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History
of
INDUSTRIAL HYGIENE FOUNDATION

A Research Association of Industries for
Advancing Industrial Health and
Improving Working Conditions



MELLON INSTITUTE
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FOREWORD

The history of Industrial Hygiene Foundation is in itself an impressive record of the changing concept of industrial health practice and of the progress made by industry as a whole, and particularly by those companies affiliated with the Foundation. As the pattern has been transformed from one of curative medicine to that of the prevention of occupational illness and injury, the nature and scope of the services the Foundation has been asked to perform have systematically followed this change.

Industrial Hygiene Foundation has played an important role in bringing about higher standards of health maintenance in industry. Not only has it added greatly to the basic knowledge on the subject through its research activities and through dissemination of information, but it has rendered valuable service to its members in the solution of specific industrial health problems and the establishment of medical programs.

The fact that is most impressive and most gratifying about the growth and achievements of the Foundation is that everything has been accomplished through the unified efforts of many diversified industries. There is no disputing such clear-cut evidence of industry's interest in the health and welfare of its workers and consumers.

C. RICHARD WALMER, M.D.
Managing Director

March, 1956

History of Industrial Hygiene Foundation

In the early 1930's events of great significance to the growth of industrial hygiene were taking place. An awareness of the value of healthful environments in occupational disease control, which up to that time had barely been acknowledged, was increasingly evident in industrial, governmental and professional circles. Instead of merely providing sufficient medical care to fulfill requirements of compensation laws passed in 1911, industry began to focus attention on the study and control of the work environment as a means to eliminate health hazards. That such a policy was economically sensible as well as humanitarian was easily proved.

People were becoming conscious of the air we breathe. The fact that in an eight-hour working day one takes into the lungs five times as much air as food and water combined indicated a real need for keeping the air clean and pure in order to protect the health of the worker.

Attention was further focused on the harmful effects of contaminated air by an incident which occurred early in 1930. A number of silicosis cases became evident during the construction of a tunnel at Gauley Bridge, W. Va., and some deaths were attributed to it. The furor which followed demanded that concentrated efforts be directed to a solution of the problem. It was obvious that the cooperation and teamwork of numerous professional groups was necessary. The objectives of industrial health cannot be obtained by any one group or several groups acting independently.

With this philosophy in mind, industry brought this environmental problem to Mellon Institute. A small group

of physicians, scientists and industrialists in Pittsburgh gathered to discuss the possibility of a scientific research program to work on the solution of the problem of dust diseases, and particularly of silicosis. All were acutely aware of the need for assembling and evaluating available information and conducting research to provide the necessary technical knowledge. Out of that meeting the Air Hygiene Foundation, with some 20 member companies, was evolved, and a new Fellowship in that name was created at Mellon Institute on December 2, 1935. Dr. H. B. Meller, who had been in charge of the program for the abatement of smoke and dust in the City of Pittsburgh and who had headed air pollution investigations at Mellon Institute, was appointed Managing Director of the Foundation.

The air pollution studies of Mellon Institute had begun as early as 1912 with a survey of the amount of soot fall in different parts of the City of Pittsburgh. Conditions in plants making unnecessary smoke were investigated and the effects of smoke on health, on vegetation, on paints, building materials and interior decorations were studied. Nine bulletins were published on these subjects. Ten years later an eleven-months' survey was conducted, taking into consideration all solid matter that was deposited and comparing the results with those of the earlier tests and with the findings in London between 1914 and 1923. A third study was begun in 1928 to cover phases not previously considered, such as: determination of amounts and compositions of solid matter and gases at the sources; a study of the distribution and behavior of these solids and gases after they are introduced into the atmosphere, and their effects, particularly in screening out sunshine; and the possibility of developing methods to prevent such solid particles and objectionable gases from getting into the atmosphere. These and other studies carried out by the City of Pittsburgh Bureau of Smoke Control and Mellon Institute gave Dr. Meller an excellent background

for supervising the Foundation's studies of dust diseases and their control.

The Foundation was set up at Mellon Institute on a multiple fellowship basis. The Fellowship System is a practical plan for studying long-term industrial problems under the auspices of an educational and scientific institution. Mellon Institute's activities have been largely in the fields of chemistry, physics, and the engineering sciences and technologies, with ever-increasing emphasis on their application to the important problems of human welfare. The program of the Air Hygiene Foundation fit perfectly into this structure.

In addition to the administrative supervision by the Fellowship's staff, each such group at Mellon Institute is assigned a member of the Institute's Executive Staff as an adviser, who is a specialist in some aspect of the over-all investigational work, and is responsible for the progress of a group of independent Fellowships. The members of the Executive Staff advise the Fellowship Heads and coordinate the activities of the Fellowships. Dr. William A. Hamor, Director of Research at Mellon Institute, was appointed the Adviser to the Air Hygiene Foundation, and has made unlimited contributions of his time, energy and experience to the progress of the Foundation. The young organization was helped immeasurably by Dr. Edward R. Weidlein, President of Mellon Institute. His deep, personal interest in the activities of the Foundation has been a major factor in the attainment of its present outstanding position. Thus the Foundation has had at its disposal at Mellon Institute the wise counsel of leading scientists and the use of the best facilities and equipment obtainable.

KEEPING PACE WITH OPPORTUNITIES

It was not surprising, therefore, that by 1941 the scope of the Foundation's activities had expanded to other phases of environmental control. The name of the organization was

changed to Industrial Hygiene Foundation, in keeping with the increasingly broader range of activities in the industrial field. With each extension of research the membership grew, and by 1955 there were approximately 370 outstanding companies and associations in the United States on its roster.

The Foundation's staff today includes physicians, industrial hygienists, chemists, engineers, and various technicians—all specialists in health problems arising in occupations, particularly in the industries. The staff is supplemented by five professional committees—medical, legal, preventive engineering, chemical-toxicological, and air-pollution control—whose members aid in supplying facts and counsel and in supervising the Foundation's thoroughgoing studies and researches in these five sectors. Member companies tap this rich source of accumulated knowledge and experience for the solution to their specific industrial health problems, the control of health hazards, and the development of health and medical programs. The Board of Trustees is comprised of top echelon leaders in management, technology, science and education.

The Foundation's investigative activities are carried on both in the field and in laboratories. Environmental health surveys, many on an industry-wide scale, are conducted for its members, as are plant studies on specific phases of industrial health problems. In the realm of medicine, the Foundation is an authority on the establishment, expansion and conduct of medical programs. Medical audits are made by I-H-F staff physicians to appraise existing health programs and to recommend improvements or changes to meet present and future needs. The engineering division of the Foundation is equipped to advise on control requirements for specific operations, new plant design, reconstruction in existing plants, and modifications in processes to minimize or, whenever possible, to eliminate hazard. This division studies air pollution

and its control, reviews plans for ventilating systems, and guides attack on special air-cleaning problems.

Basic scientific research carried on by the Foundation at Mellon Institute includes investigations on the nature and mechanism of action of hazardous dusts, fumes, vapors and gases, and on other environmental factors such as noise, illumination and radiant heat, with special reference to actual conditions of plant exposure. The development of apparatus and techniques for collecting and measuring air pollutants is an important part of this activity.

The Foundation's toxicological laboratory makes studies in the physiology, toxicology, and biochemistry of physical and chemical agents, their mode of entrance into the body in relation to the physical and chemical condition of the atmosphere, and their subsequent possible toxic action. The findings serve as a basis for evolving proper control measures to protect the health of workers.

Each year at its annual meeting the Foundation brings together at Mellon Institute nearly 700 executives, physicians, attorneys, engineers, chemists and industrial health specialists. This convention affords an opportunity to exchange valuable information on the year's achievements, trends and needs in the industrial health field, particularly at the Foundation's medical, legal, engineering, and chemical-toxicological conferences. The main session, which is designed for management, encompasses the broader objectives respecting human relations, socio-economic considerations and administrative policies in industrial health.

A monthly publication, *Industrial Hygiene Digest*, is prepared on all phases of industrial health, including the legal aspects. Other publications are the Transactions of the annual meeting, journal contributions by staff members, pamphlets on subjects of current interest, and special bulletins.

Numerous technical papers each year are based on the

new knowledge acquired through research studies by the staff. Two outstanding publications were technical volumes by staff members. Theodore E. Hatch, Research Adviser of the Foundation, co-authored the book *Industrial Dust* with Professor Philip Drinker, a member of the Foundation's Board of Trustees. Published by McGraw-Hill Book Company, Inc., in 1936, it was revised and expanded and a second edition published in 1954. *Plant and Process Ventilation*, authored by W. C. L. Hemeon, Engineering Director of the Foundation, was published by The Industrial Press in January, 1955. The 448-page volume presents a comprehensive treatment of fundamental principles and their application to practice in the design of ventilating systems for the control of industrial atmospheric contaminants.

RESEARCH AND PUBLICATIONS IN THE EARLY YEARS

In the early years of its existence, the Foundation conducted and stimulated investigations and research on problems in the field of air hygiene and gathered and disseminated factual information relating thereto. Fact-finding studies were made in medicine, preventive engineering, and law, and a research program drawn up based on the findings. A legal review, "A Survey of Statutes and Court Decisions Respecting Occupational Disease from Air Pollution," was the first of the three major studies completed in 1936. Its preparation was supervised by the Foundation's legal committee headed by its Chairman A. C. Hirth, of Toledo, Ohio. Published in seven parts, it covered statutory and case law with respect to the rights and liabilities growing out of dust hazards and air pollution in industry, and was the most comprehensive legal analysis of its kind ever undertaken. It disclosed sharp conflicts among the laws of the various states with respect to compensation for injuries and occupational disease and to regulations governing physical examinations of workmen as requirements of employment. It was realized

that the lack of uniformity could be remedied by research, which the Foundation proposed to undertake. Two supplements to the legal review followed, bringing the information on court decisions and important legislation considered by the state legislatures up to date.

In 1937 two more legal bulletins were prepared, one on "A Critical Study of Provisions for Occupational Disease Legislation," which presented an impartial discussion of the important basic principles to be considered in legislation and of the controverted issues involved; the second, "Compensation Legislation—A Critical Review," analyzed in summary form the existing laws of the several states and discussed in detail certain of the subjects and problems that are peculiar to these laws.

The preventive engineering study, dealing with "Measurement and Control of Industrial Dust," was directed by Professor Philip Drinker, of the Harvard School of Public Health, Chairman of the Foundation's preventive engineering committee. The subsequent bulletin published on the subject thoroughly treated the troublesome and controversial topics that confronted hygienists and industrialists in the general field of dust control, and outlined the scientific research needed to solve various important problems in the field.

The third major "inventory" study undertaken as prerequisite to the drawing up of the Foundation's research program was a world review and evaluation of "Silicosis and Allied Disorders." This report of the Foundation's medical committee, headed by its Chairman, Dr. A. J. Lanza, brought together for the first time a practical summary of what was known and what remained to be learned about dust disease. The 178-page report outlined a six-point program for protecting the health of industrial workers, and a definite plan of medical research designed to help curb industrial disease

was recommended to the Foundation for consideration. The findings led the Foundation to support research that contributed greatly to the solution of problems relating to the pneumoconioses and to other industrial health hazards.

Scientific investigations were begun in 1937 for the Foundation at The Saranac Laboratory; at the Moore School X-Ray Laboratory, University of Pennsylvania; and at the Harvard School of Public Health.

The first project at Saranac, under the direction of Dr. L. U. Gardner, dealt largely with "mixed" dusts and "protector" dusts. During the 14 years that grants were made to the Saranac Laboratory the research included other projects, such as the determination of effects of arc-welding fumes on susceptibility to tuberculosis; and disability in silicosis and the effects of aluminum therapy.

The work at the University of Pennsylvania sought to improve roentgenographic apparatus and techniques, and sought to place diagnostic procedure on a more practical basis for use in industrial plants, as in the physical examination of large groups of workmen. Studies at the University of Pennsylvania continued through 1942 and included engineering study of exhaust equipment; reactions of living tissue to silica granules as observed microscopically; and evaluation of present exhaust ventilation for the control of industrial health hazards.

The research at Harvard from 1937 to 1942 dealt with the development and improvement of engineering measures for the control of such industrial pollutants as dusts, fumes and gases through mechanical means. Specific studies included the relationship of particle size to silicosis; an investigation of gases and fumes evolved in arc welding with coated rods; and a study of hood design of tanks.

Results of these investigations were published in a num-

ber of bulletins. Bulletin No. 2 of the engineering series was published in 1938-1939 in eight parts:

1. The Determination of Benzol Vapor in the Atmosphere
2. The Use and Care of Respirators
3. The Determination of Chlorinated Hydrocarbon Vapors in the Atmosphere
4. Design of Exhaust Hoods
5. Design of Duct Work for Exhaust Systems
6. Determination of Lead in the Air
7. Identification of Industrial Dusts
8. Routine Sampling for Control of Atmospheric Impurities

Engineering Bulletin No. 3, published in 1942, consisted of two parts: "Air Flow Measurement by the Dilution Method;" and "Measuring Air Flow in Industrial Ventilation."

A fourth engineering bulletin on "Air-Conditioned Crane Cabs," published in 1947, outlined practical measures for the improvement of crane cabs, removal of irritating dust, fumes and gases, and reduction of the heat load. One objective of this bulletin was to point out the many unique mechanical features required for this particular application of air-conditioning, which the prospective purchaser should look for in the selection of equipment.

Also published in 1947 was a reference manual on "Industrial Air Sampling and Analysis" which was prepared for the Foundation by Dr. Leslie Silverman, of the Harvard School of Public Health. Even more comprehensive than the Preventive Engineering Series Bulletin No. 2, Parts 1, 3, 6, 7 and 8, which were its predecessors on the general subject, this bulletin presented methods of sampling and analysis with the view of rather complete coverage, but choice of methods were also indicated for the beginner.

Second in the medical series was a bulletin on "The Comparative Values of Chest Roentgenograms Made on

Film and on Paper for Industrial Surveys," published in June, 1939, which reported the results of an investigation. This was followed in January, 1940, by Medical Series No. 3 on the choice of methods of roentgen examination of the chest for diagnostic surveys.

Seeking to help reduce the great losses to labor and management through absenteeism, the Foundation in 1940 launched a survey of sick absenteeism among industrial workmen in collaboration with the United States Public Health Service and the American Association of Industrial Physicians and Surgeons. The survey covered 16 member companies of the Foundation, representing 70,000 workers in a variety of industries. Findings were published as Medical Bulletin No. 4 on "Sick Absenteeism in Industry" in February, 1940, which included a proposed program for recording absenteeism. Absenteeism studies in a number of the companies were continued until 1953 and the results presented at the Foundation's annual meeting and included in the Transactions.

Medical Bulletin No. 5 reported the results of a comparison of stereoscopic miniature chest films, single roentgenograms on paper, and single roentgenograms on large film.

"Effects of Daily Exposure to Arc Welding Fumes and Gases Upon Normal and Tuberculous Animals" was published as Medical Bulletin No. 6 in September, 1942.

Meanwhile, the first bulletin in a Special Research Series (SO₂) was published in September, 1937, on "Concentrations of Volatile Sulphur Compounds in Atmospheric Air," which was a report of a survey made in and near a group of representative cities. A second bulletin on the same subject appeared in 1938.

A study of fatigue was made for the Foundation by Dr. R. R. Sayers, Director, U. S. Bureau of Mines, and a member of the Foundation's medical committee. The report

was presented at the Sixth Annual Meeting of the Foundation in 1941, and was published in *War Medicine*, Vol. 2, pp. 786-823 (September, 1942).

With the influx of women into industry during World War II, a factual study of the health problems of women in the industrial field, based on actual manufacturing conditions and experience, was needed. Accordingly Industrial Hygiene Foundation arranged with Dr. C. O. Sappington to conduct a practical investigation of this subject on plant production lines. The outcome was Medical Bulletin No. 7 on "Health Problems of Women in Industry," published in January, 1944.

In 1948 another investigation by Dr. Sappington was sponsored by I-H-F on "Industrial Health Department Functions and Relationships," and the report was published as Medical Series Bulletin No. 8. The two-year survey covered a quarter of a century of progress in industrial health administration, providing inventories of industry's existing health facilities, procedures, and policies for conserving human resources in the world of work.

Bulletin No. 9 in the medical series was published in 1949 on "Tuberculosis in Industry."

Following World War II, thousands of veterans were returning home, imposing upon industrial management and industrial health specialists the grave responsibility of successful job placement. The Foundation at its meetings in 1943, 1944, and 1945 sponsored panel discussions on the subject, which were subsequently published in three special bulletins, under the title "Putting the Disabled Veteran Back to Work."

Other important literature on industrial health grew out of presentations at the Foundation's annual meetings and technical papers by the staff. Of all the Foundation's publications, however, probably the best known and most widely

used is the *Industrial Hygiene Digest*, which was begun in 1937 and has been published monthly since. The Digest carries abstracts of the world's literature on all phases of industrial health and hygiene. An *Annual Index* of the abstracts is published, and a *Decennial Index* for the years 1945-1954 was compiled.

Allied to the mechanics of preparing the Digest is the "Library Classification System for Literature on Industrial Hygiene and Allied Subjects" devised by W. C. L. Hemen, Engineering Director of the Foundation, and Lorraine Sullivan, Boston Public Library, for filing the original material abstracted. The library classification system proved so valuable that it was reproduced for the membership and added to the available literature of the Foundation.

While the earliest activities of the Foundation centered around the acquisition and dissemination of technical knowledge based on the research sponsored by it, field work and consultation on specific environmental and medical problems were allied services that were soon in great demand. In 1936 a study of outdoor atmospheric pollution (SO_2) was made for a smelting company. A similar survey started the next year for another industry has been made winter and summer each year since. The first in-plant dust studies were made in 1938, and plant hygiene investigations to appraise working conditions for their possible effects upon health and to provide preventive engineering measures to control noxious and obnoxious exposures in workplaces were thereafter made for many member companies. Besides fostering healthful working conditions, the Foundation's plant surveys proved to be increasingly helpful in advancing harmonious labor relations. A major project in 1944-45 was the dust-control study of the pottery industry, and refinement of the technique of appraising the degree of silica concentration to which workmen in dusty industries may be exposed.

I-H-F specifications for engineering soon constituted a

common basis for obtaining bids and for the writing of contracts, and, in effect, to ensure an adequate end-result in terms of air concentration while permitting reasonable latitude to equipment companies and contractors. The Foundation's health engineers were called upon to examine plans for new or remodeled plants from the viewpoint of infusing into such construction the maximum of correct physical working conditions in the light of current knowledge.

In 1942-43 the Foundation began to expand the types of studies it made. Facilities at the University of Pittsburgh and at Mellon Institute were used to conduct the first laboratory research work by the Foundation's staff on specific problems presented by member companies. An experimental study on the solubility of ceramic colors in tissue fluids was made, and the effects of perthiocyanic acid on the eyes was investigated through biological testing with animals. Chemical dermatitis problems were overcome through the coordination of field investigations with experimental studies by ten dermatologists.

THE ADMINISTRATION OF THE FOUNDATION

In 1942 Dr. Meller retired, and John F. McMahon was appointed Managing Director of the Foundation, a position he held until his death on September 15, 1950. Mr. McMahon played an important role in the field of industrial health and in the growth of the Foundation. He was succeeded by Dr. C. Richard Walmer, a well-known specialist in industrial health problems, who had been Medical Director of the Foundation since July, 1946.

Even before Dr. Walmer's appointment as Medical Director the Foundation had begun medical advisory work for its members. The first such report was made in 1943 through arrangement for consultation services of an industrial physician to work with the staff's industrial hygienist. Realizing that the environmental and medical phases of

health maintenance are closely integrated and that the Foundation must increasingly serve its members in both capacities, the Board of Trustees subsequently appointed Dr. Walmer as full-time Medical Director. The expansion of the staff made possible medical surveys of broad scope, many on a company-wide basis. This involves study of the medical facilities and program, interview of individuals in all areas relating to the medical services, examination of the records of employment, illness, and injury, and tabulation of the cost of these items where possible. Coupled with this is an evaluation of the potential hazards for that particular industry and recommendations for a medical program suited to the needs of that company. The Foundation has a strong medical staff.

SCOPE OF ENVIRONMENTAL AND MEDICAL STUDIES BROADENS

There was a pronounced trend in 1947 toward both environmental and medical studies of an industry-wide character, many initiated by associations of industries. Five such studies were scheduled for that year. This efficient procedure brings together the experience of many plants with common problems and the findings benefit the whole industry or a substantial segment thereof. In such a program there is greater utilization of the accumulated experience within industry respecting a common problem. Typical of these was the study of the asbestosis problem made for the companies belonging to one association. Another was the environmental survey of a large number of plants in the sand industry, and the preparation of a manual on "Safety in Sandblasting" for the group. A Canadian association of industries requested a study of silicosis throughout its member companies. A group of glass manufacturing companies jointly sponsored a study of radiant heat problems.

Other associations have gone one step further and sponsored basic research at the Foundation to develop techniques

and instruments that can lead to the solution of industrial health problems. Large-scale air pollution investigations supported by the American Iron and Steel Institute were begun in 1950. Instruments have been developed for the easy measurement of hourly intensity of smoke, dust fall, sulfur dioxide, and hydrogen sulfide, thus facilitating micrometeorological studies which can contribute importantly to a sound understanding of, and an orderly approach to the whole air pollution problem. Stack dust sampling was next investigated.

A major air pollution research program to develop a technique for tracing the path of stack gases over long distances was initiated by the American Petroleum Institute in 1953.

Individual companies, as well, increasingly requested broad environmental surveys, indicating management's sincere interest in the positive aspects of health maintenance and the preventive approach to industrial health problems. One of these was the industrial hygiene survey for a large oil company and all of its subsidiaries in 1949. Another was the medical study for a large metal fabricator, covering 60 plants in 38 states in 1948. A third was an extensive medical survey for a glass industry.

One unique study by the Foundation in 1952 was the community air pollution study in New Haven, Connecticut, to appraise the air pollution problem of the city, thus to assist the board of aldermen toward a decision as to the advisability of enacting a control ordinance.

The problem of noise in industry claimed the Foundation's attention and has resulted in two important publications in 1955. To fill the need for reference material on existing laws providing compensation for impairment of hearing, Industrial Hygiene Foundation had prepared for its members a *Legal Survey on Occupational Impairment of Hearing*, by Theodore C. Waters, General Counsel for the Foundation,

giving references in summary form to state compensation statutes dealing with impairment of hearing and to judicial decisions. Also published in 1955 was *An Annotated Bibliography on Noise, Its Measurement, Effects and Control*, covering more than 2300 references for the use of engineers, executives, physicians and others who may be concerned with problems resulting from excessive noise.

NEW FACILITIES FOR TOXICOLOGICAL RESEARCH

Keeping pace with the growth of the Foundation's activities in the field was the program of toxicological and biological researches, many of great magnitude. The early arrangement of utilizing outside laboratory facilities to carry on such projects proved inadequate, and early in 1948 the Foundation acquired the facilities for conducting new and expanded researches in industrial toxicology and physiology. The Foundation's toxicology laboratory was set up in an annex of the Elizabeth Steel Magee Hospital (a part of the University of Pittsburgh Medical Center) where the necessary animal work could be carried out. Long-term chronic toxicity studies on commercial substances were begun to determine the health hazards for both workers and users. Many acute toxicity tests of the range-finding type have been conducted on compounds in the developmental stage to guide manufacturers in their programs. When lamp manufacturers were experiencing troubles with the use of beryllium in fluorescent lights the Foundation undertook for them toxicological testing of new phosphors over a period of two years to ascertain whether their use in the manufacture of the new fluorescent lamps would have ill effects. Another investigation dealt with the nature and extent of possible eye irritating effects of a number of formulations. A three-year program of biological research on the effects of silicon carbide dust on normal lungs and on the evolution of pulmonary tuberculosis is in progress at the present time. A two-year pro-

gram to evaluate the potential response to a variety of synthetic and natural inorganic particulate matter of different size ranges was completed. Basic information was obtained through these and other studies on pneumoconiotic deposits in the lungs which has important implications regarding the fundamental mechanism of the action of dusts in general.

Supplemental to researches on dust carried on by the Foundation were the studies of retention of industrial dusts in the lungs conducted for the Biological Department of the Chemical Corps, Department of the Army, in the Foundation's toxicology laboratory from 1950 to 1954 under the supervision of Theodore F. Hatch, then laboratory director of the Foundation. (Mr. Hatch is now Research Adviser to the Foundation.) Investigation of the fate of industrial dusts following inhalation was made with the object of finding the relationship between the particle size of inhaled particulates, the site of deposition, and the percentage of the material retained in the human respiratory system under various conditions. The respiratory characteristics of test subjects under different breathing depths were determined for establishing useful correlations between these characteristics and the retention of inhaled dust. The findings and conclusions of this study included a range of particle sizes from the sub-microscopic region to five microns. Invaluable in hundreds of tests made was the iron lung which was lent to the Foundation in 1947 by the Warren Collins Company. The mechanism, bearing series No. 3, is probably a museum piece in that the first two manufactured by the company cannot be located. The only older models were the original ones designed by Professor Philip Drinker, a trustee of the Foundation, who negotiated the loan of the Collins iron lung to the Foundation. Intended for therapeutic purposes, the iron lung was admirably adapted to research work. In such studies as determination of dust retention in the lungs the respirator was used to control the frequency and depth of breathing of the

test subject and to actuate a mechanical partitioning valve on the breathing mask which separated every exhalation into seven separate fractions. The first fraction of the exhaled air came from the nasal chamber and the last fraction from the deepest part of the lungs. Differences in the amounts of dust contained in the several fractions reflected the differences in the degree of dust retention in the different parts of the respiratory system.

Reversing the usual order of research procedure, the Foundation first used human subjects and then animals. Making use of exactly the same plan as employed in the human respirator, the staff constructed miniature respirators for use with experimental animals.

TWO DECADES OF LEADERSHIP AND SERVICE

In its first twenty years of existence Industrial Hygiene Foundation has done much toward making better environmental health a reality. Special studies made for its member companies are approaching the 700 mark. Included are over 400 extensive field surveys and approximately 100 on specific phases of industrial problems encountered in the plants. In addition, the Foundation's specialists in engineering, medicine, chemistry and toxicology have made nearly 200 consultation visits throughout the country. Some fifty basic research studies have been conducted in the Foundation's laboratories, and analytical studies are well into the second hundred. A number of the projects have been on an industry-wide basis, so that many companies not directly involved in the research have benefited from them. In addition to specific projects the Foundation has assisted members in the solution of smaller problems through inquiries by correspondence or telephone. Thousands of requests for technical literature are filled each year in addition to regular mailings to members. Some 3,000,000 employees profit directly from the Foundation through their companies' membership.

A vast fund of technical information and experience has been built up by the Foundation's staff and is constantly being tapped by its members. The Foundation is truly the medium through which industries in all categories can unite their efforts in protecting the health of their workers and their consumers.

Andrew Fletcher, President of St. Joseph Lead Company, and Board Chairman of Industrial Hygiene Foundation, had this to say about the organization in an address at the 20th Annual Meeting held in November, 1955:

"For two decades Industrial Hygiene Foundation has been a leader in the field of industrial health. Not only has it added greatly to the basic knowledge on the subject, but it has been instrumental in stimulating and encouraging health maintenance in industry and has rendered valuable service to its members in the solution of specific industrial health problems and the establishment of medical programs.

"The history of the Foundation is in itself an impressive record of the changing concept of industrial health practice and of the progress made by industry as a whole and particularly by those companies affiliated with the Foundation. As the pattern has been transformed from one of curative medicine to that of the prevention of occupational illness and injury, the nature and scope of the services the Foundation has been asked to perform have systematically followed this change."