TRANSACTIONS

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NATIONAL SAFETY COUNCIL, INC.

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Ambassador, Chelsea, Ritz-Carlton Hotels
and Atlantic City Auditorium

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Maintaining Interest in Safety

WEDNESDAY AFTERNOON SESSION

October 7, 1936

The causes of lagging interest in a safety program and the means of reviving this interest were discussed in the session on Maintaining Interest in Safety, which was held Wednesday afternoon, October 7.

C. B. Boulet, Personnel Director, Wisconsin Public Service Corp., Milwaukee, was chairman of the panel discussion.

Panel participants were E. W. Beck, Supervisor of Safety, U. S. Rubber Products, Inc., New York City; Roy S. Bonsib, Chief Safety Inspector, Standard Oil Co. (New Jersey), New York City; Clayton Braatz, Personnel Director, Marathon Paper Mills Co., Rothschild, Wis.; W. T. Filmer, Supervisor of Safety, Youngstown Sheet and Tube Co., Youngstown, Ohio; G. A. Kuechenmeister, Personnel Manager, Dominion Forge and Stamping Co., Walkerville, Ont., Canada; T. E. Lightfoot, Engr. in Charge of Accident Prevention and Compensation, Koppers Coal Co., Pittsburgh; G. E. Sanford, General Electric Co., Schenectady, N. Y.; and H. F. Webb, General Safety Director, West Penn System, Pittsburgh.

Chairman Boulet: It is easy to start a safety program. With the blare of bands and the flag waving everyone is temporarily interested, and usually accident frequency will take a sharp drop. However, after you have had a program for several years everyone takes it for granted, and the interest drops. Immediately your frequency goes up. For this reason it is vitally important to find ways to maintain interest.

But first we must find out what causes lack of interest.

A. H. Nielan (Crown Cork & Seal, Baltimore): Is it possible that a let-down is due to a part-time safety director?

Mr. Lightfoot: Yes. A safety director's job is an all-time job. I feel that if you have a part-time safety director, you can look for a let-down. There may be an exceptional case of an unusual industry, or an unusual part-time safety director, of course.

But it is hard to understand how any plant can maintain an efficient and definite safety program when the safety director or the safety engineer may suddenly be called away or directed to do something else.

Chairman Boulet: I think that is the right slant for a big plant—a full-time man; but I disagree on the small plant. I don't see how you can have it.

Mr. Titus (National Lock Washer, Newark, Ohio): It seems to me that if you take up these problems with the safety man, and he is not much interested in them because he has a lot of production work to do, he just slips up on the job.

Mr. Braatz: If your management is thoroughly sold on safety, whether your safety director is part-time or not, your program will be successful. I am laying the blame for a let-down in the safety program in management's lap entirely. You men probably have had waste to contend with in the past, and your wastes have been overcome by action through your management. Accidents are merely another form of waste, and when your management lays some emphasis on waste, you are going to get action, and not until then.

Mr. B. Lincoln (Indemnity of North America): A good foreman is recognized as a good example of the part-time safety man. His duties are multiple and important in successful safety management.

George Lexander (Socony Vacuum): Outside influences have a direct bearing on the let-down of your safety program

—interesting influences of national scope, such as bank holidays.

Chairman Boulet: Elections and world series?

Mr. Lexander: Right.

Mr. Beck: I disagree with the statement about the foreman doing safety work on a part-time basis.

A foreman will do it in his own department, yes, but you are interested in the whole plant. If you have a small plant you can maintain interest with a part-time safety man, but only if he is given responsibility.

Chairman Boulet: I think that clinches the part-time question: In a large plant a full-time man is necessary, and in a small plant a part-time man can do a good job and maintain interest, provided he is definitely given the responsibility and authority.

Mr. Turner (Bethlehem Steel): What influence has the depression had on the let-down of safety?

Mr. Webb: A great deal, because our executives, even though they were safety minded and thought a great deal of safety, neglected it during the depression.

Safety effort reached bottom during those years, but I think it is coming back fast. It is regaining executive assistance and support, and that is what you must have to maintain interest in safety.

You must have a two-fisted executive who will go down the line and say, "I am for safety, and I am going to have it!"

Chairman Boulet: Does a continued good record cause a let-down in safety?

F. M. Pepper (Illinois Bell Telephone Company): There is a danger of that. I am not a very strong advocate of contests; and the reason ties right in with that. I think there should be some form of appreciation of a job well done, whether it is safety or something else, but I don't think we should pick out the safety job particularly and pin saucers and medals and other things on men's chests just because they did something they should be doing; and that goes for the supervisory people just as it does for the workers.

A continuous and successful safety program brings a danger of getting contented with what we are doing. The winning of too many contests will lead to that to some extent, and it takes an energetic executive to keep prodding us, to keep us out of that situation.

H. P. Heyne (Industrial Commission of Ohio): I disagree. In Ohio we are interested in the community type of safety campaign, and in Cleveland some years ago we started a safety campaign among all the industries. We had 307 companies. This year on October 1 we completed our sixth annual campaign with 1,400 Cleveland companies. If there is any way to maintain interest, and if there is any way to keep from getting too satisfied with a safety record, I believe this is one way of doing it.

Not only has it proved successful in industry but also in vehicle fleet management.

As a matter of fact, the company that won in Cleveland this year has now won first place four times out of six years; and it employs 1,800 men, and works close to 2,000,000 hours, without a single lost-time accident.

I believe that the number of companies participating—307 in 1931, 500 in 1932, 650 in 1933, 715 in 1934, 1,100 in 1935, and 1,650 in 1936—is enough to bear out the value of the contest.

George Hanley (Perfect Circle Co., Hagerstown, Ind.): I think the question of lack of interest in safety is measured by how busy the firm is. This old question of dollars and cents enters into safety more than anything else, and when we have licked that, we have licked the whole problem. When the departments of a plant get so busy that they just haven't got time for safety, that is when accidents happen.

When management and men really become interested in safety, not from a safety angle, but from the angle of people going home whole and unhurt and well and in their normal condition, then we will have real safety; but until then, there isn't any contest nor anything of that sort that will answer the purpose.

Mr. Beck: We have been conducting a safety contest for 10 years, and if I were asked to discontinue everything but one thing, I would hold onto the safety contest.

One of the large rubber companies has just established a record of 6,000,000 man hours without a lost-time accident. Interest has been stimulated through the rub-

ber section contest, and not a man can afford to break that record. They are on their toes all the time. Bring in crutches? No, sir.

The contest is based on compensable accidents; and where money is spent, it counts against their experience. They cannot cheat. The contest is tight and sound. It is based on their improvement on their previous three-year average, and they are all competing with themselves and nobody else.

T. E. Lightfoot: Why should we run contests in our plant, with only 250 men? We know their families, and we know these men. We simply tell them, "Don't get hurt, whether it is accidental or wilful or anything else."

We don't say that contests are no good, but my point is that they should be used in a program if they fit. If you can prevent injuries without contests, why not do it?

You know what happens to production any time the supervisory staff loses interest in it. Down it goes; and if it is true what we have been told for the last five or ten years, that safety and production go hand in hand, then why try to separate them and run safety as a program or contest or something of that sort, when you don't do it and don't have to do it with production?

Chairman Boulet: How many think contests are all right? How many are opposed?

The ayes have it.

T. A. Schlatzer (Davison Chemical Co., Baltimore, Md.): The main instrument for the prevention, not of accidents, but of personal injury, is education. If we conduct a contest, we don't do it for direct commercial value, but for advertising value; and from that advertising we receive safety education. If you can do this, by all means use your safety contest.

But if the manager of a plant puts an injured man to work pushing a broom to keep him from considering it a lost time accident, he is not kidding anyone but himself. The only valuable information we get from a safety contest is how much better we are doing our job than we have done it before, and how much better than the other fellow in the same line of work. If we are losing interest in our safety organization, it is not the fault of the management, nor of the men, but of you, the safety engineer.

Dust off your bookshelves, read up on safety, and you will be able to stimulate more interest among your men than a safety contest can do.

To keep interest stimulated in a man, we must understand the individual. We must know his domestic troubles, and sympathize with him, give him advice, and not mistreat the confidence he has in us. When a safety engineer accomplishes this, he will not have a problem of stimulating interest.

Chairman Boulet: "What is the proper method of approach to the workers to inspire interest in safety?"

Mr. Sanford: With various types of individuals the same method isn't going to work. Suppose you have some ruling that you would like to put through in the plant. You may start with your general supervisory committee and discuss it. Then let each one of those men go back to the group of which he is chairman and discuss the thing, asking, "What do you think of it?" Then sell the idea to the next group, and so on, until you get to the workmen's committee. Get their slant and bring it right back to the management. When the order comes out, you will find these fellows saying, "There is something I had a hand in."

Get them to express their opinions, and you may sell the idea to them without their realizing that it is coming from the top down.

Another rather old-time method is the workmen's safety committee. I know of one plant that arbitrarily picked out one man from ten, right down to the floor, telling him he was on the safety committee. It was his job as long as there were no accidents.

It was surprising how accidents decreased immediately. Each man was taking care of his brothers as well as himself.

V. I. Calkin (American Seating Company): Sometimes these methods come from the men themselves. In our plant the men suggested that each foreman appoint one or two men in each department, for one month, to be the safety committee in that department. It was decided to try it for one month, and the results were such that the plan was used for a whole year. So far this year we have

at least sixty men vitally interested in safety who were not greatly concerned with it before.

Taeke Bieboer (American Seating Company): We also instituted a safety cigar or candy bar plan. In any department which goes without a lost-time accident for a month, every member gets a cigar at the end of that period. I think this has done more to interest our men in safety than anything else.

W. P. Coster (American Sugar Refining Co): What success have any individual members had with strict enforcement of discipline in inspiring safety or keeping up safety interest?

I. H. McNeil (Nebraska Power Co., Omaha): A few years ago we used to give cigars away, and we threw the plan out. Strict enforcement of discipline and observance of safety rules will do more than anything else.

A. D. Schiller (Corning Glass Works): About four years ago in the mixing room at the Corning Glass Works we had the problem of making the men wear goggles and respirators. We used discipline, telling those men either to wear the goggles and the respirators or to leave their jobs. Now they wear their protective equipment without being told.

A. H. Trestrail (Pickands, Mather & Co., Caspian, Mich.): We had difficulty in training men to report accidents, but after we gave a man a three-day layoff, we didn't have any more trouble. We do give awards, however. We used cigars for a long time, but now have an accumulated credit system. If a department goes a month without a lost time accident, we credit each man with 25 cents. After the second month this is increased to 30 cents a month, and by the end of a year a man builds up a prize fund of about $3.50. By buying wholesale we can give him a reward of something worth about $7.

Now, you can laugh at cigars, but we gave candy, cigarettes, cigars, and then we switched over to this accumulated credit system, and it works. Discipline has to be accompanied with some sort of contest. We couldn't teach men first-aid until we had first-aid contests. This stimulated their interest enough to make them seek an education; if you can get a man interested in safety, he will seek his education, but of course you have to have the educators ready to supply the information.

Mr. Filmer: Notice the wording of that. The best way is to inspire, not to compel. Action that is compelled is not spontaneous. It is likely to let up as soon as the compulsion is removed.

When you inspire, you appeal to the best there is in a man, and he responds because something inside of him is telling him that it is to his interest, not somebody outside telling him, "You do this, and you get a cigar." Possibly there is a selfish purpose behind it for the man, but where can you eliminate selfishness?

Why ask a man to wear safety shoes? If he fails to protect his feet, his own toes will suffer. Why ask him to wear the goggles? To save his own eyesight.

Something inside of the man is telling him, "For your own interest, for the interest of your family, for the interest of your future and your ability to carry on your job with all of your faculties—work safely. It is your problem, and not ours."

You are then inspiring that man, and not compelling him. You have him working with you, and you don't have to worry so much about him after that.

Mr. Kuechenmeister: How many of you men have a working agreement with your wife, that for every day she doesn't burn her finger, you will give her any little trinket? Do you promise your children that if they come home from school without getting hurt, you will buy them a lollipop? You haven't got your working program with your family, and you don't think it is necessary, because you suspect that being hurt is very much like virtue—it has its own reward.

Teach the man in the plant that it is his eyes, and his toes; but provide him with the necessary devices. Make it easy for him to buy safety shoes. Show him that it is for his own protection, and that safety, or the lack of injury, has its own reward.

Chairman Boulet: Jim Eaton, here, gives away safety shoes. Will you tell us why you do it, and whether it works?

James P. Eaton (General Electric, Schenectady): I think the plan was suggested by the men themselves, a group in the plant. If they go six months without an accident, their name is put in a hat, and they get a pair of safety shoes

free. I don't know how many accidents we have prevented, but it is creating a lot of interest.

Mr. J. L. Schaeffer (National Cash Register Co., Dayton, Ohio): One way to maintain interest is to investigate every accident, minor or otherwise, and discuss it with the injured and with the men closely associated with him. That has a psychological effect on the whole department. It shows that the foreman, supervisor, or the leaders of that department are interested in the man's welfare and that where anything can be done to prevent some other workman from having a similar accident, it will be done.

G. A. Cooper (Public Service Electric & Gas Co., Newark): What about the "white elephant contest," in which the management provides a white elephant, and the foreman with the worst record for the previous month is obliged to keep the elephant on his desk and explain to all inquirers why it is there.

Chairman Boulet: We have a white elephant in our company. Our company won national honors in the Public Utilities section for three or four years, and then we had a let-down.

We decided our supervisory force was at fault. We started this contest on June 30, and we have not had a lost time accident since then. For the first time in the last three years we have gone more than 30 days without a lost time accident. I give the elephant some of the credit. It is just a means to the end. In itself it doesn't mean a thing, but nobody wants it, and everybody is on his toes.

Let us see hands. This is a debatable question. This disciplinary action, and we will have the vote.

Somebody wants a vote here, so I am willing. How many favor disciplinary action where it is needed?

How many say no?

Well, here is a man that says no. He wants to talk again.

Mr. Hanley (Perfect Circle Company): Regarding discipline and protective equipment—we have no right to go into a man's pocketbook, even though it is a protection to himself, and take the wages that belong to him and his family. There is another approach to this disciplinary action that is much more effective.

In our plant each foreman is told, "Don't have a lost time accident in your department."

He will say, "But what shall I do about this?" We say it is up to him to figure it out. He calls his men in and says, "Men, we are not going to have a lost time accident." He works with those men personally, and after all, safety is a personal problem.

When you get your foreman working with individual workers in his department, you will soon eliminate accidents.

We have in each department a foreman's safety record, hanging on a bulletin board. If he has a clear record for the month, we send him a gold star, and he gets his men together, and up goes the star. If he has a lost time accident, he puts up a red star together with the man-hours of exposure, and his standing in comparison with other departments.

H. E. Hensel (Youngstown Sheet & Tube): If you want your men to be interested in your accident prevention program, give them a part in it. Several of our foremen developed this idea.

In the semi-monthly meetings of their men, they appoint a man from the ranks to talk on safety at the next gathering. When those fellows dig up facts on accident prevention, talk and think about hazards of their department, they can't very well go back into the department and commit unsafe practices.

Chairman Boulet: I think that is a hundred per cent right.

R. B. Robinson (Washburn Crosby Company): The only man who can do the work safely is the man doing the job; but the foreman must help him. We have used that principle for the last three years, getting the man himself to take part in our program with the help of the foreman, and you would be surprised at the practical ideas that will come from those men.

Mr. Kinner (Accident Prevention Association of Ontario): I want to give another slant on this disciplinary thing. Some years ago I investigated a fatality on a construction job. The victim had been riding on the foot board of an engine, and the engine jumped the track. The man died from loss of blood and shock.

The foreman said "I warned him every day for a week not to ride on the foot board of the engine."

I said, "If you had fired him the second day you caught him doing that"—

"Yes," he said "he would probably be alive today."

I said, "I don't know whether he would or would not, but at least your skirts would have been clean of any possibility of being blamed for his death."

There is another point regarding disciplinary action. In Ontario we don't pay compensation until a man has been off for seven days, and we had one firm with an exceedingly large number of one-week accidents. At the end of the seventh day all the men were ready to come back to work. The boss, peeved at this, said, "For every man that loses time through an accident that is his own fault, I am going to deduct 5 cents an hour from his wages for the same number of hours that he loses through the accident."

At the end of the next year he had taken 15 cents off his workmen's wages.

Regarding the proper method of approach to inspire interest, I would suggest the setting of a good example. Mr. Kuechenmeister has a rule that the president of the company can not come into the plant unless he wears goggles like the rest of the men, and that inspires interest in his workmen.

Mr. Braatz: I wonder how many of you men ever asked your foremen what they want to do about discipline? Our safety committee, composed of men in the ranks, set their own safety rules, and they follow them.

David Snell (Kimball Glass, Vineland, N. J.): I disagree with the thought that 75 per cent of the men will obey rules and be safe and that the other 25 per cent, for some reason, need discipline. The latter are intelligent enough to do their work, and certainly intelligent enough to be safe. It is up to the men above them to take the responsibility.

Mr. W. H. Hasam: If a man makes a recommendation regarding a hazard, see that it is followed as quickly as possible. That shows your interest in his ideas, and he then takes a greater interest in his work. In discipline I believe we should be tolerant. If a man breaks the rules, talk to him about it and reason with him; if he continues to commit the crime, use your disciplinary measures.

C. V. Davison (American Rolling Mill Co., Middleton, Ohio): During the past few months we have taken on a lot of new men, fellows who have been out of work, or who have been out of school for possibly five or six years and have never worked before. Sometimes these boys get into trouble. I have found that instead of using discipline it is better to talk to them like a Dutch uncle.

Chairman Boulet: What is the responsibility of the safety department, the management and the foremen, in stimulating interest in the program?

E. J. Kreh (Philadelphia Co., Pittsburgh): I think responsibility begins with the management. It is necessary first to get the support of the executive and work through him to get the support of the supervisors, and down through them to the men.

J. P. Watson (Bureau of Indian Affairs): The fact that an organization has a safety engineer is evidence that there is executive interest in safety. It is not the responsibility of management to direct the safety engineer. He was hired on the assumption that he knew his business.

If he has the correct application and interpretation of the statistics in hand, then the interest on the part of other departments will be self-evident. They will recognize the value of what he is trying to do, and the results will be, I think, sufficient remuneration.

Mr. Bonsib: I think the function of the safety engineer and the safety man is to act as a mainspring, to keep the thing moving. I don't think it is possible for any safety man to go in and tell a man what to do, but he should be the means of getting that employee to do what he should do—and to get the employee to see that the things that cause accidents are exactly the things that cause high production costs, waste, and inefficiency.

The sooner we safety men stop talking safety and talk efficiency and cost, the sooner we will get safety.

The trouble is that the safety man is thinking only of how he can prevent accidents, and he forgets about the fact that the plant is trying to make dividends. If a guard interferes with production, it is going to be taken off; it is up to the safety man to work with the productior

man and see that a guard is designed so that it helps production rather than hinders it. That is simply a technical matter that can be worked out. Some of the guards these safety men design are ridiculous, and I think that that is what has hurt the safety movement—the failure of the safety man to realize that the production has got to go on.

I want to repeat—the same thing that causes accidents causes inefficiency.

Chairman Boulet: I suppose we might sum that up by saying that the job of the safety department is to act in an advisory capacity.

M. A. Gimbel (General Electric Co.): If a man is to be disciplined, have you ever had your foreman say this: "If I send that man home, we are penalizing ourselves; we need the job."

From the floor: Send the man home. You are driving for safety. If you get sentimental, and he gets hurt, then it is your responsibility.

Chairman Boulet: You think after one or two penalties you won't have the trouble again, and that an accident will stop production, too.

Suppose the foreman is responsible for an accident?

From the Floor: Any time that there is an accident in a department, we compel the foreman to wear a big yellow button for the following week. We hold the foreman strictly responsible for every accident in his department.

I. A. Brinkman (Macintosh-Hemphill Co., Pittsburgh): The president of our company issued an order that if any man had an accident which goggles or safety shoes would have prevented, that man would lose his job, and the foreman would get a week off without pay.

One fellow took the lenses out of his goggle frames and lost his eye. He lost his job, and the foreman got the week off without pay. We haven't had an accident to an eye or a foot since.

Chairman Boulet: Let us get down to the responsibility of the management.

Mr. Wurten (Bayuk Cigar Co.) I am a manager. Our plant has gone about four and a half million man-hours this year without a lost time accident. I have heard varying opinions here that the foreman is the crux of the situation, or that the safety director is the crux of the situation, but everyone seems to agree that management must first be sold.

It doesn't make any difference what the safety director or the foreman is—management is 100 per cent responsible for every accident that occurs. Until the management in our organization recognized that fact, we got nowhere.

Chairman Boulet: Let us go to the foreman.

P. H. Sanville (Philadelphia Electric Co.): I was, until about a year ago, general line foreman. My conception of safety was that it was entirely my job to sell it to the foremen and the linemen and the ground hands. That was in conjunction with the safety department.

It was necessary that the safety department act as a clearing house for me. I had to get my facts from them. Still, I believe that the foreman is the only man who can carry safety through to those below him.

Mr. Filmer: I wish this matter of management were as simple as has been represented. I wonder if we have enough sympathy for the position of management? The same men who are responsible for safety at the top are also responsible for production, for satisfying customers, for satisfying stockholders, for satisfying everybody, and they have to play all those things together.

We must look to them for the establishment of a policy which they are able to fulfill. We must take safety out of the abstract and put it into the concrete and say, "We know that sometimes the budget will not permit the purchase of this or that, or permit certain work to be done, but we don't want to stall on it."

The attitude of management is not understood by the man on the floor. The superintendent may not want to add to his month's costs something that ought to be done. And the man on the floor is going to say, "You talk to me about safety; why don't you have that taken care of?"

Management's responsibility is to keep the man on the floor in sympathy, and management needs to be in sympathy with the man on the floor.

Mr. Webb: When you produce something that you think is going to help stimulate the safety program, remember that it is not an all-time stimulator. Be-

fore long you have to think of something else to maintain the interest of the men.

Mr. Bonsib: Remember that everything that we do is a result of two great principles, pride and fear. Fear gets results, in the way of discipline, but pride is the greatest instinct man has. Lie awake at night thinking of how you can do your work better, and you will think of things that will appeal to the employees' pride. Pay attention to statistics, but use them correctly. Get statistics along lines that will show you where the trouble is, and what causes it.

With such statistics you can stimulate the competitive instinct, because deep down in his heart every man honestly believes he is just as good as somebody else, and he wants to show it.

Chairman Boulet: The meeting is adjourned.

ADJOURNMENT

Occupational Diseases

FRIDAY MORNING SESSION

October 9, 1936

The session was called to order by the chairman, Dr. Hart E. Fisher, Vice-President for Health, National Safety Council, and Chief Surgeon, Chicago Rapid Transit Co., Chicago, who presided, introducing the speakers.

The Lesser Known Facts About Common Occupational Diseases

By DR. ROBERT B. HUNT

Medical Advisor, American Mutual Liability Insurance Co., Boston

Probably the leader in the parade of industrial diseases is an acute or chronic inflammation of the skin which we call dermatitis. This disease may present itself in any type of shop, factory or foundry. Any paste, powder, gas or liquid which comes in contact with the employee's skin, even the water supplied by the town in which he lives or works, may be the potential cause of such a skin disturbance.

The wide diversity of causes together with the varying susceptibility of different individuals makes the problem of control difficult.

Much investigation is under way to determine why one person may be susceptible to a certain substance while another is not. It has been proved many times that a poisonous substance formed within the body has been able to prolong the action started by some external influence. A printer developed a marked dermatitis from ink which persisted for two years. Finally food tests were made and showed that he was susceptible to lettuce, which, when removed from his diet cleared the skin. He returned to his usual occupation without a return of symptoms.

The poisoning of allergic substances is usually an accumulative process. It takes time to produce a manifestation of disease, but let any other substance cause the disease, and the irritating food may be of sufficient strength to magnify its action.

All cases of dermatitis cannot be cured by eliminating offending foods, but further investigation along these lines may give us a clue with which to lessen the loss of time from work and the discomfort now produced by industrial dermatitis.

Metals

Lead

The distribution of lead poisoning is quite extensive.

The skin of the body is a protective covering, and as long as it remains intact it does a good job except in the case of tetraethyl lead, which is used in blending gasoline and which is readily absorbed through the skin, having a tendency to create changes in the nervous system. The effect of other forms of lead, through that avenue of entrance, is practically nil, which explains the extremely low poisoning rate in typesetters, painters and others who continually come in contact with metallic lead.

Lead in any form, introduced through the mouth, acts rather slowly when compared with the inhalation of lead dust or fumes. However, no matter what the portal of entry may be, lead is acted upon by the body fluids and so converted that it may eventually be deposited within the bones.

Those bony safe deposit vaults may retain their lead contents for days or for years, and if the exposure is removed, may also free the employee of all signs

and symptoms of lead poisoning. But imagine the surprise of that supposedly cured person when years later, perhaps following some type of infectious disease or the excessive use of alcoholic beverages, he awakes to find that he suffers the aches and pains and paralyses of an acute lead poisoning. As the body fluids alter lead that it may be deposited, so may those fluids attempt to de-lead the body, and too rapid absorption may produce the original disease with all its discomforts.

One can readily see, then, that in some cases investigation of previous occupations is quite necessary to determine the original contact with lead.

Heating of molten lead causes a black scum of lead suboxide to form on its surface, and the heat from the metal disburses the fine powder into the air. Hence, in the process of smelting ores such as zinc, copper and silver, mixed with lead, we find a rather high lead poisoning rate.

Those engaged in the manufacture of lead wire and cables, batteries, glass, pottery and rubber industries, plumbers and users of dry colors offer their share of lead poisoning.

Probably the greatest source of lead poisoning may be found among those who sandpaper, scrape, chip or burn lead paint, for the dust and fumes caused by those activities are rather rapid in their action. Such workers may become incapacitated in a few days because the inhalation of lead dust causes the maximum amount of absorption into the blood stream in the minimum space of time.

Chromium

Chromium is a metal widely used as a foundation for colors, and dusts from its various salts may produce lesions of the skin and mucous membranes of the nose. Chromium plating by electrolysis may cause fumes which are similarly irritating. Although chromium poisoning does not usually cause death, the number of days of absence from work on account of incapacity which it causes is gradually increasing.

Other Metals

The most efficient portals of entry of foreign substances into the body are the nose and mouth. The smaller the dust (the size of smoke particles for example) the greater the speed of absorption by the blood. Fumes from hot metals carry not only poisons but numerous minute dust particles. This explains the incapacities occurring among those engaged in acetylene and electric cutting and welding. When men are so employed over a prolonged period of time, the constant inhalation of fumes and dust might produce symptoms of the metal upon which they work. In the shipbuilding trade, particularly in the construction of metal ships, we find occasional cases of metal-fume fever. "Brass chills" and "spelter shakes" from zinc are names applied by the lay people to such diseases. The terrific heat applied to some of our common metals and alloys by acetylene torches produces sufficient fumes to cause a temporary incapacity in 24 hours. Permanent disability from such causes is rare, however.

Diseases Due to Dust

Twenty-five per cent of all workers exposed to high concentrations of inorganic dust are expected to develop changes within their lungs due to that agency. We are at a loss to explain why the other seventy-five per cent are not so affected.

Mining, quarrying, foundry work, grinding, sandblasting, abrasive soap manufacturing, asbestos work, the making of emery and carborundum products and many other occupations offer opportunities for employees to inhale microscopic dust particles and create a foundation for possible future incapacity.

We are interested particularly in those men who work with sandstone, quartz, flint, granite, and sand, because they expose themselves to silica, and the chemical changes between that dust and the body fluids, in the presence of tuberculosis, may and usually do lead to a fatal ending.

It is safe to say, in light of our present knowledge, that the action of other inorganic dusts is much less virulent and incapacitating. That, however, does not allow us to lower the vigilant methods to improve dust control and protect employees, because all dusty occupations are potential trouble makers.

Although the actions of various dusts differ within the body, the exposure to asbestos fibres, present in the weaving and grinding of dry asbestos material, offers another type of dust which may cause fatalities among workers.

The organic dusts from cotton, silk, wool, tobacco, flour and similar substances are practically harmless. Such dusts rarely reach the lungs but may cause irritation of the windpipe and larger air tubes and result at the most in a mild bronchitis.

The factor which should be borne in mind, particularly when dealing with silicosis and asbestosis, relates to the progression of such disease. When changes occur within the lungs as a result of the presence of such dusts, nature forms scar tissue to heal such lesions but may fail to stop when the job is finished. As a result, the continuation of that healing process may lead to such structural changes within the lungs that partial or total incapacity may follow months or years after the employee has been removed from his dusty occupation.

Benzole-Benzene

Benzol is a distillate of coal tar used extensively in industry. It is an essential ingredient in the manufacture of explosives. It is an excellent solvent for grease, oils and cements, and because of that property it is important in many phases of the rubber and cleaning industries. In the manufacture of shoes benzol may be an ingredient of the dressing applied to the leather and of the cement which fastens the heels and soles. Not only in the shoe trade but in other branches of industry where employees work with gummy, sticky material, the workers soon learn of the solvent and cleansing action of this liquid and use it freely for that purpose upon themselves. The subsequent outbreak of skin afflictions may be the first indication of such unauthorized use.

Benzol is extremely poisonous, entering either through the nose or mouth or absorbed through the skin. Its action within the body is varied and may produce a multitude of signs and symptoms. The bone marrow becomes affected which in turn alters the character of the blood; hemorrhages are common; it may cause death.

The fumes from benzol are heavier than air and lie near the floor, which is an important point in the engineering problem of ventilation.

The members of the benzene group are absorbed through the skin, and more cases of poisoning are found when men perspire than when their bodies are cool. Probably the answer to that is that the fumes may solidify as they cool and the powder may settle on the skin. The sweat on the body may dissolve this dust so that it is more readily absorbed through the increased surface blood supply.

Chlorinated Hydrocarbons

This group of petroleum derivatives has been known to science for years but during the past decade its advance into the industrial field has been widely distributed and most important. Led by carbon tetrachloride and its chemically associated members, it has furnished industry with refrigerants for ice chests, excellent solvents for rubber, wax, oil and grease, thinners for lacquers and a very fine household necessity for the removal of spots from clothes. Hospitals have been using it more and more for the removal of adhesive plaster.

Due to the non-flammability of carbon tetrachloride, it is used in fire extinguishers. The rapid evaporation produces fumes which may smother a small blaze, but we must not forget that excessive heat of the actual fire may bring about combustion sufficient to produce such biproducts as hydrochloric acid and phosgene gas. Like its associated member, chloroform, it may produce sleep when inhaled by an individual, and only 1/350 of an ounce in a quart of air is necessary to produce such action. That thought must be remembered when a large quantity of those liquid products is spilled on the floor, perhaps accidentally. Action should be started at once before the liquid gasifies, and employees should be notified to keep their heads up to avoid the low ceiling of gas.

Chemists have developed and introduced to industry many new products, the basis of which is the chlorinated hydrocarbons. These derivatives of petro-

leum distillation are frequently combined with those from coal tar to form valuable chemical combinations. They have been placed on the market so rapidly that medical science has been unable to determine their physiological effect upon the health of man. We have known that some of these chemicals are capable of creating changes in the liver, and only recently in a city in Massachusetts one of these newer products caused the death of two employees and a battle to retain life among two others.

Carbon Monoxide

You remember the adage, "Where there is smoke, there is fire." We might add to that, "Where there is fire there is carbon monoxide."

This odorless but poisonous gas may occur in any industry or in any home, but the poorer the ventilation the better the chance of producing physical incapacity.

Since the advent of the motor car, whose exhaust pipe may pour forth as high as 6% of carbon monoxide, we are all exposed to that gas, particularly in crowded cities. The ordinary passenger car liberates about two cubic feet per minute, and one can readily estimate the physical damage that may be done if such a motor is allowed to run within the doors of a poorly ventilated garage or shop. Fortunately, serious cases of such poisoning are not common among those employed in public garages, but many of those employees are likely to complain of headache and faintness at the end of a day's work, especially in colder weather when doors and windows remain closed.

In the steel industry, where gas is used as the heating agency in the blast furnaces, care must be used to provide proper ventilation. Within the mines, workers are warned to allow enough time following blasts for the escape of this gas.

Being a colorless, odorless and tasteless gas, quick of action within the human body, the manifestation of the very first symptom may be too late to save a workman from partial or total incapacity or perhaps death.

Because the exposed person suffers first from motor paralysis, he may be unable to help himself or even to warn others of the danger. Even if removed from the poisonous gas at that period, the damage actually done by the gas may result in permanent physical damage.

Infection

The skin is a protective covering of the body against infection and is extremely efficient as long as it remains intact, but allow it to be broken or punctured, introduce bacteria, and a battle ensues between the offensive agencies of infection and the defensive powers of the body. The winning of such a struggle may determine the presence or absence of incapacity. Infections are common throughout industry, but two types are particularly prominent — infection resulting from anthrax and infection among meat packers and fishermen.

Many of our fur, hair or wool-covered animals may contract anthrax. The germs of that disease defy the ordinary methods of sterilization and may linger on hides, bristles or hairs for long periods of time. Tanners, wool sorters, and hair or bristle workers may introduce the anthrax spore beneath their skin and undergo much physical suffering and sometimes death.

Infections are frequently found among meat and fish packers and those engaged in deep sea fishing. Although death rarely occurs, the loss of fingers, hands and nasty septic wounds are the result.

Punctured wounds, cuts, abrasions, burns and scratches are potential avenues of entrance for bacteria which would seem to be waiting everywhere at all times for such a break in the skin. Early medical treatment might often save later surgical interference, not to mention the accompanying discomfort, incapacity and perhaps the loss of an essential body part.

Summary

I feel that the time has come when an employer must demand of a manufacturer the answers to two questions:

1. How will your product affect my business?
2. How will your product affect the health of my employees?

That employer is entitled to honest answers based upon sufficient chemical and physiological examinations of the questionable product. That manufacturer

should be held responsible for the ills produced by the use of his product and unless he can guarantee its safety, it has no place in industry. Too many lives have been lost or jeopardized by too little knowledge of a product's action upon those who handle it.

The incidence of lost time due to illness and injury in industry has been greatly lessened by the many agencies working along lines of safety. When industry has been made fool-proof by the substitution of non-toxic preparations for those now found to be harmful and when each employee is imbued with the idea that constant thoughtfulness and care are most necessary for the maintenance of health and happiness, then, and not until that idealistic stage has been reached may vigilance and perseverance to maintain and preserve health, limb and life be lessened.

Pre-Employment Examination as an Aid to the Control of Industrial Diseases

By DR. W. C. TEMPLER
Medical Director, Corning Glass Works, Corning, N. Y.

We may well ask whether or not physical examination is of any value to the world at large, rather than limit the discussion to the control of industrial diseases. In the conservation of life and health much progress has been made in the eradication or control of such diseases as occur in epidemic form, as well as that type of disease which is not truly epidemic, but occurs in such frequency that general health programs are necessary. Much has been done to control such disabling illnesses as heart disease, arterio-sclerosis, kidney disease and diabetes; and something has been accomplished in the control of morbidity, which tends to, at least, make people happier through good health, even though an increased span of life is not gained.

Physical examination has played a large role in accomplishing these things, because it was through physical examination and physical observations that investigators were led to exert themselves to find a remedy for the cause of such conditions. Small-pox is no longer prevalent, due to such observations, which led to its control by vaccination. Malaria and yellow fever have been brought largely under control, and knowledge is now available in the control of venereal diseases, if the proper physical examination and laboratory methods are used to arrive at a diagnosis. We are all familiar with the results obtained in decreasing the death rate due to tuberculosis. In fact, in the treatment of all epidemic-type diseases that have so far been eradicated, the examination of patients to determine the severity of symptoms and the improvement has been of foremost value.

Knowing that the average span of life has been increased eight years in the last quarter century and assuming that the above mentioned factors have had some bearing on it, could we decry the value of physical examinations for the general population?

If we know that examinations made by insurance companies and their associating examining institutions, the clinics run by the United States Public Health Service, and the great mass of physicians, who all carefully examine their clientele, have been of value in the control of disease, may we not assume that examinations in industry will help control the incidence and extent of industrial disease, particularly when the life expectancy of industrial workers is less than that of the general population?

In fact on April 14, 1936, at the National Conference on Silicosis and Similar Dust Diseases, called by the Secretary of Labor, Dr. R. R. Sayers of the United States Public Health Service said, "Preliminary and periodic physical and roentgenological examination should be made of all employees engaged in industrial processes where there is a potential if

They should never be patched haphazardly and turned back into service. Ladders needing repair should be tagged and turned over to the foreman, who should determine whether they can be repaired. If he decides that repair is possible, he should turn the ladder over to the maintenance department.

3. What should be the angle of a ladder leaning against the wall?

In general practice the ladder should stand one-quarter of its own length away from the wall.

4. Is it possible to use steel scaffolding for temporary work?

Yes. This type of scaffolding is easily erected and can be placed on rollers and easily moved about.

5. In purchasing a ladder how can it be determined whether the tenons project far enough into the side rails to give a firm footing?

There is no type of inspection that will determine this. The only way one can be sure the tenons are firmly imbedded is to purchase a quality ladder.

6. Is the airplane cable or the solid steel bar the best form of re-enforcement in a ladder?

The solid steel bar. It gives the firmest and most dependable support. Cable re-enforcement is now practically obsolete.

Unusual Developments in Leg Protection

By E. L. WHEELER

Chicago

In times of serious illness one always obtains the services of the best doctor available, buys the best medicine procurable, from a reliable source. Is there any reason why protective apparel should be regarded differently? Is not the preventive as important as the cure?

Part of the time almost any kind of protective apparel is good enough, but when the emergency arises, when real protection is needed, then is the time your men should be provided with the best protection obtainable. If protective apparel does not protect against the extreme hazard, it is absolutely worthless. Your men may complain that certain apparel is a bit cumbersome, a bit uncomfortable, but an accident is a thousand times more uncomfortable, and usually results in loss of time plus untold suffering. To be safe it must be sturdily made, though it may not be 100 per cent comfortable; but complete working comfort without maximum protection is a compromise that does not make for safety.

There is now available standard leg protection that will safely meet every normal hazard in industry, and furthermore, it is possible to have made special products for specific hazards of almost any nature.

Possibly because of the fact that the greatest number of them have been used in recent years, the most unusual and varied development in leg protection has been centered on what are commonly called "foundry leggings."

The first leggings I know anything about consisted of bag-like tubes that hung from the waist or from the knee and were made from anything that wouldn't explode upon coming in contact with molten metal. Early it was discovered that chrome leather was a good heat resister and gradually asbestos cloth was woven into a more useable, pliable fabric, with fire-proofed duck used in some instances. These three materials are still chiefly used, with chrome leather leading.

With more or less stabilization of basic materials, improvement in design came in for prompt attention. Leggings with snap buttons and straps were put on the market, and arctic buckles were also used as a means of fastening. The knee length legging rapidly became the most popular style. It is a prime requisite that such a legging shall be so constructed that it will afford protection from the knee down to, and including, the foot. Its design should be comfortable, but comfort should not be sacrified for safety. It should be fully and quickly adjustable and instantly removable.

With these fundamentals in mind various kinds of spring knee leggings were created—one of the first great improvements in legging construction. However, in some cases there seemed to be justified complaints about the circular springs getting too hot for comfort and so the manufacturers promptly eliminated this by covering the springs or insulating them. Spring knee leggings still are preferred by some and will undoubtedly be used for many years to come.

But we find many new so-called springless types of leggings appearing in the field. We also find that the old stunt of wrapping legs in wet burlap is almost extinct, thanks to the efforts of safety men.

Subsequently the springless type of legging further combined safety and comfort. The popular appeal of this type was chiefly its greater comfort and finer adjustability. Every conceivable kind of fastener is here used to insure ease of putting on and to assure quick removal. Entirely new fasteners have been developed and use has also been made of already existing types.

Individual features carry their appeal to safety men, but all recognized types of leggings on the market today are much more comfortable and safe than those of a few years back.

Leg protection against acid splashes calls for not nearly so many styles of leggings but is adequately covered. The types of leggings and spats that protect against cuts, bruises, and similar injuries are many and varied. Some are made from a heavy leather base covered with metal reinforcing strips, properly placed to give the needed protection. Others are made entirely of heavy fibre with or without metal flares as the hazard demands. Steel studded chrome leather is also used in some cases. There are styles made from chrome leather reinforced with flexible reeds backed up by felt to act as a shock absorber. A most interesting anti-rattlesnake legging is made in a sort of spring knee type, using fibre as a base and covering it with water-proofed duck as a further protection while walking through long wet grass.

Pure grain rubber mounted over light leather has been successfully used as leg and foot protection against sand blast shot. Hip length leggings, while used in lesser numbers, are still standard equipment in foundries where protection is needed from the hip down. They range in style from regular pant leg shapes to extensions put on spring knee or springless type leggings and are made from asbestos cloth, fireproofed duck, and leather. A combination of chrome leather bottom with an attachable asbestos top has proved a very desirable style from both a safety and an economical standpoint. Here again, as in the knee type, safety, comfort, adjustability, ease of putting on and taking off are important factors. Of course, almost any of these styles of leggings is adaptable for other uses, especially when sparks, molten metal or severe heat are encountered.

In rather rare instances light leggings or spats have been used with more or less success for leg and foot protection for women.

Proper protective apparel will speed up production, will keep men on the job, will keep them happy, and will increase profits.

The following questions were brought out in the discussion:

1. Do spats give as good leg protection as leggings?

No.

2. Why are spats worn at all?

They are used when workmen have an aversion to leggings or when only low splashes of hot material are expected. In the latter case, however, the workman wearing spats is taking a gamble, because, by the law of averages, the hot splashes may not always be low.

3. What material is the best heat resister?

Asbestos gives the best protection from severe heat, but this material will not stand wear and friction as well as some other materials.

Respiratory Protective Equipment for Use Against Dusts, Fumes and Gases

By PHILIP DRINKER
Boston, Mass.

There appears to be some confusion as to the distinction between dusts, fumes, vapors, mists, and gases, with the result that respiratory equipment for protection against them occasionally is wrongly applied. The respirator manufacturers have many examples of such misunderstandings and often are blamed for errors which result solely from confusion in nomenclature.

Dusts include all types of dry earthy particles small enough to be blown about by ordinary air currents. Dust suspensions may be generated as the result of a grinding, blasting, or comminuting process; or they may result from the handling of finely divided materials as in mixing processes, in sweeping, or the blowing about of wood flour, plant pollens, or common road dust. There is no chemical limitation implied by the term "dust" while the range in size of dust particles extends from the sub-microscopic to small sand grains. Such materials can be caught very effectively by the modern type of dust respirator.

Fumes embrace two definite kinds of atmospheric suspensions. It is unfortunate that such double-naming exists in the trade but one had best admit the fact. Thus, "lead fume" is a very old term used to describe the visible dark grey suspension which evolves from lead heated to high temperatures. The material in such suspensions is mostly tiny particles of lead (and lead oxide), much smaller in size than those of the average dust, with some lead in the gaseous state. When such a mixture is cooled down to the point where it can be breathed the contaminant is then the lead particles alone without any gaseous lead.

The word "fume" is also used to describe the mixture of gas and mist which may come from a bath of hot nitric acid, for example. None of the material in the suspension is dry—it is all in the form of a true mist (liquid droplets) or as a gas, yet it may have a thick brownish color. One buys fuming sulfuric acid (a liquid) from any chemical supply house and one can see large plants for recovering lead fume—a dry powder. Obviously, one does not want the same kind of respiratory equipment for two such different substances yet the customer often asks for a respirator to protect against fumes.

Lead fume happens to be very difficult to filter out so that the ordinary respirator which catches dust particles may be inadequate against lead fume. The acid fumes, containing both liquid particles and gas, require a filter to catch the droplets and a gas absorbant to catch the gaseous constituent. Therefore, it usually happens that the respirator manufacturer, in self protection, advises the customer to use an air-supplied or air-line respirator because he will then be adequately protected whether the fume is of solid particles, like lead, or a liquid and gas mixture. If the customer stated exactly what the suspension consisted of or told how it was generated he might be able to use less expensive equipment.

A vapor is a gas which can be converted into a liquid at ordinary temperatures and pressures. Thus, water vapor is a common constituent of the air and is contained in concentrations which vary with atmospheric conditions. Respiratory protective equipment is used against low concentrations of a great many vapors arising from common organic solvents such as benzol. Many such substances are absorbed by activated charcoal as in gas masks. There is a small cartridge type respirator in which the cartridge is filled with activated charcoal for absorbing a vapor such as benzol or with soda-lime for absorbing an acid gas such as carbon dioxide. Because these small cartridges contain comparatively little of the absorbant their use is limited to very low concentrations. They should not be used for emergency rescue work.

A mist consists of a suspension of liquid droplets together with the gas from which the droplets condensed. The commonest example is atmospheric fog.

Droplets of mist are necessarily microscopic in size or they would not remain in suspension. As soon as several droplets collide and form a large drop the liquid settles out. Therefore, it is possible to dispel a true mist very readily by simply stirring up the air—ventilation or dilution is unnecessary.

Mist droplets can be filtered out by ordinary dust respirators—that is, the visible portion of a fog is easily removed by filtration—but the gaseous constituent may pass through the filter. If the mist happens to be corrosive to fabrics the resultant effect upon a dust respirator is bad. Paint spraying generates a mist and a certain amount of vapor. Protection usually consists of an air-line respirator but it is not at all uncommon to use cartridge respirators containing activated charcoal and a filter.

A gas contains no solid or liquid particles under ordinary atmospheric conditions. The filter units of any of the common makes of respirators are ineffective against gases. Respiratory protective equipment which catches gases always consists in some chemical agent which either absorbs the gas or converts it into some other substance which can be absorbed. Because one can rarely be sure of the gas concentration to be encountered it is common practice in exploring man holes, for instance, to use devices supplied with air or oxygen in order that the wearer may be safe, regardless of the conditions he finds. The gas mask, however, and its outgrowth, the chemical cartridge respirator have a definite place in industry and are in wide use today.

The U. S. Bureau of Mines has helped in the manufacture and use of respiratory protective equipment greatly by its issuance of specifications for permissible equipment. Their present schedules do not include the air-supplied respirators such as those used in paint spraying or sand blasting but both the Bureau and the American Standards Association will issue such specifications presently.

Discussion following the address was based on these points:

1. What protection is provided against a dangerous accumulation of air pressure in the ordinary fresh air hose mask?

The helmet is not rigid. Air will leak out long before a dangerous pressure accumulates, or a safety link, provided in some types of hose mask, will blow out.

2. Would a protective mask approved for lead dusts filter out zinc oxide?

Yes. However, almost any type of mask will filter out zinc oxide, since these particles are easily trapped.

3. Will the simple face mask filter out ordinary smoke or will it absorb it?

It is impossible to answer such a question. There are as many types of ordinary masks as there are ordinary dusts. A mask must be purchased to fit a specific need. This is not difficult, however, since all types are available.

Glass Used for the Protection of the Eyes Against Injurious Radiation

By E. D. TILLYER

Southbridge, Mass.

The effect of excess visible light on the eye is immediately felt. If there is too much, anyone except the sun gazers immediately turns away, closes the eyes or seeks some kind of relief. There is a tendency to use too dark glasses in welding, inherited from the days when even the blackest glasses gave practically no protection from the insidious invisible radiations. A proper rule is, use a shade number which gives good, immediately comfortable vision and insist that this glass give protection against the invisible radiations.

The effects of the ultra-violet and the infra-red radiations are not as quickly noticed as the visible. We cannot say, as we said for the visible, "get good immediately comfortable vision" because the first noticed effect of the ultra-violet oc-

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William P. Yant, Mine Safety Appliances Co., Pittsburgh, Pa.

WEDNESDAY NOON SESSION

October 7, 1936

The annual meeting of the ASSE-Engineering Section of the National Safety Council followed a luncheon and convened with C. W. Smith, Standard Oil Co. (Ind.), Chicago, general chairman, presiding. All reports had been mimeographed, and copies were distributed at the luncheon.

Dr. Francis F. Lucas, Member, Technical Staff, Bell Telephone Laboratories, New York City, and international authority on microscopy and photomicrography, spoke on "Late Developments in High Power and Ultra Violet Microscopy."

The report of the nominating committee was presented by A. S. Regula, chairman. Other members of the committee were S. E. Whiting, R. F. Thalner, C. B. Auel, and Dr. M. G. Lloyd. The committee's list of officers, as elected, will be found elsewhere in this sectional record.

Other sessions sponsored by the ASSE-Engineering Section included those on "Safety Belts," "Safety Training," "Exhaust Systems," "Safety Exchange Round Table," and "Occupational Diseases." Reports of these sessions will be found elsewhere in the Transactions.

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Metals Section

Officers 1935-36

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Frank Rowe, Wheeling Steel Corp., Portsmouth, Ohio.
Herman Stoller, The Youngstown Sheet and Tube Co., Evanston, Ill.
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J. A. Voss, Republic Steel Corp., Cleveland, Ohio.

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E. J. STRAUSS, Bethlehem Steel Co., Bethlehem, Pa.
J. A. VOSS, Republic Steel Corp., Cleveland, O.

MONDAY AFTERNOON SESSION

October 5, 1936

The opening session was called to order by General Chairman H. W. Darr, Bethlehem Steel Co., Johnstown, Pa., who presided. Chairman Darr welcomed

to think, inability to draw a personal lesson from the experience of others, overconfidence and a desire to make good on the job. These can only be overcome by careful and systematic handling on the part of the supervisor. His is the responsibility of putting over to the worker the value and advantages resulting from a close observance of rigid safety inspections.

Systematic Organized Safety Effort

There should be little need to make a plea for more concerted action along this line. As safety men, we know how easily the small employer could be put out of business as the result of even a few accident losses. The larger employer, as well, cannot afford to overlook the situation—his losses, through waste of time, money and materials, will seriously affect his profits and hold his company up to the public as a very inefficient organization. The ever increasing cost of compensation insurance will undoubtedly be a factor in forcing more consideration for well organized safety work. Personally, I emphasize the side of humanity above the dollar and am satisfied from long experience that where humanity rules, the profits will be satisfactory. Where a real safety program is followed, without doubt efficiency and economy of the highest order will also prevail.

The Present Status of Control of Dust and Fumes in Industry

By H. B. MELLER

Managing Director, Air Hygiene Foundation of America, Inc.; Head, Air Pollution Investigation, Mellon Institute of Industrial Research, Pittsburgh, Pa.

The problem divides itself naturally into medical, preventive engineering and legislative phases, and includes consideration of the responsibilities of employer and employee to each other and to the public.

It is axiomatic that, in case of physical disorder, impairment of function or disability, the more thoroughly the cause and course of action are known, the more certainly can possible remedies be applied or preventive measures taken.

In the diseases or affections under consideration, there are facts upon which preventive methods are based, and upon which further studies now in course or contemplated are, at least in part, predicated.

During the development of the present state of knowledge of the influence of some air contaminants on health, naturally many theories were advanced that later scientific work has modified or displaced. However, not always has the correction been as widely and thoroughly disseminated as was the original theory; this condition, perhaps, has led to some confusion in the minds of many who have not followed too closely the evolution of knowledge in this field.

Classification of Dusts

There are available different published classifications of dusts. Included in such classifications are dusts, the exposure to inhalation of which are, or are likely to be, occupational. Those that are inherently toxic when inhaled or otherwise absorbed and which cause systemic poisoning, include lead, arsenic, mercury, manganese. Examples of dusts which have the ability to penetrate the deep lung tissues and to be retained there are quartz, flint, chert, asbestos, talc, coal, iron, clay, slate, and other types of rock dust.

Attention here will be centered upon this last group and upon pneumoconiosis, the general term used to designate lung conditions caused by dust. Silicosis, which is caused by the inhalation of free silica, has been prominent recently in the public press, sometimes in a way that made misunderstanding possible, if not probable.

Aside from silica, many of the insoluble mineral dusts may bring about slight changes in the lung tissues, which may be demonstrated on the roentgenogram if there is silica in the dust that is inhaled. As far as is known today, most of them are relatively or entirely harmless.

Ability of Dusts to Cause Injury

It has been established that the potentiality of silicious dusts to cause lung damage is, with few exceptions, dependent upon their content of free silica (SiO_2). The development of silicosis depends, therefore, upon the concentration of dust containing free silica in the air breathed. In other words, the total amount of free silica breathed and retained seems to be the primary factor; the length of time necessary for a sufficient accumulation is important, but less so than the total load.

Silica occurs also in chemical combination in silicates. Some of these compounds have been proved to be relatively harmless to health, some are still in the realm of doubt, and one—asbestos—may cause the industrial disease called asbestosis, which is the result of lung damage similar to, but not identical with nor as serious as, that produced by free silica.

Importance of Particle Size. The size of dust particles in the air which an individual may breathe is important. Not often are particles larger than 10 or 12 microns found in the deep lungs, except in the case of asbestos dust, where fibers as long as 200 microns have worked their way down lengthwise.

Uncomplicated Silicosis. Silicosis, uncomplicated by an infection, is more of an impairment than a disability. It is not seriously disabling until it reaches an advanced stage, and does not of itself greatly shorten the life of a silicotic.

Silico-Tuberculosis. When a silicotic dies, the immediate cause of death is usually some type of intervening lung infection. It is not known just why the presence of silica in the lungs increases susceptibility to tuberculosis, but when an adult with silicosis is exposed to tuberculosis, an active infection may occur, regardless of the previous state of health. It is thought probable that silica dust can reactivate healed tuberculous lung lesions of the adult type; how long after such lesions have healed the reactivation is possible is not certain. Exposure of silicotics to tuberculosis or of tuberculous individuals to silica dust is serious and should be avoided.

After silicosis has become well established in the lungs, medical science has not found a way to arrest the progress of the silicotic process toward the stage of disablement except through limiting or preventing further exposure to silica dust. Nor has medical science found a way to prevent tuberculosis from being superimposed upon silicosis, except through control of contact. The course of silico-tuberculosis is chronic and is very difficult to influence by treatment, according to phthisiologists.

Medical Control. As a basis for intelligent determination of the physical fitness of a man for a job in a dusty trade, physical examination, with stereoscopic roentgenograms of the chest, is necessary. Along with this study goes, naturally, the preparation of an occupational history with detail as to the exact nature of previous work and of exposure to industrial dust—not a valueless recording of occupations as "laborer," "machinist," etc. Dr. Sayers, of the U. S. Public Health Service, has developed a method of securing information for a proper occupational history; among others, Cummings, of Saranac Laboratory, also has worked out a useful history blank.

Standards have been developed for the diagnosis of silicosis. There is also a suitable technic for taking roentgenograms of the chest in order to bring out the characteristic lung changes.

From the considerable amount of work that has been done, it is possible to forecast with a reasonable degree of accuracy the silicosis potentiality of various dusts.

Periodic physical examinations, including roentgenograms, are essential if employers are to be enabled accurately to learn the effect of individual exposure and intelligently to transfer affected workmen to lower dust concentrations before serious injury has been done, or to work out a system of rotation where indicated as desirable in order that exposure may be intermittent. Such examinations are helpful also in showing the efficiency of engineering control methods.

The ability to place responsibility in case of claim for injury is no small part of the value of such initial and periodic examinations.

Asbestosis. Clinical experience has shown that the inhalation of a sufficient amount of asbestos dust causes a serious type of fibrosis, which is not accompanied

bility for potential efficiency is upon the manufacturer.

There is available comparatively little information upon which to base the scientific design of hoods. The Preventive Engineering Committee of Air Hygiene Foundation includes in its recent report a table of minimum air velocities to capture certain industrial dusts (for use in granite cutting, grain elevators, paint spraying, sand pulverizing and electric welding).

For protective equipment such as dust respirators, air supplied masks, sand blast helmets, and goggles, very complete information is available, because of the work of the U. S. Bureau of Mines, the Bureau of Standards, and the American Standards Association in preparing and issuing specifications to be met if the equipment is to be used under conditions where approval is necessary.

Of course, all agree that, where possible, dust should be controlled at the source, and protective equipment used where this action cannot be accomplished.

Permissible Dustiness

There are various figures that have been and are being used as guides to permissible dustiness where free silica is present. It should be noted that many of the data were not determined as the medical requirement, but as being attainable in good practice and apparently satisfactory from a safety standpoint.

In South Africa the figure is 5 milligram per cubic meter (or 300 particles per cubic centimeter, or approximately 8.5 million per cubic foot).

Dr. Lanza found in 1917 in the Joplin, Mo., district that, with good engineering practice, a figure of 1 milligram per 100 liters of air could be attained.

The U. S. Public Health Service, in its study in the anthracite region of Pennsylvania, found that 50 million particles per cubic foot with 5 per cent quartz in the coarse dust and 10 million particles per cubic foot with 35 per cent quartz were apparently satisfactory and often were attained.

The figure of 10-20 million particles per cubic foot for granite dust with 35 per cent quartz content is often quoted from the Vermont granite studies of the U. S. Public Health Service.

Some metal-mining companies have gone further, setting the maximum of permissible dustiness at 5 million particles per cubic foot.

Certainly, there is a degree of air cleanliness that is safe, from the standpoint of concentration of harmful dust. But the engineer may find himself in the position of practically being forced to control any dust, harmful or otherwise, if he would protect his employers against suits at common law and the possibility of award of damages to men who have breathed dust containing little or no free silica. A dusty workplace is difficult to defend in court. Neither courts nor compensation boards, and certainly not juries, have seemed to be greatly impressed with a low silica dust count in an otherwise dusty atmosphere.

Quoting from one of the reports referred to: "Each state is a unit—a sovereign—and it handles its problems in its own way. Uniformity is lacking, although of course the statutes of many states are similar. The courts of the various states follow such precedents as appeal to them: consequently, on any important question, there is likely to be a divergence of opinion among the courts, and often the courts fall into two or more groups, each group following a different theory with respect to the same legal problem."

Workmen's Compensation Acts

Workmen's compensation acts have been passed in 46 states (all except Arkansas and Mississippi) and the District of Columbia. These acts are compulsory as to private employers in 15 states and elective in 31 states. Insurance to cover the risk is compulsory in seven states.

A state fund, out of which compensation is paid, is maintained in 18 states: in two of these the employer may, by proving financial responsibility, carry his own risk with limited contribution to the state fund for the expense of administration; in 11 more of this group of states the employer is not required to avail himself of the privileges of the state fund and may provide compensation otherwise. In 28 states there is no provision for a state compensation fund.

Administration of the compensation act is vested in a commission, board, or single

Examination After Claim for Disability Arises

No two state acts contain identical provisions, but in all (including the District of Columbia) that have compensation acts, there is provision for physical examination after claim for disability arises.

In five states (Kentucky, Massachusetts, New York, North Carolina, and West Virginia), definite recognition has been given to the importance of some sort of medical board composed of specially qualified physicians and surgeons, and charged with the duty of diagnosing occupational disease and of advising the administrative board or commission with respect thereto. The laws of these five states are quite different and should be studied separately for details, but in each occupational disease, including silicosis, is compensable.

The importance of roentgenograms in any thorough physical examination for pneumoconiosis is well known. This importance is recognized in the Acts of New Jersey, New York, North Carolina, and West Virginia.

Medical Treatment

In the 17 states (including Maryland) in which occupational disease is, to some extent, compensable, the acts usually entitle the claimant to a limited amount of medical, surgical, and hospital care, measured in money cost or length of time covered by treatment.

These points were raised in the discussion following the addresses:

1. How much time is required for completing a training course?

Mr. Davison said that the training course in their plant ordinarily covered a period of one and one-half years, but that some students completed it sooner. The time required depends upon the individual.

2. Is it advisable to limit the number of students per teacher?

Ten students per instructor is a good ratio.

3. Which gases present the greatest hazards in welding?

Silicon gases are the most harmful. The risk, however, has largely been overcome by manufacturers of welding supplies.

THURSDAY MORNING SESSION

October 8, 1936

Metals Section Safety Contest

Two hundred and two units were registered in the 1936 Contest of the Metals Section. During the Contest period 267,792 employees worked 561,788,579 man-hours with an average frequency rate of 8.030, a decrease of 4 per cent from the 1935 rate of 8.354. Ninety-five units completed the Contest with a frequency rate below the average, and 8 per cent of the units finished with perfect records. Nineteen plaques and eight certificates were awarded in the Contest.

The plaques were presented by John B. Gibson, Publicity Director, Hawthorne works, Western Electric Company, Chicago, and Vice President for Community Safety Councils, National Safety Council, as follows:

Steel Mills Division, Group A—Continental Steel Corporation, Kokomo Division, Kokomo, Indiana, 4,141,806 man-hours, 12 injuries.

which had been followed during the past year.

Report of Exhibits Committee. The Committee reported that definite steps had been taken to assure good attendance at the National Exposition in the Convention Hall, and that these measures included the following:

Routing of delegates through the Exhibit Hall; suitable notices in programs; luncheon and cloakroom facilities; an "Exhibit Day" in each Section program; a worth-while attendance prize, with eligibility limited to delegates who showed a real interest in the exhibits; cooperation of exhibitors in providing attractive displays; providing exhibitors with daily registration of delegates; publicizing the exhibits.

Report of Program Committee. The Committee reported that a series of talks on five different subjects had been prepared for presentation at the National Safety Congress. (A record of the Safety Equipment session will be found elsewhere in these proceedings.)

Other reports presented were those of the Publicity Committee, the Finance Committee, the Activities Committee and the Membership Committee.

Meeting of October 6, 1936

The meeting was called to order by Chairman T. A. Willson, who had been re-elected. Executive Secretary A. O. Boniface acted as secretary of the meeting.

George Shull, J. B. Davies and C. H. Gallaway were appointed directors.

It was agreed that committee appointments would be made later by the Executive Committee and that members would be notified of the results by mail.

It was voted to continue the positions of executive secretary and assistant treasurer on the present basis.

ADJOURNMENT

Accident Prevention Equipment Manufacturers

Who Exhibited at the Twenty-Fifth National Safety Congress and Exposition

Atlantic City, N. J., October 5-9, 1936

Ballroom—Convention Auditorium

Aetna Casualty & Surety Company, Hartford, Conn.
Automobile Driving Tests.

American Abrasive Metals Company, Irvington, N. J.
Safety Treads for Walkways and Safety Gratings.

American La-France & Foamite Industries, Inc., Elmira, N. Y.
Fire Extinguishing Equipment.

American Mutual Liability Insurance Company, Boston, Mass.
Insurance, Workmen's Compensation, Property Damage, and General Automobile
American Optical Company, Southbridge, Mass.
Head and Eye Protection Products.
Arntzen, Inc., Chicago, Illinois.
Auxiliary Emergency Stretcher and First Aid Equipment.
Arroway Traffic Signal Corporation, Kingsport, Tenn.
Traffic Control Signals.
Associated Guard Manufacturers, Chicago, Ill.
Dust Control Units and Mechanical Safety Guards.

Frank E. Barnes Company, Chicago, Illinois.
Electrician's Rubber Gloves.
Beacon Corporation, Minneapolis, Minnesota.
Direction and Danger Signals for Motor Transport Vehicles.
Bendix Products Corporation, South Bend, Indiana.
Automotive Equipment.
Robert A. Bernhard, Rochester, New York.
First Aid Supplies.
Blatchford Corporation, Chicago, Illinois.
Traffic Signals and Markers.
Bradley Washfountain Company, Milwaukee, Wisconsin
Group Washing Equipment.
Stewart R. Browne Manufacturing Company, New York City.
Safety and Special Purpose Lights and Lamps.
Brown Shoe Company, St. Louis, Missouri.
Men's and Women's Safety Shoes.
R. H. Buhrke Company, Chicago, Illinois.
Safety Equipment for Construction and Maintenance.
E. D. Bullard Company, San Francisco, Calif.
Industrial and Mining Safety Equipment.
Burroughs Wellcome & Company, (U. S. A.), Inc., New York City.
First Aid Kits and Medical Equipment.

H. Childs & Company, Inc., Pittsburgh, Pa.
Safety Footwear.
Cities Service Company, New York City.
Oils and Gasoline.
Columbus-McKinnon Chain Corporation, Tonawanda, N. Y.
Alloy Steel Sling Chains.
H. S. Cover, South Bend, Indiana.
Respirators and Safety Goggles.
Crouse-Hinds Company, Syracuse, New York.
Traffic Signals and Flood Lights.

Davis Emergency Equipment Company, Inc., New York City.
First Aid and Safety Equipment.
C. H. Dockson Co., Detroit, Mich.
Head and Eye Protection.
Do-More Chair Company, Elkhart, Indiana.
Posture-Health Chairs for Office and Factory.
Dual Parking Meter Company, Oklahoma City, Okla.
Parking Meter Equipment.
Donald S. Duncan, Inc., Chicago, Ill.
Parking Meter Equipment.

Eagle Signal Corporation, Moline, Ill.
Traffic Signals.

Elliott Service Company, New York City.
Elimination of Waste, Promotion of Efficiency and Safety.

Fairway Laboratories, Inc., Belleville, Ill.
Anti-fatigue and Heat Exhaustion Antidote Tablets and Dispensing Equipment.

General Electric Company, Schenectady, N. Y.
Electrical Equipment.
Louis Gerber, New York City.
BOON the Glove Invisible.
Harley Davidson Motor Company, Milwaukee, Wis.
Police Motorcycles and Equipment.
The Highway Safety Signal Company, Baltimore, Md.
Double Filament Traffic Lamps and Color Design Traffic Lenses.
Holcomb Safety Garment Company, Chicago, Ill.
Industrial Safety Clothing.
Hoof Products Company, Chicago, Ill.
Motor Vehicle Speed Control Governors.
Huntington Laboratories, Inc., Huntington, Ind.
Disinfecting and Sanitation Products.
Hynson, Westcott & Dunning, Inc., Baltimore, Md.
Mercurochrome Antiseptic for First Aid Application.

Indian Motorcycle Company, Springfield, Mass.
Police Motorcycles and Equipment.
Industrial Gloves Corporation, Danville, Ill.
Steel Grip Gloves and Safety Apparel.
Industrial Products Company, Philadelphia, Pa.
Accident Prevention Equipment.
International Shoe Company, St. Louis, Mo.
Safety Shoes.

Keystone Coat & Apron Manufacturing Corporation, Philadelphia, Pa.
Service Uniforms for Industrial Purposes.
Keystone View Company, Meadville, Pa.
Visual Safety Tests.
Walter Kidde & Company, Inc., New York City.
Fire Extinguishing Systems and Portable Extinguishers.

Walter G. Legge Company, New York City.
Compounds for Cleaning and Treating Floors.
Lehigh Safety Shoe Company, Allentown, Pa.
Leather and Rubber Safety Shoes.
Liberty Mutual Insurance Company, Boston, Mass.
Automobile and Industrial Safety Service.
The Lima Cord Sole & Heel Co., Lima, Ohio.
Non-slip Soles and Heels.
Liquid Carbonic Corporation, Chicago, Ill.
Fumigant for Infestation Control.

Macwhyte Company, Kenosha, Wis.
Wire Rope and Braided Slings.
Martindale Electric Company, Cleveland, Ohio.
Dust Respirators and Highway Safety Signals.
Metropolitan Life Insurance Company, New York City.
Insurance, Industrial Group, etc.
Milburn Company, Detroit, Mich.
Protective Creams for Prevention of Occupational Skin Diseases.
Mine Safety Appliances Company, Pittsburgh, Pa.
Safety Appliances and First-Aid Materials.

Monarch Governor Company, Detroit, Mich.
Automobile Speed Control Devices.

National Bureau of Casualty & Surety Underwriters, New York City.
Casualty Insurance.
National Carbon Company, Inc., New York City.
Equipment for Battery-Operated Devices.
National Safety Council, Inc., Chicago, Ill.
Poster, Bureau of Information, Research and Education Divisions.

Parkrite Corporation, Houston, Tex.
Parking Meter Equipment.
Patent Scaffolding Company, Chicago, Ill.
Safety Ladders and Scaffolds.
Protectoseal Company, Chicago, Ill.
Safety Devices for Hazardous Liquids.
Pulmosan Safety Equipment Corporation, Brooklyn, N. Y.
Respiratory Protection and General Safety Equipment.
Pyrene Manufacturing Company, Newark, N. J.
Fire Protection Equipment.

Railway and Industrial Engineering Co., Greensburg, Pa.
Interlocking Systems.
Reece Wooden Sole Shoe Company, Inc., Columbus, Neb.
Wooden Sole Safety Shoes.
Rose Manufacturing Company, Denver, Colo.
Ladder Shoes, Window Cleaners' Safety Belts.

Safeguard Electric Company, Inc., Brooklyn, N. Y.
Shockproof Portable Lamp Guards.
Safety Engineering, Alfred M. Best Company, Inc., New York City.
"Safety Engineering," Insurance Publications and Reports.
Safety Equipment Service Company, Cleveland, Ohio.
Goggles and All Types of Accident Prevention Equipment.
Safety First Shoe Company, Holliston, Mass.
Safety Shoes.
Safety Shoe Company, New York City.
Safety Shoes.
W. H. Salisbury & Company, Inc., Chicago, Ill.
Linemen's Rubber Protective Devices.
W. W. Sly Manufacturing Co., Cleveland, Ohio.
Dust Control Equipment & Respiratory Protective Devices.
Spencer Turbine Company, Hartford, Conn.
Heavy Duty Vacuum Cleaners and Dust Collecting Equipment.
Standard Safety Equipment Company, Chicago, Ill.
Dust Protective and Safety Equipment.
Stonehouse Signs, Inc., Denver, Colo.
Accident Prevention Signs and Tags.
Strauss Company, Inc., Pittsburgh, Pa.
Safety Belts, Foot Guards, Safety Hats.
Sugar Beet Products Company, Saginaw, Mich.
Industrial Soaps.
Surety Rubber Company, Cartollton, Ohio.
Linemen's Safety Equipment and Synthetic Rubber Industrial Equipment.

John S. Tilley Ladder Company, Inc., Watervliet, N. Y.
Safety Ladders and Scaffolding.
Traffic Toy, Inc., Canton, Ohio.
Traffic Warning Signs.

U. S. Steel Corporation & Subsidiaries, Pittsburgh, Pa.
Steel Products and Cement.

Weaver Manufacturing Company, Springfield, Ill.
Automotive Testing Equipment.

West Disinfecting Company, Long Island City, N. Y.
Products for the Promotion of Sanitation.

Willson Products, Inc., Reading, Pa.
Personal Protective Devices.

TRANSACTIONS

25th National Safety Congress

NATIONAL SAFETY COUNCIL, INC.

ATLANTIC CITY, NEW JERSEY
OCTOBER 5 to OCTOBER 9, 1936

Ambassador, Chelsea, Ritz-Carlton Hotels
and Atlantic City Auditorium

Accident Prevention Equipment Manufacturers

Who Exhibited at the 25th National Safety Congress and Exposition

Atlantic City, N. J., October 5-9, 1936

Ballroom—Convention Auditorium

Aetna Casualty & Surety Co., Hartford, Conn
Automobile Driving Tests.
American Mutual Liability Ins. Co., Boston, Mass
Insurance, Workmen's Compensation, Property Damage and [illegible]
Arntzen, Inc., Chicago, Ill.
Auxiliary Emergency Stretcher and First Aid Equipment
Arroway Traffic Signal Corp., Kingsport, Tenn
Traffic Control Signals.
Beacon Corp., Minneapolis, Minn.
Direction and Danger Signals for Motor Transport Vehicles
Bendix Products Corp., South Bend, Ind
Automotive Equipment.
Blatchford Corporation, Chicago, Ill.
Traffic Signals and Markers
Cities Service Co., New York City.
Oils and Gasoline.
Crouse-Hinds Company, Syracuse, N. Y
Traffic Signals and Flood Lights
Dual Parking Meter Co., Oklahoma City, Okla
Parking Meter Equipment.
Donald S. Duncan, Inc., Chicago, Ill.
Parking Meter Equipment.
Eagle Signal Corp., Moline, Ill.
Traffic Signals.
General Electric Co., Schenectady, N. Y.
Electrical Equipment.
Harley Davidson Motor Co., Milwaukee, Wis.
Police Motorcycles and Equipment.
The Highway Safety Signal Co., Baltimore, Md
Double Filament Traffic Lamps and Color Design Traffic Lenses
Hoof Products Co., Chicago, Ill.
Motor Vehicle Speed Control Governors.
Indian Motorcycle Co., Springfield, Mass.
Police Motorcycles and Equipment.
Liberty Mutual Insurance Co., Boston, Mass.
Automobile and Industrial Safety Service.
Martindale Electric Co., Cleveland, Ohio.
Dust Respirators and Highway Safety Signals.
Monarch Governor Co., Detroit, Mich.
Automobile Speed Control Governors.
National Carbon Co., Inc., New York City.
Equipment for Battery Operated Devices.
Parkrite Corporation, Houston, Texas.
Parking Meter Equipment.
Traffic Boy, Inc., Canton, Ohio.
Traffic Warning Signs.
U. S. Steel Corporation & Subsidiaries, Pittsburgh, Pa.
Street and Highway Markers and Highway Guards.
Weaver Manufacturing Co., Springfield, Ill.
Automobile Testing Equipment.

by an unduly high incidence of tuberculosis.

Other dusts and silicate compounds so far studied produce, at most, only a mild non-progressive reaction in the lungs, provided there is no significant amount of free silica in their composition. While not serious clinically, such conditions may give rise to considerable litigation.

Adequate statistics on morbidity and mortality from occupational disease, to serve as a basis for effectively focussing the efforts to study and control dust diseases of the lungs, are non-existent.

In concluding this section, the following quotation from a court decision in Wisconsin is pertinent (Schaefer v. Industrial Commission, 265 N. W. 390 (Supreme Court, February, 1936)):

". . . It will be necessary to distinguish carefully between medical or pathological disability and actual physical incapacity to work. The medical experts apparently ignore this distinction, and so increase the difficulty of arriving at a just result under the law."

Preventive Engineering

It would be needless repetition to discuss in a technical way the engineering phases of dust control. All interested are referred to "Industrial Dust," by Drinker and Hatch, which deals comprehensively with the subject; U. S. Bureau of Mines Information Circulars 6840 and 6848, by Harrington and Davenport, a review of literature on "Prevention of Dust Diseases"; U. S. Public Health Service Bulletin 217, by Bloomfield and DallaValle, on "The Determination and Control of Industrial Dust"; Report Z9 of the American Standards Association; and to the U. S. Bureau of Mines for a list of approved protective devices.

It may be said that, in general, the engineering specialist can and will devise the necessary equipment to meet the conditions specified to him. But the setting of limits of permissible dust concentration is not his but the physician's responsibility. The engineer is concerned with keeping dustiness to or below the limits at present considered satisfactory.

Methods of Determining Dust

Some dusts (as lead) are determined by chemical methods and the concentrations in air are recorded gravimetrically as milligrams per cubic meter. Others (as silica, where size is a factor in determining dangerous particles), are given by count. Neither method gives the whole story, but in both cases it may be possible to secure the information necessary for the purpose.

In one of the reports referred to earlier, there occurs this statement: "There is no doubt in the mind of anyone familiar with the present dust-sampling and dust-estimating methods that they will be amended and changed from time to time. At the present writing we would advise the use of the simplest possible procedures where dust control alone is in question. If one wishes to obtain values which can be compared with published data, it is generally necessary to copy with considerable care the technic used in the original case. This is another way of admitting the annoying fact that results by one method are usually not comparable to those obtained by another method."

In another place, the report says: "It is very doubtful if any useful purpose is served by determining accurately extremely dense dust concentrations—the only excuse for such data is to show the skeptic that the workplace is much dustier than it should be. . . .

"It is probable that any sampling procedure which fixes concentrations in groups 100 per cent apart is sufficient and that the results of any attempts to come closer to the concentration at the moment of sampling are simply misleading. Thus ranges such as 0-5, 5-10, 10-20, 20-40, etc., suffice for dust control."

As dust particles in the lungs are of the order of 1 micron, with rarely a particle over 10 microns, dust control for hygienic reasons should be aimed at particles in the size range found to have been breathed and retained. Again quoting: ". . . if one could avoid use of the dusts of 1 micron or less or exclude them from the dust which passes a 325-mesh screen, nearly all dust diseases would be eliminated."

Dust Elimination

Obviously, it is better, when possible, to purchase equipment already supplied with exhaust hood, rather than to have to worry to fit one to equipment not designed to be hooded. Thus the responsi-

[illegible]shed monthly in the interest of accident prevention and industrial health

Volume 34, Number 5

Contents for NOVEMBER, 1936

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20 North Wacker Drive, Chicago, U. S. A.

Industrial Health

A Department for Physicians and Laymen

Lesser Known Facts About Occupational Diseases

By ROBERT B. HUNT, M.D.

American Mutual Liability Insurance Company

PROBABLY the leader in the parade of industrial diseases is an acute or chronic inflammation of the skin which we call dermatitis. This disease may present itself in any type of shop, factory or foundry. Any paste, powder, gas or liquid which comes in contact with the employee's skin, even the water supplied by the town in which he lives or works, may be the potential cause of such a skin disturbance.

The wide diversity of causes, together with the varying susceptibility of different individuals, makes the problem of control difficult.

Much investigation is under way to determine why one person may be susceptible to a certain substance while another is not. It has been proved many times that a poisonous substance formed within the body has been able to prolong the action started by some external influence. A printer developed a marked dermatitis from ink which persisted for two years. Finally food tests were made and showed that he was susceptible to lettuce. Removing this from his diet cleared the skin. He returned to his usual occupation without a return of symptoms.

The poisoning of allergic substances is usually an accumulative process. It takes time to produce a manifestation of disease, but let any other substance cause the disease, and the irritating food may be of sufficient strength to magnify its action.

All cases of dermatitis cannot be cured by eliminating offending foods, but further investigation along these lines may give us a clue with which to lessen the loss of time from work and the discomfort now produced by industrial dermatitis.

Metals

LEAD: The distribution of lead poisoning is quite extensive.

The skin of the body is a protective covering, and as long as it remains intact it does a good job except in the case of tetraethyl lead, which is used in blending gasoline and which is readily absorbed through the skin, having a tendency to create changes in the nervous system. The effect of other forms of lead, through that avenue of entrance, is practically nil, which explains the extremely low poisoning rate in typesetters, painters and others who continually come in contact with metallic lead.

Lead in any form, introduced through the mouth, acts rather slowly when compared with the inhalation of lead dust or fumes. However, no matter what the portal of entry may be, lead is acted upon by the body fluids and so converted that it may eventually be deposited within the bones.

Those bony safe deposit vaults may retain their lead contents for days or for years, and if the exposure is removed, may also free the employee of all signs and symptoms of lead poisoning. But imagine the surprise of that supposedly cured person when years later, perhaps following some type of infectious disease or the excessive use of alcoholic beverages, he awakes to find that he suffers the aches and pains and paralyses of an acute lead poisoning. As the body fluids alter lead that it may be deposited, so may those fluids attempt to de-lead the body, and too rapid absorption may reproduce the original disease with all its discomforts.

One can readily see, then, that in some cases investigation of previous occupations is quite necessary to determine the original contact with lead.

Heating of molten lead causes a black scum of lead suboxide to form on its surface, and the heat from the metal disburses the fine powder into the air. Hence, in the process of smelting ores such as zinc, copper and silver, mixed with lead, we find a rather high lead poisoning rate.

Those engaged in the manufacture of lead wire and cables, batteries, glass, pottery and rubber industries, plumbers and users of dry colors offer their share of lead poisoning cases.

Probably the greatest source of lead poisoning may be found among those who sandpaper, scrape, chip or burn lead paint, for the dust and fumes caused by those activities are rather rapid in their action. Such workers may become incapacitated in a few days because the inhalation of lead dust causes the maximum amount of absorption into the blood stream in the minimum space of time.

CHROMIUM: Chromium is a metal widely used as a foundation for colors, and dusts from its various salts may produce lesions of the skin and mucous membranes of the nose. Chromium plating by electrolysis may cause fumes which are similarly irritating. Although chromium poisoning does not usually cause death, the number of days of absence from work on account of incapacity which it causes is gradually increasing.

OTHER METALS: The most efficient portals of entry of foreign substances into the body are the nose and mouth. The smaller the dust (the size of smoke particles for example, the greater the speed of absorption by the blood. Fumes from hot metals carry not only poisons but numerous minute dust particles. This explains the [illegible]

electric cutting and welding.

When men are so employed over a prolonged period of time, the constant inhalation of fumes and dust might produce symptoms of the metal upon which they work. In the shipbuilding trade, particularly in the construction of metal ships, we find occasional cases of metal-fume fever. "Brass chills" and "spelter shakes" from zinc are names applied by the lay people to such diseases. The terrific heat applied to some of our common metals and alloys by acetylene torches produces sufficient fumes to cause a temporary incapacity in 24 hours. Permanent disability from such causes is rare, however.

Diseases Due to Dust

Twenty-five per cent of all workers exposed to high concentrations of inorganic dust are expected to develop changes within their lungs due to that agency. We are at a loss to explain why the other 75 per cent are not so affected.

Mining, quarrying, foundry work, grinding, sandblasting, abrasive soap manufacturing, asbestos work, the making of emery and carborundum products and many other occupations offer opportunities for employees to inhale microscopic dust particles and create a foundation for possible future incapacity.

We are interested particularly in those men who work with sandstone, quartz, flint, granite, and sand, because they expose themselves to silica, and the chemical changes between that dust and the body fluids, in the presence of tuberculosis, may and usually do lead to a fatal ending.

It is safe to say, in light of our present knowledge, that the action of other inorganic dusts is much less virulent and incapacitating. That, however, does not allow us to lower the vigilant methods to improve dust control and protect employees, because all dusty occupations are potential trouble makers.

Although the actions of various dusts differ within the body, the exposure to asbestos fibres, present in the weaving and grinding of dry asbestos material, offers another type of dust which may cause fatalities among workers.

The organic dusts from cotton, silk, wool, tobacco, flour and similar substances are practically harmless. Such dusts rarely reach the lungs but may cause irritation of the windpipe and larger air tubes and result at the most in a mild bronchitis.

mind, particularly when dealing with silicosis and asbestosis, relates to the progression of such disease. When changes occur within the lungs as a result of the presence of such dusts, nature forms scar tissue to heal such lesions but may fail to stop when the job is finished. As a result, the continuation of that healing process may lead to such structural changes within the lungs that partial or total incapacity may follow months or years after the employee has been removed from his dusty occupation.

Benzol-Benzene

Benzol is a distillate of coal tar used extensively in industry. It is an essential ingredient in the manufacture of explosives. It is an excellent solvent for grease, oils and cements, and because of that property it is important in many phases of the rubber and cleaning industries. In the manufacture of shoes benzol may be an ingredient of the dressing applied to the leather and of the cement which fastens the heels and soles. Not only in the shoe trade but in other branches of industry where employees work with gummy, sticky material, the workers soon learn of the solvent and cleansing action of this liquid and use it freely for that purpose upon themselves. The subsequent outbreak of skin afflictions may be the first indication of such unauthorized use.

Benzol is extremely poisonous, entering either through the nose or mouth or absorbed through the skin. Its action within the body is varied and may produce a multitude of signs and symptoms. The bone marrow becomes affected which in turn alters the character of the blood; hemorrhages are common; it may cause death.

The fumes from benzol are heavier than air and lie near the floor, which is an important point in the engineering problem of ventilation.

The members of the benzene group are absorbed through the skin, and more cases of poisoning are found when men perspire than when their bodies are cool. Probably the answer to that is that the fumes may solidify as they cool and the powder may settle on the skin. The sweat on the body may dissolve this dust so that it is more readily absorbed through the increased surface blood supply.

Chlorinated Hydrocarbons

This group of petroleum derivatives has been known to science for years but the industrial field has been widely distributed and most important. Led by carbon tetrachloride and its chemically associated members, it has furnished industry with refrigerants, excellent solvents for rubber, wax, oil and grease, thinners for lacquers and a very fine household necessity for the removal of spots from clothes. Hospitals have been using it more and more for the removal of adhesive plaster.

Due to the non-flammability of carbon tetrachloride, it is used in fire extinguishers. The rapid evaporation produces fumes which may smother a small blaze, but we must not forget that excessive heat of the actual fire may bring about combustion sufficient to produce such by-products as hydrochloric acid and phosgene gas . Like its associated member, choloroform, it may produce sleep when inhaled by an individual, and only 1/350 of an ounce in a quart of air is necessary to produce such action. That thought must be remembered when a large quantity of these liquid products is spilled on the floor, perhaps accidentally. Action should be started at once before the liquid gasifies, and employes should be notified to keep their heads up to avoid the low ceiling of gas.

Chemists have developed and introduced to industry many new products, the basis of which is the chlorinated hydrocarbons. These derivatives of petroleum distillation are frequently combined with those from coal tar to form valuable chemical combinations. They have been placed on the market so rapidly that medical science has been unable to determine their physiological effect upon the health of man. We have known that some of these chemicals are capable of creating changes in the liver, and only recently in a city in Massachusetts use of these newer products caused the death of two employees and a battle to retain life among two others.

Carbon Monoxide

You remember the adage. "Where there is smoke, there is fire." We might add to that, "Where there is fire there is carbon monoxide."

This odorless but poisonous gas may occur in any industry or in any home but the poorer the ventilation the better the chance of producing physical incapacity.

Since the advent of the motor car whose exhaust pipe may pour forth as high as six per cent of carbon monoxide, we are all exposed to that gas, particularly in crowded cities. The ordin-

of passenger car liberates about two cubic feet per minute, and one can readily estimate the physical damage that may be done if such a motor is allowed to run within the doors of a poorly ventilated garage or shop. Fortunately, serious cases of such poisoning are not common among those employed in public garages, but many employes are likely to complain of headache and faintness at the end of a day's work, especially in colder weather when doors and windows remain closed.

In the steel industry, where gas is used as the heating agency in the blast furnaces, care must be taken to provide proper ventilation. Within the mines, workers are warned to allow enough time following blasts for the escape of this gas.

Infection

The skin is a protective covering of the body against infection and is extremely efficient as long as it remain intact, but allowing it to be broken or punctured introduces bacteria, and a battle ensues between the offensive agencies of infection and the defensive powers of the body. The winner of such a struggle may determine the presence or absence of incapacity. Infections are common throughout industry, but two types are particularly prominent—infection resulting from anthrax and infection among meat packers and fishermen.

Many of our fur, hair or wool-covered animals may contract anthrax. The germs of that disease defy the ordinary methods of sterilization and may linger on hides, bristles or hairs for long periods of time. Tanners, wool sorters, and hair or bristle workers may introduce the anthrax spore beneath their skin and undergo much physical suffering and sometimes death.

Infections are frequently found among meat and fish packers and those engaged in deep sea fishing. Although death rarely occurs, the loss of fingers, hands and nasty septic wounds are the result.

Summary

I feel that the time has come when an employer must demand of a manufacturer the answers to two questions:

1. How will your product affect my employees?
2. How will your product affect the health of my employees?

That employer is entitled to honest answers based upon sufficient chemical and physiological examinations of the questionable product. Too many lives have been lost or jeopardized by too little knowledge of a product's action [illegible] handle it.

Ferrosilicon

Industrial Data Sheet D-Chem. 20

A. Problem

1. What are the hazards of ferrosilicon and what precautions are necessary in its use?

B. Hazards

2. The principal hazard is that of poisoning by inhalation of the gases that may be given off, especially in the presence of moisture.

C. Discussion

3. Ferrosilicon is prepared by melting iron ore or steel shavings with coal or coke and ganister or quartz at a temperature of about 2,000 degrees centigrade (3,632 degrees Fahrenheit) in an electric furnace. In making steel, ferrosilicon is used for removing objectionable gases and oxides and also as an alloying element. When alloyed with cast iron, it affects the carbides and renders the iron soft and gray. More concentrated silicon alloys are sometimes used in certain processes for making hydrogen gas and in the manufacture of explosives.

4. The hazard in connection with ferrosilicon results from very small percentages of phosphorus together with other elements which may be present as impurities originating in the raw materials used. In the presence of moisture the phosphorus compounds react to form phosphoreted hydrogen or phosphine. This is a gas which in sufficient quantities is decidedly poisonous. It has a strong and distinctive odor somewhat resembling garlic so that its presence can be readily recognized. The stability of ferrosilicon depends upon its silicon content, grades below 48 percent and above 65 percent being entirely stable and ferrosilicon in these ranges does not give off any appreciable quantities of phosphine, even in the presence of moisture. It is, therefore, only in the intermediate range between 48 percent and 65 percent that there is any appreciable hazard.

Symptoms of Poisoning

5. When a person has breathed poisonous gases liberated from ferrosilicon, the symptoms of poisoning usually develop quite suddenly and are characterized by general and abdominal pains, nausea, vomiting, diarrhea, hemorrhages, loss of consciousness, dilated pupils, cold clammy perspiration and coma. Cases of poisoning have been mistaken for cholera, gastro-enteritis, ptomaine poisoning, pneumonia and influenza.

First Aid

6. When a person displays any symptoms of poisoning because of the inhalation of the poisonous gases liberated by ferrosilicon, he should be promptly removed to the fresh air and, if conscious, be given a mild alkali drink. If unconscious, the prone pressure method of artificial respiration should be started immediately after the patient has been removed to the fresh air. In all cases of poisoning the services of a doctor should be promptly obtained.

Precautions

7. Ferrosilicon should be stored away from such places as offices and work rooms or living quarters of any description.

8. All buildings in which ferrosilicon is stored should be well ventilated and dry. *(See Note X.)* Ordinarily, in an open factory building the natural ventilation through monitors in the roof or through windows is sufficient if the ferrosilicon is kept dry.

9. If men are required to handle wet ferrosilicon in a confined space, artificial ventilation should be provided.

10. In case phosphine has been allowed to accumulate in a closely confined space such as a closed room or box-car, so that a strong odor of the gas is noticeable, no one, unless he is wearing a suitable gas mask or fresh air hose mask, should be allowed to enter the room until it has been thoroughly ventilated. *(See Note Y.)*

NOTE X. Detailed information on ventilation will be found in National Safety Council Safe Practices Pamphlet No. 27 "Industrial Ventilation."

NOTE Y. Detailed information on fresh air hose masks will be found in National Safety Council Safe Practices Pamphlet No. 41 "Respirators, Gas Masks, Hose Masks and Breathing Apparatus."

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