-technical periodicals, or in the form of reprints from scientific journals distributed by the manufacturers of the compounds studied.

The actual case reports of illness produced by exposure to volatile solvents, and of many other health-hazardous compounds in common use in industry, continue to appear almost exclusively in medical journals. It is the compilation of some of these reports that I have been asked to present to you.

* 1. *Chlorophyll* *Chlorophyll* *Chlorophyll*
 2. *Chlorophyll* *Chlorophyll* *Chlorophyll*
 3. *Chlorophyll* *Chlorophyll* *Chlorophyll*

Accounts of the effects of the newly developed and the more widely advertised solvents are undoubtedly the ones which have the greatest interest for the manufacturer. Thus far, practically no cases of ill health due to these substances have been reported in the literature. Whether this is due to the harmlessness of these compounds, or to the greater care exercised in their use, is not known. Whatever the cause, this apparent immunity should not lead to relaxed vigilance.

In discussing petroleum distillates in one of the German medical journals, Floret reported two unusual cases. One was that of a girl who suffered from epileptiform convulsions for a year after an acute poisoning from benzene fumes. The other case was that of a man who, while filling cans with benzene, lost consciousness. He developed high fever and became acutely ill. Later, sores appeared on his body and in his mouth and throat which, Floret believes, were caused by the excretion of the benzene through the skin and the mucous membranes. The man died five weeks after the accident.

Another author, Stiefler, described the case of a man twenty-one years of age who fell unconscious after emptying a can of benzene. He was treated in a hospital and was discharged as recovered after ten days. Later he also developed convulsions which recurred every four or five months and were epileptic in character.

It would seem that the great amount of publicity given to benzol and its physiologic effects should insure adequate protection in its use. However, cases of illness continue to be reported. Among those from Germany was that of a workman who entered an empty vessel which had contained benzol. The vessel had previously been washed out with water six times. Nevertheless, the man lost consciousness shortly after entering it and all efforts to revive him failed. As several plumbers had worked in the same vessel it was thought that benzol could not be the cause of death, but at autopsy considerable amounts of benzol were found in the brain and other organs, so this case must be regarded as one of unusual susceptibility.

A report from Vienna gives details regarding a group of cases of benzene poisoning occurring in Central Europe. Fifty cases appeared among the women workers in a rubber-goods factory within a few weeks after beginning employment. Seven of these cases resulted in death. It would be of great interest to learn the exact composition of the compound used by these women. Unfortunately that was not published in the report, benzene, evidently one of the ingredients, being regarded as the toxic agent.

Carbon disulphide has been held responsible by certain French observers for a case of neuritis in which the muscles of the legs and the arms were affected. This man had been employed for five months in the making of mustard plasters by spreading on paper a mixture composed of rubber, benzene, and carbon disulphide.

Injurious effects arising from the use of the chlor compounds continue to be reported. The German factory inspectors' report for 1927 carried accounts of several cases of poisoning from trichlorethylene, most of them being merely loss of consciousness with no lasting effects, although two important cases were included, one of very serious eye injury and one of death.

A report from Paris describes two cases of poisoning from carbon tetrachloride. The first case was that of a man who, on showing slight symptoms, stopped work and recovered in a few days. The second case was of greater severity. This man had been using carbon tetrachloride in a small, poorly ventilated room in a cleaning establishment. At the end of his second day's work he became acutely ill, developing vomiting, headache, dizziness, abdominal pain, and a temperature slightly above 102 degrees F. He became unconscious and was removed to a hospital for treatment. His symptoms indicated involvement of the liver, spleen, and kidneys but he was discharged from the hospital after two months, very much improved in health. A physical examination one year later showed him to be completely recovered.

The recent controversy on the permissible uses of methanol apparently quieted down following the publication of the agreement between the manufacturers of methanol and the United States Public Health Service, which agreement went into

effect July first of this year. While a large number of deaths and some cases of blindness have been reported as being caused by the drinking of methanol, no recent fatalities have been reported from its industrial use. At the present time several investigations are being carried on in well-known laboratories for the purpose of increasing our knowledge as to the toxicity of this compound both by inhalation and by skin absorption. With additional data on these two points methanol should assume its proper place in industry. Certainly with what is known of its physiological action at the present time, it should not be used as a solvent for general purposes.

In the preparation of this paper assistance was solicited from a number of companies manufacturing or using volatile solvents in large quantities. The questions asked referred exclusively to the kind of protection used by these companies for conserving the health of their workers.

The replies brought out little that is new. The points emphasized were those which have many times been presented at meetings similar to this one: the handling of volatile solvents in closed systems; the use of positive pressure helmets or hose masks, with an adequate supply of fresh air, by persons cleaning tanks or repairing leaks in valves or pipe lines, (this type of work never to be done by one man alone) and, in the case of a tank, only after it has been thoroughly steamed or washed out; adequate ventilation of workrooms; alternation of jobs for workers exposed to volatile solvents with jobs in which there is no such exposure; periodic physical examination of workmen; and substitution of nontoxic, or at least less toxic materials, for toxic compounds.

As exhaust ventilation at the point of evaporation of a solvent is the procedure usually recommended, it was a surprise to learn that three large companies, when using benzol as a solvent, are depending upon general room ventilation alone. Two of these companies specified that this ventilation was by means of blowers at the floor level of the room.

One company stores most of the volatile materials which are kept within the plant, in underground tanks, or, in the case of especially volatile materials, in refrigerators. The latter procedure seems to be an admirable method for conserving material and also for eliminating a health and a fire hazard.

Another company, which has as a special hazard carbon disulphide, conducts its process almost entirely under water seals. In cases where escape of this vapor is inevitable it is ignited and burned to sulphur dioxide.

Education of the workers concerning the potential health hazards of the materials they are handling is most important. Such education gives them a definite reason as to why certain rules have been formulated and why they must be obeyed. One company emphasizes the importance of constant and close supervision by technically trained men. This is regarded as particularly necessary in the case of operators who use piping, pumps, etc. and are inclined to apply personal ideas which might prove dangerous.

At intervals during the past two years "The Rubber Age" has published a series of most interesting and instructive articles by Dr. P. A. Davis, Assistant Medical Director of the Goodyear Tire and Rubber Company, dealing with toxic substances in the rubber industry. Many of these articles carry a section which should be of great help to the plant physician and the personnel department in the selection and placement of workers. In discussing the subject of physical examinations Dr. Davis specifies in detail the kind of person who should not be employed when such employment involves exposure to the particular substances under consideration. The volatile solvents on which these details are given are carbon tetrachloride, carbon disulphide, amyl acetate and other amyl compounds, and acetone.

In conclusion, I should like to make a plea for the reporting of cases of ill health caused, or suspected of being caused, by volatile solvents. I am sure that the files of the medical departments of many companies contain records that should have

wide publicity in scientific journals. A large company, with its corps of chemists, physicians, and safety engineers, can make any plant safe. These men are familiar with the hazardous substances with which they are dealing, know how to recognize their toxic effects on the human being, and how to provide for the safe use of these compounds. But what of the physician in general practice who, for example, may be treating a cobbler, ill because he has been using a cement containing benzol? His knowledge of industrial processes and materials is limited. Without aid from industry itself, he cannot be expected to keep accurately informed as to the physiological action of the many volatile solvents which are being developed and utilized in rapid succession. But he does read his medical journals, which carry occasional items on the subject of these important industrial hazards. The average physician has some knowledge of the effects of the more commonly used solvents. It is ill effects from the group of newer solvents therefore that should be brought to his attention by frequent and detailed reports. The sooner we have general knowledge of the toxic action of these substances, the better prepared we shall all be to combat it.

The American Public Health Association is attempting to compile records on just such cases. The committee having this work in charge depends largely on published records. It would welcome informal personal communications, carrying reports of cases, to embody in its report. With such cooperation from industry itself these reports would soon be built up into a useful source of information for reference. For the more we know about the health hazards encountered in the handling of volatile solvents the better able we shall be to employ these compounds with safety, and thus retain for use valuable materials which would otherwise be outlawed.

CHAIRMAN ROACH: The floor is open for discussion.

I would like to hear from Dr. Greenburg on that paper.

DR. LEONARD GREENBURG (United States Public Health Service, Washington, D. C.): I have nothing to add to Dr. Bricker's excellent presentation of the subject. I think this is a field which is continually enlarging, and Dr. Bricker's review is certainly an excellent summary of the present status of the problem of some of the industrial poisons.

Mr. Gumaer made an interesting suggestion last night, namely, that some organization should continue to compile the literature on each of these substances that comes out, and keep a running file of the literature, particularly the toxic doses of these newer chemicals and solvents. He suggested that the National Safety Council do that. I do not know of any mechanism by which the Council could, but I think it was an interesting suggestion and perhaps some of the members may know how.

CHARLES GREENFIELD (DuPont Viscoid Company, Arlington, New Jersey): I would like to ask Dr. Bricker if, when carbon tetrachloride comes in contact with fire, the fumes are more dangerous than when it is simply inhaled or there is contact with fumes from an open tank.

DR. BRICKER: I think Dr. Hamilton, in her book on Industrial Poisons in the United States, has gone into that. It is not so much the carbon tetrachloride itself, which is dangerous when used on fire, but the products of its decomposition. She considers phosgene is the compound which is so dangerous under these circumstances.

DR. EDWARD G. MEYER (Assistant Chemist, U. S. Bureau of Mines, Pittsburgh): The Bureau of Mines is making tests of the use of carbon tetrachloride on fires, and when it is used on fires, phosgene, chlorine and hydrochloric acid are the poison substances. If you write in to the Bureau of Mines, they will send you the information.

CHAIRMAN ROACH: I wonder if we have any records of fatalities or injuries, at fires, caused by carbon tetrachloride?

DR. MEYER: The reason for this investigation by the Bureau of Mines was the fatality of two navy men who were working in a compartment where a fire started, and they were using carbon tetrachloride and were killed. Then this investigation was made.

MR. GREENFIELD: The investigation also covered the gases that came in the New York City subway, when that cable came out. Somebody squirted a Pyrene extinguisher on it and the Bureau of Mines found phosgene was one of the decomposition products at that time.

DR. W. J. MCCONNELL (Metropolitan): Just a few weeks ago there was reported a death of a janitor, who was using a wax containing tetrachloride. The wax was rather hard, and he put it on the stove to melt the wax and the tetrachloride was liberated and he died after ten minutes exposure.

DR. ALBERT S. GRAY (Director, Bureau of Occupational Diseases, Connecticut State Department of Health, Hartford): I was very much interested in Dr. Bricker's discussion of carbon tetrachloride. They are using it now in household cleaning machines, and I consider that extremely dangerous, because the literature sent out with these machines does not dwell sufficiently upon the toxicity of the material.

I know of three cases rendered quite ill by the use of this material. They are using it and sending it out for use in small hand cleaners, and they also have a very nice electrical cleaning device, in which the individual is furnished with about five gallons of this material, largely carbon tetrachloride, and instructions for using and cleaning the carbon tetrachloride after it becomes dirty. They furnish them with a canvas bag and Fuller's earth, with instructions to pour the material into the canvas bag with the cleaner and put the Fuller's earth in and pour it out into the original can two or three times, until it becomes clean. You see the possibilities of danger to the woman working with that material, using it in a poorly ventilated room. They do tell you it should be used in a room preferably where there is cross ventilation, with a door opening outside. They read those directions and they do not do it.

I know of two cases where it was used in a basement and one case in which it was used in a kitchen, with very unfortunate results. We know the vapor is about five times as heavy as air. I think there are going to be some tragedies there.

It is suggested that children and animals be not permitted on the floor during its use, but we are bound to have children crawling on the floor while this work is going on. I think if the companies selling that do not make more definite statements we are going to have unfortunate accidents.

DR. BRICKER: I have asked the Pennsylvania Dry Cleaners' Association to keep us informed of any cases of poisoning from carbon tetrachloride that come to their notice, but evidently none have appeared as yet. I shall be glad to learn of any occurring outside of the state.

CHAIRMAN ROACH: Would you care to say something about the absorbent properties of the fluid?

DR. BRICKER: I took that matter up some time ago, and as far as the literature would indicate there is no toxic effect from skin absorption, although you have that skin irritation which you always have when a substance is used which removes the fat from the skin. Since carbon tetrachloride is used to remove the fats from clothes or other substances, it may produce dermatitis.

P. W. GUMAER (Consulting Engineer, New York City): In one case you mentioned where a man was overcome with acute poisoning in a tank, after it was supposedly cleaned and after other men had worked in there—I would like to explain about that.

You take a ten thousand gallon tank car and supposedly clean it out; it does not take very much liquid solvent to get a concentration which will cause acute poisoning. Now there are certain gums that are slowly deposited on the inside of tank cars, that have carried solvents for a long time. They are on the inside of the car, and if you could steam the car out, some of them would come out, yet not the full amount. Suppose the car stands for a considerable time after it is steamed out, and then the men go in; there has been time then for the solvent to escape from the gums into the atmosphere of the car. On a ten thousand gallon car you get a concentration of two thousand parts of a million, which might cause acute poisoning; it only takes one

cupful, and it is very conceivable that that amount of material might be distributed over the whole surface of the car, inside the car film, although it might be very very thin.

I make this explanation in order to emphasize the fact that no one should ever go into a closed tank for any purpose, without gas mask and attendant, even though it has been supposedly cleaned beforehand.

CHAIRMAN ROACH: I think that point has been well emphasized and I hope it will be more strongly emphasized. In the last seven years we have had many tragedies in New York sufficient to warn us, in backing up the experiences by Mr. Gumaer, about some of these tanks supposedly clean and free from vapors.

I would like to hear from Dr. Winslow.

DR. C.-E. A. WINSLOW (Professor of Public Health, Yale Medical School, New Haven, Connecticut): I was very much interested about the publication of our current comments on industrial solvents. Dr. Sappington and I have discussed it a great deal; certainly if the Industrial Health Division did that work of publication of our current comments on industrial solvents, there would be such a protest from manufacturers of some of the products as to reasonable standards, and such a protest and such fear on the part of industry that these figures would be quoted on compensation cases, that the Industrial Health Division would probably be wiped out. We have to recognize quite frankly that there are certain things the National Safety Council can do quite well. No other organization has the ability to get the things into the actual daily works of the industry; on the other hand there are certain things we can not do in our organization, and I think that is one of them.

When there is a tremendously big issue like benzol, we have to face it and take our medicine; but if we were to start out and give a general list of solvents and their dangerous concentrations, I can assure you the reaction would overbalance the benefit. There are other organizations that can do that. The American Public Health Association can do that kind of thing. They are not responsible to industry; they can do it and we can use it, but I am afraid it would be a very dangerous thing for us to do the thing we ought to do, unless it was big enough to make you believe you had to stand for it and have a big fight.

I was very much interested in another point, particularly the small plant. I listened the other day in the Governmental Officials' Section to an illuminating address by Colonel Reninger. He faced well the fact that where we are following an entirely practical ideal, if we expect to solve the small plant problem it must be through the small plant. He said the only way to solve it was through action by governmental officials and insurance companies. He suggested, I think very wisely, that it would be very well if our officials in accident prevention—I would say the same with those concerned with industrial disease—should devote a very much larger part of their attention to the small plant. The big plants can take care of themselves, as he put it, in the accident field. What is the use of an inspector visiting at regular intervals a big plant that has not had a lost time accident in three years, and ignoring three or four smaller plants in the neighborhood that are having them rather constantly?

I think the most useful thing to do would be to persuade the governmental bodies to devote a much larger share of their attention to the small plant than they do.

DR. C. O. SAPPINGTON (Director Industrial Health Division, National Safety Council, Chicago): May I make a few remarks supplemental to what Dr. Winslow said?

The basis upon which information is given out by the Council, particularly in regard to industrial poisoning, is largely through correspondence. We write probably 3,000 technical letters during a year, endeavoring to answer some of these questions. It seems to me significant that 60 per cent of those inquiries are on chemical health hazards. As you are a chemical section, you certainly must be interested in that trend. In other words, there are about 1,800 inquiries on chemical health hazards that we receive.

Now, in addition to that, you might also be interested to know that approximately 90 per cent of these inquiries do not come from physicians or nurses. They come from safety engineers or safety supervisors, which of course is what you would expect in an organization built up primarily of safety people. We have been recently asked for the safety precautions necessary in storing fifteen one-ton drums of chlorine in a large city.

IRA V. KEPNER (Pennsylvania Salt Company, Philadelphia): We store probably a dozen times that much at the plant, keeping it in a cool place where there is ventilation.

DR. SAPPINGTON: It would be all right in a large city?

MR. KEPNER: Yes. I do not know of any place where they would have restrictions. That is only one tank car or two.

MR. GUMAER: In reference to Dr. Winslow's remarks regarding compiling information on toxicity, I think it would be a great benefit to industry, state departments of health, and labor, and also engineers, to have this information available. Before I can do any work on ventilation, I have to know how toxic a material is, how many particles of material a workman can breathe without endangering his health. A firm endeavoring to use a new solvent wants to know how safe it is to use.

The ideal thing would be to carry on research and determine the toxicity of all these materials; but that is obviously impracticable and would require a long, long time for that work. However, there is information on many materials, and on a great many materials there is no information at all. Some of the information is in obscure foreign journals that the average person would not have access to. My thought that I discussed previously with Dr. Greenburg was that we could compile the information that is available—not publish it, but possibly have it on file for Dr. Sappington to give to any one asking for information on toxicity. It would be a great saving for everybody in that work, if he would give the references, establish a good bibliography on the subject.

The American Chemical Society, Paint and Varnish Section, is preparing a monograph on lacquer raw materials, and they are giving the properties on the very many solvents and materials used in lacquer. It seems as if industry would benefit from such knowledge.

DR. WINSLOW: That is a practical suggestion, and I think Dr. Sappington will confirm me when I say he is quite ready to do that. One of his principal values to the Council members is his readiness to give any such information in correspondence.

DR. SAPPINGTON: I think, if I may be allowed to say another word, there is a distinction which Dr. Winslow has made between documentary evidence, which is broadcast over the entire country, and the other method which we use through correspondence when we discuss specific problems; there is a distinct difference between the interpretation of information given in those two types of media. Now there is much more chance for misinterpretation in printed documentary evidence of the kind that we put out in our pamphlets, than there is when a member writes in for information on a specific problem, and gives you exactly the problem he would like to know about. I think that should be emphasized, and probably that is exactly what is in Dr. Winslow's mind.

DR. J. P. LEAKE (United States Public Health Service): This is all very interesting, and I think very profitable.

In regard to carbon tetrachloride, to make the record complete, probably several of you know of instances that were cited, in Kansas City, with affidavits, and so on, with fatal results, supposedly, from the use of one of these cleaning machines, using carbon tetrachloride. From what I saw of the data, it did not look conclusive that that was the cause of death or probably some toxic effect.

CHAIRMAN ROACH: Mr. Timm, do you care to join in the discussion?

E. A. TIMM (Standard Oil Company of New Jersey, Bayonne, New Jersey): I just wanted to state we had an electrician who was cleaning a motor with carbon tetrachloride, spraying it in there, and the man was using a gas mask at the time;

but he took off the gas mask and he was slightly overcome. Of course we took him to the first aid and gave him the necessary treatment and he came around all right. I wonder, in spraying that carbon tetrachlorid, if phosgene is generated there without the application of heat?

MR. GUMAER: If your commutator is sparking very badly you have intense heat at the sparking point.

MR. TIMM: The motor was shut down.

CHAIRMAN ROACH: I was very much interested in that part of Dr. Bricker's paper that dealt with the possibility of toxic poisoning from benzene, that is the petroleum distillate. I wonder if we have any American cases on that. We certainly make enough of it to have had some experience with it.

DR. LEAKE: I know of one fatal case of gasoline poisoning.

R. E. YANDELL (Standard Oil Company of New Jersey, Elizabethtown, New Jersey): The last speaker commented that he knew of an occasion of death due to gasoline vapor. Just what manner or nature was that?

DR. LEAKE: Of course it is not the same thing as petroleum benzene, but quite similar. This was a boy cleaning a car off with gasoline, spraying it all over the car in a tightly closed small garage. We know that it is toxic and that apparently was the only possible cause of death, at the autopsy.

We know of a lot of cases, particularly in our southern refineries, where tramps go in a long string of tank cars in a train, a rain comes up, they find an empty one and go in and the tramp is always found dead when the tank car reaches the refinery.

CHAIRMAN ROACH: Gentlemen, the floor is still open for discussion. I doubt whether the subject has been exhausted. I was very much interested in what Dr. Winslow said about frequent plant inspection of small plants. I think that practice is carried out in most states, to give very much more attention to small plants than to very large ones where they have such engineering services that the police inspection made by the departments of labor is not very helpful. After all, you must remember that our authority is based upon police power. When we go in, we do not go in by asking permission of anybody. The state commands a certain thing be done, and while we try to "soft pedal" that particular aspect of plant inspection we would rather go in there, if we have the ability, to give consulting advice on matters. Primarily the authority of a state inspector is a police authority, and we do very much better with that kind of service in medium and large sized plants than probably we do in plants only employing a few people.

It is much more difficult to convince a man employing ten or fifteen people, that the plant requires a great deal of safety attention, than it is to convince a very large plant employing a large number of people that the safety program is an important part of their operating program. It is possible to go into the small plants and see that plant premises are reasonably safe, structures, buildings, equipment are safeguarded, and if those were the major causes of accident, there would not be any problem about it at all, because we would not ask the help of anybody to make plant premises safe so far as buildings and equipment are concerned.

However, if you look over your records you will find that unguarded machinery or dangerous structures are not the major causes of accidents in industry, but that the unseen things that are not altogether visible at the moment when an inspector is there, are the ones that we have to guard against, and that is where this safety educational feature comes in. If we were to inspect small plants once a month (which NO state does, no state, I am sure of that, they would not have an inspection force large enough, and I do not believe they ought to have it large enough to do that) I doubt even then if it would make the plant very much safer, unless we can sell the thought to the man that operates the plant, that is on the premises all the time, so that he becomes safety conscious. Down in our state we are trying to do that through annual state-wide inter-plant safety contests, that will permit an employer having ten or more people to enter the contest.

I have in mind an accident in a tank that cost three lives in a small plant. No

kind of factory inspection could prevent that type of accident. One man entered the tank that was sour, was overcome, and another entered, and he was overcome; a third went in, the superintendent of the plant was the third man, and he was overcome by the vapors, and then a fourth man went in and brought out the other three. The three of them died. The superintendent of that plant certainly was not safety conscious, because our rules are printed, published and posted, that NO person shall enter a tank without a life line, and a fellow workman on the outside at the end of that line. But these rules were disobeyed, and probably had never been followed out, for the reason that in that small plant the man who was responsible for the operation of the plant was not safety conscious.

We can do a little to sell safety in a plant. The insurance carrier can do a great deal, and most of them do a great deal, in selling safety in the small plants; but I am not a bit sure that we are going to solve the problem of the small plant until we can educate the man employing ten or twelve people, that he has just as grave responsibility resting upon him for the safety of those men, as has the man who employs five hundred or a thousand people.

MR. GUMAER: I spent about five years in studying a particular industrial poisoning and giving free service to plants where that particular chemical is used, in endeavoring to get them to use proper precautionary measures, and it is my opinion that in industrial poisoning, the problem of the small plant is even greater than in the case of accidents in the large plant. I infer that the only solution to that, as Dr. Winslow mentioned, is better state supervision.

Now the larger plant is being penalized by the poisoning of the small plant. The small plant does not take the interest that the larger plant does. In most cases I have never encountered any difficulty at all in getting the larger plant to make changes in their ventilation for precautionary measures. They are willing and anxious to do it. It is very seldom that the small plant follows recommendations willingly. I have even had to get the firm I represented to state that they would refuse to sell them the material if they did not make changes. That shows you the impartial attitude or the attitude of large producers to protect the health of individuals even at the expense of their own sales.

In Mr. Roach's state about a year and a half ago, I happened into a plant, and a man was using the solvent in cleaning off tires, just before they were wrapped. He was down in the basement, in a corner of the room, where there was absolutely no ventilation. The man looked anemic. I warned them at that time, that it was a very dangerous condition, and that they should put in exhaust ventilation. They had been in financial difficulties and did not do it. A month from that time the man was dead.

The problem is the small plant. I think there is room for improvement in the state inspection. The inspection of these solvent toxic materials is left to routine factory inspectors. Very few of them know about proper use of these solvents and the ventilation. If each state would have at least one man especially trained in this particular line, and they had gradually acquired—like Dr. Gray has in Connecticut—a list of all the plants in the state that are using chemicals, and this particular man made inspection of that plant, and of the amount of the air necessary, it would go a long way toward solving the problem.

A. V. BERQUIST (Youngstown Sheet & Tube Company, East Chicago, Indiana): I am interested in a steel plant but we also are associated in chemicals in a way. It strikes me that nothing was said about the use of self-contained apparatus in the rescue of men who had been overcome from poisonous fumes of some kind, ammonia gases or fumes from oils, and the like. I would like to hear an expression from some of the members as to what they do in the training of men as to the use of self-contained apparatus for rescue work.

CHAIRMAN ROACH: Is there anybody here that can answer the question?

MR. YANDELL: I might answer that. We are in the petroleum manufacturing industry and we realize it is hazardous. You are more or less constantly in contact

with gases. Not as an answer, but as a preventive, I might recommend the very close scrutiny of the possible dangers and warn the men against entering into gaseous areas without the necessary equipment. We also try to emphasize that to employees particularly in our process operations, by giving them at least once a year instruction in the pressure prone method. You can always get a capable instructor. We emphasize the pressure prone method of resuscitation.

We usually catch the men after their shifts and reimburse them for coming there so there is a considerable number of the men entering into that training, and after they have that it makes them more conscious of that danger. In case of necessity, although there are plenty of them I have seen get out of there, I would hate to have my life depend on their ability, but it does make them safety conscious and in a number of cases it is advantageous.

Mr. BERQUIST: We may have a break in the line in the ammonia building; the men in there possibly may be overcome. How do you get them out?

Mr. TIMM: As far as the self-contained apparatus is concerned we find we can add the fresh air hose line to the gas mask; that is, if the man is overcome. If the man is overcome in the first place, we can get to him with a twenty-five or fifty foot length of fresh air hose. We have not discovered any case yet where we have to use a self-contained breathing apparatus, either a Gibbs or McKay. We use the ammonia canister type of gas mask, with a fifteen hundred or two thousand c. c. canister to it.

Mr. BERQUIST: I think any plant, of any size, ought to have a man drilled in McKay or Gibbs apparatus. We recently had a Bureau of Mines man, Mr. Grimes of Vincennes, Indiana, come up and train some of our men. It seemed we could do with green men; in the use of McKay apparatus, you can train them in a short period of time. We trained them in a month. They can go through the process, take the machine apart; we held competitive drills with those men after one month training, three teams; we put them through a smoke room for three minutes, changing the apparatus, sterilizing, shutting off the bottle, sterilizing, putting on the goggles, made a complete change of four men in twelve minutes.

Mr. TIMM: If you have use of that type of self rescue, it is a fine thing to train a man. We did back in 1920 train a man in the use of the McKay machine. We found it was a two hour machine at that time; a man trying to get into the tank car would have an awful job on his hands.

Mr. BERQUIST: In a tank car it is impossible to do that.

We also use a power blower. We have a little different situation than you probably do in a chemical plant, because with the gases and carbon monoxide being present you may have them spread around. With the power blower, if you do not set them down in an atmosphere that is absolutely pure, you are liable to blow gases or draw gases into the blower and blow them to the men.

Dr. EDWARD G. MEYER (United States Bureau of Mines, Pittsburgh, Pennsylvania): There is a representative here with the Bureau of Mines, with a gas mask exhibit. I invite you people to write in and tell your experiences and ask what suggestions we can give to solve your difficulties. There are a great many of these difficulties we never hear about and naturally we can not improve the equipment.

FRANK SCOTT (Hamlin and Company, New York): I am representing the Consolidated Gas Company in New York. In connection with this question regarding rescue work, they have cars equipped for emergency service. They have on them the two hour apparatus and also the half hour oxygen breathing equipment; we recently have installed one hour apparatus on our larger holdings. I do not think it is generally known that they have the one hour oxygen breathing apparatus. The

ADJOURNMENT

TWENTIETH ANNUAL SAFETY CONGRESS NATIONAL SAFETY COUNCIL



Construction Section

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Tuesday Morning Session

October 13, 1931

GEORGE WIDUA, Chairman

Woods Brothers Construction Company, Lincoln, Neb.

The first session of the Construction Section convened with General Chairman George Widua presiding.

CHAIRMAN WIDUA: It is a great pleasure to see this large assembly and I bid you welcome.

I want to say that I think the chairman of our Program Committee, Mr. Tubesing, has arranged a fine program, one of the finest that I can remember in the Section, and I think we will all learn considerable from the speakers who are to deliver the papers.