Industrial Health Monthly

Volume 11 Number 12

DECEMBER 1951

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FEDERAL SECURITY AGENCY
PUBLIC HEALTH SERVICE

INDUSTRIAL HEALTH MONTHLY

Formerly *Industrial Hygiene Newsletter*

Volume 11 December 1951 Number 12

Issued monthly by
FEDERAL SECURITY AGENCY
Public Health Service
Division of Industrial Hygiene

This is a special issue covering some of the many occupational health problems encountered by Federal, State and local physicians, nurses, engineers and chemists, and how they are solved.

This publication is free to persons engaged in industrial hygiene in governmental agencies (Federal, State, or local). For sale by Superintendent of Documents, Government Printing Office, Washington 25, D. C. Rates—$1 a year (domestic); $1.25 (foreign); single copies 10 cents.

Articles in this publication are indexed in the *Current List of Medical Literature.*

The printing of this publication has been approved by the Director of the Bureau of the Budget March 16, 1951

Name of Division Changed to Reflect Services Accurately

THE NAME of the Division of Industrial Hygiene, United States Public Health Service, has been changed to the Division of Occupational Health.

The new designation was adopted to reflect more accurately the Division's function of promoting better health for the individual workers. The announcement of the change was first made at the annual meeting of the Advisory Committee to the Public Health Service on Occupational Health.

A comprehensive program for additional protection of the health of American workers is being developed by the Division in a broad range of activities not previously covered by the Division.

An important new concern is the investigation of health hazards in the production, processing and handling of radioactive materials and radiation-producing processes. These materials and processes are being employed by such a great variety of industrial establishments today, many of them small, that the closest attention must be given to the development and intelligent use of proper safeguards.

Dr. Seward E. Miller, recently appointed chief of the Division, has emphasized, however, that the program of the Division will not be concerned solely with such occupational health hazards, but will deal with all problems affecting the health of workers.

"All too often," Dr. Miller said, "the conditions under which workers live may do much more to tear down their health than the conditions under which they work. Air pollution, for example, may not be limited to the immediate neighborhood of a factory; it can envelop a whole community."

The Division is preparing to make additional intensive studies of the health requirements of special occupational groups, such as workers in the chromate-production industry. A study of potential health hazards in this industry is a current one.

In the planning stage is a study of emotional and other psychological factors affecting the health and output of workers. Employee health programs have been under study for some time and this will continue and be expanded to determine the extent to which they meet the needs of workers.

Occupational Health is a Complex Field, as Illustrated by Current Activities of National and Local Health Staffs

THE PURPOSE of this issue of INDUSTRIAL HEALTH MONTHLY is to present a composite picture of the many facets of occupational health practices by means of current examples of Federal, State, and local activities in this field.

The articles in this number have been contributed by personnel in official agencies. Each article in no way represents the whole activity of that particular unit, but illustrates only one phase of the medical, nursing, engineering, and chemical services necessary to make the job environment a healthy place in which to work, and to help every worker achieve and maintain his optimum in health.

Few persons have what may be called ideal working conditions from the standpoint of health protection and maintenance, yet steady progress is being made to improve the working environment and health services for many thousands of workers. Significant studies have been made in reducing the illness and death tolls from silicosis, poisoning from lead, carbon monoxide and mercury, and other occupational diseases. Much remains to be done, however, in bringing the benefits of available knowledge to all workers.

Most owners and managers of factories, mills, mines, and other industrial plants are well aware of the value of safeguarding the health of their employees. How much they have done within their own organizations has depended upon many factors, but lack of know-how is probably the one factor most likely responsible for the inactivity of many plant owners in the area of occupational health.

To advise and assist large and small plants with their occupational health problems, almost every State and some cities have employed industrial health specialists. These staffs vary in size from one engineer in some States to as many as 38 professional personnel, including engineers, chemists, physicians, nurses, and a nutritionist, in New York State. About 90 percent of the industrial health work of State staffs is administered through the health departments and the balance by the labor departments.

No one agency or department in State or Federal Government can raise the occupational health standards of workers without the cooperation of management, employees, private organizations, and community groups. This integration of effort is particularly necessary because health services cannot be isolated.

For many years the United States Public Health Service has been conducting research and field studies to determine the causes and means of controlling and preventing occupational diseases. State and local (city and county) industrial hygienists call upon the United States Public Health Service for consultation and often for assistance in conducting a study. Private industries, labor unions, insurance companies, and many other organizations and individuals use the services of the Division of Occupational Health of the Public Health Service.

Within the last 10 years, studies have been made in chromate-producing plants, shipyards, foundries, steel mills, carpet factories, and other industries.

With the increasing emphasis on the importance of health manpower in time of defense production, and the growing interest of employer and employee groups in health services, a broader concept of the occupational health program is developing.

It is increasingly recognized by industry, labor, and government that the health of the worker cannot be divided into segments—occupational versus nonoccupational influences, or physical versus emotional disturbances. All health influences—regardless of their cause—affect the worker's well-being and productivity. Consequently, there is greater emphasis on general diagnostic and preventive measures.

Industry is increasingly making itself available as an examination center for community multiphasic tests for tuberculosis, heart disease, diabetes, venereal disease, and other illnesses. As a result of the broader concept of health, geriatrics and human relations programs are also coming into the industrial health picture.

These forces will make their impact felt on all plants in time. At present, however, the majority of plants are providing only environmental control services, such as good housekeeping, sanitation, and ventilation practices. Some include first-aid facilities.

The objective of a well-rounded health protection and maintenance program through the provision of in-plant health services has been achieved, in general, only by the large establishments—those employing 500 or more workers. With the assistance of State and local industrial hygienists, many small plants are now finding it both beneficial and economically feasible to provide such services.

With the growing concern for greater production, the value of in-plant health programs and other health services will be enhanced. By sharply reducing absenteeism, these programs can contribute materially to meeting our additional manpower needs. At the same time, the provision of health services to this large segment of the adult population will help to build a healthier nation.

Explaining the reason for the change in name, Dr. Miller said, "The term *industrial* in the earlier designation led many to believe that the Division was concerned primarily with large industry, and more particularly, with large plants. The Division's purpose is, in fact, to render service through the States to widely diverse occupational groups of all sizes and kinds."

"The term *hygiene*," he said, "suggested emphasis on personal prevention of disease only, whereas the Division is interested not only in disease prevention but also in promoting a condition of physical, mental and social fitness beyond the mere absence of disease or infirmity."

COVER PICTURE—An industrial hygiene engineer in Georgia captures samples of the air in the breathing zone of this granite worker, taking them, for comparative purposes, with and without the ventilation equipment in use. In this photograph, the exhaust ventilation has been turned off. Note the dust in the working area.

MEDICAL AND ENGINEERING TEAMS MAKE THOROUGH STUDY OF WORKERS AND EXPOSURES IN CHROMATE INDUSTRY

SUSPECTING that the number of deaths from lung cancer is abnormally high in the chromate industry, representatives of the chromate-producing companies in this country requested the Division of Occupational Health of the United States Public Health Service to make an investigation of health conditions.

Supported by evidence gathered in a privately sponsored epidemiological survey and the earlier reports from German chromate producers, the Division agreed it was necessary to make a thorough and complete study of the health hazards in the chromate industry.

Teams of engineers and chemists went to work on the environmental phase of the study, and teams of physicians, nurses, a dentist, and laboratory technician attacked the problem of physical examinations of exposed workers. Seven plants and about 1,000 workers were studied.

The Engineering Study

A study of the manufacturing processes, which are basically the same in all chromate plants, preceded the atmospheric sampling.

Briefly, the manufacturing process consists of roasting the finely ground ore with soda ash or with a soda ash and lime mixture to produce a water-soluble chromium compound, sodium chromate, which is converted by acidification and crystallization to the product sodium bichromate. Soluble materials other than chromates and bichromates occur in the chromate and bichromate liquors. Byproducts such as alumina, sodium sulfate and sodium vanadate may be recovered from these liquors.

The process may be divided into two general phases known in the industry as the "dry end" and the "wet end." The dry end of the process may be subdivided into segments of operations referred to as milling, roasting, and leaching. The wet end of the process may be subdivided into segments of operations referred to as neutralizing, treating, and concentrating.

A total of about 1,800 samples were collected throughout the industry for the purpose of defining the atmospheric environment. Approximately 1,600 of these were samples of airborne materials and were collected with the standard impinger and the midget impinger.

About 100 material and settled dust samples were also collected, using the thermal precipitator, the high-volume filter, and the Zeiss konimeter. The NBS carbon monoxide indicator and the electrostatic precipitator were also used for the collection of special information.

Respirators were furnished workmen in several plants to evaluate their suitability for use as air sampling devices. The respirator filters were analyzed in the laboratory, together with the other samples collected in the study.

The large number of samples collected made it possible to obtain an accurate measure of average conditions in the various operations in the industry. Air samples were analyzed in the field for soluble hexavalent chromium. Other analytical determinations on both the air and material samples were performed in the Division laboratories in Cincinnati. These analyses included, among other things, determination of chromium in its various valence states. Spectrographic determinations were made on the samples to identify and measure various other elements present.

This information is in the process of being evaluated and correlated with the medical findings.

The Medical Study

The purpose of the medical study was to evaluate the present health status of the chromate workers. The examining team was composed of a physician, dentist, nurse, and a laboratory technician.

The **physician** obtained the medical history of the worker and carried out the physical examination, paying special attention to those organ systems which might be most likely involved in exposure to chromates.

The **dentist's** function was to evaluate the manifestations of disease which might appear in the mouth of the worker. All pathologic conditions and abnormalities of the lips, mucous membranes, gingiva, tongue, palate, and velum were noted and entered on a special form.

In addition to assisting the physicians the **nurse** elicited and recorded the personal and occupational histories. She also measured and recorded oral temperature, pulse rate, respiration, height, weight, vital capacity, and visual acuity.

The **laboratory technician** took samples and made tests of the blood and urine. Examination of the blood included red blood cell count, white blood cell count, differential blood cell count, hemoglobin determinations, sedimentation rate, hematocrit, and serologic test for syphilis. The urine was studied for specific gravify, glucose, and albumin, and ordinary sediment was examined microscopically.

Two chest X-rays on 14- by 17-inch films were taken for each worker, one on deep inspiration and one on deep expiration. The films were sent to the Saranac Laboratories where planimeter readings were done.

In addition to these studies, procedures of a more specialized nature were carried out on groups of workers of varying size. In one plant, a dermatologist made a study of the skin effects of exposure to chromium compounds. Blood and urine were analyzed for chromium for certain workers.

In one plant, urine was analyzed for coproporphyrin content. Blood serum was obtained on 62 workers for determination of mucroprotein and polysaccharide levels. These determinations were made at the National Cancer Institute.

A special panel of radiologists reviewed a group of X-ray films which showed possible pathological conditions. Detailed nose and throat examinations were made by a specialist on 87 men. Tissue sections from the lung of a man with bronchiogenic cancer were prepared and examined by the National Cancer Institute. The lobe of a lung containing a cancer was ashed, and the cancerous and noncancerous portions were chemically analyzed for chromium content.

A special survey was made of the availability and utilization of health and medical services of chromate workers. In each plant and in each community the local medical facilities, with

emphasis on diagnostic facilities, were noted. The plant medical programs, especially the preplacement and periodic examinations, were evaluated. Health insurance programs for chromate workers were described.

To obtain a background for the study of health problems in the chromate industry, an exhaustive review was made of all literature in this field, both foreign and domestic. Scientific articles extending from 1827 to the present date were examined. The chromate-consuming as well as the chromate-producing industries were included.

As part of the chromate investigation, a statistical study was made of the morbidity and mortality experience of the seven plants in the United States engaged in the extracting of chromates from chemical grade chromite ore. These plants are located in Maryland, New Jersey, New York, and Ohio. Data were collected on all paid death claims and on cases of sickness and nonindustrial injuries disabling for eight calendar days or longer among members of the plant sick benefit associations.

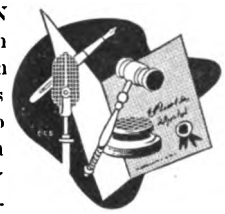
Morbidity experience for 1946–50 was analyzed as was mortality for 1940–50. Comparable statistics were developed on mortality by cause for chromate workers and for all males in the United States, 15 to 74 years of age. It was thus possible to learn for what diseases and in what age groups chromate workers had an unfavorable mortality and morbidity experience.

Statistical analysis of available data was necessary in order to develop norms against which certain medical findings among workers in the chromate industry could be compared. Thus, prevalence rates were secured for tuberculosis, heart disease, and lung cancer among comparable segments of the general male working population.

To provide data with which to compare other medical findings in the chromate industry, a group of white male workers and a group of colored male workers not exposed to chromates, were selected and given the same medical examination by the same field team. These men were as nearly like the chromate workers as possible with respect to socio-economic status and work requirements but had no chromate exposure.

This wealth of information is being organized and evaluated by the occupational health teams. When the report is complete, it will contain not only the findings but also the recommendations of the Division to the chromate industries on the protection of the health of their workers.

PUBLIC HEALTH OFFICIALS AND REPRESENTATIVES OF MINING COMPANIES CALLED TO CONFERENCES ON RADON HAZARD



THAT RADON is present in the uranium mines and mills of the Colorado plateau area in sufficient quantity to justify the application of control measures has been determined in the beginning of a study by the Division of Occupational Health of the Public Health Service. The study was undertaken in July 1950 with the close cooperation of the Atomic Energy Commission.

The problem of attempting to secure adequate control measures in all of the mines by personal consultation was felt to be far beyond the ability of the study group. For this reason it was felt advisable to call a conference of all of the groups concerned in order to apprise them of the findings of the mine studies and to give them more complete information on the control of radon.

Two conferences, under the direction of Duncan A. Holaday, were held at the Occupational Health Field Station, PHS, Salt Lake City, during August 1951. The first of these conferences was held for persons associated with State and official agencies; the second 2-day conference was limited to the industrial group.

At the State conference there were representatives from the five State health departments concerned, the United States Geological Survey, and the Atomic Energy Commission. At the industrial conference, there were 20 representatives from 8 mining companies and three representatives from the United States Bureau of Mines.

The first day of each conference was devoted entirely to a review of atomic physics so that the persons in attendance would be in a better position to comprehend the radon problem in the uranium mines. The second day was largely devoted to the radon problem and methods of measurement.

Recent work has shown that under mine conditions the concentration of radon daughters is much more significant than is the radon alone. Both groups were presented a method of estimating the concentration of radon daughters in the mines which is much simpler and more rapid than the present method of taking air samples in an evacuated container.

The method recommended was to draw a measured volume of air through a 1-inch filter paper using certain field instruments. Following this, it was recommended that these filter paper samples be counted, using an instrument sensitive to alpha particles. It would be necessary to make radiological measurements on this sampling medium at definite time intervals after obtaining the sample in order to determine the half-life of the radioactive dust that had been sampled.

By means of mathematical relationships, the original concentration of radon daughters in the atmosphere may be estimated from the radioactivity on the filter paper. Although the results obtained are not true figures, the magnitude is sufficiently accurate to serve as a guide in controlling the contaminant.

Special guests who attended these conferences included Mr. Joseph E. Flanagan, Assistant Chief, Division of Occupational Health, Washington, D. C., and Dr. Aaron W. Christensen, PHS Regional Medical Director, Region 9, Denver, Colo.

Other conferences will be called when additional findings are available and other improvements in the methods of estimating and controlling radon and its daughters are known.

NOTICE

Articles by J. J. Bloomfield and L. T. Fairhall which were scheduled for this issue will be printed in the January 1952 number.

INDIANA MEDICAL SOCIETY AND INDUSTRIAL BOARD COOPERATE TO EXPEDITE COMPENSATION CASES

RECOGNIZING the need to expedite compensation cases, the Committee on Industrial Health of the Indiana State Medical Association and the Industrial Board of Indiana met to lay plans for closer cooperation. In a year's time, the backlog of untried cases was reduced to normal, and there are no further complaints that litigants cannot get doctors.

As a result of a joint conference of the Committee and the Industrial Board members, the following statement of policy was drafted regarding industrial medicine and medical testimony:

"The physicians of Indiana are ready and willing to assume their responsibility in making the industrial laws of the State function as intended. They wish to cooperate with the claimants, employers, insurance carriers, attorneys, and members of the Industrial Board so that cases may be handled promptly and expeditiously.

"The medical profession is cognizant of the legal responsibility placed upon it by the State's industrial laws, and it will endeavor to fulfill this obligation by working with all agencies involved. In return, the profession welcomes and expects cooperation from the other participants. In this way the best interests of all parties will be served.

"Inasmuch as the laws clearly define types of injuries, and clearly set forth the basis for determining percentage of disability or impairment, members of the medical association stand ready to assist and, if necessary, to testify in contested hearings, upon proper notice by either the claimant or the defendant, expressing their opinions in truth exactly as they believe the conditions to be, and without bias or prejudice against either side.

"The medical association commends the Industrial Board for requiring attorneys in contested claims to agree upon a date for hearing. If allowed 2 weeks to schedule appointments with his regular patients, the physician can most likely arrange his work to be present to testify at the appointed time. It should be remembered that emergencies arise which the physician cannot control and which may detain him.

"If full and complete cooperation is received from all parties interested in industrial cases, the medical profession pledges proper medical assistance to every person needing the doctors' help."

This was approved by the Executive Committee of the Indiana State Medical Association and published in their journal. The Indiana State Bar Association adopted a similar statement of policy.

Through this action fuller cooperation has been achieved among the physicians, claimants, employers, insurance carriers, and attorneys.

Industrial Nurses and Public Health Nurses Integrate Programs

IN SOUTHWEST MISSOURI, industrial nurses are learning about community health services, and public health nurses are learning about industrial health. Five industrial nurses and five public health nurses from four counties have been meeting together to promote better integration of their services.

The first informal get-together was held at one of the plants with management as host. Although this plant is a light industry and employs 250 people, there is a part-time physician and a full-time nurse, evidence that management believes in adequate health service for all employees. The program for the nurses included a tour through the plant, a luncheon, and a period for informal discussion.

The second meeting was held in a health center with the Community Health Council providing the luncheon. After a tour through a local plant, a meeting was held and the following films shown: *So Much for so Little* and *Coming Home.* The discussion centered around the services and cost of a health department and around the problems of rehabilitation of the person with arrested tuberculosis.

Believing these meetings to be well worth the time, the nurses plan to meet three times a year in an effort to give their communities better health services.

Management and Workers Must Cooperate to Keep Mercury Exposure Low

THAT MERCURY vapor exposure is not easy to control has been demonstrated by a study in a small Mississippi plant manufacturing thermometers. A physician, an engineer, and a chemist from the Division of Industrial Hygiene of the Mississippi Board of Health made numerous trips to the plant to procure and analyze air samples, and make recommendations for ventilation; to obtain for mercury tests urine samples from the four men exposed; and to follow up the recommendations with further tests.

The initial engineering survey disclosed that far too much mercury was concentrated in the workroom atmosphere. Later, as a result of the rearrangement of operations and better housekeeping, the amount of mercury in the air was less than the maximun allowable concentration. However, urinary samples continued to show mercury, and subsequent atmospheric tests revealed an increase instead of the expected decrease in mercury concentration.

Several factors contributed to this condition. For one thing, because of the change from warm to chilly weather, the exhaust fan was not in use, and the doors were closed, thereby reducing ventilation to a minimum.

The engineers recommended that (*1*) the breaking and scaling operations be moved closer to the exhaust fan, away from the shielding effect of the wall; (*2*) the exhaust fan be operated at *all* times, regardless of weather, during the following operations: scaling, breaking, and centrifuging; (*3*) renewed efforts be directed toward minimizing spillage and breakage: and that (*4*) mercury spilled should be promptly cleaned up, and that the entire plant (tables, floors and machinery) be thoroughly cleaned of mercury periodically, at least once a week. Advice in self-protection was also given those who cleaned the plant.

Ventilation Changes in Lead-Zinc Mine in Idaho Effect Better Health

EXTENSIVE recommendations to improve the working environment in a lead-zinc mine in Idaho were completely carried out by management to assure the best health protection possible for the miners, according to a report made by Idaho's industrial hygiene engineers. During a 3-day survey of the mine, the two engineers reported the need for more ventilation, which was obtained in this mine by natural draft. Extra air doors were necessary to permit sufficient and proper circulation through the shafts and in the working levels.

Excessive dust exposures of the underground workers were due not only to inadequate ventilation but also to such practices as dry collaring of holes and to the use of insufficient water spraying.

Conducted as part of the industrial hygiene service of the State Department of Public Health, this study was one of many made in Idaho's mines in an attempt to control conditions that are crippling the lungs of miners.

The industrial hygienists are specially trained in mine ventilation and are provided with all the necessary equipment for dust sampling and dust determination.

DECADE OF SURVEYS IN GEORGIA GRANITE SHEDS AND QUARRIES RAISE HEALTH STANDARDS

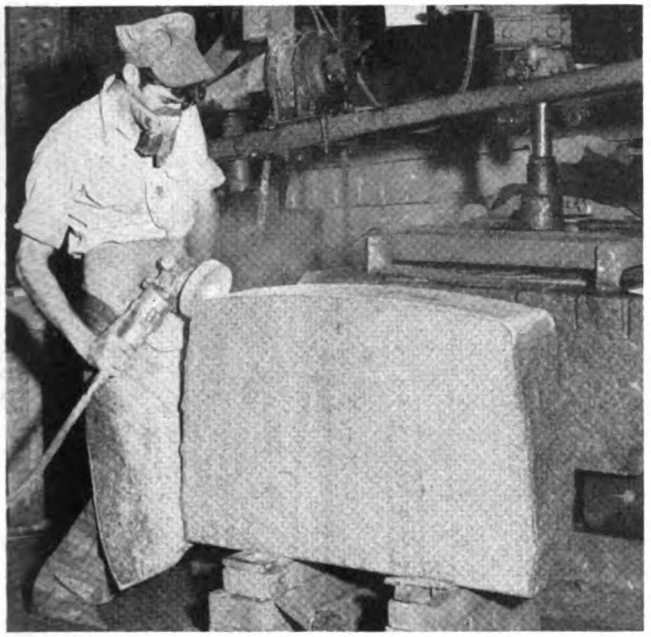
IN THE 10 years that the Georgia Division of Industrial Hygiene has been assisting the employers and employees of the granite sheds and quarries, industrial health in this industry has vastly improved.

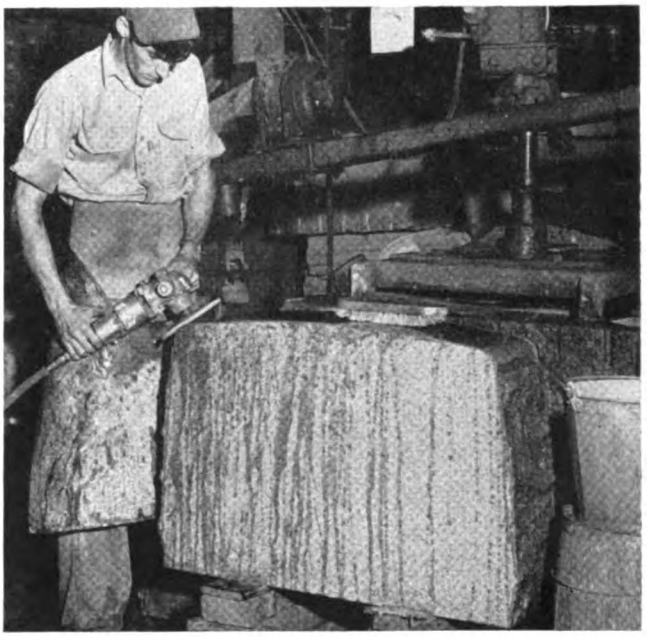
In 1940, the first chest X-ray survey was made in the northeastern section of Georgia where Georgia's 50 some granite sheds and quarries are located. Out of 189 workers X-rayed, 137 showed symptoms of pneumoconiosis. The community now has a population of about 7,000 persons, and approximately 1,400 of them are employed in the granite industry. In a 1949 county-wide X-ray survey, out of 8,792 persons studied, only 101 showed evidence of pneumoconiosis.

Much of the ventilation equipment necessary to prevent the occurrence of silicosis could not be obtained during the war years, from 1941 to 1945. Therefore, at the close of the war when some of the equipment had been installed, the Division of Industrial Hygiene was called on again to make a study of the plants. A pilot study in the plants where control equipment had not yet been secured showed that the workers were exposed to from 2 to 10 times the maximum allowable concentration for silicious dust.

After the local exhaust ventilation equipment and approved-type dust respirators were in use, a complete study was undertaken by the Division to determine the efficiency of the equipment. The dust samples that were again taken and the checks on air flow through the ventilation equipment indicated that conditions were much better. In all plants where ventilation of the proper type had been installed and was used properly the dust counts were below the maximum allowable concentrations.

Periodic checks will continue to be made by the Division in this industry to ascertain the environmental working conditions.





Workers in the granite industry frequently use a respirator as protection against the fine granite dust, cause of many cases of silico-tuberculosis. In the second photograph, the man is using plenty of water to lay the dust as he polishes the piece of stone. Photographs by courtesy of the Georgia Department of Health.

Postwar Downward Trend of Male Sickness Absenteeism Swings Up in 1950 Figures*

A DOWNWARD trend of male sickness absenteeism, based on illnesses and nonindustrial injuries disabling for 8 days or longer, began in the postwar period. The absenteeism rate for 1950, however, is somewhat above the rate for 1949 and may be the beginning of an upswing. This increase in frequency was participated in by each of the broad cause groups: respiratory diseases, digestive diseases, nonrespiratory-nondigestive diseases, and nonindustrial injuries. The female rate in the postwar period, on the other hand, has described generally a level trend with only a slight increase in the rate for 1950.

The increase in sickness frequency during 1950 is in harmony with past experiences when higher sickness rates occurred in periods of increased industrial activity. Associated with increased industrial activity are a number of factors which may be responsible for increased sickness absenteeism. Such factors may be listed as follows: Increased employment of youth, the older worker, and of women; the hiring of workers long unemployed, and of the inexperienced; emotional strains, and personal mental conflicts; lack of job satisfaction; poor plant nutrition programs; inadequate housing, and living conditions; and lack in the community of prompt and efficient medical service.

*Division of Occupational Health, PHS.

FREQUENCY OF 8-DAY OR LONGER DISABILITIES, 1941–50

Year in which onset of disability occurred	Average annual number of absences per 1,000 persons (absences of 8 days or more)	
	Males	Females
1941	101.3	163.3
1942	106.1	168.4
1943	138.1	204.1
1944	140.9	221.0
1945	147.4	257.9
1946	114.5	248.2
1947	111.9	260.4
1948	104.5	257.2
1949	95.5	254.5
1950	116.8	258.4

Oklahoma Studies Mercury Hazards in Seed-Treating Plants

WHEN the Oklahoma farmers and wheat elevator operators started using a new organic mercury compound to destroy fungous infections on seed wheat, the Industrial Hygiene Division of the State Department of Health made a technical study of the plants to determine the mercury exposure.

The State-wide preliminary survey of all existing seed wheat treating plants revealed the following facts:

(1) The organic mercury compound was the only treating agent being used on a commercial basis that would kill deleterious fungi on seed wheat; (2) there were 74 plants in operation, with approximately 8 more to be in operation within 2 years; (3) most of the workers in these plants complained of a brassy taste in the mouth, loss of appetite, and various stomach disorders; (4) dry-type treaters were much more hazardous than wet or slurry-type treaters, which reduce dust more effectively; (5) the treating and handling of the treated grain often occurred in a poorly ventilated place, and (6) in approximately 30 percent of the plants, the treated grain was sacked; in no instance was mechanical ventilation provided for the sacking operation.

A technical study of the atmospheric mercury concentrations in these plants was started a year ago and will be repeated every year. Plant owners have given excellent cooperation during the studies and have made every effort to reduce the exposures.

Seed wheat treating is seasonal, and the plants operate only 4 or 5 weeks a year during the wheat-planting season. Because of the large number of plants and the short treating seasons, an instrument had to be utilized that would give on-the-spot indications of excessive exposure. For our purposes, the best instrument available was a mercury-vapor detector. This instrument has the disadvantage of being sensitive to many organic substances, but for our needs it was judged satisfactory.

The findings are not complete, but to date 90 percent of the plants have initiated control measures of some type to reduce the exposure in the chemical storage and the seed-treater areas, and the operations where the treated seed is moved by hand.

Many recommendations have been made and are being made to reduce the mercury concentration below the maximum allowable concentration. Special emphasis is placed upon isolation of the treating unit and storage area, adequate ventilation of the working spaces, protective clothing, good personal hygiene, and good housekeeping.

Since mercury vapor can be absorbed through the skin, the use of a respirator against the mercury vapor has not been stressed. Discontinuance of sacking and manual moving of the treated grain by the plant employees is recommended at all of the plants.

New plants are purchasing the slurry-type treaters to reduce the dust problem. Likewise, the older plants are replacing dry-type treaters with the slurry-type. During the initial survey, 52 of the treating plants were utilizing a dry process, and only 22 were using the slurry or wet method to apply the chemical to the seed. Now, approximately one-half of the treaters are of the slurry-type, and the remaining ones of the dry-type.

LONG ILLNESS OF POLICE OFFICER LEADS TO DISCOVERY OF LEAD EXPOSURE ON FIRING RANGE

ONE OF THE interesting investigations made by the Detroit Bureau of Industrial Hygiene resulted from a call from the chief of police of a small municipality adjacent to Detroit. He asked if this Bureau, as a courtesy to his city, would investigate the cause of illness in one of his veteran patrolmen—one of the best pistol shots on his force.

This man had been suffering from ill health for a number of months and had consulted several physicians. His symptoms had been pains in his stomach, muscular discomfort, and weakness. After receiving no help, he had finally gone to a doctor who diagnosed his illness as lead poisoning.

The physician had associated this lead poisoning with the patrolman's long periods of practice at the police department's shooting range. The chief of police, however, felt that the shooting range was adequately ventilated and as modern and well-equipped as most municipal ranges.

An investigation revealed that the police department supported a pistol-shooting team which engaged in national competition and that fairly long periods of time were spent by a number of the members of the police department in the pistol range. In order to reduce the expense of buying cartridges, a bullet-molding installation had been provided for the department. This operation, however, was found to be ventilated.

The shooting range was ventilated by a centrifugal fan exhausting the air through an opening directly over the firing line. A visual observation indicated that the smoke resultant from firing cleared in several minutes. The firing range and the room behind the targets were swept once a week. This operation was noted as a possible source of lead exposure.

It was learned that the patrolman who was ill had been on leave for a year in an attempt to recover. Deciding to interview him for further information, Bureau personnel found the patrolman to be a fine-appearing physical specimen over 6 feet tall and weighing about 200 pounds.

Upon shaking hands with him, however, they observed that his grip was very weak. He reported that even light work, such as gardening and trivial chores around the house, was too much for him.

During his 6 years with the police department, he had done a great deal of shooting at the range. Because he was one of the best shots in the department and was well-qualified for instructing rookie cops in the technique of pistol shooting, he had been placed in charge of the range.

It was decided to run urinary lead determinations on all the police personnel who spent time at the shooting range. It was also felt necessary to make lead-in-air determinations of all operations which exposed the police personnel to lead fume and dust. The urinary lead determinations ranged from 0.07 to 0.32 mg. per liter, the critical range being generally felt to be above 0.15 mg. of lead per liter.

The member of the police force having the highest urinary lead value was the successor to the patrolman who was convalescing at home. This man was now in charge of the range and spent a great deal of time instructing members of the force, cleaning up the range, and molding bullets.

Air determinations made around the various operations in the range were as follows:

Bullet molding, 1.5 (milligrams of lead per 10 cubic meters of air*); removing of dross into can from lead pot, 27.7; sweeping in room behind target, 48.6; during heavy shooting in shooting range, operator's breathing zone, 225.0 to 360.0.

The above air determinations indicate that the highest exposures occur during actual shooting practice. At that time the concentrations are over a hundred times the maximum allowable concentration. It was thought that the lead in the air might come from two sources. First, it might be the result of the fume generated from burning the lead azide primer cap. The second possibility was that the lead fume might result from the vaporization of hot lead from the bullet heated by the friction of passing through the barrel of the pistol.

*The maximum allowable concentration of lead fume in air is 1.5 mg. of lead per 10 cubic meters of air.

During target practice on the firing range, the policemen were exposed to dangerous concentrations of lead fumes. Now the officers are protected by an improved ventilation system, made possible by reducing the opening to the range.

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To determine if the lead in the air was primarily from the lead azide primer, it was decided to undertake comparison tests by making air determinations during the firing of cartridges using lead-free primers and by making air determinations with lead primers under exactly the same conditions.

These tests showed that the concentration of lead in air during the firing practice with lead-free primers was slightly less than in the firing practice under the same conditions using lead primers. It was concluded from these tests that only part of the lead in the air resulted from the primer. The greater concentration of the lead appeared to come from vaporization and fragmentation of the bullet.

An analysis of the data obtained from this study indicated that the police personnel engaged in shooting-range practice were exposed to excessive quantities of lead. This was supported by the results of the lead-in-urine determinations. The air determinations indicate that the highest exposure to lead occurred during actual firing practice. Other lesser exposures came from sweeping the floor, removing dross from lead pot which was used to mold bullets, and the bullet-molding operation.

The following requirements for correction of this condition were given to the police department:

(1) The ventilation at the firing range must be improved to give adequate control of lead fume generated during the firing of pistols.

(2) The floor of the shooting range should be cleaned daily by means of a hose or wet mopping.

(3) The ventilation hood over the lead melting pot should be extended to include the dross retaining can.

(4) The lead melting pots should be thermostatically controlled to operate at a temperature below 500° F.

The ventilation of the shooting range appeared to be the most important item for the control of the lead exposure. The existing ventilation consisted of an exhaust opening directly over the firing range provided with a centrifugal fan which effected an airflow of 1,500 cubic feet a minute.

The firing range was 15 feet wide, 70 feet deep, and 10 feet high. It was believed necessary to provide an airflow away from the personnel firing the pistols of at least 100 linear feet a minute. For a room this size, an airflow of 15,000 c. f. m. would be required.

To obtain an airflow away from the firing range personnel, it was necessary to provide the fan exhaust opening at the far end of the shooting range behind the targets. Inasmuch as this is a large quantity of air and would impose considerable load on the heating system of the building, it was suggested that the cross-sectional area of the range be closed by a partition at the firing line and that the patrolmen fire through window openings. An airflow of 100 linear feet a minute or greater would be obtained through the window opening. An installation of this type is shown in the accompanying photograph.

Lead-in-air determinations made during firing practice through these window openings at the man's breathing level showed a concentration of 0.3 mg. of lead per 10 cubic meters of air. The results of this study indicated that the lead-in-air resultant from the firing of pistols can be adequately controlled without using excessive volumes of air.

Filtration Plant Employees Exposed to Lead Dust in Scraping Paint Off Troughs

LIKE the proverbial children of the shoemaker, certain municipal employees of the city of Cleveland apparently had not been receiving the proper amount of attention from the family.

The first information which the Bureau of Industrial Hygiene had concerning the illness from exposure to lead dust came through a request from a hospital physician who asked that lead analyses be made on blood and urine specimens from three hospital patients. The blood analyses showed about 0.13 mg. per 100 grams, and the urines, about 0.41 mg. per liter.

These patients were employees of a water-filtration plant and had been scraping tubercles and rust spots from steel wash water troughs on a rapid sand filter. The troughs had been painted with red lead paint about 6 years previously and were being prepared for repainting.

During the winter, two men started to prepare filter troughs for repainting by scraping troughs by hand after preliminary brushing with a motor-driven brush. A month later, four additional men were added. About 3 months after this work had been started, all but one of the workmen had been reported too ill to work and later were diagnosed as having had lead poisoning. The one exception was a man who had retired, and no further information was available concerning him.

Since the work had been completed at this filtration plant before the workmen became too ill to work, no exposure studies could be made there. However, arrangements were made at another filtration plant to have the work performed under as nearly the same conditions as obtained at the plant where the illnesses had occurred.

Air samples taken while the power-driven brush was being used showed 229 mg. of lead per cubic meter of air sampled in the breathing zone of the brush operator. The concentration nearby where the dust from the brush was thrown probably would have been much higher, judging from the amount of dust visible in the air. An air sample taken while a worker was hand scraping and brushing on a relatively dry trough revealed 32.2 mg. of lead per cubic meter of air sampled.

Similar operation on a trough which was quite damp, and ordinarily would not have been scraped until drier, produced 2.4 mg. of lead per cubic meter of air sampled. At a later date, more troughs which were quite dry were scraped less vigorously, but gave results of 63 to 73 mg. The sample taken on the main gallery, a short distance from the filter that was being scraped, showed 0.26 mg.

Evidently, the workers who had become ill were exposed to lead dust in the range of several hundred milligrams per cubic meter, and probably even greater than that at times. These men had respirators available, but had not used them.

Scraping of the lead-painted troughs had been done when necessary, probably at 5- or 6-year intervals, without any particular protective measures because the supervisory personnel did not think there was any hazard. The motor-driven wire brush, however, had been used only once.

Control of the dust produced by a motor-driven brush cannot be accomplished easily, and since the painters believed that it removed too much good paint, it was agreed that its use would be discontinued. Control of the dust produced by hand-brushing could be effected by using portable collecting hoods and dust collectors, although this would be rather awkward.

One filtration plant had manholes above the filter beds where exhaust fans would be placed to provide general ventilation. Filter type respirators were found not to be satisfactory for this high exposure because the men were likely to take them off to talk or smoke while the air was still contaminated.

During the tests, it was found that the respirators used by three of the four persons exposed had leaked; streaks of red were visible around the nose, and some of the men showed tinges of red in their saliva. Supplied air respirators were used during another test and probably would have been more satisfactory than filter-type respirators if the air intake had been located in an uncontaminated area. Tests of the air from the supplied air respirator showed 0.4 mg. of lead per cubic meter of air sampled.

This incident shows that municipal employees as well as industrial employees may be exposed to serious health hazards. Quite likely, it would have been unreported except for a fortunate series of coincidences. One of the workmen who had become ill was a brother of a private physician and received treatment more promptly than might have been expected otherwise; also, the resident physician where he was hospitalized was "lead poisoning conscious" and notified the Bureau of Industrial Hygiene.

Because of this incident, other painters working for the city received health examinations. Blood and urine analyses showed that a high percentage of them had significant lead absorption, although only one exhibited symptoms of lead poisoning.

FIVE YEARS OF MORBIDITY REPORTING IN 12 SMALL PLANTS REVEALS VALUABLE INFORMATION

A MORBIDITY reporting system among 12 small plants, covering about 1,600 workers, was inaugurated in 1948 by the New Hampshire Division of Industrial Hygiene. Plants with less than 150 employees were selected because in small plants the absentee reports are likely to be more accurate than those from large plants. When management is closely associated with every employee and employees are acquainted with each other, their reports are fairly dependable. Also, since all absences regardless of cause are reported in small plants, the statistical work is not an added burden for the individuals who record the data. Since 1948, additional plants have requested to participate in the reporting system.

Each plant was visited and the purpose of the morbidity reporting was fully explained to both management and the employees. Letters which explained the reason for the study were sent to the plants, where they were posted on bulletin boards. Personal histories, including such items as name, age, sex, nationality, marital status, number of children, military service record, present and past occupational history, and yearly income, were obtained for each employee in the plant. These histories were taken by personal interview and the statement signed by each employee. The interviews presented an opportunity to explain the purpose of reports and necessity for truthful statements on absences.

Employment records are submitted each month by the plants on a form provided by the Division. This form includes such items as name of plant, total number of days worked, number of employees by sex, names of new workers employed, date employment began and number of days worked during the month, names of workers terminated with dates of termination and days worked during the month. This information was required so that an absenteeism record by cause could be computed in terms of days worked for each plant.

Two persons, usually from the payroll or personnel department, were trained to record the absenteeism information. Before a worker returns to work after an absence, he reports to the recorder the time he has been absent with specific information as to the reason; also, if a physician was seen, the name of the physician; whether he was confined to bed and the number of days in bed, as well as the number of days he was absent.

During the talks with the workers and in the letters which were posted on the bulletin board, the need for truthfulness of statements given for the reason of absences was stressed. Arrangements were made with management so that there would be no penalty for absence of workers except in severe situations. The reports of morbidity are forwarded to the Division's office each month, where the information is tabulated and analyzed. A keysort system is used to record the data, and a monthly report is sent to each plant.

During the 3-year period that this morbidity reporting system has been in effect, interesting data have been obtained, although not yet in sufficient quantity for statistical analysis. The effects of upper respiratory diseases during the winter season as well as the effect on absenteeism of such factors as the opening of deer hunting and fishing seasons are dramatically revealed.

In general, the statements given by the employees for reason of absence are believed truthful, since such expressions as "went to Boston to a ball game" or "a little celebration of my own" are common among them.

Several of the plants in the study have said that the reporting has decreased considerably the absenteeism rate, and this has been borne out in the records on some of the new plants that have joined the study. This study represents a good index of the morbidity rates among the gainful workers in the State. In fact, it is the only index on morbidity for the adult population that is available to the State Department of Health. Frequently, illnesses from occupational hazards are detected from this reporting system.

COUNTY HEALTH OFFICERS IN WEST VIRGINIA HELP INDUSTRIAL HYGIENISTS EVALUATE LOCAL AIR POLLUTION PROBLEMS

COUNTY HEALTH departments have been a great help to West Virginia's Industrial Hygiene Bureau in evaluating the air-pollution problems in their particular vicinities, according to the Bureau chief, Mr. P. D. Halley.

Conducting studies of various aspects of air pollution away from the home office is very difficult in view of the great number of variables involved. When a task force is sent to an area to study a specific problem, meteorological conditions or other factors may be such at the moment that it is impossible within a reasonable period of time to obtain technical data on the problem.

Inasmuch as the local health departments are closely concerned with most of these studies, they cooperate willingly with the industrial hygienists who must determine the magnitude of air-pollution problems and work out means of control. Several examples of these cases follow:

Power plant.—For several years, people living in a small West Virginia community had been beset with fly ash emanating from a power plant located just across the State line. The Industrial Hygiene Bureau set up a sampling program to be carried out by the local health department for determining the magnitude of the fly ash from the plant settling in the community. The sampling program was carried on by the local department with the analysis being made by the State Bureau. In addition, the sampling work involved obtaining samples of coal and ash from the plant and leaves of plants for spectrographic analysis and sulfur content of the leaves.

As a result of this cooperative work, which also involved an active citizens' committee, the power plant officials committed themselves to the installation of controls costing approximately one million dollars.

Blast furnace slag.—A plant engaged in crushing and sizing blast furnace slag was creating a considerable dust nuisance. Also involved was dust from another plant on the same grounds which was processing the crushed slag into an asphalt-type road surfacing material.

Samples of the dust were collected by both the Bureau and the local health department from the plant processes, from dirt-fall cans, from window ledges, and from other places in the area. Results of analysis indicated the plant to be a major offender. Through constant contact by the local health department and occasional visits and supplying of technical help by the Bureau, a great reduction in the amount of dust emitted to the air has been effected.

Refuse coal piles.—Common to West Virginia are burning "gob" piles, or dumps of refuse material from the mining of coal. This material often ignites spontaneously, resulting in the formation of smoke, sulfur gases, and carbon monoxide. The rate of burning which varies considerably, coupled with the variability of meteorological conditions, makes it difficult to evaluate actual conditions at the height of pollution.

In one of several cases, the trouble arose in a small community located more than 200 mountainous miles from the Bureau's laboratory. The conditions that arose would last for sufficient time to alarm the residents, but would usually disappear by the time an engineer could reach the scene. Consequently, sampling equipment was devised for use by the local health department only 30 miles away, the samples to be sent to the Bureau laboratory for analysis.

The local health department was subsequently called in by the residents when conditions were bad. As a result of the local health department being on the scene to confirm the fact that the pollution was relatively intense, steps were taken by the company to remove most of the material, cover the remainder, and change the dumping site to a remote area.

Another case involving a burning "gob" pile was called to the local health department's attention by the board of education. Upon being called in, Bureau personnel made a preliminary appraisal of the situation and left instruments for evaluating the condition which involved a local grade school.

Limestone and cement plant.—The Bureau is presently engaged in studying a problem in a community of approximately 15,000. The problem involved is that of determining the degree to which one particular limestone and cement plant contributes to the dirt settling in the area. In this particular case, the collecting equipment is serviced by the city government, the samples are prepared for shipment by the local health department, and the analyses and interpretation are made by the State Bureau.

Plant Checks Illness by Installing Ventilated Welding Booths

SEVERAL cases of illness among the workers in an aircraft industry were reported to the Industrial Hygiene Section of the Division of Sanitation of the Kansas State Board of Health and assistance was requested in finding the cause. These workers complained of headaches, eye irritation, coughing, and some nausea. Illnesses were reported intermittently on both the day and night shifts.

An investigation revealed that the building in question contained a vapor-spray-vapor trichloroethylene degreaser in one end and several hand-operated, open, inert gas-shielded arc welding units in the other end. Aluminum parts were being welded, and aluminum wire was being used as the welding unit electrode. Helium gas was being used to shield the arc so that the use of flux or flux-coated rods was unnecessary. A conveyor carrying baskets of aluminum parts through the degreaser extended from one end of the building to the other.

The cases of illness were reported among the welders and workers in the general vicinity of the welding operation. There was no local exhaust ventilation on either the degreaser or the welding units. However, there was some natural general ventilation which varied with the weather conditions.

Determinations for trichloroethylene vapor indicated that there was little possibility of toxic concentrations of trichloroethylene or phosgene being present. However, it was found that

some degreaser solvent was being carried out into the room in pockets provided by rust spots and square corners on the baskets.

To provide better control of trichloroethylene dissemination into the room and the possible formation of phosgene, the industry decided to replace all the baskets on the conveyor line used for the degreaser with baskets made from a noncorrodible metal with rounded corners and smooth welds.

The characteristic odor of ozone was noticed in the building, particularly in the welding area. Subsequent analysis of air samples indicated that ozone was present in sufficient concentration to cause discomfort. Analysis of air samples indicated that nontoxic concentrations of oxides of nitrogen were present.

It was the opinion of the engineers that the illnesses were caused by ozone produced from the welding operation. Consequently, separate booths each equipped with local exhaust ventilation were recommended for the welding units.

Workers in Excessive Heat Need Special Medical Supervision

EXPOSURE to excessive heat and chlorine gas in a cell room of an electrochemical plant was the subject of an investigation by an industrial hygiene section of a State board of health. The study was requested by the State Industrial Commission, which had received a complaint from the employees of the firm.

The investigation included temperature and humidity measurements by the industrial hygiene engineer, interviews of employees regarding the effect of the heat on their health status by the industrial hygiene physician, and atmospheric samples for chlorine which were analyzed by the industrial hygiene chemist.

Temperatures averaged nearly 50° F. higher in the cell than the outside temperature, and Effective Temperatures were as high as 86° to 96° E. T. during the study. The dry bulb temperatures ranged from 117° to 154° F.

However, since the men's work is light, being mostly inspectional, and they work only about one-half to three-quarters hour out of each hour, spending their free time in adjacent rooms having ordinary temperatures, the effects of the heat were ameliorated.

Four air samples were taken, and the highest chlorine concentration found was only one-tenth of the maximum allowable concentration of one part per million.

All the employees have experienced moderate to severe chlorine exposure while attempting to make temporary repairs of blown water seals and of leaks in the ceramic pipes that remove the chlorine from the cells at very low pressure. The exposure of the men results from their unwillingness to use the personal respiratory protective equipment provided.

Interviews with six of the eight process operators revealed that four had experienced some adverse effects from the heat, including substantial weight loss, decreased energy, marked persistent fatigue, and episodes of feeling faint, dizzy, and nauseated, the last occurring while on the job. Some of the employees did not take the salt tablets provided because "they don't like stomach burning." Instead, they rely on heavy salting of food at home.

The cell room operators are given only the usual preplacement physical examination, and no special selection is made of employees for this work on the basis of fitness for work at high temperature. Periodic physical examinations are not given.

It was recommended to the plant management that the cell room temperature be reduced by insulating the cells, provided that a practical means of doing so is developed; that the cell room employees be given closer medical supervision; that the employees be urged to use the respiratory protective equipment; that salt be provided at the plant through regular tablet dispensers or other means; and that employees be urged to take the salt during the warmer season of the year.

The plant is now experimenting with an insulating material on some of the cells. Any successful developments in this direction will constitute the most significant change to take place, though some tangible results can be measured already.

Employees in Plastic Plant Wear Gloves, Use Creams to Prevent Dermatitis

AN INDIANA plant was engaged in making large plastic bags, used to cover industrial machines and aircraft engines during shipment to protect them from moisture. The plastic used was essentially a stabilized rubber hydrochloride with an organic antioxidant to prevent disintegration by light and air during transit. The organic antioxidant used had the trade name R. M. F.

After 3 weeks of processing this material, most of the women workers developed a contact dermatitis on the exposed portions of the body. In addition to the dermatitis, swelling of soft tissue was common, so much so that often the eyes were swollen shut.

To determine the cause of this dermatitis, it was necessary to patch test all the workers exposed to the plastic without the antioxidant, to the oxidant alone, and to the finished plastic containing the antioxidant. This procedure revealed that only the antioxidant produced positive patch tests. Epidemiologically, other factors were ruled out.

This formed the basis of the conclusion that the dermatitis was due to the antioxidant. Other Indiana plants using the same named plastic were not experiencing any difficulty. It developed that only the plastic used for engine covers contained this antioxidant.

To control the dermatitis, it was recommended that all workers wear protective clothing, including washable leather gloves, and use protective creams on the face, and that all supersensitive individuals be transferred if the above procedures failed. Most cases cleared up within 3 weeks, and only a few workers had to be transferred.

Federal, State, and Local Industrial Hygiene Agencies

This list of Federal, State, and local Industrial Hygiene agencies is published here for the benefit of readers who may wish to request information or services from their own units.

FEDERAL

WASHINGTON 25, D. C.—Dr. Seward E. Miller, Chief, Division of Occupational Health, U. S. Public Health Service, FSA.

CINCINNATI 2, OHIO—Dr. L. J. Cralley, Chief, Division of Occupational Health Field Headquarters, U. S. Public Health Service.

SALT LAKE CITY, UTAH—Mr. Henry N. Doyle, Chief, Occupational Health Field Station, U. S. Public Health Service.

STATE AND LOCAL

ALABAMA—Mr. H. E. Seifert, Director, Division of Industrial Hygiene, Alabama Department of Public Health, Birmingham.

ARIZONA—Mr. G. W. Marx, Director, Bureau of Sanitation, Arizona Department of Health, Phoenix.

ARKANSAS—Mr. L. E. Renes, Director, Division of Industrial Hygiene, Arkansas State Board of Health, Little Rock.

CALIFORNIA—Dr. H. K. Abrams, Chief, Bureau of Adult Health, California Department of Public Health, Berkeley 2.

California—Dr. Harold Price, Acting Director, Division of Industrial Health, Los Angeles City Department of Health, Los Angeles 13.

California—Dr. Melvin R. Plancey, Director, Division of Industrial Hygiene, Los Angeles County Health Department, Los Angeles 12.

California—Mr. Sidney F. Dommes, Jr., Oakland City Department of Health, City Hall, Oakland 12.

COLORADO—Mr. P. W. Jacoe, Director, Division of Industrial Hygiene, Colorado Board of Health, Denver 2.

CONNECTICUT—Dr. Howard Johnston, Director, Bureau of Industrial Hygiene, Connecticut Department of Health, Hartford 1.

DISTRICT OF COLUMBIA—Dr. Fred H. Goldman, Bureau of Public Health Engineering, District of Columbia Health Department, Washington 1.

FLORIDA—Dr. J. M. McDonald, Director, Industrial Hygiene Division, Florida State Board of Health, Jacksonville.

GEORGIA—Dr. L. M. Petrie, Director, Division of Industrial Hygiene, Georgia Department of Public Health, Atlanta 3.

IDAHO—Mr. H. C. Clare, Director of Public Health Engineering, Idaho Department of Public Health, Boise.

ILLINOIS—Mr. Arvid Tienson, Chief, Supervising Engineering Factory Inspection Division, Illinois Department of Labor, Chicago 1.

INDIANA—Dr. L. W. Spolyar, Director, Division of Industrial Hygiene, Indiana State Board of Health, Indianapolis 7.

IOWA—Mr. C. L. Campbell, Chief, Industrial Hygiene Section, Iowa Department of Health, Des Moines 19.

KANSAS—Mr. James F. Aiken, Jr., Acting Chief, Industrial Hygiene Section, Kansas State Board of Health, Lawrence.

KENTUCKY—Mr. W. W. Stalker, Director, Division of Industrial Health, Kentucky Department of Health, Louisville 2.

LOUISIANA—Mr. W. H. Reinhart, Chief, Industrial Hygiene Section, Louisiana Department of Health, New Orleans 7.

MAINE—Mr. R. H. Mansur, Chemist, Industrial Hygiene Section, State Department of Health and Welfare, Augusta.

MARYLAND—Dr. W. F. Reindollar, Chief, Division of Industrial Health and Air Pollution, Maryland Department of Health, Baltimore 18.

Maryland—Mr. Charles E. Couchman, Director, Bureau of Industrial Hygiene, Baltimore City Health Department, Baltimore 2.

MASSACHUSETTS—Director, Division of Occupational Hygiene, Massachusetts Department of Labor and Industries, Boston 10.

MICHIGAN—Mr. John C. Soet, Acting Director, Division of Industrial Health, Michigan Department of Health, Lansing 4.

Michigan—Dr. W. G. Fredrick, Director, Bureau of Industrial Hygiene, Detroit Department of Health, Detroit 2.

MINNESOTA—Dr. W. E. Park, Director, Division of Industrial Health, Minnesota Department of Health, Minneapolis 14.

MISSISSIPPI—Dr. J. W. Dugger, Director, Division of Industrial Hygiene, Mississippi Board of Health, Jackson 113.

MISSOURI—Mr. L. F. Garber, Chief, Bureau of Industrial Hygiene, Division of Health of Missouri, Jefferson City.

MISSOURI—Mr. John Magill, Director, Industrial Hygiene Service, Kansas City Health Department, Kansas City 6.

Missouri—Dr. B. W. Lewis, Acting Chief, Industrial Hygiene Section, St. Louis Health Division, St. Louis 3.

Missouri—Mr. R. W. Lamberton, Director, St. Louis County Health Department, 651 South Brentwood Boulevard, Clayton 5.

MONTANA—Mr. L. S. Champa, Chemist, Division of Industrial Hygiene, Montana Board of Health, Helena.

NEBRASKA—Director, Industrial Hygiene Division, Nebraska Department of Health, Lincoln 9.

NEW HAMPSHIRE—Dr. F. J. Vintinner, Director, Bureau of Occupational Health, New Hampshire Department of Health, Concord.

NEW JERSEY—Dr. M. A. Sena, Chief, Bureau of Adult and Industrial Health, New Jersey Department of Health, Trenton 7.

NEW MEXICO—Mr. Carl Jensen, Supervisor of Industrial Hygiene, New Mexico Department of Public Health, Santa Fe.

NEW YORK—Dr. Leonard Greenburg, Director, Division of Industrial Hygiene and Safety Standards, New York State Department of Labor, New York 13.

NORTH CAROLINA—Dr. O. J. Swisher, Jr., Director, Division of Industrial Hygiene, North Carolina Board of Health, Raleigh.

NORTH DAKOTA—Mr. J. H. Svore, Chief Sanitary Engineer, Environmental Sanitation Service, State Department of Health, Bismarck.

OHIO—Dr. T. F. Mancuso, Chief, Industrial Hygiene Division, Ohio Department of Health, Columbus 15.

Ohio—Mr. H. G. Dyktor, Commissioner, Division of Air Pollution Control, Cleveland Department of Public Health and Welfare, Cleveland 14.

OKLAHOMA—Mr. W. C. Galegar, Assistant Engineer, Industrial Hygiene Division, Oklahoma State Department

of Health, Oklahoma City 5.

OREGON—Dr. R. R. Sullivan, Director, Industrial Hygiene Section, Oregon Board of Health, Portland 5.

PENNSYLVANIA—Dr. Joseph Shilen, Director, Bureau of Industrial Hygiene, Pennsylvania Department of Health, Harrisburg.

Pennsylvania—Mr. Lee Schreibeis, Industrial Hygiene Engineer, Industrial Hygiene Division, Pittsburgh Department of Public Health, Pittsburgh.

RHODE ISLAND—Dr. J. P. Deery, Medical Director, Division of Industrial Hygiene, Rhode Island Department of Health, Providence 3.

TENNESSEE—Director, Industrial Hygiene Service, Tennessee Department of Public Health, Nashville 4.

TEXAS—Mr. M. C. Wukasch, Engineer, Industrial Hygiene Section, Texas State Department of Health, Austin 2.

UTAH—Mr. Pope A. Lawrence, Director, Division of Occupational Health, Utah Department of Health, Salt Lake City 1.

VERMONT—Mr. H. B. Ashe, Director, Industrial Hygiene Division, Vermont Department of Public Health, Barre.

VIRGINIA—Director, Bureau of Industrial Hygiene, Virginia State Department of Health, Richmond 19.

WASHINGTON—Dr. J. L. Jones, Head, Division of Preventive Medical Service, Washington Department of Health, Seattle 4.

WEST VIRGINIA—Mr. P. D. Halley, Associate Director, Bureau of Industrial Hygiene, West Virginia Department of Health, Charleston 5.

WISCONSIN—Mr. W. L. Lea, Director, Industrial Hygiene Division, Wisconsin Board of Health, Madison 2.

Wisconsin—Mr. L. A. Penn, Engineer, Industrial Hygiene Section, City Health Department, Milwaukee 2.

WYOMING—Mr. R. E. Sundin, Engineer-in-charge, Industrial Hygiene Service, Wyoming Department of Public Health, Cheyenne.

HAWAII—Mr. F. A. Schramm, Chief, Bureau of Industrial Hygiene, Department of Health, Honolulu.

PUERTO RICO—Mr. Juan Alberto Gonzalez, Chief, Industrial Hygiene Section, Puerto Rico Department of Health, Santurce.

Limestone Plants Rain Dust on Wisconsin Community

TWO LIMESTONE plants, responsible for a veritable rain of dust in a Wisconsin community, are the cause of a two-horned dilemma in the area. A school principal, within a stone's throw of one plant, feels that dusty desks and rooms are jeopardizing the children's education. The plant managers say, "Why should we spend thousands of dollars to stop the dust when it isn't considered directly hazardous to health?"

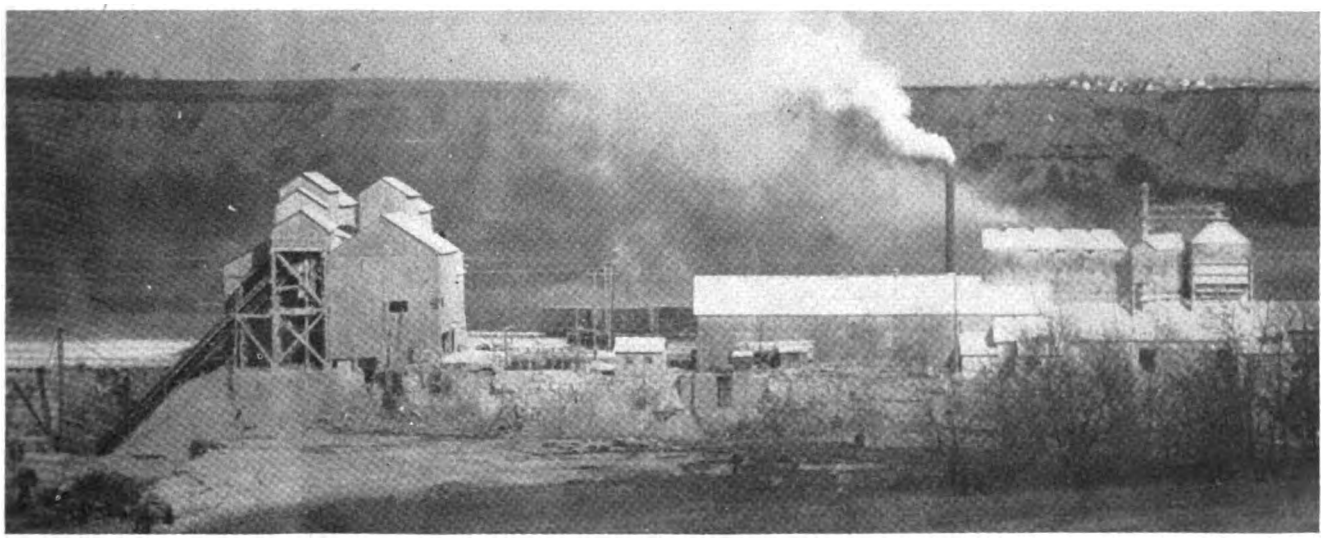
Dust escapes into the atmosphere mainly from the drying kiln stacks and the screening rooms. Air samples taken in one screening room averaged 3,000 million particles per cubic foot of air. This dust-laden air escapes through the open windows.

A dustfall study, involving 12 sampling locations in a half-mile radius of the plants, produced startling results. For a 3-month period from April to July, the average dustfall was 158 tons per square mile per month. The collected dust averaged approximately 60 percent calcium and magnesium carbonate. One sampling location collected the equivalent of 710 tons per square mile per month over a period of 16 days. Its average for the 3-month period was 403 tons per square mile per month.

This would mean a daily half-thimble full of fine powdery dust on a standard office desk, coating the desk and everything on it, day after day. Repetition of this annoyance combined with the current opinion that the limestone dust, if not a health hazard, is at least a nuisance of the first order has caused a general irritation among the residents affected.

Spurred on by the community attitude, one plant has installed a wet-type collector at the discharge end of the rotary kiln. Last year, 800 tons of dust were effectively collected. This plant plans, as its next corrective measure, the installation of local exhaust ventilation in its screening room.

The other plant is contemplating the installation of a collector, having been urged, on one hand, by the persons interested in improving the dust conditions inside the plant and, on the other, by those concerned with controlling the outdoor pollution.



A Wisconsin Limestone Plant

Insurance Company Requests Help in Checking Pilots' Exposure to Parathion

A CASUALTY insurance company's request for help in checking the exposure of a group of pilots engaged in spraying parathion on tobacco fields in West Florida resulted in a study by the Industrial Hygiene Division of the State Board of Health.

The tobacco was being grown under a light framework covered with a loosely woven cotton fabric. To assure adequate penetration of the parathion aerosol through the cloth, the pilots had to fly their planes within a distance of five feet above the "shade" structure. Flying within such close limits demands that nothing interfere with a pilot's vision, depth perception, or balance.

A survey of the spraying operation disclosed the following facts: In advance of actual spraying, an employee called the *mixer* measured out the quantities of a 25 percent solution of technical parathion in xylene required for the formula of each particular spray job, adding DDT where called for. This operation was carried out in the open air. He then delivered the measured ingredients to the individual flying fields. The mixer carefully protected himself with heavy rubber gloves and by frequent bathing and changing to clean clothing.

The pilot emptied the ingredients into an open tank and added the proper amount of water to form an emulsion. The emulsion was then transferred by hand pump through a rubber hose to the tank of the airplane. The tank, suspended below the fuselage and equipped with wind-driven agitator and pump, was connected to metal pipes under and parallel to the lower wings. The spray was emitted from small orifices in the spray booms. The pilot was provided with remote control of the flow of emulsion to the distribution system.

Arrangements were made with the Gadsden County Health Department to draw samples of blood from the pilots at convenient intervals. The red cell cholinesterase level was determined on each sample of blood. Results are shown in the accompanying table.

Prior to this study, a group of healthy unexposed persons had been examined in order to obtain an average normal value of red cell cholinesterase activity. Conforming with established practice, all individual results have been expressed in terms of percent of this average normal value.

To determine the individual normal values, the pilots were examined four different times before heavy spraying started about May 3. After this date, exposure was greatly increased. Each pilot worked for 4 to 5 hours in the early morning and again in the evening for 7 days a week.

The effects of the stepped-up exposures are clearly evident in the lowered cholinesterase values after May 2 to the end of the study. Following the May 18 determinations, management was advised of the marked reduction in cholinesterase levels in pilots No. 4 and No. 6. Pilot No. 5 left for a similar job in another State and was furnished with a record of his red cell cholinesterase levels. Pilot No. 6, the mechanic, the mixer, and the manager withdrew from further participation in the program.

Warnings against continued exposure were repeated since each test showed progressive depletion of the cholinesterase. Finally, on June 29, it was recommended that pilot No. 1 be removed from exposure for 4 weeks or until his cholinesterase level returned to normal. At the same time, pilot No. 4 was taken off flying and at least 2 months' absence from that work was recommended. One week later, his level had risen from 30 to 38 percent.

The only medical complaint came from pilot No. 4 on June 14, 1951. He stated that for the 3 days previous to this date he had had some diarrhea. However, he also stated that he had had several bouts of diarrhea in the 4 months just before he was exposed to parathion. Clinical findings do not provide a satisfactory indication of the injury caused by parathion absorption. It is evident, therefore, that men exposed to parathion should have frequent determinations of cholinesterase levels to keep them from reaching a stage where further exposures might give rise to severe or fatal reactions.

About June 30, this group of fliers left Florida to spray tobacco in Connecticut. As previously arranged, our findings were transmitted to the Bureau of Industrial Hygiene, Connecticut State Department of Health.

Grateful acknowledgment is made of the services rendered by the Gadsden County Health Department under the direction of Dr. E. C. Love, Jr.

Reference

(*1*) MacDonald, W. E., Jr.: *A Rapid Micromethod for the Determination of Red Cell Cholinesterase Activity in Whole Blood.* A thesis presented to the Graduate Council of the University of Florida in partial fulfillment of requirements for the degree of master of science, June 1951.

Cholinesterase Activity Changes Incident to Parathion Exposure

[Values expressed as percent of average normal value]

Occupation	Apr. 11	Apr. 16	Apr. 18	May 2	May 18	June 14	June 22	June 29
Pilot No. 1	110	106	110	114	95	79	59	52
Pilot No. 2	.....	94	102	112	96	86	86	80
Pilot No. 3	103	106	.....	105	95	89	.....	82
Pilot No. 4	90	92	94	96	70	45	34	30
Pilot No. 5	101	103	.....	105	96	.....	.....	.....
Pilot No. 6	95	96	97	96	77	.....	.....	.....
Mechanic	98	99	98	95	.....	.....	.....	.....
Mixer	101	101	.....	102	103	.....	.....	.....
Manager	98	101	.....	98	.....	.....	.....	.....
President	.....	.....	.....	.....	115	.....	109	.....

Radioactive Watch Dial Painting Requires Routine Check of Workers

THE INDUSTRIAL Hygiene Section of the St. Louis, Mo., Health Division initiated studies at a plant which was doing radioactive watch dial painting. The studies included radon samples of the employees' breath, radon samples of the workroom atmosphere, determinations of the general radiation level at various places in the workroom, and determinations of the actual radiation received by the individual employees. In addition, the exhaust ventilation system was checked for efficiency, and the working surfaces were examined for contamination with radioactive paint in the darkened room using an ultraviolet lamp.

The initial radon samples collected of employees' breath indicated that two employees had accumulated within their bodies an amount of radioactive material in excess of the tolerance dosage (0.1 microgram of radium). This was indicated by breath radon contents exceeding 100 percent of tolerance.

The radon samples of the workroom atmosphere also exceeded tolerance. This was indicative of contamination of the workroom surfaces by deposits of radioactive material very probably in the vicinity of the painting operation. The suspected contamination was then confirmed by means of an ultraviolet examination of the darkened room.

Determinations of the workroom radiation level indicated that this was satisfactory. In addition, the actual external radiation received by the employees was well below tolerance.

As a result of these studies, numerous recommendations were made to help safeguard the health of the employees. These included:

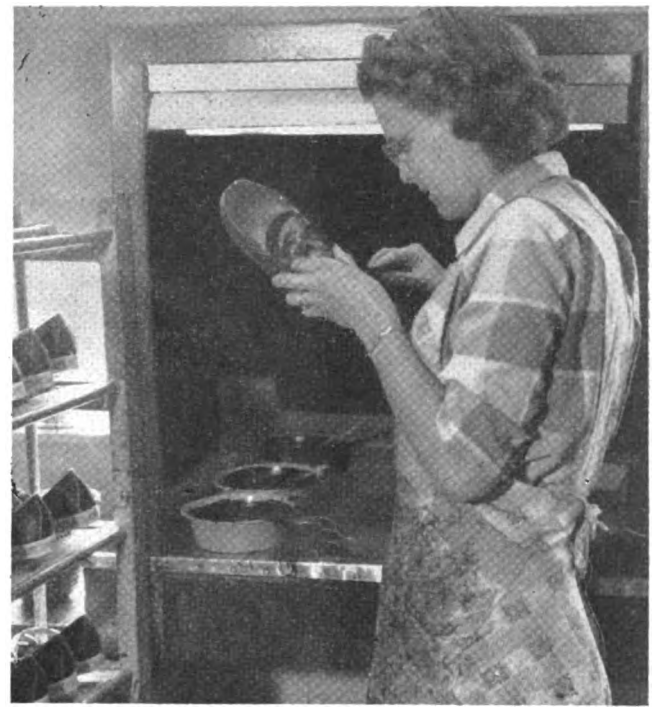
(1) Provision of adequate facilities for routine inspection of employees to indicate possible personal contamination with radioactive material, (2) installation of hand-washing facilities to be used in conjunction with personal inspection procedures, (3) use of paper bags for disposal of residues from the painting operation, and safe disposal of the bag and contents at the close of each work day, (4) use of wet-mopping procedures, rather than dry methods, for cleaning the workroom, (5) storage of reserve stocks of vials of luminous paint in a drawer or on a shelf several feet from the workers.

These and other recommendations were carried out diligently by management, and later a follow-up study was made. The comparative results were most gratifying. The follow-up study indicated that all of the plant employees had breath radon contents of less than tolerance. In this study the workroom atmospheric samples, too, were well below tolerance.

Despite the encouraging improvement shown, the company was urged to have similar studies conducted routinely because of the highly toxic nature of the material handled.

MAINE SHOE FACTORIES SUBSTITUTE TOLUOL FOR BENZOL TO PROTECT WORKERS

IN THE course of routine inspections throughout Maine industries, the industrial hygiene engineer discovered that benzol was in general use in the moccasin-type shoe factories.



The job in which benzol was used is known as "edge staining," and consists of applying a liquid stain to the shoe sole edges by means of a small hand brush. Several samples of the stains used were analyzed in the laboratory, and the engineer's suspicions that the material contained benzol were confirmed.

To determine whether or not the workers were dangerously exposed to this poisonous chemical, samples of the air in the breathing zone of the workers were taken and field determinations made, using a Davis M6 Vapotester. The results ranged from 200 parts per million to 500 parts per million. The maximum allowable concentration adopted by the American Conference of Governmental Industrial Hygienists is 35 parts per million.

To correct this situation, it was recommended that a less toxic solvent be used in the stain, and that adequate local exhaust ventilation be installed.

All but four of the factories involved substituted toluol, which is less toxic, for the dangerous benzol. The others, however, sought assistance in designing a suitable ventilating system. One of the four immediately executed the suggested design and, when it was proved by tests to have reduced the exposure to a safe level, the other factories installed similar systems. The photograph illustrates the corrected operation.

The minimum velocity found at the face of one of these booths was 110 feet per minute, and the maximum was in excess of 150 feet per minute. The latter figure was the rate recommended by the engineer who made the study. The adequacy of these protective measures is periodically checked by means of field instrument tests.

Storage Battery Plant Uses Periodic Check on Operations and Personnel to Guard Against Lead Poisoning

A NEW STORAGE battery plant in a Virginia town began operation in July 1949, employing approximately 60 persons. A few months later, and once a year thereafter, the Bureau of Industrial Hygiene of the Virginia State Department of Health has been called in to determine whether any hazards exist.

The medical program and plant control measures in effect are similar to those in other plants owned by this company. A physician is employed on a part-time basis, and the nurse is a full-time employee. Regular preplacement examinations for lead workers are given all new employees.

Periodic physical examinations as well as red, white, and stipple cell counts on blood are made on all employees, the interval of time lapse depending on the hazard involved. (Editor's note: High lead findings in urine and feces are also considered excellent diagnostic criteria in the presence of lead exposure, blood changes, and related symptoms.)

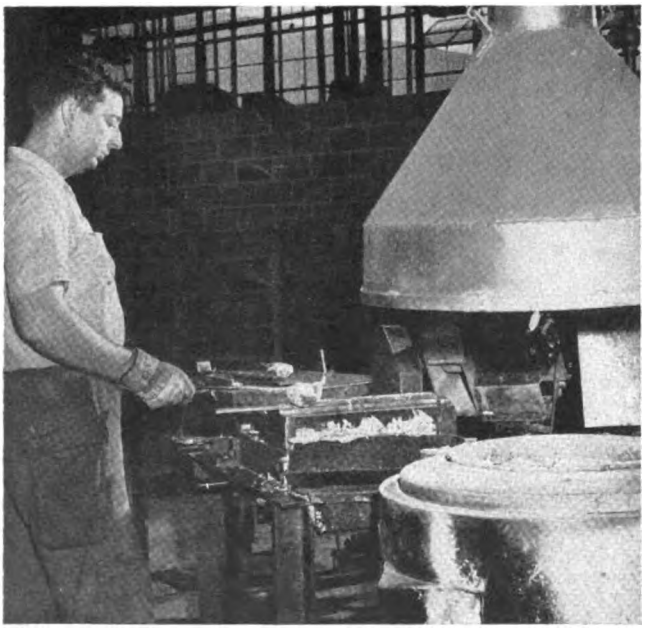
Adequate wash basins, showers, toilets, and lockers are furnished also to insure opportunity for regular personal cleanliness, which is especially important for workers exposed to lead.

On the first plant study, using an MSA electrostatic precipitator, the engineers took atmospheric samples for lead dust and fumes at the following operations: Terminal and strap molding; automatic grid molding; grid filling with lead oxide paste, plate breaking and buffing; plate cooling; group assembly; group terminal burning; group stuffing with plate dividers; case filling; strap burning; terminal building; terminal buffing; and other operations in the general plant areas.

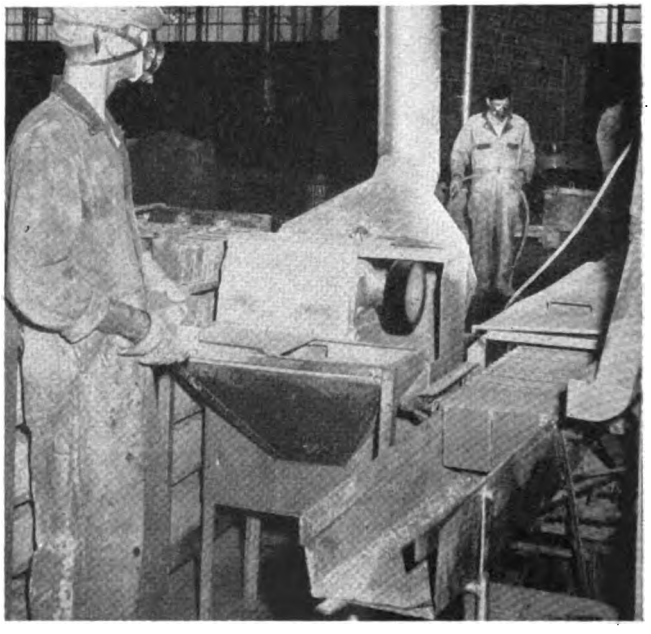
Atmospheric samples for sulfuric acid mists in the battery charging section were taken, using sintered bubblers. These samples were taken back to the laboratory for quantitative analysis. Air flows at the paint and lacquer spray booths were also checked. Air velocities at the spray booth face appeared adequate, ranging from 175 to 225 linear feet per minute. Sulfuric acid mist was found to be approximately half the MAC. Atmospheric concentrations of lead varied at the different operations from 0.050 to 1.340 mg. lead per cubic meter.

Considerable variation was noted where several samples were taken at the same operation. For instance, four samples taken at one operation varied from 0.054 to 0.524 mg. lead per cubic meter. This was attributed to variation in the operators' work habits and poor housekeeping. In general, the highest lead concentrations, and most of those which were above the MAC of 0.150 mg. lead per cubic meter, were encountered at the grid pasting, grid breaking and buffing operations, and along the assembly line where oxide filled plates were handled. Some of the oxide dust was stirred up by sweeping.

Specific recommendations were made concerning better housekeeping, more careful handling of scrap, shielding and hooding of melting pots, wearing freshly laundered coveralls daily, installing



1. The operation of terminal and strap molding in the photograph is well-ventilated. Note the section in the duct which the worker can lower about 15 inches when necessary. The shield at the back serves to decrease cross drafts.



2. This operation in batterymaking is known as plate drying and buffing. The operators are doubly protected by respirators and enclosed, ventilated buffing wheels. Note the operator in the rear hosing the floor in the grid pasting area.

better exhaust ventilation at points, insisting upon continued use of respirators for toxic dusts on some operations and personal hygiene; and careful observation by the doctor and nurse for symptoms of chronic lead intoxication by physical examinations and stipple cell counts.

In June 1950, another survey was made. At that time two shifts were operating on which approximately 85 persons were employed. Some improvements had been made; in general, housekeeping seemed to be better. Yet atmospheric lead concentrations all along the line from grid molding through case filling were above the recommended MAC, varying from 0.180 to 0.450 mg. lead per cubic meter. Further recommendations were made.

In August 1951, still another survey was made. At that time only one shift—about 60 persons—was in operation. The following improvements in operations and practices were noted: (1) Melting pots for terminal molding had been partially shielded, and the entire hood had been lowered approximately 15 inches. (See photograph No. 1.) (2) Melting pots for automatic grid molding had been enclosed except for a small opening for scrap return. (3) Floors in the grid-pasting and plate-buffing areas were being hosed down three times per shift. (See photograph No. 2.) (4) The unused front area of the plate-buffing wheel had been closed off to give greater capture velocity. (5) Operators in pasting and buffing were being changed every 2 weeks, giving 2 weeks on duty in these positions and 2 weeks of work completely removed from the area. (6) Three changes of coveralls each week were furnished employees on pasting and assembly line. (7) Stipple cell counts were made on all employees at frequent intervals, some as often as every 2 weeks. (8) A plant cafeteria had been established.

Atmospheric samples at this time showed antimony to be less than 0.01 mg. per cubic meter and sulfuric acid mist to be 0.35 mg. per cubic meter. Air velocities at duct openings and at capture points were checked, and in general were satisfactory or not far below acceptable velocities. In spite of the apparently improved conditions, atmospheric lead concentrations from grid-pasting through case filling varied from 0.16 to 0.58 mg. lead per cubic meter, the average being 0.26 mg. lead per cubic meter. The highest concentrations were found at grid pasting and plate buffing operations.

From the above, it will be noted that the lead hazard has not been completely controlled even yet. It is believed that better housekeeping, less dusty methods of handling scrap, trained operators who will produce less dust, and an expanded ventilation system to include portions of the assembly line which are not ventilated at present will control the lead hazard.

No lost-time cases of lead intoxication have been reported from this plant in 2 years of operation. The probable reasons for this are: Careful observations for symptoms and stipple cells by both the doctor and nurse; shifting of operators if stipple cells appear; and the wearing of respirators at certain operations.

Small Pottery Plant Rebuilds to Eliminate Lead Hazard to Workers

AN OCCUPATIONAL disease report prompted Los Angeles City's Division of Industrial Health to make a study in a small pottery plant. Each operation, from the handling of raw material to firing the figurines, was studied for potential hazards to the 26 workers employed at the plant.

Slip making.—Various clays were mixed with water and agitated in four large wooden barrels, called blungers. Dust counts taken at the time of charging exceeded the 4 million particles per cubic foot maximum, which has been proposed by the United States Potters' Association. The lack of exhaust ventilation, open mixing, and poor handling of dry materials were largely responsible for the high dust counts.

Casting.—Liquid slip from blungers was poured by hand into plaster of paris molds. Although dust counts in this area were well on the safe side, dried drippings of clay from the molds had accumulated on the floor and created a housekeeping problem.

Glaze laboratory.—Glaze components were weighed and loaded into small ball mills without local exhaust. During each operation, which was intermittent, the workers were exposed to white lead and leaded frits. In the adjacent room, where leaded materials were stored, the sampling revealed that the lead content of the air was nearly six times the maximum allowable concentration.

Spray staining.—Prior to glazing, the dried-clay figurines were sprayed with a color stain. The air velocity readings taken at the face of each of the four booths were as low as 50 linear feet per minute. An air sample taken in the workers' breathing zone showed 0.12 mg. of lead per cubic meter, approaching the maximum allowable amount.

Glaze dipping.—Stained figurines were dipped by hand into a barrel containing glaze solution. No personal protective measures were used. Glaze spillage on the floor dried into a fine dust and created a lead hazard. Air sampling showed 0.16 mg. of lead per cubic meter of air, which was above the maximum allowable concentration.

Figurine firing (kiln).—Readings for carbon monoxide taken at the gas-fired kiln showed no appreciable amounts of this dangerous gas.

Recommendations.—The plant owner, convinced that his employees were endangering their health in the old and poorly designed building, erected a new structure to house the hazardous operations.

The four small blungers were replaced by one large blunger, set in below floor level to make loading easy. It was equipped with a local exhaust system and kept covered during the mixing operation.

Wet methods were instituted in the casting area and throughout the entire plant. Metal table tops and metal transporting carts were installed to facilitate easy cleaning and maintenance.

Open gas flames for heating have been discontinued and replaced by warm air circulated underneath the tables.

The glaze laboratory was isolated from other operations, and all frits and other leaded compounds are now kept in covered metal containers and stored in the glaze laboratory. An approved toxic dust respirator is worn during compounding.

Twelve new spray booths have replaced the four stain booths previously used. A new exhaust system equipped with a water scrubber in the stack was installed. Velocity at the face of the

booths ranges from 175 to 250 linear feet per minute, which is more than adequate.

Neoprene gloves are now supplied for glaze dipping, and a long ladle is used for stirring the glaze.

An educational program is being carried out to instruct the workers on the harmful effects of lead and the necessity for personal cleanliness. Regulations have been established and enforced to prevent eating and smoking where lead materials are handled.

Better lighting, improved housekeeping, up-to-date locker facilities, and other improvements have brought about not only a healthy working environment but also increased production, better industrial relations, and a feeling of deep satisfaction on the part of management.

Massachusetts Team Investigates Mercury Exposures in Laboratory

THE ESCAPE of mercury vapor and the spillage of mercury were causing trouble for an electronics research and manufacturing concern in Massachusetts. The Division of Occupational Hygiene of the Department of Labor and Industries was called upon to help solve this problem.

The personnel administrator of the firm reported to the Division that mercury vapor was being evolved in the mercury delay line room at the plant. Sometime before that he indicated, mercury spillage had occurred in one of the ovens, and it was believed that some of the vapor was given off every time the oven was heated, thereby exposing the one woman and four men who worked in that room.

Numerous air tests were performed with the G. E. mercury vapor detector and by the Barnes chemical method at the production plant and also at the plant laboratory. Urinalyses on each potentially exposed worker were also made.

Atmospheric concentrations of mercury at the plant averaged 0.39 mg. per cubic meter of air by the chemical method and 0.18 with the detector, while at the laboratory the averages were 0.11 and 0.05, respectively. The Massachusetts maximum allowable concentration is 0.10 mg. per cubic meter of air.

The urinalyses gave results averaging 0.58 mg. per liter at the plant and 0.05 for the workers at the laboratory. The Massachusetts harmful exposure value is above 0.25 mg. per liter. These tests showed concentrations averaging slightly in excess of the hazardous level at the laboratory, although at the plant the values were far in excess in every test.

In the meantime, the Division's consultant physician examined the workers involved, but found no evidence of mercury poisoning. The physician allayed the fear of the workers about the high urinary values and promised to return in a month to check again.

The chemists recommended improved housekeeping practices, treatment of the floor and other surfaces to prevent volatilization, and additional ventilation. They also suggested that the workers wear impervious gloves when handling mercury to prevent absorption through the skin.

For treatment of the floor, the chemists advised the application of a calcium polysulfide and a ferric chloride solution. These were first tried out on a small scale, since the former gives off some hydrogen sulfide, while the latter is somewhat corrosive. They also suggested the use of a suitable sequestering agent of ethylene diamine tetraacetic salts.

The engineers recommended the installation of two propeller-type fans in the windows, and also an increase in the number of openings for make-up air in the wall opposite these windows.

A follow-up check on the effectiveness of the improvements was made some time later. Atmospheric tests showed an average of about one-tenth the concentrations found at the beginning.

However, the urinalyses did not show the marked decrease that might be expected, to correlate with the air tests. With one exception, they were at or above the hazardous exposure level. This may be due in part to direct absorption of mercury through the skin. It is also possible that the mercury may be a carry-over from the heavy exposures prevailing before any improvements were effected. Further urinalyses will be made.

Union Enforces Use of Exhaust Equipment in New Hampshire Granite Plant

WORKERS in a New Hampshire granite plant who fail to make proper use of the exhaust equipment are fined $5 by, and payable to, the Union. This cooperation on the part of the employees has made it possible for the company to carry out a very successful industrial health program. Beginning in 1926 with a survey by United States Public Health Service personnel, the plant's program has developed gradually.

Upon recommendation of the United States Public Health Service, the granite company installed what was then considered good ventilation for dust control. No further industrial hygiene activities were carried on at this plant until 1937, when the Division of Industrial Hygiene was established in the New Hampshire State Health Department.

At that time, as the result of further dust studies, the ventilating systems for dust control were revamped. Since the Union would not permit chest X-rays, meetings were held with Union officials and many of the wrong impressions concerning the cause of silicosis were corrected. Many believed that silicosis was caused by steel particles from the tools, because the United States Public Health Service engineers had suspended magnets in the plant during the early study and the magnets were seen coated with steel particles.

Today, the most modern exhaust ventilation equipment is in use at this plant, now employing about 80 persons. Dust concentrations are measured twice a year, once during the summer and once during the winter; and the ventilating system is checked for efficiency four times a year. Every banker, surfacer, polisher, and dust-creating operation has been numbered, so that the results of dust counts and ventilating studies at each unit are easily available to the workers.

A medical program has been established which includes chest X-rays and periodic health examinations. Aluminum therapy has been made available. In the past 5 years of chest X-rays there have been no new cases of silicosis, or any recognizable increase in the degree of silicosis among the older workers.

Engineers Seeking Cause of Strange Odor in Grocery, Uncover Fire Hazard

A TELEPHONE call was received by the New York Division of Industrial Hygiene and Safety Standards from a local health department in up-State New York, requesting that an investigation and air tests be made for the purpose of determining and evaluating exposures to vapors or gases alleged to be released in irritating concentrations from unknown sources.

The firm under suspicion occupied the south end store and basement of a three-story apartment building which contained a total of three stores. The proprietor and several grocery-store clerks informed the investigators that in the last few months they had been subjected to atmospheric contaminants for periods varying in length from 1 to 4 hours, occurring at irregular intervals ranging from about 1 to 15 days.

According to the workers, the odor varied in intensity and was strongly characteristic of gasoline vapors. Occasionally, when the odor was exceptionally heavy, one or two of the workers had headaches which they attributed to these odors. Relatively higher concentrations of the contaminant, on the basis of odor intensity, were usually encountered in the basement, which was used for the storage of groceries. The basement also housed a coal-fired furnace and two compressors for freon cooling systems used in meat refrigerators which were located on the first floor at the west end of the store.

Several visits to the store had been made in recent weeks by representatives of the fire and health departments; air tests also had been made by an engineer from a company operating a nearby gasoline filling station, but apparently to no avail.

Three pivot windows, each about 30 by 36 inches, were located in the upper half of the south wall. This wall adjoined an open parking lot where three gasoline storage tanks, each of 3,000-gallon capacity, were set horizontally in the ground with the nearest tank located approximately 40 feet south of the wall. Each of the tanks measured 5 feet 2 inches in diameter by 18 feet in length and rested on supports fixed 8 feet below ground level.

Use of the tanks and connecting lines had been approved by the fire marshal after pressure tests had been made as required by the city's ordinance. The Division engineers observed that the initial complaints by workers of headaches and disagreeable odors began about 3 months after these installations had been made.

At the time of the visit, no perceptible foreign odor was to be found in any part of the store. However, there was a faint gasoline-like odor on the southeast section of the basement. Tests for carbon monoxide made in the basement near the furnace, and elsewhere were negative. But the combustible gas indicator disclosed that maximum concentrations of combustible vapors were present at the base of the south wall about 15 feet from the west wall.

At this location, the concentrations were in the explosive range. This point of maximum concentration was approximately 40 feet directly north of the gasoline storage tanks which were supported at a level about two feet higher than the basement floor. The concentration of combustible atmospheric contaminants diminished rapidly several feet away from this section of the south wall.

Apparently, combustible vapors of gasoline were entering the cellar of the store near the base of the south wall which adjoins the yard of a gasoline filling station. The matter of control in this instance was left with the fire marshal, who had legal jurisdiction and who was glad to assume responsibility for correction of the situation.

Oregon Legislature Provides for Air Pollution Authority

At the last session of the Oregon Legislature, an Air Pollution Authority was created as a division of the State Board of Health. It was provided that the State health officer should be a member and that the State sanitary engineer should serve as secretary.

The program of the Authority will be carried out by the State Board of Health's Division of Sanitation and Engineering with laboratory services from the Industrial Hygiene Section.

Division Physicians and Dentist Now Located in Cincinnati Headquarters

THE CLINICAL Investigations Branch of the Division of Occupational Health, PHS, is now located at the Field Headquarters in Cincinnati, Ohio. Primarily concerned with studies relating to the diagnosis and prevention of occupational disease, this branch is currently staffed by three medical officers, a dental officer, and a laboratory technician. Three other physicians regularly on the staff are on temporary leave of absence.

The chief of the branch, Dr. Harry Heimann, is in India on a 6-month assignment with the Department of Labor. He is one of a party of four who were asked to make studies in that country. Dr. A. Link Koven is doing graduate work in industrial ophthalmology at the University of Pennsylvania. Dr. Mitchell Zavon is at Duke University for graduate study in ionizing radiation.

The Acting Chief of the branch is Dr. Donald J. Birmingham, who has been with the Division since 1942 and who recently completed 3 years of training in dermatology at the New York Skin and Cancer Unit of the New York University-Bellevue Medical Center. Dr. Birmingham is carrying on the work established by Dr. Louis Schwartz in the field of occupational dermatology.

It is the responsibility of this branch to perform medical, dermatologic, and dental field studies and to provide consultative services to States and industries. Through evaluation of the results of such services, recommendations can be made of appropriate preventive measures. It is probable that no large scale medical field studies will be undertaken within the next few months. However, requests for dermatologic consultation in the nature of field investigations, surveys of certain industries, and associated dermatologic inquiries will be honored, if feasibly possible, by the dermatologic consultant.

In addition to the above activities, it is contemplated that the branch will engage in clinical research as applied to occupational disease with emphasis upon the following:

(1) Better diagnostic methods adaptable to field studies.

(2) Medical and dermatologic appli-

cation with respect to the toxicologic effects of certain of the newer compounds.

(3) Studies associated with industrial cleaners, creams, and protective-clothing devices.

The transfer of the Clinical Investigations Branch to the Field Headquarters in Cincinnati completes the structure of the Field Headquarters into a center of occupational health where medical, dental, toxicologic, and engineering studies can be performed with a high degree of coordination.

Longshoremen's Union Requests Multiphasic Physical Examinations

LONGSHOREMEN of the San Francisco Bay region turned out in record numbers for a multiphasic screening survey recently. In spite of the fact that the tests were offered on a voluntary basis and employment on the waterfront was at a record peak, two-thirds of the 5,500 members of the International Longshoremen's and Warehousemen's Union who were eligible for the tests took part in the survey.

The study was requested by the Health and Welfare Fund of the Union, which is participated in by union and waterfront employers. It is financed by employer contributions as a result of collective-bargaining negotiations. The examinations were made by the Permanente Hospital on the premises of the union hall. Over a year ago the organization had signed a contract with the Permanente Health Plan for medical care for the members of the union in California and Portland, Oreg. In Seattle, the fund contracted with the Puget Sound Medical Cooperative.

Over a period of 6 weeks, 4,001 individuals were tested, an average of about 130 persons a day. All follow-up of findings in this screening study are being made by the Permanente group except in those instances where an individual may prefer a private physician. The average age of the longshoremen was 47 years.

The examination included the following procedures: A modified Cornell Index self-administered history; height and weight; vision test; audiometer hearing test; blood pressure; electrocardiogram; blood sugar; hemoglobin; serological test for syphilis; urine sugar; and urine albumin.

The testing was planned by a medical committee but was actually carried out by nonmedical personnel. The latter included laboratory technicians and medical students who were employed for the project. A registered nurse was present to handle emergencies but none occurred.

Although the Permanente Health Plan contributed most of the medical services and facilities, a number of other agencies assisted in the planning and actual conduct of the project. For example, the San Francisco Tuberculosis Association furnished the portable X-ray machine and technician. The San Francisco State College provided an audiometer operator.

The San Francisco Heart Association assisted with the electrocardiogram set-up. One of the technical problems which troubled those who planned the study was the feasibility of doing electrocardiograms. However, this was solved so that it was possible to do an EKG every 3 minutes.

Other groups which cooperated included the University of California School of Public Health, the State Vocational Rehabilitation Administration, the State Health Department, the San Francisco Health Department, and the United States Public Health Service.

H. H. Hudson and Roy Schneiter Die Suddenly

THE sudden deaths of Dr. H. H. Hudson of the Tennessee Department of Health on September 8, and Dr. Roy Schneiter of the United States Public Health Service on October 15 were a great shock and sorrow to their fellow workers.

Dr. Hudson had been director of the Tennessee Industrial Hygiene Service for 7 years and was a nationally known leader among industrial physicians in this field. He was only 41 years old.

Dr. Schneiter, as a bacteriologist for the Division of Occupational Health, had built a wide reputation for his work on industrial anthrax. Dr. Schneiter's home was in Cincinnati, Ohio, and Dr. Hudson's in Nashville, Tenn.

Leaders in Occupational Health Accept Positions on PHS Advisory Board

Dr. William P. Yant, director of research and development, Mine Safety Appliances Co., Pittsburgh, Pa., and Dr. William A. Sawyer, medical consultant, Eastman Kodak Co., Rochester, N. Y., have recently accepted appointment to the Advisory Committee to the Public Health Service on Occupational Health. They replaced Mr. Theodore F. Hatch and Mr. Vincent P. Ahearn, who had completed their 2-year appointments.

Other members of the committee are: Mr. Andrew Fletcher, president, Saint Joseph Lead Co., New York 17, N. Y.; Dr. Leo Price, director, Union Health Center, International Ladies Garment Workers' Union, New York 1, N. Y.; Dr. Harold A. Vonachen, medical director, Caterpillar Tractor Co., Peoria 8, Ill.; Dr. R. H. Hutcheson, Commissioner of Public Health, Tennessee Department of Public Health, Nashville, Tenn.; Mr. Boris Shiskin, acting director of social insurance activities, American Federation of Labor, Washington, D. C.; Mr. Harry Read, executive assistant to the secretary-treasurer, Congress of Industrial Organizations, Washington 6, D. C.; Mrs. Margaret Lucal, American Association of Industrial Nurses, Inc., Ohio Rubber Co., Willoughby, Ohio; and Mr. Paul Scharrenberg, director, California Department of Industrial Relations, San Francisco 3, Calif.

Rhode Island Nurses Help Employees by Home Visiting

THE AMOUNT of home visiting done by the industrial nurse is gradually increasing in Rhode Island. Fostered by a sincere interest in the welfare of the employees, this service has been encouraged by a few plants. This increase is attributed to several factors.

The plants providing home visiting nurse service feel that employee-management relationships are enhanced by the nurse's visit to an ill employee. By representing management and offering a vital service to the worker and his

family when he is temporarily disabled, the nurse gives the worker a feeling of "belonging," which is important in building job responsibility.

Knowing the community facilities, the nurse is able to direct the family to sources of help that they might otherwise not know about or be reluctant to make use of. The nurse's understanding of community health problems, which she develops through visiting in the homes, is invaluable in helping to advise the employee or his family.

Visits are usually made to employees disabled by acute conditions, occupational or nonoccupational, as well as to those who are chronically ill. Except in the latter cases, generally one visit is adequate to assist the employee and his family in planning for necessary medical care. This service often enables the employee to return to work earlier than might otherwise be possible.

Kentucky Builds Industrial Health Program Through Service and Publicity

CONVINCED that a State Division of Industrial Health cannot serve its industries to the maximum unless its services are known, the Kentucky staff has taken many steps recently to introduce its services to industrial groups throughout the State.

Last February, industrial physicians, engineers, nurses, plant owners, labor union leaders, public health officials, and others were invited to a conference in Louisville to hear nationally known speakers on pertinent subjects.

The year before, the Division, with the cooperation of county health personnel, made a State-wide survey of industries and their health and medical programs. Direct contact with hundreds of plants was made by county health officers and nurses to get accurate information on questions concerning the health of the workers and to offer the services of the Division.

During the past summer, the Industrial Nursing Consultant mailed a package of informational material to every industrial nurse in Kentucky, and advised her to get acquainted with her local health department and to seek the assistance of the Division of Industrial Health when necessary.

Firm Handling Parathion Reports Favorably on Protective Measures

DESPITE the fact that large tonnages of parathion have been handled during the past 2 years, a Maryland firm reports that it has had no cases of occupational disease attributable to parathion. The following three-phase program is given the credit: (1) Properly designed local exhaust ventilation; (2) proper protective clothing with personal protective equipment; (3) and adequate washroom and locker facilities.

This plant was one of several in Maryland that was surveyed by the Division of Industrial Health and Air Pollution when organic phosphate insecticides were new products. Before the dangers were brought to the attention of the plant, the management had planned to formulate and package substantial tonnages of parathion dusts and wettable powders of various concentrations without the use of additional safeguards. They believed that existing equipment and local ventilation would be adequate for the job.

A study of the exhaust ventilation in use showed that the equipment, which had been designed for control of far less toxic materials than parathion, had air velocities well below those necessary for highly toxic materials.

Following the recommendations of the Division, the plant management installed a satisfactory ventilation system and washroom and change house facilities. Because parathion penetrates the skin and may produce toxic effects in this way as well as by ingestion or inhalation, the following protective clothing was provided: Impervious gloves, aprons and sleeves, as well as respirators and a complete change of clothing, including underwear, head and foot covering, and coveralls.

Each worker was assigned two lockers, one for work clothing and another for street clothing. Complete sets of freshly laundered work clothing were provided at the beginning of each shift, and the men working with parathion were required to take showers after work. The company allotted 15 minutes for this purpose.

The manager of this firm reports that the improvements initially brought about by health considerations have been paid for in part by enabling the company to supply their dealers with a cleaner and more attractive package, and by aiding them in getting more of their product into the bag and less of it on the floor. The firm believes also that the improved working conditions have attracted employees who might otherwise not have worked in the plant.

Engineers Solve Another *Whodunnit* In Textile Plant

THE EFFECT of mass hysteria on the well-being of workers was aptly demonstrated in a recent situation investigated by the Pennsylvania Bureau of Industrial Hygiene.

On a Monday morning a certain textile plant began operations as usual. The product manufactured was men's sport shirts, and all operations were typical of the industry. Shortly after Monday noon, three women fainted while performing their duties in the pressing department. The next morning employees stated that they were again ill and were permitted to go home. When this occurred again on Wednesday morning, the Bureau of Industrial Hygiene was notified and was requested to make an investigation.

Upon arriving at the plant, the industrial hygiene team learned that the illness was confined to the employees in the pressing department. An examination of this area disclosed the fact that it contained a propane-fired boiler used to generate steam for use in the pressing equipment. The presence of this boiler, coupled with the description of the symptoms, indicated poisoning from either carbon monoxide or propane.

The system was examined for leaks, but none was found, and carbon monoxide and combustible gas tests were negative. Employees in the pressing department were showing signs of hysteria because of the "strange and deadly gas" that was making them sick.

At the time, it appeared that the employees made ill must have been exposed to some substance at the source of their pressing, as a large exhaust fan hastily placed in operation Tuesday morning made remote the potentiality

of a build-up of a harmful concentration of any substance in the general air.

It was suggested to the plant management that the dye of the material may have been altered in some way to cause the phenomenon. Similar materials had been processed previously and, with all other conditions remaining the same, a change in the dye seemed to be the only possible factor responsible for the illnesses.

On Thursday a telephone call to the dyer of the material brought out the information that no change in the dye had been made and that other processing plants had been using material from the same batch mix without ill effects.

With one line of inquiry closed by the report from the dye house, the representatives of the Bureau continued their investigation on Friday in an attempt to uncover any other factors which might have been present on Monday morning when the illnesses first occurred.

One worker in the pressing department offered the information that illness had not started until after the "sooty dust" had appeared in the department. Following this lead, it was discovered that, without the knowledge of either the manager or the foreman, the pipe leading from the propane gas boiler to the chimney had been removed from approximately 9:30 a. m. until noon Monday for the purpose of replacement and that the boiler had continued to operate during this time.

From this information, the investigators concluded that carbon monoxide had escaped from the boiler into the pressing area from 9:30 a. m. until noon on Monday. By the time the pressers returned from their lunch, the concentration of carbon monoxide had built up in such quantity as to cause some of them to faint.

Residual carbon monoxide may have been responsible for the slight effects experienced on Tuesday morning, but the exhaust fan which was installed at this time soon removed all traces of carbon monoxide.

The peculiar odor which some types of rayon material give off when steam-pressed stimulated the imaginations of the pressers on Wednesday, and the symptoms they experienced were probably psychological. The results of the investigation satisfied the pressers, and they returned to work.

REPORTING MAKES HISTORY

Illustration by Garnet Jex, USPHS

Occupational Blindness.—The literature on this subject dates back to 1700, in which year Ramazzini, in the first book on industrial medicine, *De Morbis Artificum*, published the first clinical description of an occupational eye disease causing blindness. Ramazzini's interest in occupational ophthalmology was aroused when one day he observed workers engaged in cleaning sewers of his home town, Modena, Italy. He noticed that the eyes of these workers were red and inflamed. When questioned, the men stated "that after a few hours' work in the sewers their eyes burned so much that they were obliged to run home to wash them out with water." Ramazzini relates that many of these workers lost their sight and later were to be found begging in the streets.

We now know that in underground passages, sewers, cesspits, and tunnels, hydrogen sulfide is present in the air in high concentrations and that this irritant gas causes a severe conjunctivitis and keratitis.

Reporting Promotes Health

Scattered throughout the world's medical literature, increasing numbers of reports are being made of the effects on the eye of various chemical agents, physical conditions, and biological agents found in industry. Efforts have been made to combat these hazards. One of the outstanding examples was the development of a specific antidote (certain dithiol compounds, BAL) to arsenical vesicant liquids, such as Lewisite.

Great advances have been made in the field of industrial illumination, especially in the United States, helping greatly to minimize the amount of visual fatigue, poor vision, accidents, waste, and spoilage. Many believe that miners' nystagmus, which is prevalent in Europe and Great Britain, also will be gradually eliminated.

New devices and concepts in regard to selection for various jobs with specific visual requirements have been developed. These efforts have made and will continue to make great strides in efficient production and to afford many persons visual rehabilitation previously denied.

Reporting of industrial ophthalmological conditions is still necessary to further progress in this field.

Report All Cases of Occupational Disease

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U. S. GOVERNMENT PRINTING OFFICE: 1951