and enlightening, as well as the chairmen and officials of the various sections who have worked hard and diligently t make the sectional meetings a success. I also wish to express our thanks to the General Committee, which has so graciously and generously assisted in the development of the program and promoting an interest in attendance. We are grateful to the newspapers for their support, to the exhibitors who have brought to the Congress such a splendid display of safety devices and appliances. I want to express appreciation to the members of the Commission, who have so wholeheartedly supported our division in making the Congress a success and for their personal contributions to the success of the program. We are deeply appreciative of the assistance of and want to thank the employees of the State of Ohio not only for the splendid cooperation that we received from them in making this Congress a success, but for the splendid support that they have given to us during the past year, and the many years in which our organization has been active in our efforts to prevent industrial accidents in Ohio.

In conclusion, might I express the hope that each and every one of you has enjoyed the Congress, that you have profited by it? And we are going to look forward to your continued support and cooperation and to seeing you again next year.

With these few words, my parting message is, "God bless you." (Applause.)

CONGRESS ADJOURNED

The Congress thereupon adjourned.

PROCEEDINGS

of

10th. All Ohio Safety Congress

Held under the auspices of
THE INDUSTRIAL COMMISSION OF OHIO
and the direct management of
THE DIVISION OF SAFETY AND HYGIENE
Published under the authority

of

The Industrial Commission of Ohio

Neil House
Columbus, Ohio
April 18, 19, 20
1939

F. J. HEER PRINTING CO.
Columbus, Ohio
1939

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Dr. Robert E. Smith, Associate Professor of Education, Ohio State University, Columbus, Ohio.
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B. H. Taylor, Personnel Director, Diamond Alkali Co., Painesville, Ohio.
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Homer J. Weeks, Manager, Safety, Sanitation & Welfare, American Steel & Wire Co., Cleveland, Ohio.
R. M. Weimer, Dayton Rubber Manufacturing Co., Dayton, Ohio.
O. W. Wiswell, Executive Secretary, Ohio Coal Conference, Inc., Columbus, Ohio.
John K. Witherspoon, General Laundry Co., Columbus, Ohio.
Wm. E. Yater, Champion Paper & Fibre Co., Hamilton, Ohio.
Charles Young, Wheeling Township Coal Mining Co., Adena, Ohio.
Joseph H. Zuccer, Cleveland Plain Dealer, Cleveland, Ohio.

Program

Chairman: Carl L. Smith, Managing Director, Cleveland Safety Council.

Exhibits

Chairman: Buell W. Nutt, President, Safety Equipment Service Company, Cleveland, Ohio.

Entertainment

Chairman: H. G. Ehret, Safety Director, Division of Factory and Building Inspection, Department of Industrial Relations of Ohio.

Publicity

Chairman: H. M. Paul, Supervisor of Printing and Publications, Division of Safety and Hygiene, Industrial Commission of Ohio.

Reception

Chairman: A. L. Rose, Assistant Superintendent, Division of Safety and Hygiene, Industrial Commission of Ohio.

Registration

Chairman: C. C. Beasor, Statistician, Division of Safety and Hygiene, Industrial Commission of Ohio.

BUREAU OF INFORMATION ON SAFETY, COMPENSATION AND CLAIMS

SAFETY

Chairman: George P. Meehan, Mechanical Engineer.

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H. P. Heyne.....Safety Engineer
T. E. Fennessy.....Safety Engineer
Mackin Kelly.....Safety Engineer
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James Fluker.....Special Investigator
R. C. Jones.....Special Investigator
James P. Scanlon.....Special Investigator
Sidney Smith.....Special Investigator
A. R. Taubman.....Special Investigator
Ben T. Godfrey.....Special Investigator

COMPENSATION

Robt. W. Nott, Supervisor of Information, Industrial Commission of Ohio.

MUSIC

GENERAL SESSION

Tuesday, April 18, 9:30 A. M.

Group Singing
H. G. Ehret, Baritone
Marie Arms, Pianist

ANNUAL CONGRESS BANQUET

Tuesday, April 18, 6:30 P. M.

ORCHESTRA

"The Real McCoys"

Miss Betty Fry, Soprano
Marie Arms, Accompanist

GENERAL SESSIONS

Wednesday, April 19, 2:00 P. M.

Thursday, April 20, 9:30 A. M.

QUARTET

The O. S. U. Musketeers

Group Singing

CELEBRATING THE TENTH ANNIVERSARY! SAFETY EXHIBIT

Hotel Lobby

and

Mezzanine Floor

The Largest and Most Comprehensive Display of

SAFETY DEVICES

and

Equipment for Accident Prevention

and

Industrial Hygiene

Ever Shown at an All Ohio Safety Congress

MECHANICAL SAFEGUARDS
PROTECTIVE CLOTHING
FIRST AID AND SAFETY SUPPLIES
DUST ELIMINATION
FIRE PREVENTION
ILLUMINATION
ACCIDENT CHARTS AND STATISTICS
SAFETY LITERATURE
TROPHIES, EMBLEMS AND AWARDS

Everyone Attending the Congress Should See This Most Interesting and Instructive Display.

OPEN

9 A. M.—6 P. M. Tuesday
9 A. M.—9 P. M. Wednesday
9 A. M.—4 P. M. Thursday

EXHIBITORS

Tenth Anniversary All Ohio Safety Congress

April 18, 19, 20, 1939

E. D. Bullard Co., Chicago, Ill.
Williams & Co., Inc., Pittsburgh, Pa.
Brown Shoe Co., St. Louis, Mo.
The Geo. L. Williams Co., Cleveland, Ohio.
Panther-Panco Rubber Co., Chelsea, Mass.
Davis Emergency Equipment Co., Inc., New York, N. Y.
American Optical Co., Cleveland, Ohio.
H. Childs & Co., Inc., Pittsburgh, Pa.
Safety Equipment Service Co., Cleveland, Ohio.
Standard Safety Equipment Co., Chicago, Ill.
Hynson, Westcott & Dunning, Inc., Baltimore, Md.
Melflex Products Co., Akron, Ohio.
Pyrene Mfg. Co., Chicago, Ill.
The M. F. Murdock Co., Akron, Ohio.
The Safety Scaffold Corp., Cleveland, Ohio.
The Kimball Safety Products Co., Cleveland, Ohio.
Wiesman Mfg. Co., Dayton, Ohio.
Shepherd Safety Shoe Corp., Chicago, Ill.
Acme Safety Products Co., Akron, Ohio.
Lehigh Safety Shoe Co., Allentown, Pa.
Willson Products, Inc., Reading, Pa.
The Erickson Mfg. Co., Cleveland, Ohio.
Flohr Mfg. Co., Buffalo, N. Y.
International Shoe Co., St. Louis, Mo.
Keystone View Co., Meadville, Pa.
Metropolitan Life Insurance Co., New York, N. Y.
Mine Safety Appliances Co., Pittsburgh, Pa.
Industrial Gloves Co., Danville, Ill.
Safety Engineering Magazine, New York, N. Y.
M. E. Cunningham Co., Pittsburgh, Pa.
H. W. Peters Co., Columbus, Ohio.
Safety First Supply Co., Pittsburgh, Pa.
The Positive Safety Mfg. Co., Cleveland, Ohio.
The Surty Mfg. Co., Inc., Chicago, Ill.
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Daniel Woodhead Co., Chicago, Ill.
Milburn Co., Detroit, Mich.
Industrial Commission of Ohio, Division of Safety and Hygiene.
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C. H. Dockson Co., Detroit, Mich.
A. Schrader's Son, Brooklyn, N. Y.
The Safety Clothing Co., Cleveland, Ohio.
Burroughs Wellcome & Co., Inc., New York, N. Y.
The Fyr-Fyter Co., Dayton, Ohio.
Pulmosan Safety Equipment Corp., Brooklyn, N. Y.
Toledo Machine & Tool Co., Toledo, Ohio.
Porter-Cable Machine Co., Syracuse, N. Y.
G. H. Packwood Mfg. Co., St. Louis, Mo.
Department of Highways, State of Ohio.
Sugar Beet Products Co., Saginaw, Mich.
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American LaFrance-Foamite Corp., Chicago, Ill.
Huntington Laboratories, Inc., Huntington, Ind.
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Harry L. Morgan Co., Columbus, Ohio.
Consolidated Expanded Metal Cos., Wheeling, W. Va.
Bauer Mfg. Co., Wooster, Ohio.
The Lima Cord Sole & Heel Co., Lima, Ohio.
Wolverine Shoe and Tanning Co., Rockford, Mich.

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TUESDAY, APRIL 18

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PULP AND PAPER

PETROLEUM

NEWSPAPERS AND PRINTERS

INDUSTRIAL AND COMMERCIAL MOTOR VEHICLE OPERATION

EMPLOYEE PUBLICATIONS

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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THURSDAY, APRIL 20

2:00 P. M.

GENERAL SESSION

SUPERVISION SAFETY IMPROVEMENT

GENERAL SESSION

Tuesday, April 18, 10:00 A. M.

The first General Session was called to order at 10:00 o'clock in the Ball Room of the Neil House by J. W. Beall, Chairman of the Industrial Commission of Ohio

CHAIRMAN BEALL: While our friends, the safety men and the women of Ohio, continue to congregate, we will open by the singing of America, led by Mr. Harry Ehret, of the Department of Industrial Relations. Those who are not familiar with the words as I am will find them on Page 13 of the program.

"AMERICA"

By the Congress; led by H. G. Ehret; accompanied by the orchestra.

CHAIRMAN BEALL: The Tenth All Ohio Safety Congress will now come to order. Will the door men kindly instruct those coming in that there are still plenty of vacant seats down in front? We are not going to take up any collection, so you don't need to stay near the door.

Three Scotchmen went into Church, got there, sat down just as the plate was being passed. Being a Scotchman myself, I can tell this. At that moment when the plate neared the pew in which the three Scotchmen were seated, one of them with great presence of mind fainted and the other two carried him out. (Laughter)

There will be no collection here this morning, so there is no need for any of we Scotchmen to faint.

It is very fitting indeed that we of this great land of ours, this free America of ours, should open this session with the song "America." It is also most fitting that this assemblage dedicating its work to the saving of life and limb in Ohio industry should also inaugurate the labors of this three-day session with an invocation from Almighty God. The audience will please rise while the Reverend James Thomas, Pastor of Broad Street Methodist Church, will invoke the divine blessing.

INVOCATION

REV. JAMES THOMAS,
Pastor, Broad Street Methodist Church, Columbus, Ohio.

Great and Eternal God, we pause at the beginning of these sessions that we may recognize Thee as the giver of life. Conscious indeed are we that we are living in a world of mystery. Round about us are forces we do not understand. Round about us are combinations of forces that are destructive. We feel our dependence upon Thee that we may come better to know how that we may conquer these destructive forces and turn them in the direction of construction of human life.

We pray that Thou shalt bless us today, especially because we are members of a world that is beclouded by war, a world that is not safe. We pray in this hour that Thou shalt help us that we shall be very helpful about matters pertaining to not only material safety, human safety, safety of the human body, but we pray that further than that we may think of lives that are cracking up and that somehow or other we shall go further than matters of bodily safety to consider matters of mental safety. And then, Our Father, we realize that our civilization rests upon morality and as we witness lives that are breaking up morally, we pray that we shall

start of the talk, this matter of safety in welding is not something that has been going on for a long period of time, and there are so many factors in welding that has not received most of the attention, but now we are getting down to the fine points of cost production and are finding out that the protection and comfort of the operator helps in cost reduction. That angle has just started to receive the attention it should in the welding industry. It is only a year and a half or two years that safety and protection of the operator have had attention, and often, as I mentioned in my talk, and as you noticed in the pictures, you will see a man equipped with apron and gloves but no spats, yet the feet and ankles are the most exposed spots of the welding operator, particularly when standing at his work.

MR. SCOTT: I wonder if we can put Mr. Meehan "on the pan?"

MR. MEEHAN: Yes, sir.

MR. SCOTT: Could you answer this question—under the laws of the State of Ohio, in case of accident if it is proved that the company the injured man was working for has not met a code set up by the State, can he collect additional compensation? When speaking of a fatality, can the beneficiaries of the deceased bring action and recover above the stated amount given by the State?

MR. MEEHAN: That is only true where we have specific requirements for an industry, and we do not have a set of specific requirements for the petroleum industry. For instance, in construction, the repairing of something around a refinery, if the code calls for a certain type of scaffold which is not provided, and a man falls and dies, the beneficiaries can file for additional award, and it can be from 15 to 50 per cent, based on the degree of negligence, but a claim for an additional award cannot be filed because of the failure of the employer unless there is a particular set-up for that particular type of industry. I think there are 16 of those, but not in the petroleum industry, and probably there never will be, for the simple reason you are taking care of that now, and the laws are not made by the Industrial Commission, they are enforced thereby the people themselves, the employers and the people who work. If death or serious injury comes by the negligence of an employer under a specific requirement in the law, an additional award can be recovered.

That is the smallest part of our work. I rather imagine that out of 200,000 claims we have had 175 or 180 additional award cases. So the employer feels we do pretty well, and the employee is pretty decent, he just wants to be fixed up so he can go back to work.

MR. EGAN: May I ask a question? In the discussion you will remember I mentioned about the Industrial Commission making an award for partial loss of vision of the operator due to a flash. That at the present time I think is a very, very small percentage. I would like to ask if any of you men here know personally, in your own organization or anywhere else, where an operator has had permanent damage to the eye from a welding flash?

MR. W. A. SANDERSON, Standard Oil Company of Ohio, Cleveland: We have a number of electric welders. We use the best equipment we can buy, and the boys claim that during the day, after being on the work continuously for a year or two years, they have eye fatigue, they want a rest period once in a while. Whether that is permanent or not I don't know, but as I say we have bought the best equipment for the eyes that we can buy and still we have the complaint. They claim that eventually their eyes are going to get bad, in view of that. Whether they are or not I don't know.

MR. EGAN: I will tell you what I know about it. In the first place, I think I am safe in saying the medical profession does not know very much about the injury

that is said to be caused by the electric arc. In other words, one of the specialists in town has a book on his desk about that thick, on diseases of the eye, ear, nose and throat, and on this subject of the eye injury from a flash there is half of one page. The center of the eye they say is a liquid, which is clear, and due to intense application of heat, or X-ray, such as looking at the sun, or a close flash of the arc, that heat causes some kind of integration of the liquid. It turns gray, and the man has to see around instead of through the center portion of the eye. That can be gradual or sudden, if what they say is correct, but three months ago a case came up before the Industrial Commission in Columbus which was the first case in twenty years I had ever heard of a permanent recorded injury to the eye from a flash.

I am trying to check this every place I can get actual evidence and information on that particular subject. I take it that none of you know of a case of permanent injury to an eye from a welding flash?

MR. SANDERSON: This only comes from fellows who have been welders for a considerable number of years. They are not boys, and probably their eyesight is failing to some extent, it may not be from the welding, although it can be, of course.

MR. EGAN: The eye specialist can determine very quickly if the trouble can be caused by the flash, or whether it is something else. It can be very definitely and easily recognized, the eye condition that can be caused by an arc flash.

MR. WILLIAM SCOTT, Standard Oil Company of Ohio, Cleveland: Couldn't that be ascertained by, we will say, semi-annually having their eyes tested? It may be that if there is any reaction at all, it would be so gradual you could only detect it by semi-annually testing the vision.

MR. EGAN: That is the reason for my asking the question. In other words, I am trying to find out just how much of an item this is going to be. If it is something that will be of any great extent we should recommend to the companies that they have semi-annual technical eye examinations for the operators. For instance, in the case in question, there had never been any technical eye examination of this condition. Maybe it was caused from something else, but there was no evidence whether his eyes were okay or not okay before. If it is something that is going to happen rarely, it is hardly worth the expense of an eye examination, which costs money.

The other point, of course, is that it can only happen by accidental flash. If it is going to be an item, perhaps instead of having a number 10 lens, say, in the shield that you have the operator wear goggles like this over his eyes with No. 4 lens and perhaps have No. 6 lens in the shield, and have him wear them both at the same time. This goggle lens you could not weld through but it would protect the eyes against accidents while he takes away his head shield just as somebody flashes, and there are the goggles underneath. That is inconvenient to the operator, to have goggles, particularly in the summer when they might fog, and probably would not work out so good, but again, if this is an isolated case there is no use going to much expense about it. If it is going to keep coming up, we want exact information, to be prepared and to be advised what we can expect.

CHAIRMAN MCPHERSON: If there are no further questions, I wish to point out that our session tomorrow starts at 9:00 o'clock, and we expect it to measure up to the performance of this session, and all in all, we hope to match the record Mr. McLean made last year.

I wish to urge you to prevail upon your friends in the oil industry to attend the session tomorrow. We are especially anxious to make a good showing in attendance, and we will appreciate it greatly if we can have a capacity crowd. Any assistance you can give us in that way will be appreciated.

I now declare this session closed.

CERAMICS

OFFICERS FOR 1939-1940

Chairman: D. A. O'Neill, Owens-Corning Fibreglas Corp., Newark, Ohio.
First Vice-Chairman: John Bowen, Jr., American Vitrified Products Co., Uhrichsville, Ohio.
Second Vice-Chairman: J. Harrison Keller, Limoges China Co., Sebring, Ohio.
Secretary: Prof. H. E. Nold, Ohio State University, Columbus, Ohio.

The Ceramics Section was called to order at nine o'clock in the Ball Room of the Neil House by H. L. Pollock, Ohio Brass Company, Barberton, Ohio, Chairman.

Chairman Pollock: Before we start this meeting, I would like to ask Mr. A. W. Keys, John Bowen and C. L. Sebring to meet Professor Nold in the rear of the room immediately after he makes one announcement.

Professor H. E. Nold, Ohio State University: I just have one announcement to make. I was just informed about five minutes ago that our friend Bob Kiplinger of the Metropolitan Paving Brick Company, was taken to the hospital for observation just within the last few days. He is in Mercy Hospital at Canton. We don't know what is the matter with Bob. He hasn't been in very good health for some time and we hope it isn't serious. You who are friends of Bob Kiplinger know how a man in the hospital appreciates a postal card occasionally, and you can address him at the Mercy Hospital at Canton.

Now if I can meet with those three gentlemen at the back of the hall for a few minutes please.

Chairman Pollock: Before launching into the main part of our program, I would like to read you the accident statistics for the Ceramic industry. I am not intending to make any lengthy discussion for we want to launch into our regular program as soon as possible, but I have these statistics here that I want to read to you.

Note: Statistical tables presented may be obtained from Division of Safety and Hygiene, Industrial Commission of Ohio.

Chairman Pollock: In launching into our program, "Meeting the Silicosis Challenge", we have as our first speaker, a man who is following in the footsteps of his illustrious father. Years ago when I first became interested in safety, back in 1926, there was one man in this industry that stood out above everyone that I knew of at that time, in safety. That man was William H. Cameron, whom I hope to introduce to you a little bit later. Coming along in his footsteps is his son, Bill Cameron of the U. S. Department of Labor, Safety Adviser. So I will call on Mr. Cameron at this time.

LEGAL PHASE OF SILICOSIS

W. T. Cameron,
Safety Adviser, Division of Labor Standards, U. S. Department of Labor, Washington, D. C.

Chairman Pollock and Gentlemen: I think that you have selected a particularly fitting title for the theme of this meeting, "Meeting the Silicosis Challenge", because it really is a challenge. You also have assigned me a particularly hard spot in that challenge, the "Legal Phase of Silicosis." You are going to have a three-ring circus

here this morning, or a three-team vaudeville act, as it were, and my particular part of the program is the more complicated but less spectacular part of the program, the legal phases.

Nevertheless, due to the action that was taken three weeks ago when the Supreme Court reversed itself and the decisions of the lower courts and granted two awards in two silicosis cases, in two silicosis common law suits, silicosis was again pu: on the front pages in Ohio.

These civil suits were instituted for damages resulting from silicosis on the ground that the disease was caused by the employer's negligence in failing to provide a safe place to work, and arose before silicosis was made compensable in Ohio under the 1937 amendment to the Workmen's Compensation Act.

The Ohio Supreme Court's decision says in effect: "Good people of Ohio—employers, workers, and the public—your intentions were good back in 1911 when you enacted a compensation law assuring every worker some redress for injuries or deaths arising out of and in the course of employment without the necessity for recourse to law suits, or employment of attorneys or payment of court costs. Your intentions were good when you decided to give the worker an additional award without suits at law where the injury was the fault of the employer due to his failure to comply with specific requirements for the safety and health of his workers, when you fixed a limit of financial liability in injury cases to protect the assets and credit of the employer, when you agreed to wipe out the 'open liability'—giving recourse only to the compensation law for injuries and deaths arising out of and in the course of employment. But, good people of Ohio, with all your good intentions, you left some workers completely out in the cold, completely without protection. By including a list of specified occupational diseases and excluding others, you told the workers of the State that if they became disabled or died because of an occupational disease enumerated in the schedule, they would be taken care of through the orderly procedure of workmen's compensation; but that if the worker died or suffered injury from an occupational disease not included, he had neither recourse to the compensation law nor at common law, although he may have been just as sick or just as dead, and the sickness may have been just as definitely related to the employment as any of the diseases on the schedule."

The decision said, "Good people of Ohio, this court has ruled in the past that these unfortunate workers have no recourse whatsoever, that they are just out of luck. But now this court feels that it is about time that this obvious injustice of allowing some employees who contract occupational diseases to receive compensation and others nothing, be corrected. We find that the language of the organic and statutory law is general in character and that there is no statutory or constitutional provision expressly denying the right to maintain an action growing out of a non-compensable occupational disease. We, therefore, good people of Ohio, feel 'that the letter of the law should not prevail over the spirit'; the poor unfortunates whom you failed to cover under the compensation law still have a right to their 'day in court.' In conclusion, good people of Ohio, an exhaustive search of similar questions in other States has revealed only one jurisdiction outside of Ohio in which it was held that this right of action does not exist."

What does this decision mean to you?

What, now, is your financial liability as an employer?

Can you insure this liability?

What are the rights of your employees?

Under this decision can an employee sue for damages for silicosis allegedly contracted under the five-year time limit set forth in the silicosis amendment?

Will the courts be flooded with similar litigation?

Will this decision give rise to negligence suits for other occupational diseases not now included in the schedule of twenty-three diseases, never filed because the right

to sue was assumed to have been taken away by the language of the Workmen's Compensation Act?

Of course, I am not going to attempt a categorical answer to these and a dozen other questions that may be prompted by an analysis of this decision. But let us review some of the implications and possibly lay a plan of action to guide our future activities.

The history of industrial relations legislation has been one of continually lessening the complicated legal processes and letting each party know where they stand.

Common-law actions to recover damages for injuries arising out of employment are beneficial to neither employer nor employee. An analysis of hundreds of cases indicate that the employee gets little of the judgment awarded; the lump sum he does get is too many times squandered or enticed away by sharpshooters of one kind or another. To the employer, this method of settlement may mean an award for damages large enough to end his business career; or often, even if he wins the suit, he has spent in legal and other professional fees amounts far in excess of the present awards under the compensation plan.

Under the system now in vogue the employer can forecast in advance his liability expense and cover this liability with insurance. He knows in advance what his cost will be and, like all other items on the balance sheet, it can be carefully scrutinized to determine how and where they can be pared down.

I do not believe there is an employer or an employee in the State of Ohio who would like to return to the old system. But as long as we have loopholes in the system, as long as some workers are left without workmen's compensation protection through occupational disease exemptions, industry exemptions, and numerical exemptions, industry is going to be involved in expensive litigation with all of its uncertainties.

What will happen because of this reversal by the Supreme Court, no one knows. Apparently employers become liable for all of their sins of the past. The barn was left unlocked, the horse is stolen, and I predict a hey-day for the lawyers. I understand that 40 suits have already been filed in the last three weeks.

However, as safety men, let us leave the process of righting the wrongs of the past to the lawyers and turn our study to the present-day situation and view it in the light of the present decision. Does not this immediately suggest to you as a preventionist that we need more than ever before to dig into the dark corners of our plants, to subject to the severest scrutiny every substance, every commodity, every chemical that is used in our manufacturing process? Does it not suggest an analysis of the air in our workrooms for atmospheric contaminants, tests to determine the amounts of dusts, vapors, fumes, gases and mists present, and their possible harmfulness, of studies to show what occupations expose our workers to excessive fatigue, hypertension, extreme heat, dampness, radiant energy, jobs involving repeated motion, pressure or shock?

I think we no longer can consider our safety job done when we correct all of the conditions we can possibly foresee that may lead to accidental injury or expose workers to the disabilities listed in the occupational disease schedule. Our job is not done until we know and warn the workers of every conceivable hazard of our manufacturing process, until we take steps to provide ventilation systems, protective clothing, respiratory devices, protective salves, adequate washing facilities, and all the other things necessary to protect our workers from harm. Our job is not done until we learn to recognize the early symptoms of occupational disabilities of every type and description and know what steps to take not only to effect a cure, but to correct a recurrence.

Where can a safety man get this information? May I recommend to you, first, the services of your own excellent Division of Safety and Hygiene. A request to Mr. Kearns will bring an expert to your plant to consult with you, to survey

conditions, to make specific recommendations. Next, I would recommend the services of the Industrial Hygiene Bureau of your State Health Department, working in close cooperation with Mr. Kearns, with doctors, engineers, technicians and laboratory facilities at your disposal.

Next, I would suggest the same careful review and study of the literature on occupational diseases and industrial hygiene that you have given to the literature on accident prevention. I would suggest starting with a little booklet entitled, "Occupation Hazards and Diagnostic Signs—a guide to impairments to be looked for in hazardous occupations—by Lewis I. Dublin and Robert J. Vane, of the Metropolitan Life Insurance Company, and published as Bulletin No. 582 of the Bureau of Labor Statistics of the United States Department of Labor.

On the subject of silicosis there is a world of valuable material, and, for a starter, you cannot do better than to make a thorough perusal of the Summary Reports of the National Silicosis Conference held in Washington in 1936 and 1937. There is first, as Bulletin No. 13, the Summary Report, giving you the economic background and some of the principal features and the highlights of the four Committee Reports. Then in addition, are the four reports which are published as Bulletin No. 21. Then there is the Final Report of the Committee on the Prevention of Silicosis through Legal Control, the Final Report of the Committee on the Prevention of Silicosis through Engineering Control, the Final Report of the Committee on Economic, Legal and Insurance phases of the Silicosis Problem, and finally, the final report of the Committee on the Regulatory and Administrative Phases of the Silicosis Problem, the last word on the Silicosis problem generally.

Included in each of these reports is a bibliography of other relevant and pertinent books on the various phases of the silicosis problem.

Your obligations as a member of this great fraternity of professional safety workers extend, I believe, far beyond the statutory requirements of the Ohio law. The legal obligation of today is not what it will be tomorrow. When that now unlisted disease becomes compensable two, five, ten years from now, will you be defending your liability before the Supreme Court because of negligence today?

What can we forecast in the way of regulations governing the control of dusty occupations? Several States have already prescribed by regulation or rule having the force and effect of law permissible limits of dust concentrations based upon the findings of the National Silicosis Conference. Other States have established regulations stating when and how certain dusty processes shall be exhausted. You can expect more stringent and more specific regulations and minimum standards in Ohio sometime in the future. I would suggest that you study carefully New York State's recently promulgated rock drilling code, the Massachusetts and California recommended permissible limits code, the Wisconsin ventilation code, and the reports of the Pennsylvania Department of Labor and Industry which are leading up to the development of a permissible limits code.

There has been considerable discussion on the relative merits of these two forms of regulatory approach in the control of hazardous dusts. The ventilation or blower code requires certain prescribed devices to be applied to known hazardous machines or operations and outlines in detail the type and shape of exhaust hood, the size of pipe, kind of dust collector and velocity of air-flow. This type of regulation usually requires the submission of plans for proposed installations to the regulatory body and puts the burden of decision as to the effectiveness of the device upon the State. In other words, the State says, in effect: "If you do the job thus and so, it will be considered acceptable and tangible proof that your workers are protected, assuming of course, that you keep the apparatus in efficient working order."

The other approach, the permissible limits code, sets a "speed limit," saying in effect, "We believe that dust concentrations in excess of five million particles per cubic foot to be harmful, less than that, harmless. We don't care how you

accomplish the job, but the air in your workrooms must not be contaminated in excess of what is considered the safe limit."

Both methods have many advantages and many disadvantages. The ventilation code helps the employer by telling him word for word, pipe size for pipe size, exactly what constitutes compliance, but has the disadvantage of putting the State in the engineering business, as it were, charging it with responsibility for complete knowledge of a variety of manufacturing processes and knowledge of how to correct every variety of dust producing job. If workers become disabled, contract silicosis, under this kind of an arrangement the State, it would appear, is to blame (of course, assuming that it could be proved that the device was maintained and operated according to the specifications).

The advantages of a permissible limits code are obvious, as it puts the burden of compliance upon the ingenuity of the manufacturer who certainly is a lot closer to his operations than the State agency. But it has the disadvantage of offering no guidance whatsoever to employers, especially small employers without trained technical personnel, in the construction of a suitable device to accomplish the safe limits set forth by law. The ideal regulation, in my opinion, is one which establishes a limit of dust concentration which is considered safe, that puts the burden of proof of compliance upon the employer, and in addition, that illustrates and describes in detail a number of exhaust devices, wet methods, etc., which have been successful on definite operations in obtaining the desired limits, and which in all probability would do so on any similar operation, but which will not be considered as prima facie evidence of compliance.

To attempt to forecast this morning what "is in the cards" in the way of future legislation, or to draw any set conclusions from a review of court decisions involving compensation claims for occupational diseases is indeed hazardous. However, the present decision of the Ohio Supreme Court, and others studied, definitely indicate that management's responsibility is not limited merely by the letter of the law. Courts in the various jurisdictions are tending more and more to allow claims in cases where there has been negligence on the part of the employer. Does not the legislative solution, therefore, lie in bringing speedily within the scope of the compensation law all hazards of employment, be they accidental injuries or as yet unlisted or unknown occupational diseases? Do you not agree that the way to plug the present loopholes which leave certain workers and their employers back in that dark era of "employee negligence," "assumption of risk" and "negligence of fellow servant," is by the passage of a blanket occupational disease amendment providing coverage for all possible disabilities which might arise out of and in the course of employment? Fourteen States have already said "yes" to this question, either by legislative enactment or by broad interpretation of the word "injury" to cover all occupational diseases. Why not let both the worker and the employer know where they stand? This is the American way.

To me, silicosis, from a legal standpoint, involves not only keeping the parts of the legislation in effect or contemplated in this state, but a careful study of the trends in other states of this country and other nations of the world. It involves keeping abreast of court decisions in all of your various jurisdictions. It involves above all, a full knowledge of the hazards present in occupations and materials in your plants, and providing for future legislation and future court interpretation and using every reasonable and practical safeguard for the protection of those employed today. Thank you a lot. (Applause.)

CHAIRMAN POLLOCK: Thank you, Bill. Now, at this time we would like to throw the meeting open for a discussion on this question of the legal phase of silicosis, and in asking questions, the reporter has requested that you state your name and your company affiliation. Are there any questions?

MR. BOWEN; American Vitrified Products Company: Mr. Chairman, the first thing I would like to know is, you spoke particularly of dust concentrations, your permissible concentrations, and those specifically apply to free silica, do they not?

MR. CAMERON: As to free silica, I merely used five million as an example. Five million is the limit, as I said, where your percentage of free silica runs very high. Now, in your rock-drilling code, they have set up a number of limits depending upon the percentage of free silica in the rock being handled or the material being handled.

MR. BOWEN: Well, in any of the laws which we have, is there anything which permits in silicosis cases, a compensable case where the only dust you get is from the silica in a combined form?

MR. CAMERON: Will you say that once again please?

MR. BOWEN: In other words, as silicates instead of free silica.

MR. CAMERON: I don't know; I can't answer that without the advice of counsel, and I don't happen to be a lawyer. I don't recall any cases offhand. We have known of cases where silicosis has been very definitely contracted by an employee, or by a person in less than the five year period that is set up here in Ohio, although the committee generally assumes that it takes from five to ten years or longer for silicosis to develop. There have been some cases where workers have been exposed to high concentrations or high percentages of free silica, where they have contracted the disease and have been completely and totally disabled in three or four years.

MR. BOWEN: Well, then each one of the laws states specifically in it that the injurious material must be free silica.

MR. CAMERON: No, no. Very few of the laws now mention free silica at all, or any remainder limits or any percentage of free silica. You might get your answer to this in your rock drilling code, if you are willing to look for it.

MR. BOWEN: All right, sir. I will do that. Well, you take for instance, now, just take an example where they have silica in a free state, and also in a combined state, and we have then a concentration of say fifteen millions particles, but the material is about 20 per cent free silica, which would, by mathematics, only make four million.

MR. CAMERON: Yes, and my offhand opinion would be that you were well within the safe limits.

MR. BOWEN: That would be within safe limits.

MR. CAMERON: I would say so, yes. It seems to me that the highest limit stated in this rock drilling code is ten per cent. of free silica, and the limit is set at fifty million particles per cubic foot, where the percentage is only ten per cent. You see what it does? They allow fifty million particles per cubic foot, and there is a scale, a range, you see, that goes up.

MR. BOWEN: Oh, I see.

MR. CAMERON: And if this were about 90 per cent or over of free silica the limit is set at five million particles.

MR. BOWEN: All right, sir. Thank you.

CHAIRMAN POLLOCK: Any other questions?

PROFESSOR H. E. NOLD, Ohio State University, Columbus, Ohio: Mr. Cameron, I have a question I would like to ask you, although perhaps this was answered, I didn't get a chance to listen to all of your talk. As I understand the thing, there

is quite a variation in the different states, in their laws, as applying to silicosis. Is there any tendency in the United States or by any agencies of the United States to attempt to develop some uniformity in the different state laws?

MR. CAMERON: Yes, that is being handled through a special medical committee under the auspices of the American Standards Association. This is a committee to establish permissible limits of concentrations for toxic substances, one of which is silica, and there are several representatives, labor representatives and representatives from manufacturers, and the Sand & Gravel Institute, and a number of people on that committee. It is a typical American Standards procedure, where the concensus first is reached, before the limit is set. Once that is set up, it becomes the standard of America, called the American Standard for dust concentrations, and that then will presumably be adopted as standard by a number of states. In fact, Massachusetts, California, Pennsylvania and these others that now have only recommended limits, permissible limits, are waiting for the development of this code before they make their limits mandatory, and I am convinced that within six months you will have a report on at least five toxic substances, one of which will be silica dust, and then the medical committee, a technical committee, will review reports from all over the world, experiments in South Africa and Australia and so on, as well as experiments in this country, and will make that report on a fair limit.

MR. BUTLER, Akron Porcelain Company: Many of us have employees who have worked for other companies in years gone by, I suppose. Now, would you suggest that we have our employees X-Rayed to see whether they may have silicosis, and if so, how are we going to prove where they contracted that, if they have it? Should we recommend that they get other work or what action should be taken along that line?

MR. CAMERON: You have sprung the most difficult question that confronted the National Silicosis Conference, and that is the subject of medical examinations, and in addition the subject of accrued liability, where a worker who works for half a dozen different companies where he is exposed to dust, each one of his employers having contributed some to his occupational breakdown, should he become totally disabled in your employment and he has only worked for you for six months, are you responsible for accepting total disability. Now, I have forgotten just how you do take care of that in Ohio. Do you have some information on that point, Mr. Donnelly?

MR. THOMAS J. DONNELLY, Secretary, Ohio Federation of Labor, Columbus, Ohio: I couldn't say. You understand that our silicosis branch is just getting into operation.

MR. CAMERON: Yes. I can perhaps give it to you in a minute. This is a chart showing that in a number of states. I don't locate it immediately on this chart. This is a chart of the compensation provisions for the seventeen states that do not compensate for silicosis. It may be on here. It is handled differently in most of the states. In Pennsylvania, for instance, a special fund was set up by the state as a second injury fund. If an employee has worked for you for one year and becomes disabled, you pay one-tenth of that benefit and the state pays nine-tenths. If he has been in your employ five years, you pay half and the state pays half, and I think there is some similar provision in Ohio. Possibly I can find this while we are on the next question.

MR. DONNELLY: I would like to just state now, Mr. Cameron, perhaps I haven't collected myself yet this morning, or at least hadn't when you asked me that question. In Ohio we have no special premiums—

MR. CAMERON: Come up to the rostrum, Mr. Donnelly, the room is expanding.

MR. DONNELLY: Why ever since our occupational diseases section was put in the compensation law in Ohio, we levy on all of the industries. In other words, on all employers under the act we have levied a flat premium rate to cover all of the costs of occupational diseases. Now, a man down here running a retail store is paying his flat rate, and is paying for that, because part of his premium goes to silicosis disability because that happens to be in the list, or to anything else. So, in the case of permanent total disability, as I see it now without making a study of the law, it appears to me that there is nothing in the occupational disease section at this time that levies anything upon the employer because of this permanent and total disability. It all comes out of that flat rate. I am not quite so sure just what that is now, but I think it is about two cents per hundred dollars of payroll. Now, we have had a very limited experience, because we have just added silicosis; it is just getting under way. Now, employers can understand, that you have your experience, and, of course, have your hazards and you have your classifications and have all of those things that determine your rate, but under occupational diseases we do not have that. I am rather of the opinion that perhaps later on there may be a rate fixed for the various industries to meet the cost of compensation that will come from occupational diseases, in those particular industries as against those which have no occupational diseases. For instance, in New York, one half of these costs is levied under their law. In Ohio we cover all occupations. Every employer in the State of Ohio having three or more employees is subject to the Workmen's Compensation Act. While that may not seem equitable, and it doesn't look like that a person who is conducting a business that never has any occupational diseases that that business should be paying for the occupational diseases of some other business, yet the cost has been so low, that they just made a flat rate. Perhaps, taking the easy way out of it, and not wanting to go to the same system that we have in the plant end of it or the industrial end of it, that we would cover it with a flat rate. From all the statistics I have been able to get about the occupational disease end of the Workmen's Compensation Act, it has been rather a minor item. Of course, with the development of industry and the greater use of chemicals perhaps there will be more occupational diseases, and the cost would eventually be measured by the same measurements of compensation being applied as in the other end of it. But in Ohio the premiums are paid on a flat rate. I think at the present time it is two cents on $100.00 of pay roll, and occupational disease cost is not levied against the employer; it does not affect his rate in relation to that.

MR. CAMERON: I think I have now got the definite answer to your question. The specified liability limitations are $500.00 maximum the first month after the act became effective and then that increases $50.00 a month up to the maximum amount of $3,000.00, and then full compensation for all exposure, that is, after the effective date. In other words, five years from the date of the enactment of the legislation, the worker gets from the employer the full amount, but one month after the act the employer is only liable to the extent of $500.00, and then $50.00 a month increase. Now, on the other problem as to what we are going to do with employees that are partially disabled, I want to read this pamphlet of the National Silicosis Conference. Their first problem was to find out what were the economic phases, how many workers were exposed, how many workers had been disabled from silicosis, and so on. This answers the question: "What about the workers that have silicosis?"

"In answering this question, it should be recognized that the worker who risks his health and life as a result of this disease has a paramount interest in finding an adequate solution to the problem. With this in mind, perhaps, it would be well to consider four groups of workers as already suggested:

"1. A percentage of the 4,000 to 5,000 workers who are completely or partially

disabled because of silicosis and whose difficulties are further complicated with tuberculosis.

"2. The remainder of the 4,000 to 5,000 who have silicosis and disability in some degree, but no tuberculosis.

"3. The 105,000 who have silicosis but no disability and no tuberculosis.

"4. The 900,000 who are exposed to silica dust, but who do not have silicosis."

Now group 1—that is your lowest of the list: "From the standpoint of these men in Group 1, the problem is a serious one, and there seems to be no doubt in anyone's mind that these workers should be removed from employment and compensated for total disability just as if they had been incapacitated by accidental injury.

"Group 2. The remainder of the 4,000 to 5,000 workers who have silicosis and disability in some degree, but no tuberculosis, should in the majority of cases continue to work. While a few persons may still be of the opinion that such workers are 'through' and doomed to an early death, every study conducted thus far confirms the fact that the great majority of these men will not necessarily progress from bad to worse. Perhaps it may be wise to transfer some workers to other employment, but many may be continued at their regular occupations if known methods are applied to control the dust and if such special care is employed to prevent the development of tuberculosis, pneumonia, and other lung complications.

"Group 3. To the 105,000 workers who have silicosis, but no disability and no tuberculosis, the problem is not particularly serious. It is generally agreed that, if the dust is properly controlled at all times, such workers would be as well off in continuing at their present jobs as if they were discharged or transferred to other employment. Therefore, such men should be permitted to continue work at their regular occupations, but known methods of controlling dust should be applied and care should be used to prevent the development of tuberculosis, pneumonia and other lung complications.

"Group 4. For the benefit of the 900,000 workers who are exposed to silica dust but who do not have silicosis, all emphasis again should be placed upon the application of known methods of controlling dust. These methods are outlined later in this summary."

Does that answer your question?

MR. BUTLER: Yes, it does, but the employer is not relieved of any of the risk, as I understand it. To be very specific, if I can take just a minute—

MR. CAMERON: Yes.

MR. BUTLER: In our employ there was a man, or rather he was in our employ—we had a man that had been working in various other factories in Ohio for twenty years. He came to us about seven years ago, and very suddenly and much to our surprise we found that he was tubercular. In fact he is being entered in the Springfield Sanatorium today, and his X-Ray pictures show that he has silicosis. Now, I know that he did not get it at our plant, for we think we have a very clean plant, and he himself even thinks he knows where he may have contracted it, in a plant that is now out of business, but that has kind of thrown a scare into the rest of our employees. There is one thing, however, that happened which is in our favor. Two women in the plant immediately went down on their own volition and were X-Rayed. One of them, I understood, showed a trace of silicosis, but she had for four or five years worked in the same old plant that this man did I have referred to. The other woman, who has never worked in any plant except ours, showed no trace of it whatsoever. Now, the point is that I am going to be asked to sign an affidavit for this man, to sign this man's application for compensation, and in so doing, I don't really want to admit any of the responsibility for his condition, because I don't think that he did contract it in our plant, and I wonder just how I could handle that, and I

was wondering whether we are going to be penalized, etc. Now, that particular question has come up in our little plant, and now the question has come up, should all of our employees be X-Rayed, and if it is shown that some of them have it, what are we going to do with them? Now, I am bringing this up so as to know just what action to take, and I would like to have a suggestion.

MR. CAMERON: Well, I would like to have more definite and specific information before I would hazard an opinion on that. I don't know quite enough about the inner workings of your compensation law, especially this silicosis amendment. I can see that inasmuch as this first gentleman you referred to was in your employ at the time of his breakdown, that you are stuck with it, even though he became disabled up to the point of breakdown in another plant. If, of course, you had pre-employment medical examinations, you would know before you took the man that he was about ready to break down, but then the question arises, what is going to happen to the man that you refuse to hire because he is partially or almost disabled from silicosis? Must he then file a claim against his past employer? I think he can. I think he has a perfectly legitimate claim if he can not get employment because of his disability. I think then he has a claim. In these other cases, I would do everything in my power to prove to them that you do not have unsafe conditions and unsafe concentrations in your plant, and as far as that is concerned, tell them that people have continued for years in a healthy atmosphere without this disease progressing in any way. They may have some lung spots, they may have some scar tissue, but if your conditions are all right there is nothing in your plant that is going to bring on further breakdown, any more than if they worked in some plant without a trace of dust, as long as you keep your concentrations within safe limits, and I would assure them, if they are good workers, and they think there is a trace of it, but if you give them a physical examination and fire them because of some slight exposure, you may have a claim filed against you. After all, somebody has got to take care of them. But I think to protect yourself, you ought to have examinations of employees before you take them in from some of these other plants.

MR. BUTLER: If I might say one more thing, and I will quit. It so happened about two years ago when the question came up why I called upon the Ohio Brass Company, who has a dust counter, or whatever you call it, and they came over and took a count, and right in this particular plant where this man worked, it showed under four million in an atmosphere that has about 17 per cent. free silica in it.

MR. CAMERON: You are O. K.

MR. BUTLER: Well, you say I am stuck though with this fellow that is now disqualified or can't work any longer since he was in our employ.

MR. CAMERON: I just gave that as my impression, that you were stuck. I don't know the workings of your compensation law. Perhaps he can go back and charge that up to a previous employer, but he has a perfectly legitimate right to file a claim against you, because he was in your employ at the time of his breakdown. Now, that is one of the things you are going to have to find out about here in Ohio.

MR. BUTLER: Is there any way that you can see, whether we are assuming responsibility by signing his application?

MR. NOLAN, Industrial Commission of Ohio: I believe I can answer that question and say that you are assuming responsibility because the law of Ohio provides in this silicosis amendment, in the first place, that no man can have a compensable claim for silicosis if, when he enters the employment, he refuses to answer truthfully all questions concerning his previous employment. Now, the sole purpose of such a clause in the law is to protect employers from the exact situation that you are bringing up now. Now, it seems to me that it is the duty of the employer to

ask questions of any man seeking a job, and if he has given a past history of an occupational disease or if he has been exposed to just the conditions, it would seem to me that it would be the duty of the employer, if a man came in for employment today, to either refuse employment or else have the man X-Rayed to determine the exact nature of his condition, because as Mr. Donnelly has pointed out, as it is now, every employer in the state has some premium to pay to cover occupational diseases, so that there is no provision where we can go back and say, like Mr. Cameron mentioned, we will assess one-tenth against this employer, or two-fifths against another one. It all comes out of the same fund to which all employers pay the same premiums. So therefore, if this man that you are talking about came into your employ at some stage of the disease, and you sign his application, the claim would be allowed by the Commission as against you, assuming, of course, that the man did have some exposure, some injurious exposure while in your plant. If there were no injurious exposure, then, of course, the claim would probably not be allowed, unless it could be assessed against the previous employer. I hope that that answers your question.

MR. BUTLER: Then I will have to prove that we didn't do it. Now, is there some standard which you can go by to prove that you are within the limits?

MR. NOLAN: Yes, sir, I believe Mr. Cameron mentioned it before, that the United States Department of Labor has a standard of five million particles of silica dust per cubic foot. Now, of course, as I understand it, if you want, you cannot simply take a dust count and show that it is 4,500,000 and it is not injurious, but it does fluctuate, and it will depend entirely on the circumstances. A man who works for five years in an exposure of four million particles and who clearly has silicosis, there certainly is no question but that he was injuriously exposed, regardless of what standards the Department of Labor has set up. So in this particular claim, if you have been so informed, that he had an unusually low exposure while in your employ, I should say that the claim would be disallowed.

MR. BUTLER: Would he get his compensation, though?

MR. NOLAN: Well, it would depend on when he quit the last employment. The law provides that one must be injuriously exposed after the effective date of the silicosis amendment, which was July 31, 1937. Now, if he quit his previous place of employment prior to July 31, 1937, and while in your employ was not injuriously exposed, the claim would not be compensable.

MR. BUTLER: Then it is up to the employer to prove that he was working under proper conditions.

MR. NOLAN: Well, in a way, yes. We have these apparati for taking dust counts, etc. It is the law, however, that the burden of proof in any claim is on the claimant to establish that he was injuriously exposed rather than for you to disprove that.

MR. CAMERON: My suggestion is that every plant should have dust counts taken, and that you should make a request to the Ceramics Engineer with the Division of Safety and Hygiene, and ask that a dust count be taken so that you know where you stand right now, for those become state records, that on such and such a date, or over a period of a week or a month, your dust concentration was so and so, presumably safe, so that you have a record.

Now, I think the time is coming in the very near future when you are going to have prescribed limits here in Ohio, which will be set down in the rules of the Industrial Commission, it being the department required to enforce the law, and these limits will probably be similar to the limits adopted in New York State, which are five million particles per cubic foot in concentrations where the percentage of free silica is less than ten per cent, and that runs up to 90 per cent of free silica,

depending upon the material you are using. Now you have wonderful facilities through the Bureau of Industrial Hygiene and the State Department of Health and you have Mr. Merritt with the Division of Safety and Hygiene, who knows how to do it, and he will come out to your plant with an impinger and take a dust count, so then your concentrations will become a matter of record with a state agency, where it can be referred to.

MR. THOMAS DONNELLY, Secretary, Ohio Federation of Labor, Columbus, Ohio: There is just one other point there. Now, of course, you take your dust count. The count itself should not give you a clean bill of health. That count may be taken in times when it does not show the maximum dust count. On the other hand you shouldn't treat people unjustly because they have had a certain amount of disability, because of exposure to this dust. Perhaps, you ought to give the employer and the plant an opportunity to know whether in that plant it is possible to acquire silicosis. Now, I think you know that in New York, Dr. Goldberg conducted a survey there, and they took X-Rays. Now, it is very difficult to get people to submit to X-Rays and physical examinations. There are a number of things which enter into it, and it seems to make for bad industrial relations. But the processes and the system they set up at that time were too indefinite to result in any finding for any given plant for a given industry. You know this silicosis proposition is really new to us in America. They wished to find out if there were employees in that plant who had worked in that plant a sufficient time to acquire silicosis and if there were conditions in that plant which would create it. So they went through the plant. They took X-Rays, but they did not take names, and they showed the result to the employer, that here was a discovery, that a certain percentage of his employees had worked there a certain length of time and had acquired silicosis. Now, that checks against the dust count. You may think from the dust count that you are O.K., but when you X-Ray your employees you may find out that you are not O.K. So that permits the employer to know just really what the conditions are in his plant without straining any industrial relations and without injustice to any person who may have shown a resulting case of silicosis, but who could work for a great many years and never be incapacitated from it.

MR. CAMERON: That is the kind of survey that you will get from your Health Department here. They will come out to your plant and make a general survey of all the employees without using any names, and they will simply give a report on the sum total of all the workers, and that a certain percentage have a slight trace of silicosis, and you know how long those people have been in your employ and so on. I do want to mention that. You must proceed in the right way. I do not believe in making the worker a guinea pig to test the effectiveness of your control devices. In other words, you install a fine blower system, and then you start taking X-Ray examinations every six months to determine whether that exhaust hood is doing its work. That, I think, is the wrong approach. We know the engineering technique to determine pretty accurately the effectiveness of these devices. Then as a further check, as Mr. Donnelly says, these chest examinations can be made. But first we should use the engineering approach and let us clean up the atmosphere first, and not use our workers as testing devices of the effectiveness of the exhaust system.

MR. WILLIAM RANDALL: Mr. Chairman, the company I represent has been in business about 65 years, and I have been employed seventeen years in the capacity of safety and health director. About two months ago, we had our first occupational disease, supposed to be our first occupational disease. Now, he had been working for us for twenty years, this man, and our company doctor told us that he had doctored this man occasionally for the past few years, and the last time he treated

him he had influenza and it left him with a spotted lung. Of course, everything is silicosis now, no matter what is wrong with the lung. At any rate we had an X-Ray taken and the X-Ray did show a tubercular condition. Now, we are just working on that case now. Now, in all that time that is the first instance of a case of that kind, so I just tell this to show that our plant condition is in quite good shape regarding dust.

MR. CAMERON: I think Dr. Gardner who appears later on the program is going to be able to answer some of these medical questions on X-Rays and so on. So I think we should defer that question until later.

CHAIRMAN POLLOCK: Well, gentlemen, this has been a very interesting discussion. We hate to cut it off, but we have two other speakers. Now, I would like to say that after the meeting, if there are other questions you would like to ask, I am sure Mr. Cameron will be glad to answer personally any questions you may have.

At this time I would like to introduce to you Mr. Lester M. Merritt, Safety Engineer of the Industrial Commission, Division of Safety and Hygiene. Mr. Merritt is equipped to take dust counts in your factory free of charge, and I will introduce Mr. Merritt. If you have any problems in your plant, I am sure that he will be glad to work it out for you. Mr. Merritt. (Applause.)

MR. MERRITT: Gentlemen, all I wish to say at this time is that we are glad to help you, that we want to come into your plant and get what information you want, and get the information so that you can use it. If you have a high count, you want to know it. If your count is below the normal, you want to know that, and have a record made of it, and if you will get in touch with the Division of Safety and Hygiene in Columbus, by letter, or with the representative in the field, the industrial representative in the field, we will make arrangements to get to your plant at a time which will be convenient to you. Now, at the present time we are young in the game. We are learning. We have been able to get out and make some dust counts and are getting a line on what is happening, and if you will get in touch with us we will try to do what we can now and a year from now, and any time you wish. Thank you. (Applause.)

CHAIRMAN POLLOCK: Before introducing the next speaker, if you haven't turned in your registry card, will you pass them to the aisle, and a gentleman will pick them up?

At this time, I would like to introduce to you a man who has had considerable practical experience in the engineering phase of silicosis. This gentleman happens to be from the same plant with which I am connected, and he has not only had a lot of experience in our plant, but he has also done quite a bit of study on this subject.

I would like to introduce at this time Mr. Albert M. Morris, of the Ohio Brass Company, Barberton, Ohio, our Plant Engineer, Mr. Morris. (Applause.)

PLANT ENGINEERING FOR DUST ELIMINATION

MR. ALBERT M. MORRIS,
Plant Engineer, The Ohio Brass Company, Barberton, Ohio.

Mr. Chairman, Delegates to the All-Ohio Safety Convention, and Our Other Friends:

This is Round No. 2. I would like to speak for a few minutes generally on the subject of plant engineering for dust elimination.

In order to deal intelligently with the dusts prevalent in a ceramic plant we must first decide to what extent these dusts are to be considered harmful to the human system. In every ceramic plant there are certain areas where dust is plainly visible, and generally there are some manual operations required within these areas.

If our experience encompasses an actual case or two of silicosis, the question arises as to whether or not these operators are being subjected to that hazard; if it does not, we are still disturbed simply by the circumstance of men breathing perceptible dust. The problem is with us, and the severity of our attack is dependent entirely upon the attitude we set up for ourselves against this hazard. Both the lawyer and the doctor have made us dust-conscious. We are forced to recognize at least the setting for a serious hazard and to inquire into the actual extent of it.

Now, in order to do this we go to the authorities on silicosis, and we inquire into the causes of silicosis, the action of the fine dust particles upon the human lungs, the gradual progress of the disease, and the final tubercular climax. Out of all this we search for some figure which will define for us a condition which is safe, with the idea that we may be able to gauge up the problem in our own immediate plant. That is the very thing that we have been discussing.

Now, if we go into the innumerable case records which have been placed before us by the capable authorities who have been studying silicosis in all its phases in years gone by we find quickly a few fundamental conditions which seem to control the viciousness of this dust hazard. Now, these conditions, as I see them, are four in number. They are:

First, the percentage of free silica particles below the ten micron size present in the dust; second, the degree of dustiness; third, the extent of time exposed to the dust, and fourth, the actual individual resistance of the person exposed.

Now, items 1 and 2 which deal with the nature and the degree of dustiness, are obviously for the determination of the engineer, and items three and four are just as aptly in the field of the personnel manager and of the doctor.

Now, as an engineer I would like to deal for a short time with these two first phases; one, the nature of the dust, and two, the degree of dustiness.

In the ceramic industry, generally, we are dealing with raw materials which contain from, we will say, two per cent in the clays, to some 99 per cent plus in the ground flint. In the field of electrical porcelain specifically, that industry with which I am identified, we find free silica to the extent of 2 to 20 per cent, in the raw materials excepting the flint. Our product in the dry state, up to the firing, contains approximately 19 per cent free silica. Therefore, it has been deemed expedient by us at the Ohio Brass Company to divide our dusts into two groups only. Our main work was built around the hazard which accompanies the dust containing 20 per cent free silica particles. That dust which contains 100 per cent free silica does not bother us so much, for the simple reason that we deal with it just from the freight car to the batch, so after that we are through with it. But our main hazard is that dust which contains 20 per cent free silica. That is the nature of the dust.

Now, then, as to the degree of dustiness, there is only one way that I know to determine the degree of dustiness, and that is to actually measure it. Now, those measurements may be made in one of two ways, either by seeing the amount of dust present in a given amount of the atmosphere or by actually counting the number of dust particles. Now, if you have read the report of these eminent authorities, I think you will readily agree with the general statement to the effect that it is the particles below the ten micron size which do the dirty work. Therefore it would seem that the method of counting the particles would be better than weighing the particles, because if you weigh the particles in a given amount of atmosphere you include not only the ten micron size and smaller diameters, but you also include the large ones, whereas if you count the particles by the use of a microscope, you can definitely pick out those particles which are ten microns in diameter and smaller. We can see the enemy and fire. Now, for that reason most of the scientific endeavor has gone into the development of dust counters rather than dust weighers. Today there are on the market a number of instruments which, in the hands of any intel-

ligent person, with a little care, can be used to make individual dust counts. Now, these counts will not be absolute. They can not be absolute on account of the nature of the particles with which you are dealing, but you should set up for this condition which you wish to attain as a safe condition, and I might just as well tell you now that you have got to make up your own mind as to what that safe condition is, because I haven't been able to find out yet; maybe you can, but I haven't been able to. You must set up this condition which you are aiming at, and with these instruments, these precision instruments, you can tell whether you have fallen within the range of the safe limit.

Now, I think it may safely be said empirically that in any atmosphere where siliceous dust is visible to the naked eye in ordinary life, that condition is dangerous. It does not follow that if the dust can not be seen that the condition is safe, because, as I have said, those particles below the ten micron size—and ten microns is .0004 inches in diameter—particles of that magnitude are entirely invisible except in strong light or high concentration.

Then knowing the nature of the dust and having the ability to count the particles in it, is there a condition which we may set up for ourselves as the safe condition? Again we go to those authorities who have been studying this disease in the cases of tunnel workers, in the case of miners, and granite shippers. These men have been studying this condition for years and we go over their literature and we try to find the answer. Among these men are doctors who have produced silicosis I might say artificially in animals, studying the disease in all its phases, and we read what they have to say. Now, we find this figure, but only as a range, and necessarily ambiguous. So we make up our minds as to what we would like to set up as a safe condition for our plant, and after a lot of thought and consulting with others we at the Ohio Brass Company finally set up these figures. I have nothing to back them up, except the literature which is available to you just as it is to us. We find we can do this, however, and there is no reason why we shouldn't do it, even though it does seem to lie well within the safe side. We have set up for ourselves, in the case of ground flint a dust count of two million particles per cubic foot of air. For the siliceous dusts and all other dusts, we grouped them all as one, we found out that we had a condition, with a maximum of 20 per cent free silica, for all kinds of dusts, we set this for all dusts except ground flint, a maximum count of five million particles per cubic foot of atmosphere. Now, we have also defined the method by which these counts were to be taken. I said that there are several instruments on the market for doing this work, and we have selected two of them. I have nothing to say for either of them. Either of these instruments is probably just as good as the other for studying our conditions. We chose to take our original counts in our original investigation, by means of Greenburg-Smith impinger, a picture of which I will show you on the screen a little later, and the control counts which we have adopted, we made by means of a more rapid instrument, the Bausch & Lomb dust counter. Now, I want to say at this point that as knowledge of silicosis becomes more revealed, and we find what is a true threshold value, we will change our values if it becomes necessary to do so.

Now from this point on, and I know whereof I speak, any engineer who is attacking this problem would be wise to annex to himself the services of a good practical sheetmetal worker, a man who can convert into cold metal the theoretical characteristics required in good hoods and piping. Wherever practicable drawings should be made before the installation of new equipment if it is at all possible, so that you may study it from A to Z. If this is not possible due to the cut-and-dry methods which must sometimes be pursued in building a good hood, the drawings should be made immediately at the completion of the work, for a record and also as a guide to future designs. It goes without saying, I think, that it is generally

accepted that all of your exhaust lines beyond the fan should be riveted and soldered in order to prevent any of the dust coming back into the exhausted area. All elbows should have just as generous a radius as you can give them. Above all make plenty of provision for clean-outs so that the maintenance may not be too hard and therefore be neglected.

Now, in a general way I would like to outline to you the way that we at the Ohio Brass Company attacked our problem. First we made a full survey of the plant in order to determine just what particular parts of the plant were being subjected to a real dust hazard. These areas were—and as I name them, I know you ceramics men will have in your minds similar areas in your own plants—the car unloading docks. That is the area where we get the material from the cars into the bins. The charging area, in which we bring the materials together and put them into the batch, the sagger-making area, the glazing area, the scraping and trimming area, or as I believe some of you ceramics men call it, the fettling area, the area in which we fire the porcelainware in order to produce smooth flat surfaces which we must use in some of our transformers, and finally the dry scrap return areas. You must understand that all of our scrap that is made up to the glazing operation is returned to the mix. That is quite an item in order to return that to the batching area without creating dust hazards.

Now, as I described before, we took dust counts at all these locations and established the degree of dustiness as a basis for future comparison. At each one of these locations then we began to study them individually in order to determine the best method of getting rid of the dust. We considered such things as change of method, isolation of the operation entirely if we could; we gave consideration to suppressing the dust by means of water, and we finally gave thought to the best design of exhaust hoods to take care of the situation. Now, after we had done this in each case, we went to work. Needless to say, in order to acquire experience, we took the easy ones first and gradually worked into the harder ones. After we had made the change and installed our equipment or changed the operation or whatever we did, we went back and took our dust counts again. If the count wasn't down we went back to work again and tried it over. I will show you a couple of slides here as to mistakes which we made, and some of these mistakes, you might just as well know what they are. Finally we got around to the point where our dust counts were down where we wanted them.

Now, eventually, and probably most importantly, we set up a program of maintenance of these various systems throughout our plant, and we put on this one of our best maintenance men, a man whom we trained, to check up on the equipment. Once a month this man turns over to the plant engineer a written account as to the condition of the dust systems. Now, I might just as well say here that it is no solution for anyone to put in a dust system if it is not maintained properly. You are just fooling yourself. We found there was only one truly accurate way to hold the dust count down, and that was to give maintenance on these once a month, and get it right into the hands of the plant engineer. Now, these maintenance inspection trips include an examination of the hoods, the piping, the dust arresters, including the housings, the bags, the vibrators, the fan motors, the wiring and all the bearings, everything from A to Z; that is all included in the statement on the part of this maintenance man and as to whether or not he considered that the man who was operating the apparatus was doing it correctly or if he was abusing the equipment.

In most cases we have found, as you probably know by this time, that exhaust fan ventilation was the real answer to our problem. We tried to knock down the dust in at least two places by means of water, but we found that we couldn't do it largely due to the time element involved.

In suppressing the fine dust, while it was in motion, we were able in some case

to change the operation. For instance, we changed from dry trimming on one of our operations of trimming to wet trimming, and thereby were able to cut out the dust hazard entirely.

As good housekeeping is a primary necessity to all other safety work, so is it necessary for safe dust conditions. An industrial vacuum sweeper is an important adjunct to good housekeeping, at any time in any plant where dust exists, and we experienced considerable improvement in our plant when we substituted it for the broom and the air hose. The air hose has no place in a ceramic plant for cleaning up after the day.

Exhaust systems which are infrequently maintained and improperly used may sometimes be worse than no system at all. An incident that occurred rather early in our experience may serve to make clear this point. Dust-laden air was being exhausted from around the legs of an operator, the dust presumably being collected in a bag-type arrester outside the room, and the clean air allowed to come back into that working area at a point directly over the head of the operator. Well, the atmosphere in the room showed dust. We investigated it right away. Then we found that the entire system was working in reverse. Two torn bags were permitting practically all the dust that we were pulling out from the man's legs to come back and be discharged again right over his head and pulled down over his body and went out through his legs again. Now, this pointed out two things; first, had the man been dust conscious and second had that exhaust system had a regular periodic inspection, that condition never would have existed, at least not for long.

Out of such an experience as this which I just described, has also come our present policy never to discharge air from a dust arrester whatever the type, back into the working area. Our arrester outlet dust counts generally show a perfectly safe condition, but we have found that it takes so little in the way of a disruption to send that dust count skyward, that we have definitely chosen rather to accept the loss of B. t. u.'s carried out in the air—the air itself is free, but you must furnish the heat—rather than to run the risk of recontamination of the working area.

Now in designing these exhaust hoods of which I have spoken, we have nothing new to add in addition to precepts which may be found in the numerous State and National bulletins on this subject, covering such factors as putting the mouth of the hood as near to the source of dust as possible without getting it in the way of the operator; shaping the hood mouth to catch the natural fling as it is produced, so that the natural fling of the dust will be thrown into it; pulling the air down past the operator's breathing zone in such a manner so that he will breathe the air before it is contaminated instead of afterwards; and providing baffles to prevent the blasting of air from within the hood wherever compressed air is necessary in an operation. Sometimes it is necessary to clean off the ware with an air hose, and in those cases, we have learned to put in baffles, which will keep the air from going back into the exhausted area, but be carried out without having to be breathed by the operator.

It has been our experience that even a poorly designed dust hood will reduce the dust count satisfactorily, provided you put enough horsepower on the fan shaft. As a matter of fact, the real purpose served by the engineer in designing hoods, pipings, gates, etc., is not so much to produce a system which will work as to make it work with a minimum of horsepower.

Not only has this matter of exhaust system design been thoroughly covered by government bulletins, but fan manufacturers, such as The American Blower Corporation and The Buffalo Forge Company, and engineering societies such as the American Society of Heating and Ventilating Engineers, and the American Foundrymen's Association have contributed most valuable data. A very practical book which I found in the library at Cleveland on exhaust systems, published for the layman, is Mr. E. W. Favalora's "Practical Design of Exhaust and Blower Systems." Now, all of this information is available to you and is very useful in working out the

details of the design of equipment to meet your specific dust problems. We have been most fortunate in our work, during the development of our safeguards against the dust hazard, having the kindly help and guidance of Dr. Leroy U. Gardner of Saranac Lake. We are also indebted greatly to Dr. J. T. Villani of The Edwin Shaw Sanitarium of Akron, Ohio, for the valuable assistance which he has given us.

In the pictures which follow, taken at various points throughout our plant, I shall try to indicate as we go along some of the principles which we have used in eliminating as much as we have, our dust problem. (Applause.)

(The following discourse was concerning lantern slides exhibited to the Section.)

Now, in case it is of interest to any of you, in order to give you some idea of what we have gone through, our plant ordinarily employs about 500 men. Now, these systems have been described to you, and we will show them to you on the screen here. This involves the displacement of about 60,000 cubic feet of air per minute, which requires about 110 connected horsepower to drive it out, and the installations which we have put in as a result of our attempts to cut down the dust hazard have cost us in the neighborhood of $25,000.00. Now, this matter of exhausting the heat, is not so much as it might seem. I was just figuring it out yesterday, and on the basis of five dollar coal, in order to exhaust this 60,000 cubic feet per minute, it costs only two and one-fourth cents per hour per degree of Fahrenheit difference between inside and outside temperatures. For instance, on a day when it is 20 degrees Fahrenheit outside, and we have the shop at 70 degrees inside, there is 50 degrees difference, and 50 times two and one-fourth cents, that is $1.12½ per hour, and for an eight hour day, that is $9.00. With regard to the horsepower, I said that we used between a hundred, I believe, and 110 connected horsepower, and for that we have figured about $20.00 per day for horsepower, so that will give you some idea about what the power cost is to operate the system.

First I would like to introduce here to you certain of our products which we make and some of the particular phases of our work, so that you may know some of the conditions which we encountered in attacking this dust problem. Here are some of the tubes, which are put into use in transformers and for various uses in high potential work.

This is a part of the Greenberg-Smith impinger. Now, the technical end of this has been handled largely by another department of our plant, but I am familiar with the instrument and have taken a few actual counts myself. This is the vacuum pump; here is the air. The air is pulled through by the vacuum pump, through here, which impinges it against the bottom, and the dust is knocked down here and you obtain a certain amount of dust in here, which goes to the side of the bottom of the container, and then later counted by means of a microscope of one hundred or one hundred fifty diameters magnification, and comparing that with a grid to make your actual counts. This is the Greenberg-Smith impinger, and we used it for establishing the original counts. That is the instrument we used for establishing the original counts. I want to show you also the Bausch & Lomb instrument at the same time.

This is the more rapid instrument, the Bausch & Lomb dust counter. This simply consists of a tube here, which has a piece of blotting paper inside of it, that has moisture on it, and you bring your air in this tube with this little bulb here, and give it a whack, and that places a certain amount of air in it, and the air is passed through here which throws the dust against a plate of glass, and the moisture which goes through from this tube causes it to stick to the glass. With this instrument you can turn to the microscope and right away get your dust count right on the spot. With the Greenberg-Smith impinger, it probably requires a half an hour to go through the making of a dust count, and this one will require anywhere from five to ten minutes.

This is a dust hood. I know a lot of you have seen hoods of this type. It simply consists of these grooves here to keep the coarse particles from pulling through, the fine particles are pulled through and go through here and are exhausted, and this is one of our scrubbing operations, and here we have got another slot in the rear, so that any tube can be held over that slot.

This is a glazing operation here, or an operation prior to the glazing. It consists of the operation of pulling the dust from the surface of the face of the porcelain preparatory to baking it in the kiln. Now, we have to make a series of shapes from those materials, and for this reason we have to build a hood which is of practical use for those various sizes. We have been able to displace 8,000 cubic feet of air per minute with this hood. This is another view of the machine on the side, and I have opened this door here so that you can see how entry is made, particularly if a man stands on this side, and we close these two doors here. Now, we might say, well does it make much difference if those two doors are open or closed? I have taken some anemometer readings, and with the anemometer setting on the work right down here, we had a velocity of 80 feet per minute right at the work with the doors open, and closing the doors that ran up to 120. So you can see by closing the doors you increase the velocity of air through the hood, and even with minor openings there it decreases it, and with this increased velocity the exhausted air can be controlled and it can be taken away before it gets out into the working area.

This is a retrimming operation of some dry ware, and we are exhausting through this slot. A great variety of sizes and shapes of material are handled in this area, and must be retrimmed on this table. This is a rotating table here which runs at a fairly high speed. You can see in this picture how near the face of the operator is to the work. We have taken a reading by actual measurement, we know that we have a velocity of 80 feet right here, and back where the breathing zone is we have a velocity of 250 feet. I would like to say that these velocities generally run from 150 to 250 feet. It does not make any difference what the velocity is. What we are after is to get the dust out of there, but I just happened to take some measurements right here, and that will give you some idea on that if you have a similar problem.

This is a general view of our sanding area. Now, at the sanding area all of the particles of clay are in the size of sand and are being applied to our porcelain insulators, and we found before we went into this department, that the dust count ran anywhere from ten to sixty million particles. After we put in the hoods as you see here, that was reduced to some three million particles. In the next view I will show you the detail of one of those hoods. We have arranged here to exhaust from several points. One of these points is right above the center of the insulator. This sand, as we call it, which is nothing but dry porcelain broken up into sand size and is put into here, and then taken out again. Now, in that operation the operator stands right in front of this piece of porcelain here, and you can see in this type of operation he would make dust, at least certainly where he puts his hand in in order to take it out, there is bound to be some dust there, and we have taken the dust out here and we have taken the dust out here, and you can tell from that slide where it is. Actually, around in this place, we have a pretty fair velocity.

This is another detail with another hood along the side in order to effect dust reduction. This happens to be an inspector's bench prior to the glazing operation. Now, here again we were able to secure a reduction in the dust count from some seven million down to some two million.

This is one of our trimming areas which shows two hoods here. We have hooded this in order to take out the dust produced by this operation, and I believe I can show you a little bit about it here. Here is an opening here, this real dark part; that is the hood here, and that in the back, that area to the right here, back

here is the carrier, and that is the reason we had to cut this out. And the same thing is true here, but the only thing I would like to call your attention to is the fact that we have put a slot through the end right here, so that if they change the size of work which is handled on that machine, they can use that slot over here and get a maximum velocity in that area. The same thing here. Whereas, if they needed to exhaust the dust while working on a longer piece, then they could probably only run one of these machines at a time. You see here we have a damper opening this one up, to give proper velocity here. This is a close-up of that same operation and shows the main breathing zone here in which the operator is working. Of course, this picture does not show those particles but we obtained an original count in this area which existed for a short time only, because after we put on our devices here, we found that we were making dust about five times as fast as we made it before, because we were running the operation five times as fast, and we had a count of 26 million, and after we put on the hood, we had a count of two million. Now, the velocities we can vary here. There is a door there which we can open when it is needed, but ordinarily they are closed on the end of it. The velocities here are in the neighborhood of 250 feet per minute right at the breathing zone, and about 450 feet per minute down at the opening to the hood. This hood is about eighteen inches away, and there, of course, you should keep your hood just as near to the work as you can so that you do not have to use any more power than you have to.

This is a picture of the hoods we use on operations to grind the ends of our tubes, to square the bottoms, etc., on those which have to have flat surfaces, and this is done on the ware after it is fired. I simply had this picture taken so that you might see these hoods and also to pick out points in regard to them. We have tried to keep our hoods as much as possible out of the way of the operators. You see what we have had to do here in order to do that, and here we have used metal tubing to exhaust the air and dust from this end up to here. We have got all of our hoods made to catch dust; then it goes into this pipe, which goes to the roof, where we have our fan. Here is a close-up of the end hood, the hood that was nearer me. I would like to call your attention to some of the characteristics of this hood. There is the peeler there, as we call it, which knocks down fine dust particles. They are pulled down by the natural force of the wheel itself. Ordinarily, in this peeler operation, if there were no hood to take care of that, the very fine particles would fly out there and hit you. Now, that device is used not only to catch the dust particles, but you will notice the way that hood is constructed, it is made so that you can get up close to your work, just as closely as you possibly can, and because of this tangential action, it will throw those particles down to the hood, and they will be exhausted out and we can unload them out here. Here is shown a screen for inspection. In the next picture you will be able to see the details of a design of such a hood. Of course, you see, what dust is made right there, it means that that won't be thrown down there and we have to use a different type of apparatus, and in order to get that dust out of the way and handle it, we have provided a baffle here, you see here and here are baffles on the inside near the point of exhaust, down here, which means that that is the only point now where we have maximum dust, and we found that this hood works out. We have been able to reduce dust from around ten million to about a million and a half in this department.

This is an old machine which we have developed to cross cut these, which has been converted into a cutting wheel. Now, the cutting wheel is here that we cut the tubes off with. We have been using that machine for the reason that we can't afford to buy a separate machine for that, and the dust created by that operation here, we took out through this slot. We have a high velocity, of course, in order to catch all the dust there at the wheel, and it goes out through this type of device,

and up through the roof. Now, the maintenance on this machine was so high that we had to change it because it was drawn around the bearings, which made it very costly to operate. You can see here, that after you pull this air away from the operator, you get this dust into these bearings and you have got to keep the dust away from there, otherwise you won't have any machine.

This is a wet pan. The wet pan is used in mixing up the ingredients, which we found were very dusty. This has always been a very dusty area, with a count up around 30 million particles and free silica is frequently high, and as I say, it is very dusty. So what we did here in order to make that operation perfectly safe, was to house it off entirely by itself, and that is why, you see, we left an opening here in which to get the material to it. Our method here was to cut holes in the side of the hood, and that left a small opening. I think the next picture will show you just what that situation is. Of course, these clays that go into here, are dusty, and the crank which comes down from out here and around shows you that is very dusty. It is one of the places where we tried to use water to settle the dust, but we found that we couldn't use it on this operation. We cut the count, but not low enough to satisfy us, and so we finally had to resort to entire hooding.

Now, here, instead of putting a hood around the whole machine, we have put a little hood up with a platform on it over the operating position, and requiring the man to come and pick up his sack from back here and lift it up onto that platform, and to take a knife and cut it in two, and handle his material that way. The material comes to us in the car already bagged. Our hoods, as you see, we have had to cut them away both here and here. Now, this is a rear view of a dry pan. This hood is exactly like the wet pan that we saw, but I want to bring out one point here, and that is when we started using that installation, we worked twelve operations, and that dust arose immediately above here. This is the bottom of the hopper in which this material goes. Now, when we come down here with a charge, for that hopper, in order to dump it, to keep the dust out of here, we simply use these things up here, and whatever dust is produced when it is dumped in it, will be handled at one end or at another hood.

This operation is drilling the holes in what we call extra insulators. Now, this has been a very dusty operation. Those machines had hoods on them, and this machine had a rather high roofed hood, as we used in the past. When we began our work about 1933, some of our first work; we didn't really begin to take dust counts until about 1935, but on some of the early hoods they were put on there simply to keep the operator from having an unsafe condition; we didn't realize that there was a hazard there, but we took the old hood in this case, and we constructed it up, put sideboards on it and cut a narrow hole in here, just because we thought it would do better work. But the dust is pulled out of this hood and it is directed down here into the hopper, which is entirely closed in the bottom, and the dust which drops down in this case, is pulled out through this way.

The next view will show you a drilling operation, which is an important operation. Here, in order to take care of that dust, we put vessels that were somewhere near equal there underneath. Now, here is a drill and here is a drill, and from each one of these drills dust, big dust drops down, and we tried to get the fine dust in here and let the heavy dust drop here, and then take that out through this pipe. This was a very contrary job to lick, although it turned out in the end to be a very simple solution to it. We had an operation where we had to use an air hose on the top of those insulators and blow that into those vessels. The dust hit the back of the hood and bounced out in front and came out into the room, so that we had almost as much dust after we put the hood on as we had before, and we couldn't get enough draft here to stop the flow of dust out into the room, the impact threw it out more rapidly than the velocity pulling it back, so what we did here was to

put that door on hinges. The air went down behind this way, and it is being pulled out here.

Here is also the edge of the hood and the back of the hood, and this is the operating area here, and there is enough velocity here that we have found we can very easily keep any dust from getting back into the room.

This is another view of that same operation with one flap of the hood down out of the way so that a man can do his work. Here is a man actually doing the work. You see he is able to handle those insulators without being in the dust area, due to the fact that there is a baffle there, and the machine is clear.

This is the second part of the operation which shows the flap of the hood down, and here the man is able to handle the operation just as easily as he did before we put on the hood.

Now, this is an example of what not to do. This is one of our original hoods, and like a lot of other people we thought that was a good exhaust hood. The air returned up through that eight inch pipe. This man is spraying glass upon that insulator here, and the man has to stand back from the operation. In the next picture I will show you what we did in that case. We put a slot extending as high as we expect any of that work to run, and with the same fan and the same type behind this hood, we were enabled to cut the count down to about one-fourth of the original quantity.

Here is a view of a dump area for return scrap. Now, the scrap is brought over here and dumped upon this grill. It is in fine enough shape that most of it will drop through. You will notice that we have a 60 degree incline on that grill which keeps the material from clogging, and there is just enough air in there to take all the dust out of that pile of return scrap as he dumps it, so that it is kept out of the room, the air supply being controlled by a damper.

This is simply a picture of one of our isolated hoods to show you what we do sometimes to save a half a horsepower. This is an isolated hood to show the manner of conserving energy by the location of the hood underneath the ware. You will notice that in this case we installed another hood which is connected to the same system. In general, I will say that I think it is wise to connect as few hoods on one system as possible.

Now, as I have said, we look at dust as dust. Now, here is our set-up for handling cement. In our industry we can't take any chances on the cement having large lumps in it, so that we run it through the apparatus shown here, which is vibrated by motor. We simply take the sacks, like we did in the wet pan, and put them on here and cut them in half and dump the cement on the incline, and those sacks, instead of being thrown back then on the pile, they are allowed to accumulate until the end of the day when a man takes all the sacks at once and puts them into the barrel and hauls them away.

Now, I don't know whether you can see this or not. I can see it up here very plainly. This is our chart for maintenance, and on that we include the names of all the dust collectors, arresters and exhaust systems, and their location, and all special machinery. We list them all on here, and we list all the things that we expect that maintenance man to check over at least once a month and sign his name to it, so that we can call him in and check on these things. That is the way we keep the system in working order.

Now, this is another terrible example of an operation. You will notice there is dust all over the area here. Sometimes during the intermediate stages, if parts of your plant are isolated, you might think, if an operation were far enough from the rest of the plant, that you did not need to care about it. You can see what we have done here was to try to keep this dust from contaminating the surrounding atmosphere, and I believe we have done it very well, because you can see here this dust collects on the first surface that it comes to, whether it is underneath the machines

or in any cracks that may be open out along the side, and then comes back into the area and re-contaminates it; so that a condition like that should not be tolerated for any length of time; one way to correct it is to put a dust hood on it and the other is to raise these outlets beyond the height of the building to which they are attached so that there is absolutely no danger of that dust being carried down into the working departments.

This is another example of not using a dust arrester, but dumping your debris on top of the roof. So what we have done here, we have taken that up inside of the building and turned it around to face this way. The prevailing winds are in this direction, and we are paying for the maintenance on this roof rather than for dust machinery at the present time. The maintenance of these roofs also runs high because the dust turns into clay, wet clay and that wet clay lays on the roof, and in a short time if allowed to stay there results in a hole in the roof. That particular roof is our next improvement for this next summer, by the way, but it will only cost a hundred dollars.

Now, coming to this sand that I was telling you about which requires dumping, that one machine will cost about $10,000.00 to install. After we got through we thought we had licked that hazard. Now, this product, which is sand, we apply to our insulators before firing, and to make the sand stick, we put on to our insulators a form of cement, and that operation in this area, of course, forms dust. Well, we put a hood on there to take it away to a dust collector. We have also connected up this whole system and evacuated the dust which is left when we get the sand out of it. That dust amounts to about three tons every eight hours, and I will show you the system that we have to take that dust out.

This is a hood for one of our operations which requires plenty of elbow room for the operator, and instead of building a little hood into which he would have to place his hands, we have made a large opening and provided a high velocity exhaust down here and connected the entire system into one dust arrester, and so we have taken care of that problem in that manner.

For a certain kind of our ware, such as suspension insulators we use a high priced material, and this is the set-up for handling that type of work. This operation consists of two sand blasts here, using silica sand, and the dust just comes to here and is drawn up into this arrester and discharged.

Now, in our plant a week ago there was an engineer who looked at that and he said, "That is a mighty small fan. Do you mean to tell me that it gives you a safe dust condition?" And I said, "Yes, that fan will give us 300 cubic feet displacement per minute." Here is the reason it is safe. We have cut our openings down to the minimum. These openings here are just large enough to shift the edge of the insulator along it. Now, along here and here, you can use a piece of rubber, but we have cut the size of the openings down to such an extent that we have less than three-fourths of a cubic foot of opening there. By installing such a hood as this, we were able to get a velocity of 200 cubic feet per minute, which is perfectly satisfactory to take care of all the dust created here by the machines.

Now, this is a system which is not a dust arresting system primarily. It acts more as a conveyor, but if we did not take the dust out through this conveyor here we would certainly have a lot of hazards because that dust amounts to about three tons per day, and that material is worth about two cents a pound to us.

So that what we have done here is to hook up to that system an eight inch pipe with a high velocity in the pipe, so that we get practically a cyclonic action, and the centrifugal force along the outside of the chutes is so great that we are enabled to get an efficiency of practically 90 per cent. In other words, 90 per cent of all the dust in that air is dropped out in that manner, and it drops into a hopper below, which I will show you in the next picture.

Here we are back in the stock department. We have located this right over the

top of that bin. This is air which is more or less pure now. It comes out here where it is slowed up by that larger diameter and comes down here and then it is directed back over the chute and into this bag type arrester, and we catch the other ten per cent of the dust in here, where it is then taken to these hoppers down below and the air, now purified, comes out here.

This is another view of the same thing, it shows your eight inch pipe coming out from down below the operator here, and the air then comes down through here and through that hopper, and from there it goes down to the stock department for recharging.

The air then goes through this dust arrester, which is a bag type arrester, and the dust is knocked down into this hopper here, and the clean air goes out here finally. The dust going to the stock department runs in the neighborhood of three tons in the course of a day. You can see that we would certainly have a hard job to handle that dust without this being enclosed, but since it is, we can forget about it.

Now, I was telling you awhile ago about our vacuum system, and I just want to show you that, and I want to say that I don't know of another piece of apparatus in our plant that we would trade for this vacuum system, and yet it is one of the most inexpensive to operate. We have it in use all the time, and some of the times we have to double the shift, have a man come in at night. There is a certain amount of dust which will fall around these operations, because we can't expect a man to keep from making dust all day, and although his hood has been taking care of a great deal of the dust, there are some particles which get on the floor and are necessarily trampled by the operator underneath his work bench, so that instead of using an air hose, you can see how we do it in our plant, thereby eliminating a dust hazard.

Thank you very much. (Applause.)

CHAIRMAN POLLOCK: Due to the lateness of the hour, we are not going to have any questions on Mr. Morris' talk, for we would like to give as much time as we can to the next speaker. We are very fortunate in having as the next speaker, one of the outstanding medical men of the country: I will say the outstanding medical man of the country on silicosis. It is useless for me to enumerate the many things that Dr. Gardner has done for the country at large on this problem. Without going into a long introduction, I would like to introduce to you at this time Dr. Leroy U. Gardner, Director, The Saranac Laboratory, Saranac Lake, New York. Dr. Gardner. (Applause.)

MEDICAL PHASE OF SILICOSIS

DR. LEROY U. GARDNER,
Director, The Saranac Laboratory, Saranac Lake, New York.

Mr. Pollock and Gentlemen: I would like to add my word to the discussion of the previous remarks about dust concentrations as a measure of the silicosis hazard. Mr. Donnelly, I think, put his finger on the question quite accurately when he said that the actual proof of the pudding was the eating of it, that if we are producing silicosis in a plant, it makes relatively little difference whether there are four hundred million or fifty million particles per cubic foot of dust in the air. If we examine the employees in the plant and find that silicosis is being produced there then we have to take appropriate engineering measures to discover where that hazard is existing. For that reason I think it is absolutely essential for us to contemplate making surveys of the individuals now employed. Of course, we can't go back and get pre-employment examinations on men who have already done work for thirty or forty years, but we can initiate the program of pre-employment ex-

amination as soon as possible, so that we will be guided in the program of prevention in the future.

Now, the aspects of the silicosis problem can be divided into three categories. We have the research activities, which I am not going to discuss today; we have the matter of diagnoses and we have the matter of administration. With the last two subdivisions I am going to occupy your time for a few minutes.

Now, the plant physician as we know, has certain responsibilities. He has to discover evidences of diseases in the lungs; he has to determine the nature and the cause of that disease; he has to estimate the effects of such diseases upon the health of the workman and his capacity to produce for his employer; he has to recommend changes where necessary in the program. Those changes will affect the workman, and, of course, they will affect his employer. Finally, the plant physician has to collaborate with the engineering staff in his particular plant for the elimination of any hazard that may be discovered.

Now, there are certain diagnostic connections with which we are all familiar. We know perfectly well that the X-Ray is the best method of demonstrating the presence of a diseased process in the lung. Silicosis and related pneumonoconioses are such things which generally fail to give physical signs, so that the ordinary physical examination is not enough. The X-Ray is our main stay in the demonstration of the presence of a diseased process. Then we have to have supporting this demonstration of the disease a history of adequate exposure in the plant in question, or in previous plants, and interpret these evidences of disease. Finally we have to have a physical examination to discover not the diseased process itself, but what the disease is doing to the individual. In other words, we want to know whether he is disabled, and the physician's physical examination is his guide there. Furthermore the evidences of complicating infection are found through physical examination many times more rapidly than they do even by X-Ray.

Now, this matter of disability from silicosis is one that concerns you particularly. Disability in the silicotic is probably not, in most cases, due to the immediate reaction to the dust, because there is a wide margin of safety, and we never find an individual who has breathed so much dust that all of his lung tissue is replaced by scar. Disability is due to complications arising out of scar tissue produced by the dust.

We have two major causes of disability. One is the so-called emphysema, the dilatation of the air spaces in tissues around the scarred areas, which causes a good deal of the shortness of breath and a lowered degree of capacity for work. The second major cause of disability is the co-existent infection which so frequently complicates the development of silicosis, and as you well know, the most common infection which occurs in that connection is tuberculosis. Another thing we should remember is that the degree of disability is rarely proportional to the amount of dust which is demonstrable in an X-Ray film. A man may show a great many shadows in his lungs and be quite unaware of his condition, and will work and produce as much as a man without those shadows. On the other hand, there are some cases in which the X-Ray film shows relatively small amounts of involvement of lung tissue and yet these men do seem to have disability.

It is the physician's responsibility, of course, to determine by other means than the X-Ray what may be the cause of the disability. Then, having discovered and diagnosed evidence that the disease is in the lung due to the inhalation of dust, we are concerned with the problem of what to do with the individual. That will be determined by the type or damage discovered in the lung, by the age of the individual and by his employment status. If we are concerned with pre-employment examinations the industrial physician will make one set of recommendations; if on the other hand the same condition is found in a person or employee, the recommendation may be different. This difference in recommendation with the character of the

disease then leads us to a consideration of the types of reaction which we find in the lung.

I shall try to deal with these various types of reactions in as non-technical a manner as possible, realizing that you are not directly interested in these types. Nevertheless, my experience with men such as yourselves leads me to believe that most of you are pretty good Roentgenologists; most of you now have at least a slight working acquaintance with the appearances of disease as seen in the X-Ray film.

Now, there is one type of reaction which we find in X-Rays, which we have labeled for convenience the exaggeration, or linear exaggeration, and I will show you with lantern slides now a typical X-Ray film showing the appearance in the lung region of these X-Ray shadows.

(The following narration was accompanied by lantern slides).

Now, this picture of linear exaggeration is one in which there are no new shadows added to the normal roentgenogram. There is merely an accentuation of the shadows that normally exist. Ordinarily these changes are very slight. They are so slight, in fact, that I would not be able to demonstrate them in a lantern projection of this type.

We have here a man with a certain degree of this disease which has accentuated the normal shadows, even more than they were accentuated by the inhalation of dust to which this man was also exposed. This man worked in a gypsum plant for seventeen years where he had been exposed during that period to pretty high concentrations of dust. He did have demonstrable effects of that disease, but they were helped out by the cardiac or heart condition which had nothing to do with the reaction or with the dust exposure.

Now, this man died with heart disease shortly after that rentgenogram was taken. We did an autopsy and then found this condition in the lung. It is pigmented in certain areas, as you see here; there are black collections of dust particles, enough of them piled up so that we can recognize them in a careful examination. If we look carefully in many places we will see that those deposits are elongated, and if we were to cut across them, they appear roughly rounded. These black heavily pigmented areas represent a seventeen year accumulation of dust which he has inhaled. Now, these areas here, if we should rub our hands over this lung, we are not able to tell where the dust is. There are no vital processes here associated with the accumulated particles, simply pigmentation.

Now, we have a little sharper focus of that section. Here is a microscopic section of the man's lungs and you can see these small deposits of black mineral matter. Here are a few lymph nodules inside his lungs, and we have places here where we see pigment on the plural surface of the membrane. Running on the surface of the lungs there are also microscopic deposits, but the major portion of this lung looks perfectly normal. There has been no interference with function whatsoever. This accumulation of these mineral deposits here in this local arrangement gives a certain amount of shadows on the X-Ray film, and is responsible for the production of the accentuation of the normally existing shadow, but there is no disturbance of the functional portion of the lung as a consequence of that, the tissue is perfectly normal.

Now, this is a type of change that we have just seen, and this may be due to a variety of causes. That can be produced by a man breathing in dust with which we are familiar; it might even be produced by small exposures to silica dust, when they are mixed with other substances. Such reactions usually occur around the blood vessels and around the connected tissues separating the functional portions of the lung, a reaction of the nature of a low grade chronic inflammation. That can be produced not only by inhalations of dust and silica, but it may be also produced by chronic inflammations and by diseases of the arteries.

Here we see a film of an individual showing this exaggeration of the linear markings. We are not justified in saying at once that the disease is unquestionably due to the dust which the man has breathed, but we must inquire into his history and we must find out whether he has breathed dust, and if so, what kind, and how long, and we must also find out from his medical history whether he has had old infections of the lungs and we must find out from his physical examination whether he has heart disease, or disease of the arteries, any one of which could have caused this. So the history in these cases and the medical examination and the physical examination become important. As I have said, there is no disability in the disease in the majority of these cases. Therefore, I think, we can pretty generally be safe in assuming that the disability is due to something else rather than the inhalation of dust, and that it may be due to a heart condition. Furthermore, these cases with linear exaggeration in the X-Ray film are not unduly susceptible to tuberculosis, but through infection. We find in men showing such changes where they have had short exposures to pure silica dust, that statistics indicate a slight increase in the incidents of infection, but they are not marked, it is not so much greater than in men who show no such change.

As to the administrative disposal of such cases, then, which show no disability, obviously, if one is dealing with an old employee who has developed this condition as a result of age or as the result of exposure in a plant, obviously there is no change of job to be recommended. Possibly in the case of a very young man who has been workng in a plant where there were high concentrations of silicia, it would be wise to move such a young man to a place where there would be no silica, but we are assuming, nevertheless, that if you were going to examine your men and also were going to proceed with a program following engineering recommendations so that the dust hazard in the plant where this man was employed would be reduced, probably there would be no necessity for making any change.

If we are dealing with an applicant for work whose film shows evidences of this kind, I think we can afford to accept this man as one with a healthy lung and likely to stand practically any exposure. Of course, if it so happens that this applicant was thirty years of age, and if you should find that he had worked in an industry where there was a lot of free silica then we might be cautious, presuming though that he would not progress to a more advanced stage for a very long time.

As a matter of fact, in dealing with groups of miners, exposed to highly siliceous dust, we have found that the rate of progression from linear exaggeration to definite silicosis is considerably less than one per cent. per year. The next type of disease with which we deal is a definite nodular condition, or the classical type, which is advanced. This is the film of a man showing the advanced stage of such a condition. There is a generalized discreet nodulation. There are uniformly distributed through all these portions of his lungs that situation, which appear brighter than they normally should. This brightness is due to this condition in these portions of the lung. In other words, the formation of emphysema. That emphysema is compensatory to the replacement of a certain amount of lung tissue, and that may cause this individual to be short of breath. We have stages of this generalized nodulation silicosis, or classical type, and I will show you an advanced stage. Here is a picture of a lung, and you will notice that this X-Ray film is similar to that which you just saw, and scattered through the lung tissues you will see these black discreet nodules of scar tissue. Here and here, if we should rub our hands over these areas we would not be able to tell that they were present without looking at them. They are dense as lead. You will see in this case they are widely separated, separated by a considerable amount of normal lung tissue around about them. This man died of a terminal tuberculosis. Sometimes when we get inside of a silicotic we find these nodules are black because this man happened to be a lead miner and breathed a great deal of soot along with his silica. The soot didn't do anything to the picture at

all. The silica, which we can't see because it has no color, was responsible for the fibrous tissue.

Here is a microscopic section of a lung, and here you see these black nodules. You also see the tubercles and similar foci between the nodules of silicosis. You see in this individual that there is some thickening of the framework structure in the lung just as we saw the thickening in the framework of that first category of a person with linear exaggeration, but that thickening is overshadowed by the production of these large nodules. You see the soot where it was deposited in the nodules of the scar tissue.

This shows a higher magnification of a typical silicae nodula. You see how dense the tissue is and how completely this has replaced the mesh work of a normal structure, and you see the absence of any inflammatory area around about that nodule.

Now, the cause of such reaction as this is the nodulation of free silica. The diagnosis, as we have seen, depends upon the actual experience, it depends upon the history of adequate exposure to free silica, and by adequate, I mean exposure that is measured in more or less numbers of years, generally considering the minimum of two or three, and from then on to ten or twelve or even longer and finally the history of the physical examination, which in this case shows surprisingly little, the effectiveness of the physical examination is at first a significant factor when you find it in an individual, with a marked condition in the X-Ray.

Now the symptoms may be very slight. Some work along without any appreciable symptoms. Here was a man who was a hospital orderly who went along and had no appreciable symptoms; he was able to do his hospital work in spite of this scar tissue without very much shortness of breath. When he put himself to unusual exertion, his self-reserve was cut down so that he did become short of breath, but he had enough lung tissue that it could function. Between these nodules he could get enough oxygen into his blood to carry on his hospital work.

In other words, the characteristic symptoms of this classical form of silicosis or discreet nodulation is exertion. This man, however, is in danger, because he is unduly perceptible to infection and particularly to tuberculosis infection. That point is so well known that I do not have to take the time to support it with statistics. He may also be especially susceptible to certain types of pneumonia, particularly bronchial pneumonia, and we are coming to feel that we do not think he is more especially susceptible to lobar pneumonia than the general population. If he does develop lobar pneumonia the chances of recovery are not so great as they would be if he did not have a background of silicosis. Now, such cases as these offer certain administrative problems. If we are dealing with an old employee who has been working in the plant concerned for a period of many years, and the man is not disabled, is able to carry on, as this man did with his hospital work, should we discharge him? I think employers generally are coming to feel that those men may be retained, and that the individual is much better off if he is allowed to continue and to do his work and be self-supporting and self-respecting.

That type of reaction is apt to progress a little bit; each individual nodule will probably get a little bit larger, but it will never progress so that all the lung tissue is destroyed, but that progression is going to take place regardless of whether this man breathes in normal dust or whether he doesn't; he has already taken in so much; the only thing would be that he would breathe in a little more dust perhaps in that location, and you better let him stay there as long as he can work, and he will be able to work so long as he remains free from infection, and if he does become infected you will have a chance to know it as soon as anyone else, and treatment should be instituted.

Of course, if you are dealing with a mature young man, again I might make this suggestion, if he is under 30 and he has developed discreet nodulation you would probably want to change him to some other job, but again, if he is kept

in your plant he is not going to be a troublemaker and he isn't going to go out and bring suit against you, if you play fair with him. On the other hand, if you find such a condition in an applicant for work, this alters the situation somewhat, but there is no reason why you shouldn't take him on if he is a trained and skilled workman. He is capable of performing good service for you and he is capable of carrying out as much work as the majority. In conditions of labor shortage, plenty of men with discreet nodulation have been taken on, but, of course, in the past, before we had X-Ray films of prospective applicants for work, many men with such lesions were taken on but unfortunately, the administrative system we have, and the accrued liability that now exists, an employer becomes very cautious about taking such a person on. If we could adjust our compensation laws and the medical and legal aspects of the problem there are presumably many of these men who could be successfully employed.

Now this is a classical type of silicosis, where we have these nodules uniformly scattered over both lungs; that picture is very similar.

Here, on the other hand, is a common type defined as the classical. This view shows processes diseased in the lungs, the upper portion and the mid-portion on this side. These are replaced by very dense scar tissue. We have always regarded this type of change as due to a complication of silicotic nodulation which this man had in his lower lung and his cardiac compensation for this reaction, and we think from the position of this, that it is most likely to be tuberculosis infection.

Now, here is a section through the top of this man's lung, and his effective viri around the outside of it. You see packed into this lung tissue are large numbers of silicotic nodules. They have tended to fuse together. You will note only here and here are slight amounts of normal lung tissue. There is a fissure here between the two lobes of the lung, and that is all gummed up and stuck together by silicotic reaction. Obviously this type of lung tissue is not going to move very much in and out with respiration, and obviously the amount of air that comes into these spaces of normal lung tissue is not going to be very great. This man is short of breath.

Here we see a higher magnification of the same lung. You see the nodules or groups of nodules here have fused together. Now you can't recognize any evidence of tuberculosis in this case. There isn't any specific thing that we can put our finger on there which would enable us to call it tuberculosis.

Here is another one, and I will show you two or three films in series on this man. He had a slight degree of generalized silicotic nodulation. There is not enough so that we can recognize it, and we see there it is localized in the top of this right lung here, and a suggestion of it over here. This man was a mine captain. He had been on the job for twenty years, and he started to work when he was seventeen in the mines. Here is a film taken four years later showing what has happened. Here we see that small area of consolidation has now become large, and we see great big nodules there in his lower lung. Another film taken a few months later of this area shows that a great big nodule has formed, and this must be scar tissue above. We tried to treat it, but were too late. We should have, if we had been given an opportunity to do anything, made that man stop work when the first localized shadow was discovered, instead of allowing him to work four years longer before we were perfectly sure he had any of the symptoms of tuberculosis; there was nothing to suggest that he needed treatment, but we were more lenient at that time with respect to the subject's feelings.

But this is what he had progressed to and he died shortly afterwards. You will notice this great big nodule here, and he is bleeding. There is a great big blood clot and these nodules scattered all through the rest of the lung. Up here there is a mixture of tuberculosis and silicosis; down here there is a modified type of silicosis. Now, this is obviously due to tuberculosis, somewhat similar to what I just previously showed to you; there is some infection, presumably tuberculosis, which I think had

wholly and completely healed, but the scar tissue did cause much more dust to be accumulated in that local area and be piled up.

Now, all of these men were much shorter of breath with this type than those of the type that we call discreet nodulation, and therefore they were definitely limited in their capacity to work, and whenever we find one of these massive areas of conglomerate reaction, we can expect that there will be much more limitation, such as in men who have symptoms of increasing loss of appetite, loss of weight, night sweats and all the other things that are associated with an active tuberculosis, if the tuberculosis is active.

The diagnostic problem is one though that is really serious, and the doctor is up against it, I wouldn't say in the majority of cases, but when he looks at the first film to see whether that conglomerate reaction is due to active tuberculosis or whether it is due to an old healed tuberculosis, or in the same stage, or whether it is due to a partially active one that may have just started in point of time, and coming on. In diagnosing reactions like that, it is only by watching such cases very carefully and repeatedly examining them, and by whatever means at his command, that he is able to make a scientific guess at what is likely to happen. The rate of change and increase in the size of the shadow as seen in serially taken X-Ray films, taken within six months or a year apart, is likely to be helpful; any loss in weight of the individual is likely to be helpful. An examination of the sputum is often a discouraging test. Sometimes you may examine these men's sputum month after month after month for twenty, thirty or forty times and find no tuberculosis bacilli yet on the 44th trial one becomes positive and maybe the 47th and 49th are negative again and then another positive one and then if the case is one which is complicated by an active or partially active tuberculosis the sputum does become positive regularly and then the worst happens.

Now the administrative disposal of these cases of course is not so difficult because many of these men will ultimately break down. In our experience we have found that about 60 per cent. do show tuberculosis and that the other cases are probably due to healed tuberculosis and never capable of reactivating and never capable of causing those others which are due to other causes. The pathologist only shows the end of the story and he does so only to give us what facts he can tell us of the preceding life.

Your employee with a massive consolidated lesion in addition to discreet nodulation of this kind need not be discharged. Generally such a person, if he has worked for long periods of time for a company that company has a moral obligation to look out for this man. He may be pensioned if he wants to or maybe his employer has some other work for such men, as long as they are able to do any work. Many of them are happier working than they would be otherwise. Of course, as soon as they develop tuberculosis bacilli in the sputum, they become a menace to their fellow employees and then they must be removed from employment or at least segregated. At such time it is generally too late to place them in a sanatorium whenever the sputum becomes such as was illustrated in this last case, where the man worked over a period of four or five years longer. In some instances men with a disease like this have gone out and given the job up; some of the companies have placed such men in positions where they are not in contact with their fellow human beings, and some men might prefer to be pensioned or discharged.

Now, those are the three main types of dust reaction with which we have to deal. First, linear exaggeration, non-specific in character, not complicated by disability and no appreciable susceptibility to infection; second, discreet nodulation of classical silicosis with exertion, which is moderate only, and with susceptibility to tuberculosis above that of the normal, and finally those cases of the conglomerate type of the disease which is usually more productive of disease and which in 60 per cent. of the cases would probably terminate in infection.

Finally we have to deal with definite evidences of tuberculosis, particularly in pre-employment examinations. We find tuberculosis in several forms. It may be typically a latent tuberculosis which we see in non-silicotic and the normal person or it may exist in abnormal ways. There are several manifestations. We have the so-called childhood infection, and we have these manifestations of tuberculosis in the normal man, but when a man comes to us applying for work and his X-Ray film shows these changes, what are we going to do with him?

The first manifestation is the so-called childhood type of tuberculosis infection, and that we call the primary complex. This individual when he was a child had an infection with tuberculosis bacilli. He handled it perfectly well, but in healing that left some scar tissue in his lungs and in his lymph. That scar tissue is also associated with a deposit of lime salt and calcium, but it may not have been very bad, and the chances are 99 to a hundred that there are no tuberculosis bacilli in any of these foci or that the individual will react to tuberculosis. If we give him a skin test that can be borne out, that he is not going to be a case of new disease. If he did catch it, and if that has perfectly healed, and it has probably been healed since he was ten to fourteen years of age, there is very little chance of anything happening to it, and it is my personal feeling that such an individual could be subject to exposure, and to exposure perhaps of free silica without anything happening to him. If on the other hand we happen to catch this man in this stage where he has got this childhood infection still active and only beginning to heal, and he is still a young man, let us say 19 to 20 years of age, we do not need to employ him or we shouldn't allow him to be exposed to silica dust or should wait until perfect healing has occurred. In the normal individual it is significant that healing would take place. That is true in the vast majority of cases. Only occasionally would this fungus in the lung start to produce disease. So, as a general rule, if an applicant for work has the primary complex of the childhood type of infection, and if he is old enough that this has healed, I would say to disregard it and accept him for employment.

The most prevalent type of tuberculosis in human beings, however, is not due to this primary infection which we see here and here. It is due to re-infection from the old, probably; we are not absolutely certain it is from the old, but it is due to new infection of tuberculosis bacilli that manifests itself in the upper lobe.

Now here is a film of one in which the activity of this focus is debatable. We are not quite sure that that healed completely. There are, therefore, likely to be tuberculosis bacilli in that focus, and if this is a young man particularly—and I can tell you from its general shape that this is dust and what-not—we would not expose this man to any siliceous dust because of the probability of reactivating that focus, and we had better place that man somewhere else. Of course, if the man is already employed in the plant he should not be subjected to silica dust, but if he does not have any symptoms from this focus, it might be decided that he could continue to work. The decision, therefore, should be based upon the findings in that particular individual.

Here is a film in which the focus has progressed a little bit. Now, there is some activity in the midst of what otherwise is perfectly well scar tissue. That re-infection, obviously, is a source of danger. The individual might not know that he had it, but seeing that activity, we would not allow this man to work in silica dust.

Finally we come to the older individuals who have gone through a previous infection and handled it perfectly all right, and that it has left scar tissue in that shape. Presumably there is no active tuberculosis bacilli in that focus, although there might be, but I would hesitate to let that man be placed in such a position, having this character of disease, to expose himself to silica dust. He would be probably a perfectly good employee in any other department and he might be perfectly able to work in gypsum dust or any other kind, but not in silica. But then

finally, when that is completely healed, he undoubtedly can stand up against any sor of a dust environment that you want to put him into. These are the kinds o problems that the doctor is faced with in the taking of pre-employment examinations and it is upon these things that he has to make his recommendations whether t accept or reject an applicant.

There is one more thing that perhaps too little attention has been paid to i the past. We have recognized that disability from silicosis is not generally due t the silicosis itself, but it is more apt to be due to the complexing infection, an we have recommended the discharge of the infected individual whose lesion is ope and who has established tuberculosis bacilli in the industrial environment for th protection of his fellow workers, but it does very little good if industry takes hin out of this job, if it so happens that the silicotic individual is living with a case o open tuberculosis in his family. Obviously, all employers can not make community surveys to discover cases of open tuberculosis, but in some of the smaller com munities that is possible, and that is being done with very good results, and at least th employer can cooperate with the public health authorities and give his backing t these fine programs and give his backing to all measures which will tend to cut dow the amount of infection in the community, because his employees, if they have sili cosis, are more susceptible to tuberculosis bacilli than the rest of the population.

I thank you. (Applause.)

CHAIRMAN POLLOCK: Dr. Gardner, I would like to thank you very much fo that interesting and instructive talk.

In preparing our program, we asked Dr. Hayhurst to comment for a few minute on Dr. Gardner's talk. Dr. Hayhurst.

Discussion on paper entitled:

MEDICAL CONTROL OF SILICOSIS AND TUBERCULO-SILICOSIS

DR. LEROY U. GARDNER

DR. EMERY R. HAYHURST, Columbus, Ohio: Mr. Chairman and Gentlemen Professor Nold called me last week and asked if I would lead a discussion on Dr Gardner's paper, and in the meantime we got into communication with Dr. Gardner and he furnished us with a brief of the general type of talk he was to give. O course I cannot discuss by any means many of the points that he discussed, but i order to save time I reduced what I wanted to say to typewriting.

The four general types of lesions of silicosis as described by Doctor Gardner appear to have general acceptance. In my experience in the Central States we see much more of silicosis as an autonomous disease than one associated with chronic infection or tuberculosis.

The earliest complication of breathing mineral dust in excessive quantities ap pears to be the so-called "dust pneumonia" as exemplified in the dust storms of th Near West. Next follows the early disability and high death rate in acute or rapi forms of silicosis where only a few weeks to a few months often occasion disability and death. Only extreme exposure could produce such results.

In the chronic form of the disease, pneumonia may appear in the first few months, usually broncho-pneumonia, after which more or less immunity to this disease appears to follow.

In regard to tuberculosis, my experience follows more closely that reported i recent triennial reports from South Africa[1] where, for example, only two or three cases of "tuberculosis with silicosis" are reported annually amongst an average 18,00 to 22,000 working miners of European origin, where new cases of "simple silicosis' average about 200 per year and new cases of tuberculosis, about 25 per year. In the

triennial report ending in 1935, among 925 autopsy investigations on the lungs of European miners in South Africa, 553 were found free of silicosis and tuberculosis, 262 to have silicosis without tuberculosis, 93 silicosis with tuberculosis, and 17 tuberculosis without silicosis. The report states that the number of cases originally notified as having "tuberculosis with silicosis", detected annually since 1925-26, has been so small that a record of their future history is of no statistical value so that returns regarding them have been omitted in recent years. This remark refers to Schedule VI in the report in which the number of these cases was as high as 120 new cases for the year 1918-19, dropping thereafter rapidly to 17-28 cases annually in the years to 1924-25, and to 7 cases in the year 1925-26.

Probably our experience with tuberculosis in silicotics is not as favorable as that reported by Conrozier and Magnin[3] from the Gard Basin of Southern France, viz., 3 out of 120 silicotics found complicated with tuberculosis; or that reported by Sleeswijk[4], in Holland, who found but 6 tuberculosis cases in 963 stone-cutters. Moller[5], in Denmark, found tuberculosis rare in 798 porcelain workers, and thought these workers were somewhat protected against this infection. It is probable that 5 per cent would represent the prevalence of tuberculosis in our cases.

We have previously reported[6] that of 912 men examined in the sandstone quarries of Lorain County in 1926, the total tuberculosis we found was but 1.9 per cent, which figure checked relatively closely with the tuberculosis statistics of the community, and up to 1932 the tuberculosis records of the County revealed that only 5 deaths had occurred from this disease among the workers still resident in the County, and but 5 active cases were on record among them at that time. In the next five years only some 12 to 15 additional cases of tuberculosis were reported among them. A collateral check on the prevalence of tuberculosis in the families of these quarry workers was made in 1934, under Dr. H. P. O'Brien,[6] the County Health Commissioner, in which Mantoux tests on school children revealed rates no higher in quarry villages than for those in neighboring villages except in one group of 40 children between 15 and 19 years of age which ran 57.5 per cent positive as compared with the neighboring village of Oberlin, which ran 41.4 per cent, both figures low when compared to the usual city rates.

For the year 1936, the annual inquiry made by the Ohio Department of Health[7] of the 21 tuberculosis sanatoria in the State received reports from 6 institutions enumerating 11 cases of silicosis with tuberculosis and, among these institutions, that of Hamilton County (Cincinnati) the largest with 635 beds, and Franklin County (Columbus), 210 beds, reported no case of silicosis in any of their tuberculous inmates.

Hence it is very likely that the prevalence of tuberculosis among silicotics is chiefly a factor of the prevalence of tuberculosis in the given community. Nevertheless, it would seem that silicosis is a condition which predisposes to local infection in the lungs, the nature of the infection dependent upon current circumstances. Also, I am sure we see many partially disabled and some completely disabled cases of silicosis in whom neither tuberculous infection nor ordinary infection can be determined by the usual laboratory or clinical methods, and in whom the degree of lung tissue replacement with fibrous tissue, including nodules and conglomerates, impairs aeration to the apparent extent of being the sole cause of the disability present.

I have seen a number of cases showing no more than an exaggerated linear pattern which, following a cold or an attack of the flu, have developed a pronounced reticular network, as seen in the X-ray, which persists for months, accompanied by considerable disability. Sometimes these take on a pattern resembling miliary tuberculosis but they usually subside and the picture returns practically to its previous condition, although some of the increased reticulation remains.

Where the lung damage can be shown to be due to infection, then correction and treatment must logically be directed against such. The prognosis, however, is not good where infection of any kind is present.

Isolation of those infected, whether with influenza, or the organism of bronchopneumonia, or tuberculosis, should be strictly practiced.

The adoption of an X-ray refinement known as "tomography", which enables particular sites in the depths of the lungs to be more accurately visualized, suggests a considerable advance in diagnosing the nature of possible infection or other process at such sites.

The medical control of silicosis should take into consideration examination centers, mass-screening by chest X-rays, the finding of suitable "other jobs" for those too disabled to pursue their regular trades, provision for suitable recreation and wholesome mental hygiene. One of the greatest questions to be met is the silicotic with "lost courage" or with a predominance of neurasthenic symptoms, while we shall always have to contend with the malingerer in this field, as in other diseases where any sort of possible compensation is prospective. Hence centers for chiefly objective tests conducted under governmental supervision, probably in cooperation with labor and employer organizations should be thought of.

After disability is more or less complete the medical disposition considers the prospects of institutional care, change of climate (as, to a low altitude and dry type with high percentage of sunshine), nutritious diet with small and frequent meals to prevent over-stressing the heart and respiration, and, toward the end, symptomatic treatment by drugs, oxygen, etc., to relieve the exceeding distress, cyanosis, and other features associated with extreme shortness of breath, and other complications present.

The small plant—not large enough to organize a medical program—is still a fundamental problem in the ceramics industry and cognizance of the presence of silicosis is quite recent in the situation.

I quite agree that silicotics should be kept at their jobs as long as possible, without detriment to themselves and others, with stress placed upon the prevention of further dust inhalation and with periodic X-raying and objective procedures to test physiologic capability.

It is probably not well to expose youths under 25 to siliceous dust, but to select workers over that age whose youthful experiences with chest infections have become staid, as may be determined by periodic examinations.

The mixture of other dusts such as lime and aluminum with the idea of mitigating the silicosis hazard is hardly possible in the ceramic industry, as I understand it, but more processes in this industry could undoubtedly be performed wet rather than dry. One objection to lime and aluminum dusts is their tendency to produce upper respiratory catarrh with atrophy of the mucous membrane and, perhaps, perforating ulcers of the septum.

The duration of the activity of silica particles in the pulmonary tissues, uncomplicated with infection, is still problematical but experience would seem to show that such endures not much beyond two years' time, when the pattern becomes fixed. Undoubtedly, also, there is something to Sir Francis Aitkins'[8] observation in South Africa, in 1913, to the effect that the fibrous tissue changes formed as the result of the irritation of dust in the lungs tends to become organized and permeated by newly-formed blood vessels as the years proceed, as a result of which it is in part absorbed and the particles of silica remaining are liberated and carried away in the blood stream.

May it not eventually be possible that our chemotherapists may discover substances which may be administered to the silicotic that will actually dissolve excess hyalin and fibrous tissues as well as nests of increased reticular cells and cells bearing dust? It is, of course, too early to say.

References

1. South Africa, Union of: Report upon the Work of the Miners' Phthisis Medical Bureau for the Three Years Ended July 31, 1935, pp. 23, 28, 45 and 70.
2. Conrozier, M. and Magnin, J.: Silicosis—Case Reports. La Medecine du Travail, 10, 5:173-218 (Sept.) 1938. See translation, somewhat abbreviated in Industrial Medicine (Chicago) 8, 3:114-120 (March) 1939.
3. Sleeswijk (of Delft): IVth Int'l Congs. of Ind. Accid. and Diseases, Amsterdam, 1925. Abstr. in J. Indust. Hyg. VIII, 3:48 (March) 1926.
4. Moller, P. F.: On Silicosis in Porcelain Workers. Acta Radiologica, 15:587-602, 1934. Abstr. in J. Indust. Hyg. 17, 2:27 (March) 1935.
5. Hayhurst, E. R., Kindel, D. J., Neiswander, B. E., and Barrett, C. D.: Silicosis with Low Incidence of Tuberculosis. J. Indust. Hy., 11, 7:228-244 (Sept.) 1929.
6. Ohio Department of Health: The Prognosis of Silicosis. Ohio Health News, 11, 11:4 (June 1) 1935.
7. Ohio Department of Health: Occupational Disease Cases in 1936 Second Highest on Record. Ohio Health News, 13, 3:2-3 (April 1) 1937.
8. Oliver, Sir Thomas: Dust Diseases of the Lungs, in Kober and Hayhurst's "Industrial Health." Philadelphia, Blakiston's Son & Co., 1924, pp. 718-19. See also Kober and Hanson: "Diseases of Occupation and Vocational Hygiene" (Blackston's), same author and same reference, p. 234.

Conclusion

To meet the silicosis challenge from a legal standpoint involves not only keeping abreast of the legislation in effect or contemplated in your own State, but a careful study of trends in other States of this country and other nations of the world. It involves keeping abreast of court decisions in various jurisdictions. It involves, above all else, a full knowledge of the hazards inherent in occupations and materials in your plant and providing for future legislation and future court interpretations every reasonable and practical safeguard for the protection of those presently employed. (Applause.)

CHAIRMAN POLLOCK: Thank you, Dr. Hayhurst. I am sure we have gotten a great deal of valuable information from these talks. They have all been very interesting and surely have been very instructive.

The results of the meeting of the Nominating Committee show that their selection is, for Chairman: Mr. D. A. O'Neill, Safety Director of the Owens-Illinois Glass Company, Newark, Ohio; for First Vice Chairman, John Bowen, Jr., American Vitrified Products Company, Uhrichsville, Ohio; for Second Vice Chairman, J. Harrison Keller, Limoges China Company, Sebring, Ohio, and for Secretary, H. E. Nold, Ohio State University, Columbus, Ohio.

What is your pleasure?

(No response.)

CHAIRMAN POLLOCK: Are there any other nominations?

(No response.)

CHAIRMAN POLLOCK: Hearing none, we will declare the nominations closed and these men duly elected.

I want to thank you for your very splendid attendance at this meeting.

Adjournment.

RUBBER

The Rubber Section was called to order at ten o'clock in the Garden Room of the Neil House by R. W. Morse, Firestone Tire & Rubber Company, Akron, Ohio.

CHAIRMAN MORSE: It is a little after ten o'clock and I think we had better open our meeting. We have with us a number of excellent speakers this morning; that is, men that will give us an insight into lines of safety that we have never viewed before. It is just as we were talking about yesterday, they wrap it up a little differently; they give us something to sell in a little different fashion. That is what we want and need today.

Now, first I think I will call on Walter Schneider who is a member of the nominating committee to let us know whom they have nominated, or suggested for office.

MR. WALTER SCHNEIDER: Mr. Chairman, the nominating committee nominates for office Urban L. Moler of Inland Manufacturing Company, Dayton, as chairman; C. W. Ufford, Ohio Rubber Company, Willoughby, vice chairman; and William Spanton, American Hard Rubber, Akron, Ohio, secretary.

CHAIRMAN MORSE: You have heard the report of the nominating committee for officers for the ensuing year, 1939, kindly indicate your pleasure or displeasure by saying "aye".

(Thereupon the "ayes" were voiced by the audience.)

CHAIRMAN MORSE: Carried. Now, I will ask Mr. Moler to kindly introduce Mr. Lee. He is connected with his concern and he knows him a little better than I do. Mr. Moler.

MR. URBAN L. MOLER: Thank you. I assure you it will be a pleasure for me to endeavor to work with the rubber section as chairman. Our company is fairly new in the rubber business, having been operating in rubber since about 1929, so I have taken advantage of a lot of these old-timers in the rubber section and learned a lot about rubber since becoming identified with the rubber section and I am sure that I can testify to any of you new men that are interested in accident prevention work in the rubber section that you will find these old-timers from the various rubber plants over the country anxious and willing to help you with your problems. I came into this group as a boy and knew very little about it and I found out a lot of things, and the contacts you make and the problems you meet you can ask these fellows questions—how they have been handling these things for twenty years and that gives you a good education. I think these sectional meetings and our state safety meetings, the contacts you make with the fellows that are in the same type of work that you are in, are the beneficial results obtained.

Now, I am very happy to present our first speaker here this morning. I have known Mr. Lee quite intimately for a number of years. He was connected with various General Motors plants in Dayton for quite a long while, as an engineer and inventor and a foreman in the plant. He has been a teacher and he is quite versatile in all lines. He flies his own ship and he is quite a fellow and a real fellow with it. He is connected with the General Motors now in public relations work and is very deeply interested in this subject of safety. Mr. Lee is going to talk to us this morning on the "Five Principles of Safe Plant Operation." Mr. Lee. (Applause.)