

FILE NAME: Industrial Hygiene Foundation (IHF)

DATE: 1955 Nov

DOC#: IHF063

DOCUMENT DESCRIPTION: Conference Proceedings



20th  
ANNUAL MEETING

INDUSTRIAL  
HYGIENE  
FOUNDATION

MELLON INSTITUTE  
PITTSBURGH, PA.

November 16 and 17, 1955

BOX ITEM

## ENGINEERING CONFERENCE

Wednesday, November 16, 1955

Mellon Institute

### MORNING SESSION (9:30 A.M.)

#### Conference Room

*Chairman:* **WESLEY C. L. HEMEON**  
Engineering Director,  
Industrial Hygiene Foundation

**Work in Excessively Hot Environments** . **LUCIEN BROUHA, M.D.**  
Head, Physiology Division, Haskell Laboratory  
for Toxicology and Industrial Medicine,  
E. I. du Pont de Nemours & Company, Inc.

**Noise—Measurement and  
Personal Protection** . . . . . **PAUL L. MICHAEL, Ph.D.**  
Research Physicist,  
Mine Safety Appliances Company

**Safety in the Use of Radioisotopes** . . . . . **HERMAN CEMDER**  
Graduate School of Public Health,  
University of Pittsburgh

### AFTERNOON SESSION (2:00 P.M.)

#### Conference Room

**JOINT CONFERENCE**  
**Engineering — Legal**  
**Program on Page 7**

## JOINT ENGINEERING—LEGAL CONFERENCE

Wednesday, November 16, 1955

Mellon Institute

### Conference Room (2:00 P.M.)

*Chairman:* **THEODORE C. WATERS**  
Miles & Stockbridge, Baltimore, Md.  
Chairman, Legal Committee of I-H-F

### ENGINEERING AND LEGAL ASPECTS OF MANAGEMENT'S RESPONSIBILITY FOR CONTROL OF INDUSTRIAL HAZARDS

#### A Panel Discussion

*Moderator:* **J. DEWEY DORSETT**  
General Manager,  
Association of Casualty and Surety Companies

#### Participants:

**H. GLENN GARDINER, M.D.**  
Medical Director,  
Inland Steel Company

**J. T. GRESH**  
Assistant Director, Department of Personnel Services,  
American Brake Shoe Company

**WESLEY C. L. HEMEON**  
Engineering Director,  
Industrial Hygiene Foundation

**HUGH M. JACKSON**  
Manager, Industrial Health Program,  
Johns-Manville Corporation

**B. E. KUECHLE**  
Vice President and Claim Manager,  
Employers Mutual Liability Insurance Company

**JEROME POLLACK**  
Program Consultant, Social Security Department,  
International Union, UAW-CIO

**JAMES J. REID**  
South Carolina Industrial Commission

# **TWENTIETH ANNUAL MEETING**

## **INDUSTRIAL HYGIENE FOUNDATION OF AMERICA**

*HELD AT*

**MELLON INSTITUTE  
PITTSBURGH, PA.**

**NOVEMBER 16 and 17, 1955**

### **TRANSACTIONS OF The General Meeting**

*AND*

#### **The Conferences—**

**—Medical**

**—Chemical-Toxicological**

**—Joint Medical and Chemical-Toxicological**

**—Legal**

**—Engineering**

**—Joint Engineering and Legal**

Copyright, 1956  
Industrial Hygiene Foundation of America, Inc.  
Pittsburgh, Pa.

# HIGHLIGHTS OF THE PROPOSED MODEL WORKMEN'S COMPENSATION LAW

ARTHUR LARSON, LL.D.

Under Secretary, United States Department of Labor

In a few days we shall distribute to workmen's compensation experts throughout the country, for criticism and suggestions, our "discussion draft" of the proposed model workmen's compensation law.

It was just about a year ago, in Orlando, Florida, that I announced the initiation of this venture and adumbrated some of the possible features of a model law. And when I accepted the invitation to speak at this meeting, it was in the hope that this could be the occasion for unveiling some of the more interesting and controversial items in the draft.

## Background of the Project

When someone asks why the Department of Labor of the Federal Government is taking such an interest in a field that is predominantly one of State legislation, it is appropriate to recall that this is in line with a tradition that goes back 62 years.

The beginning of the workmen's compensation movement in this country can be traced to the Fourth Special Report, in 1893, of the Commissioner of Labor, who was, of course, the lineal ancestor of our present Department of Labor. The Commissioner, John Graham Brooks, published a detailed analysis of the German system, which had been introduced by Bismarck in 1884. This report antedated by four years even the first British Act, which was passed in 1897.

The Commissioner's report aroused widespread interest among the States, and a number of Commissions were set up to study possible State legislation. The first commission was that of Massachusetts in 1904, followed by Illinois in 1907, Connecticut in 1908, New York in 1909, and a number of others in 1910.

It is significant, so far as Federal interest is concerned, that the first compensation act to survive in this country was the Act passed by Congress in 1908 covering certain Federal employees.

For today's purposes, the most interesting moment in this early story occurred in 1910, when a conference took place in Chicago attended by representatives of all the State and Federal commissions

studying workmen's compensation legislation. At this conference there was drafted a Uniform Workmen's Compensation Law.

I may be mistaken, but, so far as I know, there has never from that time until today been put together a document which dared to call itself a model workmen's compensation law.

The theory of this present undertaking is not that anyone is wise enough to write an exemplary act, but that the various States, through experience, ingenuity, and trial-and-error over the years, have in effect written such an act, if we can only find it. It lies in the best provisions of the best acts, and almost every State has something to contribute.

The "discussion draft" was prepared by a committee of six within the Department of Labor, under the chairmanship of the Under Secretary, Mr. Paul Gurske, Director of the Bureau of Labor Standards, was able to contribute the experience of one who very recently directed a State program; Mr. McElroy brought the research and statistical background of his experience in the Bureau of Labor Statistics where, among other things, he has a special *expertise* in work injuries statistics and reporting; Mr. Driscoll, who heads our administration of the Longshoremen's and Harbor Workers' Act, has had years of contact with an act which is comparable in substance and procedure to State acts; Mr. Ward Boote, Assistant Solicitor of Labor, has had a long association with both the legislative and litigation aspects of the two Federal acts, and has spent countless hours on the drafting as well as the substantive problems of this act; and Mr. Bruce Greene, of the Bureau of Labor Standards, has borne the main burden of building up the draft and carrying the project forward, utilizing his specialized knowledge based on many years of working with States on improvement of their compensation laws.

We all realized that this was a rash—almost arrogant—undertaking. That is one reason I announced it in Orlando, since I figured that once a public commitment had been made we would have to go through with it. There were many times during the year when there flashed through my mind those stirring lines:

*Somebody said it couldn't be done.*

*With a smile he went right to it.*

*He tackled the thing that couldn't be done,  
And couldn't do it.*

Well, it isn't done yet, but, with your help, we think that before too long it will be. We decided that it would be impractical to consult with various interested groups during this initial drafting stage, since there are literally thousands of people who have a right to con-

7. Cataracts have been studied in more detail. In general, there has been a delay in onset of from 2 to 60 days following exposure, whether the result of a single large dose or repeated smaller doses.

8. While these effects have been observed qualitatively, good quantitative data are lacking, particularly in regard to power.

It appears to be fairly obvious that animals can be injured by the so-called microwave segment of the electromagnetic spectrum. There is no such evidence that humans are similarly affected. Further work is indicated and is being done. The important problems are related to measurement and evaluation of exposure; limits of exposure as related to frequency and power; continuing studies of humans known to be exposed. If a hazard is indicated, the question of methods of protection must be investigated. In the meantime it is strongly suggested that exposure to microwaves, particularly from radar should be avoided. Eye protection is particularly important. Some studies are now being made of use of special screen glasses for this purpose, but there are many problems involved in their use.

It is hoped that this brief discussion will stimulate sufficient interest in this whole subject so that answers will be found which will permit either dismissing it as no problem, or if it is a problem, to establish the means—engineering and medical—for controlling it.

## RECENT OBSERVATIONS ON CHRONIC PULMONARY BERYLLIUM DISEASE

G. W. H. SCHEPERS, M.D., D.Sc.

Director, Saranac Laboratory and Trudeau Foundation

The concept berylliosis has already become so firmly entrenched in the medical literature that it may seem audacious to challenge its validity. The results obtained from research recently conducted at the Saranac Laboratory<sup>1</sup> impels one, however, to reconsider the criteria of this disease and, more particularly, those pertaining to its chronic manifestations. This research has also brought to light certain interesting aspects of the fundamental pathology of the pulmonary derangements provoked by various compounds of beryllium.

The observations to be briefly presented in this review of the subject are based on the following studies:

- (a) a systematic histological and physico-chemical review of 31 of the 58 lung specimens constituting the Saranac Laboratory collection assembled since 1943 and on which material remained in the Laboratory for detailed study;
- (b) a review of the material and results obtained from the comprehensive series of experiments conducted in the Saranac Laboratory with beryllium compounds since 1943 (Table 1);
- (c) personally conducted long-range experiments on the biological action of a variety of beryllium compounds, acknowledgement being hereby made to the Damon Runyon Fund, American Cancer Society, Atomic Energy Commission and the Office of Naval Research for generous assistance in connection with this work (Table 2);
- (d) a detailed study of the pulmonary material from a current series of nine beryllium pulmonary disease cases; acknowledgement is made for the assistance of physicians who cooperated in furnishing the lung biopsy or autopsy specimens;
- (e) a broad-range investigation of the potential role of beryllium in the genesis of pulmonary diseases not usually associated with the problem of berylliosis (sarcoidosis, anthracosis, asbestosis, siderosis and silicosis).

1. Acknowledgement is made to G. J. Dobrogorski, M.D.; T. M. Durkan, M.E.; A. B. Delahant; M. Roberts, M.E., and F. Creedon of the Saranac Laboratory for their technical assistance in connection with these programs.



Figure 4.  
Diffuse Reticulosis of Alveolar Walls  
Lung biopsy from an employee of a beryl ore  
extraction and beryllium copper master alloy  
plant. (Bielewsky - 175 x)



Figure 3.  
Diffuse Collagenosis of Alveolar Walls  
Exposure to beryllium oxide from a beryl ore  
extraction and beryllium copper master alloy  
plant. Deceased. (Winfrey - 176 x)

capacity to cause chronic disease. Many of these substances certainly are inert with respect to certain animal species (Table 1).

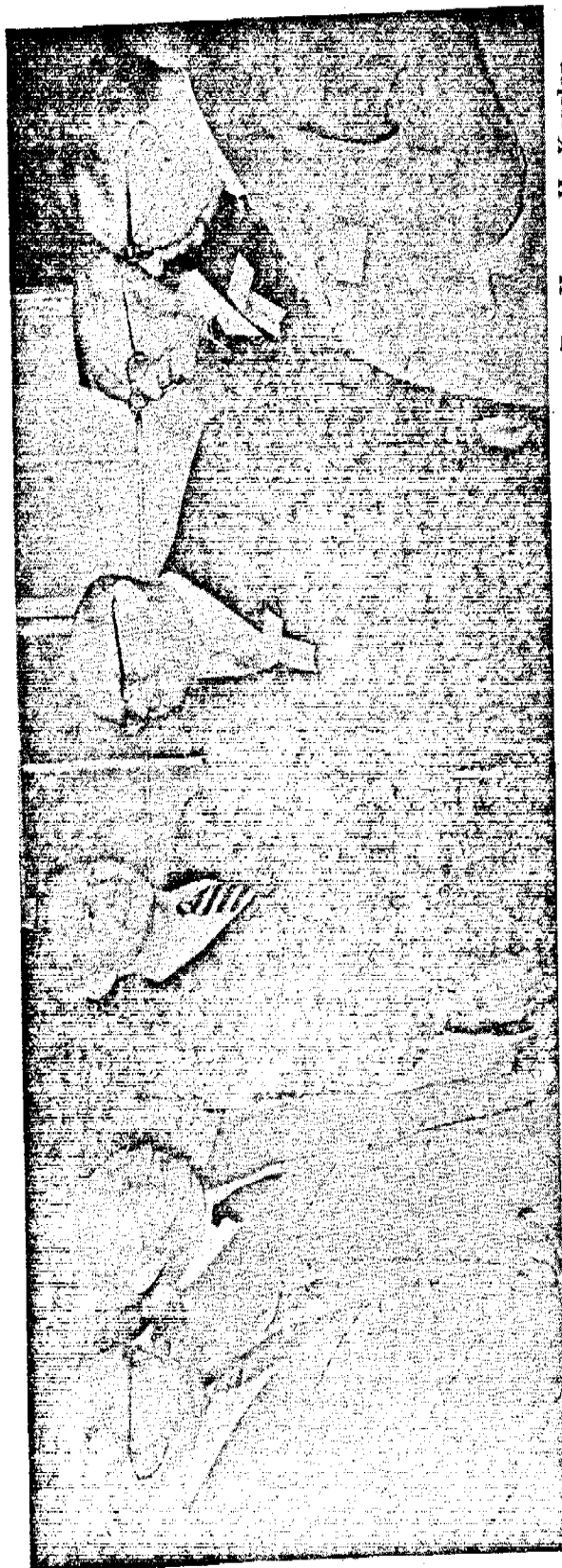
Such generalizations may fortify those who have been claiming immunity for certain beryllium industries. It is necessary to confirm, therefore, that our Saranac Laboratory cases include indisputable examples of the chronic disease from employees of virtually every major industry in the country which has handled beryllium compounds. Thus we have cases from industries primarily concerned with the extraction of beryllium from ore and the manufacturing of beryllium copper master alloys; cases from brass foundries; ceramic and electrical industries; and even a case arising in an atomic pile worker. The fluorescent tube industry has yielded the largest number of cases.

### Lung Cancer Caused by Beryllium Compounds

One of the more spectacular results we have recently obtained with our studies on beryllium concerns the production of lung cancer. This discovery was presaged by Doctor Gardner's original demonstration that fluorescent tube powder (zinc beryllium manganese silicate) induced bone sarcoma in rabbits and guinea pigs on intravenous injection. It has now been possible to show that this same substance causes squamous cell carcinomatosis in rats (Figure 8). That it is the beryllium in the compound mixture which constitutes the pulmonary carcinogen has been confirmed with repeated success with beryllium sulphate (Figure 9). All the common varieties of carcinoma have already been produced and the yield of tumors is high after a relatively prolonged induction period (Table 4, Figures 10 and 11).

Though frequently multifocal in origin the tumors are truly malignant, metastasize and would eventually kill the victims if left undisturbed. The normal control rats have never been observed to yield similar pulmonary tumors. Not only have we succeeded in transplanting such tumors to subcutaneous tissues of other rats, but we have succeeded in retransplanting such growth subcutaneously into other rats now even to the fifth successive generation.<sup>3</sup> Even transplanted tumors have retained their capacity to metastasize. We have conducted studies on the possible co-carcinogenesis of the beryllium with quartz, iron and asbestos dust. The latter study is still in progress but the earlier studies showed that the presence of either quartz or iron in the lungs of animals exposed to the beryllium sulphate

3. Acknowledgement is made to Dr. O. J. Dobrogorski and Mr. A. B. Delahant of the Saranac Laboratory for their assistance in the program of tumor transplants.



Legal Conference speakers were, left to right: James L. Hill, Ford Motor Company; Dr. Henry H. Kessler, Kessler Institute for Rehabilitation; Andrew Kalmykow of the Association of Casualty and Surety Companies; Theodore C. Waters, Miles and Stockbridge; William E. Zimmermann, Sun Oil Company; and Harlan L. Hackbert, Chicago Attorney.

## WORKMEN'S COMPENSATION LEGISLATIVE REVIEW—1955

ANDREW KALMYKOW

Assistant Manager, Casualty Department  
Association of Casualty & Surety Companies

This has been a busy year. I am not now speaking of our own individual activities, which I am sure justify the use of this phrase. I have in mind rather the activities of the various State Legislatures. This being an odd-numbered year, regular sessions were held in 48 jurisdictions. No regular sessions were held in Kentucky, Mississippi and Virginia. There were in addition special sessions in 14 states. As usual, workmen's compensation received a great deal of attention. In observing the subject matter of legislation over the years, I doubt that any other laws consistently receive throughout the country so much legislative attention. It is probably fortunate that only a comparatively small portion of this volume actually gets enacted into law. Even at that, numerically the volume is substantial.

It would be well beyond the reasonable length of a paper such as this, to discuss such amendments in any degree of detail. I am going to limit my remarks therefore primarily to the more important occupational disease enactments. I am appending, however, a complete list of such occupational disease legislation for convenient reference. I will also touch briefly upon a few of the more important workmen's compensation changes which have been adopted.

There have been no new laws providing compensation for occupational diseases where previously no such compensation was paid. Neither Wyoming nor Mississippi have enacted such laws. These are the last two remaining States which do not provide some form of compensation for such diseases. While Montana does not have a regular compensation act for occupational diseases, it provides a public pension for persons suffering from this disease. This year an attempt was made to have industry in that State retroactively pay the cost of such benefits. However, this was not enacted. Other legislation which would have provided compensation for occupational diseases generally also failed of enactment.

### Compromise of Viewpoints in Wisconsin

One of the most interesting laws passed this year, and one which is likely to have considerable effect in other states, is that relating to loss of hearing in Wisconsin. This is the first of such laws designed

for standards and techniques. It should assist in setting up controls. It should provide the know-how. In short, it should provide the theory of control so to speak, but the duties of application must ever remain with management.

The moment management fastens on the notion either consciously or unconsciously that because insurance is in the picture it is not responsible, that is, that its responsibility has shifted to the carrier, the battle of control is 50 per cent lost.

Should the carrier accept such an untenable position, it will be required to attempt the frequently impossible task of seeking action from persons not within its control, and even though the employees of management are sympathetic and cooperative, the carrier cannot from a cost standpoint provide the constant attention and supervision which such a controlled program requires.

MR. JACKSON: I would concur entirely with Mr. Daily. It is management's responsibility.

MODERATOR DORSETT: This question is addressed to Mr. Hemeon and Mr. Jackson. "Are there any important new engineering developments respecting dust collection for avoiding air pollution nuisances? What procedure should be followed by a company in the selection of the most suitable dust collector?" Mr. Hemeon.

MR. HEMEON: In the sense of discovery of a new principle such as electrostatic precipitation and the like, no, there are none. I do, however, want to emphasize a point which seems to me to be frequently overlooked. We have in existence now adequate equipment for controlling any dust air pollution problems that exist. The problems are economic problems. More particularly, I think it unfortunate that there is such a general lack of interest in attempts to measure and to rate the relative importance of different emissions in a community. Since the air pollution problem is such a vast one, it is most logical to adopt the philosophy of first things first and, therefore, to seek methods and procedures to define what requires primary attention first, what is second, and so on.

There is an additional point of importance. One prime illustration of what to me is a fundamental error in consideration of air pollution due to particulate matter is one that I emphasized in the paper I gave at one of the Foundation's meetings a few years ago, and a point which I would like to reemphasize now, and that is this: The almost universal tendency to rate emissions from stacks on the basis of what they look like to the man on the street as he walks by and not only that, but to the engineer in the plant as he walks through

the plant. There are many many communities where the nuisance due to dust fall of relatively coarse particles depositing by gravity on surfaces is the nuisance of importance, and yet we find ourselves universally allowing almost any untrained person to rate the relative importance of emissions in terms of how much fumes or smoke or dust *appears* to be coming out of the chimney. Our progress is going to be very seriously impaired unless we modify that viewpoint.

MODERATOR DORSETT: Mr. Jackson.

MR. JACKSON: There are many engineering approaches to dust collection. There are many problems in determining what is the right method of dust collection, for a given situation, particularly when you think in the terms of the types of dust with which we are confronted. A micron is 125 thousandths of an inch, and it is not at all unusual to find industrial dust in terms of hundredths of a micron. When we visualize that we have particles that size to contend with, we realize that the matter of dust control and dust collection is no longer a job that can be turned over to the plant tinsmith. All of the engineering skills, knowledge of all of the most recent developments in collection equipment design are needed to insure adequate control. The control of dust and other air pollutants is a job for an expert. If you do not have a qualified staff of your own, make sure that the consulting organization has had ample and successful experience.

MODERATOR DORSETT: Let's take up the next question. "What is the responsibility of the manufacturer to the industrial consumer in identifying the toxic constituent or potential of the product?" That is addressed to Mr. Jackson and Mr. Gresh.

MR. JACKSON: I think the manufacturer has a very definite responsibility to identify to his industrial consumer the constituents of his products. Insofar as our own industrial health program is concerned, I have found little difficulty in obtaining such information. In general, manufacturers permit an exchange of data quite adequate to enable the consumer to properly control whatever exposures might be potentially harmful.

MR. GRESH: I go along with that with perhaps a few additional remarks, and that is that if the manufacturer, and I believe this is required by the Manufacturing Chemists' Association who have very expensive and elaborate labeling codes, puts on a label the degree of hazard of the chemical or the toxic material, what it contains and what the antidote might be, he has, to a large degree, satisfied the requirements of industry or management.

I know within our own company, our medical department has

## SPECIAL SUBSCRIBERS

### UNITED STATES GOVERNMENT

#### Armed Forces

AAF School Aviation Medicine,  
Randolph Field, Texas  
Army Industrial Hygiene Laboratory,  
Maryland  
Army Medical Library  
Bureau of Medicine & Surgery, Navy Dept.  
Naval Air Station, Alameda, Calif.  
Naval Air Station, Pensacola, Florida  
Naval Gun Factory, Washington, D.C.  
Naval Radiation Lab., San Francisco, Calif.  
Navy Yard, Boston, Mass.  
Navy Yard, Bremerton, Wash.  
Navy Yard, Brooklyn, N.Y.  
Navy Yard, Charleston, S.C.  
Navy Yard, Mare Island, Calif.  
Navy Yard, Pearl Harbor, Hawaii  
Navy Yard, Philadelphia, Pa.  
Navy Yard, Portsmouth, N.H.  
Navy Yard, Portsmouth, Va.  
Navy Yard, San Francisco, Calif.  
Navy Yard, San Pedro, Calif.  
Navy Yard, Vallejo, California  
Office on Industrial Relations, Navy Dept.

#### Other Federal Agencies

Tennessee Valley Authority  
U.S. Civil Service Commission  
U.S. Dept. of Labor Library  
U.S. Public Health Service

Chicago  
New York  
San Francisco  
Washington

### STATE DEPARTMENTS OF HEALTH

|             |               |
|-------------|---------------|
| Alabama     | Montana       |
| California  | New Hampshire |
| Connecticut | New Jersey    |
| Georgia     | Ohio          |
| Idaho       | Oregon        |
| Illinois    | Portuguese    |
| Indiana     | Tennessee     |
| Iowa        | Utah          |
| Kansas      | Vermont       |
| Kentucky    | Virginia      |
| Maryland    | Washington    |
| Michigan    | West Virginia |
| Missouri    | Wisconsin     |

#### Other State Agencies

New Jersey Department of Labor  
New York Department of Labor  
New York State Insurance Fund  
New York State Library  
Ohio Industrial Commission

### CITY DEPARTMENTS OF HEALTH

Baltimore Detroit Los Angeles St. Louis

### SPECIALISTS

|                        |                     |
|------------------------|---------------------|
| Mr. T. J. Barry        | Dr. E. R. Hayhurst  |
| Dr. Elston L. Bulknep  | Mr. J. H. Holden    |
| Dr. Edward E. Dart     | Dr. R. T. Johnstone |
| Dr. Charles Kenon Good | Dr. Hedwig S. Kuhn  |
| Dr. J. W. G. Hannon    | Dr. Carey P. McCord |
| Dr. C. O. Sappington   |                     |

### INSTITUTIONS AND OTHER ORGANIZATIONS

American Association of Industrial Nurses, Inc.  
American Association of Industrial Physicians and Surgeons  
Argonne National Laboratory  
Carnegie Library of Pittsburgh  
Health Institute of the UAW-CIO  
Jefferson Medical College  
Johns Hopkins University  
New York Academy of Medicine  
New York University  
Safety Research Institute  
University of California  
University of Colorado  
University of Rochester  
University of Texas

### FOREIGN COUNTRIES

Arlbejts & Fabrikstillelynets Lab., Denmark  
Atklø-dager Nordiska Bokhandeln, Sweden  
Bureau of Standards, Pretoria, South Africa  
Department of National Health and Welfare Library, Ottawa  
C. R. Ross, Halifax, Nova Scotia  
A. P. Windish, Edmonton  
Department of Health & Public Welfare, Winnipeg  
Faculdade de Higiene, Sao Paulo, Brazil  
Government Mining Engineer, Johannesburg, South Africa  
Health Department, Wellington, New Zealand  
International Labor Office  
Montreal, Canada Geneva, Switzerland  
Medical Research Council  
London, England Cardiff, S. Wales  
Ministry of Health, Quebec  
Ministry of Labour & National Service, London  
Eldanger Salpeterfabriker, Norway  
University of Sydney, Australia  
Workmen's Compensation Board, Vancouver, B.C.

## OFFICERS AND STAFF

### BOARD OF TRUSTEES

ANDREW FLETCHER, *Chairman*  
President, St. Joseph Lead Company, New York, N.Y.  
V. P. AIBARN, *Secretary*  
Executive Secretary, National Industrial Sand Association, Washington, D.C.  
T. C. WATERS, *General Counsel*  
Mullikin, Stockbridge & Waters, Baltimore, Md.  
H. G. BATCHELLER  
President, Allegheny Ludlum Steel Corporation, Pittsburgh, Pa.  
ARTHUR A. BATTIS  
Chairman, The Carbocendun Company, Niagara Falls, N.Y.  
VANDIVER BROWN  
Secretary, Johns-Manville Corporation, New York, N.Y.  
NEO H. DEARBORN, Ph.D.  
Managing Director, National Safety Council, Chicago, Ill.  
J. DEWEY DORSETT  
General Manager, Association Casualty & Surety Companies, New York, N.Y.  
PHILIP DRINKER, Sc.D.  
Harvard School of Public Health, Boston, Mass.  
WILLIAM B. GIVEN, Jr.  
President, American Brake Shoe Company, New York, N.Y.  
A. C. HIRTH  
Owens-Illinois Glass Company, Toledo, Ohio  
R. A. HITCHINS  
President, National Refractories Company, Philadelphia, Pa.  
B. E. KUECHLE  
Vice President, Employers Mutual Liability Insurance Company, Wausau, Wis.  
A. J. LANZA, M.D.  
Associate Medical Director, Metropolitan Life Insurance Company, New York, N.Y.  
J. W. McLAUGHLIN  
Vice President, Union Carbide & Carbon Corporation, New York, N.Y.  
JOHN F. McMAHON  
Managing Director, Industrial Hygiene Foundation, Pittsburgh, Pa.  
GEORGE MIXTER  
Vice President, U. S. Smelting, Refining & Mining Company, Boston, Mass.  
BEN MOREELL  
Chairman and President, Jones & Laughlin Steel Corporation, Pittsburgh, Pa.  
R. R. SAYERS, M.D.  
Chairman, Medical Advisory Board, FPMV Welfare & Retirement Fund, Washington, D.C.  
C. D. SELBY, M.D.  
Medical Consultant, General Motors Corporation, Detroit, Mich.  
M. W. THOMPSON  
Treasurer and General Manager, Hall China Company, East Liverpool, Ohio  
W. P. YANT, Sc.D.  
Director of Research and Development, Mine Safety Appliances Company, Pittsburgh, Pa.  
R. E. ZIMMERMAN, Sc.D.  
Vice President, U. S. Steel Corporation of Delaware, Pittsburgh, Pa.

### EXECUTIVE STAFF

|                         |                      |
|-------------------------|----------------------|
| John F. McMahon         | Managing Director    |
| Theodore F. Hatch       | Research Director    |
| C. Richard Walmer, M.D. | Medical Director     |
| W. C. L. Hemen          | Engineering Director |
| Jack Brown, Ph.D.       | Research Biochemist  |
| James F. Morgan         | Chemist              |
| Harlow M. Chapman       | Chemical Engineer    |
| George F. Haines, Jr.   | Chemical Engineer    |

Paul Gross, M.D.  
S. R. Haythorn, M.D.  
A. G. Kammer, M.D.  
C. F. Katscher, M.D.  
C. Howard Marey, M.D.