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ALICE HAMILTON HONORED BY A. P. H. A.

On October 9, 1947, the American Public Health Association bestowed its Lasker Awards on five doctors for their work in combating the most frequent causes of disease and death. One of the five awards went to the first woman to be so honored, Dr. Alice Hamilton, who has spent most of her 78 years pioneering in the field of industrial hygiene.

As one of the first American scientists to inquire into the dangers threatening industrial workers, Dr. Hamilton needed more than the spirit of scientific curiosity. She had also the courage to recognize and accept the challenge of battling ignorance and greed. She took upon herself the task of forcing upon an often unwilling public, acceptance of the principle that a man has the right to earn his living without danger to life, limb, or health.

In 1910, when she was teaching pathology at a medical school in Chicago, Dr. Hamilton met Jane Addams, Director of Hull House. Through her friendship with Miss Addams, Dr. Hamilton's interest in labor and social reform grew. When Illinois formed a commission to conduct a formal study of occupational diseases, she eagerly accepted a position on the investigating staff.

White lead plants in Illinois were the first objects of her investigation. Later as an investigator for the United States Department of Labor, she conducted Nation-wide studies in such industries as lead smelting, pottery glazing and decorating, painting, the printing trades, storage battery plants, aniline dye works, explosive plants, and rayon textile mills.

By 1919, Dr. Hamilton was recognized as the Nation's leading authority in the field of industrial medicine and was appointed to the faculty of the Harvard Medical School.

The reforms which have grown out of Dr. Hamilton's work are legion. She has been privileged to see great changes in industry which have eliminated or controlled the hazards which she helped to discover. Many of these changes she helped bring about by her own work in promoting the passage of protective legislation. Early in her career, she realized that the acceptance and application of medical and scientific truths generally follow, rather than precede, the passage of occupational disease compensation legislation. She therefore fought constantly for laws which would help guarantee healthful conditions to American workers.

Dr. Hamilton's boundless energy has made her prominent in the movement for world peace, as well as industrial health. Dr. Hamilton was the only woman ever appointed to the League of Nations. She has played an active role in many international conferences.

Dr. Hamilton has recounted experiences in the crusade for industrial health in a very readable book, "Exploring the Dangerous Trades." Her story, however, is not yet done. She is still active and ready to investigate new fields. She is certain that no matter what dangers and hazards may be found, industrial hygienists will find a way to control them.

The Role of Progressive Industry In Medicine

Abstract of speech by Frank W. Abrams, Chairman of the Board, Standard Oil Company of New Jersey

The basic function of the industrial manager is to produce the goods and services which people need and want, and to make them available in the most convenient way at the lowest possible cost. The American people have discovered and developed the technique of mass production by the use of modern machines and engineering methods. But we have neglected the human problems which came with this machinery.

You often hear statistics indicating the number of man-days lost by industries or by the Nation because of strikes. But the loss due to absenteeism is equally important. Over the 10-year period ending last October, the more than 50,000 domestic employees of the Standard Oil Company of New Jersey and its affiliates lost more than 2½ million days from work because of illness. In terms of dollars and cents this is a substantial figure. But there are also a great many employees in industry whose efficiency is lowered because of health factors, although they are not ill enough to be absent.

In addition to providing employees with first-aid facilities, sanitary working conditions, correct lighting, proper ventilation, and safety devices, a prospective employee should be evaluated from a temperamental as well as a physical viewpoint and effort made to put the right person in the right job.

Our company hires men with physical ailments because it is sometimes found that physical disabilities are an advantage rather than a disadvantage. A man who must lead a sober life because of a bad heart condition may be ideally suited to perform certain duties. We couldn't hire such a man to be a tank gauger, of course, because he would have to climb steep steps to the top of a tank to measure the contents.

Having solved the problems of selecting men, giving due consideration to questions of health and temperament, individual companies have a great deal to gain from a wise and thorough use of *preventive* medicine and what we might call *constructive* medicine. It is the job of good industrial management not only to maintain a healthy individual, to prevent illness, but also to help the men and women of an organization to improve their physical condition.

The organization which develops and maintains a healthier, more vigorous personnel is automatically achieving at least two highly important competitive advantages. It is likely to get first choice of the best people, and it is far less likely to have explosive human relations troubles. Consideration for the individual and his problems which is inherent in any intelligent health program is in itself a good thing from the viewpoint of leadership. It has a sound and stimulating effect.

Curative medicine, except for minor treatment and emergency cases, is the province of the private physician. It is neither practical nor desirable for industry to take over the entire responsibility for medical care of employees where competent private care is available, but the physician in industry can be of great service by making facts and laboratory findings available to the employees' private physicians.

Expenditures to improve the health and vigor of employees are justified not only by humanity and social conscience but also by the solidest of practical operating reasons. Management of today which does not give great consideration to the whole question of human relations and the specific problem of the physical wellbeing and efficiency of employees has a more difficult accounting to make than one which clearly recognizes the importance of the field and moves into it boldly and vigorously.

COVER PICTURE—*Courtesy of U. S. Steel Corp.*

AIRLINE ASKS HELP ON CARBON MONOXIDE PROBLEM

One of the major airlines had received complaints of exhaust gas entering baggage compartments, pilots' cabins, and passenger cabins when planes are being prepared for takeoff. In several cases apparently the concentration of CO was sufficiently high to cause loss of consciousness among baggage handlers. No passengers had been overcome, but many had complained of "fumes" in the cabins.

Eastern headquarters of the airline had conducted their own investigation and directed the western regional safety director to make an independent search for the cause of the complaints. Accordingly, the Industrial Health Division in Los Angeles was brought into the picture for technical assistance.

The source of the trouble was found to be the gasoline-powered mobile air conditioning units which are brought to the planes as soon as they have landed and their engines cut off, or when planes are being readied for flight. Ordinarily these outside conditioning units are hooked in for no longer than 15-minute intervals, but there have been occasional runs of 1 hour or longer.

The only point where CO concentrations far exceeded the maximum allowable of 100 p. p. m. was the exhaust outlet from the air conditioning engine. However, levels of 60–80 p. p. m. were found at all three locations: pilots' cabin, forward baggage compartment, and passenger cabin. The study eliminated outside sources of CO and definitely pointed to the conditioning engine exhaust as the origin of the CO. Apparently, air currents were carrying the exhaust gas to the air intake of the conditioning unit, as well as to the open doors of the pilots' cabin and baggage compartment.

Because of the possibility that under different atmospheric conditions the CO level might exceed the maximum allowed, it was recommended that upward extension ducts be provided for the exhaust outlets on the conditioning engines, and that trucks be faced downwind to permit maximum diffusion of exhaust gas.

PHOSGENE GAS CAN BE CONTROLLED

Most of us are familiar today with the animated appearance presented by devices producing a succession of bubbles in a lighted tube filled with liquid. Such devices which provide the eye-catching effect of motion are used in advertising displays, Christmas tree lights, juke boxes, and similar apparatus. A plant engaged in the manufacture of one type of these devices was the subject of an investigation by the Kansas City Area Industrial Hygiene Service as a result of complaints from the employees. Most of the complaints referred to respiratory symptoms such as pain or tightness in the chest, difficulty in breathing, and coughing.

It was found that the liquid used in this plant was methylene dichloride which boils at 104° F. Despite the numerous opportunities for escape of this very volatile solvent into the atmosphere, all air concentrations were found to be well below the recommended maximum of 500 parts per million. However, at three points in the manufacturing process, gas flames were employed. The passage of the relatively low concentration of solvent vapor through these flames caused its decomposition with the production of phosgene gas and other chlorinated products. The distinctive odor of phosgene was apparent in the immediate vicinity of these burners. Tests made for phosgene, by the British impregnated filter paper method, confirmed the fact that excessive concentrations were present in these locations.

Recommendations were made for the elimination of flames from all operations except the final seal off. Alternate methods of heating and changes in the operations made this possible. Other recommendations were made for reducing the amount of solvent released into the air and for more effective application of exhaust ventilation to collect the vapors at their source. These measures have been adopted and a hazard eliminated. Phosgene concentrations in the breathing zone of the workers were all below one part per million when last tested. Tests for methylene dichloride on successive visits to the plant have shown repeated reductions and the average concentration is now well below 50 parts per million. Closer medical control measures have been instituted and a full-time registered nurse has been employed. Along with the improvement in atmospheric conditions have gone a great increase in production and a decrease in labor turnover. While this is not necessarily a case of cause and effect it does demonstrate that health hazards can be brought under control without adversely affecting production.

The problem of phosgene production by the interaction of heat and chlorinated solvents has come to the attention of the writer three times in recent months. This serves to emphasize the necessity, frequently overlooked, of keeping such compounds away from heat. Concentrations of solvent far below toxic levels become extremely dangerous when even a small percentage is converted into phosgene.—**H. F. Schulte, Kansas City, Mo.**

CONCENTRATION OF METHYL ETHYL KETONE FOUND IN FACTORY

A rather ingenious ventilating system was recently installed according to the recommendations of the Massachusetts Division of Occupational Hygiene in a plant manufacturing elevator shoes. Preliminary air tests were taken in the vicinity of the operation which involved molding cork soles. Under simulated winter conditions with doors and windows closed, concentrations as high as 2,800 p. p. m. of methyl ethyl ketone were found. This is in contrast to the Massachusetts maximum allowable concentration of 300 p. p. m. for this solvent.

After the cork soles are molded, they are placed on racks and air-dried in the main room next to the molding table. Under these conditions, a design for dilution rather than local exhaust was necessary. However, since concentrations at the work bench were highest, a combined local exhaust and general dilution ventilating system was designed. Under this arrangement, outside air is drawn through a furnace, preheated, and blown into the room. The air delivery is thermostatically controlled so that a drop of 2° below 70° F. actuates the mechanism for delivering warmer air into the room. The exhaust and supply systems were set up to handle approximately the same quantities of air—about 1,300 c. f. m. Subsequent tests have shown atmospheric contamination values ranging from 0 to 190 p. p. m. This is satisfactory under present operating conditions and should be adequate for the contemplated expansion in the near future.—**Harold Bavley, Mass.**

MEDICAL STUDENTS STUDY INDUSTRIAL HEALTH

In the fall of 1947 a section on industrial health was established in the Department of Preventive Medicine and Public Health at the University of Louisville School of Medicine. Dr. Gradie R. Rowntree, who is Associate Professor of Preventive Medicine and Public Health, was appointed Chief of the Section, and W. W. Stalker was appointed to the faculty of the Medical School as Lecturer in Industrial Health.

The course, consisting of 30 hours, is given to the medical students in their third year. Ten hours will be devoted to didactic work, and 20 hours to field and laboratory work. The course includes organization and function of industrial medical services, field and laboratory methods in industrial health, and occupational diseases and their control.

In addition to the didactic field and laboratory work, the plan is to integrate the teaching into the clinical and preclinical years as much as possible. Thus, the various clinical and preclinical department will be encouraged to emphasize the fundamentals of industrial medicine and toxicology. It is hoped that the introduction of this new course in the medical school curriculum will go far in interesting young physicians in the practice of industrial medicine.

Bibliography of Industrial Medical Care Available from USPHS

A bibliography on industrial health and welfare matters has been mimeographed and may be had free upon request as long as the supply lasts. Address Managing Editor, *INDUSTRIAL HYGIENE NEWSLETTER*, Washington 25, D. C

MONTANA TO STUDY OCCUPATIONAL DISEASES

The Montana legislature has created a State commission for the study of occupational diseases. The duty of the commission is to make a comprehensive and detailed survey of occupational diseases with particular reference to silicosis, to determine the extent to which such diseases exist in Montana and the measures by which undesirable existing conditions can be remedied.

The members appointed to this commission are Dr. F. I. Terrill, State Tuberculosis Sanatorium, representing the medical profession; Mr. H. J. Rahilly, Anaconda Copper Mining Company, Butte, and Mr. Carl Trauerman, Secretary of the Montana Mining Association, Butte, representing management; and Mr. Mike Lacey, C. I. O., and Mr. James Graham, A. F. L., representing labor. The act provides for public hearings and also for a report to the next regular legislative assembly. The assistance and cooperation of the Division of Industrial Hygiene is offered to this new commission.—**Montana Roundup.**

DETROIT NURSES OBSERVE FOUNDRY WORK

Recently a program was inaugurated in Detroit for department of health nurses to observe the various dusty operations associated with foundry work.

The department of health nurses take tuberculosis histories which contain information on the worker's present and past jobs. To make these occupational histories mean more to the nurse, it is important that she should have an understanding of jobs that most frequently predispose to lung disease. Since foundry work is one of the chief causes of pneumoconiosis in Detroit, it was felt that a tour through a foundry would be helpful.

Because of the large number of nurses, it was impossible for all to observe, so 12 representative nurses were selected who were able to explain what they had seen and to offer advice to other public health nurses who take occupational histories.

The plant nurse in one of the local foundries conducted the public health nurses through the plant. She called special attention to the dust-producing operations, namely, the shakeout, molding, coremaking, chipping, tumbling, grinding, and sandblasting operations. She was able to explain these jobs in detail and answer any questions that were asked.

The nurses found this experience to be of great value. It has given them a clearer understanding of occupational dust exposures, thus emphasizing the importance of correctly listing the exact jobs where a man has been employed. It has also made silicosis a more real problem to them and it is hoped that they have received a more lasting impression by actually having seen the jobs in operation.—**Esther W. Kilmer, R. N., Industrial Nursing Consultant, Detroit, Mich.**

A. M. A. COUNCIL MEETS IN CLEVELAND

The Council on Industrial Health of the American Medical Association will hold its Eighth Annual Congress on Industrial Health in the Cleveland Auditorium, Cleveland, Ohio, on January 5 and 6, 1948. These dates immediately precede the Interim Session of the American Medical Association which will be held in the Auditorium on January 7 and 8. The program of the congress will include discussions of nutrition, control of respiratory infections, physical examinations, administrative practices, applied physiology, aviation medicine, radiation medicine, and practical expositions of occupational disease management, traumatic surgery, and rehabilitation.

Since full use of medical services in industry depends on support from management and the worker, the essential relationships will be discussed.

The congress sessions are open to representatives of all groups allied with the medical profession in the promotion of industrial health—nurses, representatives of labor and industry, insurance personnel, and industrial and safety engineers.

NEW HAMPSHIRE LEGISLATES OD COMPENSATION

Wage earners in New Hampshire have recently gained greater protection through the passage of revisions to the State's Workmen's Compensation Law. For the first time, the law provides compensation for workers who contract specified occupational diseases in the course of employment. The number of States offering occupational disease compensation has now reached 39.

The schedule of disease for which compensation is offered in New Hampshire includes: Anthrax, lead poisoning or its sequelae, dermatitis venenata, diseases due to the enhalation of poisonous gases or fumes or their sequelae, and silicosis and other pulmonary dust diseases. Compensation for partial disability from silicosis is not allowed. The law is not retroactive, in that it does not cover workers for occupational diseases they may have, but which they contracted before the passage of this law.

Several other changes have been made in the compensation law. Probably most important is the fact that the law is now compulsory for employers of five or more workers, except those engaged in farm labor and domestic service. The law is elective for all other employers. The revised law also sets up a second injury fund.

Benefits paid under the law have been increased. Weekly compensation payments may not exceed two-thirds of the average weekly wage. Formerly, payments could not exceed half the weekly wage. The maximum payments for all disabilities have been raised from $21.50 to $25.00 a week. Minimum payments have been raised from $8.00 to $10.00 a week for temporary and permanent total disabilities, and $15.00 for permanent partial disability. Death benefits are now to be paid in weekly installments ranging from $15.00 to $25.00 a week for a maximum of 300 weeks. Total payment for death or for any one single illness or accident may not exceed $7,500. This represents an increase over the former maximum payment of $5,400 in event of death.

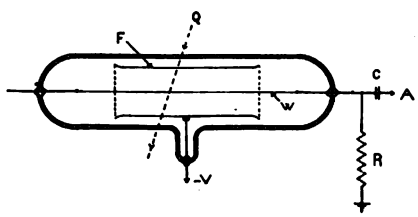
Copies of the revised Workmen's Compensation Law may be obtained from the New Hampshire Bureau of Labor, Concord, N. H

RADIANT ENERGY

Duncan Holaday, USPHS

Geiger-Mueller Counter

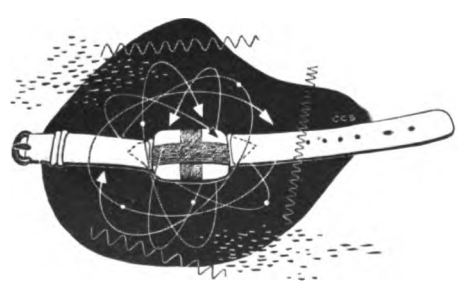
Ionization chamber-type instruments for detecting ionizing radiations have been discussed in a previous article (August 1947). In these instruments the ionization produced may be measured by simple collection on charged electrodes. For weaker radiation fields electronic amplifiers are used to increase the ionization current to a detectable amount. In many situations, however, even the amplification so obtained is not enough to detect the small amounts of radiation present. As even very weak intensities of radiation are significant physiologically, it is sometimes necessary to use a more sensitive instrument than ionization chamber types.



The Geiger-Mueller counter is used to measure very small amounts of radiation. This is one of the most sensitive instruments known to man, and will detect the weak background due to cosmic rays which is always present. The upper range of portable Geiger-Mueller meters is about twice the maximum permissible level of x- or gamma-radiation. In these regions of weak intensity the Geiger-Mueller tube is an invaluable tool.

The Geiger-Mueller tube is a device for registering the passage of single charged particles or photons as electrical impulses. A brief discussion of the principle of operation of this tube may be of interest to industrial hygienists. Figure 1 shows a diagram of a Geiger-Mueller counter. A wire, *W*, is stretched along the axis of a hollow metal cylinder, *F*, enclosed in a glass tube. This tube is usually filled with a noble gas such as argon or neon with a small admixture of a polyatomic gas such as alcohol or xylene. A high negative voltage, *V*, is applied to the cylinder electrode (the cathode); the wire (the anode) is connected through a condenser, *C*, to a vacuum-tube amplifier, *A*, and through a high resistance, *R*, to ground. The voltage in *V* is adjusted so that it is nearly high enough to cause a brush discharge between the electrodes. When the tube is in this sensitive state, any ray or charged particle, *Q*, passing through *F* and liberating one or more ions will cause a gas discharge between the electrodes. This discharge may be explained by the following mechanism: An electron produced by the original ionizing event is accelerated through the intense electrical field between the electrodes, ionizing other gas molecules with which it collides. The electrons so produced cause further ionizations and the end result is an avalanche of electrons. This chain reaction gives an amplification of 10^{10} to 10^{15} which is much greater than any conveniently obtainable with an electronic amplifier. The pulse produced by the counter is introduced into an amplifying circuit, from where it is fed into a rate meter or some other indicating or recording device. The gas discharge is quenched by the action of the polyatomic gas and the counter is ready for the next charged particle.

The Geiger-Mueller tube may be regarded as a very sensitive relay which can be tripped by a single electron. It counts individual particles without regard to the ionization caused by the particles. Ionization chamber instruments take into account the amount of ionization produced by each particle. Therefore, Geiger-Mueller counters and ionization chamber instruments must be calibrated against the same source of radiation to give similar readings in roentgens. To obtain comparable readings this calibration must be done for each different type of source against which the instruments will be used.



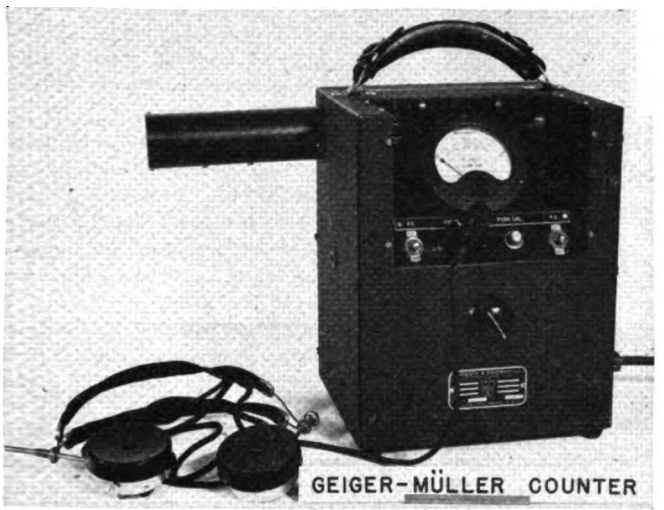
Portable Geiger-Mueller counters are used for field surveys to detect and measure ionizing radiations. These are relatively light, battery-powered instruments, and when properly calibrated give accurate results. Geiger-Mueller countersurvey meters are not as rugged as the ionization chamber instruments and usually require more maintenance to keep in proper working condition. Even with these limitations they are an invaluable aid in studying radiation hazards.

HOME-MADE ATOMIC BOMBS NEXT?

The Bureau of Industrial Health, Michigan Department of Health, furnished a display booth at the recent Municipal Open House in Grand Rapids, October 21 and 22. A total of 22,000 people visited the exhibit, which included photographs, an equipment display, and a three-dimensional scale model factory layout showing proper illumination and "three-dimensional" painting which was volunteered by an employee of Grand Rapids industry.

The most interesting incident concerned the visit of a young man, a junior in high school, at the industrial hygiene booth. He became interested in the portable Geiger-Mueller counter, and requested that it be taken apart so that he could trace the circuits. Very little comment was volunteered by the young man, except that it was "a nice job of wiring." It later developed that he had just finished building a Wilson cloud chamber at home and was going to tackle a Geiger counter next. Later that evening the young man returned with several friends and the Geiger again submitted to surgery. It still works, too.

MODIFICATION OF GEIGER-MUELLER COUNTER



A modification of one type of portable Geiger-Mueller counter has been made which allows greater facility in transportation and use and reduces danger of breakage.

The illustrations show the rebuilt instrument with the tube in the retracted and extended positions.

The tube housing was shortened to the width of the case and the tube and mounting block were installed inside the case. The mounting block slides on a small piece fastened inside the case, and a bolt, fastened to the top of the block, slides in a slot sawed in the top of the case. By tightening a wing nut on this bolt, the tube may be held at any position, including the full extension as shown.

The instrument has been checked and calibrated by Herbach and Rademan, the manufacturers, who have given full approval of the change.—**Kenneth E. Robinson, Michigan Department of Health.**

Men Exposed to Mustard Gas in 1942 Hospitalized

At the request of Dr. F. J. Halpin, Medical Director of the Bureau of Employees' Compensation, F. S. A., Dr. H. T. Castberg, Chief, Medical Section, Industrial Hygiene Division, USPHS, attended a meeting of representatives of the Bureau of Employee's Compensation, the Memphis Marine Hospital and the Huntsville Arsenal. The meeting was called to discuss clinical, industrial hygiene, and social aspects of the problems arising out of the exposure of Huntsville Arsenal workers to excessive amounts of mustard gas.

About a thousand workers who were employed in the Huntsville Arsenal (Huntsville, Alabama) in 1942-1943 show symptoms of excessive exposure to mustard gas. During the war, the arsenal was engaged in manufacturing the gas and filling gas shells.

Most of the workers who were exposed to mustard gas have developed respiratory disorders (bronchiectasis or chronic bronchitis). About 300 of them are now under observation or treatment. Many must be on a regular regimen of potassium chloride and postural drainage for their bronchiectatic lesions. Most of the men have a true physical disability and a psychoneurotic component is evident in many.

Since so many of these men live in the Huntsville area, the problem is of community-wide importance. Many men receive employee's compensation. In the face of living costs, this offers them little. Employers in the area are loath to employ Huntsville Arsenal workers, because they are disabled. The employers fear the cost of complete disability, in case the men are injured again.

Medical treatment, disability rating, rehabilitation, and job placement were discussed. It was decided to be as lenient as possible when establishing a disability rating. It was recognized that the establishment of a second injury fund in the State would ease the employment problem. It was agreed that assistance from the Office of Vocational Rehabilitation should be sought in working out a rehabilitation program.

Dr. Castberg points out the urgent need for supervisors in plants where poison gases are handled to have adequate industrial hygiene consultation.

ENGINEERS AND DOCTORS GO TO SCHOOL

A week's lecture course on "Medical Aspects of Atomic Explosions" was given by the United States Army during November. Doctors and engineers on the staff of the Industrial Hygiene Division, USPHS, who attended were Clyde M. Berry, Dohrman H. Byers, Jason Geiger, Lewis W. Moore, Robert P. Ralls, Lucian E. Renes, and Robert A. Sammons.

George Clayton, S. A. Engineer (R), attended the Celotex Corporation Acoustical School in Chicago the last of November.

ARKANSAS

Personnel—Mr. Clarence Overcash has accepted a position as industrial hygiene engineer with the Arkansas State Board of Health, Division of Industrial Hygiene. Mr. Overcash is a graduate of Purdue University. He formerly served one year with the State Board of Health as an industrial hygiene chemist.

LOS ANGELES, CALIF.

Electroplating—Employees in a chrome furniture plant complained of irritating fumes carried into the upholstering shop indoors from the plating department just outside the building. A study revealed that prevailing winds swept the irritating mists from several plating tanks at high velocity into open windows.

The worst offender was a chrome tank which was not provided with exhaust ventilation because of the mistaken notion that merely setting the tank outdoors would protect employees from the corrosive mist. An air sample taken in the breathing zone of the worker at the chrome tank showed more than 20 times the maximum allowable concentration of chromic acid mist. A list of recommendations transmitted to the plant owner included direct ventilation of the chrome tank to protect the operator himself, and to prevent the mist from affecting workers inside the plant.

Ultraviolet Light—A case of alleged conjunctivitis due to exposure to ultraviolet light from a germicidal unit was investigated. It was learned that a butcher in a cafe had worked for two hours cleaning a meat cooler in which two germicidal units were installed. The units were only a foot above the worker's hand and were unshielded. Symptoms of painful eye irritation developed on the night of exposure after the worker had gone to bed. Uneventful recovery occurred in 24 hours. Recommendation was made that dark glasses be worn whenever the worker found it necessary to expose himself to the ultraviolet radiations from the germicidal overhead lamps.

COLORADO

Personnel—Mr. Jack D. Torrey, chemist, has been added to the staff of the industrial hygiene section. The services of a director are needed and the vacancy will be filled as soon as possible.

FLORIDA

Speech—Dr. John M. McDonald, director, division of industrial hygiene, gave an address on industrial hygiene before the general assembly of the Florida Public Health Association's annual meeting at Tampa, Fla., on October 23.

NEW HAMPSHIRE

Nurses—Eighteen nurses were present at a meeting of the New Hampshire Industrial Nurses, held November 12, 1947, at the Century house in Manchester, N. H. A discussion on the structure study was held and it was decided that a letter be written to Mrs. Mary Delehanty, who is the president of the National Association of Industrial Nurses, from the New Hampshire branch in answer to one received by all industrial nurses from her on this subject. Due to the resignation of two of the officers an election was held to fill these vacancies. Mrs. Nina Collins of the Amoskeag Lawrence Mills was elected secretary and Mrs. Hazel Downing of the International Shoe Company, treasurer. Mrs. Priscilla Cummings accepted the position as chairman on the Membership Committee.

NEW JERSEY

Publication—The *Industrial Health Bulletin* of the State Division of Industrial Health has launched its second volume with an issue devoted to the subject of anthrax. Starting with a concise history of the disease, the bulletin covers in rapid, but thorough succession, its industrial importance, and its etiology, diagnosis, treatment, and prevention in human beings and animals. The second issue of volume two is concerned with vision. It sets forth the benefits of industrial sight conservation programs, the techniques of eye examinations in industry, and the industrial significance of scientific illumination and color selection.

The most recent bulletin is on phosphorus—the incidence, toxicology, and control measures.

These bulletins are available without charge on request from the New Jersey State Department of Health, Division of Industrial Health, Trenton, N. J.

KANSAS

OD Legislation—At the present time there is no statute in Kansas covering occupational diseases. The Committee on Labor and Industries has made a progress report of their study on this aspect of industrial health. The committee is considering the advisability of legislation which will give the State Board of Health power to (1) maintain a complete occupational disease reporting system; (2) establish and enforce reasonable control and preventive regulations; (3) engage in research for causes of occupational diseases; and (4) maintain adequate inspection service.

The Labor Department has been in touch with many employers and employees during the past several months and from an analysis of these contacts it appears that during the past year there were approximately 680 employees in Kansas affected by what is commonly known as occupational diseases. Approximately 500 of these cases received first aid, but lost no time.

KENTUCKY

Personnel—Mr. Wilber A. Mitchell, Industrial Hygienist of the Division of Industrial Hygiene, is attending Columbia University Graduate School this winter where he hopes to complete the requirements for a master's degree in industrial hygiene.

Mr. Norman E. Schell, chemical engineer, has recently been added to

the division's staff. Mr. Schell has had extensive industrial experience in the field of heavy chemicals and more recently with the refractories industry.

MASSACHUSETTS

Guests—The Massachusetts division has been honored recently by the arrival of a good number of distinguished visitors. From Spain have come Dr. Manuel R. García-Puente of Salamanca and Dr. José Zapatero of Madrid; and from Holland, Inspector F. Groeveld of The Hague and Dr. Jan F. Hampe of Amsterdam. English visitors include Drs. John Agate, Peter Nash, and Martin Herford. All sections of the division have benefited from the exchange of ideas on common problems.

Bulletins—The division has been preparing a series of bulletins on recommended safe practices. For each harmful substance, the chemical data sheet specifies the hazard classification, general description of the material, harmful effects on persons exposed, maximum allowable concentration, protective measures, and methods of medical control. The ventilation data sheets include sketches of suitable hoods for the particular operation, as well as pipe sizes and air volume necessary for adequate control of the hazard.

Nurses—Mrs. Sarah E. Almeida, R. N., nursing consultant of the Massachusetts Division of Occupational Hygiene, presented the affirmative view in an effort to activate an industrial nurses' section in the Massachusetts State Nurses Association. This was part of the 32d Annual Fall Conference of the New England Industrial Nurses Association held on October 4, 1947, in Fall River. The final vote, however, barred activation, since it was believed that such a move would tend to split membership and interest.

Personnel—Dr. Thomas E. Gibson is the new consultant dermatologist to the Massachusetts Division of Occupational Hygiene. He has served in the AAF and recently was affiliated with the University of Pennsylvania Hospital, Department of Dermatology.

KANSAS CITY, MISSOURI

In-Plant Feeding—The Kansas City Area Industrial Hygiene Service assisted this past year in sponsoring a workshop conference on in-plant feeding of industrial workers. Other sponsors were the Industrial Hygiene Division of the Kansas State Board of Health and the Production and Marketing Division of the U. S. Department of Agriculture. One of the most promising results of this meeting was the decision by those present to organize themselves into an association and to have similar meetings regularly.

Members of this group have expressed a strong desire to have active participation in the meetings from personnel people and plant nurses. In this way mutual problems can be discussed and the in-plant feeding program integrated with other related plant functions such as industrial relations and industrial health.

In this setting, the program can be seen to consist primarily of three closely related phases—economics, sanitation, and nutrition. Through the activity of an organization such as this one in Kansas City, all three phases can be emphasized and advanced simultaneously.

ST. LOUIS, MISSOURI

Air Pollution—The Industrial Hygiene Section was invited to participate with other city officials in a study of the atmospheric pollution problems. To assist the various officials in determining the nature of the dust problem, a series of general atmospheric dust samples were collected and prepared for microscopic demonstration. Three conferences were held and two proposed ordinances drawn up. One ordinance was for the purpose of strengthening our present smoke control law by increasing the power of the Division of Smoke Regulation to control pollution from fly ash and the production of smoke from the combustion of fuel and refuse. The other was designed as a general air pollution ordinance to control all other forms of atmospheric pollution (to include dust, fumes, mists, vapors and gases) to be administered by the Health Division.

OREGON

Personnel—Dr. G. D. Carlyle Thompson is Acting Director of the Industrial Hygiene Section, Oregon Board of Health, having replaced Dr. C. M. McGill, who resigned from the U. S. Public Health Service.

PENNSYLVANIA

Nurses' Training—The Bureau of Industrial Hygiene cooperated in the presentation of an industrial nursing course held during the period from October 1 to December 10 in Williamsport, Pa. The course was sponsored by the Williamsport Technical Institute and Industrial Health Committee of the Williamsport Community Trade Association.

Dr. Joseph Shilen lectured on the functions of the bureau; Miss Katharine A. Lembright, R. N., on records and reports; Mr. Fred B. Koppenhaver on sanitation, ventilation, lighting, noise, and dust; Miss Katherine M. Altland, R. N., on health education, and problems of women in industry; and Dr. E. R. Aston on a dental program in industry.

SOUTH CAROLINA

Conference—The Industrial Nursing Section of the Statewide Industrial Safety Conference met in Columbia, October 30. Mrs. Lula B. Exum, R. N., Nursing Consultant of the Division of Industrial Health, was chairman of this sectional meeting. The meeting was an interesting one and included addresses by Dr. Donald J. Birmingham, Dermatology Section, Industrial Hygiene Division, USPHS, Washington, D. C., Mr. Harvey Frick, Personnel and Safety Director, Greenwood Cotton Mills, Greenwood; and Miss Julia P. Brunson, Nutrition Consultant, State Board of Health.

Dr. Birmingham confined his address to some basic principles of industrial dermatoses. He outlined some of the predisposing causes of occupational dermatoses, defined primary irritants and cutaneous sensitizers, and continued with a discussion of the action of chemicals in contact with the skin. A brief summary was given of the rôle of biologic agents in the production of skin conditions. Some criteria to observe in the diagnosis of occupational skin diseases were reviewed and some precautions to observe in patch testing were discussed. Prevention was the subject of his concluding remarks. The lecture was illustrated with an array of pictures, most of them in color. Dr. A. M. Rubinowitz, dermatologist of Columbia, discussed Dr. Birmingham's paper.

(Continued on page 16)

PORTABLE MICROPROJECTOR

Using the same optical system and basically the same equipment as described and discussed in Midget Microprojector for Dust Determinations, by Carlton E. Brown, Bureau of Mines Publication No. RI 3780, September 1944, a portable microprojector has been constructed.

The dust counting and particle size determinations made with the new unit are satisfactory and match closely with the data collected using the standard microscope counting and particle size determination technics.

The complete unit consists of a microscope having a substage condenser, a Bausch and Lomb photomicrographic lamp and a combination projection and carrying case. A 30× microscope eyepiece is used, giving a 1,000× over-all magnification when calibrated.

The projection case is of wood and built to be used for storing and carrying the smaller accessory pieces of equipment. Both the mirror and translucent screen can be adjusted to any angle by an automobile choke cable mechanism.

The ruled screen is made of translucent tracing paper. Several other materials such as translucent cellulose acetate sheet and tracing cloth were used for the screen but were unsatisfactory.

For those interested in constructing a portable microprojector, the following summarized list of equipment, used in our unit at an approximate cost of $400. is given:

Photomicrographic lamp having the following parts: One lamp housing, one tungsten arc bulb, one self-regulating transformer.

Microscope equipped with two or more lenses, substage condenser, mechanical stage, adjustable draw-tube, 16 mm. and 1.9 mm. achromatic objectives, and 10x and 30x eyepieces.

Adjustable right angle reflecting prism for use above the eyepiece, top diameter of which is 28 mm.

Mirror about 12 by 12 inches.

Screen made of a piece of high and uniform translucent tracing paper, about 12 by 12 inches.

Projection and carrying case equipped with angular controlled mirror and screen frames (constructed according to specifications).

Beaverboard eye shield painted black.

This bureau will furnish upon request detailed information concerning construction of the microprojector carrying case.—**Bernard D. Bloomfield, Bureau of Industrial Health, Michigan Department of Health.**

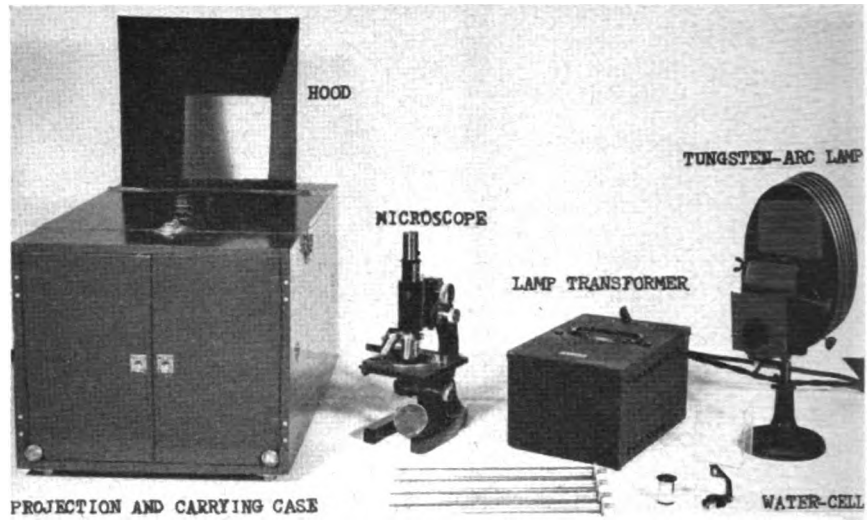
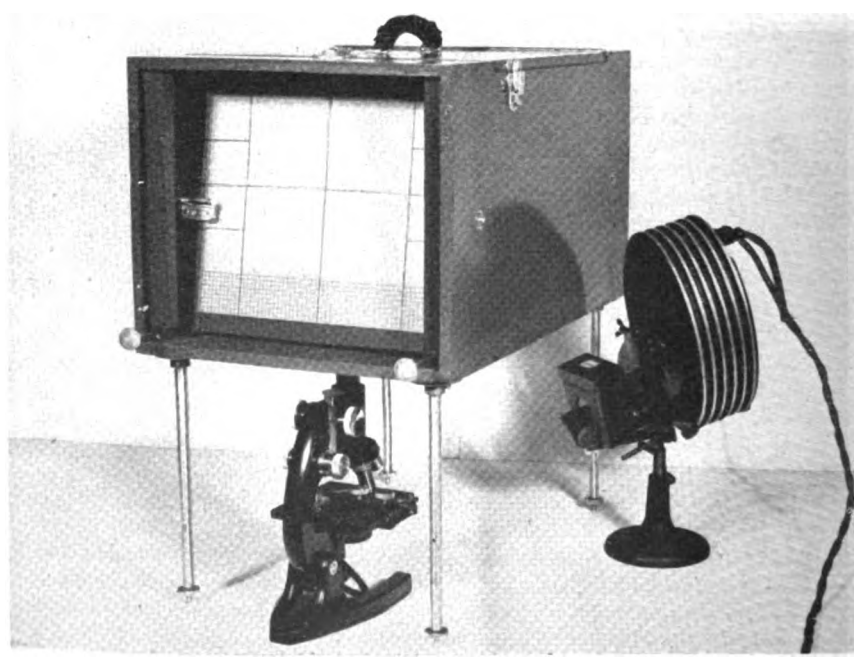


Figure 1 (above)—Microprojector—disassembled.

Figure 2 (below)—Microprojector—assembled without hood—showing screen.

Figure 3 (opposite page)—Microprojector assembled for use.

(Photographs by courtesy of the Michigan Department of Health.)



INFORMATION PLEASE

Here is your chance to give advice and ask for it—free. Many of you have requested this publication to be a clearing house for unusual problems. Send *your* perplexing problem to Managing Editor, *INDUSTRIAL HYGIENE NEWSLETTER*, USPHS, Washington 25, D. C. It will be printed in INFORMATION PLEASE.

If you have a solution to offer to the problems presented below, please write to the Bureau of Industrial Health, Michigan Department of Health, Detroit, Mich.

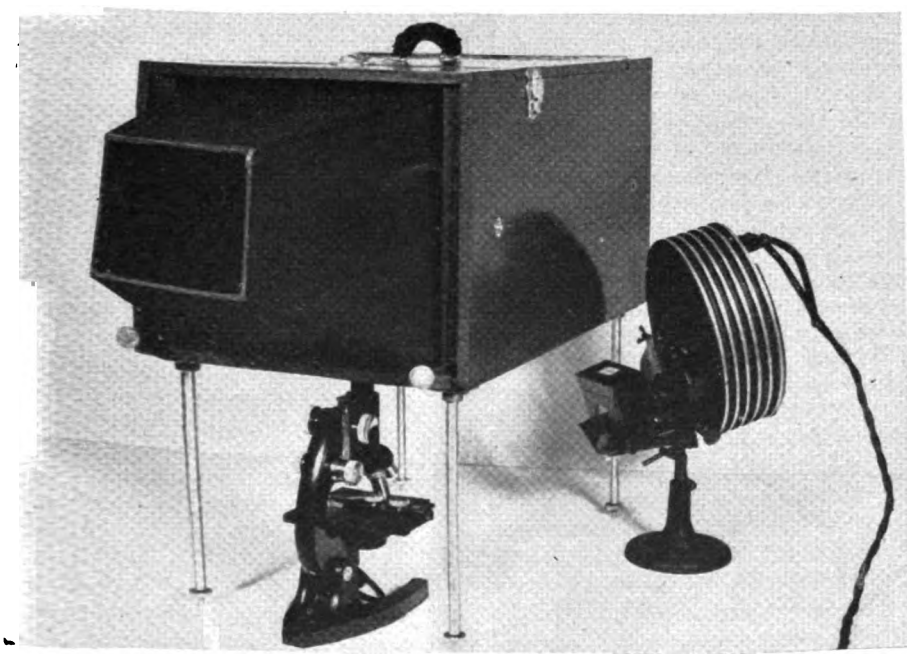
Garnett Machines

We can find in Michigan no completely satisfactory ventilation designs for Garnett machines in the textile industry. The types of ventilation fall into two general categories, the first of which provides for close-fitting covers over the rolls of the machine with local exhaust ventilation applied to the enclosure; the second involves the use of a canopy over the entire machine. The Garnett operators object to enclosure and ventilation of the base of the machine since they must have immediate access to this area in case of fire. The two common types of ventilation are not completely satisfactory since the type involving roll covers requires that these covers be kept tight and in better repair than is usually found in most plants. The canopy-type hood is unsatisfactory because of the large air volume required and the relatively poor control achieved. Has anyone seen really satisfactory Garnett ventilation?

Picker Machines

A problem has arisen concerning the ventilation to be provided for the control of cotton dust at a picker machine operation where cotton is fed into the picker and is discharged by an air blast from the picker directly into mattress ticking. Since the cotton is not cleaned in any other way, considerable quantities of irritating dust emanate from the mattress ticking while it is being blown full of cotton. The discharge of the picker machine is separated in a Y so that one branch is blowing a ticking while on the other branch, a mattress is removed and a new ticking placed. It is necessary for the workmen to have considerable freedom around the operation. The total floor space occupied by the mattresses during this blowing operation is approximately 7 by 10 feet.

Both canopy type and down-draft floor grille type ventilation have been contemplated for this operation. Has anyone seen a similar operation with effective means of control?



INDIANA HEALTH STAFF TRIES FLU VACCINE

In order to have some first-hand information as to what one may expect from the new centrifugal influenza virus vaccine, Types A and B, when it is given to a group of workers, we (Indiana State Board of Health) decided to immunize our own working population. On a voluntary basis the employees were offered the vaccine.

A prophylactic 1 c. c. dose of Squibb Influenza Virus Vaccine was given subcutaneously to 124 employees on November 4, 1947. The vaccine contained 50 percent Type A Virus (equal parts of PR8 and Weiss Strains) and 50 percent B Virus (Lee Strain). The FM1 addition was not available. All were questioned as to egg sensitivity and three were refused the vaccine due to history of egg sensitivity. Seventy percent of this group were females.

At the time of the administration of the vaccine each employee was given a 3 by 5 card and was asked to return this card 3 days later noting any and all reactions that were noticeable to the employee. These reactions were then tabulated. Summary of tabulations: Total number participating 124; no reactions of any kind reported by 64 or 51.62 percent; one or more reactions reported by 60 or 48.38 percent. The reactions reported were as follows:

Sore arm—47 or 37.90 percent of entire group.

Aches all over and headache—13 or 10.48 percent of entire group.

Temperature and chills—7 or 5.64 percent of entire group.

Nausea and vomiting—3 or 2.41 percent of entire group.

Four persons lost time representing 3.22 percent of the 124 participants.

(Continued on page 16)

HEALTH FOR ALL

Excerpted from an article by Dr. V. C. Baird, Medical Director, Humble Oil and Refining Company, written for the plant publication to inform employees, stockholders, and others of the work of the company's medical department.

Doubtless the sage of ancient days who coined the proverb "an ounce of prevention is worth a pound of cure" never had a Kahn and Kline test and never donned a pair of safety shoes.

But very probably he would agree with the corps of doctors, nurses, and technicians of Humble Company's medical division (who think his adage is mighty apropos) that good health is how you keep it.

Simply listed, the functions of the medical division are impressive: Promote a high standard of health among employees; conduct preemployment and periodic health examinations; recommend corrective measures in occupational health hazards; assist safety engineers and operating management in establishing safe working principles; conduct health education among employees; care for or cooperate with insurance carriers in industrial accident cases; advise with and recommend to management placement and transfers of employees according to their physical capabilities; advise and offer counsel on medical subjects to employees.

Of course the medical division does not claim, aspire, or intend to play the role of family physician to Humble's more than 17,000 employees. A man's doctor is like his church—he must choose his own. However, the division is interested in anything that makes for healthier, happier, and more efficient employees, because it has been proved that a sound industrial health program contributes to decreased absenteeism and increased efficiency of employees and is good business in dollars-and-cents savings to employees and to the company.

Facilities of the medical division are available to every employee in the company without discrimination. Whoever he or she may be—there is available such services as: a physical examination to determine where their capabilities may best be utilized; periodic check-ups; special examinations should conditions warrant; treatment of injuries occurring on the job; rehabilitation from such injuries should it be necessary; treatment of minor illness; counsel concerning illness requiring absence from work; medical advisory service; advice on job sanitation and, in company field communities, on sanitary living conditions.

A complete medical record is kept for each employee from the date of his preemployment examination throughout his association with the company. Detailed statistics are kept concerning the frequency and severity of disease groups, as well as analyses of the causes of deaths among employees.

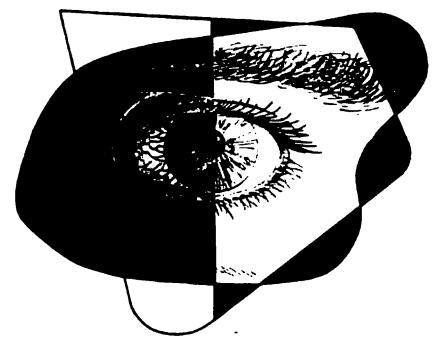
At medical division headquarters there is a completely equipped, modern clinic and laboratory. The medical staff includes six physicians, nine nurses, and seven industrial field nurses, four technicians, and a clerical force sufficient to handle the great volume of records and paper work necessary.

A recent addition to the division's staff was a field medical examiner—a physician who devotes his entire time to traveling from one operating headquarters to another, wherever groups of Humble men and women are employed, assisting them, where his services are wanted, in keeping check on their health and well-being. At this time the field examiner is engaged in conducting periodic physical examinations which will be available on a voluntary basis to every man and woman employed by the Humble companies in field operations.

Preventive medicine, of course, is the backbone of the medical program—the techniques on a community basis that guard water and food supply, seek to prevent epidemics, to promote healthful and careful living and working habits, to prevent illness before it strikes. To accomplish these objectives, sanitary codes for field communities have been developed by the medical and civil engineering groups. These codes provide for regular bacteriological analyses of water supplies; insect and rodent control; drainage; establishment of out door playgrounds; and other factors contributing to the better health and well being of the employee and his family living in the company camp.

The division is constantly engaged in eliminating occupational hazards and protecting against occupational diseases. In addition to routine health examinations, it is the policy to make special examinations to determine the fitness of employees assigned to jobs where there may be special health hazards. Reexaminations are performed as needed.

However, most of the work done at Humble in eliminating occupational hazards and protecting against occupational diseases has been on specific toxicological problems.



Visual Improvement Study Completed

Is worker morale definitely improved by better lighting, proper use of colors in the environment, and correct glasses when needed? Do the workers produce more under these favorable conditions? If so, are the increased production and better morale valuable enough to offset the cost of providing these better conditions? The Federal Government, after a 2-year study, has come up with some of the answers.

Cooperating in the project were the Public Buildings Administration, the National Bureau of Standards, the Bureau of Internal Revenue, the National Society for the Prevention of Blindness, and the Industrial Hygiene Division, USPHS.

For this study, a card-punch subsection of the Bureau of Internal Revenue was chosen, where data are transferred from original income tax forms to punch cards. The first factor studied was the eyesight of the girls.

Their eyes were refracted and glasses supplied to everyone who needed them. A study was made of the efficiency of each girl in relation to the sharpness of her sight for the task she was doing.

Lighting was the second factor conconsidered. Engineers had to decide, among other factors, what quantity and quality were best and whether to use incandescent or fluorescent sources. A third factor for study was the depressing appearance of the room and how to change it so as to lift the morale of the girls and provide reflecting, rather than absorbing, surfaces for the lighting.

The walls, furniture, and machines were painted in shades of gray green and blue green and the ceiling, an off white. The floor was covered with tan marblized linoleum. The light fixture selected was a semi-direct unit 4'-0" long that contained two 40-watt, 3500-degree, K-white fluorescent lamps.

The Public Health Service measured the results of the program by analyzing production rates, percentages of errors, and absenteeism, and by tabulating the answers to a questionnaire.

The problem of setting up criteria for the measurement of the effect of the improvements on the productivity and well being of the workers was most perplexing. Of the 103 workers who were given the eye examination and whose records were secured from April 1, 1945, through September 1946, only 30 were present both years, that is, steady enough in their employment to use as a basis of discussion on results. In comparing the two periods, April through September 1945, and the same months in 1946, which compose the "before and after" periods, the improvement in production of certain forms was 5.5 percent.

However, the changes in difficulty of the tax returns tabulated by the girls made the two periods very difficult to compare. On the basis of the evidence, it is fair to state that in this card-punch operation, better lighting, painting and vision resulted in improved morale and an increase in production; and that if the nature of the task had remained the same in both years, it would doubtlessly have been substantially greater than the observed increase.

A limited number of copies of the report of this study is available from the Industrial Hygiene Division, USPHS, Washington 25, D. C.

INDUSTRIAL ORAL HEALTH

Third * of a Series of Articles by Vernon J. Forney, Dental Surgeon, USPHS

III. ORAL EXAMINATION FOR EVERY EMPLOYEE

A third recommendation which is made for limited oral health services in industry is that of providing preplacement and periodic oral examinations and diagnosis for all employees. Clinical oral inspection of the employees is the basic procedure in both types of examination.

Preplacement oral examination is required by many industries before an individual is placed on the job. Industrial management is interested in knowing the oral health status of the person before he starts working in specific occupations.

Preplacement oral examinations should consist of a comprehensive inspection of all oral tissues and structures. Roentgenographic films and laboratory aids in diagnosis should also be used to their best advantage. An accurate record of all oral findings is made at the time of examination because this record serves a dual purpose. The record form will serve as a unit when records of all employed persons in the industry are analyzed for indexes of oral health needs. It may also be used as a means of identification of the individual. In many instances, the employee and employer have benefitted in compensation cases by having preplacement oral examination records available.

Periodic oral examinations are recommended in industries where potential occupational hazards exist which may cause oral manifestations of disease arising from various exposures. It might be well to mention a few substances used by industries in manufacturing and processing which produce oral lesions on exposure; for instance, inorganic and organic acids; chromium and its salts; volatile solvents; plastic resins; mercury, arsenic, lead, antimony, copper, zinc, cobalt, and their salts; refined sugars; corn products; and abrasives.

Although the atmospheric concentration of some of these substances may be within accepted permissible limits, this does not necessarily mean that these substances will not produce oral lesions. Therefore, it is advisable to conduct periodic oral examinations to evaluate the efficiency of control measures in use.

Diagnosis of oral findings in industrial employees is important since lesions found within the oral cavity are often attributed to an occupational exposure without sufficient investigation of the environment to substantiate the diagnosis. Nonoccupational oral disease has been observed in 75 percent of several industrial populations not engaged in hazardous occupations. When you consider this percentage of expected oral disease plus the potential oral lesions from hazardous employment the problem becomes apparent.

Scientific information regarding investigation of oral health hazards in the industrial environment and the study of oral lesions arising from specific exposures has not appeared in the literature. Few, if any, exposure limits have been advanced for the protection of oral health among industrial employees. Clinical oral examination of the workers provides the necessary data which are needed for detailed study of occupational environments. In the past, too little attention has been paid to the atmospheric concentration level of substances surrounding the worker and the relation these concentrations may have to oral manifestations of occupational disease.

An individual harboring accrued oral defects, exemplified by caries of the teeth, periodontoclasia and areas of tissue degeneration, has greater susceptibility to atmospheric contaminants than the individual who shows normal oral tissues and structures. Therefore, it is necessary that all oral tissue defects in all employees be recognized and diagnosed at the time of preplacement or periodic oral examination. All employees showing defects should have those abnormalities eradicated to protect not only themselves but their fellow workers.

* Sept. '47-Eradication of Oral Sepsis.
Dec. '47-Adequate Records.

Exposure to Benzol Found in Drug Plant

One of the recent experiences of New York's Division of Industrial Hygiene and Safety Standards illustrates again the need for extreme vigilance when highly toxic chemicals, such as benzol, are used in industry.

After the death of a chemist in a New York City drug plant extracting alkaloids from gums with large quantities of benzol, extensive control measures and operative changes recommended by this division were installed by the concern; and, on the basis of tests made, safe working conditions seemed to have been established.

This year, one of the workmen in the same alkaloid department was hospitalized with clinical manifestations of benzol poisoning, and the assistance of this division was immediately requested to determine the cause. One of our engineers was assigned to visit the plant.

After observing normal operations for a day, all potential sources of benzol vapor were ruled out with the exception of one seemingly unlikely possibility. A batch of gum is extracted for 3 days and nights with successive portions of benzol in a completely enclosed system. The residue in the kettle is then treated for 2 hours with steam at 15 pounds pressure to remove all remaining benzol. The worker then transfers the residues to drums, naturally, using a scoop. This operation is repeated twice a week for a total operating time of 2 hours. Respirators which were available were not always used.

Since the working space was very cramped and the man worked with his head close to the material, it was decided to make breathing zone air tests with a benzol detector. The results were dramatic. At one foot above the gum, within the worker's operating breathing zone, benzol concentrations were found ranging from 1,500–2,000 parts per million (p. p. m.)—an enormously high concentration when one considers that 50 p. p. m. or less is considered to be the toxic limit for this solvent. Three feet away, concentrations below the allowable limits were found. Six feet away, the detector did not register. In short, the residues, which were apparently freed of benzol contained enough residual solvent to release very high **local concentrations** which were rapidly dissipated, thus escaping routine detection by the plant.

Having found the source of contamination, our engineer went into conference with the plant engineer to remove the hazard. Because of the nature of the operations and the cramped quarters, local ventilation could not afford complete protection. The use of efficient respirators could not be relied upon. The concern was strongly urged, therefore, to explore the possibility of substituting a solvent of low toxicity for the benzol. But the chief chemist stated that continuing research along these lines had proved fruitless. The recommendation was then made that the material to be extracted be originally placed in the extraction kettle in a removable wire basket or canvas bag, fitted with eyes, either of which could be quickly removed from the kettle using the existing overhead travelling chain hoist. Thus, the 2 hour weekly exposure to benzol would be reduced to 5 to 10 minutes. At the same time the operational efficiency would be greatly increased.

The concern appeared to be pleased with this suggestion and immediately took steps to put it into effect. Subsequently, however, the division was informed by the concern that it had finally discovered a solvent of low toxicity which was being introduced in the place of the benzol. A very difficult problem was thus solved.—**May R. Mayers, M. D., New York.**

Utah Studies Soil for Arsenic From Smelters

The Agricultural Experiment Station of the Utah State Agricultural College, in cooperation with the United States Bureau of Entomology and Plant Quarantine (Division of Bee Culture), conducted a survey during 1946 to establish a rough "arsenic level" for areas in Utah that have sustained most frequent adult bee losses through contact with poisons.

In the Jordan Valley of Salt Lake County, many smelters were operated in the past. Most were closed by injunction when arsenic and other metals, passing up flues, seriously contaminated farm land and crops. At present, most of the arsenic is being trapped by baghouses or the Cottrell system installed in the operating smelters. However, the several large systems around Sandy and Midvale, closed years ago, poured out large amounts of the arsenic which now contaminates local soils.

The highest average soil arsenic was for the Murray area, with 171 micrograms per gram of soil (expressed in arsenic trioxide). The second highest averaged 26.61, while samples from other areas varied from 17.49 to 5.03 micrograms per gram of soil. Soils in general varied from 4 to 10 micrograms per gram except for orchard soils. (Samples for study were purposely taken from uncultivated soil and plants to avoid the possible influence of agricultural sprays and dusts.)

While arsenic in pollen generally followed the same trend as that in the soil, being high at Murray and Midvale, this was not true at Sandy, where soil arsenic samples were relatively high, but pollen arsenic averaged lower than elsewhere. Also, in early spring, arsenic content was high in trap pollen in certain areas, but tended to drop during midsummer in the same localities.

Arsenic in bees averaged approximately 0.1 microgram of arsenic trioxide equivalent per bee, in all but two areas, where it was higher. Average arsenic in sweet clover blossoms remained at a rather constant level in most counties, between 1 and 2 micrograms per gram of blossom.

INDUSTRIAL TOXICOLOGY

Lawrence T. Fairhall, Ph. D., U. S. P. H. S.

BENZENE HEXACHLORIDE

(Gamma-hexachlorocyclohexane)

Benzene hexachloride, hexachlorocyclohexane, $C_6H_6Cl_6$, one of the newer insecticides also known as BHC exists in five isomeric forms, the *alpha*, *beta*, *gamma*, *delta*, and *epsilon*. It is produced by bubbling chlorine gas through benzene while powerful ultraviolet rays irradiate the mixture. This produces a solution of crude benzene hexachloride containing the various isomers from which the four isomers which are useless as insecticides are eliminated and the *gamma* isomer is concentrated. A process recently reported utilizes dilute caustic during the chlorination reaction and is claimed to increase the yield of the *gamma* isomer to 42 percent. Crude benzene hexachloride has a strong, musty persistent odor. The pure *gamma* isomer itself, however, has but very little odor. Benzene hexachloride or 1, 2, 3, 4, 5, 6-hexachlorocyclohexane, $C_6H_6Cl_6$, should not be confused with hexachlorobenzene, C_6Cl_6.

Benzene hexachloride is a remarkable compound in that it functions as a stomach poison, contact poison, and fumigant and that it is stable in acid and at high temperatures. Since its insecticidal properties are held mostly by the gamma isomer it is sometimes called gammexane. This isomer has been shown to be highly toxic to a wide range of insects and related pests at low concentrations, while the other isomers are only from ⅙ to ⅒ as toxic.

Gamma-hexachlorocyclohexane is a British war discovery and against certain pests this substance has proved more toxic in laboratory tests than any other insecticide examined (*1*). Investigation of this insecticide by measuring the amount necessary to kill individual roaches and flies shows that the approximate LD50 for the cockroach is 4.6 milligrams per kilogram and 0.8 milligram per kilogram for the housefly (*2*). *Gamma*-benzene hexachloride is distinctly more toxic for these insects than DDT. At the 50 percent mortality level *gamma*-benzene hexachloride is about nine times as toxic to housefies as p, p'-DDT and about 18 times as toxic as the pyrethrins (*3*) However it does not possess the long-lasting toxicity of DDT, and to overcome this lack of residual strength it may be combined with DDT for special applications.

It is particularly effective against the cotton boll weevil, cotton aphids, and the cotton flea hopper. It is one of the few compounds that will kill both cattle lice and eggs at the same time. Lice, fleas, flies, mosquitoes, and numerous other insects are readily controlled and current trials indicate that benzene hexachloride has considerable value as a soil insecticide.

The acute and chronic toxic effects of benzene hexachloride have been investigated by ingestion experiments with rats (*1*). The amount of the *gamma* isomer by mouth necessary to kill 50 percent of the animals in 7 days was 190 milligrams per kilogram of body weight. No chronic effects were noted, following the administration of benzene hexachloride. The *gamma* isomer was fed to rats in amounts of 10, 20, or 30 milligrams per day for 5 weeks without producing any effect whatsoever. Woodward and Hagan (*4*), however, reported some liver damage following feeding the *gamma* isomer to dogs for 36 to 49 days, although they fed 100 milligrams of the mixed isomers daily to rats for 2 months without apparent injury. There is evidently no absorption through the skin since rats painted daily with this substance for 2 weeks showed no signs of absorption. The subcutaneous injection of the *gamma* isomer in amounts of 100 milligrams per kilogram of body weight killed 25 percent of the animals.

Recent experiments have shown that exposure to sprays of oil-base containing 3 percent *gamma* isomer killed rats after 11 days of exposure (*5*). The *gamma* isomer has also been found to be distinctly toxic to fish at concentrations of one part per million.

So far as toxicity to humans is concerned, it has been fairly well established that the crude isomer is less hazardous from a toxicological standpoint than DDT (*5*). Furthermore, no cumulative effects have been reported. Though there is obviously a definite need for more work to be done toxicologically, present indications are that it is improbable that such residual quantities of benzene hexachloride as might remain on foodstuffs under conditions of ordinary application will present any hazard. No maximum allowable concentration value has so far been established for benzene hexachloride.

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Nurses Hear Talks On Toxicology

At the October meeting of the Industrial Nurses Section, Washington State Nurses Association, in Spokane, the importance of a knowledge of toxicology to industrial nurses was stressed in talks presented by Dr. L. M. Farner, Head, Industrial and Adult Hygiene Section, State Department of Health, and Ruth Gordon, R. N., Boeing Aircraft Company.

Dr. Farner pointed out that a knowledge of toxicology is one of the industrial nurse's most important tools. It helps

(Continued on next page)

State News

(Continued from page 9)

Mr. Frick gave a most interesting and challenging talk to the industrial nurses. He stressed the importance of the nurse knowing *line authority* and of obtaining the cooperation of all department heads.

Miss Brunson talked on the advantages of good nutrition in industry. She gave a most interesting report of a nutritional survey that was made in a plant village showing diet deficiencies and irregularities which were reflected in a low hemoglobin, thus reducing efficiency and so, production. She urged that management provide more nutritional education to help eradicate the usual lunch of "a dope and a dog." She also emphasized the value of the workers eating a good breakfast before starting work. Charts showing a breakdown in food values of various foods were displayed. She summed up her remarks by the slogan "Let's feed the boys."

WISCONSIN

Heart Disease—In spite of the fact that heart disease is the leading cause of death, little progress has been made to stimulate the routine use of special diagnostic methods to find these cases and bring them under the proper control measures. This is one of the principal reasons for initiating a special program to use the electrocardiograph as an aid in detecting organic heart disease.

The members of the State Board of Health have approved such a program to be conducted by the Industrial Hygiene Unit. By using portable equipment, it will be possible to make electrocardiographic studies in any plant wishing to cooperate in this program.

Nurses Hear Talks

(Continued from page 15)

her understand the various processes and their hazards in her plant. With this understanding she is able to take an accurate, intelligent history of a worker's complaints and correlate the significance of his symptoms with his working environment. Such analysis can be an invaluable aid to the industrial physician in making a diagnosis or, in his absence, makes it possible for the nurse to determine, in accordance with the physician's orders, the treatment to use.

The value of the industrial nurse to her employer and the workers, according to Dr. Farner, depends in part on her keeping abreast of the changes within her plant in materials, processes, and methods of handling. It was also brought to the nurses' attention that courses in industrial nursing and industrial hygiene and toxicology, especially designed to help industrial nurses do a better job, are now available at the University of Washington.

In a complementary talk, Miss Gordon related how these university courses had stimulated the nursing staff in her particular plant in the realization that a knowledge of all toxic substances used in the plant would benefit the nurses in the everday treatment and health education of the employees. To provide such knowledge, it was decided the nurses would compile a chart listing all materials, their toxic symptoms, and the proper treatment.

The first step in the development of the chart was to gain the cooperation of the factory superintendent, through whom information on the specific materials and a list of the departments requisitioning each was received from plant stores. From other plant supervisors and the safety department, information as to toxic ingredients of trade name products was learned. Material on toxicity was then gained from such sources as the university lecture course, recognized authoritative publications, official nursing journals, and informed plant personnel. With all the data at hand, the chart was arranged in several columns as follows:

(1) Alphabetical list of materials
(2) Recognized maximum allowable exposures
(3) Shops or departments where used
(4) Source of hazard (process)
(5) Mode of body entry
(6) Symptoms—acute and chronic
(7) Treatment—whether by nurse or by physician only
(8) Prevention

As portions of the chart are completed, the material is checked by the chief nurse, then referred to the medical director for correction, criticism, and additions. Several impressions of the final copy are then made and distributed to all plant medical stations so that the material is available to every nurse.

RECOMMENDED READING

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Two lost 1 day each and two lost one-half day each. The sore arms lasted 2 days and the duration of other reactions was generally 24 hours.

Statistically, then, if one is permitted to speculate from this limited group, one may expect a practically even distribution of reactors and nonreactors. However, the chief reaction noted will be a sore arm. Lost time may be incurred but the duration is very short. Thus it appears that no serious reactions or a great deal of lost time may be expected from using the centrifuged influenza vaccine in industry.—**Louis W. Spolyar, M. D., Indiana.**

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