The American Ceramic Society

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CERAMIC ABSTRACTS

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inert gas curtains inside furnaces, and simplified, smaller plants; (3) predictions for whiteware which include greatly shortened maturing schedules, custom-made kilns, unbreakable china, uncontaminated raw material, handling timed to make storage unnecessary, automatic batching, casting in a fraction of the present time, faster jiggering, radiant heat and atomic fuel, and rapid decorating; (4) predictions for glass which include smaller plants, pneumatic material handling, presintering for fast melts, trend toward automatic forming, combination annealing and heat-treating, lightweight glass, throw-away containers, and oxygen melting. Twelve charts with curves predict the rise and fall of market conditions for major appliances, architectural porcelain, porcelain sanitary ware, hollow ware, dinnerware, floor and wall tile, vitreous sanitary ware, electrical porcelain, glass containers, flat glass, glass tableware, and structural glass. C.G.B.

Controlling abnormal dust exposures. M. W. Thompson. *Occupational Hazards*, 10 [4] 12–13 (1948).—The removal of dust from places of origin by mechanical means and by moistening materials and air, as adopted by the American dinnerware industry, is discussed. M.H.A.

Dried molding sand. P. Nicolas. *Fonderie*, 1943, No. 29, 1172–76.—The results of tests are given in curves of humidity content after drying, density as a function of humidity, and compressive strength as a function of humidity and of exposure to air. The optimum values of a sand containing 18% clay with a fineness of A.F.A. 110 were obtained with a humidification of 7% for plasticity, 5% for cohesion in the green state, and 10% for strength after drying. To obtain a fine surface on the cast pieces the dried molds should be coated with stove black containing about 8% volatile matter and 25 to 30% ash; the grain size should be less than 0.7 mm. For steel castings, good results are obtained with a coating having a base of very fine silica; for cuprous alloys, a coating of silica and also one having a base of ocher are used; a coating composed of graphite, ocher or clay, and talc is used for general purposes. M.H.A.

Dropped-caisson shaft sinking. William S. Cole, Jr. *Eng. Mining J.*, 149 [4] 82–83 (1948).—Bauxite deposits in Saline and Pulaski Counties, Ark., require many shallow shafts in proportion to the tonnage mined. Conventional shaft sinking is not advisable due to layers of quicksand. A concrete caisson was made 18 in. thick and with an inside diameter of 8 ft. for a shaft. It was planned to dig out the middle, drop the caisson, and put another ring of concrete and repeat, but considerable trouble was encountered; however, it was finally completed to a 204 ft. depth. Future projects should (1) avoid test holes closer than 20 ft., (2) have adjustable guides for aligning the shell, (3) have guide runners to keep the caisson aligned, (4) have a gasket to stop sand blows, and (5) use water-tight joints between all pours. 4 figures. W.D.F.

Factors which will influence ceramics in next 25 years. Anon. *Ceram. Ind.*, 50 [6] 85 (1948).—Fifteen factors which will influence the next quarter century in ceramics are as follows: Americans will live better; there will be more family units; the population trend is up; the average age will be slightly older; military preparation will be planned in billions; commercial construction has only started; institutional and government needs involve huge construction; the European Recovery Program will tax American production; competitive raw materials are being depleted; home and rental construction will increase; backlogs still exist and may be increased; technological developments will broaden markets; industrial construction will continue strong; competitive product developments will challenge ceramics; and labor relations will be mutually more enlightened. C.G.B.

Failure to block doorways of freight cars causes severe damage to packaged freight. Anon. *Am. Paint J.*, 32 [23] 76–80 (1948).—A series of documentary photographs taken by the Shipping Container Institute show freight damage, its causes, and the results. The value of blocking doorways to prevent load shifting is stressed, and methods are suggested to prevent such shifting. A.J.H.

How to make a silk screen. Anon. *Ceram. Ind.*, 50 [6] 97 (1948). C.G.B.

How to set up a simple perpetual inventory system. B. L. Gough. *Am. Paint J.*, 32 [30] 40–46 (1948).—A system through which any manufacturer or supplier of numerous articles can determine profitable items, reserve stock quantities, and control production, mark-ups, and reserves of raw materials can be set up using 3 × 5 in. file cards in a visible reference type file. Suggestions are offered concerning actual data to be entered on each card. A fictitious case illustrates the value of such a system. A.J.H.

Immersion media containing methylene iodide. Robert L. Darneal. *Am. Mineral.*, 33, 346–52 (1948).—The usefulness of methylene iodide in immersion media is emphasized. The nonlinear relationship of indices of refraction to composition by volume of some liquids containing methylene iodide is shown by experimental data. An empirical equation has been devised for calculating the indices of mixtures of methylene iodide and 1-bromonaphthalene from volume percentage data: $n_D = 1.6587 - 1/10^7 (4530x + 37x^2)$, where n_D is index and x is CH_2I_2 (vol. %). Calculated indices show close agreement with experimental values. The decomposition, purification, and preservation of methylene iodide is discussed. 17 references, 1 figure. W.D.F.

Mental hygiene and industrial health. R. G. Novick. *Natl. Safety News*, 56 [6] 28–29, 83–84 (1947).—Emotional factors in the adjustment of an employee to his work are beginning to be recognized as an important factor in safety. W.A.

Methods of sterilization of protective equipment. Walter F. Scholz. *Am. Ind. Hyg. Assn. Quart.*, 8 [4] 92 (1947).—A liquid soap solution is used, followed by a stream of warm water to remove the soap. The disinfectant Rocal is then used after diluting 6 oz. with 6 gal. of water; the bath is used for a week. At one plant about 75 respirators, 300 goggles, 100 goggle cases, 12 rubber suits, 5 rubber boots, and 65 miscellaneous pieces are sterilized in one week. Time of immersion in the bath is 10 min. The hands are not affected by immersion in the Rocal. Zephiran chloride is also satisfactory but more expensive. W.D.F.

Pulmonary dust disease. A. R. Riddell. *Ind. Med.*, 17, 168–70 (1948).—Silicosis is the most important but there are other dust diseases. The status of aluminum as a therapeutic agent for silicosis has not yet been determined. Fumes from heating bauxite to make corundum can cause trouble. The fume contains much alumina, silica, etc. Early cases are symptom-free with a slight lung shadowing. Later the symptoms may simulate pneumonia and heart disease and the shadowing spreads. Cadmium or cadmium compounds, either as fume or dust, cause a serious lung disease. During the war beryllium poisoning became known. Asbestosis has long been known. Workers in a very dusty talc mill showed lung damage, but the miners did not. The talc was fibrous and contained 30 to 50% free silica. There are some benign pneumoconioses, such as siderosis, which do not affect the length of life. 7 references. W.D.F.

Photoceramic technique. S. A. Berzon. Abstracted in *Steklo'naya i Keram. Prom.*, 1947, No. 9, pp. 17–18.—Details are given for transferring images from glass onto ceramic ware. The following reagents are used: (1) for cleaning the glass, a solution containing 4 gm. of ammonium dichromate, 10 gm. of dextrin, and 20 gm. of sugar in 100 cc. of water; (2) for transferring the image from the glass onto the ceramic ware, a solution consisting of 50 collodion, 30 ether, and 20% of 96° alcohol; (3) a dark-brown color containing the pigments $Fe(OH)_3$, $CO(OH)_2$, and ZnO in the proportion of 2:1:1 and a black color containing the pigments $Fe(OAc)_3$, $MnCO_3$, and $CO(OH)_2$ in the proportion of 2:1:4. The flux for these colors consists of Pb_3O_4 75, quartz 12.7, and boric acid 12.5%. B.Z.K.

Report on British Industries Fair. Jack Brooks. *Ceram. Ind.*, 50 [6] 131 (1948). C.G.B.

Research on asbestos fibers. M. S. Badollet. *Trans. Can. Inst. Mining Met.*, 51, 213–16 (1948).—The John-

Pulmonary Dust Disease

A. R. RIDDELL, B.A., M.B., D.P.H.

OPINIONS concerning dusts and pulmonary disease have changed somewhat during the last few years. For a considerable period following 1918 attention was chiefly centered on silica. Dusts were classified as active or inert according as the reaction they occasioned in the lungs resembled or differed from that produced by silica. Although silica is still recognized as the most important dust concerned with dust lung injury, it has gradually become apparent that dusts other than silica and the silicate asbestos may be involved in pulmonary disorders.

A description of silicosis is superfluous at present. The disease has received so much attention and has been discussed so often that you are all conversant with its general features. You realize that silica dust inhalation, if the quantity of dust inhaled is adequate, may result in lung fibrosis of a special nature. Collagenous nodule formation is characteristic of this process, but its regular deposition may be altered often profoundly by accompanying infectious processes, or by admixture of the dusts of other materials with silica. It is general knowledge that silicosis is prone to association with tuberculosis, but the implication may not be so fully appreciated.

The late DR. GARDNER[1] is reported to have advanced the opinion that, when chronic, a combination of silicosis with tuberculosis constituted a disease quite different from either of the other two contributing conditions. Certainly it is difficult to treat. As a rule it gradually progresses in spite of what is attempted, and surgical measures are unsatisfactory. This disease may be seriously disabling, although those affected are not always obviously ill.

The importance of tuberculosis in conjunction with silicosis is illustrated by information supplied by consideration of the causes of death in a series of 436 silicotics on whom we have records. The persons concerned had been employed in various occupations carrying a silica hazard. A little more than half of them were miners. Pulmonary tuberculosis caused the deaths of 62% of the persons comprising the whole series, and was responsible for 68% in the mining group.

Estimations of disability are notoriously troublesome in silicotics. It would seem that these are too often based on radiographic appearances together with attempted measurements of breathing capacity, and that other useful information is apt to be neglected. In assessing disability the clinical picture should be viewed as a whole. Careful consideration of the information afforded by the symptomatology and clinical findings in the individual cases, may be of considerable value in the estimate of disability.

A review of the symptoms and signs presented by 637 persons with silicosis was recently made. This offered information which may be usefully applied. The investigation confirmed the finding that dyspnea is the commonest symptom and limited expansion the commonest sign. It also disclosed, that of 203 persons with a history of having had night sweats, 117, or approximately 58%, had positive sputum. Bacilli were demonstrated either at the original examination, or later on follow up. It indicated, that 70, or 80%, of those with hemoptysis were tuberculous, and that 184, or 75%, of those whose fingers were clubbed or who had curving of the finger nails, had positive sputum, or were dead when the analysis was made.

It will be realized that for practical purposes, diagnosis in silicosis involves the differentiation of type as well as recognition of the disease. Commonly this is made on the radiographic appearance a case presents. Cases with clear cut uniform nodulation are interpreted as simple, and those with conglomerate or massive shadowing as complicated. Although this may be a useful working rule in relation to the interpretation of radiograms, there are many exceptions to it. Not infrequently the radiographically simple case will prove to be complicated, and no evidence of an infectious process can be demonstrated in the radiographically complicated, even at autopsy.

Compensation complicates the silicosis problem. With diagnosis so dependent on the interpretation of radiographic shadowing as is the case at present, it is well to remember that heavy or prominent shadowing in the lung fields or even nodulation, does not necessarily denote fibrosis or silicosis. These appearances, commonly ascribed to the effects of silica, may be simulated by lung changes related to other conditions than silicosis, in which there is often no fibrosis. When cases presenting such radiographic appearance lack a history of dust exposure the situation may not be too difficult, but with such a history they may cause considerable confusion. We have found the more important of these confusing conditions to be—heart diseases, particularly mitral stenosis, certain fungus infections, benign pneumoconioses, disseminated new growths of the lung, and sometimes pulmonary tuberculosis with a miliary distribution.

Aluminum dust employed in the treatment of, or as a prophylactic in silicosis, has received much attention in this regard during the last few years. It is administered in two forms, as finely divided metallic aluminum, and as aluminum hydroxide. The metallic powder is the more important agent, and at present many persons are receiving it both here and abroad. Its adminis-

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tration has not been observed to be attended by injury, neither however, is there convincing evidence that it has been of objective benefit to silicotics. Nevertheless, many persons receiving, or who have received aluminum for silicosis claim subjective improvement.

The status of aluminum as a therapeutic agent has not yet been determined. It seems to offer possibilities as a prophylactic, but as considerable time is still necessary to establish its usefulness, no laxity in regard to recognized methods of dust control should be countenanced.

Early in 1942 an occupational lung disease new to this continent was discovered by DR. C. G. SHAVER, Superintendent of a sanatorium situated near St. Catherines, Ontario. A description of the disease and the circumstances which revealed it has already been published.[2] The details need not be repeated. In the process involving bauxite, aluminum ore is converted to corundum, a hard metal used in the abrasive industry. While the process is in operation, the attendant workmen are exposed to dense fumes from the materials being treated.

The process is not new. It has been carried on for upward of 20 years in some of the plants concerned, yet it was not previously known to be injurious. This may be explained on the basis, either that in the past it did not occasion lung injury, or the disease was not recognized because its accompanying signs and symptoms were ascribed to other causes. The latter is the more probable. Early cases are symptom free, the signs, exclusively radiographic, are often so slight that they would be readily missed by one not conversant with the situation and on the look out for them. Later cases as characterized by attacks of sudden extreme dyspnea and chest pain which have, on occasion, been interpreted as indicating heart disease or pneumonia.

The radiographic characteristics of the condition may be divided into "early" manifestations and "well established" disease. The early manifestations are extremely slight. They consist of an indefinite granular appearance in the apices with slight rather lace-like shadowing which appears in the sub-apical area and which may extend to the first interspace. As the condition advances the lace-like shadowing is found extending lower in the lung fields. A further extension is accompanied by the loss of the lace-like character of the shadowing. Eventually the whole lung field may be occupied by shadowing which has a rather granular, or even an irregular nodular appearance.

Coincident with the peculiar lung shadowing the diaphragm is generally markedly distorted. and the mediastinum is widened. The "well established" case is characterized by the occurrence of spontaneous pneumothoraces, very often bi-lateral. These occurrences are associated with the rather dramatic appearance of desperate dyspnea and severe chest pain.

The fume is the source of this lung damage. It contains considerable quantities of very finely divided alumina and silica, and small amounts of many other substances. Which of these is responsible has not yet been determined. In the presence of so much silica, this material cannot be absolved, on the other hand rather similar lung damage has been reported from Germany[3] in exposures in which aluminum at least figured. MIDDLETON[4] also reported a case in England in which exposure to aluminum was associated with lung changes.

The inhalation of cadmium or cadmium compounds, either as fume or dust is attended by respiratory damage of a serious nature. In an Ontario exposure 15 workmen from two plants were injured in this way in 1935—two died.

Dust is produced when the metal is being ground or polished. Fumes are evolved during welding operations, or when the metal is subjected to high temperatures by accident, or for the purpose of removing cadmium plate.

When small quantities of cadmium are inhaled, dryness of the throat, cough, a sense of restriction in the chest, headache and vomiting are produced. Heavy exposure is followed by severe lung changes, accompanied by marked dyspnea, persistent cough, cyanosis and prostration, which may be prolonged. The disease has the characteristics of a chemical pneumonia, and this is confirmed by postmortem findings. Convalescence is apt to be protracted, but they eventually return to work without disability.

In one instance radiographs were prepared during the acute illness. In this, the lung fields were seen to be occupied by intense nodular shadowing, closely resembling that to be observed in certain cases of silicosis. Radiographic examination of the survivors of the affected was carried out some years later. In none was there evidence of any permanent lung injury.

It was during the war years that beryllium poisoning was drawn to our attention.[5] Exposure to beryllium or to certain of its compounds is attended in certain individuals by skin troubles. It is also attended by lung disease, often of a serious nature. The disease has special features: Symptoms may develop during exposure, or they may be delayed, perhaps, for months or years after exposure has ceased. Two types of the disease are recognized, an acute type and a delayed. The acute form has characteristics which suggest a chemical pneumonitis. It results from exposure to high concentrations of beryllium compounds. It may be severe and even fatal, but in those who survive, the condition has a tendency to clear. The delayed form appears to have little relation to intensity of exposure. It is more apt to occur where relatively light, but more prolonged exposure has been sustained. A feature of the delayed form is the occurrences of scattered granulomatous areas in the lung tissue which may undergo organization. In some cases the radiographic appearances closely resemble silicosis. it was therefore thought at one time that the disease might be a modified silicosis. The etiology is still obscure. While investigating this matter, it was DR. GARDNER'S[6] opinion that some other factor than beryllium

might be involved. This apparently has not yet been established. Considerable data is being collected and may serve to resolve the question.

The dust of asbestos, a fibrous silicate, induces a lung fibrosis which may be disabling. The disease asbestosis differs considerably from silicosis. Although areas of fibrous tissue develop throughout the lungs, these do not exhibit the nodular pattern that distinguishes that condition. Radiologically it is also different. Characteristically the heart shadow is shaggy, and the lung fields have a granular or "ground glass" appearance, but definite nodulation is not apparent. Circulatory embarrassment is common in asbestosis. The disease however, does not appear to predispose to tuberculous infections.

Aside from asbestos, silicates are not usually related to lung injury. In this respect talc, a hydrated magnesium silicate, may be an exception. Although no clear evidence of injury has been produced in connection with persons handling talc, in many industrial operations such as tire building, paper making, etc., injury has been demonstrated in relation to the production of this substance. Some years ago in Ontario the miners and millworkers from a small talc producing plant were surveyed. None of the miners showed radiographic changes suggesting disease, but examination of 37 mill men engaged in crushing ore discovered 13 in whom chest films gave evidence of lung fibrosis. The exposure periods in these cases were from five to 18 years. The average exposure was 12 years.

The radiographic appearances were not uniform. In some, diffuse fine granular shadowing was seen throughout the lung fields. In others, nodular shadowing resembling but rather softer in character than that of silicosis was present. Several presented a combination of these appearances, with or without areas of massive shadowing. Repeat examinations of many of those affected reveals that in none has there been any clearing, but that several have progressed.

The talc, a fibrous and flaky variety containing a small quantity of tremolite, occurs in formation consisting largely of crystalline limestone. In this formation numerous stringers of quartz are found. In the past, dust conditions in the mills were very bad, and great clouds of dust, visible from a considerable distance, could be seen escaping when crushing was in progress.

Dust sampling was done in these mills. The samples varied considerably in silica content, depending on where they were collected. Air samples contained approximately 34% silica, and settled dust from the beams about 55%. The free silica content was estimated at 1% to 2%.

It is evident that in 1943 SIEGAL[7] and others encountered a situation somewhat similar to this in St. Lawrence County, New York.

Doubts are entertained respecting the Ontario exposure. Having regard to dust conditions and the quartz in the limestone carrying the talc, the abnormal findings may very well reflect a silicosis modified by other dust. On the other hand, the matter of the extremely heavy dosage must be considered. Although several of our cases have died, we have not so far secured autopsy material. This is essential to a solution of the problem.

Certain lung conditions termed benign pneumoconioses, of which siderosis is an example are not infrequently encountered. These conditions are not in the least disabling and they do not affect life expectancy. They arise in relation to occupations in which dust of metals or other inert materials are produced. Particles of these materials opaque to the roentgen rays, on reaching the lung tissues are deposited in relation to the lymphatics, where they remain inactive causing no injury.

These conditions are not properly termed disease. I have referred to them merely because they may occasion radiographic appearances scarcely to be distinguished from those due to silicosis. It should be remembered however, that infectious processes may occur in persons with benign pneumoconiosis. In such cases the infection is the disease to consider.

YOUR attention has been directed to a few dusts which are involved in the production of pulmonary diseases, and certain characteristics of the disease they occasion, have been referred to. The subject has not been exhausted however: The connection between bagasse, sugar cane from which the sap has been extracted, and lung disease, should not be overlooked. Neither, should it be forgotten that dusts such as arsenic and those of certain radioactive materials have been related to the occurrence of neo-plastic lung conditions. You will recall that cotton workers are subject to an occupational disease, in which the materials they handle are in some way concerned, and that cotton dust may be involved.

We have in Ontario, plants in which the workers are in exposure to radioactive materials, arsenic and cotton. Most of the plants have medical departments, and x-ray surveys of the working staffs have been conducted from time to time. In spite of this careful supervision however, no convincing evidence has yet been forthcoming which would indicate that any of these materials are implicated in the causation of this type of lung injury in Ontario.

Complacence, especially in regard to occupational dusts of any nature, is always dangerous. Also new substances are frequently being introduced into industrial operations, and older substances used in new ways and combinations. The result of these changes is often unpredictable. Constant vigilance is therefore necessary.

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