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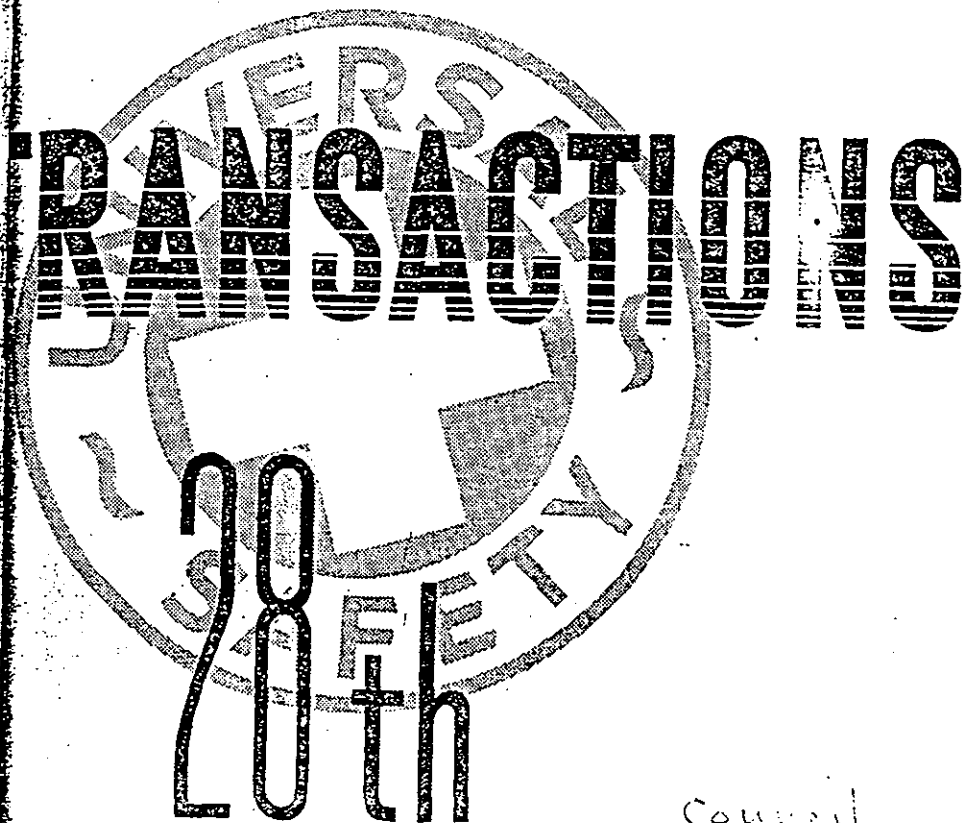
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Council
NATIONAL SAFETY CONGRESS

Transactions

ATLANTIC CITY
OCTOBER 16-20, 1939

NATIONAL SAFETY COUNCIL, INC.

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Council Purpos

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

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

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

3. MAINTAINING INTEREST IN SAFETY. People retain interest in very few things of which they are not continuously reminded. Therefore, it is the task of the newspaper, the radio, the magazine, the school, the public speaker and every other educational influence to keep reminding the worker, the driver, the pedestrian, the housewife and the school child that freedom from accidents depends on personal caution, and that the safe way is the right way and the best way—from the standpoint not only of human satisfaction, but of social efficiency and economy.

4. ENGINEERING IMPROVEMENT. Many accidents occur because equipment is faulty. The punch press is unguarded, the automobile brakes are worn, the stairway is crudely built, the propeller is defective, the stop sign is obscured. The avoidance of accidents, therefore, requires that safety be built into every piece of machinery, every home, every school, building, every high-

Occupational Disease Control

THURSDAY MORNING SESSION

October 19, 1939

sound unit operating a strip film projector may not be adapted to the sound recordings of the film. The opaque projector, a slide unit and the may be readily adapted.

For the basic governing principles presented. Pictures

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amp housing and sub

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portability is more or less governed almost entirely by the projection power and to portability. I have a projector lamp below 200 watts.

My preference is for a projector bulb of from 150 to 200 watts larger than this circuit which may be needed. In projectors larger than 300 watts draft ventilation otherwise damage to the projector is almost certain. The bulb itself may overheat.

The session planned for the discussion of problems in industrial occupational disease control was called to order by A. S. Johnson, Assistant to the Manager, Engineering Department, American Mutual Liability Insurance Company, Boston, Mass., who presided. The problems were presented as a panel discussion, and Chairman Johnson introduced the members of the panel, as follows:

Roy S. Bonsib, Chief Safety Inspector, Standard Oil Company of New Jersey, New York City.

Warren A. Cook, Division of Industrial Hygiene and Engineering Research, Zurich General Accident & Liability Insurance Company, Chicago.

Dr. A. G. Cranch, Industrial Toxicology Department, Union Carbide Company, New York City.

Dr. Leonard Greenburg, Executive Director, Division of Industrial Hygiene, New York State Department of Labor, New York City.

Willis G. Hazard, Personnel Division, Owens-Illinois Glass Company, Toledo, O.

Dr. E. G. Meiter, Director, Industrial Hygiene Laboratory, Employers Mutual Liability Insurance Company, Wausau, Wis.

Dr. O. A. Sander, Milwaukee, Wis.

The Discussion Plan

CHAIRMAN JOHNSON: We have agreed to have a working base from which we will talk. This working base from which we will try to develop our opinions is what I choose to call a triangle of responsibility, visualizing what may be called the three A. B. C.'s of an equilateral triangle.

At the top of this triangle is management of an industrial enterprise, the man who has to pay the bills, the man who hires the labor, the man who worries about

their health. On the left base is the medical side. They are the group employed to carry out the medical part of industrial management's responsibility. And on the lower right is the third base of this triangle where we find the engineers or industrial hygienists, who have to develop and prepare for the operating group the controls of occupational disease, as far as engineering is concerned with controlling them.

Now, there is a strong tie between the medical and the engineering phases through that base line of the triangle. What we hope to do in discussing each topic is to develop that tie, which we will call the balance of opinion between the medical phases developed by the doctors on my left, and the engineering phases developed by the engineers on my right.

I would like to ask this panel a question. For a great many years occupational hazards have been studied in one industry or another. Would this panel feel, let us say, sanguine that any industrial enterprise is now ready, by employing proper personnel, by searching out the answers wherever they may be found, to solve an occupational disease problem if they have one, and by the proper solution maintain the safety and health of the employees? Put another way, are we still groping in the dark on some of these hazards by reason of conflict of opinion, conflict of experimental data and theoretical expression by folks who find the theoretical hazard in exposure because it is suggested in the book? Will Dr. E. G. Cranch talk briefly along this line of suggestion?

DR. CRANCH: This question is a broad one: Is any industry satisfied that it is in a position to solve an occupational disease on the basis of present information? I would say, absolutely yes, for the majority of occupational disease problems are sufficiently understood to adopt efficient measures for control.

CHAIRMAN JOHNSON: Frequently I hear it said, "Well, why should I do anything about this until you folks come to terms on whether I ought to have two parts per million or two thousand parts per million?" Let us develop this farther and ask the opinion of Dr. E. G. Meiter, on the engineering side.

DR. MEITER: I agree with Dr. Cranch that there is enough known to solve these occupational disease hazards. If some employers are not willing to do anything at all until all possible information is available, I would say that they are never going to start.

In solving these occupational disease problems, we have a progressive solution. In the same way that the 1940 automobile could not have been built in 1920, just so are we progressing in all the branches of engineering, ventilation, ventilation equipment, and respiratory protective devices, and so I think adequate information is available.

A Basis for Truth

CHAIRMAN JOHNSON: I think we have a balance of opinion there. If you have an occupational disease hazard, there is enough knowledge stored somewhere in the books and brains to tackle it or solve it in progressive fashion. But we are cluttered up, I think, by a lot of crack-brained notions. I have read any quantity of literature in which somebody has ventured the opinion that because such and such materials are used, we must have a hazard that is just about ready to kill off the population of the plant.

Do we know enough about the hazards and control of benzol, silicosis, arsenic, phosphorus, radium, x-ray, and so forth, to sort out the truth and build upon solid fact an effective safety program? Will Dr. Leonard Greenburg develop that for a couple of minutes?

DR. GREENBURG: It seems to me that there is a definite body of evidence which is available on the more important occupational poisons and for the more important occupational diseases, that makes it possible to prevent and control these poisonings and these hazards with a great deal of certainty.

That holds for substances such as carbon monoxide and lead and chromium and

arsenic and benzol. The chief reason, it seems to me, why we still continue to have poisonings in industry is because the employer and the worker do not realize the gravity of these hazards and do not take the problem seriously enough to institute the necessary and proper means of prevention.

CHAIRMAN JOHNSON: Now I am going to switch to the engineering side and ask the same question. Let us visualize an industrial enterprise that is fearful, that has a notion that some exposure is a serious one, and wants to know if there is anything from an industrial engineering standpoint that will make it impossible or difficult to devise the proper instruments to measure the quantity of exposure, whether it be dust, gas or fume.

I am going to turn that over to Warren Cook.

MR. COOK: Today we have more methods available for finding out how much of the injurious materials a man is being exposed to than we have ever had in the past. Formerly it was a very laborious procedure in most cases to analyze the atmosphere inhaled by the worker. Today in connection with more and more of the injurious materials, we are having placed in our hands and are having developed methods which will quickly tell us how much of the injurious material is in the atmosphere breathed by the worker.

We have devices which will determine the concentration of carbon monoxide merely by reading a gauge. Similar equipment is being developed for other injurious materials. For vapors, about the best device is the Innerperometer, and we hope we will be able to get equipment of this kind manufactured in this country one of these days, but at the present time it is rather difficult to obtain.

Practically all of the injurious materials in industrial atmospheres can be determined. Some of the methods are more simple than others, but methods are being simplified all of the time so the safety engineer in the plant can avail himself of these methods.

CHAIRMAN JOHNSON: Now I am going to ask Roy Bonsib a rather critical question. In cases of doubt, where fear has to be balanced with knowledge, would he think it advisable to attempt to detect a hazard in a plant without technical

measurement? That is, by visual inspection. Or does he feel that it is a question desirable to have the survey technically by industrial hygienists, men trained to sample proper proper instruments?

MR. BONSBIB: I think the trouble in industry today is that there has been too much guess work, dealing with insidious problems such as new substances and some of the substances which have been introduced, pretty hard to hang your hat on anything, and the average executive wants to know exactly what is going on. You cannot know that without evidence. You have got to get the information and data.

When once you know the facts, they can only be obtained through means and by experienced people give them something definite, they can base definite conclusions which you can base your measures.

CHAIRMAN JOHNSON: I am assured that we can discuss some problems. We have our base, an agreement that there is no occupational disease hazard that is not based on fact, that there is sufficient evidence to sort fact from fancy, and that we have instruments sufficient in quantity and kind for proper engineering and that there is no need of guesswork.

Let us start now an occupational disease control program. We have the management at the top, the hazard, if any. Control it. I am setting up a medical department, setting up engineering or hygienists. I want you fellows to develop a program so that my operation can install the necessary whatever they may be, and assure there will be no emergence of a reason of these exposures."

The Medical Program

Let us build first the medical program. Of what does it consist, Dr. O. A. Sander?

DR. SANDER: I am glad to see the need of a medical program in occupational disease control, and with the engineering examination of all work

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chief reason, it still continue to be because they do not realize the hazards and do not try enough to use proper means of

ON: Now I am engineering side. Let us visualize that is fearful, the exposure is a no know if there is industrial engineering it impossible or proper instruments of exposure, or fume.

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we have more finding out how materials a man is have ever had was a very laborious cases to analyze by the worker. In more and more we are having de will quickly tell serious material is by the worker.

h will determine carbon monoxide. Similar equipment for other injuries, about the best, and we hope equipment of this country one of recent time it is

serious materials can be determined methods are more methods are being so the safety engineer avail himself of

ON: Now I am a rather critical doubt, where for knowledge, would attempt to define without technical

measurement? That is, by visual observation. Or does he feel that it is beyond all question desirable to have the survey made technically by industrial hygienists or by men trained to sample properly with proper instruments?

MR. BONSB: I think the greatest trouble in industry today is that there has been too much guess work. In dealing with insidious problems such as the new substances and some of the old substances which have been introduced, it is pretty hard to hang your hat on everything, and the average executive today wants to know exactly what is what, and you cannot know that without concrete evidence. You have got to get definite information and data.

When once you know the facts, which can only be obtained through technical means and by experienced people, you can give them something definite on which they can base definite conclusions and on which you can base your preventive measures.

CHAIRMAN JOHNSON: Now I feel assured that we can discuss some detailed problems. We have our base. We are in agreement that there is no ordinary occupational disease hazard that cannot be coped with, that there is sufficient evidence to sort fact from fancy, that there are instruments sufficient in quantity and kind for proper engineering analysis, and that there is no need of guessing.

Let us start now an occupational disease control program. We have Plant X. The management at the top says, "Find my hazard, if any. Control it, if need be. I am setting up a medical department: I am setting up engineering occupational hygienists. I want you fellows to work out a program so that my operating department can install the necessary safeguards, whatever they may be, and assure me that there will be no emergence of disability by reason of these exposures."

The Medical Program

Let us build first the medical half of that program. Of what does it generally consist, Dr. O. A. Sander?

DR. SANDER: I am glad you emphasized the need of a medical program in an occupational disease control program, along with the engineering control. An initial examination of all workers exposed

to a particular occupational hazard is as necessary as is the exact determination of a hazard by engineering methods.

The appearance or the findings in any group of workers exposed to a particular dust, or what have you, gives an accurate picture of the hazard which has existed over a period of years. That picture is one which the engineers cannot give you, because their dust counts or other determinations may be only temporary or may vary from day to day. It may have changed considerably in the past few years; the hazard may have been for example, ten times as great two years before as it was on the day the dust counts were made. So no occupational disease control is adequate without initial examination of all employees.

CHAIRMAN JOHNSON: Dr. Sander has developed the need for the medical examination as a survey question to determine whether conditions as they have existed have produced any pathology in the men. Let us assume that, and install our program of control. Dr. Greenburg, what do you feel about the need for periodicity in the examination program?

DR. GREENBURG: That would largely depend on what particular hazards were present in the plant itself. In certain cases it would be desirable to examine workers very frequently, perhaps even as often as once a month; and in other instances it might be very satisfactory to examine them once a year, depending on just what particular substances the workers were exposed to in their daily occupation and how satisfactory the technical means of control were.

For example, in the case of benzol, it might be satisfactory to examine workers every three months. I believe in the case of tetraethyl lead, the du Pont Company examines its employees about once a month, though I am not quite sure about that. In the case of sand blasters, it might be desirable to examine them and x-ray them every six months; whereas in the case of foundrymen it might be perfectly satisfactory if the men are engaged in ordinary foundry work to examine them once a year and x-ray them once a year or once every year and a half.

It would be largely a question of judgment, depending on the particular occu-

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pation and the particular substances employed.

CHAIRMAN JOHNSON: I would like to ask Dr. Greenburg to amplify just one point. If the survey about which Dr. Sander spoke discloses no specific occupational disease hazard as having caused any pathology—and that is the situation that obtains in most plants—but still there may be some moderate exposures to this or to that, and the management wants to be perfectly sure, how often as a general thing should those men come up for re-examination?

Understand, this survey has disclosed no pathology, no damage, nothing you can put your teeth in or hang your hat on as indicating a great need for engineering changes in current methods of control.

Re-examination Periods

DR. GREENBURG: That would largely depend on whether there were any hazardous materials being used in the plant. If the condition of the men at the time of the initial examination was quite negative and no hazardous material is being used in the plant, I should say the decision as to whether or not you are going to have physical examinations is largely an open one, and a matter of wide judgment.

For example, in the case of a department store's employees, where young women act as salesladies, under ordinary conditions, it might not be necessary or desirable to give them physical examinations more than once in five years, perhaps not even then.

If, on the other hand, the physical examinations were quite negative, and yet toxic materials are being employed, the decision would depend on how toxic those materials are and what the analysis of the plant atmosphere shows.

It seems to me that the answer to the question is a matter of judgment which must be based on a comparison of the relative hazards of the exposure as compared with the cost and desirability of continuing intensive physical examination, and only by knowing the detailed facts can one arrive at a sound decision in a particular given instance.

CHAIRMAN JOHNSON: I think that it is very important for you all to

consider carefully the opinion expressed there. You will observe that he has placed the burden upon his own profession, by careful discussion, of course, with the management that is to pay the bill; but the decision must rest with the doctor upon the evidence as presented by the conditions of the plant and the employees themselves.

There is no cook book formula which says you must put employees through the mill at standard intervals. But the making of medical examinations is another thing. It always presents problems, because men frequently are frightened when they know they are being examined to see if there is anything the matter with them, not just being examined to see if they are all right. They are always fearful that some dire calamity may overtake them soon. It is a real personnel problem, one that has to be handled with judgment.

I am going to ask Dr. Cranch if, in his long experience of examining a great many employees for operating exposures that might not be hazardous, he has always been able to keep those employees calm and collected and quiet and quite content with what things were found.

DR. CRANCH: Physical examination programs for occupational disease control can hardly be divorced from a physical examination program aimed at general health conservation. Where it is possible to have a medical service, where the physician is in daily contact with the man, physical examination presents far fewer difficulties than where it is done only for the sake of occupational disease control.

If an outside physician comes in to examine certain groups of men at intervals of from one month to two years, men logically have a right to expect that there may be something going wrong with those who are called in frequently, and that leads to considerable nervousness on their part as to what will be found.

There is a matter of psychology and practice in carrying out such a program of examinations. It is much simpler, where it is possible to arrange it, to have reasonably frequent examinations for general health conservation, and these examinations, then, will be included in the regular procedure and help to determine the effects of an occupational disease exposure.

As Dr. Greenburg said, we do attempt as a rule a routine examination at a fixed interval of a year, we do. The periodicity of our re-examinations is determined largely by several factors: first, the possible exposure to occupational disease hazards; second, what we have in connection with that man's health days go by.

Our supervisory force is usually instructed to send in any man who seems a little under the weather, who doesn't seem to be doing well, who seems slipping a little. From their recommendations often we pick up cases that require examination which otherwise would easily have been overlooked.

Another thing which we have to remember is that many symptoms are connected not only to occupational diseases but to diseases incident to life in general; a medical program for the control of occupational disease is therefore extremely important in that the contact must be established with the men to determine what changes are going on and what the origin is.

CHAIRMAN JOHNSON: The important point to me is that you drag in a physician from the outside, a total stranger to your problem, because he is an expert toxicologist, expert something else, and ask him to do a medical examination or control for about a week, and then depart.

Hire him to consult with your physician, but let your own physician fold the occupational disease program into the general health conservation program, that the findings of the one augment and support the findings of the other.

Now I am going to talk to the engineers and assume that a survey has been made in which we have discovered a sufficiently dangerous so that, in the doctor's opinion, something ought to be done about it. I am not assuming the men are gone so far as to kill men, but it has manifested itself either in moderate early symptoms or some actual demonstrable pathology in a few.

I want to ask this group of engineers what they want the medical men to do, what they may use to instruct them in their own work in connection with the occupational disease

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I want to ask this group of engineers
what they want the medical men to tell
them which they may use to utmost ad-
vantage in their own work in connection

with surveying to locate and find the
hazard that they want to control.

Will Willis Hazard discuss that one?

MR. HAZARD: It seems to me that
the most important thing that the doctor
can tell the engineer is what his findings
are from the physical examination. That
more or less determines how serious the
hazard is; it often isolates it to certain in-
dividuals in the plant, and that points the
way to places that should come under en-
gineering control in that regard.

CHAIRMAN JOHNSON: Perhaps
you have already visualized what I am
leading to. I want Mr. Bonsib to develop
that a little farther. Here we have the
medical examination installed to disclose
what is wrong, if anything. I want him
to develop the engineering control method.
What fact and what data does he need to
go about his business?

Engineering Control

MR. BONSI: Since the amount of
damage to the human mechanism depends
upon the exposure and the concentration,
the engineer should know the maximum
allowable concentration to which he would
have to maintain the working atmosphere
or the working condition, and as an en-
gineer that is something that the medical
profession must give so that the engineer
will have something to which to work.

I think the answer to the question, then,
is that it is very essential that the thresh-
old or maximum allowable concentration
permissible be known.

CHAIRMAN JOHNSON: I do not
think we will quarrel about that. I am
certain no engineering group will stick
out its neck far enough to define for the
medical profession what constitutes the
safe threshold limit. It is not quite the
answer to the question I had in mind,
however.

For a great many years, you know, the
medical profession has been conducting
its work successfully in industry, main-
taining the greatest degree of confidence
between the employees and the doctor
through the fact that the doctor never
revealed what was the matter with the
man if there was anything wrong. He
grades the men in a general way employ-
able, or employable subject to medical

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service, or employable in limited exposures.

I think I have blown open a question here: Can the doctor inform the engineer of a sufficient number of facts about the hazard to which these men have been exposed without weakening that professional confidence which he has established in the workmen whom he is examining?

What I want this group of engineers to develop is: Can they use adequately mass information, or information about the group, without having to know that Mike Dambrowski is about one month from emerging with a disability? Will you develop that, Mr. Hazard?

MR. HAZARD: It seems to me it is entirely possible for the engineer to use the medical results in a purely statistical manner. He does not have to know who is sick or whether it is Mike Dambrowski or somebody else. It is extremely important that he know the number of people who are showing the same ailment and the number of people who are working in the department or the plant as a whole.

MR. BONSBIE: I do not see how you can protect against something unless you know what it is going to do; and I do not see how you can provide necessary protective measures without knowing to what extent you have to go on them. You must know the threshold limit to which the substance or the material, whether it is gas, fume or dust, is causing the trouble. If you do not know what the toxic limit is, that is, the amount it takes to make people sick or how much the human mechanism can stand, making due allowance for the idiosyncrasies of the susceptible, I do not see how the engineer can provide the necessary measures.

Therefore, I still maintain that the threshold limit is the essential thing for the engineer to know. That gives him something to shoot at. In other words, he must reduce that concentration to the point below which it will not make anyone sick, and the length of exposure necessary to which that person must be exposed.

MR. COOK: An instance might be cited where other factors than threshold limits have been utilized. For example, in the gypsum industry, in certain plants there is what is known as a sanded plaster manufacturing operation where there is

much dust. It had been shown that gypsum dust itself does not cause silicosis or injury to the lungs. Where there is silica sand, we look for that injury to the lungs and the development of fibrosis and silicosis where the exposure is high and continued over a long period of time.

Consequently, where about half of the material used in this operation was silica sand, it was the guess of the engineer that here was a condition which had to be controlled effectively to keep the dust concentration down to very low levels.

To everyone's surprise, the x-ray examinations of workers who had been exposed to these operations for a number of years, showed that there was no development of fibrosis.

Further engineering data was collected, and it was found that two things happened. In the first place, the grain size of the sand was rather uniformly large and well washed. There was no abrasive action to produce a great number of fine particles. In the air itself, the concentration of free silica was not 50 per cent, or what it was in the main material, but only one or two per cent. Finally, laboratory examination showed that where you get quartz dust falling, or where you would get gypsum dust settling out of the air fairly rapidly, the quartz dust settled out more rapidly; and the combination of quartz and gypsum settled out even more rapidly than either one alone, due to the fact that the gypsum dust caused agglomerations with the silica dust, and you had large groups of particles which caused this more rapid settling.

Now, the data obtained through the medical examination and the x-ray was what gave the hint that the cost and the completeness of the control at that operation was not as great as it would normally be thought to be by the engineer walking into the situation.

CHAIRMAN JOHNSON: I think that illustration binds together these various points.

I have watched that particular study developed with a great deal of interest, and, for a fact, the engineers did not know, or did not have to know, anything about the men as individuals; the doctor kept that in his file completely.

Now let us summarize for just a moment, to see where we have arrived. We

have the doctors and the two bases of our triangle, sanguine that hazards. We know enough, therefore, to edge in the aggregate. We say that the need for a program is as vital as the engineering program; that to be the plant doctor, specialists as he needs to work with him; that the amount of factual information must turn over to the engineer for his use as a performance, and that should tell the engineer how the hazard must be made reasonably safe; the perfectly willing and hazard in some fashion; and the period of time to find out whether he did a job or not depends on the doctor fine in the men themselves.

Of course, the engineer continues to use the information to check their own results.

Now I am going to program and explore the suggestions there. I discuss phases of exhaust in the engineering of describing machinery or to make it possible to design an exhaust system. He thinks he needs it? He trades, glorified vacuum market to pick one and install it in the to produce results?

Dr. Meiter, will thoughts on present tailor-made exhaust engineering design of fit the individual plant?

Exhaust

DR. MEITER: It is not available ready-made equipment. The can select from a catalog your problems has been in the progress of this.

By that I mean that the man will have, say, they call him in and

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have the doctors and the engineers as the two bases of our triangle. Our panel feels sanguine that hazards can be controlled. We know enough, there is enough knowl- edge in the aggregate to control them. We say that the need for a medical pro- gram is as vital as the need for an en- gineering program; that the doctor ought to be the plant doctor, augmented by such specialists as he needs to employ to coun- sel with him; that they have a certain amount of factual information that they must turn over to the hygienist or en- gineer for his use as a check for his per- formances, and that the medical crowd should tell the engineering crowd how low the hazard must be taken to consider it reasonably safe; that the engineers are perfectly willing and able to tackle the hazard in some fashion if they know those things; and the periodicity of the exami- nation to find out whether the engineers did a job or not depends upon the condi- tions as the doctor finds the record written in the men themselves.

Of course, the engineers are going to continue to use the instruments of survey to check their own results.

Now I am going down to our printed program and explore some of the ques- tions suggested there. The panel will dis- cuss phases of exhaust systems. Are there in the engineering catalogues, data de- scribing machinery of one kind or another to make it possible for the engineer to design an exhaust system if he wants it, or thinks he needs it? Are there enough high grade, glorified vacuum cleaners on the market to pick one out of the catalogue and install it in the plant, and expect it to produce results?

Dr. Meiter, will you develop your thoughts on present market conditions of tailor-made exhaust systems as against engineering design of exhaust systems to fit the individual plant circumstances?

Exhaust Systems

DR. MEITER: In my opinion, there is not available ready-made exhaust ventila- tion equipment. The assumption that you can select from a catalogue and ventilate your problems has been a great drawback in the progress of this work.

By that I mean this: Oftentimes a con- taminant will have, say, a local tin worker. They call him in and he, without know-

ing what the requirements are of the State Code, without knowing the limits to which the gas, dust or fume has to be exhausted, immediately sets about and de- signs a hood.

Then, without even knowing how much air can be handled by that hood, he looks into the classified section of the telephone book and calls up the fan company. The fan company has a salesman, but he is not in, so the office girl looks up the technical data, and the company ships the fan.

When this ventilating system is finally installed, the sheet metal worker says, "Well, the sheet metal work portion of it is all right, and that is all I guarantee."

Then the fan company, on the other hand, says that the fan delivers a certain volume of air at the speed shown in their catalogue, so they wash their hands of it. And finally, when the whole thing is in, it does not work and a job has been poorly done. So the point I wish to make is that ventilation, no matter how simple, requires technical knowledge and technical instru- ments to determine when the system is really working.

CHAIRMAN JOHNSON: I think Dr. Meiter has put his finger on a very critical point. When I speak about engineering control, I mean engineering control, and I do not mean tinsmith control. Let me illustrate.

Sander talked about the metal fume fever, zinc shakes. Visualize, if you will, the problem of a shipyard building de- stroyers for the United States Navy of galvanized sheet plate, with a great deal of electrical welding work to be done in confined spaces, in the little tanks and cells of which the ship is constructed.

There is a plant set up in the field, you might say, lying for nearly a year at its fitting-out basin, a little plant about 325 feet long and 30 feet wide, 25 to 30 feet molded depth and heaven only knows how many tanks in it (they get down to pretty small sizes) with welding to be done in most. In those confined spaces welding, steam-fitting and electrical-work must be done. Can you imagine a tailor-made ven- tilating system being used there?

Now let us go to the next question, pro- tective creams and lotions. Let us have clearly in mind that a cream or a lotion is smeared on the skin for a purpose, and

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usually the purpose is to prevent the moderate amounts of something or other from coming into contact with the skin.

These creams and lotions are of two kinds, those that are water soluble for use in oily exposures, and those which are oil soluble for use in aqueous exposures. This use of cream, I declare arbitrarily, as Chairman of this party, is not in lieu of any other control. These creams are used because controls cannot be made absolute, and because there are sensitive skins to be taken care of.

Dr. Cranch, would you like to discuss the effectiveness and the use of creams, from the viewpoint of the doctor who has a cock-eyed purchasing agent who buys an oil soluble when he wants a water soluble, and vice versa?

Protective Creams and Lotions

DR. CRANCH: I think you have started something. Protective creams certainly have a field in the protection of skin from various irritant substances. I would put far ahead of the use of protective creams, however, good personal hygiene and thorough cleanliness on the part of the worker. Where that is obtained, the question of protective creams is of lesser importance; sometimes negative importance.

There are certain exposures, however, where no amount of personal hygiene or cleanliness is enough to protect from possible harm. Therefore, we do have a place for protective creams of the two classes Mr. Johnson has just mentioned.

Primary in the consideration and selection of any cream, of course, is the nature of the exposure. If it is on an oily substance, we must use a water soluble cream which will form a coating over the skin and resist the penetration of the oily material.

And, on the other hand, if it is a water soluble substance from which we must have protection, we must have an oily base in the protective cream.

The first consideration, then, is that the cream itself shall not contain an irritant. That incidentally opens up the whole field of allergy. There are many people sensitive to certain of the common ingredients used in many of these protective coatings. They can probably only be discovered by

means of a patch test or by actual experience in the use of the cream. In that case, some other means of protection must be adopted, or the man assigned to other work.

The great proportion of creams now on the market appear to be reasonably free from any irritants or substances that are particularly likely to bring about an allergic reaction. The main thing is to select the one designed for the type of protection required.

These creams, we have found, are often considerably abused. Men seem to think, in many places, that the cream has to be applied in a coating that by its mechanical thickness to the naked eye will protect the skin. I have seen a man put on a quarter of a pound where half an inch squeezed out of a tube would probably have answered the purpose.

In that case, they often run into other difficulties. Many of these creams which protect from oil substances, are creams which have a soap base; the men are simply running around in a soap poultice, and they work up an irritation which is as great or in some cases greater than that which would have resulted from the exposure they sought to prevent.

In the oily cream preparations which protect from water soluble substances, they offer us very queer mixtures. Lanoline as a base, I think, is the thing of choice for that type of protection, rather than a petrolatum. It works a little further into the skin, I believe, and will protect in a more thorough manner than the petrolatum base preparations which just smear over the surface and are more easily rubbed off and fail in their protection.

Another thing to consider is, that the last word has certainly not been said on protective creams; they are in the process of rather rapid development. I believe there are commercially available many suitable types of protective creams, and, on the other hand, they can be made up for a specific purpose very satisfactorily on the advice of your physician. You can get a very satisfactory cream that can be produced in bulk for your own use.

Respiratory Protection

CHAIRMAN JOHNSON: We will continue the discussion of respira-

tory protection. In connection with the examination of thousand men, Dr. Sander has explanations which they conduct. He knows what they all mean. He has found that some of the men protected by exhaust system are protected by protection, either filters or of respiration.

I interpret respiratory mean the kind of respirator that you stick onto the man. It is all respiratory protection if Dr. Sander would let us know whether or not he has found examination of men that type of respirator has been will actually protect them.

DR. SANDER: Beginning with the sand blasters, undoubtedly the helmet affords almost 100 per cent for the prevention of silicosis. The helmet is kept in good condition and provided the air pressure the helmet is satisfactory.

In the observation of sand blasters in a seven-year period, yet to see the first one who had worked only with the helmet. Also, I have seen a few stage cases develop a silicosis during that interval. The case has been kept at work and been shifted.

We feel that a sand blaster's modern helmet is breathing for anyone else in the foundry. And there is certainly shifting him out onto the piece of respiratory giving him more dust than at his sand blasting job.

As far as the other men are concerned, of course, they are exposed to exhaust where there are a few occupations that are exhausted satisfactorily. Sand and chipping, and when that must be done, it is advisable to wear the filter. However, even there it is advisable to use other method of cleaning that is all that is feasible. Washing with high pressure water and sand, and so on. With ordinary stand-

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tory protection. In connection with the examination of thousands of foundrymen, Dr. Sander has explored the operations which they conduct so that he knows what they all mean. He of course has found that some of the men are protected by exhaust systems, and some of the men are protected by personal body protection, either filters or the airline type of respiration.

I interpret respiratory protection to mean the kind of respiratory protection that you stick onto the man. Of course, it is all respiratory protection, but I wonder if Dr. Sander would like to discuss whether or not he has found by the actual examination of men that the satisfactory type of respirator has been found which will actually protect the men.

DR. SANDER: Beginning with sand blasters, undoubtedly the modern air helmet affords almost 100 per cent protection for the prevention of silicosis, provided the helmet is kept in good working condition, and provided the air pressure coming into the helmet is satisfactory.

In the observation of about 300 sand blasters in a seven-year period I have yet to see the first one develop silicosis who had worked only with the modern helmet. Also, I have seen no so-called first-stage cases develop a second stage silicosis during that interval. A first-stage case has been kept at work; he has not been shifted.

We feel that a sand blaster with a modern helmet is breathing less dust than anyone else in the foundry as a matter of fact, and there is certainly no point in shifting him out onto the floor, removing his piece of respiratory protection and giving him more dust than he is getting at his sand blasting job.

As far as the other foundry operations are concerned, of course it is always advisable to exhaust when possible. There are a few occupations that cannot be exhausted satisfactorily. One of these is sand chipping, and where sand chipping must be done, it is advisable for the chippers to wear the filter respirators. However, even there it is advisable to try some other method of cleaning the casting if that is all that is feasible—for instance, washing with high pressure combined water and sand, and so forth.

With ordinary stand grinding, there is

no need of respiratory protection, provided an exhaust system is used and is in proper working condition.

The exhaust ventilation for swing grinders is a little more difficult, but it has been accomplished. There are very few swing grinders in Wisconsin that are exhausted, however. It has been our experience that swing grinders have not developed as much silicosis as was at first believed, and the reason probably is that by the time they get the castings there is no more molding sand on them. It has all been removed first in the grinding wheels with all the artificial abrasive, so the only silica the swing grinder is breathing is generally plant dust.

Molders and core makers need no special respiratory protection, in my opinion. A molder just could not do the job very well if he were required to wear a respirator from morning until night.

I do not think I would depend on a respirator for the protection of the man with the tuberculous scar. I would rather move him to some other job, or move his job somewhere else, or localize his job in a separate room and ventilate it.

I see no reason why we should worry about a sand blaster today, even with a tuberculous scar. We feel they are not going to develop silicosis, and therefore we think that what little dust there may be will have no effect on such a tuberculous scar. We have not permitted sand blasters with tuberculous scars to continue working on that job, but I think we should permit them to do so today, knowing that the hazard of sand blasting is controlled provided, of course, the equipment is kept in working condition.

CHAIRMAN JOHNSON: That dissertation answers beautifully the question of respiratory protection as far as it applies to the foundry, and I think direct analogy will carry that opinion over into almost any other exposure that you choose to carry it into.

In order to play absolutely fair with everyone in the audience, I am going to start on the questions that have come to me, and there are quite a number.

Here is the first question: Assuming that the development of adequate engin-

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engineering and medical departments is essential to properly control dust hazards. How can the smaller plants, those having 100 or 200 employees, cope with this problem and determine whether or not they have a hazardous dust condition or any other occupational disease condition? It would be impossible in many cases for these small plants to set up elaborate and expensive control departments.

To lead the answer in a definite direction, I am going to suggest that perhaps the answer lies in the recent development in almost every industrial state, divisions of occupational disease hygiene, either in the Department of Labor or the Department of Health. I am sure Dr. Leonard Greenburg would like to answer that question.

The Small Plant Problem

DR. GREENBURG: There are two things that the smaller plant may do: one is to make use of its insurance company to the fullest extent; and the second is to make use of such facilities as the state has at its disposal, either the Department of Labor or the Department of Health.

In approximately 30 states in the Union, there are divisions of industrial hygiene in either the Department of Labor or the Department of Health, and in a few cases in both, and they are always prepared and eager to help the smaller plant, particularly with such problems as this.

Many of the insurance companies have developed divisions of hygiene and have experts on their staff who are also prepared and able to render service along these lines. It seems to me that the biggest problem is to get the small plant management to recognize that the stumbling block is management itself. Once that recognition has been achieved, it is a relatively simple thing to obtain practically free service from either of these two organizations in an effort to really do constructive preventive work.

CHAIRMAN JOHNSON: Let me add one thought to that answer. I am familiar with most of those divisions. In none of them is there anybody carrying a big stick to browbeat or to hammer into shape the small plants that want help. They are already giving help in an advisory fashion.

There has been fear, at times, that you

could not let a state man into the plant without expecting him to change a recommendation into an order overnight. I have not seen that in this treatment of the occupational disease problem. I am not telling you that it does not exist; I say I have not seen it.

I have here a question for our engineers. Yesterday they were talking about welding metal and fume fever, and so forth. Here is the question: Does an exhaust system from electrical welding affect the type of weld?

As I view this question, it means this: When you weld with an electric welding process using a coated electrode, the fluxing of the coating produces an umbrella or tent over the weld arc itself and thereby excludes the air from the arc and prevents oxidation of the steel which is being cast into the hole being filled up, and prevents oxidation of any of the material or metal that is in the fused state.

Now the question is, if you stick a heavy exhaust there and pull away that vapor which provides the protection, do you ruin your weld? Is the control for health at the expense of the weld, or would it be better to forget that and limit the time of the welding?

Does anybody here want to answer that?

MR. BONSBIB: I think that if you have general ventilation there would be very little danger of destroying that umbrella that Mr. Johnson has mentioned. Of course, it is advisable to remove those fumes as near the source of origin as possible. You have to get within eight inches, and not more than that, to really get efficient results, and being that close you do not require more than 100 or 200 lineal feet per million.

I do not think there is enough cooling action to do damage. As a matter of fact, some tests we were interested in making seemed to indicate that there was no damage done. However, you come where the damage would be done if you exceed that, but I do not think you need to exceed 100 or 200 lineal feet per million. If you have general ample ventilation, then you do not have any danger, in my opinion.

CHAIRMAN JOHNSON: That seems to be a logical conclusion. It is certainly an opinion based upon observation of that

sort of problem. T

"Is there enough fire brick to affect

In other words, if its refractory proper and its plasticity on descending order of the fire brick on through plastic chis on the other?

Mr. Hazard, the to talk about the air fire clay, and for w tion let us leave o which is a brick t know to be pretty silica.

MR. HAZARD: a medical question. fire bricks which ar and certain others none or a negligible have a range there called a dangerous c where you are prac exists.

It seems to me t brick with very hig the chipping and k layer against the b considerable dust a hazard, but I would cal side on that ques

CHAIRMAN JO of the doctors discu of the fire clays : handled in the mar

DR. GREENBU the Chairman ougt percentage of free s He has talked aro he has not told us problem.

CHAIRMAN JO lem seems to me notion that maybe mixed that other t produce an allevia ing effect to preve from causing silicos

Clays do not see It is the dry-pan t things that produc of dust some of w I cannot remembe what the amount of

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MR. COOK: The literature does contain some information concerning the development of irritative actions, and we are wondering in Connecticut whether the concentrations which were listed in the literature and the irritative action was associated with a tolerable amount of irritation, or whether it was in the higher degrees of irritation.

We ran some analyses on some formaldehyde gas in an operation where formaldehyde was being used in the manufacture of synthetic resin. The method we used was the bubbling of the air of the plant through water, with two bubblings in a series, and tested with Shift's reagent, the regular method for the determination of formaldehyde; and we got results that were in the area of the breathing zone of less than 20 parts per million, which is usually suggested as a satisfactory concentration.

At one point we ran it up to 90 or 100 parts per million, and at that point I found I could keep my nose there for thirty seconds before I decided to back away from it.

But I do agree with Dr. Cranch and Dr. Meiter that where the irritation does get excessive, then the irritative gas can be taken as the determining factor even though with most of the materials the irritation is not the safe way to determine whether a gas condition is or is not safe.

CHAIRMAN JOHNSON: Here is another question:

"Is sulphur dioxide gas in concentrations as low as 10 parts per million for prolonged exposure considered hazardous to the health?"

Going to the medical side, will either Dr. Greenburg or Dr. Cranch tell us if sulphur dioxide in such low concentration represents a hazard for continuous exposure?

DR. GREENBURG: I cannot say off-hand. It is just about on the borderline, I think.

CHAIRMAN JOHNSON: Now, if an employee upon examination shows a very slight increase of lead content above normal after sixteen years of exposure, would you change his occupation?

I do not know what a "very slight" amount of lead is. I think presumably this means a few stipple cells, or some-

thing like that. If an employee upon examination shows a very slight increase of lead content above normal after sixteen years' exposure, would you change his occupation?

DR. GREENBURG: I would want to know where he showed it, and how.

CHAIRMAN JOHNSON: If I may answer the question, it seems logical that if there is lead showing up, it came from somewhere, and having explored that you can determine the engineering phase of the control, and perhaps he can stay on the job after you have controlled the lead fumes.

Mr. Cook, won't you answer the following question? "What instruments are there on the market which are reasonable in cost for small shops to purchase which can be used to check atmospheres in metal spray work for zinc, iron and other harmful fumes? Must several instruments be used where many types of metals are sprayed during a working day?"

Metal Spraying Equipment

MR. COOK: On metal spraying, there are several angles. No. 1, a booth, a ventilated booth should be used where possible. Secondly, the man should in most cases be given a positive pressure air supply.

Now, assuming that the particular operation is one in which the man may be spraying brass, there are various methods using the ventilated booth. Let us assume for the moment that he is provided with no respiratory protection. If a man is spraying zinc and the booth is providing adequate exhaust so there is not much of a cloud of zinc and he does not get metal fume fever, it is probable that it is not necessary to make any determination for zinc. If during the course of the day the man is spraying some lead and some cadmium, I would feel very definitely that it would be well to run an electrical precipitator sample, analyze the sample, and obtain the electric precipitation for lead and also for cadmium which would be a routine chemical procedure, and the concentration of both of those should be kept below the suggested toxic limit in order to assure that you are on the safe side.

I would feel that it would not be necessary to analyze for zinc under those con-

ditions, or for other of the metals there is some additional one that is particularly toxic. But particularly, if you do have lead or cadmium, the determination should be made for those based upon those determinations to get an idea on the basis of the duration of spraying of those particular metals what the exposure is.

DR. MEITER: I agree with Mr. Cook and I believe the solution of this problem is first, the use of a properly ventilated booth so as to eliminate the exposure of the other workmen in the vicinity.

The second item is the use of a positive pressure airline respirator to protect the operator. I think that conducting spraying operations all over the shop without adequate equipment, especially where such metals as lead are being sprayed to produce occupational diseases, is not the proper thing to do. It is right with the proper type of equipment by providing the booth and protecting the man, and you will then not need sampling devices.

CHAIRMAN JOHNSON: That is a specific answer to the question.

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employee upon exposure. A slight increase in lead level after sixteen hours would change his

would want to know and how.

AN: If I may say, it is logical that if it came from the spraying phase of the process, he can stay on the job and control the lead

answer the following questions: Are instruments are reasonable purchase which spheres in metal and other harmful instruments be of metals are day?"

Equipment

When spraying, there is a booth, a ventilator used where possible should in most cases have positive pressure air

the particular case the man may be using various methods. Let us assume the booth is provided with ventilation. If a man is in the booth is providing ventilation is not much of a problem. Does not get metal dust. He that it is not a determination for the rest of the day the dust and some cadmium definitely that an electrical precipitator the sample, and ventilation for lead which would be a sure, and the concentration should be kept below limit in order to be on the safe side.

could not be necessary under those conditions.

ditions, or for other of the metals unless there is some additional one that is particularly toxic. But particularly where you do have lead or cadmium, the determination should be made for those, and based upon those determinations you can get an idea on the basis of the relative duration of spraying of those particular metals what the exposure is.

DR. MEITER: I agree with Mr. Cook, and I believe the solution of this problem is first, the use of a properly ventilated booth so as to eliminate the exposure to the other workmen in the vicinity.

The second item is the use of a positive pressure airline respirator to protect the operator. I think that conducting metalizing operations all over the shop and without adequate equipment, especially where such metals as lead are sprayed, are going to produce occupational diseases. I believe the proper thing to do is to start right with the proper type of equipment, by providing the booth and protecting the man, and you will then not need the sampling devices.

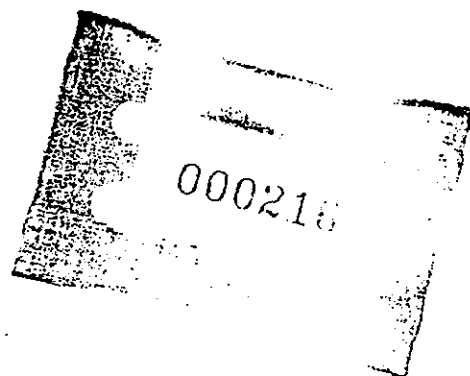
CHAIRMAN JOHNSON: Then the specific answer to the question seems to

be the lead precipitator as the one gadget that will be most useful, and the sample should be analyzed quantitatively in the chemical laboratory.

I want to ask the doctor a question in connection with pre-employment medical examinations. The exposure is something that may cause dermatitis. I take it from the question that the problem of allergy arises. Do you recommend patch tests in conjunction with pre-employment examinations to determine an employee's possible allergy to the exposure?

DR. CRANCH: In general, I would say you would hardly be warranted in conducting patch tests on all applicants for employment. Where we have a known material to which the employee is being exposed that very commonly produces an allergy reaction, it might be advisable to use such a filter. Patch tests are not 100 per cent infallible, and they are not altogether simple. They have to be very carefully given and very carefully interpreted. For that reason, they are not an integral part of an average preliminary agreement upon examination. They might be quite misleading.

ADJOURNMENT



press

the facilities were built into the original aircraft—are in the technique of international flying. They are basic to 171,871,000 over-water passengers, without a fatal accident.

Safety record of transoceanic continental air transport did not result from the result of deliberate effort, taking care, of endless research. Air travel, as we know it today, is a concept of this generation to make its way, from the competition with the matured forms of the older forms of transport, to struggle with the principles of danger inherent in any type of travel—and we have the best known to man. But, because of very reasons, more effort has been continuously and forcefully exerted to the standard of airline safety than in any similar period of time on any other means of transport.

An extraordinary effort has not come from within the industry itself. Encouraging results are, in a real sense, the tireless cooperation which the transport industry has received from the agencies such as the National Committee for Aeronautics, the government's great research organization, and the Civil Aeronautics Administration. The diligent efforts to effect the safety stand out as a signal of their first full year in operation, all having to do with aviation in the early recognition, by the transport industry, of its responsibility to the public in the matter of the combined elements all combined as ever today in their common support offers the promise that aviation can even be the safest form of travel.

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- *Past General Chairman

WEDNESDAY LUNCHEON SESSION

October 18, 1939

The Annual Meeting of the A.S.S.E.-Engineering Section of the National Safety Council followed a luncheon held in the Renaissance Room of the Ambassa-

dor Hotel. General Chairman R. E. Donovan, Chief Safety Engineer, Standard Oil Company of California, San Francisco, Calif., presided. Mimeographed copies of

committee reports were distributed to the assembled delegates.

The report of the Nominating Committee was presented by C. B. Boulet. Other members of the Nominating Committee were D. L. Royer, A. S. E. Whiting, and C. W. S. The list of names of the men elected to

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Secretary, Magn

From the standpoint of safety concern is proving that important force from physical defects or flaws of type that might cause failure.

In any discussion of flaws or the conditions surrounding the part under consideration, whether it is a newly made part in service.

In new parts defects may exist in the form of laminations or slag. On the other hand, metal free from such imperfections may be ruined by improper forging, grinding, heat treating and other manufacturing operations.

These defects may readily be detected in the mill or plant and it is, therefore, to prevent such parts from getting into service.

Used parts present a different aspect of defect usually suspected is a crack of the surface, or one extending to the surface well down in the body of the metal, commonly termed a crack.

This crack may be of such a nature as to defy detection by the means of a high powered glass or of the ordinary methods of inspection. It is a most dangerous type of defect in that if such a part is permitted to be in service, failure is likely to result.

Cracks in used parts are usually due to faulty design or poor workmanship. They are more likely the result of excessive or unanticipated stresses.

It is a known fact that any separate body is considered as a whole and regardless of depth, it is the point of excess stress or

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- TH. AVNSOE, Lone Star Cement Corp., New York, N. Y.
 *W. H. BAKER, J. E. Baker Co., York, Pa.
 E. D. BARRY, Universal Atlas Cement Co., New York, N. Y.
 J. R. BOYD, National Crushed Stone Assn., Inc., Washington, D. C.
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Past General Chairman

TUESDAY AFTERNOON SESSION

October 17, 1939

The opening session of the Cement and Quarry Section was called to order by P. N. Bushnell, Missouri Portland Cement Company, St. Louis, Mo., and Vice-Chairman of the Section, who presided. Mr. Bushnell

made a brief report upon activities of the Section during the year, and then proceeded with the election of officers, a list of whom is given above. The Chairman then introduced the first speaker.

Analysis of Cement and Quarry Accident Experience

By I. F. LE GORE

Safety Engineer, Portland Cement Association, Chicago

There seems to be no question that 1939 will be the safest year in cement industry history. And there is reason to believe that the new low accident frequency rate will keep Cement in the position it has held for the past two years as the second safest among 30 industries reporting to the National Safety Council.

The cement industry "put on the pressure" during the first half with gratifying results, and saw the accident trend continue the downward course which has been uninterrupted since late in 1936. The accident frequency rate, or score, for the first half of 1939 was 4.00 per million man hours; the severity rate was at the unprecedented low level of 1.42. This frequency rate was 13 per cent lower than the rate of 4.61 for the year 1938; the severity rate was 42 per cent lower than last year's rate of 2.44.

At the end of the third quarter the industry had slipped a bit. A new high for the year of 18 accidents was reported during August, and 19 injuries were reported in September.

With operations continuing about 18 per cent above last year, the average of accidents reported for 3 months had advanced to 14, exactly the same as the average for the first 8 months last year. This was for 130 plants, however, compared with 116 plants previously.

Greater mill activity appears not to have been responsible for the rising tide during the past two months, for August activity was only 3.5 per cent above production for the Campaign month of June, according to data from the U. S. Bureau of Mines. As yet there were 80 per cent more accidents in August and September than there were in June.

"Pressure" Was Applied

Most of you are familiar with the annual June No-Accident Campaign sponsored by the Portland Cement Association, which has contributed so much to our industry's safety progress. The 1939 Campaign covered the 3-month period April, May and June, and was the large measure responsible for

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Chemical Section

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TUESDAY LUNCHEON SESSION

October 17, 1939

The opening session of the Chemical Section was a luncheon feature, presided over by General Chairman Ralph L. Rogers, Jr., Safety Director of the Tennessee Eastman

Corporation, Kingsport, Tenn. Chairman Rogers briefly introduced the speaker of the occasion, a celebrated hunter of African game.

Safety to Life in Africa

By M. NORMAN POWELL

Kenya Colony, British East Africa

(Editorial Note: Mr. Powell was born in Africa, from early boyhood has lived in the heart of the big game country. The natives were his playmates and his friends. He has learned their folklore, customs, and beliefs. He was initiated as a warrior into the Suk Tribe and has made many exten-

sive trips into the more primitive parts of Africa. He will tell of the protective methods and safeguards adopted not only by the white people, but also by the native and animals to safeguard life and prevent injury to themselves and others. The following is a summary of his talk.)

The prevention of personal injury is a constructive thinking, planning, and effective execution. It is not enough to know whether or not the problem is adequate mechanical protection. It is also necessary to have efficient operating procedures and supervising employees that they know how, and do what they know best, but not least, profiting by the lessons learned from sad experience.

Constructive thinking then, means experience, knowledge of the way I include, for untrained men.

In the true sense of the word, I can be called a safety expert. My life of life which, since I was born, has been endangered by many accidents. I have learned the value of "creative thinking." Risk came to me in an African wilderness where a minor accident may result in death, owing to the difficulty of help.

It was in 1880 that my ancestors landed on the shores of the African continent. For month upon month they battled unknown and stormy seas. Therefore, in spite of the desolate and rocky coast presented, to the Cape of Good Hope. The soldiers of His Majesty's Army, through the Matebele, Zulu, and because of their pioneering spirit, stayed on when the conflicts were determined carried them into the hinterland. Not only for humanity, but because of the facts that would shadow their could not afford to lose one man. There were great, making them constructive.

After the World War, my father went to British East Africa, where he knew and think with and like the people.

My whole life, especially on the African continent, has depended on effective execution with a buffalo or elephant. I seldom get the chance to learn.

The devices and methods of the African tribes are almost all from sad and costly experience.

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N WHITING: Will any
some practical way of get-
ing of the union? I know
they have backed the safety
particular trades—and sig-

It is written into some
between the union and the
safety is featured there. The
ing it in.

FER: Do they appoint
from their group?

N: Safety is handled just
her phases or conditions of
eral contracts (I reviewed
year that are published in
nt of Labor in Washington
riably one of the important
in them.

N WHITING: Is it car-
more than a name?

W: It is like everything else
v. It is taking root.

FER: Would you personally
Mr. Shaw, that a union sit
an in its group perhaps to
agement on the question
-give him one responsibility

W: Not any more than
him sit in with management
phases of management
safety out by itself. Let
being conditions so that
ful and safe, and the
the rates of pay are all
tent. Some of the agree-
n's agreements and they
one are signed; and safety
safety appears from

N WHITING:
safety committee

N: Yes, they will
a friendly basis of

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TUESDAY AFTERNOON SESSION

October 17, 1939

The opening session of the Construction Section was called to order by R. J. Reigeluth, Vice-President, C. W. Blakeslee & Sons, New Haven, Conn., Vice-Chairman

of the Section, who presided. Chairman Reigeluth welcomed the assembled delegates and then introduced the speakers, as follows:

What Are Our Accident Statistics for 1938?

By THOMAS SOULE

Chief Engineer, Industrial Indemnity Exchange, San Francisco, Cal.

These facts and figures appear of interest in examining the 1938 accident rates in the Construction Industry as reported by members of the National Safety Council:

The Construction Industry Frequency Rate is.....24.93
The Construction Industry Severity Rate is.....3.24

These rates are about twice the average for National Safety Council members in 30 major industries reporting their experience.

Since 1926, the Construction Industry frequency rate was reduced 75 per cent; the Construction Industry severity rate was reduced 71 per cent; while the all industries frequency rate was reduced 68 per cent, and the all industries severity rate was reduced 44 per cent.

The respective reductions for the Construction Industry from 1937 to 1938 were 31 per cent and 6 per cent, as against 16 per cent and 5 per cent for all industries.

Credit for improvement in the Construction Industry's 1938 accident experience is due largely to the favorable experience in large organizations. They reduced both frequency and severity rates substantially,

whereas severity rates rose 35 per cent in small organizations.

The average frequency rate for large companies was 17.96, while that for small companies was 49.80, the small unit being defined as having less than 100 employees. The smaller organizations had an average severity rate of 12.31 as against 2.64 for the large companies.

The best all time no injury records and the Honor Roll for 1938 in the National Safety Council Publication "Accident Facts in the Construction Industry 1938" contain the names of the construction departments of an oil company, several industrial plants, a public utility, as well as several districts of the U. S. Engineer Department engaged in river and harbor work and the Tennessee Valley Authority. Construction companies for the most part, are conspicuous by their absence. The honored organization provided about one-third of the man hours worked and very materially lowered the accident rate figures developed for the entire group. In one classification, as an illustration, the removal of the construction department from the average industrial organization would double the average accident frequency rate for the balance of the group.

The lowest 1938 frequency rates were lowest for minor and harbor work, as severity rates were lowest for contractors, averaging 2.3 rates were highest in lock construction and in steel erection of structural steel frequency and severity 30.09.

In a series of 117 serious Construction Industry reports of these percentages were determined.

Agencies of Injury

Elevators and hoisting equipment
Machinery
Working surfaces (ladders, etc.)
Vehicles
Hand tools
Not otherwise specified

Type of Accident

Falling, sliding, flying objects
Caught in or between
Falls, one level to another
Exhaustion, absorption, strain (acute action)
Not otherwise classified

Mechanical Causes

Unsafe planning, working for housekeeping, etc., improper guarding
Ineffective agencies
Misuse of protective equipment
Mechanical cause

Personal Causes

Improper attitudes

Principal Engineer,

The largest and most of the construction industry building of modern construction of tunnels, the operation of mines, the work of dredging rivers. Some of them...

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General Chairman—H. J. GRIFFITH, Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Vice-Chairman—IRVIN A. BRINKMAN, Mackintosh-Hemphill Co., Pittsburgh, Pa.
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 T. O. ARMSTRONG, Westinghouse Electric & Mfg. Co., Springfield, Mass.
 F. J. CONROY, Union Carbide Co., Niagara Falls, N. Y.
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 B. T. DYE, Republic Steel Corp., Warren, Ohio
 W. A. JARVIS, Chase Brass & Copper Co., Waterbury, Conn.
Foundry Committee—J. H. HOLZBOG (*Chairman*), Chain Belt Co., Milwaukee, Wis.
 H. S. SIMPSON, Caterpillar Tractor Co., Peoria, Ill.
Health Committee—DR. A. G. KAMMER (*Chairman*), Inland Steel Co., Indiana Harbor, Ind.
 DR. J. H. CHIVERS, The Crane Co., Chicago, Ill.
 DR. T. LYLE HAZLETT, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
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 C. A. BIANCHI, H. H. Robertson Co., Ambridge, Pa.
 J. M. BROOKS, Miehle Printing Press & Mfg. Co., Chicago, Ill.
Poster Committee—J. P. GATHERUM (*Chairman*), Great Lakes Steel Corp., Ecorse, Mich.
 C. D. DORWORTH, Alan Wood Steel Co., Conshohocken, Pa.
 JOHN P. LEONARD, Blaw-Knox Co., Pittsburgh, Pa.
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 J. E. CULLINEY, Bethlehem Steel Co., Bethlehem, Pa.
 W. J. HOOPE, Chase Brass & Copper Co., Cleveland, Ohio.
 D. V. MEDARDE, Interlake Iron Ore Corp., Chicago, Ill.
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 E. E. GREENE, Timken Roller Bearing Co., Canton, Ohio.
 J. A. COLTRIN, The National Radiator Co., Johnstown, Pa.
Railway Car Builders Committee—P. J. BRAND (*Chairman*), Pullman-Standard Car Co., Pullman, Chicago, Ill.
Statistics Committee—JOHN P. O'ROURKE (*Chairman*), Bethlehem Steel Co., Sparrows Point, Md.
 C. S. PHILLIPS, Revere Copper & Brass, Inc., Rome, N. Y.
 H. L. ROGERS, Sheffield Steel Corp., Kansas City, Mo.
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 *C. M. ALLEN, The American Rolling Mill Co., Middletown, Ohio.
 *F. C. BENNETT, The Buckeye Steel Castings Co., Columbus, Ohio.
 *E. F. BLANK, Jones & Laughlin Steel Corp., Pittsburgh, Pa.
 *R. A. CHAFFE, Continental Steel Corp., Kokomo, Ind.
 *H. M. CROGAN, Inland Steel Co., East Chicago, Ind.
 *H. W. DARR, Bethlehem Steel Co., Johnstown, Pa.
 *M. W. DUNDON, Beloit Iron Works, Beloit, Wis.
 *JOHN P. EBY, American Steel & Wire Co., Chicago, Ill.
 *R. H. FERGUSON, Republic Steel Corp., Cleveland, Ohio.
 *GEORGE T. FONDA, Weirton Steel Co., Weirton, W. Va.
 *S. E. HAWKES, Macwhyrte Co., Kenosha, Wis.
 *H. G. HENSEL, The Youngstown Sheet & Tube Co., Youngstown, Ill.
 *P. A. LAUERMAN, Republic Steel Corp., Chicago, Ill.

*R. McMAHON, S.
 *A. NORTHWOOD,
 *J. A. OARTEL, Car
 *H. L. RESSASSER,
 *JACOB L. RIDINGER,
 *ROBERT L. SCHMITT
 *MELL E. TRAMMELL
 *J. A. VOSS, Republi
 *FRED E. WARR, Car
 *Past General Chairman

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P. R. McMAHON, Superior Steel Corp., Carnegie, Pa.
 J. A. NORTHWOOD, Bethlehem Steel Co., Sparrows Point, Md.
 J. A. OAKEL, Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
 H. L. REKRASSIER, Wheeling Steel Corp., Wheeling, W. Va.
 JACOB L. RIEBINGER, Inland Steel Co., East Chicago, Ind.
 ROBERT L. SCHMITT, Louisville Car Wheel & Railway Supply Co., Louisville, Ky.
 MEL E. TRAMMELL, Republic Steel Corp., Alabama City, Ala.
 J. A. VOSS, Republic Steel Corp., Cleveland, Ohio.
 FRED E. WARR, Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
 Past General Chairman

MONDAY AFTERNOON SESSION

October 16, 1939

The first session of the Metals Section was called to order by General Chairman Mel E. Trammell, Safety Supervisor, Republic Steel Corporation, Alabama City, Ohio, who presided. Chairman Tram-

mell made a report of Sectional activities during the past year, especially mentioning the work of the various committees, and then proceeded with the schedule of formal papers, as follows:

Coordination of Engineering and Safety

By J. M. HASSLER

District Chief Engineer, Republic Steel Corporation, Birmingham, Ala.

Engineering fundamentally is based on the strengths of materials. Engineers have found that a square inch cross-section of certain analysis steel will support a definite load of certain fixed spans. As the span increases, the load that the member will support decreases.

Engineering today, other than research, is not a science. There is no guess-work whatsoever. Facts are known and if used with discretion will keep one out of trouble.

If the strengths of materials were thoroughly proved and the exact load that a member would support was known, it was a bitter experience that this was not the case. Thoughtless persons would not be so. Moving loads were substituted for a designed dead load and the result was a failure. This was not because of lack of knowledge, but because of thoughtlessness of the individual that was unfamiliar with the laws of engineering.

The safety developed in the engineering profession is the origination of the new

famous "Factor of Five." This simply means that if a load is 1,000 pounds, and for the span needed will require a 10 pound section steel member, then it should be built five times as strong or as big, to take care of the fools that will come along and place five times the load limit on it.

You have seen bridges that have signs on them "Safe Load Limit Five Tons." Stand by that same bridge for a while and watch. Soon a thoughtless, don't care, ignorant individual comes along with a load of probably 15 tons and runs over the bridge. As a rule he gets safely across. The "Factor of Five" has saved his hide.

Basically engineering is correlated with safety. The very foundation and breadth of engineering success is based on safety. Engineers guard against failure with their knowledge—not by guess-work. They know positively what loads will be supported, what wind loads will be applied at certain velocities, what shocks, bending or twisting loads will do. They know what to do to make their structure safe.

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Mining Section

Officers 1938-1939

- General Chairman*—L. C. CAMPBELL, The Koppers Coal Co., Pittsburgh, Pa.
Vice-Chairman—ANGUS D. CAMPBELL, McIntyre Porcupine Mines, Ltd., Schumacher, Ont., Canada.
Editor—W. D. HASELTON, Pickands Mather & Co., Duluth, Minn.
Secretary and News-Letter Editor—DANIEL HARRINGTON, U. S. Bureau of Mines, Washington, D. C.
Editor and Slide Committee Chairman—J. J. FORBES, U. S. Bureau of Mines, Pittsburgh, Pa.
Publicity Committee Chairman—M. R. BUDD, The Explosives Engineer, Wilmington, Del.
Facilities Committee Chairman—W. W. ADAMS, U. S. Bureau of Mines, Washington, D. C.
Members at Large—
 G. J. BARRETT, Oliver Iron Mining Co., Duluth, Minn.
 THOMAS ALLEN, State Inspector of Coal Mines, Denver, Colo.
 J. W. ALT, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.
 W. M. ARTHUR, American Zinc Co. of Tenn., Mascot, Tenn.
 FRED E. BEDALE, Consolidated Coal Co., Inc., Fairmont, W. Va.
 JOHN L. BOARDMAN, Anaconda Copper Mining Co., Butte, Mont.
 W. H. COMINS, National Lead Co., Potosi, Mo.
 M. L. COULTER, Clearfield Bituminous Coal Corp., Indiana, Pa.
 C. M. FELLMAN, Montreal Mining Co., Montreal, Wis.
 C. W. GIBBS, Harwick Coal & Coke Co., Pittsburgh, Pa.
 B. DAWSON HALL, "Coal Age," McGraw-Hill Publishing Co., Inc., New York, N. Y.
 H. T. HARPER, Tennessee Copper Co., Copperhill, Tenn.
 H. C. HENRIE, Phelps Dodge Corp., Bisbee, Ariz.
 RUSH N. HOSLER, Pennsylvania Compensation Insurance Rating & Inspection Bureau, Harrisburg, Pa.
 C. F. KECK, Jamison Coal & Coke Co., Latrobe, Pa.
 THOMAS E. LIGHTFOOT, The Koppers Coal Co., Pittsburgh, Pa.
 J. A. MARTINSON, Pickands Mather & Co., Cleveland, Ohio.
 WILLIAM G. METZGER, Hudson Coal Co., Scranton, Pa.
 G. D. MOFFAT, Utah Copper Co., Salt Lake City, Utah.
 J. O. MURRAY, The Union-Pacific Coal Co., Rock Springs, Wyo.
 BEN T. RYAN, Mine Safety Appliances Co., Pittsburgh, Pa.
 R. P. RHINEHART, West Virginia State Dept. of Mines, Charleston, W. Va.
 J. H. SEIP, The New Jersey Zinc Co., Franklin, N. J.
 E. J. SICKA, St. Joseph Lead Co., Bonne Terre, Mo.
 J. V. SIMPSON, Alabama By-Products Corp., Flat Creek, Ala.
 J. E. TREWEK, Homestake Mining Co., Lead, S. D.
 EDWARD I. YOUNG, American Zinc Lead & Smelting Co., St. Louis, Mo.
President General Chairman

Officers 1939-1940

- General Chairman*—ANGUS D. CAMPBELL, McIntyre Porcupine Mines, Ltd., Schumacher, Canada.
Vice-Chairman—CARROLL ADLER EVANS, JR., The Hudson Coal Co., Scranton, Pa.
Editor—W. D. HASELTON, Pickands Mather & Co., Duluth, Minn.

Vice-Chairman—*N. P. RHINEHART, West Virginia State Dept. of Mines, Charleston, W. Va.

Secretary and News Letter Editor—DANIEL HARRINGTON, U. S. Bureau of Mines, Washington, D. C.

Engineering Committee Chairman—JOHN TREWEEK, Homestake Mining Co., Lead, S. D.

Health Committee Chairman—P. M. ARTHUR, American Zinc Company of Tennessee, Mascot, Tenn.

Membership Committee Chairman—HEATH CLARK, Rochester & Pittsburgh Coal Co., Erie, Pa.

Poster and Slide Committee Chairman—J. J. FORBES, U. S. Bureau of Mines, Pittsburgh, Pa.

Statistics Committee Chairman—W. W. ADAMS, U. S. Bureau of Mines, Washington, D. C.

Entertainment Committee Chairman—J. T. RYAN, Mine Safety Appliances Company, Pittsburgh, Pa.

Members at Large—

THOMAS ALLEN, State Inspector of Coal Mines, Denver, Colo.

*J. W. ALT, Calumet & Hecla Consolidated Copper Co., Calumet, Mich.

*G. J. BARRETT, Oliver Iron Mining Co., Duluth, Minn.

FRED E. BEDALE, Consolidation Coal Co., Inc., Fairmont, W. Va.

JOHN L. BOARDMAN, Anaconda Copper Mining Co., Butte, Mont.

*L. C. CAMPBELL, The Koppers Coal Co., Pittsburgh, Pa.

*W. H. COMINS, National Lead Co., Potosi, Mo.

M. L. COULTER, Clearfield Bituminous Coal Corp., Indiana, Pa.

C. M. FELLMAN, Montreal Mining Co., Montreal, Wis.

*C. W. GIBBS, Harwick Coal & Coke Co., Pittsburgh, Pa.

*R. DAWSON HALL, "Coal Age," McGraw-Hill Publishing Co., Inc., New York, N. Y.

H. T. HARPER, Tennessee Copper Co., Copperhill, Tenn.

*H. C. HENRIE, Phelps Dodge Corp., Bisbee, Ariz.

C. F. KECK, Jamison Coal & Coke Co., Latrobe, Pa.

*THOMAS E. LIGHTFOOT, The Koppers Coal Co., Pittsburgh, Pa.

*GEO. MARTINSON, Pickands Mather & Co., Cleveland, Ohio.

*C. E. MCKNIGHT, Lake Shore Gold Mines, Ltd., Kirkland Lake, Ont., Canada.

WILLIAM G. METZGER, Hudson Coal Co., Scranton, Pa.

D. D. MOFFAT, Utah Copper Co., Salt Lake City, Utah.

V. O. MURRAY, The Union Pacific Coal Co., Rock Springs, Wyoming.

R. H. SEW, The New Jersey Zinc Co., Franklin, N. J.

L. T. SICKA, St. Joseph Lead Co., Bonne Terre, Mo.

O. V. SIMPSON, Koppers Coal Co., Pittsburgh, Pa.

*HOWARD I. YOUNG, American Zinc Lead & Smelting Co., St. Louis, Mo.

*Past General Chairman

MONDAY AFTERNOON SESSION

October 16, 1939

The first session of the Mining Section was called to order by General Chairman L. C. Campbell, Assistant to the Vice-President, The Koppers Coal Company, Pittsburgh, Pa., who presided. Chairman Campbell, in his opening remarks, briefly re-

viewed some of the activities of the Section and its committees during the past year and then introduced the scheduled program as listed in the program. The general discussion in the various papers presented was "The Executive Viewpoint."

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Petroleum Section

Officers 1938-1939

- General Chairman*—J. H. BROWN, Tide Water Associated Oil Co., New York, N. Y.
Letter Editor—R. S. HUFFMAN, Oklahoma Natural Gas Company, Tulsa, Okla.
Engineering Committee Chairman—G. E. CARPENTER, Humble Oil & Refining Co., Houston, Texas.
Health Committee Chairman—Dr. JAMES W. LONG, Gulf Oil Corp., Port Arthur, Texas.
Industrial Data Sheet Committee Chairman—H. E. DISCHINGER, Shell Oil Co., Inc., St. Louis, Mo.
Program Committee Chairman—H. W. BOGGESS, Sinclair Prairie Oil Co., Tulsa, Okla.
Publications Committee Chairman—J. C. YOUNG, Tide Water Associated Oil Co., Tulsa, Okla.
Statistics Committee Chairman—HADLEY H. MYERS, Sinclair Prairie Oil Co., Tulsa, Okla.
Special Education Committee Chairman—E. D. MURPHY, Mid-Continent Petroleum Corp., Tulsa, Okla.
Atlantic Division Chairman—A. M. McKEAN, Pan American Petroleum & Transport Co., New York, N. Y.
Great Lakes Division Chairman—J. C. BERND, Sinclair Refining Co., East Chicago, Ind.
Gulf Division Chairman—T. S. MAFFITT, JR., Houston Oil Co. of Texas, Houston, Texas.
Mid-Continent Division Chairman—H. T. MARKER, Phillips Petroleum Co., Bartlesville, Okla.
Pacific Coast Division Chairman—A. L. ANDERSON, Standard Oil Co. of Calif., San Francisco, Calif.
Rocky Mountain Division Chairman—BOYD V. OSWORN, Standard Oil Co. (Ind.), Casper, Wyoming.
General Chairmen—
 R. W. BLACK, Standard Oil Co. of N. J., Elizabeth, N. J.
 H. W. BOGGESS, Sinclair Prairie Oil Co., Tulsa, Okla.
 R. S. BOSSIR, Standard Oil Co. of N. J., New York, N. Y.
 A. W. BREELAND, Lone Star Gas Co., Dallas, Texas.
 V. R. CURRIE, The Texas Co., Houston, Texas.
 R. E. DONOVAN, Standard Oil Co. of Calif., San Francisco, Calif.
 C. L. HIGHTOWER, United Gas Pipe Line Co., Houston, Texas.
 G. O. LOCKWOOD, Continental Casualty Co., Tulsa, Okla.
 H. F. PRUSSING, Union Oil Co. of Calif., Los Angeles, Calif.
 R. B. ROOPER, Humble Oil & Refining Co., Houston, Texas.
 E. J. SENNE, Socomey-Vacuum Oil Co., Inc., New York, N. Y.
 C. W. SMITH, Standard Oil Co. (Ind.), Chicago, Ill.
 H. J. WALLACE, Sinclair Prairie Oil Co., Tulsa, Okla.
Secretary—H. N. BLANCHESLEE, American Petroleum Institute, New York, N. Y.

Officers 1939-1940

- Chairman*—C. J. NOEMANN, Shell Oil Co., Inc., San Francisco, Calif.
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Chairman for Pipelines—C. A. MILLER, The Texas Co., Houston, Texas.
Chairman for Manufacturing—J. HOWARD MYERS, The Phillips Petroleum Co., Bartlesville, Okla.

Vice-Chairman for Marketing—F. R. McLEAN, White Star Div., Socony-Vacuum Oil Co., Detroit, Mich.

News Letter Editor—H. B. WILLIAMS, Pan-American Refining Corp., Texas City, Tex.

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Health Committee Chairman—DR. J. W. LONG, Gulf Oil Corp., Port Arthur, Texas

Industrial Data Sheet Committee Chairman—H. E. DISCHINGER, Shell Oil Co., Inc., Louis, Mo.

Program Committee Chairman—J. H. BROWN, Tide Water Associated Oil Co., New York, N. Y.

Publication Committee Chairman—J. C. YOUNG, Tide Water Associated Oil Co., Tulsa, Okla.

Statistics Committee Chairman—HENDLEY H. MYERS, Sinclair Prairie Oil Co., Tulsa, Okla.

Visual Education Committee Chairman—T. S. MAFFITT, JR., Houston Oil Co. of Texas, Houston, Texas

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Gulf Division Chairman—W. I. KENT, Magnolia Petroleum Co., Dallas, Texas

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New England Division Chairman—JOHN W. WELCH, Cities Service Oil Co., East Boston, Mass.

Pacific Coast Division Chairman—A. J. MARTINSON, California Petroleum Safety Board, Inc., Los Angeles, Calif.

Past General Chairmen—

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H. W. BOGESS, Sinclair Prairie Oil Co., Tulsa, Okla.

R. S. BONSH, Standard Oil Co. of N. J., New York, N. Y.

A. W. BRELAND, Lone Star Gas Co., Dallas, Texas

J. H. BROWN, Tide Water Associated Oil Co., New York, N. Y.

V. R. CURRIE, 1622 California Ave., Houston, Texas

R. E. DONOVAN, Standard Oil Co. of Calif., San Francisco, Calif.

C. L. HARTWELL, United Gas Pipe Line Co., Houston, Texas

G. O. LOCKWOOD, Continental Casualty Co., Tulsa, Okla.

Geo. F. PRUSSING, Union Oil Co. of Calif., Los Angeles, Calif.

R. B. KOOPER, Humble Oil & Refining Co., Houston, Texas

E. J. SENNE, Socony-Vacuum Oil Co., Inc., New York, N. Y.

C. W. SMITH, Standard Oil Co. (Ind.), Chicago, Ill.

D. J. WALLACE, Sinclair Prairie Oil Co., Tulsa, Okla.

Secretary—H. N. BLAKESLEE, American Petroleum Institute, New York, N. Y.

TUESDAY AFTERNOON SESSION

October 17, 1939

The opening session of the Petroleum Section was called to order by General Chairman J. H. Brown, Fire Protection Engineer, Tide Water Associated Oil Company, New York City, who presided. The first feature was a series of brief reports of sectional committee chairmen, as follows:

Sectional Activities, by General Chairman J. H. Brown.

For Pipelines, Chas. A. Miller, Vice Chairman, Petroleum Section, and Assistant Manager, The Texas Company, Houston, Texas.

For Production, C. J. Nohmann, Vice Chairman, Petroleum Section, and Manager, Shell Department, Shell Oil Co., San Francisco, Calif.

For Manufacturing, Chairman, Petroleum Section, Socony-Vacuum Oil Co., New York City.

For Marketing, Chairman, Petroleum Section, Socony-Vacuum Oil Co., New York City.

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Congress

R. JONES: Complete guarding of presses is all very well for the security of people here who have large presses with good supervision and good maintenance service. But I should like you to take my shoes and take care of our 100,000 shoes where they can't spell the word "security." See what you can do to get those shoes guarded! I don't care whether it is a public guard or what. Those fellows know anything about it. The operators his own guard. Those are the shoes that I am trying to lick.

CHAIRMAN BERMAN: I'm afraid gentlemen do not attend National Congresses.

BORAKS: Mr. Jones really told a story that is absolutely true. I feel that when I come to National Congress meetings the biggest I get is the contact with safety people. You fellows have beautiful plants, Jones said. You are the last word in safety. I tell you something ought to be about the small plants that haven't means or the inclination. Once I made a suggestion that every member of this committee bring with him somebody from a plant as a guest. It would be the first thing we ever did with this section. This company would bring an unbrella to this section in Chicago next year. Mr. Jones would make a lot of business and the insurance companies would have a little business.

JONES: I was in a plant last week in Connecticut and the superintendent said girls come in there for work and they refuse to go to work on a project. Two sweep guards on it. He let them out on the handcuff guard.

Public Utilities Section

Officers 1938-1939

- General Chairman**—R. S. METZGER, Toledo Edison Co., Toledo, Ohio.
Sec-General Chairman—H. A. PTOLEMY, Public Service Co. of Northern Illinois, Chicago, Ill.
Secretary—CHARLES S. BOWDEN, Ohio Public Service Co., Alliance, Ohio.
Engineering Committee—E. J. HANLON (Chairman), The Peoples Gas Light & Coke Co., Chicago, Ill.
Electric Committee—E. C. BOOKMAN, Virginia Electric & Power Co., Richmond, Va.
Gas Committee—J. F. McCABE, Duquesne Light Co., Pittsburgh, Pa.
Water Committee—J. O. SPEED, Alabama Power Co., Birmingham, Ala.
Electric Sheet Sub-Committee—PAUL R. KENN (Chairman), Pennsylvania Edison Co., Allentown, Pa.
Gas Sheet Sub-Committee—J. D. HALL, Atlantic City Electric Co., Atlantic City, N. J.
Water Sheet Sub-Committee—JOHN P. McCANN, New England Power Service Co., Boston, Mass.
Safety Committee—W. J. McVAY, Stone & Webster Service Corp., New York, N. Y.
Safety Instruction Card Sub-Committee—W. H. BROWN, Northern States Power Co., Minneapolis, Minn.
Telephone Committee—M. T. CASTER, Lincoln Telephone & Telegraph Co., Lincoln, Nebr.
Radio Committee—E. S. MINER (Chairman), American Telephone & Telegraph Co., New York, N. Y.
Sanitary Committee—J. M. BUSWELL, San Joaquin Light & Power Co., Fresno, Calif.
Electric Committee—E. A. RUST, Erie County Electric Co., Erie, Pa.
Sanitary Committee—A. A. KLINE (Chairman), Public Service Co. of Colorado, Denver, Colo.
Electric Committee—E. L. DONA, Central New York Power Corp., Syracuse, N. Y.
Water Committee—W. L. SMITH, Los Angeles Dept. of Water & Power, Los Angeles, Calif.
Health Committee—GEORGE G. WALDROP, City Light & Water Utilities, Fort Wayne, Ind.
Health Committee—DR. HART E. FISHER (Chairman), Chicago Rapid Transit Co., Chicago, Ill.
Membership Committee—D. C. DUNCAN (Chairman), Appalachian Electric Power Co., Bluefield, W. Va.
Electric Committee—W. H. KUSMAUL, Northern Indiana Public Service Co., Hammond, Ind.
Electric Committee—J. B. PORCHER, Ohio Edison Co., Akron, Ohio.
Electric Committee—W. R. SMITH, Public Service Electric & Gas Co., Newark, N. J.
Gas Committee—WM. L. COLE (Chairman), Utah Power & Light Co., Salt Lake City, Utah.
Electric Committee—H. H. BERMAN, Consolidated Gas Electric Light & Power Co., Baltimore, Md.
Electric Committee—E. R. KROPP, Union Electric Co. of Missouri, St. Louis, Mo.
Electric Committee—A. A. RAILL, Kansas City Power & Light Co., Kansas City, Mo.
Electric Committee—D. E. WOODS, Central Power & Light Co., Corpus Christi, Texas.
Order and Safety Kinks Committee—H. W. LUECK (Chairman), Commonwealth Edison Co., Chicago, Ill.
Electric Committee—E. P. NOYES, Central Maine Power Co., Augusta, Maine.
Electric Committee—P. L. G. HANSEN (Chairman), Pennsylvania Power & Light Co., Allentown, Pa.
Electric Committee—R. B. GROVE, Florida Power & Light Co., Miami, Fla.
Electric Committee—C. P. RYAN, Northern Indiana Power Co., Indianapolis, Ind.

H. E. SHEDD, Appalachian Electric Power Co., Bluefield, W. Va.
 W. BRILEY WRIGHT, Eastern Shore Public Service Co., Salisbury, Md.
Publicity Committee—J. M. ORTS (Chairman), Public Service Corp., Newark, N. J.
 T. S. SHINN, Carolina Power & Light Co., Raleigh, N. C.
 P. K. STILES, Electric Bond & Share Co., New York, N. Y.
 J. L. WEEKS, South Carolina Electric & Gas Co., Columbia, S. C.
Statistics and Contest Committee—J. C. MARTIN (Chairman), Bureau of Safety, Chicago, Ill.
 E. M. CHASE, Central Vermont Public Service Corp., Rutland, Vt.
 J. D. ELLIS, Northwestern Electric Co., Portland, Oregon.
 D. F. McMURCHY, Tennessee Valley Authority, Chattanooga, Tenn.

Members at Large—

H. J. BURTON, Consumers Power Co., Jackson, Mich.
 C. H. DAVIS, Commonwealth Edison Co., Chicago, Ill.
 C. H. DINSMORE, Wisconsin Power & Light Co., Madison, Wis.
 E. P. DURFEE, Consolidated Edison Co. of New York, Inc., New York, N. Y.
 C. N. RAKESTRAW, Cleveland Electric Illuminating Co., Cleveland, Ohio.

Councilors (Past General Chairmen)

JOHN J. BARADA, The Laclede Gas Light Co., St. Louis, Mo.
 E. S. BEAUMONT, The Peoples Gas Light & Coke Co., Chicago, Ill.
 C. B. BOULET, Wisconsin Public Service Corp., Milwaukee, Wis.
 G. A. DOELLER, Dayton Power & Light Co., Dayton, Ohio.
 JAMES B. DOUGLAS, The Philadelphia Gas Works Co., Philadelphia, Pa.
 W. P. ELSTUN, American Telephone & Telegraph Co., New York, N. Y.
 ROY M. GODWIN, Philadelphia Electric Co., Philadelphia, Pa.
 E. J. KREH, Philadelphia Co., Pittsburgh, Pa.
 WILIS MACLACHLAN, Electrical Engineer, Toronto, Ont., Canada.
 B. B. MCCULLOCH, Bureau of Safety, Chicago, Ill.
 GEORGE OPP, Detroit Edison Co., Detroit, Mich.
 F. M. PEPPER, Illinois Bell Telephone Co., Chicago, Ill.
 C. J. RUTLAND, Texas Power & Light Co., Dallas, Texas.
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curately controlling time, temperatures and pressures. Sufficient mercury thermometers as well as recording thermometers are correctly placed and constantly checked to assure the maintenance of correct temperatures.

Each of these processing operations requires unusual care, extreme accuracy combined with adequate supervision and inspection to assure quality and safety of the product.

In spite of the utmost care, defects in workmanship and materials do occur in any manufactured article. These defects must be found before the article leaves the factory; therefore, it is necessary to minutely inspect each article, diligently searching for and rejecting defective merchandise. These inspectors, well trained, are paid a bonus for finding defects; however, as an added precaution, their workmanship in turn is checked by product quality inspectors to assure accuracy and efficiency.

The modern tire is only one important

accessory for the car of today. The same painstaking care in manufacture, the same high regard for quality, the same precautions to assure the consumers' safety is a major part of every piece of equipment that is manufactured into each car. Tires are safe and automobiles are safe—if the person behind the wheel and in control co-operates by thinking and driving safely.

Quality control work in any manufacturing industry involves two major safety functions. The first consideration is the safety of the employee, to see that the operator is performing his job with the maximum degree of safety to himself, that the materials he works with, his tools or machines have no apparent functional defects that may be hazardous to safety. The second consideration, safeguarding the safety of the consumer by seeing that each operation is being performed correctly, being constantly alert to insure the observance of specifications in order that uniformly high quality, safe merchandise is produced.

Dusts in the Rubber Industry

By P. A. DAVIS, M.D., F.A.P.H.A.

Goodyear Tire & Rubber Co., Akron, O.

Dusts may be classified in two main groups:

1. Harmful; 2. Not harmful or nuisance.

When we think of this classification, we undoubtedly think of some type of pneumoconiosis. However, I believe we must not base our conception of dusts on this basis, but assume that all dusts are detrimental to the human system as a whole when the concentrations are high enough. Whether the disability is due to a toxic condition or to a mechanical one, of course, depends entirely upon the nature of the dust. The conditions usually referred to as being of mechanical origin fall under that condition known as pneumoconiosis with its various sub-divisions of:

1. Silicosis.
2. Siderosis.
3. Anthracosis.
4. Asbestosis.
5. Chalcosis.
6. Chalcosis.

The method of contracting pneumoconiosis is by inhalation of the dust; however, all dusts do not cause pneumoconiosis. The higher the silica content of a dust the greater the possibility of developing a fibrosis and the higher the percentage of crystal content the greater the irritation. The diagnosis of the type of pneumoconiosis is based upon the following:

1. Past history and occupation.
2. Physical examination.
3. Clinical examination of sputum.
4. X-rays of lungs.

Since we have been studying the lungs of industrial workers by x-rays, there has developed an entity which should be termed the "Industrial Lung." This condition, I believe, should not be termed a pneumoconiosis because it reaches a certain stage, does not progress any further and after several months to a year improves. There are no symptoms nor increased capacity of the lungs. It is diagnosed only by a series of x-rays taken over a period of years.

The other class of soluble dusts—silica, and metalloids—under a specific poisoning is very rare. Inhalation of lead causes throat irritations of insoluble dusts—mechanical. We must as: 1. Pneumoconiosis

Some of the types used in industry classifications are

Pneumoconiosis

1. Silicosis (same as earth, Stoughton rotten stone, more than 1/2 of 1%)
2. Siderosis—iron sulphides
3. Anthracosis—iron ore
4. Asbestosis—poor ore
5. Chalcosis—copper
6. Chalcosis—stone

Non-Pneumoconiosis Harmful:

1. Lead dusts.
2. Arsenic dusts.
3. Chromium dusts.
4. Cadmium dust
5. Antimony dust
6. Radium compounds
7. Alkali dusts.
8. Sulphur dusts
9. Tellurium compounds
10. Various colors ultra marine chromate, etc.

Non-harmful but nuisance dusts:

1. Soapstone with
2. Zinc oxide and
3. Barium sulphate
4. Plaster of Paris
5. Paris white—white
6. Talc.
7. Mica—may cause
8. Oxide of magnesium
9. Titanium dioxide

As we can see, classification of harmful dusts is not necessarily a simple one, and it is only by a series of x-rays taken over a period of years

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or the car of today. The same care in manufacture, the same for quality, the same precaution for the consumers' safety is a part of every piece of equipment that is put into each car. Tires are automobiles are safe—if the person at the wheel and in control is thinking and driving safely.

Control work in any manufacturing involves two major safety functions. First consideration is the safety of the employee, to see that the operator is doing his job with the maximum safety to himself, that the materials he works with, his tools or machines are free from apparent functional defects that are hazardous to safety. The second function is safeguarding the safety of the consumer by seeing that each operation is performed correctly, being careful to insure the observance of standards in order that uniformly high quality merchandise is produced.

Industry

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Method of contracting pneumoconiosis—Inhalation of the dust; however, it is not cause pneumoconiosis. The silica content of a dust the possibility of developing a fibrosis—higher the percentage of crystalline silica the greater the irritation. The type of pneumoconiosis is determined by the following:

History and occupation.
Physical examination.
Examination of sputum.
X-ray of lungs.

Have been studying the lungs of workers by x-rays, there has been a discovery which should be termed "Coal Lung." This condition, I did not term a pneumoconiosis until it reaches a certain stage. It progresses any further and after this to a year improves. There is no loss of capacity of the lungs discovered only by a series of x-rays over a period of years.

The other conditions caused by inhalations of soluble dusts, insoluble, but free from silica, and metallic dusts have to be discussed under a specific condition; for example, lead poisoning is very frequently caused by the inhalation of lead dust; and many nose and throat irritations are caused by inhalation of insoluble dusts whose action is strictly mechanical. We therefore may also classify dusts as: 1. Pneumoconiotic; 2. Non-pneumoconiotic.

Some of the principal dusts or materials used in industry which fall under these classifications are as follows:

Pneumoconiotic:

1. Silicosis (sandstone, slate flour, fuller's earth, Stoughton earth, infusional earth, rotten stone, any other clay with more than 1/2 of 1% silica, ground glass).
2. Siderosis—iron ores, iron oxides (nat.), iron sulphides (nat.).
3. Anthracosis—coal and carbon dusts.
4. Asbestosis—powdered asbestos, asbestos ore.
5. Chalcosis—copper ore and copper dusts.
6. Chalcosis—stone dusts.

Non-Pneumoconiotic

Harmful:

1. Lead dusts.
2. Arsenic dusts.
3. Chromium dusts.
4. Cadmium dusts.
5. Antimony dusts.
6. Radium compounds.
7. Alkali dusts.
8. Sulphur dusts.
9. Tellurium compounds.
10. Various colored compounds such as ultra marine blue, Prussian blue, lead chromate, etc.

Non-harmful but nuisance dusts:

1. Soapstone with 1/2% or less of free silica.
2. Zinc oxide and sulphide.
3. Barium sulphate.
4. Plaster of Paris.
5. Paris white—whiting.
6. Talc.
7. Mica—may cause a mechanical irritation.
8. Oxide of magnesia.
9. Titanium dioxide.

As we can see by this classification we necessarily must go back to our original classification of harmful and not harmful; and I am convinced that while silicosis is one of our predominant conditions due to

silica, there are many other conditions which are produced in the respiratory tract which are harmful to the individual.

The following are the most important materials used in the rubber industry which are in the form of a dust or powder and to which the individual is exposed. They are marked by the following letters—H, harmful; NH, not harmful; HT, harmful and toxic; HP, harmful and pneumoconiotic; NHN, not harmful but a nuisance dust.

1. Talc soapstone with 1/2 of 1% or less SiO₂—NHN.
2. Starch and potato flour—NHN.
3. Zinc oxide—NHN—see chest x-ray.
4. Lead oxide, metallic lead dusts, lead chromate, and the various powdered lead compounds—HT.
5. Carbon black—NHN.
6. Rubber dust—finely divided dust from buffing process—NHN.
7. Sulphur—H, sometimes irritates nose and throat and occasionally produces a dermatitis.
8. Whiting—NH.
9. Barytes—NH.
10. Asbestine—HP.
11. MgO, and MgCO₃—NH.
12. Lithopone—NHN.
13. Red lead—HT.
14. High grade clay—HP if over 1% of 1% silica and dust count is over 5,000,000.
15. Corn starch—NHN.
16. English vermilion—HT.
17. Graphite—NHN.
18. Chromium oxide—HT.
19. Ultramarine blue—HT.
20. Titanox—NT.
21. Thermatonic blue—NTN.
22. Zinc stearate—NHN.
23. Aluminum—NHN, occasionally causes a mechanical dermatitis and irritation of mucous membranes of nose and throat.
24. Hard rubber dust—NHN.
25. Lime—H caustic. Produces dermatitis.
26. Various alkali dusts—H caustic.
27. Various chromium and cadmium dusts—HT.
28. Mica—NH—sometimes causes mechanical dermatitis.
29. Yellow oxide (Fe₂O₃)—NHN.
30. Black oxide (Fe₃O₄)—NHN.
31. Gypsum—NHN.
32. Casein—NH.
33. Wood flour—NH.
34. Prussian blue—HT.

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35. Soap powder — irritant NH. Sometimes causes dermatitis.
36. Captax—NH.
37. Phenyl—Bela Naphthylamine—HT, causes a dermatitis.
38. Soap bark—NH, sometimes causes a little coryza and conjunctivitis.
39. Cotton lint dust—NHN.
40. Bronze powder—HT—ac to copper and lead content.
41. Zinc sulphide—NHN.
42. Sand—HP.
43. Various clays having more than $\frac{1}{2}$ of 1% of free silica—HP.
44. Antimony oxide—HT.
45. Titanium oxide—NH.
46. Various inorganic and organic chemical compounds in powdered form often produce dusts during their use and manufacturing. These must be considered individually as to their industrial hazard and toxicity and are not in the scope of this paper.
47. Wheat and potato flour—NHN.

The following procedure will be helpful in solving your problem of dust.

1. Make repeated dust counts of the working area at various levels.
2. Obtain some of the dust and send it to the laboratory for complete analysis including the determination of free SiO_2 .
3. Examine the workers, x-rays of the chest for those working in pneumoconiotic dusts.
4. Check the ventilation and increase it to produce non-hazardous atmospheres.
5. Differentiate between conditions caused by volatile substances and solvents, and those caused by dusts.
6. Protect the workers with proper clothing and protective respirators and masks.
7. Study the particular dusts from the mechanical and chemical nature and if the effects are unknown, resort to animal experimentation.
8. If dusts are toxic and harmful consider the possibility of a substitution for a non-harmful substance.
9. Examine and x-ray all employees who are being placed on jobs where there is a dust hazard. They should be examined periodically.
10. Make each dust problem an individual one, and in case of silicotic dusts, keep the count below 5 M. per cu. ft., if the free SiO_2 is more than 1%.
11. Select employees free from TB,

chronic bronchitis, post influenza infections, post pneumonic conditions, asthmatics, and persons with myocardial involvements for dusty operations.

I have found that there is x-ray evidence of tuberculosis in about 2 per cent of the cases but only $\frac{1}{2}$ of 1 per cent active and of a permanent disability. Uncomplicated pneumoconiosis of a moderate degree is not disabling to a point of permanent disability.

I want to present to you a case which I think is a rare one. This employee has never worked in any dust before his employment on his present job. He has worked for 12 $\frac{1}{4}$ years in zinc oxide dust and during our periodic examinations in 1938 the x-ray picture proved very interesting. He does not have a definite pneumoconiosis but he shows evidence of glandular fibrosis. What will develop in a few more years will be shown by x-ray examination only. He has no symptoms. If this man had been working in lead or similar toxic dusts, symptoms of that particular substance would have been present.

The dust counts on toxic dusts must be kept at a minimum, and much lower than that for silicotic dusts. In silicotic dusts the particles of 10 micron size or larger are of very little concern, but with toxic dusts the size of the particles is not so important as is the number of particles. The smaller the particles of dust the less the rate of settling and the greater the time of exposure, and this is the important item in toxic dusts. For example, the permissible amount of lead dust is approximately 15 mgs. per day of eight hours. There would be very little chance of any one ever developing a pneumoconiotic condition with this dust count, but if it is increased very little there is a chance for lead poisoning, and so it is with the various toxic dusts.

The question in most of your minds is, "What are you going to do about these conditions?" The answer is simple. You are going to correct them. It has been proved many times that it pays big financial returns, creates better working conditions, and the employees have a more efficient and appreciative attitude for the employer.

It is unnecessary for me to consider the methods of correcting the dust problems for this is in the realm of the ventilation engineer, but you must insist that the ven-

ilation be sufficient to reduce to a certain point and at that point.

You should periodically examine employees according to the dust count and as a suggestion a schedule which I suggest is a few years.

Silicosis or silicotic dusts—excluding x-rays.

Non-silicosis and non-toxic dusts—every year.

Toxic dusts—for example arsenic, antimony, phosphorus, and alkali and caustic soda.

Nuisance dusts—every year only if indicated.

If you find any evidence better to correct the cause the employee elsewhere, causes dissatisfaction at such conditions can be cooperation between the engineering and managing departments at present all conditions are compensable, so employer to correct his dust to a point at which there

Conclusion

It is impossible to give a solution of all the dusts us-

Training

Employment Management

As we scan the history of movement, we find that emphasis has been placed on responsibility in accident prevention. Authorities seem to agree (and by foremen is meant vision) are very largely the prevention of accidents.

How do these authorities reach their conclusions? Why must we assume the responsibility for accidents under their supervision?

When we tell our superiors must accept the responsibility for accidents occurring in their

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post influenzal infections, conditions, asthmatics, and myocardial involvements for

that there is x-ray evidence in about 2 per cent of the of 1 per cent active and in disability. Uncomplicated of a moderate degree is to a point of permanent disa-

present to you a case which rare one. This employee has in any dust before his employment. He has worked in zinc oxide dust and during examinations in 1938 the proved very interesting. He has a definite pneumoconiosis evidence of glandular fibrosis. develop in a few more years will x-ray examination only. He systems. If this man had been lead or similar toxic dusts, that particular substance would present.

counts on toxic dusts must be minimum, and much lower than silicotic dusts. In silicotic dusts the 10 micron size or larger are of concern, but with toxic dusts the particles is not so important as the number of particles. The smaller the dust the less the rate of settling after the time of exposure, and an important item in toxic dusts is the permissible amount of lead approximately 15 mgs. per day. There would be very little any one ever developing a pneumoconiosis with this dust count. increased very little there is lead poisoning, and so it is with toxic dusts.

question in most of your minds is you going to do about it. The answer is simple. Yes, to correct them. It has to many times that it pays big financial returns better working conditions. employees have a more efficient attitude for the employer. unnecessary for me to consider correcting the dust problem in the realm of the ventilation but you must insist that the

ilation be sufficient to reduce the dust count to a certain point and have it maintained at that point.

You should periodically examine your employees according to the type of dusts exposed to and as a suggestion the following is a schedule which I have used for a few years.

Silicosis or silicotic dusts—six months including x-rays.

Non-silicosis and non-silicotic or non-toxic dusts—every year, with x-rays.

Toxic dusts—for example lead, chromium, arsenic, antimony, phosphorus, chemical dusts, and alkali and caustic dusts—every month.

Nuisance dusts—every 1 to 1½ years—x-rays only if indicated.

If you find any evidence of trouble it is better to correct the cause than to transfer the employee elsewhere, for this often causes dissatisfaction and suspicion. All such conditions can be controlled if there is cooperation between the medical, engineering and managing departments. In most cases at present all conditions caused by dust are compensable, so it behooves the employer to correct his working conditions to a point at which there are no hazards.

Conclusion

It is impossible to give a detailed description of all the dusts used in the rubber

industry, for the silicotic dusts alone would require a volume to do them justice, but I want you to remember that there are just as many serious conditions which may develop from the inhalation of various toxic dusts.

These conditions are often more serious than pneumoconiosis and develop much faster and in a shorter period of time. For instance, a person may develop a lead poisoning in two months from inhalation of lead compounds and it might take five to ten years for a silicosis to develop in the same environment of silica dust.

There are on the market today many fine and efficient protective devices such as chemical protective masks, dust respirators, positive pressure masks, clothing and gloves which if used will give good results.

Instruction to the employees by the supervision in regard to their personal habits, their instruction concerning the type of dust they are exposed to, and why they have to use the protective appliances, will reduce the possibility of any trouble to a minimum.

All laboratory work must be done by a technician who has been trained in the various toxicological laboratory techniques and the interpretations must be made in conjunction with the past history of the individual. May I say in conclusion that it is much more profitable to correct a dusty operation than to declare it a hazard.

Training Supervision in Accident Prevention

By JOHN J. LOGE

Employment Manager, The General Tire & Rubber Company, Akron, Ohio

As we scan the history of the safety movement, we find that a great deal of emphasis has been placed on the foreman's responsibility in accident prevention work. Authorities seem to agree that foremen and by foremen is meant direct supervision are very largely responsible for the prevention of accidents in industry.

How do these authorities arrive at their conclusions? Why must the foremen assume the responsibility for injuries to persons under their supervision?

When we tell our supervisors that they are responsible for accidents occurring in their departments, we

must be prepared to state a few reasons. We ask a foreman for a report following an accident, and he has a right to a clear understanding as to the reason why he is called upon to explain when one of his workers is injured. There is nothing mysterious about the placing of responsibility for accidents. It isn't the case of management imposing a burden upon supervision that should belong elsewhere.

As soon as a person is placed in a supervisory capacity, a position where he has charge of the work of others, he becomes directly responsible for their conduct and

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that it would be to the advantage of everyone to consider it from that point of view, not only in consideration of safety, but in every condition with which a foreman has to deal.

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TUESDAY AFTERNOON SESSION

October 17, 1939

The opening session of Steam Railroad delegates was called to order by E. L. Henry, Assistant to the General Manager, Chicago & North Western Railway Com-

pany, Chicago, who presided. Chairman Henry welcomed the delegates, sketched the program of sessions briefly, and then introduced the first speaker.

Safety Today and Tomorrow on American Railroads

By CARL R. GRAY, JR.

Executive Vice President, Chicago, St. Paul, Minneapolis & Omaha Railway Company, St. Paul, Minn.

There is one thing in which I will not take a back seat for anyone, and that is the interest I have in "Safety." Perhaps it is really from inheritance that I gather my interest in this work—perhaps from the environment and association I have had with men who believe in safety, who preach it, and who practice it constantly. Perhaps it is from the standpoint of realization that it is one of the greatest factors in the solution of the transportation problem. But whether it is one or the other, or a part of both, I know that I am definitely, completely and wholeheartedly devoting a considerable portion of my life to the improvement—by

safety—of the lives of all of our people.

Naturally I should be most interested in the safety performance of the Omaha Railroad; but one cannot be safety-minded and fail to recognize and be interested in and a part of safety as it is understood in the business world today. One has but to look at the program of this Congress to realize what a tremendous place safety has taken in the lives of the American people, for it permeates the very souls of so many of us. It is, and has been, a complete success.

I read all I can concerning early American railroading. Here is a clipping from an English newspaper of March 6, 1869, quot-

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J. T. TROLINGER, North American Rayon Corp., Elizabethton, Tenn.
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*T. A. WILSON, North Carolina Industrial Commission, Raleigh, N. C.
*Past General Chairman

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*T. A. WILSON, North Carolina Industrial Commission, Raleigh, N. C.

*Past General Chairman

TUESDAY AFTERNOON SESSION

October 17, 1939

The opening session of the Textile Section was called to order by General Chairman E. A. Roberts, District Engineering Manager, American Mutual Liability Insurance Company, Atlanta, Ga., who pre-

sided. Chairman Roberts presented in his annual report a brief résumé of Section and Committee activities, and then introduced the first speaker as listed in the scheduled program.

How Far Can We Go Without Management in Developing and Maintaining a Satisfactory Safety Program?

By HUGH L. BRYAN

Personnel Manager, Sonoco Products Co., Hartsville, S. C.

There can be only one answer. The interest taken in the safety program by foremen and other employees is in direct proportion to the interest, enthusiasm and support shown it by management. I say this unreservedly and emphatically.

Who of us has not heard an associate, referring to the boss, say, "You can do almost anything else and get away with it, but you had better not fail to turn in the 'old man's' daily departmental reports," or something similar to that? Many an "old man" has a pet hobby or theory which he is very enthusiastic about and which is strictly observed by his employees, sometimes through fear but usually through respect. Now if this pet hobby or theory happens to be the safety program its success is largely assured.

This is a very ambitious subject, for we may well ask ourselves, how far can we go without the cooperation of our employees? The initial steps, however, must always be taken by management.

Often we find top men, whether presidents, superintendents, or department heads, who have been on their jobs for almost half a century—men of the old school who have done an excellent job of managing, but who have always accepted as a matter of course that a certain number of accidents were bound to happen and that not a great deal could be done about it. Since they really believed this it is only natural that their younger subordinates should share the same opinion.

The entire safety movement throughout our country is still very much in its infancy

and, although in the span of a few years it will probably be accepted universally as true value, the interest shown in it by some industries is still lukewarm. It would seem to me, then, to be the duty of us believers to make as loud a noise as possible in behalf of the safety work. Just as a product is marketed, the same principle of salesmanship must be employed in selling the safety program to management. As soon as management is sold, the accident-prevention program will pass its probationary stage, for it will have secured executive sanction.

How can we go about this salesmanship? When it is suggested to an employer that he spend more time in developing a safe program in his plant he is naturally going to ask: "How do I know that it will pay for after all, an actual investment will have to be made in time and in money, and I will want some assurance that his company and his employees will receive dividends.

The best answer that I know of is from the experience of others and a fair testimony of such a program in his own plant.

The primary consideration is, of course, from a humane standpoint. It is not necessary to dwell on that, for I am sure that we all agree that any effort to prevent accidents will prevent suffering and this is most worthwhile.

Consider for a moment the far-reaching results of an accident. In addition to the actual suffering from injury there is the injured employee's loss of earnings to consider. The effects of this loss do not cease when he returns to work, for a family man with dependents will usually find that his insurance money, while he is away from work, is insufficient to provide for the regular needs of his family, and he is then perhaps forced to obtain credit which must be taken care of when his full earnings begin again.

From the employer's standpoint a loss is also sustained. If the injured employee is a key man or skilled laborer in a production line, the entire work is retarded or held up until a suitable substitute can be obtained. This, of course, means decreased production and increased overhead.

Certainly these two results of an accident, alone, are important enough to make an employer take notice if a method can be suggested whereby such an accident could be avoided.

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Publicity Committee Chairman—F. A. POLLOCK, Lumbermens Mutual Casualty Co., Chicago, Ill.

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*H. E. SEELY, The Brunswick-Balke Collender Co., Chicago, Ill.

*Past General Chairman

MONDAY AFTERNOON SESSION

October 16, 1939

The first session of the Wood Products Section was called to order by General Chairman J. H. Lee, Safety Engineer, Liberty Mutual Insurance Company, Rockford, Ill., who presided. In his opening remarks,

Chairman Lee sketched some of the activities of the Section during the past year, paid tribute to the Sectional Committees for their work, and then introduced the first speaker.

Health Hazards in the Woodworking Industry

By R. R. SAYERS

Senior Surgeon, Division of Industrial Hygiene, National Institute of Health, U. S. Public Health Service, Washington, D. C.

In 1935 there were 579,012 workers in the United States employed in industries in which wood in some form is the principal material. Of this number 283,309 were employed in the basic industries and 133,772 in the furniture and related industries. The remainder were in wood-reworking industries, wooden-container industries, and other allied industries.

Only limited data as to absenteeism due to all illness or to occupational diseases are available. However, in a survey of 1,487,224 workers employed in 16 indus-

try groups in 16 states the data given in the accompanying table showing exposures were obtained for the lumber and furniture industry.

The table shows that dusts and the chemicals involved in finishing and preserving wood constitute the major exposures which may cause illness or untoward symptoms.

Dust

Many processes in the wood industry (sawing, planing, boring, drilling, belt-

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Percent of Workers in the Lumber and
Furniture Industries Exposed to
Specified Materials

Materials	Workers Exposed
Number of workers surveyed	93,375
1. Organic dust	51.8
2. Silica dust	5.7
3. Dermatitis producers	5.3
4. Petroleum products	5.0
5. Lacquer and varnish	3.7
6. Organic solvents	3.6
7. Other metals	3.2
8. Silicate dust	2.8
9. Carbon monoxide	2.2
10. Paints and enamels	2.1

sanding, removal and utilization of waste) give rise to wood dust.

Smith, in reviewing the literature on the relationship of wood dust to respiratory disease, states that on the whole exposure to conditions of work incidental to the trade of woodworking carries with it an increased risk from respiratory disease.

Although there may be disagreement as to whether wood dust *per se* is responsible for an increased incidence of tuberculosis among woodworkers there is general agreement that organic dust in high enough concentrations may produce some irritation of the upper respiratory tract. The possibility has also been suggested that this type of dust may act as a carrier of the tubercle bacillus into the respiratory tract. In view of the fact that there is no conclusive evidence that pure wood dust is the cause of the increased incidence of tuberculosis and other respiratory infections among wood workers a more extensive investigation of the question than has yet been made would appear to be warranted.

The occurrence of asthma due to the inhalation of fungus spores should also be mentioned. Towey, Sweany and Huron carried out a clinical, roentgen and laboratory study on a series of 35 patients in the Upper Peninsula of Michigan. The symptoms were acute and typically asthmatic. These men were working where they came into contact with dust from maple logs cut for more than a year. The dust proved to be the spores of a fungus identified as *Contosporum corticale* E. and E. In the authors' opinion, the condition was due to a local toxic

effect and foreign body reaction, combined with a delayed effect resembling protein sensitization in its clinical and certain immunologic effects. The authors recommended preventive measures which include the removal of affected patients from the environment of the spores as soon as they are detected, or exhaust ventilation of the saws during the working process.

Poisonous Woods. The fact that contact with certain woods and their dusts may produce an irritation of the skin, mucous membranes or symptoms of general poisoning is well recognized. The majority of cases of dermatitis and toxic symptoms from wood occur in those whose work brings them in contact with the dust and sawdust derived from these woods. However, eruptions have occurred from other types of contact such as proximity to the tree alone or while handling the wood in any way.

Woods of tropical origin are the more common offenders. However, the wood of numerous trees native to temperate climates has also been found to produce irritation. Among them are: birch, California sequoia, chestnut, hemlock spruce, Norway spruce, Japanese Tagayasan, cocobolo, Brazilian walnut, blackwood, satinwood, sabelu, mahogany, teakwood, ebony, boxwood, yew wood, red cedar, oak, and beech.

Few figures are available as to the incidence of dermatitis from contact with woods. Schwartz found dermatitis resulting from the dust of Brazilian walnut in 11 of 100 workers in a cabinet-making plant. He communicated with other firms using the wood, and 9 of 10 reported instances of eruptions apparently attributable to the Brazilian walnut, the number of workers affected in the different factories varying from one or two to a majority. One firm reported that it had discontinued the use of the wood because of the large number of workers affected. It is obvious, however, from the relative frequency of reports dealing with such woods as satinwood, that sensitivity occurs frequently with some, while the infrequent or single mention of other woods indicates that reactions to them are exceptional.

The precise nature of the toxic effect of

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woods has not been accurately determined. Some authorities believe that the toxic agents are free unsaturated acids; others, that they are resinous oils and alkaloids. Other types of chemicals are responsible in some cases.

The toxicity frequently varies with the habitat and in many varieties of wood, from one tree to another. Thus, it is reported that cocobolo wood from Panama can produce dermatitis, while that from Nicaragua appears to be harmless. The variation in toxicity from one tree to another is particularly marked in the case of satinwood.

The majority of woods are most toxic when freshly cut but a few become increasingly harmful as they age. Thus cases of dermatitis have been reported in persons who had sat on branches of the rengas which had been cut and dried for months. The use of this wood for the manufacture of furniture has practically ceased because of the production of symptoms by furniture which has been in use for years.

Local or general symptoms of poisoning usually appear within a few hours, days, or weeks following contact with an irritant wood. However, cases have been reported in which workers after years of immunity to a toxic wood have become susceptible to irritation by the material. In the case of some woods, tolerance may be established, but as a rule, sensitivity once established is persistent. In general, the eruptions present the usual picture of dermatitis venenata although a number of variations occur. Perspiration and seborrhea apparently increase the noxious action of practically all woods. The affection is considered by most observers to be allergic.

Patch tests with moist sawdust are usually sufficient to establish the diagnosis in cases of suspected wood dermatitis.

Paints, Lacquers, Varnishes

The paints, lacquers, varnishes and stains employed in the finishing of furniture and other wooden articles constitute a second major health hazard.

Chromates and bichromates which are used for staining and in polishing wooden articles favor the development of ulcers on the hands and feet, of conjunctivitis,

and dermatitis. Although perforation of the nasal septum has been reported, it is infrequent.

Prolonged work with stains containing methyl alcohol may cause optic neuritis. "Polishers' itch", an eczematous condition of the hands and arms, is common among wood polishers, the causative agent being either petroleum, shellac dissolved in wood alcohol, or in alcohol denatured with pyridine bases.

The use of the spray gun and dip tank for the application of paints and lacquers has largely replaced the hand brush in industry in painting operations. The adoption of these methods has resulted in a change in working conditions with resultant hazards of two types: those relating to toxicity and those relating to flammability.

The substitution of harmless pigments for toxic pigments has rendered many paints much less poisonous. Turpentine and benzol have been displaced by other solvents in many paints during the past 15 years.

A few years ago lacquers displaced paints in many finishing operations. The ordinary lacquer contains several basic ingredients such as nitrocellulose, solvents and diluents, gums or resins, softeners or plasticisers, and pigments. The volatile ingredients constitute about 75 percent by weight of an average lacquer.

The evaporation of the volatile fraction constitutes the major occupational disease hazard in the use of lacquer, although the vehicle, pigment and resinous compounds cannot be entirely eliminated from consideration as possible offenders inasmuch as the toxic properties of many of them are unknown. Among the pigments which may be toxic are those yellows, greens and oranges which contain lead chromate, the aniline derivatives and possibly those containing cadmium, antimony and barium.

Over 100 solvents are used in the lacquer industry alone. (15). Some of the more important solvents are the esters, such as the acetic acid esters of methyl, ethyl, propyl, butyl and amyl alcohol, and the ethers which include the alkyl ethers of ethylene glycol. The effect of alcohol, ether and massive doses (in excess of 1,000 p.p.m.) of the ester solvents is mainly narcosis. Some of them are also irritants to the skin and mucous mem-

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branes. There is need of investigation to determine the effects of prolonged exposure and the maximum safe concentration for many of these compounds.

The important diluents (thinners) are the hydrocarbons which include benzol, toluol, xylol, naphtha, and the alcohols (methyl, ethyl, propyl, butyl and amyl alcohols and cyclohexanol). Air concentrations of greater than 50-75 p.p.m. of benzol and 100 p.p.m. of toluol or xylol may produce serious damage to the blood-forming organs of the body. The International Labour Office regards a concentration of 100 p.p.m. of methyl alcohol as the threshold of toxicity. However, concentrations of 200 p.p.m. in a New York factory were observed to give rise to comparatively slight intoxication in the personnel. Butyl alcohol in concentrations of 100 p.p.m. is reported to cause damage to the blood, liver and kidneys of experimental animals. The other alcohols are probably not very toxic in ordinary usage.

The most important route of absorption of volatile substances is through the lungs and consequently it is essential to keep the concentration of vapors in the atmosphere to be breathed at a minimum. Although some of the vapors have but little toxic action, any volatile material may produce narcosis or asphyxia if present in sufficiently high concentrations. The practice of some lacquer workers of indiscriminately using solvents to cleanse their hands should be discouraged since absorption through the skin may produce serious systemic damage and since the cracking of the skin which results from the removal of the fats and oils from the skin of the hands and forearms provides openings through which infection may be established.

The volatile materials present in lacquer constitute the principal fire hazard as well as the major health hazard although nitrocellulose adds another inflammable element.

Wood Preservatives

Persons engaged in the impregnation of wood for the purpose of rendering it weather-proof, water-proof, fire-repellent, and resistant to fungi may suffer from vesicular and other skin eruptions due to

the chemicals employed. Eczema of the skin and catarrhal conditions of the mucous membranes of the head are fairly common.

Creosote which is used for the preservation of wood to be used for outdoor construction purposes is a primary skin irritant and may also result in the development of occupational coal tar photosensitivity.

Although the creosoting process has largely replaced the use of chromated zinc chloride in the preservation of wood to be used outdoors, the latter is still used for wood intended for indoor construction. McCord and Kilker examined 17 workers employed in a wood preserving industry and found that of the four types of skin lesions presented, three were well known as incident to work in tar. Zinc chloride burns were the fourth type of lesion and were present in all patients, occurring on the fingers, hands, forearms, and occasionally on the legs and thighs.

In determining the causes of the lesions it was found that the strength of the zinc chloride solution in the treatment fluids was too dilute to produce skin lesions. However, during the period when the ties were left in the open air, following their removal from the treatment cylinder, evaporation of the water from the zinc chloride solution occurred so that the ties when handled in loading were sometimes covered with treating fluid in which the zinc chloride approximated saturation. Additional factors to be considered with respect to zinc chloride burns are: (1) antecedent injury to the skin appears to be necessary; (2) after the initial lesion, repeated exposure to the zinc chloride solution and irritation from the tar fraction of the treating solution are factors in the severity and progress of the lesion.

Experimental studies have shown that approximately one percent mixtures of phenyldichlorarsine in medium or heavy petroleum distillates are efficient wood preservatives. Although these mixtures have not yet received commercial use it should be kept in mind that tests have shown that marked initial vesiculation may occur in certain persons exposed to the action of phenyldichlorarsine.

Pentachlorophenol and tetrachlorophenol are also used as wood preservatives. In addition to being skin irritants

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they may also be absorbed through the skin in sufficient amounts to cause systemic poisoning.

Other chemicals which are used for impregnating wood include dinitrophenol, aniline, potassium bichromate, fluorine compounds and mercuric compounds. According to the literature, each of these chemicals possesses toxic properties when absorbed in sufficient quantity into the body. Ultimately, only careful medical examination in conjunction with the study of types and amounts of exposure will establish their importance as health hazards.

Engineering Control. The basic principle in dealing with a dust, gas or fume hazard is control at the point of origin, thus preventing dissemination into the atmosphere. Sometimes a process can be enclosed or isolated completely in a sealed room or compartment, but frequently the exhaust ventilation method is preferable. Water may be used to prevent the dispersal of dust and under certain conditions it may be advisable to combine the use of water with exhaust ventilation. Proper design, installation and maintenance of any mechanical device is essential if protection is to be adequate.

Individual types of respiratory protective devices such as masks or respirators should be used only where exposure is intermittent or brief, or where some unusual condition makes a more adequate control method impracticable.

In the case of materials producing external irritation, auxiliary protective measures may include the use of protective

clothing, gloves, goggles and aprons, as well as protective salves, ointments or other compounds to delay or diminish the irritant action. General rules for hygiene and good housekeeping should also be observed.

Safety education and the proper maintenance of equipment and safety devices are the important factors.

Medical Control. Medical control, through preemployment and periodic physical examination, is one of the most important factors in the prevention of industrial injuries and illness.

The preemployment examination serves to determine the employee's physical and mental fitness for work. The purpose of such examinations is not to eliminate or exclude an employee, but rather to direct his placement in work for which he is physically suited. The practice of preemployment examinations should also be extended to include executives and officials.

The purpose of periodic examinations is to secure and maintain physical fitness. Defects and disabilities which were not observed at the time of employment may be discovered on reexamination. In such cases, an occupational adjustment should be made to provide continued employment and remove the risk of permanent injury. Reexamination of employees also serves as a check on the efficacy of the engineering control methods already instituted, or as a measure of the need for new protective devices. The frequency of examinations should be determined by the medical director unless specified by law.

WEDNESDAY AFTERNOON SESSION

October 18, 1939

Use and Abuse of Circular Saws and Their Relation to Safety

By ALBERT L. UHL

Sales Engineer, Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa.

Circular wood-cutting saws are divided into four classes, namely: cross-cut, rip, combination, and grooving. Each of these saws has its own use in the wood-working industry.

Circular cross-cut saws are manufactured in several patterns of teeth and on many spacings of teeth. Each one has certain peculiar work to do, but in all classes the teeth should be bevel filed to best save the

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Safety Exposition

Exhibition Hall—A. C. Auditorium

Alphabetical List of Exhibitors of Industrial Safety Equipment

- Acme Protection Equipment Co., Inc., Pittsburgh, Pa.
Gas Masks.
- American Book Co., New York, N. Y.
School Book Publishers.
- American Chain & Cable Co., Inc., Bridgeport, Conn.
Manufacturers of Wire Rope, Chains and Chain Products.
- American-LaFrance-Foamite Corp., Elmira, N. Y.
Fire Protection Equipment.
- American Optical Co., Southbridge, Mass.
Head and Eye Protection Products, Safety Clothing.
- Bausch & Lomb Optical Co., Rochester, N. Y.
Safety Goggles and Safety Lenses.
- Bear Manufacturing Co., Rock Island, Ill.
Vehicle Inspection and Correction Equipment.
- Bendix Products Division of Bendix Aviation Corp., South Bend, Ind.
Automotive Equipment, Steering Stabilizer, Brake Testing Equipment.
- Brown Shoe Co., St. Louis, Mo.
Men and Women's Safety Shoes.
- Stewart R. Browne Manufacturing Co., New York, N. Y.
Safety and Special Purpose Lights and Lamps.
- R. H. Buhrke Co., Chicago, Ill.
Safety Equipment for Construction and Maintenance.
- Burroughs Wellcome & Co., (U.S.A.) Inc., New York, N. Y.
First Aid Kits and Medical Equipment.
- Carbisulphoil Co., Dallas, Texas.
Foille for Burns and Industrial Wounds.
- H. Childs & Co., Inc., Pittsburgh, Pa.
Industrial Safety Shoes.
- The Cleveland Overall Co., Cleveland, Ohio.
Safe Industrial Work-Clothing and Uniforms.
- Coffing Hoist Co., Danville, Ill.
Coffing Hand and Electric Hoists.
- Columbus McKinnon Chain Corp., Tonawanda, N. Y.
Alloy Steel Sling Chains and Safety Hoists.
- H. S. Cover, South Bend, Ind.
Respirators and Rubber Safety Goggles.
- Craddock-Terry Shoe Corp., Lynchburg, Va.
Industrial Safety Shoes.
- Davis Emergency Equipment Co., Inc., New York, N. Y.
First Aid and Industrial Safety Equipment.
- C. H. Dockson Co., Detroit, Mich.
Head and Eye Protection Equipment.
- Dugas Engineering Corp., Chicago, Ill.
Fire Extinguishing Equipment.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware.
 Manufacturers of Neoprene Synthetic Rubber and Pro-Tek Hand Cream.
 Eagle-Globe-Royal Indemnity Companies, New York, N. Y.
 Safety Engineering, Automotive, Boiler and Machinery Service, Casualty Insurance.
 Eagle Signal Corp., Moline, Ill.
 Traffic Signals and Controllers.
 Elliott Service Co., New York, N. Y.
 Promotion of Efficiency and Safety.
 Charles K. Ernst, Inc., Buffalo, N. Y.
 Safety Barrel and Drum Handling Equipment.

Fairway Laboratories, Inc., St. Louis, Mo.
 Salt Tablets and Dispensers.
 Finnell System, Inc., Elkhart, Ind.
 Electric Floor Maintenance Equipment and Compounds.
 Franklin Research Co., Philadelphia, Pa.
 Floor Maintenance Materials.

Harley-Davidson Motor Co., Milwaukee, Wis.
 Police Motorcycles, Servi-Cars and Accessories.
 Hoof Products Co., Chicago, Ill.
 Motor Vehicle Speed Control Governors and Brake Eyes.
 Hynson, Westcott & Dunning, Inc., Baltimore, Md.
 Mercurochrome First Aid Antiseptic, Thantix Lozenges.

Indian Motorcycle Co., Springfield, Mass.
 Police Motorcycles and Equipment.
 Industrial Gloves Corp., Danville, Ill.
 Industrial Safety Clothing.
 Industrial Products Co., Philadelphia, Pa.
 Industrial Safety Equipment.
 Insto-Gas Corp., Detroit, Mich.
 Gas Operated Torches and Furnaces.
 International Chain & Manufacturing Co., York, Pa.
 Lug-Reinforced Tire Chains.
 International Shoe Co., St. Louis, Mo.
 Hy-Test Safety Shoes.

Juvenile Wood Products, Inc., Fort Wayne, Ind.
 Automobile Safety Seats for Children.

Kar-Tell Spot-O Parking Meter Co., Portland, Oregon.
 Automatic, Car-Mounted Parking Meters.
 Kent Co., Inc., Rome, N. Y.
 Electric Floor Scrubbing and Cleaning Equipment.
 Keystone View Co., Meadville, Pa.
 Visual Safety Tests.
 Walter Kidde & Co., Inc., New York, N. Y.
 Fire Protection Equipment.
 The Kimball Safety Products Co., Cleveland, Ohio.
 Safety Clothing and Industrial Goggles.

Lehigh Safety Shoe Co., Allentown, Pa.
 Leather and Rubber Safety Shoes.
 Lightfoot Schultz Co., New York, N. Y.
 Toilet Soaps for Industrial Washroom Use.

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