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Silicosis in the Foundry

Characteristics—Control—Compensation

by

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Silicosis in the Foundry

I. Characteristics; II. Control; III. Compensation.

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"New occasions teach new duties!" The coming of silicosis to the foundry has created a new occasion. This new occasion makes desirable that every foundry management acquire a practical working knowledge of silicosis—an ancient occupational disease, newly thrust as a problem into foundry practice.

The procurement of reliable information adapted to foundry needs, and sufficient for the formulation of policies in the foundry, has proven to be most difficult. Many half-truths and wholly irresponsible statements have accumulated during recent months. Litigation and self-promotion have dominated the picture. In addition, much of the trustworthy information has been of limited value to the practical foundryman, owing to the many technicalities in the publications related to this dusty lung disease.

No less, it is true that in the midst of many uncertainties a definite cord of substantial and fundamental truth has been kept intact and has guided competent workers to sensible and practical control procedures for silicosis. The nebulous days of silicosis in the foundry are passing. The situation is taking on tangibility through basic court decisions and the demarkation of lines along which prevention may be obtained.

The situation as estimated for today has been ap-



praised in non-technical medical language under three headings:

1. The Medical Aspects of Silicosis,
2. The Prevention of Silicosis,
3. Compensation for Silicosis.

It is hoped that this estimate and program may play some constructive part in the extrusion of silicosis from the foundry.

I.

THE MEDICAL ASPECTS OF SILICOSIS

Types of Dusts. For the purposes of this discussion, dust may be defined as fine, solid, particulate matter, suspended in the air, settled, or collected out of the air. Without entering upon any classification of types of dust, it is obvious that many varieties exist, such as vegetable dusts, animal dusts, mineral dusts, metal dusts, chemical dusts, mixed dusts, etc. At once it may be maintained that any dust in readily appreciable quantities taken into the body is injurious, but it is noteworthy that many dusts are essentially harmless—while many others are promptly and direfully harmful. The manners in which dusts exert their harm are quite dissimilar. The least harmful kinds of dust, such as for example, wheat flour dust, only harm by the production of a trivial amount of mechanical irritation along the respiratory passages (in the absence of sensitization). Next comes a group of dusts, of which lime may be cited as an example, from which immediate or early chemical action along the respiratory tract may be expected. Many dusts of vegetable or animal origin lead to peculiar states of "sensitization", of which "hay fever" from ragweed pollen dust is a practical example. Other dusts, such as arsenic—mercury—lead—etc., absorbed from the lungs and possibly other portions of the



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respiratory tract, readily lead to their corresponding intoxications. Still there remains a large group of dusts, insoluble or not readily soluble, capable of causing slow or rapid changes within the lung tissue itself. Primarily, these dusts are mineral in origin. At the top of this list stands silica. So great is the difference in the toxic properties between silica and some others of this group, that if silica be represented by 100—the relative danger from coal, silica-free marble, iron, etc., is about 5.

The feature commonly shared by all of these last mentioned substances is the capacity for producing scar tissue within the lung—which scar tissue is termed “fibrosis.”

How Silicosis is Produced. Laying aside now all other forms of dusty lung disease, non-technical consideration is extended to the mechanism through which silicosis probably is produced. As is well known, silica exists in a variety of forms, and is a constituent of many forms of mineral matter making up the earth’s surface. In some forms it may exist so purely as to consist of more than 99 per cent free silica. Every percentile gradation exists, down to a fraction of 1 per cent of silica, in a variety of minerals. It is believed that minerals containing less than 10 per cent of silica rarely are responsible for the causation of silicosis. Combined forms of silica lead to a variety of silicates. “Asbestos” is a silicate, being a combination of silica and magnesium. It is recognized that silicate dusts in sufficient quantities may give rise to dusty lung diseases to which the term “silicatosis” is applied. No further mention will be made of these diseases, since little connection with foundry work exists, so far as known.

Under industrial conditions, silica may only enter the lungs in the form of a dust. The size of the particle of

? | dust is of great significance. Large particles, such as are visible to the naked eye, are essentially harmless in the causation of silicosis. Only those particles of microscopic proportions are important. It is common practice to indicate that only those particles below 10 microns are harmful. A micron is $1/25,000$ of an inch, or $1/1,000$ of a millimeter. It also appears reasonable to believe that only those particles below 2 microns in size are outstandingly harmful. A

? | (When a dusty air is breathed into the body, approximately 50 per cent is retained. This retained 50 per cent in part adheres to the nasal and other respiratory passages, and in part reaches the ultimate microscopic air sacs of the lung tissue. If some dust other than silica be admixed with the silica, more of the silica dust finds its way upward through the bronchi and windpipe, to be discharged in saliva and other secretions of the head. B.
The minute particles of silica finding their way into the microscopic air sacs of the lungs are attacked by the scavenger, or dust cells within the lungs. These cells pass through the membranous walls of the air sacs—engorge the dust particles—pass back through the air sac wall, carrying dust particles, wander into the minute lymph or blood vessels, principally the former, and transport these unwanted dust particles to some place in the body where they may be dumped without prospect of harm to the body. The liver, for example, is a dumping ground for many types of bodily poisons. Many millions of scavenger cells are at all times busy in freeing the lungs of dust of various sorts. Much dust is deposited in the lymphnodes at the root of the lungs. In short, the body is able to protect itself against a reasonable quantity of dusts of the general type represented by coal, silica-free marble, etc., and even of silica.

When, however, the quantity of silica dust is much increased, a new and readily understandable situation arises. So many millions of scavenger cells are at work at the same time as to literally block cellular traffic through the minute lymph and blood vessels. Millions of cells containing dust particles are heaped up within and alongside these avenues of traffic. The traffic jam is permanent. Apparently, the dust particles are partially dissolved within the cells, the cells die; low grade inflammation arises; much serum bathes this mass of disintegrating cells with their silica content. Seemingly, the silica acts as a stimulant to the rapid and extensive formation of scar tissue. At least in no other dusty lung disease is so great a quantity of scar or fibrous tissue so quickly produced. Silica is thus said to be a powerful fibrogenetic agent.

At first these areas of newly formed scar tissue lie in lines, such as give rise (in X-ray parlance) to the term "arborization or linear markings."

In due time, and apparently as the result of degenerative changes, these lines break up into small segments. The segments take on rounded shapes. These rounded shapes are responsible for the mottling observable in the x-ray picture, without which mottling silicosis may not be said to exist. These mottlings or nodules increase in size, additional ones are produced—they then begin to combine, one with another. In time this scar tissue within the lungs tends to hamper circulation of the blood through the lungs—the heart becomes embarrassed—the proper taking up of oxygen out of the air is interfered with by this scar tissue, and the patient becomes short of breath. Moreover, the scar tissue leads to a certain degree of rigidity or fixedness in the size of the lung, so that the chest excursions in respiration

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become very limited. This general situation affords a most fertile soil for the growth of the bacteria of tuberculosis. Apparently, there is something about silica that fires the bacteria of tuberculosis into rapid and virulent growth. At any rate, approximately 75 per cent of persons having silicosis acquire tuberculosis and promptly leave this earth. In the absence of tuberculosis, silicosis is apt to progress. It is not known to improve, and early death is a reasonable expectancy, in any far advanced case of silicosis. Such is the nature and mechanism of silicosis.

Special Features About Silicosis. Now follow a number of isolated considerations directly bearing upon some one or more aspects of silicosis:

Whether or not silicosis develops in persons exposed to silica dust depends upon the following considerations:

- a—the percentage of free silica in the dust that is taken into the body.
- b—the length of exposure, day by day, and year by year,
- c—the size of the particles of silica in the dusty atmosphere,
- d—the number of particles present in some unit, such as a cubic foot of air,
- e—the susceptibility of the individual exposed, embracing such peculiarities as rate and depth of breathing, efficacy of natural protective mechanisms, position at work, previous medical experience, etc.

The time required to produce silicosis may not be stated with any reasonable certainty. Naturally, this must vary in relation to all the foregoing items. A few cases of silicosis possibly have been produced with an exposure limited to three months. An exposure of only eight months is said to have led to silicosis of such severity as shortly to have produced death. All of these are exceptional. No question may be raised as to the occurrence of silicosis after three years exposure. The major-

ity, however, fall within the years between five and ten. At the other extreme, it is not unusual for workmen first to become disabled by silicosis only after fifteen—thirty—forty-five or even sixty years of exposure. This does not imply that the silicosis process did not start at an earlier time, but that disabling silicosis was established only after these long years of exposure.

Stages of Silicosis. For technical purposes, and to a limited extent for legal purposes, silicosis is divided into three stages—commonly termed FIRST, SECOND, and THIRD; or ANTE-PRIMARY, FIRST, and SECOND (South African system). Some workers recognize a fourth stage. Demarkation between these stages is academic, and the issues created thereby are sometimes confusing rather than helpful. For example, in Ontario, ante-primary silicosis associated with tuberculosis becomes for legal purposes a second stage silicosis.

Progress of Silicosis. Silicosis once established is likely to progress, and unlikely to recede. One group of 728 cases of very early silicosis were removed from further exposure to siliceous dust. Six years later, this group was surveyed; 171 had died; 25% of those remaining had not progressed; 50% had passed on to severer forms; and the remainder were unaccounted for. Seventy-five percent of the 171 deaths (excluding those dead of violence) was caused by silicosis and tuberculosis.

Persons after extensive exposure to silica dust may show no signs of silicosis at the time of termination of exposure, but years later may develop true silicosis in disabling form. The number of cases of this form of silicosis sufficiently investigated to place them beyond doubt or question is so small that a certain amount of reservation is warranted.

A number of persons showing, after x-ray examination, extensive silicosis, are not disabled and are capable of sustained work without discomfort. In the absence of far advanced silicosis, and in the absence of tuberculosis, silicotics frequently live out a normal life expectancy.

A.

Physical findings, such as sought for by the examining physician, in cases of ordinary chest disease, are of limited value in silicosis diagnosis. Certain manifestations are commonly associated with various stages of this disease, but the most experienced observers are cautious in taking any stand in the absence of properly made x-ray films or plates.

The tuberculosis following in the wake of silicosis may be transmitted to those about the afflicted worker, and this form of tuberculosis is no less virulent when acquired by other persons than ordinary varieties. Negroes are believed to be more susceptible to chest diseases than persons of the white races.

Life expectancy in well established silicosis associated with tuberculosis approximates 18 months. Many die within the first year. Survival for three years is unusual.

Dangerous Concentrations of Silica Dusts. The number of particles per cubic foot of air regarded as constituting the threshold of danger naturally stands in relation to the mineral composition of the dust. Without at this time necessarily accepting stipulations of Sappington, a quotation is made from his estimate of dangerous quantities of dust:

" If the free silica content of any given dust is 35%, the standard of safety can be placed at approximately 15,000,000 particles per cubic foot of air in the breathing zone of the exposed workman; if we reverse this situation and consider a dust which has a free silica content of 70%, then the health standard will be approximately seven and one-half million particles per cubic foot of air. When there

is 90 to 100% of free silica in the air, such as when doing sandblasting, the standard is placed at approximately 6,000,000 particles per cubic foot of air . . ."

Treatment of Silicosis. At this time no treatment for silicosis is known to be efficacious. Symptomatic treatment may make the silicotic patient more comfortable, possibly life may be prolonged by the control of secondary heart disease and by the avoidance of acute inflammations. No substantial betterment is the result of any medical procedure. In short, control of silicosis is not to be found in treatment, and resides solely in prevention.

Offsetting the discouraging fact that the treatment of silicosis is of no avail—is the encouraging truth that prevention is practical and procurable. In the near future, so much will have been accomplished in terms of prevention that the development of any considerable number of new cases becomes improbable.

II.

THE CONTROL OF SILICOSIS IN FOUNDRIES

The key to silicosis control lies in prevention. The legal, medical, and economic situations all crucially center about prevention as the sole avenue through which the ill consequences of silicosis may be obviated. Each of the three mentioned situations provide a major incentive to the prompt application of preventive measures. These are:

1. A recent federal court decision points to neglect on the part of the employer as the only basis upon which court claims may be established for silicosis. Absence of neglect and prevention are inescapably entwined.
2. The physician already has admitted defeat in the curing of silicosis. In the absence of curative measures,

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only through prevention may the high fatality rate of silicosis be eliminated.

3. The economic situation is reflected in the assertion that silicosis is the most costly of all the commoner occupational diseases. The average case of well established silicosis costs, before final disposition, approximately \$10,000.

It is a matter of satisfaction to be able to take the stand that silicosis may be prevented in foundries and without the necessity of any revolutionary innovations.

Three departments stand out as the chief dust producers in the foundry. These are: Casting cleaning, Shake-out work, and Sand conditioning. Dust from these departments may be distributed throughout the plant. Of these, casting cleaning constitutes the prime dusty operation. On this account, and because recent controversies have centered about sandblasting operations, essentially all of the following program of silicosis prevention is limited to "casting cleaning".

A Tentative Program of Silicosis Prevention in Casting Cleaning Operations. The term "casting cleaning", as here employed, refers to all forms of this operation—including blasting cabinets, tumbling barrels, rotating tables, blasting rooms (some of which are automatic or semi-automatic), hydraulic and sand-hydraulic operations, grinding, chipping, etc., and lastly chemical cleaning. Manifestly, more consideration must, in this paper, be directed to the commoner practices of foundries, rather than to more remote operations such as casting pickling, or casting polishing preparatory to plating.

First. Introduce a rotating service of employment in all highly dusty operations. With some exceptions, it may be maintained that casting cleaning calls for no

high degree of skill, at least, not the skill requiring years of apprenticeship. For this reason it is urged that in sand abrasive blasting work the operators be changed frequently. As an alternative, workers may be shifted to sand abrasive work for six months, then returned to other duties about the plant for an indefinite period of not less than six months, with the prospect of resuming abrasive blasting work at a subsequent time, for another six month period.

IN THE ABSENCE OF EXCESSIVELY DUST LADEN AIR, ROTATING SERVICES, AS JUST DESCRIBED, WITHOUT ANY OTHER PRECAUTION, WILL ELIMINATE MOST OF THE PROSPECTS OF SILICOSIS! Rotating services may at a later time be abandoned as a preventive procedure, owing to the application of mechanical devices that in truth avoid silica dust production, or that at least assure the absence of silica dust in dangerous amounts entering the lungs of exposed workers. In those foundries wherein such conditions are acquired and maintained, limitation of periods of service loses its importance.

Second. Prior to placement of workers on casting cleaning involving contact with sand dusts, careful physical examinations should be conducted. Each examination should include an x-ray of the chest. No person previously employed at abrasive casting cleaning (in excess of six months) or who shows any evidence of significant respiratory tract disease, should be accepted for this type of employment. It is preferable, but not requisite, that persons below 30 years of age should not be placed on this form of work, owing to the fact that tuberculosis is a disease of youth, and the probability of acquiring this disease is greater before the age of 30, than thereafter.

Third. Negroes being more susceptible to tuberculosis as a class of workers than Caucasians, should not be used in this employment.

Fourth. During the period of employment at abrasive work, approximating one year, physical examinations are of no decisive value. No less, it is good discipline to carry out such examinations one or more times even in the absence of any complaint of impairment.

Fifth. At the end of the selected short period of services such as one year, a painstaking "exit" examination should be conducted, including an x-ray. Extensive records should be kept of all these examinations for future reference, if required. Wherever practical, the employee should merely be shifted to other employment in the plant, and not discharged. He should be told of the undesirability of further work by him in highly dusty operations in any industry.

Sixth. In selecting workers for sand blasting and similar jobs, preference should be given to superior physical types, which are likely to suffer least from fatigue, and which are least likely to develop rapid breathing as a result of exertion. Increased rates and depth of breathing, sustained over long periods of time, are perhaps of greater importance than dust concentrations. Over-time work is on this account undesirable in this department.

Seventh. First in a series of protective measures within the realm of physical and mechanical conditions, is the necessity for ordinary cleanliness in plant housekeeping. The majority of foundries are ridden with settled dust throughout the buildings. Settled dust is visible on every projection. Every vibration thrusts this dust into the air, to be admixed with newly formed dust from mechanical operations.

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The origin of this settled dust is obviously multiple sources. As a single possible source one only has to recall that a single swinging shaft grinder, under some conditions, may hourly thrust into the atmosphere as much as 1,400 cubic inches of particulate matter. Before acceptable conditions may be achieved for many foundries, it will become necessary that the three departments, mentioned as the chief sources of dust, be isolated from other departments, or otherwise dust control be secured. Complete reversals in the attitude toward the extent of cleaning in the foundry may become necessary, if certain legal standards now projected may be extended compliance. Settled dust, representing the accumulation of years, will find its way into massive vacuum cleaners, or equivalent. Sand-tight machinery will become a fact. Silicosis prevention will, in the future, influence both the design of foundries and foundry practice. No generalization as to good house-keeping applies to all types of foundries. Good house-keeping in relation to silicosis has as its foremost objective—*less silica dust*.

Eighth. Workers in dusty casting cleaning work regularly should be furnished with face masks or helmets known to be effective. The continuous wearing of a mask is disagreeable. Fortunately, much casting cleaning work is intermittent, or may be made so. No one worker should constantly tend a battery of tumbling machines, while several others merely collect and deliver the parts to be sand treated. Devise work subdivision whenever possible to the end that every worker's duties frequently take him away from the points of high dust concentration, thus temporarily freeing him from the use of his mask or helmet.

Filter types of face masks, properly cleansed and

(A)

inspected, may be efficacious. Such masks are or may be made 90 per cent effective.

Experience has, however, shown that positive pressure masks are always preferable. The supply of air hosed into the sand blaster's mask should originate at a source free from dust, possibly outside the building. Proper precaution should assure a supply of air at proper pressure, free from oil or odors from the compressor, but most of all, as near dust free as possible. In some recent studies the results appear to show that the air inside the helmet contained more dust than the work-room air, and exceeded by many times the quantities of dust regarded as tolerable. The positive pressure mask, with its connecting hose, is more cumbersome than filter types. There come times in the day's work of the sand blaster wherein the filter type of mask may be worn to advantage. The well instructed, intelligent sand blaster may form the habit of inter-use of the positive pressure and the filter type of mask, together with periods of no mask wearing, all in keeping with the extent of dust concentration.

(B)

In general it is a safe rule to recognize that any visible floating siliceous dust constitutes a condition against which precaution should be taken. In a visible dust the harmful particles are essentially below vision range, but no less the larger harmless particles serve as a telltale that the smaller and dangerous particles are present.

(C)

Ninth. No little amount of blasting makes use of steel particles or shot, or synthetic abrasives. Other things being equal, a preference is expressed for this type of abrading material. However, recognition must be given to various valid objections to the shortcomings of metal or synthetic abrasives. In any event, the use of these newer materials does not entirely eliminate

siliceous dusts when castings have been made in siliceous material moulds.

Tenth. Within the last few years wet operations have fallen into disrepute in connection with dust control. In certain grinding operations the quantity of dust from wet grinding exceeds that from dry grinding. Granting all this to be true, there still remains practical opportunity for the prevention of dusts through wetting.

At this very time much experimental and routine casting cleaning is being carried out by hydraulic methods, using approximately 1,800 pounds of pressure to the square inch. In addition, the use of sand within hydraulic systems is in some use. These methods suitably applied are not only practical, but materially reduce dust hazards. A new set of problems may be created for the foundryman, such as the control of rust. On this account any suggestion of recommendation is continually avoided.

Eleventh. One of the chief needs in foundries in connection with dust control is properly designed apparatus for the entrainment of dust at its point of origin. Local suction is in wide use, but apparatus efficient up to the limit of possibilities for the particular operation is a rarity.

A recent address before the National Safety Council (in its Washington Congress) in a symposium devoted to dusts, emphasized the need for the procurement of better designs in exhaust systems for dusts. In addition to the real need for the application of better local exhausts, much may be gained by general ventilating systems, hoods and booths, suitably designed, with an eye for dust and fume elimination.

Twelfth. In many foundries the equipment used in

sand blasting has its inherent dangers as dust producers enhanced by wear and tear. Machines, that in the days of their newness were essentially dust proof, have, through neglect and the results of use, become producers, minute by minute, of millions of particles of dust. Repair or replacement of this type of machinery is a requisite to the procurement of acceptable conditions in a large number of foundries.

Thirteenth. Current belief is that silica dust alone is more harmful than the same quantity taken into the body along with other dusts. The reason for this appears to reside in the fact that silica dust is almost free of any immediate irritant action, while most dusts stimulate the defensive mechanisms of the respiratory tract and upward removal is promoted. This has led to the suggestion that certain mines in siliceous rock be dusted (even though no explosion hazards obtain) with mildly irritant dusts, so that the miners taking into their bodies the mixed dusts will extrude greater quantities of the dangerous silica. This theory has not well crystallized, but the time may come when abrasive sand will be mixed with other particulate substances compatible with trade requirements. Admixtures of steel and sand abrasives may be a step in this direction. Alkali admixtures are credited with favoring complication by tuberculosis.

Fourteenth. Dust counting measures find their greatest usefulness in testing the efficacy of protective procedures. Dust counts have little place in codes or standards in industry. The fixing of some such maximum as 6,000,000 dust particles per cubic foot of air as requisite to legal sanitary standards inevitably will introduce confusion into the control of silicosis. No less, for the time being, reliance should be placed upon properly made dust counts as a valuable index of high or low,



tolerable or intolerable, concentrations of dusts. Dependence upon dust counts regularly should be restrained by a knowledge of their many limitations as an exact measuring stick of dust hazards.

In brief the entire prevention of silicosis may be reduced to two cardinal principles: (1) "*Keep the silica dust concentration low, and* (2) *limit exposure for all workers in high concentrations to one year or less!*" until future time provides proven protective devices permitting longer periods of service.

Summary. In foundries, the following measures, faithfully applied through intelligent adaptation to the requirements of the individual plant, will contribute to the elimination of silicosis:

- 1—Rotating services in all highly dusty employments.
- 2—Careful physical examinations, including an x-ray, prior to placement of any worker on highly dusty operations.
- 3—The isolation or dust-proofing of the three departments producing most of the dust of the foundry—namely, CASTING CLEANING, SHAKEOUT WORK, and SAND CONDITIONING.
- 4—The introduction, throughout the foundry, of good house-keeping methods, to the end that accumulations of settled dusts may be eliminated and further accumulations prevented.
- 5—The substitution of other methods of casting cleaning for sand, where practical, and other considerations being equal.
- 6—The use of dust proof machinery.
- 7—The installation of highly effective local exhausts at the point of origin of dusts, such as for example in connection with swinging shaft grinders.
- 8—The use of positive pressure and filter types of masks and helmets so constructed and maintained as regularly to afford air for breathing with a dust content below the threshold of danger.
- 9—Avoid fatigue producing practices, such as extended overtime work, since the intake of dust into the lungs is greatly increased by increases in the depth or rate of respiration.

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III. COMPENSATION FOR SILICOSIS

It is entirely fitting that trade associations in industries harboring silica dust hazards give earnest thought to the vexing problem of compensation for cases of silicosis. In this country up to the present time, few states have made provision for employer responsibility for silicosis or other occupational diseases through the medium of special acts. Although 44 states now require and regulate compensation insurance for industrial injuries, only 10 have enactments extending coverage to occupational diseases. Within this small group of 10, wide variations obtain as to the limits within which occupational diseases are compensable. In Illinois, Minnesota, New Jersey, New York, and Ohio, legislatures have enacted laws providing compensation for a selected group of occupational diseases. In Illinois the selected number is but 3; in New York 27; in Ohio 21, etc. None of these states operating under the schedule system permit the inclusion of silicosis as a compensable occupational disease.

Blanket Coverage for Occupational Diseases. In California, Connecticut, Massachusetts, North Dakota and Wisconsin the status of occupational disease legislation is such that any condition properly traceable to occupation as the cause, is eligible for compensation on a basis similar to provisions for industrial injuries. In still other states, judicial decisions have set such precedents that compensation for occupational diseases appears to have been established. Notable in this group is the state of Maryland.

Federal employees, wherever they may work, and workers within the District of Columbia, and some ter-

ritories are protected by occupational disease laws, details of which need not be here presented.

The Ohio Situation. It is noteworthy that in only 5 states may the worker afflicted with silicosis present a claim through compensation boards or equivalent. In 42 states it appears to be legally practical to seek redress against an employer in the event of silicosis, through common law procedure.

The one remaining state, Ohio, appears to be unique as to the legal protection thrown around the manufacturer. The courts of Ohio have ruled, and apparently the Supreme Court has sustained the ruling, that for an occupational disease not on the schedule of compensable ones, no relief may be sought through the courts. Claimants alleging silicosis have sought to obtain benefit through suits at common law against employers without success. On this account it appears that Ohio has escaped the distressing litigation unhappily present in many other areas.

Shifts in Position. The many jury decisions favorable to claimants for silicosis have produced a complete reversal of attitude in many quarters toward systematized compensation for industrial diseases. For a score of years, labor has sought the inclusion of occupational diseases in compensation schedules. Such legislation commonly fixes death awards at some relatively low figure such as \$6,000.00, and from \$15 to \$20 weekly for total disability. This concept of responsibility for occupational diseases on the part of the employer stubbornly has been resisted by most manufacturers and manufacturing associations. Now, with common law suits leading to death awards from \$10,000 to \$18,000, the small fixed awards, such as \$5,000 or \$6,000 have lost their lure. Consequently, labor is becoming less

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enthusiastic in its advocacy of state regulated insurance for occupational diseases and looks to the bigger returns from court decisions. Manufacturers, in some states, with a surprising change of front, now are the clamorers for protection through the medium of well regulated compensation systems for occupational diseases under state control.

Incentives to Systematized Compensation. Those who are in the process of weighing the merits and demerits of state regulated systems of silicosis compensation may profit by contemplation of the following:

- (1) Silicosis is no creation of the imagination. It is even more real than tuberculosis, is diagnosable with great certainty, and clearly may be established as the consequence of industrial exposure in the usual case.
- (2) Every well established case of silicosis means total disability and termination (in the absence of extraordinary events) in death. For every death—a death claim.
- (3) The average cost per case approximates \$10,000.
- (4) In the recent past juries have evinced pronounced willingness to make extensive awards to claimants—with or without silicosis.
- (5) During the near future, represented by a period of several years, the total number of cases of silicosis appearing over the country is likely to increase rather than diminish.
- (6) Insurance carriers are at this time much concerned because of losses growing out of silicosis, and more than one has indicated a willingness to abandon coverage for such risks. For those who remain, it is predictable that new rates may be placed so high as to make sure that losses may not evenuate.

No Specialized Legislation for Silicosis. In considering some form of state regulated insurance for silicosis, it is most undesirable that this disease alone be considered. Any new legislation limited to silicosis probably would generate attacks, on the grounds of unconstitutionality. Legislation, if contemplated, should include all characteristic occupational diseases, without

enumeration, or at least all the commoner characteristic occupational diseases of the state. At the present time the trend is towards the recognition of all characteristic occupational diseases without discrimination against the small number of unfortunate employees who may become disabled by affections falling without the category of "COMMON OCCUPATIONAL DISEASES". Whatever procedure is adopted, silicosis, if included, is likely to dominate the situation with respect to the percentage of persons dying, and, consequently, to the necessity for death awards.

Silicosis is Unlike Other Occupational Diseases.

The difficulties attending the application of any law for compensation for silicosis are greater than those for most occupational diseases in the United States. Certain peculiarities are now indicated:—

a. In the case of benzol poisoning, for example, the exposure period is likely to be limited to a few weeks or a few months prior to the development of manifestations. To the contrary, silicosis exposure leading to accumulated damage may go on for ten, twenty, or even forty years, prior to the development of disability, and prior to the knowledge of the workman that he is slowly acquiring an occupational disease. During this period the workman may have been employed by a dozen or more employers. When at last disability does arise, it is, in the absence of past, appropriate physical examinations, quite impossible to establish that the disease state has arisen within the past five years—the past twenty years—or within what period.

b. Silicosis, as demonstrated through x-ray examination, may be present in the absence of any disability. Granting the wisdom of regularly eliminating such persons from further employment in a dusty trade, diffi-

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culty no less exists in relation to decisions as to compensation for the worker apparently free from incapacity.

c. Workers who may leave dusty trades, apparently uninvolved by silicosis, as established by careful medical examination, may in succeeding years develop at least a moderate degree of silicosis, and possibly an extensive silicosis. Manifestly, the difficulty of adjusting claims growing out of such situations is great.

d. The consideration of the merits of those claims for early silicosis without disability, but with the prospect of disability, introduces difficulties not known to exist for any other conditions than dusty lung diseases. Ontario has met this situation in a manner expensive to the employer and the insurance company. This province, at the first true sign of silicosis, gives the worker \$500 or \$1,000, and eliminates him, if possible, from future dusty work.

e. A diagnosis of silicosis may be made with relative exactness, but the average physician is not sufficiently experienced at the present time to make such diagnosis. As will be discussed in a later section, plans for any system of compensation for silicosis should, for the present, embrace a board of impartial, qualified, specialists—who may be empowered to pass upon the medical merits of all claims for dusty lung diseases in any given state.

Meeting the Silicosis Claim. The dilemma created by the possible responsibility of employer to his employees with respect to silicosis may be solved on a temporary or permanent basis, through some one or more of the following procedures:

1. Defending all claims in court on the *contention of the absence of all neglect.*

2. Settling meritorious claims on the basis of the exigencies of the individual situation, out of court, and wherever possible, without legal involvement.

This plan inevitably will break down, owing to spurious claims, protests for sums larger than the manufacturer may see fit to provide, and because of the activities of attorneys. Unfailingly, this first system of settlement is complicated by inescapable court cases—which are always expensive and which at this time are frequently unfortunately handled.

3. Something may be gained through the acquirement of private insurance in the absence of any legal compulsion, such as does not exist in 42 states at the present time. The employer operating in a dusty trade thus places the responsibility in the event of claims fully upon the insurance carrier. This may prove to be the salvation of many a small plant during the next few years, during which many problems with reference to silicosis will remain unsettled. Unfortunately, any such arrangement may be attended by abnormally high insurance rates, particularly at the present time, when so much uneasiness prevails.

4. Still another method of approaching this complex situation is through the procurement of compulsory insurance laws, making mandatory that every employer of labor (with some few exceptions) obtain insurance against occupational diseases developing as the result of exposure within their respective plants. Procurement of such insurance on the part of the employer should free him from responsibility of suits at common law, through legal measures such as represented by the amendment to the Constitution of Ohio, which makes impossible the placing of the employer in double jeopardy.

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Manifestly, any such legal provision as here contemplated will call for an elaborate specification of definitions, limitations, methods of procedure, etc. These practical requirements are already well known and in some instances already well applied.

5. A final opportunity for the solution of problems of silicosis, and all other occupational diseases, for the good of all concerned, is a modification of the foregoing. This plan provides for the averaging of rates for all industries of any state. This concept recognizes that in any state, the granite quarry's rate ordinarily would be enormous, and possibly would be represented by several dollars for every hundred dollars of payroll; while the operator of a department store would present such an experience as possibly to entitle him to a rate represented by a fraction of one cent per hundred dollars of payroll. Since the number of industries presenting low hazards so greatly exceeds the few high-hazard plants, the average rate is represented by a few cents per hundred dollars of payroll. This is best exemplified under the Ohio system, where a state monopoly, with respect to compensation insurance now obtains, and where the premium rate is but one cent per \$100 of payroll, for occupational disease coverage.

It is not known that this most inexpensive system may successfully operate except in those states that maintain a state monopoly, or in the future may so do. If in any state an equalized rate were provided and imposed upon private insurance carriers, inevitably a tendency would be created for the avoidance of extra-hazardous risks, and for unusual effort to procure policy holders among low hazard groups. Ohio, at one time, created selective rates for all of its industries in terms of prospective occupational disease hazards. Experience



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established the lack of wisdom of such classification, which resulted in the equalized rate of one cent per hundred dollars of payroll, which is so low as to take away from the intelligent manufacturer the greater quantity of his aversion to occupational disease coverage.

For the reasons just recited, states now without occupational disease laws, but contemplating such, should well consider the merits of state monopolies for occupational disease insurance.

It is the intent of this recital to point out the merits and demerits of these several systems, without at this time expressing a preference for any one over any others.

Special Measures for Silicosis. It is assumable that some states will, in the near future, provide compensation for silicosis on some basis. In such an event, a number of special provisions should be made because of the dissimilarity of silicosis and other dusty lung diseases to occupational diseases in general. Measures to meet the peculiarities of silicosis are implied in the following:

1. For every state extending compensation coverage to silicosis and other dusty lung diseases, there should be created a medical board of not less than three highly qualified, non-partisan members, whose duty it shall be to pass upon the medical merits of every claim alleging silicosis or other occupational dusty lung disease. This need grows out of the recognition that at this time few physicians have acquired sufficient experience with silicosis to be able, unfailingly, to recognize it, or to separate it from the several other conditions with which it may be confused. This medical board should be freely accessible to the family physician or other physician sponsoring a claim, and should be empowered to

take testimony, such as may be required in deriving medical facts.

Available to this board should be one or more persons competent to pass upon the engineering aspects of the situation entailed, such as ventilating systems, dust removal systems, etc. This board's investigations and reports, conducted and prepared without prejudice, should serve as the final medical word in the making of decisions.

2. Inasmuch as workers alleging silicosis may have in the recent past been employed by several employers, special regulations are required in order to place just responsibility upon the employer or employers, in whose plants the silicosis was produced. Expensive as this may be, it seems necessary to recognize that suitable x-rays must routinely be made as part of the employment examination in all hazardous dusty trades. In the absence of such x-ray evidence, the last employer becomes responsible for the causation of the silicosis.

3. In the early months and years of application of new laws extending coverage to silicosis, trying situations will arise with regard to whom may be accepted as coming within the provisions of the law. In every state considerable numbers of persons will present themselves for benefits, whose genuine condition, in fact, may have been inaugurated 30 or 40 years ago—at least, long prior to the enactment of the law. Quite clearly no law may become retroactive through any such long period of exposure. Three restrictions seem necessary during the first three years of the life of the act, forming prerequisites to the legal filing of claims.

- a. Actual disability shall first occur after the effective date of the new law.
- b. Claimant must be employed in a dusty trade at the time of the inauguration of disability.



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- c. Claimant must have been exclusively employed for a minimum of three years by his employer at the time of inauguration of disability.

While such harsh provisions as these may work some hardship upon numbers of persons actually suffering from silicosis, some such line of demarkation is necessary to the practical launching of a just law.

4. After the vicissitudes of the first three years (or few years) of the application of the law, some fixed minimum employment period within the state concerned should be applied for various classes of employment. In Ontario this period is three or five years, depending upon the trade. Current opinion is that these periods are long—that two years represents a fairer employment period in dusty trades, and that an even shorter period should be recognized for certain trades.

The medical board, earlier specified as desirable, should be clothed with discretionary powers in the consideration of the merits of the individual case. The establishment of a minimum exposure period in many respects is of dubious value. True silicosis, in fact, may develop within periods shorter than three years. On the other hand, it seems necessary to clothe industrial commissions or medical boards thereunder with some machinery for escape from the palpably questionable situation, such as a claim growing out of one to three months of exposure to a minimum of siliceous dust.

5. Occupational laws related to compensation for occupational diseases, including silicosis, should take some stand for the acceptance or debarment of early cases of silicosis without disability, and for cases of disability arising well after the discontinuation of work in dusty trades. It is not here advocated that such cases be recognized, or that provisions be made for their care,

but, at least, every basic law should recognize that such cases do arise, and in some way provisions should be made for their legal status.

In Ontario the following provisions are made for early cases of silicosis without disability—Whenever, to the satisfaction of the medical commission, the worker is shown to have the earliest detectable physical signs of silicosis, he is awarded (even though he be without disability) \$500 for rehabilitation and readjustment in new employment, for first stage silicosis \$1,000 is awarded.

6. General provisions for silicosis and other occupational diseases, with respect to medical care, hospitalization, nursing, compensation, death awards, etc., should be the same as those provided for accidental injuries.

Summary. By way of summary of what has been said in connection with compensation, it is reiterated that silicosis is such a genuine occupational disease, and so closely associated with industry as the cause, that responsibility on the part of the negligent employer in terms of compensation may not be escaped or ignored. The best plan for compensation probably has not been devised. Even if compensation under state control be accepted as the best plan, special provisions for the just meeting of the peculiar problem of silicosis are requisite.

An alternative to compulsory compensation laws has just been provided by the U. S. Circuit Court of Appeals (Third District) through a decision requiring the establishment of neglect in the causation of silicosis, regardless of the severity of the disease, or the clear-cut origin in a given industrial plant.

SUMMARY

Silicosis is a genuine and direful occupational disease,



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threatening many industries utilizing silica in one or more of its many forms.

In foundry work in the absence of protective measures, silicosis may arise in any department, but chiefly is limited to the three departments designated as 'Casting cleaning'—'Sand conditioning'—and 'Shake-out work'.

In the early future, more rather than fewer cases of silicosis may be expected in many industries, including the foundries.

Basic court decisions place the responsibility for silicosis on the employer in the event of neglect, which in turn means the absence of adequate preventive measures. Prevention of silicosis in the foundry is practical, and not especially difficult or expensive. The primary requirements for prevention are—

- a—Short periods of services of workmen in casting cleaning, and other highly dusty operations.
- b—Sustained and painstaking housekeeping, to the end that the quantity of dust in the foundry may be reduced.
- c—The use of positive pressure hose masks at dusty work points,
- d—Careful physical examination of applicants and employees, including x-ray examination,
- e—Use of dust-tight blasting machinery,
- f—Substitution of steel or synthetic abrasives for sand, or other methods of casting cleaning, wherever practical to do so.
- g—Entrainment of all possible dusts at their point of origin.

Since no treatment of silicosis is known to be efficacious, extra incentives for prevention exist. Apart from the many human considerations that prevail, extraordinarily high cost per case for silicosis (which cases

nearly all terminate fatally) makes preventive measures highly desirable, economical, and in fact a necessity. The average cost per case of silicosis approximates \$10,000.

Compensation for silicosis is now provided through compensation boards in only five states, (California, Connecticut, Massachusetts, North Dakota and Wisconsin.) In 42 states suits at common law are permissible.

Many plans related to compulsory compensation for silicosis have been devised. These plans assume a responsibility on the part of the employer to the afflicted workman and (or) his dependents. A choice must be made between the best of these various compensation plans, and resistance at common law for disputed cases using the ancient doctrine of "No neglect."

WHATEVER THE CHOICE MAY BE, IT IS TO BE RECOGNIZED IN THESE DAYS OF FORMULATION OF A GENERAL PROGRAM OF SILICOSIS CONTROL, THAT THE FOUNDRYMAN NEEDS TO HAVE A CLEAR-CUT DELINEATION OF THE EXTENT OF HIS RESPONSIBILITY AND THE CHANNELS THROUGH WHICH HE MAY BE EXPECTED TO MEET THIS RESPONSIBILITY!

DISCUSSION

By E. O. Jones

Belle City Malleable Iron Company, Racine, Wisconsin

It might be of interest to all of us, before we start this discussion, to ask this question: How many here ever heard of the disease Silicosis spoken of in connection with the foundry industry prior to 1928? Prior to 1929?

It is probable that our attention was first called to Silicosis by the U. S. Health Service Bureau bulletin

No. 187 entitled "The Health of Workers in Dusty Trades." This bulletin covers a survey made in the Granite Industry at Barre, Vt., the study having been started in 1924 and completed in 1926. It was not, however, submitted for publication until October, 1928.

We are informed that during this period of time the executives of the National Safety Council authorized the appointment of a committee empowered to inquire into the importance of the problem of the sandblasting hazard in the United States, and the desirability of the National Safety Council conducting a study of the problem. Dr. Leonard Greenburg of the U. S. Public Health Service was named Chairman of a committee of six to make this investigation. The outcome of this investigation by the National Safety Council will be given later in this report.

It is interesting to note that while Pneumoconiosis and Silicosis have, in some countries, been prevalent in various industries for many years, it was not until 1931 that legislation was enacted which would affect the foundry industry in its entirety.

Within this short space of time, we in the foundry industry were suddenly confronted with a health hazard which we were not aware actually existed.

Now to what extent does this health hazard actually exist in the foundry industry? We will review just what has taken place in the state of Wisconsin and how the foundry industry of this state is attempting to solve the problem.

Compensation laws of the U. S. covering health hazards are in no way uniform and vary to a large degree in their scope of provisions. Ten states, three territories, the District of Columbia, and the U. S. have acts

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which include provisions for payment of occupational disease.

A study of compensation laws in the U. S., Great Britain, and Canada discloses some very interesting and enlightening facts. We find, for instance, that in the U. S. only 10 states at the present time cover occupational disease in a general way and in all of these, state laws still provide fertile ground for dispute due to the wording of the act.

Illinois, Minnesota, New Jersey, New York, Ohio and Porto Rico specify the occupational diseases their act covers. Wisconsin, California, Massachusetts, Connecticut, North Dakota, District of Columbia, Philippine Islands, and Hawaii cover occupational disease without schedule. Arkansas, Florida, Mississippi and South Carolina have no compensation acts whatsoever. The state of Arkansas attempted to pass an act in 1929 but failed. In Michigan and Texas the code of the compensation act was such that it might have been interpreted to include occupational disease but the courts have definitely ruled out occupational disease in interpreting the act.

In the state of Wisconsin what constitutes occupational disease is left entirely to our Industrial Commission. There are of course many difficulties confronting those who are responsible for rendering decisions growing out of claims for occupational disease:

1st—They must consider and decide whether the employee has been subjected to the health hazard which would bring on the disease for which he is filing claim;

2nd—Whether he has the disease; and

3rd—If he has it, what amount of disability should be allowed.

During the latter part of November, 1930, our Industrial Commission notified the industries of our state that due to the increasing number of silicosis claims filed, they proposed to publish a code covering dust, fumes, vapors and gases. The first reading of this code was held on December 4, 1930. (As dust is what the foundry industry is possibly most concerned about, we will deal only with that part of the code.

At this hearing many discrepancies in the proposed code were pointed out by the representatives present from our industry. Perhaps the most glaring of these was the proposed schedule for the maximum allowable concentration of silicosis dust under ten microns in size, present in a cu. ft. of air. The maximum count permissible, according to this code, was 250,000 particles which would be less than what one might find in the atmosphere of any city street. When we think of dust we ordinarily think of that which we can see. The dust particles which are of interest to us are not usually visible to the naked eye. (This piece of screen will give you some conception of the particle size of the material about which we are concerned. This is a piece of 280 mesh or a screen fineness which would permit passage of particles 50 microns in diameter—that is, particles five times the size of those with which we are concerned, or 10 microns in diameter.)

Immediately after this hearing a general meeting of foundry representatives was called by the Wisconsin Manufacturers' Assn. to acquaint our industry with the havoc which this proposed code would create if adopted in its present form.

At this meeting a committee of 7 foundry executives, with Harold S. Falk, Vice-Pres. and Works Manager of the Falk Corp. of Milwaukee as Chairman, were

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appointed for the purpose of combating the dangerous situation with which our industry was confronted.

Mr. Falk and his committee did a very commendable piece of work and our entire industry is indebted to them for their conscientious and untiring efforts to bring about a program which would be identical in purpose with that to which the foundry industry had directed and were directing its efforts.

It might be of interest to cite just what this program has covered so far. The initial step in this committee's activities was to call upon the members of our industrial commission to solicit their cooperation in formulating a program of research which would in turn assist the commissioners in drawing up a code which would be practicable and workable in its application. In this they were successful and the necessary funds were solicited from the companies operating foundries to start a survey in our plants with a view to determining the most satisfactory and effective means of reducing or minimizing any excessive dust conditions then prevailing.

Mr. Clarence Bartlett, an industrial engineer, was employed by this committee to make the preliminary survey. When this work was completed in a representative number of foundries, the report showed that regardless of the merits or shortcomings of the proposed code, there was apparently a large amount of dust being created unnecessarily in our manufacturing processes. What percentage of this dust was under 10 microns in size was the next question. Pathologists tell us that particles over 10 microns in diameter are seldom found in the human lungs.

Through the courtesy of some of our firms who carried their group and health policies with the Metropoli-



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tan Life Ins. Co. we were able to appeal for help through their policyholders' service Bureau. This Bureau maintains a department of hygiene which has devoted considerable time to the study of dust and its effect on human life. The Metropolitan immediately responded by placing at the service of this Committee, the personnel of their Hygiene Department.

On May 15, 1931, the second stage in this program was taken up by the personnel of this department and completed a few months later, with 21 representative foundries participating in the work. The study was grouped into four general classifications: Gray Iron, Steel, Malleable and Non-Ferrous.

Two hundred fifteen (215) X-ray examinations were made of chests of workers exposed to foundry dust. These workers were selected from locations where dust concentrations were the highest. Dust samples were taken at various places of employment, and process analyses made, as well as sanitary conditions noted.

After the study was completed in each of these foundries, the management received a report of the conditions as they were found in his plant. Photographs were included showing how and where the dust sample was collected. The results of the dust counts taken were charted to show the sizes of the dust particles, ranging from 10 microns to under 1 micron in size. When the entire study was completed, each of the firms participating received a composite report. This report was published in code and no photographs shown which would serve to reveal the identity of any of the companies contributing. This report served the further purpose of giving a complete picture of dust concentrations under 10 microns in size as they were found in our various occupations in the foundry and provided Mr. Falk

and his committee with an effective medium of measurement.

I might say here that our industry in Wisconsin is deeply appreciative of the very valuable contribution made by the Metropolitan Life Ins. Co. during and since this survey and in particular to their Dr. McConnell, Mr. Wm. Fehnel, and Mr. Norman B. Scott, all of whom gave unstintingly of their time and effort in helping to solve this problem.

While this part of the program was in progress, the Industrial Commission suggested that one foundry be selected as an experimental laboratory to test out the practicability of suggestions for dust prevention as they were made. Harold Falk kindly offered the use of their foundry for this purpose and our industry is indebted to Mr. Falk and his company for the many practical ideas which have developed as an outcome of this experiment. This procedure saved much individual expense and time to the foundry industry in our state.

Now I would like to digress a moment to give you a picture of what was going on behind the scenes.

On December 4, 1930, as mentioned, we were informed a new code was in the making. On May 15, 1931, the Metropolitan study was started and on September 10, 1931, we were informed that there were pending before the Commission, claims for Silicosis amounting to approximately \$600,000. Some foundries had as many as six cases filed against them and not any of these were confined to any one occupation of the industry.

It is significant to note that the majority of these cases were being handled by the same law firm, and furthermore, that the diagnoses were being made by the same doctors. This situation naturally disturbed our



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industry as from investigations it became increasingly apparent that few doctors were qualified to properly diagnose for this disease, which was of comparatively recent development, in our industry, and there was a possible danger of some of these cases pending being settled by the compensation insurance companies without the proper kind of medical testimony being presented at the trials before the Commission.

One large insurance company in our state, the Employers Mutual Liability Ins. Co., who carried approximately 70% of the compensation policies on foundries in our state, had assured Mr. Falk that when he and his committee had found, in their investigation, a silicosis claim which they felt would make a good test case, they would be willing to follow any procedure which might be suggested.

Up to this time awards were being made against our industry in amounts ranging from \$6,000 to \$18,000. A short time after this offer by the insurance company, a silicosis case developed which the committee considered would answer this purpose.

We will cite here, briefly as possible, just how this case was developed and some of its more interesting angles.

The plaintiff in this suit was a man 65 years of age who had been a molder for 32 years. His original complaint, as diagnosed by his own physician, was a saculation on the large vessel leading away from the heart. From X-ray plates, his physician at the first hearing, testified to this condition and pointed out an enlargement of the aorta the size of an orange. He also testified that this man's condition was the result of his work and the condition was common among molders. Incidentally we might say here that it was found that this

man had a lateral curvature of the spine and the seeming enlargement on the aorta was due to this condition causing a large vessel to be pushed to one side, making it more prominent.

The attorney for the insurance company did not want this case to rest on this doctor's testimony so requested permission from the Commissioner to have the plaintiff re-examined by another doctor. The doctor employed for this examination reported he was of the opinion the plaintiff's disability was not caused by his heart condition, but in the main by silicosis. The employer of the plaintiff, having no acquaintance with either of the two doctors making diagnoses, decided they would have the plaintiff examined by a doctor who had considerable experience in this particular disease. All of the X-ray plates which had been taken by both of these doctors were sent to Dr. McConnell of the Metropolitan Life Ins. Co. who in turn sent them to two doctors who were by national repute, considered to be authorities on this disease. Both of these authorities reported that this employee's disability was not caused by Silicosis.

The plight in which this employer found himself as a result of these conflicting medical testimonies, was explained to Dr. H. K. Pancoast of the University of Pennsylvania, who was one of the authorities to whom these plates had been forwarded. We succeeded in prevailing upon Dr. Pancoast to come to Wisconsin for the purpose of aiding us in this work. The day before the trial Dr. Pancoast made a complete examination of the plaintiff and ordered new X-rays taken according to the technique which he prescribed. On the day of the trial he occupied the witness stand for approximately

four hours, giving a complete diagnosis of the case and explaining the methods employed in so doing.

An interesting angle was brought out in his remark that when the opportunity was first given him to study these X-Ray plates, approximately nine months previous to the hearing, he and his associates had found a tuberculosis lesion but that from his observation so far none of the doctors who had previously testified to this man's condition had made mention of the fact. He explained this was his reason for asking, on two different occasions since he had seen the first plates, that new X-Ray plates be taken of this man's chest. He remarked that he was satisfied, from the plates which had been taken the day before, that this lesion was dormant.

Some of these doctors who had preceded Dr. Pancoast and were testifying in favor of the plaintiff, had been qualified as Tuberculosis experts but had apparently missed this lesion. Dr. Pancoast explained that from the testimony he had listened to, he could not help but think that the doctors had not made a complete diagnosis, having failed to make stereoscopic films or lateral views of the chest, or conduct a fluoroscopic examination, all of which he and his associates felt were essential to a complete and proper diagnosis of Silicosis. An opportunity had been given him to view the plates from which the doctors for the plaintiff had made their diagnoses and these he condemned from a Roentgenologist's standpoint, pointing out that the films referred to had not, he thought, been properly exposed, substantiating this statement with the explanation that due care should be exercised in securing the proper exposure and penetration on chest films for the reason that under-exposure tended to exaggerate or



bring out too much, while over-exposure produced the opposite effect.

The thoroughness and efficiency which characterized Dr. Pancoast's work left no doubt in our minds as to the wisdom of bringing him to our state, and served to increase the confidence which had originally prompted our soliciting his assistance. There is no question, but that he was instrumental in throwing considerable light on the subject of Silicosis not only for the laymen but for the medical men as well.

On the evening following the trial, Dr. Pancoast was entertained by the State Medical Society, at which time he lectured for about three hours. The following day a clinic was held in one of the local hospitals and some of the plaintiffs of current cases brought in. These Dr. Pancoast made a complete diagnosis of in the presence of the doctors who had been invited.

The outcome of this trial was a verdict in favor of the defendant.

Now the question which prompts itself is "What was accomplished in this test case?" To summarize:

1. The Commissioners were given their first opportunity to listen to the testimony of an authority on Silicosis.
2. Notice was served on the unethical men in the legal and medical profession that we were prepared to combat their inexperience in diagnoses of this disease.
3. The clinic by Dr. Pancoast was conducive to awakening a genuine interest among our medical men in this comparatively new disease and acquainting them with its many complications.
4. The interesting fact was brought to light in this particular case that the plaintiff, a man of 65 years of age, 32 of which were spent in the foundry as a molder, had not contracted the disease to a disabling degree.

By way of suggestion, based on our experience in Wisconsin, we would recommend that all cases be inves-



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tigated very thoroughly and that in every case medical services of a thoroughly reliable nature be enlisted.

Now we again digress to learn what the committee appointed by the National Safety Council in 1928 have been accomplishing. In the latter part of January, 1932, Dr. Leonard Greenburg, who was chairman of the survey and who compiled the report known as "Health Protection in Sandblasting and Metallic Abrasive Blasting," announced that they were ready to submit to the committee for adoption, the report on which they had been working. The date for the meeting of the entire committee of 38 members was set for February 23 but for various reasons only 12 members of this committee were present. The result was the adoption of the report by a vote of 11 to 1. The gentleman who entered the protest vote asked that he be allowed to prepare a minority report. This request was granted. When this information was received a conference was called to be held in Chicago in conjunction with the other national foundry associations to discuss this situation. This meeting was held on March 8 and there were in attendance representatives from every national foundry organization. The result of this meeting was that those present were unanimously of the opinion that if this report were published as adopted it would expose the foundry industry to serious and unjust penalties.

Mr. Bergquist, President, and Mr. Cameron, Secretary, of the National Safety Council, who were invited to attend this meeting, informed our representatives that nothing would be done with this report until the foundry industry had an opportunity to present their reasons for its non-publication. It was suggested that a committee be appointed to appear before the National Safety Council at their executive meeting, requesting

that adoption of this report by that committee be postponed. This procedure was carried out and our industry was given three months' time to prepare its protest. If I were to attempt to enumerate just what took place and the nature and scope of the work necessary by your Association Secretaries to complete this investigation, I should consume the remainder of the afternoon and a good portion of the morrow. I believe most of you are acquainted with the results of the investigation.

During the course of these events Mr. Falk and his committee were formulating and carrying out their program. We have referred to the Employers Mutual Liability Insurance Co. previously in this report and have mentioned the fact that they carry the compensation policies on 70% of the foundries in our state. Therefore they were vitally interested in our situation and kept in very close contact with Mr. Falk's committee. The outcome of these conferences was that this company established a complete dust laboratory for the purpose of testing and determining the amount of harmful dust in the air at a given time and in different places in a plant. This laboratory was put in charge of Dr. E. G. Meiter who was associated with the United States Bureau of Mines and located in Pittsburgh. He is one of the outstanding authorities on this line and on harmful gases and also for the proper equipment to combat these dangers. Dr. Meiter has not only made many dust counts in the different plants and determined the amount of silica contents in the dust, but he has also spent considerable time in consultation with manufacturers in reference to the proper equipment to safeguard the lives of the employees. This of course has been a very valuable service and is helping us to eliminate in many ways, unnecessary dust in our plants.



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After some of these studies had been made, the Insurance Company decided that they would hire a competent ventilating engineer, in the assumption that his services along with Dr. Meiter's would help to bring about the most effective results in the shortest possible time.

The outcome of this service made evident the fallacy of the idea that it would be necessary to purchase new equipment involving large expenditures of money, as it was found that with proper supervision, and the repair and maintenance of equipment already installed, we could materially reduce the dust at its source. We could here enumerate many practical instances to substantiate this statement from field notes of the men who made these studies.

After eliminating dust at its source as much as possible our next step was to clear the interiors of foundries of the accumulation of loose dust. This was accomplished in various ways, such as the use of water under pressure, by air, or merely brushing. In many instances this cleaning was followed by a painting of the interiors with white or aluminum paint.

Floors and gangways are kept clean from accumulations of loose sand and whenever practicable, gangways and aisles are kept moist by sprinkling. All refuse material is thoroughly moistened before being moved from the foundry. Floors are all thoroughly sprinkled before they are swept.

In many plants wind charts have been provided so that most favorable results can be obtained from natural ventilation.

The more recent move in connection with Silicosis is the establishment by the Employers Mutual Liability Ins. Co. of an X-Ray laboratory for the purpose of

physically examining not only the new employees who may be going into a foundry, but also those who have been in the foundry for some time. This laboratory has been put in charge of a doctor who has had a number of years' experience in chest work and we also have the promise of the U. S. Government that this work will be directed for some months by a member of the U. S. Government Bureau of Health who has had many years' experience in the silicosis hazard. In addition to the doctor there will be an X-Ray laboratory technician and a general technician for the purpose of examining blood and other physical conditions of the employee. In this connection they will keep a complete card index of all employees either working in the foundry industry or making application, and in this way make the laboratory a clearing house and center from which the foundry industry can be assured of securing none but healthy individuals from a chest standpoint, at least, where the occupation is to expose them to any of the dust hazards. Of course it is not the purpose to discriminate against anybody for employment where this hazard does not exist, even though he may have some other complications.

In conclusion, I might say we have been challenged with a serious problem, and the most effective way in which we can meet this challenge is through prevention and control—prevention of conditions which are contributory to the contraction of this disease, and control of such conditions as may encourage or augment it; in other words, Good Housekeeping should and must be our earnest endeavor at all times.



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