

FILE NAME: Westinghouse (WH)

DATE: 1947

DOC#: WH115

DOCUMENT DESCRIPTION: Book Excerpt - Industrial Medicine

Introduction to
INDUSTRIAL MEDICINE

T. LYLE HAZLETT, M. D., Editor
*Professor and Head of Department of Industrial Hygiene
University of Pittsburgh School of Medicine*

INDUSTRIAL MEDICINE PUBLISHING COMPANY
CHICAGO

COPYRIGHT 1947,
BY THE
UNIVERSITY OF PITTSBURGH

SECOND EDITION

PRINTED IN THE UNITED STATES OF AMERICA

PREFACE

THE material of this book consists of the lectures given in a course on Industrial Medicine at the School of Medicine of the University of Pittsburgh. To present the content of Industrial Medicine in some degree of completeness would require a series of volumes. It is impossible to attempt exhaustive treatment within the compass of the lectures given in this course.

The lecturers participating in the course are active workers in their respective fields. They have presented their subjects in the briefest possible form consistent with clarity. The basic concepts with which these lectures deal may serve as points of departure for the student whose interest demands greater detail of presentation than is possible in the brief time at our disposal.

The value of the lectures will be greatly enhanced by the student's own notations originating either from class discussions or individual reading. The bibliography provided herewith will aid in guiding the student in his excursions through the literature.

Beyond their immediate value, these lectures may be useful as future reference material. Consequently, this means is provided for their preservation as well as for the immediate convenience of the student.

Grateful acknowledgment is made of the cooperation of the contributors who, despite the many pressing demands upon their time, agreed to prepare their notes for publication.

T. LYLE HAZLETT, M.D.

CONTRIBUTORS

EDGAR C. BARNES, B. S.
Industrial Hygiene Engineer
Westinghouse Electric and Manufacturing Company

PALMER L. BEEBE, M. D.
Department of Industrial Hygiene
University of Pittsburgh School of Medicine

JOHN R. CONOVER, M. D.
Medical Referee
Equitable Life Assurance Society of the U. S.

CHARLES F. ENGEL, M. D.
Assistant Medical Director
Westinghouse Electric and Manufacturing Company

FRANK M. GATTO, PH. D., M. D.
Director of Health Conservation
Westinghouse Electric and Manufacturing Company

T. LYLE HAZLETT, M. D.
Medical Director, Westinghouse Electric and Manufacturing Company
Professor and Head of Department of Industrial Hygiene
University of Pittsburgh School of Medicine

MARLIN W. HEILMAN, M. D.
Chief Surgeon, Allegheny Ludlum Steel Company

HAROLD G. KUEHNER, M. D.
Associate Professor of Surgery
University of Pittsburgh School of Medicine
Chief Surgeon, Pittsburgh Coal Company

CHARLES F. KUTSCHER, M. D.
Medical Adviser
Industrial Hygiene Foundation

FRANK SAYLOR ROSSITER, M. D.
Surgeon, Carnegie-Illinois Steel Company

JOSEPH SHILEN, M. D.
Director, Bureau of Industrial Hygiene, Department of Health
Commonwealth of Pennsylvania

HENRY F. SMYTH JR., B. S., PH. D.
Industrial Fellow, Mellon Institute

FRANK H. STENING, M. E.
Professor and Head of Department of Mechanical Engineering
University of Pittsburgh

WILLIAM P. YANT, B.S., D. Sc.
Director of Research and Development
Mine Safety Appliances Company

TABLE OF CONTENTS

	PAGE
INDUSTRIAL MEDICINE—HISTORICAL NOTES	1
AN INDUSTRIAL MEDICAL DEPARTMENT	7
MINOR INJURIES	27
EYE INJURIES	31
GASES, VAPORS, DUSTS, FUMES AND MISTS	43
INDUSTRIAL DUSTS	81
SILICOSIS	90
INDUSTRIAL EXPOSURE TO SOME TOXIC METALS	99
CARBON MONOXIDE	113
SOLVENTS AND VOLATILE ORGANIC MATERIALS	130
PERSONAL RESPIRATORY PROTECTION	145
LABORATORY METHODS	176
INDUSTRIAL HYGIENE SURVEYS	185
ELECTRICITY	195
AIR CONDITIONING	203
HEAT DISEASE	210
NUTRITION IN INDUSTRY	223
EDUCATION IN INDUSTRIAL HEALTH	232
MEDICO LEGAL	239
BIBLIOGRAPHY	246
INDEX	254

THIS BOOK IS ENDORSED BY THE
AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS
AND SURGEONS

INDUSTRIAL MEDICINE

Historical Notes

T. LYLE HAZLETT, M.D.

INDUSTRIAL MEDICINE finds its roots in ancient history. While we cannot presume to fix any given date as marking the beginning of interest in industrial health, we know that occupational hazards were recognized centuries before the advent of Christianity. We are told that Aristotle concerned himself with the diseases of runners; that Pliny, among other observations, noted the use of masks by certain workers exposed to metallic dusts; that Hippocrates and later Galen wrote on lead poisoning. Other characters of history have contributed to the early thinking on industrial medicine. Among them may be mentioned Avicenna, who made pertinent observations on plumbism; Plautus, who reported the hernias observed in runners; Juvenal, who noted that forge workers exhibited certain eye pathology; and Herodotus, who is said to have been possibly the first to speak of the diet of workers.

Among the later writers we find one Ulrich Ellenbog who, about twenty years before the discovery of America, wrote on certain forms of toxic exposures.

The extensive compilation of knowledge of industrial medicine began later with such works as the "*De morbis metallicis*" of Paracelsus; the "*De re metallica*," published by Agricola in 1556 and a number of works by other authors. Among the topics discussed were the diseases of miners and smelters and poisoning by lead, mercury, cobalt, cadmium, and arsenic. Reports on a variety of subjects dealing with occupational hazards also began to appear in the latter half of the seventeenth century in the "*Transactions of the Royal Society*" in England.

In 1700 a book appeared which bore the title, "*De morbis artificum diatriba*." Its author, Bernardino Ramazzini, has been acclaimed the father of industrial medicine. It is doubtful that any other man has ever reached the eminence of Ramazzini in the realm of industrial medicine. In his epochal contribution, Ramazzini emphasized the existence of disease connected with the hazards of occupation. He discussed a large variety of occupations. The following are merely a few of the chapter headings in his book, chosen at random from the original edition and

the second which appeared thirteen years later: MINERS OF METALS, CHEMISTS, GLASS WORKERS, TOBACCO WORKERS, CORPSE BEARERS, STARCH MAKERS, STONE CUTTERS, PRINTERS, WEAVERS, and SOAP MAKERS.

Ramazzini's book has been of such great importance and its context is of such interest to those who have read it, that a few quotations from it may be considered apropos in this discussion. In his chapter on the MINERS OF METALS we find the following:

"In order to purify that imprisoned air infected by the exhalations emitted from the minerals and the bodies of the miners, also by the fumes of lighted lamps, superintendents of mines regularly expel the thick stale air and force in fresh and purer air by means of certain ventilating machines which they connect by shafts with the bottom of the mine. Also they protect the legs and hands of the miners from injury by means of leggings and gloves. It is evident that the ancients also paid great attention to the safety of miners, for, according to Julius Pollux, they used to cover their heads with sacks. Over their faces they tied loose bladders so that they could see through them without inhaling the pernicious dust; Pliny says that this is done by polishers of minium."

In the discussion on TOBACCO WORKERS these lines appear:

"Now what sort of safeguard shall the medical profession provide for those who make tobacco? The exciting cause cannot be removed, and the sweet smell of gain makes the smell of tobacco less perceptible and less offensive to these workers, so we must give them the following advice: When they grind, sift or handle in any way these wares—to do without them would be like doing without wine and bread, for our spirits would droop and social life would languish—they must take every possible precaution against that swarm of floating atoms by covering the mouth and nose, frequently breathing fresh air, washing the face in cold water, and rinsing the throat very often with vinegar and water; they should also drink it, for nothing is more suitable for washing away those particles or blunting their sharpness when they have adhered to the throat and stomach than something in which vinegar is an ingredient. The harm that the particles inflict will be lessened by the following remedies: emulsions of melon seeds, barley gruel, whey, rice boiled in milk. Since work of this sort is carried on in ill-ventilated and damp places, especially the grinding of tobacco leaves in the mill, and the workers complain of headache and nausea, I have regularly prescribed emetics as the quickest way of getting rid of the dust inhaled, which of its own nature provokes the desire to vomit."

In the chapter dealing with the DISEASES OF STONE CUTTERS the following interesting paragraph appears:

"We must not underestimate the maladies that attack stonecutters, sculptors, quarrymen, and other such workers. When they hew and cut marble underground or chisel it to make statues and other objects, they often breathe in the rough, sharp, jagged splinters that glance off; hence

they are usually troubled with a cough, and some of them contract asthmatic affections and become consumptive. Moreover from the marble, tufa, and stone emanates a metallic vapor which evidently severely affects the nose and brain. They say that stone-cutters who work with touch-stone are so affected in the head and stomach by the foul odor that it constantly exhales that they are sometimes forced to vomit. When the bodies of such workers are dissected, the lungs have been found to be stuffed with small stones. Diemerbroeck gives an interesting account of several stone-cutters who died of asthma; when he dissected their cadavers he found, he says, piles of sand in the lungs, so much of it that in cutting with his knife through the pulmonary vesicles he felt as though he were cutting a body of sand. He says too that he was told by a master stone-cutter that when he was chiselling stone a dust arose, so fine that it penetrated the ox-bladders hanging in the workshop; in fact in the course of one year he found that a handful of this dust had accumulated inside a bladder. The man declared that that dust would gradually prove fatal to stone-cutters who took no precautions."

In the chapter devoted to WEAVERS we read the following:

"Nowadays women sit to weave, but in such a posture that they somehow look as though they were standing. This kind of work is certainly very fatiguing, for the whole body is tasked, both hands, arms, feet, and back, so that every part of the body at once shares in the work. In winter the peasant women, who then are not busy in the fields, weave hempen or linen cloth in the stables, especially the girls before they marry, for their only dowry is knowing how to weave; it is a disgrace for a peasant woman not to be mistress of this art. Now an occupation so fatiguing naturally has its drawbacks, especially for women, for if pregnant they easily miscarry and expel the fetus prematurely and in consequence incur many ailments later on. It follows that women weavers, I mean those who are engaged wholly in this occupation, ought to be particularly healthy and robust, otherwise they break down from overwork and as they get on in years are compelled to abandon this trade."

These excerpts are representative of the observations and thoughts of a great physician who over two centuries ago laid the foundations of industrial medicine.

Other important writings followed the work of the great Italian physician. Added to the purely medical interest in occupations, we find a developing social consciousness which looked critically upon the unfavorable conditions of work surrounding the employment of women and children. There is no doubt that the growing social enlightenment was, in itself, an important factor in stimulating the growth of industrial medicine. Publications of basic value appeared from several sources. In 1831 a book appeared under the authorship of Charles Turner, "The Effects of Arts, Trades and Professions and all Civic States and Habits of Living on Life and Longevity." In France,

J. L. Alibert published the first work on industrial dermatology in 1806. Fifteen years later on a French periodical which exerted a powerful influence on the development of industrial hygiene was first published under the name of "Les Annales d'Hygiene." Other French authors made important contributions in dermatology and toxicology. In Germany such authoritative works appeared as the studies of Halfort on toxic gases, dusts, fatigue and other subjects; and the writings of Hirt and Lehmann. In the United States we find among the early works in the field a treatise published in 1837 entitled "On the Influence of Trades, Professions, and Occupations." Over thirty years later Walker published his work, "Occupations of the People."

The advances made since the onset of this century have been very great. A large number of important publications have appeared among which may be mentioned Sir Thomas Oliver's "Dangerous Trades," published in 1902 and Greer's "Treatise on Occupational Diseases and Accidents" published in 1909.

Considerable research was done in the first two decades of the twentieth century. These studies not only gave great impetus to later research but did much to develop industrial medicine. Among the varied subjects dealt with have been dusts and gases, plumbism, the pneumoconioses, fatigue and accidents. The range of these researches is becoming even broader and the resulting scientific growth has undoubtedly been influential in the establishment of courses in industrial medicine at various universities both here and abroad.

An interesting enterprise of international proportions has been the International Labour Office at Geneva, Switzerland. Several International Congresses of Industrial Accidents and Diseases have been held.

American workers have been prolific in their contributions to industrial medicine. Among the important early works we find Dr. F. A. Walker's "Occupations of the People" published in 1869. In 1884 Dr. George H. Hohe published the "Hygiene of Occupations." In 1914 appeared Dr. W. Gilman Thompson's "The Occupational Diseases" and Dr. George M. Price's "The Modern Factory." In 1919 the U. S. Public Health Service published its "Studies of the Medical and Surgical Care of Industrial Workers." In the same year the "Journal of Industrial Hygiene" was founded at Harvard University. It is now known as the "Journal of Industrial Hygiene and Toxicology" and is the most important publication in its field in this country.

Mention should be made of the introduction of courses on industrial medicine in American universities. Harvard University is reported to have been the first institution of learning to inaugurate courses of study for degrees in industrial hygiene.

Since 1932 the American College of Surgeons has conducted surveys on medical services in industry and has evolved standards which must be met for approval by the college.

Publications on toxicology have included important contributions by American authors. Among them are the "Industrial Poisons in the United States" by Alice Hamilton in 1929 and another work by this eminent student which appeared in 1934 under the title of "Industrial Toxicology." One of the standard texts, "Toxicology," was issued by McNally in 1937.

The Air Hygiene Foundation of America came into being in Pittsburgh in 1935 and has contributed a variety of significant studies. The organization is now known as the Industrial Hygiene Foundation of America.

The monthly publication, *INDUSTRIAL MEDICINE*, was founded in 1932.

In 1937 the Council on Industrial Health of the American Medical Association came into being. This body has exerted considerable influence in the evolution of higher standards for medicine in industry. The council has been instrumental in the formation of committees on industrial medicine in local medical societies.

One of the significant recent developments has been the growth of industrial nursing. The nature of industrial practice has necessitated a high type of nursing service which has attracted some of the best nursing talent. The present status of the industrial nurse represents an important phase in the historical evolution of industrial medicine.

In 1936 the School of Medicine of the University of Pittsburgh set up a "Department of Industrial Hygiene" which appears to have been the first one of its kind at least among the medical schools of America.

Clinical work in the occupational diseases naturally began some decades ago. It is said that the clinic begun by Devoto in Milan, Italy, in 1910 was the first founded anywhere for the scientific study of industrial medicine in its clinical as well as in its other aspects. Various clinics of importance have appeared in this country among which may be mentioned those founded at the Cornell Medical School, the University of Pennsylvania,

Ohio State University, the Harvard School of Public Health, New York University, the University of Illinois Medical School, and the Northwestern University Medical School. Besides the work of these clinics and of other organizations and of numerous individuals, mention should be made of the valuable contributions to industrial medicine made by the U. S. Department of Labor, the U. S. Bureau of Mines, and the U. S. Public Health Service. These official agencies have done much to further the growth of industrial medicine and to encourage the development of its high standards.

The preceding account is a brief and inevitably incomplete chronology of industrial medicine. Far more important than the specific events mentioned is the changing philosophy which has guided practice through the period of time covered by these events. From the early concepts which made the industrial physician's chief interest the administration of first-aid to the injured we have reached a stage of progress where the potential hazards of industry are neutralized before they have actually inflicted harm. From its fragmentary beginnings industrial medicine has attained to the development of highly organized programs of health conservation which affect the well being of that large part of our population engaged in the labors of industry. How this development has been attained and how industrial medicine functions today will become apparent from the accounts which follow this sketch of its early growth. .

AN INDUSTRIAL MEDICAL DEPARTMENT

T. LYLE HAZLETT, M.D.

Organization

THERE is no uniformity of practice in the organization and management of medical departments in industry. The character of a given industry, its size, and the conception of management as to what constitutes appropriate medical service to the workers are the factors which determine the nature and the scope of a medical department.

In this brief discussion it is clearly impossible to deal extensively with administrative problems. Little more can be attempted beyond the mere mention of the imperative need of selecting a medical, nursing, engineering, and clerical personnel as adequately trained as possible for the particular duties to be performed and as adaptable as possible to the peculiar needs of the particular industry they serve.

Beyond personnel, the careful disposition of physical equipment in appropriately planned and well kept quarters and a carefully developed system of records are of the utmost importance. Of the greatest significance, though often insufficiently emphasized, is a program calculated not only to serve the immediate needs of the workers for whom the department is established but to anticipate future opportunities for safeguarding and improving the health of employees. It should, in fact, be gratifying to the enterprising physician in industry that his work is not so rigidly standardized as to discourage initiative and growth. There are wide opportunities for the further development of industrial medicine which are limited only by the training, the imagination, and the energy of the industrial physician.

On the following page is outlined the organization of the medical department of a large industrial concern. It is not given as an inflexible model but simply as one which this particular concern requires for its own needs.

Physical Examinations

The development of Industrial Medicine in the past three decades may be said to have exhibited the following successive phases: (a) surgical, (b) medical, and (c) the preventive with