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CEMENT-ENGINEERING
NEWS

Founded
1896

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Dust Hazard in Rock Products Industry

Only Dusts Containing Silica Are Dangerous—Digest of Papers and Discussion at the National Safety Congress

THE RECENT National Safety Congress at Washington, D. C., included a symposium on the dust hazards to health in industry, a subject of particular interest to some rock products producers at this time because of the activity of a certain type of lawyer in promoting lawsuits for damages, running (in the aggregate) to millions of dollars.

Dr. Leonard Greenburg, Yale University, New Haven, Conn., presided as chairman. The first paper by Dr. L. U. Gardner, director of Trudeau Laboratory, Saranac Lake, N. Y., dealt with the kinds of dust encountered in industry and their effect upon the lung tissues. The second paper by J. J. Bloomfield, U. S. Public Health Service, Washington, D. C., followed with a discussion of the methods of determination of dust as to particle size and concentration in the air. The third paper by Dr. A. E. Russell, U. S. Public Health Service, Washington, D. C., discussed clinical and statistical studies in various dusty trades. In the fourth paper, Theodore Hatch, of the Harvard School of Public Health, Boston, Mass., discussed the various methods of dust control in industrial plants, and in the fifth paper, Prof. Philip Drinker, Harvard School of Public Health, outlined the various methods for protecting the worker against dust inhalation.

Dr. L. U. Gardner said in part: "At first it was thought that all dusts were capable of producing disease, but with further study it became obvious that different types of dust produced different effects. With further study it became obvious that dusts containing silica were particularly harmful and that they produced definite changes in the lung tissues. Today we recognize silicosis as a form of disease which is quite definite. There are other forms of changes in the lung tissues which are produced by the inhalation of dust about which we know little.

"We know many of these dust conditions are associated with a factor of infection in the lung. Some believe that silicosis can not exist without a background of latent infection. However, this is an extreme view, as we know we can produce experimentally a true silicosis in animals by the inhalation of silica alone.

"Much has been written about coal miners and the factor of infection due to inhalation of dust. Pneumonia rates are excessive among coal miners, but probably the tuberculosis rate is lower than in other industries. This seems to end with different groups, and much more work must be done before we can talk definitely

Lime Dusts Not Injurious

ROCK PRODUCTS took an active interest in the dust problem in its industries as early as 1921, when the editor heard from various producers that lime and limestone dust had been regarded in the industry for generations not only as not harmful, but actually helpful in the treatment of tuberculosis. In the January 14, 1922 issue is a 6-page article on "Lime and Tuberculosis" containing a symposium of the experience and opinions of numerous lime manufacturers and a summary of existing literature on the subject.

The subject has been continuously discussed in *Rock Products* since that time. In the June 28, 1924, issue is a 5-page article on the use of both lime and gypsum dusts as possible preventives and cures for tuberculosis. These articles received wide notice and Dr. Miriam Iszard was led to make her thesis for her medical degree at Johns Hopkins University on the subject. Her conclusions were not very specific as to the effect of these dusts as cures or preventives, but were quite definite that lime and gypsum dusts were not causes of tuberculosis, or silicosis, as are dusts containing silica.

In the course of these 10 years *Rock Products* collected and published much information in regard to experience and experiments with lime, limestone and gypsum dusts which should be very helpful to any producer faced with lawsuits as a result of alleged injury to health due to exposure to these dusts. The great preponderance of evidence is that the "lime salt" dusts are dissolved in the lungs and provide calcareous material to heal the lesions of tuberculosis.—The Editor.

"All dust, when inhaled, mechanically injures the lung tissues, and the small particles injure the cells. We know that the type of injury varies with the nature of the dust particle."

Dr. Gardner showed a number of lantern slides illustrating the effect of dust on the lung tissues: "If coal dust is present in excessive quantities and silica in relatively insignificant amounts, we have a distribution which is comparable to that of pure coal. If silica is in excess and coal not abundant, we have a nodular type similar to silicosis.

"As far as asbestos is concerned, we do not know the whole story. An autopsy report of an individual dying of asbestosis

has shown a tuberculosis complication. Until we have more statistics of people working in asbestos dust we should not say too much about the part played by tuberculosis in association with this condition."

Analyses of Mineral Industry Dusts

J. J. Bloomfield said in part: During the past nine years he had made numerous investigations of the dust hazard in many industrial establishments. He presented a summary which showed that the highest dust exposure was in talc mines, slate finishing mills, quartz (silica) grinding plants, coal mining and granite cutting operations. Owing to the high percentage of silica present in the dust of quartz grinding and granite cutting plants he found these to be the most hazardous of the occupations which he had studied.

"A knowledge of the dust content of the industrial atmosphere is required," said Mr. Bloomfield, "not only for the purpose of determining the extent of the hazard involved in various manufacturing processes, but it is also useful in measuring the efficiency of protective devices which may be used in the elimination of the dust hazard."

In discussing the health hazard, he said: "It is now well established that the inhalation of certain types of dust, such as granite dust, will in time produce fibrosis of the lungs, at times associated with tuberculosis. In other cases exposure to dust may result in the production of a far less degree of fibrosis without notable tendency toward subsequent tuberculosis; this is true of cement dust. And finally, there are certain types of dust as typified by marble dust, which in the quantities and lengths of exposure so far observed produce little lung fibrosis. In general it has been found that those dusts which are high in silica content are the ones which produce a disabling fibrosis of the lungs most readily. Hence, the necessity for knowledge concerning the chemical and mineralogical composition of a dust is obvious.

"With reference to the quantity of dust present in the air of a workroom, it is apparent that when the dust concentration is high the exposed person will inhale a greater quantity in a given period of time than he will when the dust concentration of the atmosphere is relatively low, and since the rate of production of the disease is partially dependent upon the rate at which the dust is inhaled, this latter fact plays an important role in predicting the relative danger of different environments. Hence the need for the evaluation of the quantity of dust in the industrial atmosphere is obvious.

"If dustiness can be controlled by local exhaust fans and dust-collecting equipment, protective devices such as respirators or positive pressure helmets have no place except as emergency equipment. However, many processes like abrasive (sand or steel) blasting, paint and enamel spraying, porcelain manufacture, stone cutting, sand grinding, and the like, will not, in all probability, be made reasonably dust free for some years to come. In work of this type, respirators and other protective devices have an important place. The safety man should understand thoroughly what can be expected of protective devices and, above all, should be able to check and observe whether the workmen are getting the protection they require.

"One sees occasionally statements to the effect that respirators have no place in industry because they filter out only large particles and let pass the small ones which are always the more harmful. Against this is the indisputable fact that the dust catching efficiency of several makes of respirators exceeds 90% on silica dust with particles less than two microns. A careful measurement of the size of dust particles entering and leaving respirators shows a slight but unimportant reduction in average size of the dust particles."

Professor Drinker reviewed the specifications for respirators which have been formulated by the U. S. Bureau of Mines and paid glowing tribute to the high caliber of its work and its importance to the safety movement. Also he outlined the requirements for testing sand blast helmets and paint spray masks.

"The manufacture of protective equipment," he said, "should be allowed all possible license in modifications and improvements having to do with appearance, obstruction to vision, comfort, ruggedness and practicability of his equipment. If the manufacturer desires his product to be certified as to its performance under the conditions for which he designed and built it, the prospective purchaser and safety engineer is equally desirous of knowing the performance data."

Discussion

Discussion was withheld until all papers were read. Chairman Greenburg then called upon various people for comment. Following this the meeting was thrown open for general discussion and then the original speakers called on for replies.

Dr. Pancoast, pathologist, University of Pennsylvania, said in part: "I have been interested in silicosis for a number of years. We have the very best way of finding out what changes are taking place in the lungs by x-rays. There can be no dispute to that question. We also have one of the best ways of determining the incapacity of the individual, but most of these examinations are not carried out thoroughly and the information is not given. The x-ray examination is only one small part, and that is

something that is overlooked so frequently. A physician who has little knowledge of the subject will present x-ray pictures—and diagnose silicosis as the cause! It takes all of the ability of many witnesses who know something about the subject to counteract the few words he may say. Many here know that. We must know the kind of dust, dust counts, chemical constituents of the dust, clinical aspect of the case, time of work, how long he works each day, whether he is breathing the general atmosphere of the room or a more concentrated atmosphere. Previous occupation is often overlooked. All of these different sides to the question must be taken into consideration in every instance in which a man is charged with lack of capacity for work."

Dr. McConnell, Metropolitan Life Insurance Co., said: "Dr. Russell made a very important point in calling our attention to the necessity of having authority to decide cases. This is a matter of considerable interest to the meeting, and much thought should be given to it."

Mr. Cunningham said: "The whole situation has been presented very thoroughly. Two things have occurred to me: (1) Those stone cutters who have cut limestone for 15 or 20 years and who have tuberculosis, in each case have cut sandstone previously. Whether a short exposure a long time ago is important 20 years later is important. (2) Examination of workers who have been exposed simultaneously to silica and alkali. Reports have been made showing silicosis may develop rapidly. I am interested in the presentation of the situation regarding the control of dust because it is the real problem ahead of us."

Dr. Lloyd, U. S. Bureau of Standards, said: "Dr. Drinker told us how they test the respirator and pointed out the impracticability of using positive air pressure as a dust eliminator. A definite opinion is desired as to what type of respirator is adequate under bad dust conditions and within acceptable operating limits for protecting a man."

Dr. Drinker: "I certainly do not consider respirators adequate under such circumstances. Supposing you have a dusty atmosphere of, say, 50,000,000 count and you want to reduce it to 20,000,000. If your respirator is 90% efficient it would get the dust concentration down to 5,000,000, but eight hours a day constant use will be objectionable. In jobs in places like foundries, mines, sand blasts, etc., the exposure is not continuous. In such cases the respirator is not worn continuously."

Dr. Knutsen, Wisconsin Industrial Commission, said: "Two or three of the speakers made mention of the decision of claims which are made as the result of men becoming incapacitated in working in dusty occupations.

"This, to me, has been one of the most

interesting sections I have attended in over 10 years of Safety Council meetings. The problem of silicosis and tuberculosis has been before us in Wisconsin since 1917, because of the fact that at that time our compensation law was amended providing compensation benefits for any disease or disability resulting from an occupation. I appreciate that one or two states have such provisions. I suggest one way of deciding a case is to have compensation laws amended covering all diseases of occupations so that claims may be decided by the industrial commission rather than by juries as the result of civil claims being filed.

"I will relate briefly difficulties we have. I do not wish to make a statement reflecting on the medical profession. The difficulty is this. Oftentimes a claim is presented to us for compensation by some individual because of a disability allegedly resulting from silicosis. In many of those cases we have members of the medical profession testify in behalf of the clients, who we personally are satisfied are not specialists or competent along those particular lines. The discouraging thing to us is that in hearing the evidence we have men before us who have specialized for years in lung diseases, men who are engaged in private practice and are at the head of tubercular institutions, testifying one group on one side, that the results of physical findings and x-rays show that the patient is disabled as a result of silicosis. Others equally qualified testify to the contrary. We have had some of these cases when we heard testimony and the individual didn't have long to live. We withheld our decision until the individual passed away and suggested an autopsy. We can not force an autopsy, but we are privileged to withhold our decision. After the autopsy, these two groups of doctors take specimens, examining them microscopically, and we hear them taking the same position that they had in the first hearing. That, I want to say, is mighty discouraging."

Dr. Roach, compensation commissioner for the state of New Jersey, said in part: "I am very much interested in the subject, because silicosis is a thing that we are very much concerned about in New Jersey at the present time. I might say that we have some experience in compensation cases in the state parallel to that described by Commissioner Knutsen from Wisconsin. It doesn't require much evidence to prove that certain quantities of silica are harmful to the human system. After an exposure continuous over a period of time long enough, permanent physical damage is bound to result, maybe to the point of the extinction of the individual. There are certain things that I am very much concerned about in connection with this subject of dust. To find some workable productive device that will safeguard the men who are exposed in 60 or 70 different industries to silica dust. It is not easy. It may be that in the laboratory ex-

periments, under rather favorable conditions, a piece of apparatus may be developed which is satisfactory. Respiratory devices that might be good on some may not work so well on others."

Dr. J. G. Cunningham, commissioner of hygiene, Toronto, Ont., said in part: "Many cases in mining come from physicians when examining miners for employment. All cases are referred to a compensation board. When the claim is received by the board it makes its arrangements to insure that all other requirements of the act have been met. In Ontario a miner must be exposed for five years. Other occupations have various exposure time limits. After these provisions have been met the cases are referred to a referee board, which is composed of three members, two of whom must see the case and complete the examination. Decision must be unanimous, and is final, and the claim is referred back to the compensation board."

Dr. Russell: "Dr. Cunningham spoke of finding among his limestone workers that they had worked in sandstone years before. If you will remember in the 'Granite-Cutting Bulletin' the death rate for manufacturers was almost equal to that of granite cutters. In most instances he (the manufacturer) was not exposed to dust. He did not work at it eight hours a day. The story is that the majority of manufacturers started out and learned the stone business by being granite cutters."

"In these days of law suits it is surprising how quickly experts can develop. I think commissioners and their boards should pay more attention to the qualifications of their experts."

Dr. Sayers, U. S. Public Health Service, said in part: "I have in mind two cases. The men both had silicosis and tuberculosis for 19 years. Both of them are still at work. We have examined them periodically right along during the period. They are not in good condition, but they are at work. I do not believe we are in a position to say whether a man has susceptibility to tuberculosis. Throughout the time the information was available, it looks as though susceptibility to tuberculosis continues for at least 20 years."

Dr. Lawrence Greenburg: "Will someone say something regarding the so-called acute cases of exposure? Most of us have the idea it is a matter of long gradual exposure."

Dr. Russell: "Acute silicosis is a problem that is facing industry. I personally can not think of silicosis as anything but chronic, my first experience being with granite workers. One case of silicosis had eight months' exposure. In a tuberculosis sanitarium the superintendent was kind enough to give me an x-ray. It is sometimes impossible to demonstrate physically or with laboratory evidence a case of active tuberculosis. In

The Journal of the American Medical Association, an article by Dr. Chapman of Boston tells of exposure extended to three years. They were considered as acute cases."

Management of Labor in Mining Operations

HOW some of the mining companies have developed efficient organizations is described in Information Circular 6650, "Management of Labor in Successful Metal Mine Operations," recently published by the U. S. Bureau of Mines.

This 35-page bulletin summarizes the data contained in some 80 information circulars on individual mines and discusses the advantages and disadvantages of various systems of paying and handling labor.

Since the cost of labor is more than 60% of the cost of mining, the development of efficient, willing workers is of the greatest importance. Organization, responsibility and planning are also discussed. According to the circular, 40% of the mines described operate entirely on a contract or bonus system, 44% operate partly on contract or bonus and partly on a day wage basis, and 16% operate on a day wage basis.

Increasing Cement Kiln Output

THE use of chains in the feed end of a wet process cement kiln is described in an article by E. Schirm in the September issue of *Cement and Cement Manufacture*.

The first of the accompanying illustrations shows an arrangement of chains to effect heat transfer and to expedite the passage of

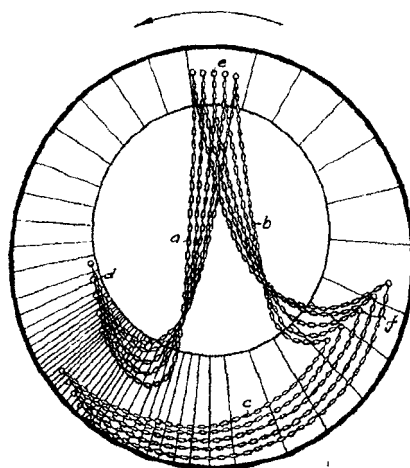


Fig. 1. Arrangement of long chains

the material along the kiln. The chains are attached in groups (three groups only being shown in the illustration) in a spiral formation, the curtain of hanging chains forming a spiral surface which moves the material forward as the kiln revolves. This arrangement gives a good exchange of heat between the gases and the material.

The second illustration shows another ar-

range where short heavy chains are used. They are hung in spiral formation so that they may move the material along the kiln more effectively, but the greater part of the kiln section is left open so that there is not as much transfer of heat flow.

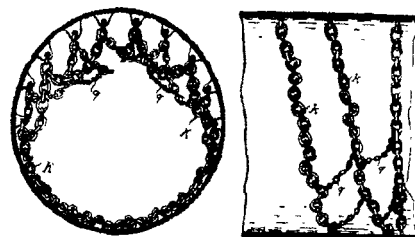


Fig. 2. Arrangement of short chains

it is stated, the long light chains can be used along with the short heavy chains, or each kind can be used in alternate zones.

The article states that the use of chains and other devices in the upper zones has considerably increased the output and that it has been found that the clinkering zone can readily handle more than the normal quantity of material which would pass through a plain kiln.

It is also stated that the radiation loss from a kiln depends upon the shell dimensions rather than the amount of material passing through and that the loss per unit of output is reduced by working at higher capacity. These methods in the wet process and similar methods in the dry process are stated to be an important advance in that one kiln can be made to do the work of two.

Rubber Sheathed Cables

ACCORDING to the Bureau of Mines there has been a marked improvement in recent years in the construction and performance of rubber sheathed trailing cables used with electrical equipment. While some failures are due to kinking and overheating when on a reel, most are caused by crushing as a result of being run over by a car or being struck by falling material. Crushing tests made by the bureau, using a 7-ton car, indicate that twin or duplex-type cables withstand such crushing better than concentric types.

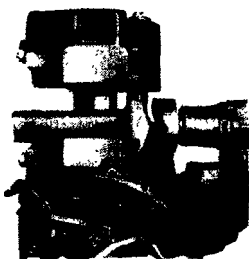
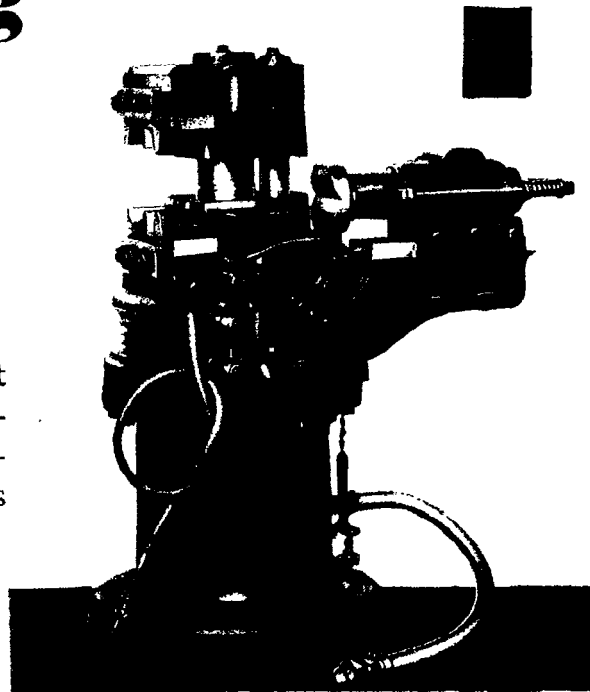
Full information covering these investigations is contained in a 52-page booklet published by the Bureau of Mines, U. S. Department of Commerce, as Bulletin 358, which may be obtained from the Superintendent of Documents, Washington, D. C.

Canada Asbestos Production

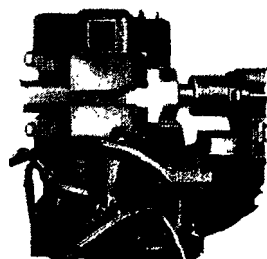
ASBESTOS production in Canada during July amounted to 7171 tons, a decline of 10.1% from the June shipments and 47.3% from the July, 1931, total. During the seven months ending July, Canadian producers shipped 60,753 tons as compared with 93,386 tons in the corresponding period of 1931.

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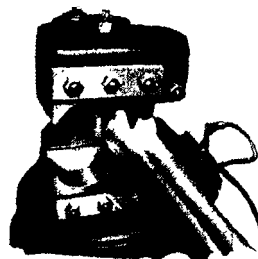
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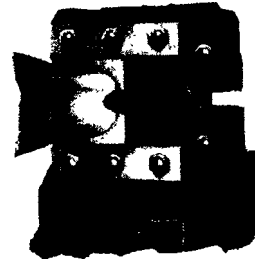
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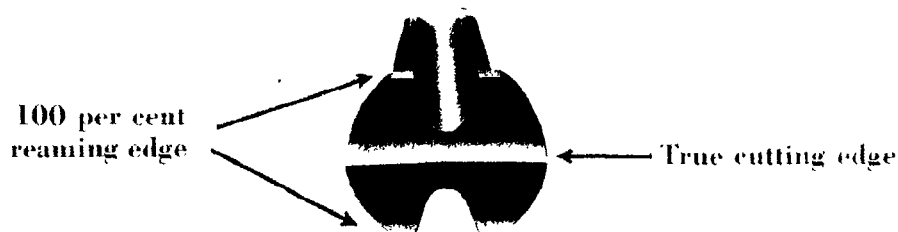
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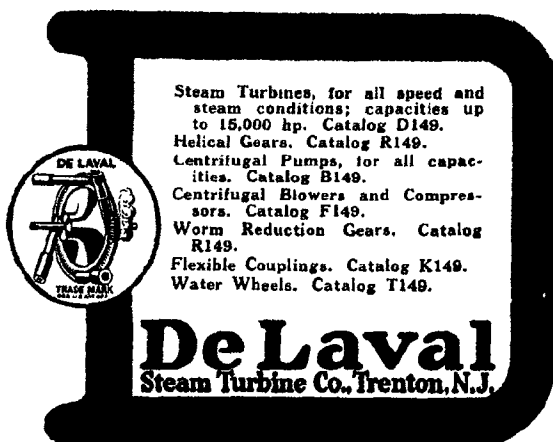


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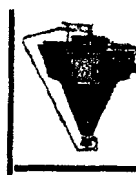
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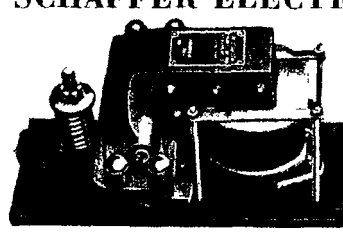


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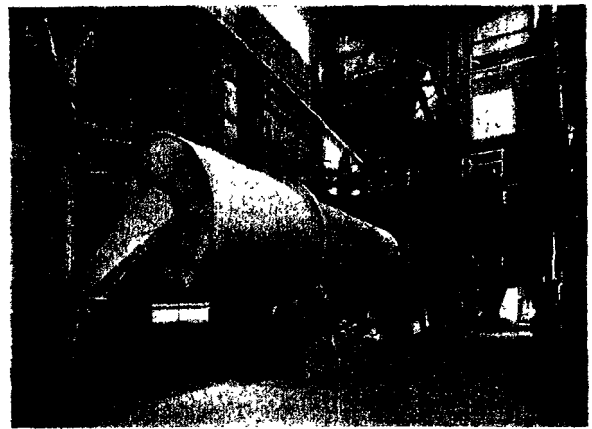
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