

Seven years of experience with Industrial Hygiene carried out as an investigative and teaching problem in Harvard University has supplied an extraordinary amount of material illustrative of the results which can be accomplished. From this experience, I have culled certain types of service and these may be taken as examples of the general activities of the Section.

The work in Industrial Hygiene at Harvard began during the war in a time of great industrial pressure and prosperity. It was a period during which it was necessary to keep every man and woman at work and medical assistance to this end was sought by industries of all types. Immediately following the war, during the period of slackness in manufacture, the Harvard enterprise continued to function with no less vigor than was evident through the active war period.

MANGANESE

The first demands upon the Section of Industrial Hygiene of the School of Public Health were made by the New Jersey Zinc Company in connection with a mining operation at Franklin Furnace, New Jersey, an operation which, as a result of war pressure, was pushed to its fullest capacity. There occurred with startling suddenness a series of very curious cases of a nervous disease. The school was consulted through official channels and Dr. C. K. Drinker was assigned the problem of investigating and reporting the situation. He spent several weeks at Franklin Furnace where the trouble existed in examining the patients and in surveying the general conditions of work. It was soon apparent that the poisoning was due to manganese which, in the main, was taken into the body by inhaling the dust caused by milling operations. The first problem was to check the immediate outbreak of the serious and baffling nervous disease. Following several weeks' work in the field, Dr. Drinker was able to draw up

a plan for systematic medical examinations of all the men employed. These examinations were directed entirely at the question of manganese poisoning and as a result of certain simple recommendations made, the immediate outbreak was stopped.

The second step was to attack the question of the poisonous dust from the fundamental standpoint of eliminating it or controlling its dangerous features. In order to accomplish this, it was necessary to make use of other resources in the Industrial Hygiene Section of the School and to procure the exact measuring and determination of the dust by the most modern methods and to formulate advice as to the safest and most economical method of eliminating it. The determinations of the dust were made and the engineering staff of the New Jersey Zinc Company working concomitantly drew up plans for a dust removal system which was subsequently installed. The operation was a very large one costing over a half-million dollars. During this time, periodical medical examination of the Franklin Furnace employees went on and are still continued in spite of the final elimination of the dust, though at long intervals. As a result of this effort, manganese poisoning as a hazard has disappeared.

The officials of the Zinc Company took great interest in the problem and as a result, a third step was undertaken intimately connected with the other problems involved. Laboratory experimentations with animals were carried out which showed the character of the damage and the possibilities of treating manganese intoxication. These latter investigations required all the resources of the laboratories of the Medical School and the School of Public Health.

The extent to which the broad facilities offered by a University may be required and the utility of associating such work with a University are well illustrated by one feature of the manganese investigation. A supplementary process for dealing with the ore dust at Franklin Furnace employed extraordinarily powerful electro-magnets. There was a strong feeling that the peculiar symptoms observed in defective men were due to work in the radius

of these powerful magnetic fields. Accordingly, one of the largest magnets was sent to Boston and for a year experiments were conducted designed to bring out the possibilities of damage to living animals within the magnetic field. These experiments required the assistance of physicists from the Jefferson Physical Laboratory in order that the dosage of the magnetic field should be consistently measured and recorded. The outcome of this particular portion of the investigation was totally negative, it being shown that the constant exposure to magnetic fields affected men in no degree whatsoever. Thus a serious source of uneasiness was removed.

Here, then is a situation occurring in a profitable industry, bizarre in type, unattackable through ordinary medical channels, demanding high grade expert service in several distinctive scientific fields. The work of the University men enabled production to go forward without delay or annoyance and eventually resulted in total elimination of the possibility of danger. The cost to the industry was great, due to the fact that an industrial hazard appeared after construction was well established which necessitated serious engineering alterations. Too often in the organization of work on a large scale, the possibility of human hazard is not foreseen and the cost of meeting it may have to be borne at a time when it will prove most expensive.

NICKEL

An illustration of less magnitude in contrast to this, lies in the experience of the Section of Industrial Hygiene connected with Nickel. The International Nickel Company desired to find an outlet for sheet nickel through the manufacture of nickel cooking utensils. Inasmuch as nickel is a hard and relatively insoluble compound, the general feeling was that such a course would be quite permissible and safe. However, certain executives in the Nickel

Company discovered that nickel utensils had in the past been believed to be poisonous. In order to have an unbiased opinion upon this matter, the Section of Industrial Hygiene was asked to make an examination of the subject. One Year's work was required and it was demonstrated quite clearly that nickel utensils were harmless and desirable. The Nickel Company was furnished with all the available information on the hygiene of their product. They then went forward to the question of manufacturing with the assurance that they had started as safely as possible.

TETRACHLORETHANE

There exists in South Boston a company engaged in the manufacture of artificial silk. In making this product it is necessary to employ an extremely poisonous substance, tetrachlorethane. This material was one of the constituents of airplane dope and was responsible for fatalities amongst workers with it in the war. Early in the experience of the Boston company, trouble began to appear and it was evident that serious consequences might be expected unless something was done at once. It is interesting to note that Sir Thomas Legge, the principal factory inspector of Great Britain, on seeing this plant near the beginning of the University's experience with it, gave it as his opinion that closure would be inevitable. However, the Section of Industrial Hygiene, through Dr. Derric C. Parmenter, and Dr. George R. Minot as consultant, and other University employees, was able to institute particular and novel methods for examination of the blood of the employees which detected poisoning in its earliest phases before material harm had been accomplished. Through the use of this method of examination, coupled with careful regulation of fumes, the plant has been enabled to continue to operate and there seems to be no reason to believe that this will not be permanent.

LEAD

As a result of many years of experience and trial, the world had become flooded with literature on lead poisoning, too often misleading and uncritical, unfair alike to the poisoned individual and the source of the poison. Four years ago, the American Institute of Lead Manufacturers, consulted the Section of Industrial Hygiene as to the question of the thorough standardisation of the problem of lead poisoning. Their idea was that Harvard University might be able to furnish a standardized and critical statement in regard to lead poisoning which would be a real help in diagnosing and in supplying new methods of treating lead poisoning. A sum of \$51,000 was provided for this task. Three years were consumed in the work which was under the direction of Dr. Joseph C. Aub, and was carried out in the laboratories of the School of Public Health and in the Massachusetts General Hospital. At the end of this time, Dr. Aub and his collaborators furnished the material required by the lead manufacturers and the results are now assembled in a monograph on lead poisoning which is certain to prove ~~YAWINUCO~~ classical authority on the subject.

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It is unnecessary to give further instances. The workers in Industrial Hygiene have busied themselves with general problems of dust inhalation, with poisoning due to carbon monoxide, with electric shock, with the problem of poisoning in the industrial separation of radium and with the general question of the hygiene of zinc and zinc compounds. All of these different demands have required not only the existence of a nucleus of experienced workers in the School, but consultants through many departments of the University who

have been of use to employers and employees alike.

In the teaching and simpler aspects of the work of the Section of Industrial Hygiene, many contacts have been made with industry in connection with the establishment of adequate medical service in large department stores, electric light and gas industries, and so on. Through Dr. Derric C. Parmenter and Dr. Wright who formerly had charge of this work, these contacts have been successfully made and results obtained which have been of great help to industries who face the problem of establishing and controlling adequate medical service, a service which is not paternalistic but which is designed to give an honest return both to employers and to employees. Many of the students in the School are now industrial physicians and the demand for adequately trained men in this field is steadily increasing.

The actual work of the School has thus concerned itself with the investigation of specific major hazards brought to it by manufacturers who have been driven into a position of great concern and who in several instances have seen the possibility of closure or curtailment in their operations. The second feature of the work has been the type of service incident upon advice as to the establishment and conduct of medical departments in industry, and the working out of health education and safety.

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