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Fiberglas Health Hazard Investigation

Plaintiff's Exhibit 9

For the use of the

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By Walter J. Siebert, M. D.

Pathologist to De Paul Hospital, Lutheran Hospital, St. Vincent's Hospital, all of St. Louis; to St. Joseph's Hospital, Alton, Illinois, and to St. Mary's Hospital, Cairo, Illinois. Formerly Professor of Pathology, Washington University School of Medicine, St. Louis, Mo.

Foreword:

This investigation was carried out at the instigation of Mr. William H. Bartley of the law firm of Bartley and Mayfield, 208 North Broadway, St. Louis, Missouri, who is attorney for the International Association of Heat and Frost Insulators and Asbestos Workers, Local Union No. 1 of St. Louis, Missouri.

The purpose of the investigation is to study the problem of possible health hazards of Fiberglas products which are used or may be used by the workers in the International Association of Heat and Frost Insulators and Asbestos Workers.

The author of this paper, Walter J. Siebert, M. D., has carried out this investigation as an unbiased, independent consultant who is not in any way, other than to carry out the present assignment, associated with either the International Association of Heat and Frost Insulators and Asbestos Workers, or the Owens-Corning Fiberglas Corporation.

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The investigation was carried out by gathering and interpreting information collected as follows:

1. Information obtained in Toledo and Newark, Ohio, from officials and employees of Owens-Corning Fiberglas Corporation.
2. Information obtained from sources independent of Owens-Corning Fiberglas Corporation.
3. Research and experiments independently conducted by the author.

* * *

I. Information was obtained in Toledo and Newark, Ohio, from officials and employees of Owens-Corning Fiberglas Corporation in the following ways:

1. Conferences with Mr. E. J. Marshall, general counsel for Owens-Corning Fiberglas Corporation, in Toledo, Ohio, June 2, 1941.

2. Conferences with Mr. Edward C. Ames, assistant to the president of Owens-Corning Fiberglas Corporation, in Toledo and Newark, Ohio, June 2, 3, 4, 1941.

3. Conferences with Mr. Tyler S. Rogers, technical director of Owens-Corning Fiberglas Corporation, in Newark, Ohio, June 3, 1941. During these conferences, Mr. Rogers gave the author complete access to information regarded as trade secrets by the Corporation, with the understanding that the author was free to use that portion of this information which was pertinent to his investigation.

4. Conferences with Dr. Fay Tooley, glass technologist, and Dr. Donald Babcock, organic chemist, members of the laboratory and research staff of Owens-Corning Fiberglas Corporation, in Newark, Ohio, June 3, 1941.

5. Conferences with Dr. H. A. Campbell and Dr. C. S. Bishop, plant physicians, and Miss Betty Laird, assistant in the office of the plant physician, in Newark, Ohio, June 3, 1941.

6. Inspection of each department under working conditions at the Fiberglas plant in Newark, Ohio, June 3, 1941.

7. Inspection, examination, and private conferences with production employees at the Fiberglas plant in Newark, Ohio, June 3, 1941.

8. Inspection of the medical records of employees of the Newark plant.

9. Inspection of the X-ray plates of old and new workers at the Newark plant.

10. Inspection of medical records of tuberculosis and silicosis victims

in the Fiberglas plant.

II. Information was obtained from sources other than officials of Owens-Corning Fiberglas Corporation as follows:

1. Reports of Leroy U. Gardner, M. D., Director of Saranac Laboratory, Saranac Lake, New York, on injections, ingestion and inhalation experiments with Fiberglas.

2. Reports of the Industrial Commission of Ohio, regarding claims or compensation paid for, or on account of, occupational disease arising out of work with Fiberglas.

3. Reports of Dr. Adolph B. Loveman, Louisville, Kentucky, regarding skin patch tests for allergy to Fiberglas textile products.

4. Confidential conferences with employees engaged in production work at the Fiberglas plant in Newark.

5. Research in world medical literature regarding health hazards in the manufacture or handling of glass wool (Fiberglas) and similar products.

6. Personal communication with industrial physicians regarding health hazards of Fiberglas, including Dr. W. K. Wilson, plant physician of the Fisher Body Corporation, St. Louis, and Dr. Clarence D. Selby, Medical Director, General Motors Corporation, Detroit.

III. Independent research investigations regarding chemical and physical properties of Fiberglas and of binders used in the manufactured products which relate to possible health hazards, as follows:

1. Alkalinity, fiber sizes, chemical composition, physical properties.

2. Biopsies of skin of workers.

3. Personal inspection of employees' hands, arms, eyes, chests, nasal and bronchial mucous membranes.

4. Study of dust properties of Fiberglas insulating materials.

- a. Raw products.

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- b. Dust properties under experimental conditions on skin, eyes, mucous membranes.

5. Study of X-ray plates of employees and of interpretations from:

- a. Dr. L. A. Mitchell, Newark, Ohio, roentgenologist.
- b. Dr. H. L. Sampson, Saranac Lake roentgenologist.

6. Study of Dr. Gardner's microscopic slides of animal experiments:

- a. Inhalation experiments
- b. Intravenous experiments
- c. Intraperitoneal experiments

7. Report on solubilities of Fiberglas products in relation to possible health hazards.

8. Study of binder substances used in Fiberglas insulating materials in relation to possible health hazards:

- a. Bakelite
- b. Mineral oil

9. Comparison of Fiberglas insulating wool with other insulating materials in relation to possible health hazards. This may take the form of a chart indexing binders, free silica, asbestosis hazard, sodium silicate hazard, for following:

- a. Fiberglas
- b. Mineral wools
- c. Asbestos
- d. 85% magnesia
- e. Rock cork
- f. Rock wool bats
- g. Lead slag

10. Comparison of insurance rates of workers in various insulating materials.

11. Insurance rates of Owens-Corning Fiberglas Corporation compared with other industrial insurance rates.

12. Comparison of eye infections, upper respiratory infections, lower respiratory infections (including t. b.), skin infections, and gastro-intestinal disturbances with Ohio Department of Health reports showing incidence of these disorders in general population and with workers in other insulating materials.

13. Report of eye inspection carried out by the author on employees, to be supplemented with possible inspection and report by an independent ophthalmologist.

14. Report of possibilities of exciting or aggravating a latent or healed pulmonary tuberculous process:

a. Chemical nature of Fiberglas is not such as is known to do this. Only free silica is known to have this effect.

b. Possibility of Gardner's carrying out such experiments.

15. Report of possibility of laying the background for producing chronic sinus infection: No evidence in factory workers or in statistical reports, nor does it appear so from medical records of employees in Newark.

16. Report, if possible or available, on experiences with health hazards of Fiberglas from:

a. United States Navy

b. Budd Manufacturing Co.

c. Custin Bacon, Kansas City

d. Boeing Aviation Co., through Pan-American Airlines, for whom Boeing builds Fiberglas-insulated Clipper ships.

17. Reports of physicians in Newark, Ohio, not connected with Fiberglas Corporation, as to incidence of:

a. eye, ear, nose, and throat disorders of Fiberglas employees compared to general practice -- statements to be obtained from four eye, ear, nose and throat specialists in Newark.

18. Report of Dr. H. L. Sampson of Saranac Lake, N. Y., who has reported on 1100 routine chest plates of new and old employees of Owens-Corning Fiberglas Corpora-

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19. Report of Aetna Insurance Co. on health hazards of Fiberglas group.
20. Report of Dr. Roy Philip Scholz, St. Louis, on use of Fiberglas as suture material in nose and ear operations.
21. Report of Safe Practice Bulletin No. 58 in Occupational Disease Prevention Series of Department of Labor and Industry of Commonwealth of Pennsylvania, Feb., 1940.
22. Report in Fiberglas Standards Sheet F4.2.1 entitled "How Workmen Handle Fiberglas Thermal Insulation."
23. Reports of A.M.A. library references on industrial hazards of spun glass, etc.
24. Reports of Belding-Heminway-Corticelli, 119 West 40th Street, New York City, on use of Fiberglas for surgical sutures.
25. Purdue University reports on settling characteristics of Fiberglas wool.
26. Reports of other insurance companies on experience.

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Conferences between the author and Mr. E. J. Marshall, general counsel for Owens-Corning Fiberglas Corporation in Toledo, Ohio, June 2, 1941, indicated that he, Mr. Marshall, as well as the officials of Owens-Corning Fiberglas Corporation, are completely satisfied that there are no serious health hazards associated with the manufacture or handling of Fiberglas products.

In the course of his investigation, the author has been at considerable pains to discount this assertion as coming from interested sources and to disabuse himself of any a priori assumption that the contention of the corporation's general counsel and officials should be accepted as valid unless supported by his own objective examination of the records and by conclusion independently reached by the author as warranted by objective evidence adduced from disinterested sources and his own mind.

The author finds, however, that the contention that Fiberglas manufacture and handling is accompanied by no serious health hazard rests on the following evidence, supported by the Exhibits as enumerated:

1. Factory experience of nine years' duration with the manufacture of Fiberglas in the State of Ohio. This experience covers millions of man hours worked by production employees, in the Newark, Ohio, plant, in number ranging from approximately twenty when production of glass wool began in Newark in 1932 up to more than 1800 employees in 1941.

(See EXHIBIT NO.1, a statement furnished to the author by Mr. D. A. O'Neill; Owens-Corning Personnel Director at the Newark plant, setting forth employment figures by months from January 1937 through May 1941.)

Records to which the author was given untrammelled access on June 3, 1941, in the office of the Plant Physician in Newark cover the health experience of these employees not only during the period since Owens-Corning Fiberglas Corporation was formed on November 1, 1938 but also during the preceding six and one-half years when the plant was operated by Owens-Illinois Glass Company. The author regards as significant the nine-year duration (1932 to 1941) of

this period as providing a sufficiently long exposure on which to generalize concerning the likelihood of the appearance of possible occupational hazards that might arise from handling products manufactured from or fabricated from fibrous glass. Further observations of the employee health record established at the Newark plant by men engaged in jobs necessitating continual handling of Fiberglas insulating products will be made later in this report. It is appropriate at this point, however, to include as EXHIBIT NO.2, Fiberglas Standards No. F4.2.1 entitled "How Workmen Handle Fiberglas Thermal Insulating Materials," published by the Corporation in May, 1940, with the following explanatory note:

"Because of their noteworthy health record and their unequalled fund of accumulated experience, we feel that a description of the technique of our employees in handling Fiberglas insulating materials is the best guide for others to follow. The recommendations below are based on practices followed by our employees."

2. The fact that no claim for workers' compensation in Ohio has been validated during this nine-year period, nor has compensation been paid, on the basis of an industrial disease arising out of employment in the manufacturing or handling of Fiberglas. Documentary proof of this assertion is made in a letter of June 17, 1941, from Mr. J. A. Shaw, Claims Referee of the Industrial Commission of Ohio, Legal Section, to the author, in which Mr. Shaw writes as follows:

"For your information, we recognize diseases of the respiratory tract as compensable occupational diseases, such as silicosis, asbestosis, anthracosis, and siderosis.

As a matter of fact there is a provision under the law to recognize any disease of this type which is caused by the inhalation of any injurious dusts.

"We endeavor to keep a complete statistical record in the Department of Safety and Hygiene of all cases of this type. I have made a thorough check with this Department, and to date we have never had a claim filed for a disease of the upper respiratory tract caused by the alleged inhalation of fiberglass particles.

"We did have an inquiry several months ago from the Owens-Corning Glass Company, Newark, Ohio, but nothing ever came of it. At that time the writer referred the matter to Mr. L. M. Merritt, our Safety Engineer in the Department of Safety and Hygiene, who handles such matters, and he made an inspection of this plant, and it was his opinion that there was absolutely no hazard due to fiberglass particles. However, about six months ago, a claim was filed by a man in Toledo who was a glazer by trade, and in his application he alleged that he had developed a severe lung condition, probably tuberculosis, as a result of the inhalation of small particles of glass. We investigated this claim, and disallowed it, for the reason that there was no proof that he could possibly have contracted an occupational disease from that source." (See EXHIBIT NO. 3).

3. The favorable reports of Dr. Leroy U. Gardner, Director of the Research Division of the Saranac Laboratory for the study of Tuberculosis and member of the Council on Industrial Health of the American Medical Association, upon animal injection, ingestion and inhalation experiments, which were conducted with glass wool dust. Documentary evidence of Dr. Gardner's

a. A letter labeled EXHIBIT NO. 4 addressed to the Owens-Illinois Glass Company, dated May 5, 1936, in which the animal experiments of Dr. Gardner are summarized as follows:

"To determine whether particles of glass wool are capable of producing reaction in the tissues, suspensions of finely ground plain and oiled wools were injected into the ear veins of rabbits and the peritoneal cavities of guinea pigs. Experience in this laboratory and elsewhere has demonstrated that these methods are adequate to demonstrate the capacity of a mineral dust to produce fibrosis. Investigation of over twenty types of dust has indicated that if no reaction occurs in organs other than the lungs, it will not occur in the respiratory tract and that, conversely, dusts like silica and asbestos that are known to produce fibrosis of the lungs also cause fibrosis in other tissues when injected in sufficient quantities."

Conclusions based on these experiments are as follows:

"Neither plain or oiled glass wools have caused fibrosis or any chronic progressive reaction by injection and therefore it is a reasonable assumption that their inhalation would likewise fail to produce such effects."

Furthermore, the report of Dr. Leroy U. Gardner of May 5, 1936, reveals the fact that ingestion of large quantities of both plain and oiled glass wool fed to guinea pigs mixed with grain by stomach tube, daily, for between 32 and 119 days failed to produce gross or microscopic changes in the mouth, esophagus, stomach, small or large intestine, or in the mesenteric lymph nodes. Conclusions based upon these ingestion experiments are quoted as follows:

"One may therefore conclude that the ingestion of as much as 51 grams of finely powdered glass wool (both plain and oiled) administered in divided doses, will not cause injury in four months' time. In the absence of any reaction at all it would hardly seem essential to continue the investigation further."

b. Further favorable reports from Dr. Leroy U. Gardner on inhalation experiments, carried out on animals, dated May 16, 1941. Documentary evidence is labeled EXHIBIT NO.5. This exhibit contains the following statement:

"Experiments still in progress at the Saranac Laboratory lead to the tentative conclusion that there can be little or no injury to the lungs from exposure to glass wool dust because the material is not inhalable. A group of one hundred guinea pigs and fifty white rats have now been exposed eight hours a day over a period of one year to as high an atmospheric concentration of dust as it has been possible to produce from the finest glass wool fiber available. A majority of the animals have remained well and healthy. In sixteen of the guinea pigs and eight of the rats that have been sacrificed from time to time during the course of the exposure there has been no evidence of pulmonary injury. Microscopic examination of their lung tissues has failed to demonstrate the presence of any fibers of glass. Small quantities of very minute particles, which are probably glass splintered in the process creating dust, have been observed within the lungs. Reaction to these particles is limited to microscopic collections of cells which could not conceivably influence pulmonary function."

c. In summarizing the experiments made at Saranac Laboratory in a letter to Mr. G. A. Hodgman of the Fidelity and Casualty Company of New York, dated June 10, 1941, by Dr. Carl M. Peterson, Secretary of the Council on Industrial Health of the American Medical Association, Dr. Leroy U. Gardner is quoted as follows:

"We have now eighteen months' experience with animals exposed to as high a concentration of glass wool dust as it is possible to produce. We have failed to demonstrate the inhalation of any of the glass in fibrous form. A few fractured particles enter the lung but they have caused no more reaction than most animals get from accidental inhalation of hay and other dirt. The major portion of the glass fibers form felt-like masses which adhere to any projecting obstruction in the room and I am coming to believe that the same probably occurs in the nostrils."

Documentary evidence for the above paragraph is labeled as EXHIBIT NO. 6. This letter was obtained on inquiry by Mr. Bartley from The Fidelity and Casualty Company of New York.

d. Further reports of Dr. Gardner's work are available in sources independent of Owens-Corning Fiberglas Corporation. In the "Annual Report of the Saranac Laboratory for the Study of Tuberculosis of the Edward L. Trudeau Foundation for the Year 1940" appears the following statement on page 11:

"The apparent lack of pulmonary damage from exposures to glass wool dust is being demonstrated by an inhalation experiment. For over a year animals have now been exposed to as high a concentration of this material as could be maintained, with no effects upon their lungs. The dust has been produced by

breaking into short lengths the finest textile glass that is made but none of the fibers that are floating in the air can be found in the lungs of the exposed animals. Their tendency, unlike that of asbestos, to form felt-like masses upon any object with which they come in contact probably prevents their inhalation. Slight amounts of chronic inflammation, similar to those observed with other harmless dusts, have resulted from accumulated particulate debris. These very fine, non-fibrous particles are the by-product of the violent beating used to break up the material." See EXHIBIT NO. 7.

e. In an article entitled "The Pathology and Roentgenographic Manifestations of Pneumoconiosis" in the Journal of the American Medical Association (February 17, 1940, Vol. 114, pp. 535-545), Dr. Gardner states as follows:

"As far as can be learned from statistical and experimental evidence, the dusts other than free silica are not responsible for alteration of natural susceptibility to tubercular infection. There is no proof that their inhalation increases the probability of infection with other organisms."

The foregoing appears on page 12 of the reprint of this article attached as EXHIBIT NO.8.

f. The following excerpt of special interest appears in "Researches of Mellon Institute 1940-41" in News Edition, American Chemical Society, Vol. XII, p. 402 (April 10, 1941):

"L. U. Gardner, director, The Saranac Laboratory, has reported on the researches which the foundation supports at his institution, saying in part:

" ... We have been studying the effect of inhaled glass wool. Apparently even the finest textile glass set up as an atmospheric dust is not inhaled in appreciable concentrations and does not produce any dangerous effects upon the lung."

A reprint of this article is labeled EXHIBIT NO. 9.

g. Related to the subject of Dr. Gardner's research is an article entitled "Response of Peritoneal Tissue to Industrial Dusts" by J. W. Miller and R. R. Sayers in U. S. Public Health Reports, p. 56, (7) 264-72 (1941). A précis of this article appears in Vol. XX, No. 5 of the publication of the American Ceramic Society (May 1941), copy of which is attached and labeled EXHIBIT NO. 10.

In this article glass wool is listed among twenty-seven dusts causing an inert reaction.

4. The chemical and physical characteristics of Fiberglass and of binders used in manufacturing and processing glass fibers are not of the kind from which serious industrial health problems would theoretically arise. Facts leading the author to this conclusion were gathered chiefly from Mr. Tyler S. Rogers, Technical Director of Owens-Corning Fiberglass Corporation, from Dr. Fay Tooley, glass technologist, and from Dr. Donald Babcock, organic chemist, employees of Owens-Corning Fiberglass Corporation. The conclusion is based chiefly upon the absence of substances which are known to be harmful in a) the glass, and b) the binder substances used. The author examined documentary proof in the records of the Corporation to support the following statements:

- a. No free silica is present in the material known as Fiberglass.
- b. No organic matter is present in Fiberglass thermal insulating products.
- c. No carcinogenic hydrocarbons or other hydrocarbons could be present in

Fiberglas because of the extremely high temperatures employed in fusing the Fiberglas during the manufacturing process.

d. No harmful fumes could be given off, since no volatile substances are present in the Fiberglas.

e. Absent from Fiberglas is any free sodium silicate, which is used in some other materials employed in the insulating trade.

f. Only three binder substances are present in glass wool products used for industrial insulation. These are bakelite (phenolformaldehyde), a thermo-setting binder that ranges from one and one-half per cent to four per cent, depending on the structural characteristics desired in the finished product, a mineral oil that ranges from one and one-half per cent to three per cent by weight in the finished products, and bentonite, a refractory clay that is employed as an ingredient of candy with the cognizance of the United States Food and Drug Administration. Bentonite is used in Fiberglas "120" block. These percentages are determined by ignition loss tests routinely conducted as a part of quality control procedure during manufacture.

g. There is no evidence from factory experience that either bakelite or the mineral oil used for binding substances is the cause of a health hazard.

5. Ohio workers' compensation rates as set by the Ohio Industrial Commission are lower for Fiberglas production employees than are the rates set for workers in other comparable industries. The following table (See EXHIBIT NO.11) sets forth comparative figures to support this statement. In each case the rate represents the contribution levied upon the employer per \$100 of payroll under Ohio law according to the State's appraisal of the hazard involved in the particular industry:

Fiberglas production employees engaged in the manufacture of glass yarns.....	66¢
Fiberglas production employees engaged in the manufacture of glass wool products	95¢

Asbestos manufacturing.....	\$1.00
Rubber manufacturing.....	\$1.00
Building material dealers' employees.....	\$1.20
Carbonate of magnesia manufacturing.....	\$1.10
Clay products manufacturing.....	\$1.60
Fiber goods manufacturing.....	\$1.10
Wood pulp mills.....	\$2.00
Paper manufacturing.....	\$1.60

6. The fact that the health of Fiberglas employees is regarded by Aetna Life Insurance Company, which underwrites group insurance (life, disability, sickness and hospitalization) for employees of Owens-Corning Fiberglas Corporation, as "better than average." In a two-page letter attached as EXHIBIT NO. 12, dated June 11, 1941, to Edward C. Ames of the Corporation, John A. Hill, Toledo General Agent of Aetna Life Insurance Company, writes:

"The health of your employees is better than average. This is evidenced by the fact that we now have in effect a 35% reduction in rate (from standard) on both the Sickness and Hospitalization insurance carried by your employees. This is the result of nearly four full years' exposure, and develops a rate lower than any similar industry that we have insured. In addition we have Hospitalization coverage which is developing a Loss Ratio, after over three years experience, far lower than almost any of the 200 industries we have insured in Ohio.

"There is in effect a Permanent and Total disability

as yet there has been only one claim from an employee, and this was due to a non-occupational accident, far removed from the course of his occupation or from any health hazard in his occupation."

Mr. Hill also writes:

"Although your compensation insurance is carried with the State, our Company does have the coverage on your new plant in Ashton, Rhode Island, and is writing this at a rate of approximately forty cents a hundred, which will indicate how safe we regard the risk to be - not only from an accident view point, but from an occupational hazard view point. "In other words, from our own experience we do not feel that there is any different hazard than from any normal manufacturing operation, and we feel the hazard is much less than in the manufacture of Rockwool, Slagwool, Asbestos, or any of the so-called 85% magnesia products."

The author regards as highly significant the following paragraph on page 1 of Mr. Hill's letter:

".... our Casualty Company carries, what is known as, Products Liability at an extremely low rate, and no claim has ever been presented, indicating, of course, that there is no hazard in the use of fiberglas or any of its products."

To supplement the statements set forth in Mr. Hill's letter, a brochure entitled "Owens-Corning Fiberglas Corporation Group Insurance" prepared

in 1940 by Aetna Life Insurance Company for distribution to employees of Owens-Corning Fiberglas Corporation to explain rates and benefits of the Aetna group coverage for which they are eligible is attached as EXHIBIT NO. 13. The small folder in the pocket on the inside of the front cover of this brochure explains expanded benefits put into effect in 1940.

7. Papers delivered on different occasions before the Safe Practices Conference sponsored jointly by the Pennsylvania State College and the Department of Labor and Industry of the Commonwealth of Pennsylvania indicate that interest in possible hazards of Fiberglas was manifested in 1939 and 1940 among safety engineers, industrial physicians, personnel directors, and governmental officials charged with the responsibility of administering legislation designed to promote workers' welfare.

This interest is evidenced by publication of the following two bulletins:

- a. Dr. E. H. McIlvain, "Insulation in Stream-lined Trains," published in 1939 as "Safe Practice Bulletin No. 2" in the Occupational Disease Prevention series of the Department of Labor and Industry of the Commonwealth of Pennsylvania. Photostatic copies of the cover page and pages 1 and 5 of this bulletin are attached as EXHIBIT NO. 14. Dr. McIlvain, who is Medical Director and Personnel Manager of the Edward G. Budd Manufacturing Company, writes:

"One insulation material may have excellent thermal efficiency, but a lot of dust. Another, no dust, but lower efficiency. A third might have efficiency and cleanliness, yet be vulnerable to fire or absorb and hold moisture. Fiberglas provides the qualities generally sought as an insulation product in stream-lined trains and in addition has proven safe for handling purposes by

- b. Tyler Stewart Rogers, "Safe Practice in the Manufacture and Uses of Fiberglas," published in February 1940 as "Safe Practice Bulletin No. 58" in the Occupational Disease Prevention series of the Department of Labor and Industry of the Commonwealth of Pennsylvania. A copy of this Bulletin is attached as EXHIBIT NO. 15.

At the time of delivery of his paper, Mr. Rogers was Assistant to the President of Owens-Corning Fiberglas Corporation. He is now Technical Director of the Corporation. The author conferred with him in Newark on June 3.

A concise summary of the manufacturing processes and a description of the uses of Fiberglas are set forth in pages 3 to 10 of the Bulletin accompanied by illustrations of the manufacturing processes and installation methods for various applications. This material is prefaced by a discussion of the safety aspects of handling Fiberglas products on pages 1 and 2 of the Bulletin, most of which is similar to the material to be found in Fiberglas Standards F4.2.1., already cited as Exhibit No. The following statement on page 1 of the Bulletin is of interest:

"Fiberglas Insulating Wool can be handled in the same manner as the common rock wool and slag wool insulations which have been used for more than fifty years. Fiberglas wool has longer fibers and is made by processes subject to much more accurate control than most rock and slag wools. As a result, it holds together better, is cleaner, and contains less 'dust' and foreign materials."

The author regards it as significant that these statements have not been challenged in the literature, for it is reasonable to assume that, had any doubts been reserved in the minds of those present at the delivery of these papers, or had any doubts been present in the

since the papers were delivered, such doubts or questionings would have found their way into print. From his familiarity with the manner in which persistent problems in industrial hygiene are wont to appear in print, and in view of the fact that Fiberglas thermal insulating products have been marketed in constantly increasing volume since 1932, the very quiescence of this subject and the paucity of references to it may be regarded as prima facie evidence, not only of lack of concern with the problem among groups acutely conscious of occupational hazards, but also of the non-existence of any occupational hazard in the handling of Fiberglas. Nor is it reasonable to assume that lack of interest in the subject may be attributed to general ignorance about the activity of Owens-Corning Fiberglas Corporation in the thermal insulating materials market. Development of Fiberglas manufacturing has been attended by wide publicity, as evidenced by the publicity and clipping files examined by the author when he visited the Corporation's General Offices in Toledo on June 2, reprints of articles about Fiberglas products that have appeared in magazines of general circulation as well as magazines that circulate to a technical audience -- reprints of which are attached as EXHIBIT NO. 16 -- and the Corporation's advertising program. A manual of reprints of General Products advertisements inserted between November 1938 and June 1941 by Owens-Corning Fiberglas Corporation in magazines of general circulation, including Time, Fortune, News-Week, and Business Week, is incorporated in this investigation as EXHIBIT NO. 17 in proof of this statement.

8. A search of the world literature of science and medicine since 1927 fails to reveal other authoritative references to occupational hazards encountered in handling Fiberglas products.

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a. Although it may be regarded as empirical and therefore unauthoritative, an answer to an inquiry concerning occupational hazards in hazards in handling glass wool that appears in Occupational Hazards and Safety, Vol. I, No. 4 (January 1938), p. 40, is nevertheless of interest as being an almost isolated reference to the subject, other than the references cited above to Dr. Gardner's research. An excerpt from this reference, attached as EXHIBIT NO. 18, is as follows:

"Careful investigation of the possible silicosis in the handling of glass wool indicates that there is no silicosis hazard involved. Extensive tests and studies have been conducted both in the laboratory and field and results indicate that the inhalation of glass wool particles will not cause silicosis."

b. Upon request of the Reference Library of the American Medical Association in Chicago for a bibliography of references in medical literature concerning occupational hazards in the handling of fibrous glass products, the author was supplied with a list of five citations. The list forwarded to him is attached as EXHIBIT NO. 19. It contains the following references:

1. Dermatitis from Spun Glass Christmas Tree Ornaments" in Journal of the American Medical Association (102:1249), April 14, 1934. Photostatic copy is labeled EXHIBIT NO. 20.

Note: This reference concerns a product manufactured in Germany by a process known as the "Gossler process," which is entirely different from the steam-drawing process employed by Owens-Corning Fiberglas Corporation. The material referred to in this citation was imported by the Strauss Eckhardt Company of New York. Owens-Corning Fiberglas Corporation has never sought a market

as officials of the Corporation know, none has ever been sold for that purpose. For this reason the author finds that this reference may not be construed as incriminating Fiberglas products.

2. "Dermatitis Due to Spun Glass" in Journal of the American Medical Association (102:1874), June 2, 1934. Photostatic copy is labeled EXHIBIT NO. 21.

Note: This reference calls attention to the article by S. von Szentkiralyi,

3. "Dermatitis Artificialis durch Engelhaare" in Dermat. Wehnschr., (93:1302), August 15, 1931. Photostatic copy of this article, obtained from the Library of the Surgeon General in Washington, is labeled EXHIBIT NO. 22.

This article, like Exhibit No. 15, refers to "angel hair" made in Germany for Christmas tree ornamentation. The date of appearance of the article — August 15, 1931 — precludes the possibility that any Fiberglas products are under discussion, since no Fiberglas was manufactured until 1932. Nevertheless it is of interest because there is some similarity in composition between the German-made "angel hair" and Fiberglas. In this connection a translation of a paragraph in the article is of some significance: (Author's translation)

"Glass wool which is used for various purposes occasionally causes marked itching especially when the material is pulverized or broken into small particles. The glass wool dust is composed of fine fibers measuring 1 -3 mm. in length. When this dust is mechanically rubbed into the skin (for instance, during the process of packing the glass wool) the skin soon becomes

reddened and itches markedly. The occurrence of a dermatitis is, however, an extreme rarity and is found only in especially predisposed individuals. The skin manifestations completely disappear in twenty-four hours after the fragments have been removed with the aid of a skin microscope."

The author of the cited article describes a case of moderately severe dermatitis which completely healed in ten days. He employed ten per cent calcium bromate intravenously daily and a local soothing ointment. The author of the article also points out that his patient displayed a marked predisposition to mechanical irritation of the skin and otherwise would probably not have developed the dermatitis.

Note: This case undoubtedly represents an allergic manifestation to glass wool. This is the only case of allergy to glass wool that the author has found in medical literature.

4. "Dermatitis from 'Angel Hair'" in Journal of the American Medical Association (103:63), 1934. Photostatic copy is labeled EXHIBIT NO. 23.

Note: Like the material discussed in the reference cited in Exhibit No. 15, this article refers to a product manufactured in Germany.

5. "Dermatitis in Glass Wool Industry -- Salt in Heat Exposure" in Journal of the American Medical Association (103:1644), November 24, 1934. Photostatic copy is labeled EXHIBIT NO. 24.

Note: An inquiry from Dr. H. A. Campbell of Newark, Ohio, with whom the author conferred in Newark on June 2, 1941, the reference sets forth Dr. Campbell's query as follows:

"I have been doing some industrial work for a firm that makes glass wool. (The reference is to Owens-Illinois Glass Company, which inaugurated the manufacture of Fiberglas before formation of Owens-Corning Fiberglas Corporation.) Minute particles of glass collect on the workers' skin and, together with the intense heat, produce a dermatitis, which is very irritating and difficult to combat. These men are required to take a shower at the end of the shift, but the cases of dermatitis continue. From the sketchy details given could you suggest a treatment?"

Queried at the request of the author by Dr. Carl M. Peterson, Secretary of the Council on Industrial Health of the American Medical Association, concerning his experience since 1934, Dr. Campbell replies in a letter labeled EXHIBIT NO. 25 as follows:

"Thousands of tons of glass wool have been manufactured here since my inquiry was published in the Journal (103:1644) on November 24, 1934. Since 1934 I have had a great deal of experience with the health aspects of manufacturing and fabricating glass wool, as well as glass textile products, having spent an average of two hours a day, five days a week carrying out my duties as Plant Physician. I have examined hundreds of workers in the plant and have devoted a great deal of attention to the possibility that they might be subjected to a dermatitis hazard or to any other occupational hazard in the course of handling glass fiber products.

"Our health records which have been carefully kept, show that dermatitis as a problem is practically excluded. Evidence

industrial compensation on an occupational dermatitis. This statement can be verified in the records of the Ohio Industrial Commission in Columbus.

"Occasionally, new employees suffer a mechanical irritation of the skin for a few days at the start of the job. For relief from this irritation during the stage when they are becoming accustomed to handling the products, I recommend that they apply as a soothing agent calamine solution containing one per cent phenol, an emollient that may be obtained at any corner drug store without a physician's prescription. But invariably - except in extremely rare cases where an individual may be allergic to an ingredient of binders or lubricants used in processing glass fibers -- the irritation disappears within a few days, the new workers apparently become immunized against the action of the fibers, and they suffer no further discomfort

"We recommend that they wear clothing loose at the neck and wrists, and in warm weather many of them work on production line stripped to the waist. The employees whose work brings them into almost constant contact with fibrous glass wool in rooms where particles of it might be in the air have compiled an outstanding health record covering millions of man hours. Some have been employed continuously for nearly ten years.

"Just as in the case of any manual labor I recommend that they use plenty of soap and water when the day's work is done. Soap and water is most effective in removing particles of fibers whether of glass or any other material from the skin. We find that there is seldom, if ever, need for gloves, armlets or other special or protective clothing. Without gloves or

similar articles of clothing, there is less tendency for fibrous particles to be rubbed into the skin.

"Our records reveal that there is no special eye hazard in handling fibrous glass that is not found in other insulation materials or in any other materials under conditions where small particles may fall into the eyes. Common sense indicates that the eyes should be protected under certain conditions of exposure, such as is the case when materials are being installed overhead and loose particles may fall in the eyes. I know of no case where any harm to the throat or lungs has resulted."

Dr. Campbell's letter then refers to the investigations carried out at Saranac Laboratory by Dr. Leroy U. Gardner. He then points out that dermatitis at the Newark plant has practically disappeared because of improvements in manufacturing techniques:

"Significant in regard to the dermatitis question is the improvement that has been brought about in manufacturing processes since I began my work as Plant Physician nearly seven years ago. When I made my inquiry of the Journal in 1934, the fibers in the glass wool then being manufactured for thermal insulation were less subject to precision control than they are now. Because of this improvement, substantial reduction in the amount of unfiberized material has resulted. 'Tramp fibers' of relatively coarse size, for example, have been practically eliminated.

"For these reasons, in my work as Plant Physician my concern is limited to normal safety practices and good housekeeping programs that will hold to a minimum routine accident cases rather than to any so-called occupational hazards."

The author cited Dr. Campbell's letter at length because its temperate tone and reasonable explanation of the evanishment of what appeared to be a perplexing confrontation of circumstances seven years ago are not unlike the matured point of view of many medical men who engage in industrial or private practice and encountered problems that are solved by time and patient study. The author, moreover, is able to offer his own evidence which he personally gathered through physical examination of production employees to substantiate Dr. Campbell's statement. This evidence is set forth in a subsequent section of this paper.

c. An independent search by the author of world medical literature since 1927 failed to reveal any further references to occupational hazards of fibrous glass products.

1. The files of the Quarterly Cumulative Index Medicus yielded only references to use of glass for rhinoplastic purposes, eye wound by solid glass fragment, criminal administration of powdered glass, visualization of shatter proof glass in tissues, roentgenographic study of glass and its visibility as a foreign body, study of glass particles resulting from breaking of glass ampules, non-injurious effects of ingesting pulverized glass, experimental tests with powdered glass administered in food and injected into circulatory system in rabbits and frogs, case proving harmlessness of eating powdered glass, experimental and medico-legal consideration of evidence that ingestion of glass is not always harmful.
2. The files of the Cumulative Book Index yielded only references to works on opportunities and conditions of work for minors in the glassware industry, composition of glass, development of American glass making and glass factory year book

Because the title of none of these references is pertinent to the subject, the author finds none of them significant for the purpose of this investigation.

9. The paucity of references to the subject in medical and other scientific literature is compensated for to some extent by evidence of the favorable experience of manufacturers and other consumers using thermal insulation made of glass wool. This evidence is presented in the following Exhibits:

a. Fiberglas is supplied to the United States Navy under seven Navy Department specifications (Nos. 32G2, 59B4, 32G5, 3211, 32C15, 32G3 and 32C14) covering thermal insulation for use on fighting ships and auxiliaries. In addition, Fiberglas electrical insulation is supplied to the United States Navy under four Navy Department specifications (Nos. 17-1-31 (Int.), 15-C-1, 17-B-4G, and 17-B-9A) covering uses in electrical equipment aboard Navy vessels. These specifications are set forth on pages 2 and 3 of Fiberglas Standards N5.2.21, "Fiberglas in Naval Service -- Where, Why and How Fiberglas Products Are Used in Navy Fighting Ships and Auxiliaries," which is attached as EXHIBIT NO. 26. On pages 4-8 of this Exhibit, references are made to Fiberglas Standards sheets in the "C" series, where full descriptive details are given of products covered in these Navy Department specifications. A manual of these "C" sheets is attached as EXHIBIT NO. 27.

The author regards these Exhibits as prima facie evidence of acceptance of Fiberglas products by the United States Navy, and he believes it to be a reasonable assumption that Fiberglas products would not have been admitted to Navy Department specifications and applied in volume aboard Navy vessels unless Navy Department officials had previously taken the precaution to assure themselves that application of these products is

attended by occupational hazards not encountered in alternative

materials.

Inquiry to the Division of Labor Standards, U. S. Department of Labor, in Washington, D. C., by the author, has failed to reveal the publication, or availability in any other form, of information regarding health hazards of Fiberglas products, although information regarding health hazards in practically every industry is available. This situation warrants the author in the belief that no serious hazard is associated with the manufacture or in the handling of Fiberglas products in industry.

b. Experience of the Moore Corporation of Joliet, Illinois, manufacturers of ranges and water heaters, as reported in a letter of March 19, 1941, to A. G. Brauer Supply Company of St. Louis from W. R. Baker, Works Manager, indicates that Fiberglas insulating wool is regarded by the Moore Corporation as having handling characteristics superior to other materials and as lacking properties present in competitive materials that necessitated use of respirators. This letter, labeled EXHIBIT NO.28, reads in part as follows:

"We have used this material now for approximately a year and believe it to be every bit as efficient as as the various makes of rock wool and slag wool on the market today. Besides this, we think it has one great advantage of being a much cleaner insulation than the average run that you find, as it is almost entirely free of any kind of shot material and is practically dustless. This is to our advantage, as we have had some materials in our plant that made it necessary for our men to wear respirators while handling it. This material, however, is clean enough for us to

eliminate the use of respirators in our present set-up.

"We also find that this material is easy to cut and very easy to handle, due to the long fibres which give it sufficient tensile strength to withstand the abuse in handling, which it naturally receives on an assembly line.

"Naturally, there is a certain amount of irritation coming from this insulation but I would say that this is not any more serious than other types of material on the market today

c. ~~The favorable experience of General Motors Corporation, whose Frigidair subsidiary in Dayton, Ohio, has used glass wool for several years to insulate domestic refrigerators.~~

~~In a letter to the author dated , Dr. Clarence D. Selby, Medical Director of General Motors Corporation and Member of the Council on Industrial Health of the American Medical Association, writes as follows:~~

~~This letter is labeled EXHIBIT NO. 29.~~

- c. Because it bears on the use of Fiberglas wool as cowl insulation in General Motors automobiles manufactured in Canada, the author desires to include reference to a letter dated March 24, 1941, to Walter Morris, Sales Manager, Fiberglas Canada, Ltd., Oshawa, Ontario, from Thos. MacLean, International Representative resident in Oshawa of the United Automobile Workers of America. The author is informed that the letter was written to Mr. Morris after members of the Oshawa local of the United Automobile Workers of America had considered whether they had any objection to installing Fiberglas insulation in an operation in automobile body assembly. The author regards as significant the following excerpt from Mr. MacLean's letter, which is attached as EXHIBIT NO. 30.

"After going through the Fiberglas Department on the morning of Saturday, Feb. 15th, the employees are satisfied that your product can be used successfully by General Motors without any [un] due hardship or discomfort to the employees involved."

The author believes that the context of Mr. MacLean's letter justifies the bracketed emendation in the excerpt quoted.

- d. Photographs of workers installing Fiberglas thermal insulation in water heaters, ranges, oil burners, and airplanes further indicate that these glass wool products are being widely used without personal discomfort or occupational hazard to the employees handling them. A manual containing seven such photographs -- picked at random by the author from files opened to him in Toledo and taken in plants of manufacturers to whom Owens-Corning Fiberglas supplies the material -- is attached as EXHIBIT NO. 31.
- They are as follows:

1. Workers applying Fiberglas insulating bats to a water heater.
2. Worker installing Fiberglas insulating bats in a domestic range.
3. Worker draping Fiberglas wool insulating bats in the oven of a domestic range.
4. Production line in the factory of a domestic range manufacturer showing workers installing Fiberglas thermal insulation in domestic ranges.
5. Workers installing Fiberglas insulating wool bats in a domestic oil burner.
6. Worker installing Fiberglas insulating wool bats in the oven of domestic range.
7. Worker installing Fiberglas thermal and acoustical insulating blankets in a Clipper ship built by Boeing Aviation Co. for Pan-American Airlines.

Photograph No. 7 in Exhibit No. 31 may be considered as illustrating an article on the use of fibrous glass in airplanes, which appeared in the Aviation Section of The New York Times of Sunday, April 13, 1941. Written by Francis Hewens, the article describes uses of Fiberglas thermal and acoustical blankets in aircraft, and the substance of the story relates to use of these blankets in the Clippers built by Boeing for Pan-American. A reprint of this story, labeled EXHIBIT NO. 32 is attached to substantiate further the author's assertion that uses of Fiberglas products have been widely publicized and that the absence of references in the literature to occupational hazards attendant upon those uses may be regarded as significant. The author regards as significant also the experience of Consolidated Edison Company of New York, Inc., as related in the following two letters:

1. Letter of May 2, 1941, to W. B. Dias, Owens-Corning Fiberglas Corporation, 718 Fifth Avenue, New York, N. Y., from C. R. Beardslee.

Manager, Contract Inspection Department, Consolidated Edison Company of New York, Inc., 4 Irving Place, New York, N. Y., in which Mr. Beardsley asserts that Consolidated Edison of New York has no specific rules setting Fiberglas products apart from other insulating materials as requiring special precautionary or protective devices. Photostatic copy of this letter is labeled EXHIBIT NO. 33

2. Letter of June 13, 1941, to W. B. Dias, Owens-Corning Fiberglas Corporation, 718 Fifth Avenue, New York, N. Y., from C. R. Beardsley, Manager, Contract Inspection Department, Consolidated Edison Company of New York, Inc., 4 Irving Place, New York, N. Y., which is attached as EXHIBIT NO. 34.

The author regards as significant the following paragraphs from this letter:

"Examination of our medical and insurance records has not disclosed any case of accident or disabilities due to working with mineral wools or Fiberglas.

"In order to complete the search we have also reviewed the practises of contractors' men in their work in our stations.

"The use of Fiberglas is of recent origin in this Company. The chief uses have been for expansion joints where the woven fabric or glass cloth has been valuable. Contractors' men installing these fabrics did not use respirators or goggles or gloves. However in filling spaces with rockwool, gloves were used to pack the material but respirators and goggles were not used.

"Recently metal mesh blankets of Fiberglas were installed experimentally as duct insulation. Gloves were used. As these blankets were applied on horizontal and vertical surfaces in location easily

"Another experimental installation of moulded Fiberglas pipe covering was made. This cut easily with a knife for fitting or shortening the standard lengths, without causing dust or flying particles. Cloth gloves were used but goggles and respirators were not used. This work was finished in Spring 1940.

"Woven fabrics have been used in our Shops by Company employees for coil insulation. Gloves, respirators, goggles are not used.

"As to the general contractor practises with rockwool, goggles and respirators are used with loose materials or when applying blankets on the underside of ducts where materials may drop.

Respirators are used in closely confined quarters where dusts may be present. Rubber gloves are used when mixing and handling all types of insulating cements. Leather gloves are used when handling metal reinforcements and bindings.

"We have consistently required our own employes to take all necessary precautions and our accident record is such that we believe the precautions are adequate. Likewise we encourage contractor to apply for the protection of their employes the same precautions we require of our own men. We do not encourage practises we deem unnecessary."

The two letters cited above from Mr. Beardsley to Mr. Dias are pertinent to a statement that appears in the minutes of the meeting of the Board of the International Association of Heat and Frost Insulators and Asbestos Workers on March 12, 1941, as reported in The Asbestos Worker Vol. XI, No. 15 (April 1941), p.4. (See EXHIBIT NO. 35.)

The statement is as follows:

"To those Local Unions whose membership work glass insulation the Board suggests that their membership adopt the precautions taken by our membership on the Edison Power House, New York City, where the employer, at his own expense, furnished respirators for mouth and throat protection, goggles for eye protection, cloth gloves for the handling of glass insulation and rubber gloves for glass cement."

The author believes that the foregoing creates a misimpression of the conditions under which glass wool insulating products were applied at Consolidated Edison, in view of the letters from C. R. Beardsley cited above. It is evident that members of the International Board received incomplete information which, as set forth in the record, leads to invalid inferences. For example, Mr. Beardsley writes, in the excerpt quoted above:

"Rubber gloves are used when mixing all types of insulating cements."

Thus, while it is true, as the minutes in The Asbestos Worker indicate, that rubber gloves were worn for glass wool cement on the Consolidated Edison job, this is a general practice and not one adopted exclusively when glass wool cement was being used.

10. The author finds that isolated cases of skin irritation attributed to contact with glass wool are insufficient to incriminate glass wool as the cause of any severe dermatitis. Pertinent to the subject of skin irritation is the following paragraph that appears in the Minutes of March 12, 1941, of the Board of the International Association of Heat and Frost Insulators and Asbestos Workers, already cited as Exhibit No.35.

"The Board considered the question of the application of glass insulation and testimony given in relation to same coming from both Union and non-Union men who applied it, one of whom, a member of an affiliated Local Union in the employ of a shop with a signed International Agreement, appeared and testified that as a result of severe skin irritation the shop in question sent him to the city hospital for immediate treatment, after which the shop's compensation Doctor informed him he would have to quit this class of work."

The author notes that the report of the case as recorded in the Minutes is in the realm of hearsay evidence and is lacking in scientific diagnostic or clinical details or any further documentation. That the worker in question may have suffered discomfort is not denied. But the author wishes to point out that the causative factor leading to the worker's condition may have been an allergy or predisposition to secondary effects of mechanical irritation of the skin, similar to that described by S. von Szentkiralyi in the article cited as Exhibit No. 22.

Scrupulously to be avoided in attempting to reach any scientific conclusion is the "after the fact, therefore on account of it" fallacy(post hoc ergo propter hoc), which is common in effect-to-cause (a posteriori) reasoning. To a large extent the science of medicine -- certainly the science of the

diagnostician and of the pathologist -- depends upon the accuracy with which causes may be isolated and assigned the responsibility of producing observed effects. The medical may go astray by treating symptoms without recognizing underlying, fundamental causes. Conversely, inexperience may lead the medical man and/or the layman to overstress the importance or seriousness of superficial symptoms and to assign as a cause of those symptoms a condition or circumstance that may be present only as a coincidence. The generalizations, these generalizations being accepted as valid by the profession to the degree that they are reached through inductive reasoning from accumulated masses of clinical and case histories subject always to revision and biological studies in the light of research.

On this basis the medical man carries on his practice, observing symptoms, making diagnoses, prescribing treatment, watching response of the patient to that treatment. In so doing, he uses deductive reasoning, and his colleagues' estimate of his skill depends upon the success with which he can produce a desired improvement in the condition of the patient by supplying a cause sufficient to bring about that effect.

The foregoing dissertation on the way in which a medical man relies upon the logic of cause and effect relationships, both through inductive and deductive reasoning, is included in this investigation to point out that sufficient clinical histories and biological investigations must be accumulated to warrant a generalization and that a hunch or hypothesis must be substantiated by authoritative case histories and biological investigations before it can be accepted by the medical profession as a sound generalization.

On page 13 of the reprint attached as Exhibit No. 8, Dr. Gardner, writing in the Journal of the American Medical Association, expresses

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this same thought in these words:

"An apparently comprehensive occupational history and the histologic evidence of a single autopsy specimen does not warrant the inference that a mineral other than free silica has caused the fibrosis."

So far the discussion of this point has been theoretical. The author offers the evidence of his own research on the question of whether glass wool may be incriminated as a factor causing dermatitis.

At the request of the author, Dr. H. A. Campbell removed two biopsy specimens of skin from the arm of a newly employed worker in the Owens-Corning Fiberglas Corporation plant in Newark. The worker from whom the biopsy specimens were taken had a moderate degree of a skin irritation. These specimens were taken from the only case of significant skin irritation which the author observed in his inspection of approximately two hundred employees during his visit to the Newark plant on June 3, 1941. The employee in question had been handling both plain and bonded glass wool for four days.

Serial microscopic sections of this tissue show a mild degree of capillary dilatation in the corium of the skin. In addition there are a few scattered lymphocytes around several of the dilated capillaries. The epidermis is entirely normal. No glass particles are found. There is no evidence of fibrosis, bacterial infection, allergy, or hyperkeratosis. Several of the serial sections show a small amount of a brownish pigment in the corium which shows no inflammatory reaction around it. It is assumed that this pigment is bakelite. The fact that there is no foreign body reaction around this indicates that this material is an inert substance and that it does not produce either a foreign body reaction or a fibrosis.

The extremely mild inflammatory reaction in the corium of the skin

Final Diagnosis of Biopsy Study. Mild mechanical irritation of skin which cannot be regarded as a progressive irritation.

The sections are available for study in the author's pathological laboratory in DePaul Hospital, St. Louis, and a colored photomicrograph of a representative section will be furnished later as an Exhibit to supplement this investigation. So far as the author is aware, this is the first biopsy study of the skin lesion encountered by workers inexperienced in the handling of glass wool.

The author attached as EXHIBIT NO. 36, copy of a letter dated June 5, 1940, written to C. G. Staelin of Owens-Corning Fiberglas Corporation by Adolph B. Loveman, M. D., Louisville dermatologist. The author regards as significant the following excerpts from Dr. Loveman's letter:

".... I patch tested ten individuals, including the eight employees at the Louisville Textile, Incorporated, to the following materials: staple-fiber, continuous fiber coating, glass fiber lint, glass fiber thread and the finished fiberglas fabric. All of these tests were negative.

"The fact the above patch tests were negative proves conclusively that none of the materials were a source of primary chemical irritation. It also makes me feel that the possibility of some chemical allergy is a rather remote one. This is especially unlikely in view of the fact that two or three employees tested were among those who complained of itching when they handled the material. In my opinion, the mild itching was due to a mechanical irritation from the fine glass particles. It is nevertheless possible to have a mild chemical allergy which is only made manifest following prolonged mechanical irritation....

"In order to make this report complete, I wish to state that I did

not find any evidence of a definite contact dermatitis in any of the employees although some complained of a mild itching when handling the product. The dermatitis produced was unquestionably of a very mild and transient nature.

"I did examine one patient who complained a great deal of a skin eruption and who felt certain that it was due to Fiberglas. He presented, however, a toxic eruption and upon questioning him I learned it had been present at times prior to working with Fiberglas. Nevertheless, we removed him from this work for a period of two or three weeks, after which time I again examined him and he presented the same type of eruption. In this particular case, it is my opinion that his teeth were probably the foci of infection."

The patient described in the last paragraph cited above presented a case that may very well parallel that of the worker described in the minutes of the Board, as reported in The Asbestos Worker, attached as Exhibit No. 35. The author deems it desirable to point out that laymen are sometimes prone to jump to conclusions on the basis of insufficient evidence, and that this human tendency may well have made it seem reasonable to members of the Board to record for the benefit of the Union's membership the case about which the Board received testimony. To provide a scientific approach to this case, however, and to the whole question of whether handling glass wool products is attended by a dermatitis hazard, the author has devoted this section of his investigation to setting forth medical findings that warrant the following generalization: Contact with glass wool may cause ephemeral discomfort among workers inexperienced in handling the material. The skin irritation, however, cannot be regarded as a progressive dermatitis, for it is non-toxic and usually disappears in a few days. In extremely rare instances, where a worker may be predisposed to secondary effects of

mechanical skin irritation because of idiosyncrasy, allergy, or the presence of foci of infection elsewhere in his body and otherwise disassociated from the effects of mechanical irritation, lesions may persist, but these cases are encountered with such rarity that they do not justify incriminating glass fiber as a causative factor.

It should be noted in this connection that in the case described by Dr. Loveman in the last paragraph quoted above, it was the patient who suggested incriminating Fiberglas as a cause for his condition. In other words, because of the patient's lack of familiarity with scientific logic, he was ready to rush to a conclusion "after the fact, therefore on account of it" -- the post hoc ergo propter hoc fallacy. Dr. Loveman, however, set this time relationship straight with the patient's admission that he had suffered a toxic eruption prior to working with Fiberglas. The author reports as additional evidence his own examination on June 3, 1941, of the wrists, arms, ankles, neck, eyes, shoulders, and waists of approximately two hundred production employees engaged in handling glass wool products in the Newark, Ohio, plant of Owens-Corning Fiberglas Corporation. These workers were employed on production lines and at fabricating operations, cutting, sawing, shaping, transporting, and packaging glass wool, both "plain" white wool and bonded wool of various densities.

The author did not see a single case of eye irritation or conjunctivitis during this inspection,

Only the worker who had begun his employment in the factory four days before on a fabricating job -- the worker from whom the biopsy specimens referred to above were taken -- showed evidence of significant skin irritation. The author was given free opportunity by Dr. Campbell, the Plant Physician who accompanied him on an unannounced tour of all departments of the factory, to examine at random any worker with whom the author chose to talk.

Private conversations were had by the author with these workers. A typical examination reconstructed by the author following his plant visit, was as follows:

THE AUTHOR: How long have you been working here:

THE WORKER: About six months.

THE AUTHOR: Do any glass fibers ever get in your eyes:

THE WORKER: Haven't noticed any. If they do, I blink them out.

THE AUTHOR: I'm a doctor. Mind if I have a look at your eyes?

THE WORKER: No, go ahead.

(The author then palpated the worker's eyes, rolling back the eyelids to reveal any symptoms or other evidence of irritation or inflammation.)

THE AUTHOR: How about your hands?

THE WORKER: Here they are.

(The author then examined the worker's hands for symptoms or other evidence of skin irritation.)

THE AUTHOR: Let's roll back your sleeves.

(The worker then rolled back his sleeves above the elbow, and the author examined his wrists and lower arms for symptoms or other evidence of skin irritation.)

THE AUTHOR: How about your waist?

(The worker then loosened his belt, opened his trousers, pulled out his shirt, opened his underwear, and the author examined his waist for symptoms

THE WORKER: Nope. Loose clothing is the thing.

THE AUTHOR: Do you notice any difference in hot weather?

THE WORKER: Well, I've only been here since December, but
most of the boys strip to the waist in the summer.

THE AUTHOR: Do you ever wear a respirator?

THE WORKER: Nope.

THE AUTHOR: Does anybody in the factory wear a respirator?

THE WORKER: Sure, the boys in the batch house do.

THE AUTHOR: Why?

THE WORKER: Well, you're the doctor, but when they're mixing
the batch they don't want to breathe any sand,
even though they've got a good set-up over there.

(The author considers it desirable to call attention at this point to the description of the batch house operation and mention of the Pangborn central dust-collecting system used therein, in EXHIBIT NO. 37, which is a reprint of "Precise Product Control at Owens-Corning Plant" in Glass Industry, August 1939. The author observed no special dust-collecting equipment during his tour of the Newark factory, other than in the batch house.)

THE AUTHOR: Why not?

THE WORKER: They might get silicosis.

THE AUTHOR: Aren't you afraid of getting silicosis from
glass wool dust that might be in the air?

THE WORKER: Not a chance. This is glass. Those fellows in
the batch house are dealing with sand -- silica
they call it.

THE AUTHOR: What's the difference?

THE WORKER: Plenty. There's just about as much difference

chlorine and table salt.

THE AUTHOR: How do you know that?

THE WORKER: Learned it in high school chemistry. And, remember, Doc, Newark's a glass town. If there was any danger of getting silicosis from this glass wool dust, we'd be wearing respirators. There's no use taking chances.

THE AUTHOR: Do these glass fibers ever get in your nose or throat?

THE WORKER: Not so I notice it.

THE AUTHOR: Ever have colds or sore throat?

THE WORKER: No more than anybody else.

THE AUTHOR: Have you had a cold in the six months since you have been working here?

THE WORKER: Had one about Easter time. Most generally do get one in the spring.

THE AUTHOR: How do you account for the fact that new workers seem to have trouble at the start of the job and then, as you say, the itch disappears after a few days?

THE WORKER: Ever get blisters on your hands when you mow your lawn first time in the spring? Ever have your feet get too big for your shoes when you go on a hike and aren't used to walking a lot? You just got to get hardened to it, just the way a brick-layer has to get his hands toughened up to handling bricks.

THE AUTHOR: Have you got any callouses on your hands?

THE WORKER: No, that's just a way of putting it. You have to get used to any job. My girl is always talking about dishwater hands. She reads the soap ads.

THE AUTHOR: Do you really get used to it once and for all, or does it still trouble you now and then?

THE WORKER: No, Doc, I'm honest about that. It really don't bother me none. All you have to do is get over that little hump at the start and take a good bath every day when you get through work.

THE AUTHOR: Bath?

THE WORKER: Sure. Bath or shower. Shower's better. Get all soaped up, and if you have picked up any slugs they wash right off.

THE AUTHOR: What are slugs?

THE WORKER: Oh, now and then there may be a few fibers get beneath your collar or on your wrist. But it's not as bad as it used to be.

THE AUTHOR: Why not?

THE WORKER: The Quality Control boys watch it pretty close and they're getting better wool than they used to.

THE AUTHOR: Have you noticed any difference in quality in six months?

THE WORKER: Not in six months, but there's a lot of fellows who've been around here for six or seven years, and they tell me this stuff isn't near so itchy now as it was when they started.

THE AUTHOR: Maybe they're just used to it.

THE WORKER: Could be, but it don't bother me none.

* * *

The author heard "it don't bother me none" repeatedly in conversations with the employees. Only the new employee from whom the biopsy specimens were taken revealed symptoms of significant skin irritation. His attitude was not one of complaint; rather it was one of expectation that the irritation would soon disappear and that he would get used to handling the glass wool just as his fellow workers had become accustomed to the materia. When the author called Dr. Campbell's attention to the skin irritation, Dr. Campbell suggested that the worker go to the office of the Plant Physician and obtain some calamine solution with one per cent phenol to apply as an emollient. The worker readily accepted the suggestion and agreed to do so. Dr. Campbell explained to the author that he found this treatment effective in relieving the skin irritation sometimes experienced by workers for a few days after starting on the job.

One 22-year-old employee who told the author he had worked in the factory for two and one-half years, said that although he became accustomed to handling glass and suffered no discomfort while continuously on the job he had noticed a mild skin irritation for a few days upon returning to the job following his two-week vacation.

"As long as I'm working right along," he told the author, "I stay toughened up to it. But if I haven't been handling it for a while, like when I'm on my vacation, then it takes a few days to get over the itch when I start in again."

Typical of the operations carried out by production employees handling glass wool products are the scenes pictured in the three photographs in the manual labeled EXHIBIT NO. 38. These photographs, selected

at random by the author from files made available to him in the Corporation's General Offices in Toledo, are as follows:

No. 1 - Worker measuring thickness of Fiberglas
insulating wool on production conveyor.

No. 2 - Workers adjusting Fiberglas insulating wool
to form sewn blankets on Norwood Stitcher.

No. 3 - Worker sawing refrigerator bat of Fiberglas
PF bonded wool.

These scenes are typical of those observed by the author during his plant inspection. In addition, half tones of other scenes are printed in Fiberglas Standards, to be found in Exhibit No. 27.

11. Examination of the records in the office of the Plant Physician in Newark reveals that there is no unusual incidence of respiratory infections among Owens-Corning Fiberglas Corporation employees, and statements furnished directly to the author by Newark physicians whose practices are limited to eye, ear, nose, and throat disease and in no way affiliated or associated with the Corporation indicate that these specialists notice no unusual incidence of respiratory disturbances among private patients employed at Owens-Corning Fiberglas Corporation as compared with their private patients who are not employees of the Corporation.

Attached as EXHIBIT NO. 39 are copies of memoranda dated May 23, 1941, and June 28, 1941, that tabulate data concerning upper respiratory, sinus and lower respiratory disorders, eye irritations and influenza covering experience among the Corporation's Newark employees from February 8, 1939, to April 1, 1941. Correlation of these figures with the employment statistics tabulated in Exhibit No. 1 show, for example, that from February 8, 1939 to December 31, 1939 four lost time tonsillitis cases were recorded among a total employed group ranging from 614 in February to 966 in December of that year.

The figures in Exhibit No. 39 are compiled from disability and sickness claims made by employees under their Aetna group insurance. Because the Aetna claim records are the source of these statistics, it should be noted that they may be regarded as complete, since all employees are covered by the Aetna group insurance and each employee who loses time because of illness has a monetary incentive to report his illness so that he may receive the benefits of his insurance coverage under the terms of the Aetna contract.

Incidence of lost time cases of tonsillitis, sinusitis, pneumonia, tuberculosis, eye irritation, and influenza may readily be seen in the following table which correlates information given in greater detail in Exhibit No. 1 and Exhibit No. 39.

Incidence of Representative Upper and Lower Respiratory Infections
and Eye Irritations Among Newark Employees of Owens-Corning Fiberglas Corporation

Length of Exposure	Size Range of Employed Group	NUMBER OF LOST TIME CASES*					Influenza
		Tonsillitis	Sinusitis	Pneumonia	Tuberculosis	Eye Irritations	
11 months	(February)(December) 614 to 966	4	0	2	0	1	13
12 months	(January)(December) 979 to 1403	7	5	4	1	2	78
3 months	(January)(March) 1525 to 1723	0	5	2	0	0	43

* Based on claim records of Aetna Life Insurance Company

The author made inquiry of the Ohio Department of Health in Columbus to determine whether data on the incidence of upper and lower respiratory infections among the general population of the State of Ohio are available for comparison. He received in response to his inquiry a copy of the brochure entitled "Vital Statistics for 1940," published by the Ohio Department of Health, which is attached as EXHIBIT NO. 40. It is impossible, however, to correlate these statistics (See EXHIBIT NO. 41) with the lost time disability records of Owens-Corning Fiberglas employees in Newark because the two sets

of date not comparable, the vital statistics being set forth only in mortality tables.

Because these data are not available, the author has sought statements from physicians in private practice in Newark who are specialists in diseases of the eye, ear, nose and throat.

Attached as EXHIBIT NO. 42 is a letter of June 17, 1941, to the author from C. G. Faue, M. D., of Newark, who writes as follows:

"It has come to my attention that you are interested in the incidence of eye, ear, nose and throat infections among Glass Workers.

"Since taking over an established practice in these specialities in 1937, I have not been impressed by a higher incidence of these infections among the workers of the various Glass Factories here than among the rest of the population."

EXHIBIT NO. 43 is a letter dated June 17, 1941, written to the author by John E. Hendricks, M. D., of Newark. Dr. Hendricks writes as follows:

"I am one of five E. N. T. (ear, nose, and throat) specialists located in this city. I have practiced my specialty in Newark for three years following a four year residency in an Eastern hospital. During these three years I have treated my share of Owens Corning employees. I can safely say that I have noticed no unusual preponderance of head or throat infections among these people as compared to my other patients who are not employed there.

"If I ever make a table showing percentages of different diseases, that I have treated, I feel sure that there would be a normal proportion of Owens Corning employees in each classification.

"I would be willing to make a sworn statement of the above statements

Another letter is directed to the author by Clark B. Hatch, M. D. Dated

"At the request of Dr. Harold Campbell, I am writing you regarding the incident (sic) of inflammatory or infectious diseases of the nose and throat among my patients who are employees of the Owens-Corning Fiberglas Corporation.

"My practice covers a cross section of all parts of Newark and I have never felt that, from an occupational standpoint, there was any larger percentage with respiratory infections, among the employees of the above mentioned corporation than from any other walk of life. In fact, until Dr. Campbell asked me for my opinion, I had never given any thought to the matter, as I naturally would have had there been more of these cases among those employed at the Owens-Corning factory.

The author examined several hundred stereoscopic X-ray plates of the chests of employees. These were selected at random by the author from the files of some fifteen hundred plates taken since the company instituted a policy in 1939 of X-raying all Newark employees. These plates are kept in the office of the Plant Physician.

The author selected for special inspection chest X-ray plates of the following three groups:

- a. Employees with records of tuberculosis. Attached as EXHIBIT NO. 45 (in nine pages) is a statement furnished the author by Dr. H. A. Campbell setting forth diagnoses of chest X-rays and employment histories of workers having tuberculosis. The eight employees listed are as follows: James Fleming, John Lusetti, Murray B. Orr, Paul Marriott, Glen Lightle, Richard Wolford, Herbert Hileman, Lawrence Hannigan.

Diagnoses of the plates for Fleming and Lusetti, as made by the Saranac Laboratory, are recorded on page 1 of Exhibit No. 45. Copies of Diagnostic Chest Charts made at Licking County (Ohio) Tuberculosis Sanatorium of Orr, Marriott, Lightle, Wolford, Hileman, and Hannigan are on pages 3 to 9, inclusive, of the Exhibit. With one possible exception, the author was convinced, these records encompass all cases of tuberculosis among Newark employees of Owens-Corning Fiberglas Corporation or of Owens-Illinois Glass Company since the manufacture of glass wool began in Newark.

The one possible exception is the case of one Virginia Lee Vandembark, who was employed in the Chemistry Laboratory at the Newark plant from March 2, 1935, until May 31, 1935. According to the record on file in the office of the Plant Physician, her work during that period consisted chiefly of taking a small sample of glass wool, weighing out twenty milligrams of the sample, and then taking the slug count, fiber length, and fiber diameter of the wool.

The records shows that Miss Vandembark was absent from work on March 22, 23, 24, 25, and 26, 1935, because of a throat ailment. Subsequently she contended to company officials that she had contracted a pulmonary disorder because of her occupation. The claim was not pressed, however, and the author finds that such a disorder cannot be construed as the result of any occupational hazard encountered in the course of her work in the Chemistry Laboratory because of the brevity of the period of exposure, even assuming that such a hazard did exist.

b. Batch house employees. Concerning these employees, the author has attached as EXHIBIT NO. 46 a letter directed to him by Louis A. Mitchell, M. D., of Newark, Ohio, whose practice is limited to roentgenology. Dr. Mitchell's statement is as follows:

"Beginning on May 19, 1939, I have made serial stereoscopic chest films of the following men who have been employed in the batch house of the Owens-Corning Fiberglas Corporation plant in this city: John Clectner, Eugene Harris, Clyde Buckingham, Joseph A. Billman, Lawrence A. Billman, Harold Myers, Dana Woolard, John Laharg, John Weisent, Arthur C. Tierpont, Jacob Pugh, Kenneth Walters, Carl Street.

"A repeat examination on all of these men has been made during the past two weeks.

"In no case has there been any radiographic evidence of silicosis or any active pulmonary disease."

In a letter to the author dated June 28, 1941, (See EXHIBIT NO. 47) which supplements his letter of June 17, 1941, already cited as Exhibit No. 41, Dr. Mitchell corrects the spelling of the name Harold Myers to Harold Meyer and points out that the list of thirteen batch house employees given in his June 17 letter should be revised: a) to substitute the name of Lawrence A. Wright for "Lawrence A. Billman," and b) to add the names of Alton Shannon and Charles Vinning.

Dr. Mitchell reports for these two additional batch house employees "no radiographic evidence of pulmonary disease. These reports of Dr. Mitchell cover the fifteen men listed in the tabulation of names and date of employment of batch house employees furnished to the author by Dr. H. A. Campbell, as supplemented by his letter to the author dated June 28, 1941. This tabulation and Dr. Campbell's supplementary letter, attached as EXHIBIT NO. 48, include all of the men who are now working, or who have worked in the batch house at the Newark plant of Owens-Corning Fiberglas Corporation.

c. Employees with records of silicosis. Attached as EXHIBIT NO. 49 is a tabulation furnished to the author by Dr. H. A. Campbell setting forth names and employment histories of three workers having silicosis. The author regards as significant Dr. Campbell's statement:

"These are the three cases of silicosis that we have found. None of these men have been employed in the batch house but they do handle glass wool. It is the policy of the company not to refuse employment to any man for whom a safe job can be found."

The author notes the following concerning the occupational history of these workers:

1. George Lovell worked at a company other than Owens-Illinois or Owens-Corning as a molder from 1924 to 1929, and was X-rayed in 1929 because of the presence of tuberculosis in his family. He was re-X-rayed in 1936 because of suspicion of silicosis. He began his employment at Owens-Corning Fiberglass Corporation on June 6, 1940.
2. Harry Pfeil was employed as a bottle blower and machine operator from 1901 to 1930. He began his employment at Owens-Corning Fiberglass Corporation on March 26, 1941. Silicosis was diagnosed following an X-ray taken May 12, 1941.
3. Robert Watson worked for twelve years as a molder before beginning employment with Owens-Corning Fiberglass Corporation on October 25, 1939. Silicosis was diagnosed following X-ray on November 1, 1940.

The author finds that in each of these silicosis cases there is a sufficient causative factor in the employment history or other circumstance set forth in the Exhibit, and that the evidence is insufficient to indicate that the condition of any of them should be attributed to any silicosis hazard encountered in handling glass wool, even assuming such a hazard

Dr. Campbell called to the author's attention records of dust counts that have been made in various parts of the Newark plant, and the author was informed that further counts were deemed unnecessary because the surveys showed absence of significant concentrations that might be considered harmful to health.

On the basis of evidence set forth in this section, the author finds that workers handling glass wool products are subjected to no special occupational hazards that manifest themselves in eye, ear, nose, or throat disorders, pulmonary disorders, or diseases of the upper or lower respiratory system.

12. The author has made reference earlier in this investigation to the fact that he observed no special dust-collecting equipment in the Newark factory of Owens-Corning Fiberglas Corporation other than the Pangborn central dust-collecting system in the batch house. He considers it significant that this is so, because it is his finding that glass wool is remarkably free of dusting characteristics. He finds that because of the length of the fibers and the "pack strength" of glass wool products, there is negligible dusting of the material during handling, and that the glass fibers break, rather than shatter, along clean edges at points where they are abraded by sawing, chopping or cutting during production line or fabricating operations.

In support of this finding that dusting during handling of glass wool products is negligible, the author attaches as EXHIBIT NO. 50 photostatic copies of two reports made to Owens-Corning Fiberglas Corporation by the Engineering Experiment Station of Purdue University. The first report in this Exhibit, dated October 4, 1937, established the fact that Fiberglas blanket insulation does not settle, sag, or pack down. The second report, dated November 15, 1937, contains the following statement under Test.No.1:

"Also, there was no dust or small particles of the material which had sifted through the muslin."

A similar statement is given under Test No. 2. Both tests are accompanied by pictures of the testing equipment and a description of the test procedures.

The author attaches as EXHIBIT NO. 51 a copy of Performance, Vol. II, No. 1, published by the National Mineral Wool Association as part of its Centennial Celebration for mineral wool. On the back page of this four-page publication is a facsimile reproduction of p. 73 of the April 1887 issue of The Scientific American, Architects and Builders Edition.

In this facsimile there is the following statement defining mineral wool:

"This substance is, in fact, nothing more nor less than a species of glass, drawn out by a peculiar process in the form of fine threads, which are curled up into innumerable convolutions, and hence the name Mineral Wool."

The author regards this as early evidence of recognition of the fact that rock wool, slag wool, and glass wool are substantially identical products. He finds this statement further confirmed in the paragraph beginning at the bottom of the second column and extending to the top of the third column, as follows:

"Mineral wool is made by converting vitreous or scoriaceous substances into a fibrous state. The slag of blast furnaces affords a large supply of material suitable for this purpose. The product thus obtained is known as slag wool. For the reason that slags are seldom free from compounds of sulphur, which are objectionable in the fiber, and in order to be independent of the action of furnaces, ~~these two products~~ which we make rock wool. These two products

comprise the two kinds of mineral wool. They are not to be distinguished from it, but from each other."

Under present-day conditions, the foregoing paragraph is not completely accurate inasmuch as rock wool may be made from quarried rocks having a natural composition suitable for conversion into mineral wool, and it does not recognize the introduction of a true glass wool. It does, however, recognize the objection to sulphur content, the presence of which in many grades of rock and slag wool tends to make them corrosive to metals, particularly aluminum. The author is convinced from his study of formulas used in compounding the batch out of which Fiberglas products are made, that Fiberglas insulating products are free of sulphur and may properly be classified as a refined form of mineral wool.

The author notes that in the next to the last paragraph of the article cited, there is a comparison between the weights and volumes of a cubic foot of slag and the equivalent value of ordinary mineral wool. These same factors, translated into terms of Fiberglas, show that one cubic foot of solid glass weighing approximately 150 pounds will make 100 cubic feet of Fiberglas wool because the latter has an apparent natural density of one and one-half pounds per cubic foot. For that reason, Fiberglas insulating wool at its natural density has one per cent fibers and 99 per cent entrapped air, which is considerably superior to what the article in The Scientific American calls the "Extra" grade of mineral wool.

The author calls attention also to the early recognition of the mechanical skin irritation experienced in the handling of rock wool and more than fifty years ago. In the first column under the subject "As to Rats, Mice, Insects, and Disease Germs," appears the following statement:

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"On the other hand, the fine fibers of glass are irritating to anything which attempts to burrow in them."

This thought is reiterated in the closing paragraph of the article, where it is classified as an important advantage.

The author regards as significant the fact that this issue of Performance commemorated the one hundredth anniversary of the first commercial production of mineral wool, for it records a statement fifty-four years old indicating that the material is substantially identical chemically with what is known as Fiberglas. It is also recognition of the mechanical irritation caused by fiber particles of mineral wools. Since mineral wool -- in which category Fiberglas insulating products are properly classified -- has been used for many years without creating any known industrial disease, the author regards this as further evidence supporting the statement that glass wool is unlikely to introduce any serious occupational hazard.

In view of the foregoing observations, the author wishes to point out what he regards as a psychological cause of alarm that may occasionally and without real foundation account for concern among workmen not familiar with glass wool products. The word glass is surrounded by connotations that suggest a hard, sometimes shatterable, transparent material. Sometimes these connotations become stereotyped. Fiberglas is glass in new physical form, and its fiber diameter in relation to length gives to glass new physical properties. Just as iron or steel may be elongated and transformed from a hard, unbendable solid into a flexible substance, so glass drawn into fine fibers becomes resilient, light in weight and unrecognizable as glass to persons for whom the word connotes only long familiar associations.

Glass wool products are still of such comparatively recent origin

and in hearing them described as

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"fibrous glass" or "Fiberglas," fail to realize that they may be classified as a new refined form of mineral wool and lack many of the physical properties long associated with objects like bottles, window panes, lamp bulbs, lenses, and ground glass.

* * *

Recapitulation and Conclusions

In submitting his best judgment based on his professional interpretation of the facts conscientiously assembled and set forth herein, the author finds as follows:

The conclusion that the manufacture, fabrication, and application of Fiberglas products is accompanied or attended by no unusual occupational hazard is justified by the evidence, being derived from the following chain of reasoning, which is supported by the Exhibits enumerated throughout the text of this investigation:

Duration of Exposure Warrants Generalizations

1. Factory experience of nine years' duration, covering an employed group in Newark, Ohio, that has increased from twenty in 1932 to 1,826 in 1941, gives exposure sufficient to warrant generalizations on the subject.

No Workmen's Compensation Claims Ever Validated

2. No claim for Ohio workmen's compensation, based on an occupational hazard attributable to Fiberglas has ever been validated or compensation awarded.

Gardner's Research Indicates No Silicosis, Fibrosis, or Dust Hazard

3. Research investigations by Dr. Leroy U. Gardner, Director of the Saranac

Laboratory for the Study of Tuberculosis and member of the Council on Industrial Health of the American Medical Association, indicate absence of any silicosis, fibrosis, or dust hazard from working in glass wool.

Binders and Lubricants Cannot Be Incriminated

4. Binders and lubricants used in processing glass wool products cannot be incriminated as the causative factor of any occupational hazard.

Compensation Rates Are Lower Than in Comparable Industries

5. Ohio workers' compensation rates for employees of Owens-Corning Fiberglas Corporation are lower than for workers in comparable industries.

Aetna Experience Indicates No Unusual Hazard

6. Experience of Aetna Life Insurance Company as insurance underwriter for group coverage on life, disability, sickness and hospitalization on all Newark employees of Owens-Corning Fiberglas Corporation, and experience of Aetna Casualty Company as underwriter on products liability coverage for Owens-Corning Fiberglas Corporation, indicate no hazard different from any normal manufacturing operation.

Medical Literature Provides No Evidence of Unusual Hazard

7. A search of world medical literature since 1927 fails to reveal references to any unusual occupational hazard in the handling of glass wool.

Market Activity Would Have Spotlighted Any Unusual Hazards

8. In view of the continually expanding market for glass wool products since 1932 and in view of promotion and advertising campaigns carried out to increase the sale of these products, the paucity of references to the subject in the literature of medicine and science and the lack of controversy or interest in the subject among persons usually alert to possible industrial hazards cannot be attributed to ignorance concerning

Corporation as compared with their private patients who are not employed by the Corporation -- these facts warrant the conclusion that there is no unusual incidence of eye, ear, nose, or throat disorders, of pulmonary disorders, or of diseases of the upper or lower respiratory system among workers handling glass wool products and that therefore such workers are subjected to no special or unusual occupational hazards that manifest themselves in such disorders or diseases.

Glass Wool Resists Dusting, Is a Refined Form of Mineral Wools Long in Use

12. Because glass wool is resistant to dusting under vibration and shaking, as revealed by tests made in 1937 at Purdue University, it may be regarded as a remarkably dust-free material; and because glass wool may be classified as a refined mineral wool and therefore regarded as similar to older types of mineral wools like rock and slag wools that have been used in the insulating trades for more than fifty years, glass wool may not be regarded as having any special or unusual hazards not encountered in the handling of these older types of mineral wool.

Walter J. Siebert, M. D.

Pathology Laboratory
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June 28, 1941

Appendix

Supplementary avenues of approach to the subject have suggested themselves to the author that may lead to evidence shedding further light on the conclusions drawn.

For example, in spite of the efforts that the author has made to exhaust completely references in the literature and other sources of information, he is making further attempts through the Missouri Department of Health and the United States Public Health Service to reveal additional information that may not have come to his attention. He would welcome from any source any information that pertains to the subject.

Research is now in progress in the author's pathology laboratory at DePaul Hospital, St. Louis, as follows:

1. To determine the exact effects of glass wool on the mucous membranes, skin, and other body tissues in controlled experiments on human beings. (The author is employing in these experiments samples of Fiberglas products selected by him at random during his visit to the Newark plant on June 3, 1941, as listed on the Owens-Corning Fiberglas Corporation "sample request", which is attached as EXHIBIT NO. 52.)
2. To make comparative studies of the dusting properties of Fiberglas and of other materials used in the insulating trades, including rock wool, slag wool, asbestos products, 85% magnesia, rock cork, and wood fiber products. In evaluating the results of these studies he will consult such published bulletins on these other materials as are available, including:

a. A. J. Lanza, William J. McConnell, and J. William Fehnel, "Effects of the Inhalation of Asbestos Dust on the Lungs of Asbestos Workers," United States Public Health Reports, Vol. 50, No. 1, January 4, 1935.

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7. To report on tissue reactions to Fiberglas products from the standpoint of its use as surgical suture material in nose and ear operations. In this connection, the author attaches as EXHIBIT NO. 55 a letter dated May 19, 1941, from Roy Philip Scholz, M. D., in which Dr. Scholz describes his use of Fiberglas thread as a suture material in nose and ear operations.
8. To report on use of glass products in plastic operations.

The author's interest in carrying out these further studies arises because his investigation of the subject has suggested that these avenues of research may yield scientific data to throw additional light on the subject. But he is unwilling to defer the rendering of his report of this investigation, nor does he deem it necessary to await the results of these further studies, some of which may have to be continued over a period of years, before submitting his findings.