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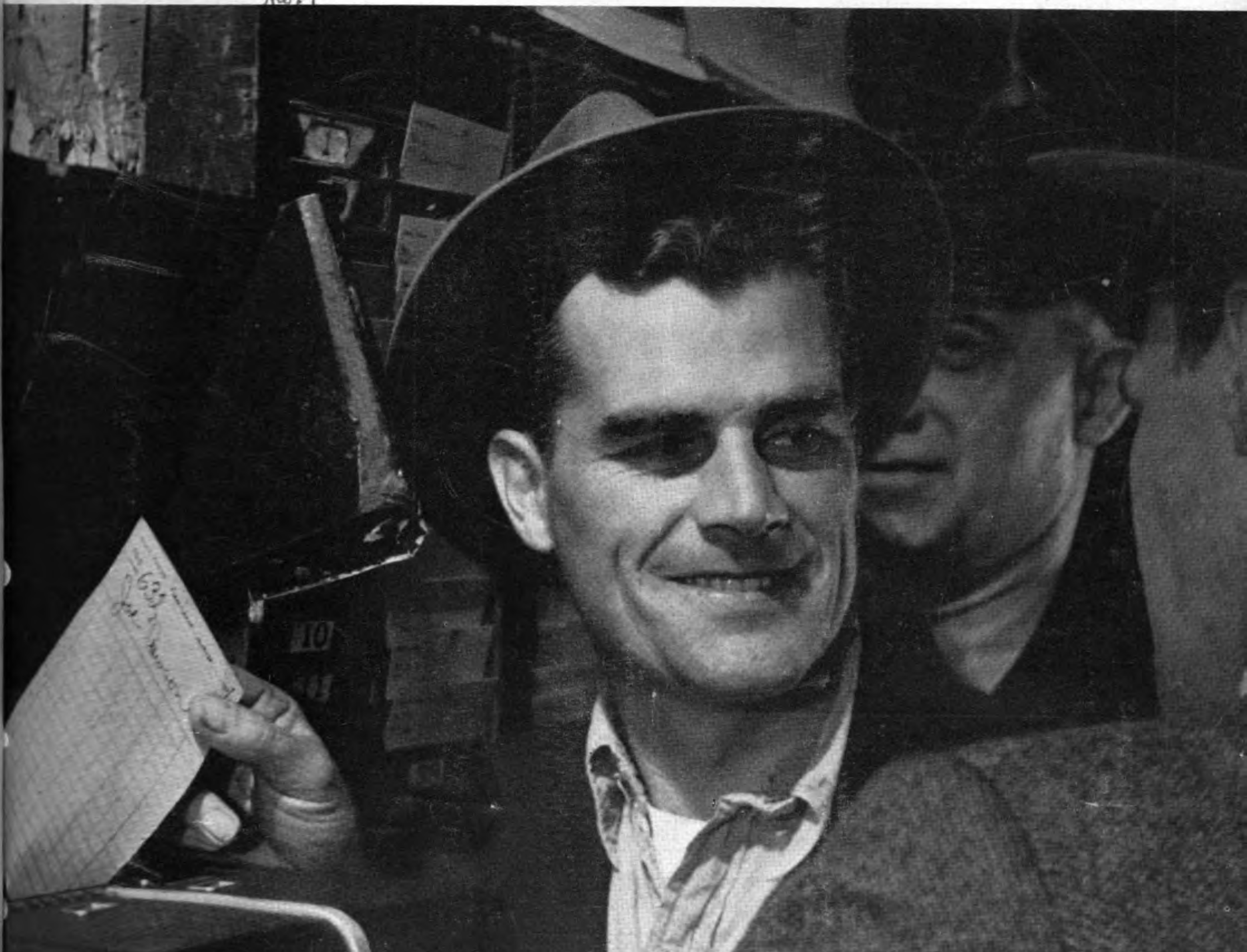

NEWSLETTER

INDUSTRIAL HYGIENE NEWSLETTER

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FEATURES

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OCCUPATIONAL MORTALITY RATES, 1950 SUBJECT OF STUDY

R. C. Strauss, USPHS

An occupational mortality study is now being planned for 1950 by the National Office of Vital Statistics of the Public Health Service, which will make nation-wide death rates by occupation and industry available for the first time to industrial hygienists and other public health workers. These groups have long expressed their need for this type of data.

The components of occupational mortality rates are the number of deaths by occupation and industry and the population by occupation and industry. The information on death certificates will give the figures on deaths by occupation and industry. The population data will be obtained from the 1950 census enumeration. The National Office of Vital Statistics is consulting with the Bureau of the Census regarding the occupation and industry questions on the 1950 census schedule to ensure the best possible agreement between the information which they will elicit and the corresponding items on the death certificates.

State Registrars of Vital Statistics are now working with the National Office of Vital Statistics to improve the accuracy of the occupational and industrial entries on death certificates. Definitions of occupation and industry have been added to the revised death certificates that are being put into effect on January 1, 1949. The new wordings will aid in obtaining the type of entries that are required. A "Guide to Occupation and Industry Items on Death Certificates" will be distributed to funeral directors and local registrars. This guide gives explanatory information on how the occupation and industry items should be entered on death certificates.

It is expected that valuable data will be obtained from this study. As a measure of the effects of the occupation itself, it will increase our knowledge of the relationship between the more important causes of death and the occupational and industrial environment. Occupation is the only measurement of socioeconomic status which is available from the death certificate. It is well established that socioeconomic factors have an effect on mortality.

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Industrial Hygiene Highlights at APHA Meeting, Boston

J. J. Bloomfield, USPHS

It seems to me that industrial hygiene in my own quarter of a century experience has gone a long way. In my early days the field of industrial hygiene was a very limited one. We were primarily concerned with finding out basic fundamentals—investigating and evaluating the strictly occupational diseases. We were just on the threshold of learning the etiology of common industrial diseases, like silicosis. Today industrial hygienists concern themselves with such problems as maximum allowable concentrations of hazardous substances, the determination of carcinogenic agents in the industrial environment, the control of ionizing radiation, the discovery of new diseases, such as Shaver's disease, and the expansion of industrial hygiene to include nonoccupational as well as occupational influences on the worker's health and well-being.

When you consider these problems, as well as the others presented at the sessions of the Industrial Hygiene Section you can see the greatly widened breadth and scope of this field. We have come a long way. This progress is not only reflected in the quantitative and qualitative character of our work, but also in the increasing recognition which it is receiving. Whereas a few years ago, only a few organizations—such as the U. S. Public Health Service, the U. S. Bureau of Mines, the newly established Department of Industrial Hygiene at the Harvard School of Public Health, and a sprinkling of States—were interested in this field, today we have industrial hygiene divisions in every State, in large cities and counties, in large industries with research and control departments, in insurance companies, and in a host of other organizations.

Industrial hygiene has indeed grown with the times. It has attained a "new look" along with our fashions. Originally, we were concerned with the health of the workers exposed to mercury, to lead, to silica, and to an increasing array of other industrial substances and processes. Today we are even concerned with the farm worker. There are more than 8 million persons in this category, and those who are migratory workers are particularly susceptible to disease, because of their transient status and attendant poverty, lack of sanitation facilities, and proper care. Plans are being mapped out on how to care for this migratory section of our farm population.

On the over-all scene, there is a keener appreciation of the importance of the worker's health. The preservation and maintenance of industrial health has various implications. To management it means greater profits and new outlets. To the worker it means employment. To the consumer it means new gadgets and luxuries—television and other modern inventions. To the industrial hygienist, however, technological developments pose headaches, because of the potential hazards inherent in new substances and processes. Consider, for example, radiation energy, new solvents and plastics.

World War II gave impetus to the adoption of a new concept of the "total man." Previously, we had attempted to dissociate the man into his working and after-hours life. The health of the worker during his 8 hours on the job was the sole concern of the industrialist. If he picked up a pneumonia bug at home, that was too bad for the worker. The war production race, however, with its stress on manpower conservation, revealed that the worker's illness, regardless of its origin, was also costly to management. Sickness absenteeism was expensive in terms of unfilled orders, necessary substitutions, and other considerations. Yielding to the pressure of circumstance, the field of industrial hygiene broadened and is continuously expanding to meet the needs of the times. That is why the industrial hygienist is also concerned with medical care. This is the result of labor's vociferous cry for adequate medical care for themselves and their families and of management's increasing recognition of the values and economic practicality of such services.

There are still other problems, however, which must be subjectively handled by taking ourselves in stock. Unfortunately, public health workers have lagged behind scientific progress in our various fields of activity. For example, long after communicable diseases had ceased to be a prominent cause of disability, the major efforts of health departments were still concentrated on this group of diseases. For the past 10 or 12 years we have been trying to get health administrators to shift their emphasis—without necessarily relinquishing 1 inch from communicable disease control—to a field which exacts a greater toll in morbidity and disability—chronic diseases. Even today there are those who continue to concern themselves almost wholly with communicable diseases. Ostrich-like, they are hiding their heads to the import of chronic diseases. This need for a shifting of emphasis also applies to the field of chronic disease itself.

Our statistics indicate a need to concentrate on such important diseases as rheumatism, arthritis, heart ailments, cancer, and diabetes. These are the chief killers today. Industrial hygiene offers the opportunity for an attack on these diseases. What we need, then, is to constantly reevaluate our problems and change our perspectives to meet changing needs.

Because of the broadening scope of the field of industrial hygiene, I should like to make a plea for the cooperation, support, and assistance of all other public health workers, both official and voluntary. The work of the industrial hygienist is necessarily a teamwork operation. Although he plays a distinct and specialized role in this field, he may still serve his colleagues by acting as a spearhead to bring their services to industry's doors. I hope that you will let the industrial hygienist help you do your job and that you will lend him your assistance with his—exerting all efforts toward our common goal, the preservation and maintenance of public health.

COVER PICTURE: Courtesy of New York University—Bellevue Medical Center.

The Industrial Hygienist and Medical Care

During the past decade a major controversy has raged concerning the proper scope of industrial hygiene. This controversy is primarily due to a confusion of the functions involved with the personnel who perform them and the organizations which bear the responsibilities. For example, Dr. Clarence Selby said 10 years ago that "Engineers * * * have innocently succeeded in limiting our conception of industrial hygiene to the application of engineering principles in the control of unhealthful working conditions and environments."

Although this very narrow concept no longer prevails, the mistake is still made of prescribing the functions by the interest and competency of certain existing specialists and organizations. The functions thus prescribed may or may not coincide with a grouping of functions resulting from a more objective approach.

Now almost everyone in the field of industrial hygiene recognizes, at least in theory, that the central objective is optimal health of the worker. Despite the logic of the comprehensive approach, however, there exists considerable reluctance to include the function of complete medical care for workers within the scope of industrial hygiene. The most important reasons for this reluctance are: (1) a lack of appreciation for the functional unity of medicine, and (2) a confusion of functions with personnel and responsibilities.

From a functional point of view medicine is indivisible. In recent years there has been a growing recognition of the interdependence, if not unity, of preventive and therapeutic medicine. What is therapeutic for one person at a certain time, is often preventive for another person, or for the same person at a different time. Furthermore, the most successful therapy is that which is initiated as early as possible in the course of a disease. As a result, it is becoming more and more difficult to distinguish between prevention and therapy. The application of this fact to industrial hygiene is obvious: there is no valid functional separation between preventive and therapeutic medical services for workers.

Presented by Walter J. Lear, M. D., USPHS, before the Industrial Hygiene Section, American Public Health Association meeting in Boston, November 11, 1948.

Equally invalid is the functional separation of medical care for occupational and for nonoccupational illness. What was considered nonoccupational in origin yesterday is today proven to be caused by occupation.

As the good health of the worker, not the source of his illness, is the financially important factor, the monetary approach is equally valid for nonoccupational illness. In fact, in terms of absenteeism rates, the economic loss due to nonoccupational illness must be considerable. Most recent studies indicate that about 90 percent of absenteeism is nonoccupational in origin, or at least so classified. In spite of this, management has not been convinced that the savings gained by providing workers complete medical care would equal or exceed the cost of such a program.

However, the companies that do provide complete medical care for their workers are thoroughly convinced of its financial worth. On the basis of their experience they feel there is no question that such service at least pays for itself as well as produces important intangible benefits. In evaluating the comprehensive medical care program at the Consolidated Edison Co. of New York, Dr. J. J. Wittmer concluded that "as a result, our absenteeism rate is well below the national average. Our worker efficiency is at a high level and employee morale is all that one could hope for."

Dr. Franz Goldman reported similar objectives for the four comprehensive industrial medical care programs he studied: the reduction of absenteeism; the maintenance of highest worker efficiency; and the assurance of good labor relations with attending low labor turnover. It is interesting to note that the total cost in these four plans about 1940 ranged from $11 to $23 per eligible person (both employees and dependents) per year for inclusive service. Clearly, then, important economic factors also support the inclusion of complete medical care for workers within the scope of industrial hygiene.

In the past, the industrial hygienist has had an important role in three of the four aspects of medical care for workers—preventive and therapeutic services for occupational injury and illness, and preventive services for nonoccupational illness. With few exceptions, the industrial hygienist has played a minor role in the fourth aspect of medical care for workers—therapeutic services for nonoccupational illness. The time is long past due for the industrial hygienist to join with the practicing physicians and all other community health resources in filling this important gap in the field of industrial hygiene.

In considering general therapeutic medical services for workers, the industrial hygienist must, first of all, bear in mind the unity of medicine. This means he should have a thorough grasp of all aspects of medical care for workers. The industrial hygienist who has been in the field for some time is already familiar with the provisions for the medical care of workers with occupational illness. The newcomer in the field, however, should acquaint himself thoroughly with the State workmen's compensation law, local in-plant medical services, and special provisions in the community for the prevention and treatment of occupational disability. Several national organizations conduct periodic surveys of in-plant medical services. The industrial hygienist will find the most recent of these surveys helpful in evaluating this phase of medical care for workers. The unity of medicine also means that the opportunities for introducing good public health practice into therapeutic programs should not be overlooked.

In summary, the industrial hygienist of today must be concerned with all functions that affect the health of workers. This approach is not simply a long-range objective; it is a current necessity, as the Medical Advisory Board of the National Security Resources Board has given top priority to the problem of worker health.

The industrial hygienist must assume

(Continued on page 5)

States Spend More Money on Industrial Hygiene

Victoria M. Trasko, USPHS

Appropriations for State and local industrial hygiene activities for fiscal year 1949 have reached a new high and represent the highest amount budgeted over the past years.

Sixty-one jurisdictions in 48 States, the District of Columbia and the four Territories budgeted $2,500,723 for industrial hygiene activities for the fiscal year 1949. Of this amount, Federal funds made up $1,337,986 or 53.5 percent; State funds, $934,970 or 37.4 percent; and local funds, $227,767 or 9.1 percent. A line item of $964,666 of Federal grant-in-aid funds was designated for industrial hygiene work, but the States budgeted an additional $373,320 of general health funds.

Federal funds were budgeted by 56 of the 61 jurisdictions carrying on industrial hygiene programs on full or part-time basis. The other 5 units included in the count are local units and obtain their funds from local sources only. Of the 61 units, 17 are being supported entirely by Federal funds.

Comparison with 1948

A comparison with the 1948 fiscal year shows that State and local agencies will be spending approximately $95,000 more this current year for industrial hygiene activities. While this sum is not great, it is significant that this increase is made up from State and local funds. In fact, the study shows that the agencies will use $130,476 more State and local monies, and $35,593 less Federal grant-in-aid this year than they did during the 1948 fiscal year.

Summary of Annual Appropriations

Table 1 represents a summary of annual appropriations for industrial hygiene activities for the past 8 years. The information was culled from State health department budgets received by the Bureau of State Services, Public Health Service, and in some instances, from correspondence with the agencies themselves. The administrative set-up of some of the units often made it difficult to identify all the funds used by them, especially State and local monies. For this reason, the figures shown in Table 1 are probably slight underestimates of the actual amounts allotted for industrial hygiene activities.

Industrial hygiene programs in State health departments received their main spurt in 1936 with the availability of Social Security funds. Since then, the growth in the number of units and the extent to which these units are assuming more and more financial responsibility have been on the increase, as is reflected by the figures in this table.

The period 1945–46 marks the year when the proportion of State and local funds was greatest—59.1 percent; and that for Federal funds was the lowest—40.9 percent. The following year, 1946–47, one million dollars of Federal funds were set aside for industrial hygiene grant-in-aid. These funds were allocated according to a formula, making it possible for the rest of the States to start industrial hygiene services and for others to expand their programs. In that year, the proportion of State and local funds decreased to 39.8 percent and Federal funds increased to 60.2 percent. Even at that, the actual amount budgeted from State and local sources was greater than for the previous year.

In 3 years, during which time the annual designation of approximately one million dollars of grant-in-aid for industrial hygiene was continued, the proportion of State and local funds increased to 46.5 percent, and the proportion of Federal funds dropped to 53.5 percent. The figures in the table demonstrate that the State and local agencies are not only budgeting more funds for industrial hygiene, but also that the trend to obtain State or local support is continuing.

Table 1.—*Annual appropriations for State and local industrial hygiene activities*

Year	Number units budgeting	Amount			Percent		
		Total	State and local	Federal	Total	State and local	Federal
1941-42	35	$930,176	$357,059	$573,117	100.0	38.4	61.6
1942-43	38	1,005,821	457,556	548,265	100.0	45.5	54.5
1943-44	37	1,239,064	624,159	614,905	100.0	50.4	49.6
1944-45	44	1,246,538	600,571	645,967	100.0	48.2	51.8
1945-46	46	1,432,088	846,769	585,319	100.0	59.1	40.9
1946-47	59	2,209,700	879,227	1,330,473	100.0	39.8	60.2
1947-48	61	2,405,840	1,032,261	1,373,579	100.0	42.9	57.1
1948-49	61	2,500,723	1,162,737	1,337,986	100.0	46.5	53.5

MEDICAL CARE

(*Continued from page 4*)

the leadership for the over-all planning and integration of a comprehensive program of work health. One important function bearing on the health of workers is the provision of their medical care. The industrial hygienist should be familiar with all aspects of medical care for workers: that for occupational injury and disease, that available to the worker in the community at large, and that provided by special plans for employed groups. These plans are growing very rapidly in numbers, size, and complexity. The industrial hygiene units of public health departments are in the most favorable position to provide an impartial service that will assure the incorporation of proper objectives and high standards into industrial medical-care plans. The industrial hygienist in industry must also acquire a background in this field in order to serve as an effective consultant to and representative of management in matters concerning these plans.

Assuming these various new duties will not be an easy task. However, it will be a most rewarding one in terms of the improved health and medical services for workers that will result. This is an opportunity that all of us in industrial hygiene cannot afford to miss.

COST ANALYSIS OF A MEDICAL DEPARTMENT IN INDUSTRY [1]

Paul A. Brehm, M. D., Supervisor

Industrial Hygiene Division
Wisconsin State Board of Health

To establish, equip, staff, operate and maintain an industrial medical department requires a substantial investment in order to provide specific services which can be of definite benefit to both employer and employee. The costs of such a department depend upon a number of factors, mainly the size, hazards and health needs of the manufacturing establishment and the comprehensiveness of the program.

Since industry must constantly watch every item of operating cost in order to realize a profit, it is interesting to observe how this watchful spending is applied to the medical department. Industry has certain legal requirements to protect the health and safety of its workers. Beyond that point, the measures used for a more complete health and safety program depend upon management's concept of the value of the human machine in relation to better production and better business. The variations we find in management's attitude is reflected in the administration of the medical department. We are familiar with the functions of a good medical department, but we are not too clear as to the costs of part or all of these services in relation to the size and problems of a given industry.

In order to evaluate the organization, functions, and costs of such departments, it was necessary to analyze the experience of a number of different industries. An analysis of costs is not a simple task—the information is not always easy to obtain. Fortunately, only a few employers were reluctant to supply any information or, at best, only meager facts. The majority of employers cooperated fully; some were most enthusiastic about their medical department, proud of their program and anxious to compare their services and costs with other industries of like size and kind of manufactured goods.

Most of the plants found it difficult to uncover all of the expenditures which directly or indirectly resulted from the operation of the medical department. It is hard to understand how a business otherwise most proficient in accounting for expenses to run every other department has not followed the same practice for the medical department. To be sure, all these costs had been charged against plant operations, but they were buried in the expenses of other departments. The larger organizations offered more difficulties than the smaller ones. It was possible, however, to assemble the information from all of the plants and develop some basis for making a cost analysis.

It should be pointed out here that, in using the term "plant medical department," we refer to a separately housed and equipped dispensary or hospital unit under the administration of professional personnel with or without the direct supervision of a physician hired on a part- or full-time basis. There will be no attempt made in this presentation to discuss the value or benefit to an industrial organization resulting from medical department functions. This has been adequately covered by many National and State agencies and organizations, by a number of our leading industrial medical consultants and by the excellent reports from top management and medical directors of several large industries.

The medical department costs and services in 40 plants were analyzed. This is a small number and perhaps not as significant statistically as a more extensive coverage. Nevertheless, this number represents a good cross section of industry—all sizes, varied in hazards and products manufactured, and representing every phase of medical department administration.

Size distribution and per capita costs were as follows:

Number of employees	Number of plants	Average per capita cost
100-499	13	$15.67
500-999	12	21.28
1,000-1,999	7	12.36
2,000-4,999	6	10.15
5,000 and over	2	6.00

This table illustrates how the health needs and problems of an industry can greatly influence the costs. The smallest industry in this entire series housed only 150 men and women. It was an industry operated exclusively for the rehabilitation of handicapped persons. The medical staff and services included a full-time graduate registered nurse, visiting nurse service, a part-time medical director, numerous consultants, dental services, extensive equipment for a rehabilitation program, technicians, artificial appliances, a very good visual correction and protection program, and a rigid safety program. These persons are taught trades of all kinds; they are subjected to a wide variety of hazards. For these reasons, the most complete protective measures must be taken. This small plant has a per capita cost of $33—unusual but most essential for this group of individuals.

The progressive drop in the per capita cost from the 500–999 group through the 5,000 and over group is significant and in keeping with similar studies by others (1, 2, 3). It indicates that the larger plants with a greater staff and with more emphasis on good administration will tend to have lower costs.

Cost analysis by type of manufactured products:

Industry	Per cent of total	Average per capita cost
Paper and its Products	18	9.66
Food and Beverages	15	11.54
Iron and Steel (Heavy) [1]	30.5	14.41
Miscellaneous Machining Operations	36.5	9.81

[1] Foundry sections in each plant of this group.

The industries in these classifications represent working hazards and potentially harmful exposures of almost every known kind. The hazardous nature of the processes in the heavy iron and steel group caused a more costly disability experience and required a more extensive preventive program than the other groups. The food and beverage industries were found to have good medical programs—excellent sanitation and emphasis of the health of the employees was of paramount importance.

The type of supervision of the medical department was distributed as follows: 1 plant with a full-time medical director; 8 plants with part-time physicians in charge; and 31 plants with physicians on call only, with graduate registered nurses in charge of the department.

[1] *Presented at Industrial Nurses Section, Illinois State Nurses Association, Rockford, Ill., October 9, 1948.*

In order to appreciate the variety of costs chargeable to medical department activities, the following items are listed here:

1. Salaries and Fees

Nurses: Full-time; part-time and visiting.

Physicians: Full-time; part-time. Consultants are used for physical examinations and treatment of industrial cases by the various specialists. The family doctor receives payments for first calls on suspected industrial cases and for all or part treatment of industrial injury or disease.

Dental: The plant dentist—full- or part-time—dental hygienist, partial payment of fees of local practicing dentists.

Clerical: Those on medical department staff.

Technicians: Laboratory, X-ray, specialized treatment procedures.

First-Aid Attendants.

Janitor service.

Safety department personnel (if included as part of one health and safety department).

2. Supplies and Equipment

Medical supplies.

Equipment and quarters.

Costs of construction of quarters, including separate hospital buildings.

Costs of starting a department make the first year's expenditures higher than those of subsequent years.

Repairs, replacements, depreciation, additions and alterations.

3. Medical Services

Physical examinations: Preplacement should be complete, including chest X-ray, blood serology for the diagnosis of syphilis and routine blood and urine analyses. In addition, any other specialized diagnostic procedures where indicated and at the judgment of the examining physician. Example—electrocardiogram, basal metabolism, etc.

Periodic reexaminations—as complete as the preplacement examinations, including any special diagnostic measures considered necessary.

Return to work examinations—where indicated. The extent of the examination is a matter for the judgment of the examining doctor.

Exit examinations—complete.

Diagnosis and care of industrial injuries and illnesses.

First-aid treatment for nonindustrial injuries and illnesses (minor treatment given in some plants). Treatments and dressings ordered by outside doctors.

Home visits: Occasionally by plant doctors, plant nurses, or visiting nursing agencies.

Pay travel expense for nurse's car—usually a fixed amount per month plus a certain rate per mile for distances traveled.

Eye screeners—rental basis.

Prescription safety lenses—industry's share of the cost.

Special examinations or health programs: Chest X-ray programs; vision testing services; hearing tests; venereal disease diagnostic programs; immunization programs (including cold vaccines); electrocardiographic studies; dental programs (hygiene), diagnosis, corrections; nutrition programs (includes dispensing vitamins).

Specialized treatments: Physio- and hydrotherapy; rehabilitation program (artificial appliances; hearing aids).

Plant sanitation and industrial hygiene: In-plant hygiene facilities or outside agencies or consultants.

Health education: Purchase of posters, pamphlets, films.

4. Insurance coverage and compensation costs

Compensation insurance premium.

Group insurance coverage—hospital, medical and surgical. (Industry's share of the premium.)

Self-insurers—charge payments of compensation for disabilities to medical department.

5. Miscellaneous charges

Nurses' uniforms; laundry (uniforms and dispensary linens); subscriptions to periodicals, books, etc.; travel expense to meetings, special college courses, etc.; partial payment of employee's salary (indirect labor costs); for time spent at the doctor's office—outside the plant; for time spent on safety committee work; for time spent in the plant medical department.

Telephone and telegraph; pay-roll taxes; rents and depreciation; heat, light and gas; stationery, printing costs for record forms, postage, etc.; transportation costs—taking ill or injured to home or hospital.

6. Safety department costs (other than salaries)

Equipment and supplies: quarters and furniture.

Safety equipment and supplies—goggles, shoes, gloves, hats, clothing, respirators, masks, etc., and costs of maintenance, repair and replacement of the same.

Recommendations and Conclusions

The costs of industrial medical departments can and should be accurately tabulated and analyzed. If we ever hope to present doubtful management with a dollars and cents argument on the value of a medical program, our best chance is by means of accurate cost records, analysis of those data and an intelligent interpretation of these findings.

Cost analyses should be determined by a uniform method to be of any value for the purpose of comparison. The most common and acceptable method is to arrive at the cost on a per capita basis. Some industries use the basis of costs per 100 dollars pay roll. Per capita costs are determined by dividing the total of all expenditures per month or per year by the average *total* employment for that month or year.

There is a definite need to study this problem in greater detail in each industrial State. Attempt should be made to record all medical department costs, to analyze these costs by size and type of industry. An industrial medical department is as important as any other subdivision in the organization and should receive such recognition by top management.

The information from this study furnishes some idea of what is done in some industries. It illustrates the wide variety of services rendered by the medical department and how inadequately the costs of those services are recorded. There is no attempt here to tell industry what features of a sound health and safety program should be adopted. The intention is to show what other industries are doing and how much they are spending for those activities. Let the comparisons indicate whether any one program is adequate and whether the money spent is being invested wisely.

It is time that more men in top management realized that efficient administration of the plant medical department will result in better service at a lower

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LABOR HEALTH INSTITUTE

Medical Care Program

Medical directors of seven different types of industrial medical care programs have been invited to describe their programs for Newsletter readers. This is the sixth article in the series. Those printed in earlier issues were: Medical Care in Consolidated Edison, May 1948; Employee Health and Safety Program Developed in TVA, June 1948; The Permanente Health Plan, September 1948; The Medical Department of The American Cast Iron Pipe Co., October 1948; The Medical Care Program, Endicott Johnson Corp., December 1948.

The Labor Health Institute, located in St. Louis, Mo., is a nonprofit organization devoted to preventing illness and curing its members when they become ill. The Institute was established by a union through collective bargaining with management in November, 1945. At that time the organization covered only 2,500 members in the shops under contract with the union. At present there are nearly 8,000, membership having been extended to cover any other union groups which include the LHI clause in their contracts with management. Associate members are also accepted on an enrollment fee and regular dues basis, which entitles them to receive medical care at a reduced fee-for-service basis.

The first contracts called for the companies to pay an amount equal to 3½ percent of the workers' wages to the LHI. For this amount, the workers themselves were given complete health and sick care on the basis of need. After 2 years' experience, the union and the companies realized that the workers' families should be included in the program because the health of the family has a direct bearing upon the health and efficiency of the worker. New contracts call for a 5-percent contribution by the management to provide health and medical care not only for the worker but his family as well.

The pivot of the entire program is the physical examination. Special emphasis is made to get every member into the LHI for a physical to determine his present state of health and to correct any major or minor disorders or diseases before they become serious. Media utilized to instruct the members are the official newspaper of the sponsoring union, company bulletin boards, shop meetings, and labor-management committees.

Physical Facilities

The Institute occupies two floors of the Publicity Building. The clinic includes a spacious, well-lighted, attractive waiting room, modern examining rooms, a surgery department equipped for minor surgery, 3 dental offices, a complete X-ray room, laboratory, physiotherapy department, eye examination room, basal metabolism machine, electrocardiograph and other equipment necessary for complete diagnosis and treatment outside a hospital. By having the LHI physicians under one roof, members may see as many specialists as necessary in a single visit to the health center.

Coverage

Medical personnel includes physicians, dentists, medical social workers, nurses, laboratory technician, X-ray technician, physiotherapist, pharmacist, medical librarian and clerical personnel. All except the physicians and dentists are employed full time. General medical service is given at the health center, in the home or hospital. Specialist services include surgery, gynecology, obstetrics, pediatrics, eye - ear - nose-throat, urology, allergy, internal medicine, dermatology, orthopedics, neuropsychiatry, cardiology, gastroenterology arthritis and certain consultative services not available at the health center. These services are given without cost to the members.

The following dental care also is given without cost to the members: dental examination and diagnosis, including X-ray, prophylaxis and gum treatment, extractions and emergency work. Restorative dentistry, including bridges, fillings and false teeth, is provided the members at low fees, approximating the cost of the materials used.

A registered pharmacist is on duty full time to fill prescriptions at low cost. The LHI pharmacy also carries drugs and sundries at low prices.

Hospitalization is provided under Blue Cross. The LHI pays initiation fees and membership dues and arranges for the members to get into the hospital.

Counseling service is provided at home, in the hospital and the health center. In addition to these services, the medical social worker acts as a liaison between the LHI and the community agencies and institutions.

Personnel

Physicians are selected for their skill and knowledge and also for their understanding and appreciation of the workers' problems. They have private practices and represent all of the hospitals and medical schools of the city. Obviously, to secure the best doctors possible, salaries are made attractive and schedules are arranged to fit in with the heaviest load at the health center. Since most of the members have to obtain their medical care after work, the doctors' schedules are concentrated between the hours of 3:30 and 6:30 in the afternoons. There are morning clinics, however, and certain doctors are on call on assigned nights to handle inquiries, home visits and emergencies for LHI members. They also see LHI members in their private offices, if the need arises, during the morning hours before the doctors arrive at the health center.

Cost

During 1947, medical services cost $147,380.52. Hospitalization was paid on the regular Blue Cross rates. The average pay per doctor per hour was $6.03, and the doctors saw an average of 3 patients per hour. The total number of doctors' hours was 8,985. Hospital days in 1947 totaled 2,071.

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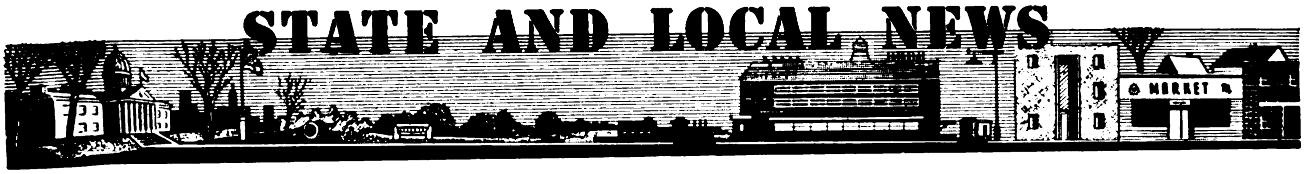

DETROIT, MICH.

Nurses—Detroit industrial nurses are attending a series of 3 one-day institutes this winter on mental hygiene at Wayne University. The first institute on November 6 dealt with the foundations of personality. The lecturer on January 29 will discuss deviations from normal behavior—including the neuroses, alcoholism, accident proneness and epilepsy. On March 12, the techniques of interviewing and counseling will be discussed.

Detroit industrial nurses took part in the formation of the Michigan State Association of Industrial Nurses at the first meeting on October 16. Miss Janet Geister, R. N., was the guest speaker, and plans for the new organization were launched with enthusiasm.

Detroit nurses are already busy working on committees for the annual meeting of the American Association of Industrial Nurses to be held in Detroit April 3.

KENTUCKY

Personnel—Mr. W. W. Stalker, Director of this Division, is on leave attending Harvard University School of Public Health. He is working for the degree of Doctor of Science. N. E. Schell is acting director. The position of Industrial Hygienist, vacated by Mr. Richard S. Kneisel, has been filled by Mr. Charles E. Lane.

LOS ANGELES, CALIF.

Conference—The California Conference of Governmental Industrial Hygienists held its second official meeting on December 9 and 10 in Los Angeles. One day was devoted to business and one to discussion of technical matters.

MASSACHUSETTS

Publication—"Functions of the Industrial Nurse" is the title of an 8-page pamphlet recently made available by the Massachusetts Division of Occupational Hygiene. Written by nurse consultant Sarah E. Almeida, R. N., and illustrated by director John B. Skinner of the Division, the bulletin spotlights the role of the industrial nurse in the prevention of occupational disease. As health educator and counselor, the industrial nurse is in a key position in the plant and should be given more opportunity to shape the health program so that the benefits of her broader functioning will accrue to both workers and management alike. Services of the State nursing consultants are offered in promoting these essential health activities.

Talk—Dr. Clarence M. Maloof of the Massachusetts Division of Occupational Hygiene was invited to give an informal talk on occupational diseases and their control from the medical viewpoint on October 28 before the Rotary Club of Concord.

MISSISSIPPI

Personnel—James J. Hudgens, formerly with the Industrial Hygiene Section of the Louisiana State Department of Health, has joined the staff of the Industrial Hygiene Division of the Mississippi State Board of Health.

Dry Cleaning Survey—Engineers of the division, assisted by Mr. A. D. Hosey of the USPHS, have initiated a survey of the dry-cleaning establishments of the State. Results of this survey, which is being conducted to ascertain health conditions in this industry, will be published at a later date.

Nursing—At the request of Dr. W. E. Doyle, USPHS, Mrs. Pearl Walden, R. N., Industrial Nursing Consultant, will lecture to the graduate physicians in the Post-Graduate school of Public Health at Tulane University in New Orleans on March 7, 1949.

NEBRASKA

Personnel—Charles P. Bergtholdt resigned his position with the Division of Industrial Hygiene to do industrial hygiene work for the Naval Gun Factory, Washington, D. C.

NEW JERSEY

Reorganization—The Government of New Jersey, by virtue of the adoption of a new State Constitution at the 1947 elections, has been undergoing considerable reorganization in its judicial and administrative branches during the year. The new Constitution called for consolidation of the numerous bureaus and agencies into not more than 20 State departments, of which the Department of Health will remain as one. There will be six bureaus in this department: (1) Local Health Services, (2) Vital Statistics and Personnel Administration, (3) Constructive Health, (4) Preventable Diseases, (5) Environmental Sanitation, and (6) the Bureau of Laboratories.

The present Division of Adult and Industrial Health will fall into the Bureau of Constructive Health when reorganization is accomplished, instead of the Bureau of Preventable Diseases, where it had been grouped with other subdivisions such as tuberculosis control, cancer control, etc. The purpose of the reorganization is to bring about greater efficiency in administration and to coordinate and thereby integrate the various functions of each department and the entire State government, with final responsibility residing in the office of the Chief Executive, the Governor.

Personnel—David F. Reilly, M. D., became associated with the Division in April 1948, as industrial hygiene physician. He was formerly assistant plant physician at the Graselli works of E. I. du Pont de Nemours, Inc. He is now attending Columbia University School of Public Health, where he will continue for the current academic year.

Meetings—W. A. Munroe attended the convention of the Illuminating Engineering Society in Boston during October. Mr. Munroe has been specializing in the study of illumination as it affects health and welfare. A special project in classroom illumination is now under study.

Miss Agnes E. M. Anderson, R. N., B. S., Industrial Nurse Consultant of this Division, participated in the pro-

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gram of the N. J. Industrial Nurses' Association meeting jointly with the N. J. American Industrial Hygiene Association and the N. J. Association of Industrial Physicians and Surgeons, Newark, N. J., October 9, 1948. Her subject was: "State Industrial Nurse Consultant and the Nurse in Industry." She was followed by Miss Mildred E. Dunn, R. N., M. S., in a talk entitled: "Why Education for the Industrial Nurse?"

Mr. E. L. Schall, engineer of the Division, is serving as secretary of the Philadelphia Section of the American Industrial Hygiene Association and as president of the New Jersey Section for the current year.

Bulletins—Volume 3 of the *Industrial Hygiene Bulletin* issued by the Division has been appearing. The titles of the first two numbers are: (1) Zinc, (2) Sulfur Dioxide. The mailing list for these Bulletins has been undergoing revision to eliminate obsolete addresses, and to add many new ones in accordance with changes and numerous requests which have been received for them. Bulletin No. 3 of this volume bears the title: Industrial Illumination. In plain language, it explains some of the significant factors essential in comprehending the elements needed for better lighting and sight conservation.

OREGON

Appointment— Dr. Ralph R. Sullivan, Director of the Venereal Disease Control section of the Oregon State Board of Health, has been appointed Director of the Industrial Hygiene Section, according to Dr. Harold M. Erickson, State Health Officer.

Dr. Sullivan will continue to devote part-time to the Venereal Disease Control program until a new director is named. Dr. G. D. Carlyle Thompson, Director of the Preventive Medical Service Division, has been serving as Acting Director of the Industrial Hygiene Section.

VIRGINIA

Nurses' Meeting—The Graduate Nurses Association of Virginia held a joint institute and public relations workshop Nov. 11-12 in Richmond. At the meeting of the Industrial and Office Nurses Section, Miss F. Ruth Kahl, R. N., Nursing Consultant, Industrial Hygiene Division, USPHS, talked on "Professional Organizations of the Industrial Nurse." When Miss Kahl addressed a joint meeting of the group, her subject was "The Relationship of the Industrial Nurse to Other Fields of Nursing."

WISCONSIN

Nurses' Seminar—To meet the needs of nurses new to the industrial field, the University of Wisconsin School of Nursing has arranged a seminar to be held January 31 to February 3, 1949. Registration is limited to approximately 20 nurses. The seminar is being offered in cooperation with the Wisconsin State Board of Health and the Industrial Nurses Section of the Wisconsin State Nurses Association, the Industrial Health Committee of the Wisconsin State Medical Society, and the Wisconsin Manufacturers Association. General subjects to be discussed are the place of the industrial health service within a business organization; workers' protective legislation; fundamental industrial health services; nursing practices; health records; emergency nursing care; and control of environmental hazards.

In-plant Clinic—Plans are being made to hold a series of in-plant health clinics during the spring of 1949. The purpose of these clinics will be to familiarize physicians with the industrial environment in the local plants where many of their patients are employed. They also serve to create a better understanding of industrial health problems between physicians, industrial nurses and management. Similar clinics were held in 1947 and 1948, and, as in the past, they will be jointly sponsored by the State Medical Society and the Industrial Hygiene Division of the State Board of Health.

Medical Students Receive In-Plant Training

The teaching of industrial health has become an important part of the medical college curriculum for the junior and senior medical students of the University of Wisconsin. This reorganized course is under the Department of Preventive Medicine, directed by Dr. John W. Brown.

The junior medical students are given a course of 16 lectures and clinics covering a wide range of the industrial health field. The seniors are given an intensive three-and-one-half-day in-plant teaching course. The Gisholt Machine Company of Madison, Wis., has cooperated in this phase of study. All lectures are held at the plant, and visits to the various departments of this large machine tool company form part of the basis for the industrial medical and surgical subjects.

The senior students are most enthusiastic about the in-plant method of instruction. Members of the faculty of the University of Wisconsin Medical School, personnel from the Industrial Hygiene Division of the State Board of Health, industrial medical and surgical consultants from Madison and Milwaukee, and members of the health and safety department of Gisholt Machine Company make up the teaching force.

The new industrial health course was started during the late winter of 1948. The immediate success of this new program will insure its continuation and further improvement.

LABOR HEALTH INSTITUTE
(*Continued from page 8*)

A total number of 51,361 services were given in 1947. These included: medical, 12,374; surgery, 6,926; dental, 6,413; X-ray, 4,243; laboratory, 7,274; nursing services, 7,688; physiotherapy, 2,117; hospital calls, 2,385; home calls, 468; 66 major operations, 173 minor operations; 17 deliveries; 536 outside referrals; and other less frequent services. During the year, 1,958 new individuals visited the health center. The average number of new individuals per month was 163 and the average number of returning patients was 682.

The Labor Health Institute is based on the recognition of the fact that health is man's greatest asset. In its short existence the LIH has proven on a small scale that service and not money to pay for service is the answer to the health needs of large groups of people. Regardless of the method of paying for medical care, no plan will work if there is a continuous struggle between the premium and the benefit. It will only work if the best available service is brought to the people when they need it, where they need it and for as long as they need it.

"It's Your Life"

Chicago residents have been listening to a new radio show called "It's Your Life" introduced over the air by the Chicago Industrial Health Association. This radio series, which is presented 5 days a week over WMAQ at 11:15 a. m. is spearheading the Association's education-information program.

This organization, launched on January 1, 1948, is a joint undertaking by Chicago's official and voluntary health and medical agencies, business and labor organizations, and industrial and commercial firms. The purpose of the Association is to develop and carry on a comprehensive program of health education and services for workers and their families.

The plan was approved by the Chicago-Cook County Health Survey, recently completed under the auspices of the U. S. Public Health Service. The project has been supported so far by contributions from the American Cancer Society, Illinois Division; American Red Cross, Chicago Chapter; General American Transportation Company; Tuberculosis Institute of Chicago and Cook County; and the Illinois Department of Public Health, Division of Industrial Hygiene (allocation through Chicago Board of Health). Three labor organizations—CIO, AFL and Railroad Brotherhoods—have approved the Association's program and are affiliated with it.

The Association aims to reach and influence a large proportion of Chicago's population with the radio program on health subjects of wide interest, such as cancer, tuberculosis, alcoholism, infant care, and emotional problems. The tape-recording technique, which captures actual situations in the lives of Chicago people, is a unique device seldom used in a daily program to such an extent. The show, written and produced by Ben Park and sponsored by Johnson and Johnson, is the first public service daily program produced by a nonprofit group and underwritten by a commercial sponsor.

A monthly newsletter addressed to Chicago executives is the next goal in the Association's program. It will include a lively summary of developments in the industrial health fields as well as direct communications from the Association on its services and activities for industry. A monthly magazine to be called "YOURS for Better Health" is also planned. Dr. Andrew C. Ivy, vice president of the University of Illinois, is editor. A series of posters will be issued for display on bulletin boards of the participating firms.

AN UNUSUAL RADIANT HEAT PROBLEM[1]

A manufacturer of small metal pieces reported that workers had complained of illness when a new hot forging operation was introduced.

Bureau investigation disclosed that the worker placed the pieces between opposing gas flames and, when they were heated, transferred them to the forge die by means of short-handled tongs. The vertical dimensions of the flame area were approximately 2½ by 18 inches.

The complaint was primarily that of a "big head," which could not be described as a headache, together with a reddening of the face, profuse perspiration and enervation. All of these symptoms were relieved upon a short absence from the forge.

The process and patient's symptoms led us to believe that radiant heat was the causative agent. Recommendations were made for the installation of a baffle to be placed between the worker and the open gas flames. The baffle was constructed of asbestos board from the floor level to a point well above the worker's head, except for a small area through which the work could be passed. This opening was provided with a vertical sliding panel of double glass which permitted handling and observance of the work. The glass placed nearest the flames was of a heat-resisting type while that placed nearest the operator was designed to absorb heat. The installation proved entirely satisfactory to the operator.

[1] This article appeared in *Connecticut Health Bulletin*, September 1948—written by Mr. L. W. Woodhouse, Principal Industrial Hygiene Engineer.

Will You Forget?

LEAD HAZARDS FROM SAND BUFFING OPERATIONS[1]

By Robert M. Elrick

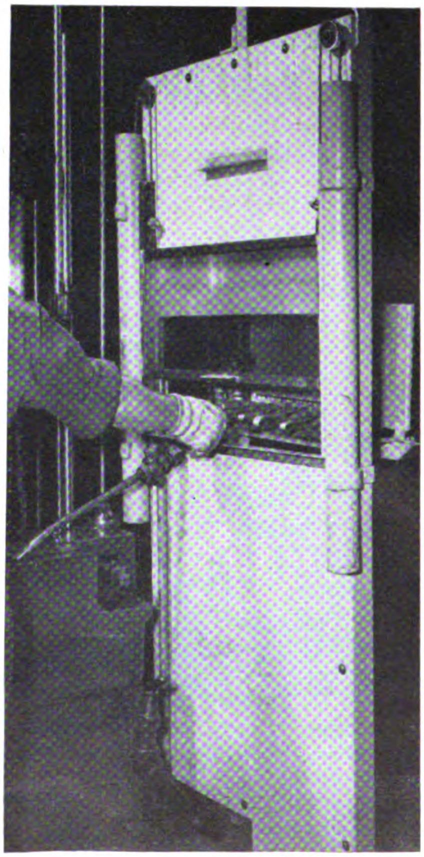
Connecticut Department of Health

The manufacture of plated silverware requires a large variety of white metal castings for use as handles, legs, decorative trim, salt and pepper shakers, and other articles of irregular form. These castings are prepared for plating by means of a process known to the trade as "sand buffing." This process differs from conventional rag or cloth wheel buffing in that no buffing compound is applied to the wheel, but rather a handful of fine pumice or sand, mixed with oil, is held against the wheel along with the article to be buffed. The abrasive action of the sand or pumice thus applied prepares the surface of the pieces for plating by removing minor imperfections and scratches. The wheels, themselves, are generally made from thick leather, such as walrus skin, rather than layers of cloth as is the usual case with rag wheel buffing.

Sand buffing stations cannot be exhausted by conventional means because all of the "sand" would soon be lost to the exhaust system. The buffing lathe, therefore, is commonly enclosed by a wooden bin which is used to contain the sand and, after a fashion, to reduce dust concentrations by retaining the sand thrown out by the action of the buffing wheel.

Prior to the war-born shortage of tin, these white metal parts were generally cast from the tin-copper alloy, britannia. At that time, pumice, which is composed largely of silicates, rather than sand, was used as the cutting compound. Consequently, sand buffing operations were of no serious concern to industrial hygienists. During investigations, which form the basis for this paper, it was learned that some plants are now using silica sand instead of pumice, thus introducing a possible silica dust hazard. That problem, however, will not be discussed in this paper.

The continued shortage of tin made it necessary for manufacturers to find a substitute metal. The substitute commonly adopted is a lead-antimony alloy of 80 to 85 percent lead. Compositions of this type, of course, made investigations of possible lead hazards advisable. Consequently, studies were made in the plants of seven plated ware manufacturers who were using lead-antimony alloy castings. In one of the seven plants, it was found that the white metal buffing was being done on conventional exhausted ragwheel lathes. The exhaust rate found at those stations was in accordance with the standards of the American Standards Association for the size of wheels in use; but the hood design was poor, and, consequently, control efficiency was poor. The chemical study showed average lead concentrations of the order of 0.4 milligram per cubic meter. Upon the recommendation of bureau engineers, the hoods were redesigned to effect maximum practicable enclosure, and a subsequent chemical study revealed average concentrations of the order of 0.08 milligram per cubic meter, or about one-half the maximum allowable concentration. This reduced concentration was accomplished without change in exhaust rate, which in this case was about 380 cubic feet per minute.



Baffle for control of radiant heat and gas-fired forge.

The other six plants were using sand buffing methods without control. Lead studies revealed average concentrations much greater than the threshold limit in every instance. These concentrations ranged from 0.5 milligram per cubic meter to a high of 5.9 milligrams per cubic meter, or about 3 to 40 times the maximum allowable concentration of 0.15 milligram per cubic meter.

A comparison of the above figures immediately raises the question: "Why not switch to ragwheel?" or "What are the advantages of sand buffing?" When we asked those questions, the answers we received were not entirely satisfactory, but, with one exception, the manufacturers were not anxious to make the change. They claimed in somewhat vague terms that sand buffing does a faster and a better job, or that the workers had been using loose abrasive so many years they would resist a change. In some cases, it appeared that the workers, being on piece work, were concerned about the size of their pay envelopes if they were to be required to learn a new technique.

At any rate, in only one of the six plants was an immediate switch to ragwheels agreeable; and, even in this company, the management stated that some of their work would require sand buffing.

The other five plants preferred to attempt control by ventilation methods. Since there is no generally adopted method of exhausting sand buffing bins, various methods were tried by plant engineers.

One plant installed two 24-inch window fans directly behind their two sand buffing bins, in an attempt to control the hazard by a sort of localized general ventilation. As might be expected, this method was only partially

[1] *This paper was given at the New England Section Meeting, American Industrial Hygiene Association, Hartford, Conn., November 5, 1948.*

successful. The lead concentrations were reduced from an average of about 0.7 milligram per cubic meter to an average of about 0.2 milligram per cubic meter. This concentration, of course, is still in excess of the maximum allowable concentration, but the installation was temporarily approved in this particular case because the workers are rotated and lead antimony buffing is done only 3 to 4 hours per day Such an arrangement is not advisable, however, as it requires continual close observation to insure its continued effectiveness.

A second plant installed cone-shaped flared hoods at the ends of adjustable ball-jointed branch connections. Each hood was placed at one side of the buffing wheel and exhausted at a rate of 400 cubic feet per minute. Although this arrangement also did not appear efficient, atmospheric lead concentrations were shown to have been reduced from an average of 1.6 milligrams per cubic meter to an average of about 0.10 milligram per cubic meter.

Other plants, following the recommendations of bureau engineers, installed fish-tail type hoods lying horizontally at the leading edges on the tops of the sand buffing bins. One of these plants showed what appeared to be a remarkable reduction in lead concentrations with an exhaust rate of 450 cubic feet per minute. The uncontrolled concentration was of the order of 5.3 milligrams per cubic meter, while the concentration after control was found to average only about 0.09 milligram per cubic meter. This looked like the answer, but enthusiasm was short-lived, because another plant which installed similar hoods not only failed to control the hazard, but also showed extremely erratic and inconsistent results whenever studies were made. As an example, I should like to quote a few figures taken from studies of two sand buffing stations in this plant.

Study No.	Operator No. 1
1	0.18 milligram per cu. meter
2	0.33 milligram per cu. meter
3	0.44 milligram per cu. meter (AM)
	0.05 milligram per cu. meter (PM)

Operator No. 2

0.50 milligram per cu. meter
0.08 milligram per cu. meter

The exhaust rate at these stations was only 280 cubic feet per minute instead of the recommended 500 cubic feet per minute, but it was soon obvious that some previously neglected factor, other than merely a low exhaust rate was causing the inconsistencies found in these studies. The results of the third study just mentioned gave us our clue. In order for the lead concentrations to drop tenfold from morning to afternoon, some change must have occurred during the lunch hour. Investigations revealed that the operator had changed his sand before starting his afternoon's work.

With the cooperation of the plant manager, we secured samples of sand which had been in use in these bins for periods of from 1 to 4 days. The lead concentrations in sand which had passed through a 200-mesh screen were found to range from 5 percent lead by weight in sand which was used one day, to 39 percent lead in sand which had been used 4 days. An attempt was then made to correlate the length of time sand had been in use with the atmospheric concentrations. The following results were obtained:

Age of Sand	Pb Concentration in Sand
One-day-old sand	5% lead through 200 mesh.
Two-day-old sand	16% lead through 200 mesh.
Three-day-old sand	23% lead through 200 mesh.

Atmospheric Pb Concentration

0.02 milligram per cubic meter
0.07 milligram per cubic meter
0.17 milligram per cubic meter

On the basis of these results, it was concluded that a rather definite relationship exists between atmospheric lead concentrations and the length of time the sand has been in use. This relationship, then, must be considered in the evaluation of lead studies and engineering control methods whenever sand buffing of lead alloys is encountered.

It also makes advisable additional studies during the coming winter months of some of the installations previously approved, in order that the control provided may be evaluated in the light of this relationship.

The results of this project have led to the following conclusions, which, of course, are subject to change in the light of future findings.

(1) Sand buffing of lead alloy castings, without control, creates a definite health hazard.

(2) The best method of controlling this exposure is to substitute ragwheel buffing at properly hooded and exhausted stations.

(3) If ragwheel buffing is not considered practicable, the sand buffing bins should be exhausted at a rate of at least 450 cubic feet per minute and the sand or pumice changed at least every third working day.

(4) If the exhaust rate at the sand buffing stations is much less than 450 cubic feet per minute, a medical program should be included.

Industrial Toxicology

PHOSGENE

L. T. Fairhall, USPHS

Carbonyl chloride, or phosgene, $COCl_2$, is a colorless, volatile liquid at temperatures below its boiling point of 8.2° C. The gas, which is highly toxic, has a very characteristic odor resembling that of green corn. Carbonyl chloride is slightly soluble in water, in which, however, it slowly hydrolyzes. It dissolves freely in benzene, toluene, glacial acetic acid, and most liquid hydrocarbons. It is a fairly stable compound at ordinary temperatures and in the absence of moisture. Phosgene in the liquid form attacks rubber. Liquid phosgene is also capable of dissolving large quantities of other toxic substances used as war gases, such as chloropicrin, diphenyl chlorarsine, and dichlorodiethylsulfide (1). Phosgene is prepared by passing a mixture of carbon monoxide and chlorine over activated charcoal as a catalyst. The gas is easily liquefied and is shipped in steel cylinders.

Phosgene is much like chlorine in its physiological effect; but, owing to the fact that it may be inhaled more deeply with no warning symptom for the first hour or so, it is much more insidious in its action. Furthermore, it is many times more toxic than chlorine itself. More than 80 percent of the gas fatalities of World War I were caused by phosgene (2). The physiological and toxic effects of phosgene are caused by the local hydrolysis of the material at the cell site. The hydrolytic products are hydrochloric acid and carbon diox-

(Continued on page 18)

NEW APPARATUS FOR COLLECTING HALOGENATED HYDROCARBONS

Russell Frazier, Chemist

Division of Industrial Health, Minnesota Department of Health

Present methods for measuring atmospheric halogenated hydrocarbon concentrations are generally of two types.

(1) The gas is analyzed directly with ultraviolet light, light absorption being measured electrically by means of a photocell.

(2) The sample may be decomposed over platinum at about 900° C. and the resulting halogen acid collected and measured by chemical means. The second method is much more useful, since the first involves the use of extremely expensive equipment which is bulky and thus not too portable, and which is limited in application. Carbon tetrachloride will not respond to this treatment at all, while many nonhalogenated solvents or vapors give interfering readings.

In the second method, the heat necessary to decompose the sample is obtained with an electric furnace. In the commercial apparatus we have used, this has resulted in a somewhat cumbersome, not too portable apparatus, which is slow to heat and slow to cool down, and which requires a source of electric current.

The apparatus we have has the further disadvantage in that it is only accurate when large samples are taken. This is due to accumulation of small amounts of halogen acid in the parts of the apparatus preceding the absorption column.

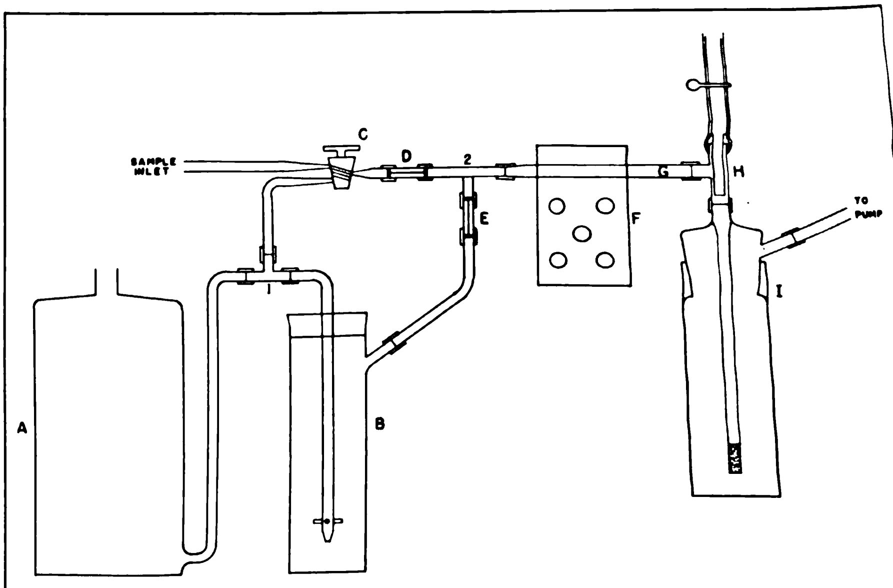
We have had occasion to measure halogenated hydrocarbons where no electricity was available. To do so, we developed a piece of apparatus weighing less than 2 pounds, which is easily attached to an MSA hand-operated impinger pump. It is otherwise self-contained and is, of course, extremely portable. This apparatus makes use of the fact that methyl alcohol vapor in the presence of oxygen is spontaneously oxidized when it comes in contact with active platinum.

In practice, we use heavy platinum foil and preheat it to start the reaction. Once initiated, the action is exothermic and supports itself. The fuel-air mixture is prepared by bubbling air, previously freed of halogenated hydrocarbons by passage over activated charcoal, through methyl alcohol. To this fuel-air mixture a small amount of air to be sampled is added, and the combination is passed over the platinum, which is maintained at yellow heat by the reaction. The burned gases are then passed through an absorption tube.

This apparatus can be built from material usually found in any laboratory. The essential parts are laid out schematically below. 1 and 2 are 6-millimeter T tubes. "A" consists of a 500 milliliter aspirator bottle with a glass wool mat on the bottom, and filled with granular activated charcoal. It may be placed inside the impinger pump case. "B" is an ordinary midget impinger tube charged with 10 to 15 milliliters of methyl alcohol. "C" is a two-way stopcock which permits either filtered or unfiltered air to enter the apparatus. "D" and "E" are capillary tubes of such size that together they pass about 3 liters of air per minute under 12 inches of water pressure. Of this amount, "D" should pass about 325 milliliters. "F" is a perforated aluminum tube about 1½ inches in diameter with the bottom closed off by a metal bottle cap set inside it. It serves as a burner to preheat tube "G" which passes through it near the top.

"G" is the furnace and consists of a quartz tube about 8 millimeters in outside diameter and a little over 3 inches long. This tube is charged with platinum which can be prepared as follows: Roll out a platinum crucible cover or otherwise obtain a sheet of platinum 1 inch by 1½ inches by about 0.004 inch thick, and make many cuts with a shears, perpendicular to the long edges of the sheet, and extending inward to not quite the middle. When finished, the platinum resembles the backbone of a fish with the attached rib bones. Finish forming it so that it fits snugly into the quartz tube.

"H" consists of a T tube with a loose fitting inner tube extending from the top to slightly below the side tube. This inner tube is held in place by a sleeve of rubber tubing which fits tightly over the T tube and the extending inner tube. Another larger rubber tube is placed over this sleeve and closed off at the top with a pinch clamp. This arrangement makes it possible to wash



HALOGENATED HYDROCARBON APPARATUS SCHEMATIC DIAGRAM the tube extending into "I" without flooding the furnace. "I" is an all-glass impinger tube with a fritted glass nozzle.

Units are connected together with rubber tubing sleeves, and any convenient system of mounting may be used. However, the fuel supply (Unit "B") must be close to the furnace to compensate for heat loss due to evaporation. On our apparatus, the fuel supply unit is mounted on unit "F" with an adjustable mounting. Since the furnace operates at yellow heat, the rubber connection between it and the unit "H" must be replaced frequently. It would probably be possible to purchase a quartz T tube for the furnace, instead of the straight tube shown.

The small dimensions of this apparatus and the provision for washing all tubing beyond the furnace make it suitable for micro work. When using a method of analysis capable of determining micro quantities (10 to 120 micrograms) of halogen acid, it will never be necessary to sample more than a liter of air. We use a collection solution of basic sodium arsenite and determine the halogen turbidimetrically with silver nitrate.

Directions for Operation

Bring the methyl alcohol level in the fuel chamber to about 13 milliliters with a good grade of methyl alcohol. Put about 10 milliliters of distilled water in the collection tube "I" and fasten into place. Place about 1 milliliter of methyl alcohol in the burner under the quartz tube and ignite. This can be done by touching a lighted match to one of the air holes in the burner. After the burner has been well started, turn the impinger pump crank in small arcs, to draw small amounts of fuel into the furnace. Do not build up full steady pressure until the fuel in the furnace ignites. The sample inlet tube should be open for this operation.

If the generation is carried out in an atmosphere containing halogenated hydrocarbons, the stopcock may be turned so that filtered air is drawn through the sample orifice. After the furnace begins to glow, blow out the flame in the burner and turn the crank at the normal operating rate for about 15 or 20 seconds to thoroughly heat the apparatus. Stop pumping and replace the distilled water in the collection tube with 10 milliliters of collection solution. Turn the stopcock to sample position and sample for 3 or 4 minutes.

After collection, turn stopcock to the filter position and insert the tip of a 10-milliliter pipette containing 5 milliliters of double distilled water into the rubber tube, extending upward from the collection tube. Build up a vacuum with a pump and open the pinch clamp, allowing the water to flow out of the pipette into the collection tube. Close the pinch clamp, remove the pipette and finally detach the collection tube. Note the total volume of the sample and transfer to a test tube. Rinse the collection tube with double distilled water and discard the rinsings. Refill with collection solution, reassemble and take another sample.

Notes

Water is used in the collection tube during generation, since the amount of methyl alcohol coming through the furnace before ignition is sometimes sufficient to cause excessive frothing.

The furnace should operate at yellow heat. To maintain this condition, it may be necessary to adjust the position of the fuel chamber in relation to the furnace so that the vapor-air mixture above the methyl alcohol is of the right concentration. The cooling effect of evaporation must be balanced by heat input from the furnace.

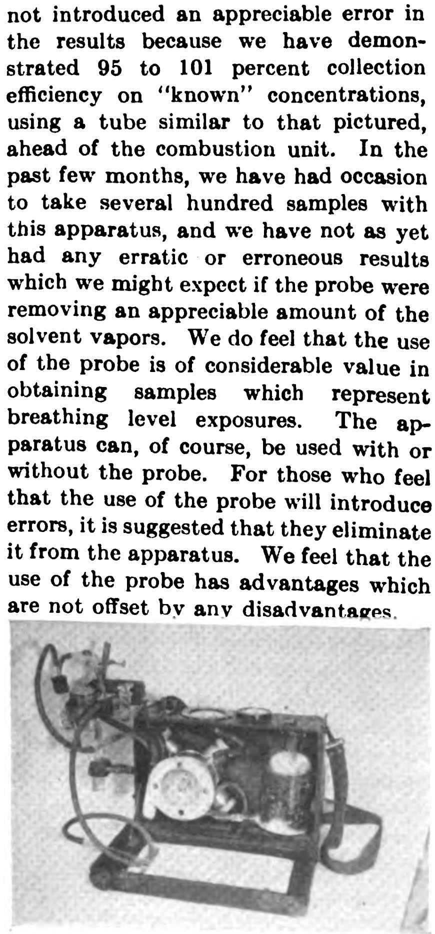
When the fuel level gets below 8 milliliters, fuel should be added. Under normal conditions the pump may be stopped for periods up to 2 minutes before it becomes necessary to reheat the furnace upon resumption of operations. However, it is good practice to turn the crank for a second or two during every 30-second interval. The collection tube must be in place; but if the stopcock is turned to the filter position, the sample cannot be hurt.

If it appears desirable, the collection tube and bubbler may be more thoroughly washed between samples. After the sample has been transferred to a test tube, return the empty collection tube to its position on the apparatus, build up a vacuum and introduce a few ml. of water through the rubber tube over the bubbler. Remove the collection tube, rinse and refill.

Measure the sampling rate occasionally with a wet test meter. Sampling pressure may be fixed at any point that proves to be satisfactory. We sample at 13 inches of water pressure.

In testing this apparatus against known concentrations of various halogenated hydrocarbons, we found the collection efficiency varied between 95 and 101 percent. Part of this variation may well be due to errors in producing "known" concentrations. In any case, the efficiency is well within the limits for good industrial health apparatus.

We have not made a thorough investigation of the effect of sampling halogenated hydrocarbons through a rubber tube. We do feel, however, that using such a tube on this apparatus has not introduced an appreciable error in the results because we have demonstrated 95 to 101 percent collection efficiency on "known" concentrations, using a tube similar to that pictured, ahead of the combustion unit. In the past few months, we have had occasion to take several hundred samples with this apparatus, and we have not as yet had any erratic or erroneous results which we might expect if the probe were removing an appreciable amount of the solvent vapors. We do feel that the use of the probe is of considerable value in obtaining samples which represent breathing level exposures. The apparatus can, of course, be used with or without the probe. For those who feel that the use of the probe will introduce errors, it is suggested that they eliminate it from the apparatus. We feel that the use of the probe has advantages which are not offset by any disadvantages.



Study of Health Hazards Among Art Pottery Workers in Laguna Beach Area *

Historical

Pottery making is one of the oldest industries known to man, being of prehistoric origin. The first recorded manufacture of it in this country was conducted at a pottery opened by Dr. Coxe in 1685 in Burlington, N. J. Silica dust and lead—the twin health hazards of the industry have likewise been known for many years. Ramazzini in Italy described the diseases of potters in his classic, *Diseases of Workers*, the first edition of which appeared in 1700. (An English translation by W. C. Wright was published by the University of Chicago Press in 1940.)

Numerous studies of the health hazards in pottery have been made throughout the world. The most important and comprehensive study in this country was made by the United States Public Health Service in 1936 and 1937.** Nine selected plants in West Virginia were studied intensively. Physical examinations including chest X-rays were made on 2,516 men and women actively engaged in the manufacture of pottery products. Laboratory examinations were made of the blood and urine of 141 workers who were exposed to the various lead compounds used in glazes. Engineering surveys were made in these plants to study the manufacturing processes, to evaluate the working environment by dust counts and dust analyses, and to investigate the methods already in use by the industry for the control of health hazards with the object of recommending control measures to eliminate such hazards.

Of the 2,516 men and women examined, 189 cases of silicosis were discovered. Twelve cases of active tuberculosis were diagnosed. Only one case of lead poisoning was found. The study thus indicated silicosis to be the most serious hazard in the industry, while lead was apparently coming under better control since the early days when it was regarded as the principal danger in pottery making.

The results of this study have been of great significance in pointing up the need for health vigilance in the pottery industry. An outstanding contribution of this study was the evidence it obtained to support the maintenance of a definite maximum limit of dust concentration in the working atmosphere. The percentage of workers affected by silicosis increased with increasing length of employment in the pottery industry and with increasing silica dust concentration above 4 million particles per cubic foot.

Origin and Scope of Study

At the request of the Division of Industrial Safety of the California Department of Industrial Relations, a study of the ceramic plants in the Laguna Beach area was undertaken by personnel of the Bureau of Adult Health of the California Department of Public Health in cooperation with the Orange County Health Department and the Division of Industrial Safety. The study covered 27 potteries comprising a total of some 430 workers. These plants are essentially small industries employing from 1 to 75 employees each. They manufacture various decorative ceramic objects.

The engineering phases of the study were begun early in 1945 and were completed on August 23, 1946, when reports of findings and recommendations were sent to the potteries studied. Since this time the Bureau of Adult Health has continued to check the plants periodically and assist them in installing controls.

Several meetings were held with representatives of the California Art Potters Association, the Laguna Beach Pottery Association, the Orange County Health Department and others to discuss with them the interpretation and implementation of the recommendations.

One outcome of these conferences was the decision to conduct a study of the pottery workers, limited to chest X-ray films and urine lead determinations. In March 1947, a total of 327 chest films was taken through the cooperation of the Orange County Tuberculosis Association. At the same time, 73 urine specimens were examined for lead and 24 of those who demonstrated excessive lead absorption were rechecked.

Health Hazards Inherent in the Materials and Processes

The health hazards peculiar to pottery manufacture arise from the character of the basic materials used. All pottery clays contains a large portion of free silica. For example, several samples of typical clay materials used in the Laguna Beach plants were analyzed by both the Bureau of Adult Health Laboratory and United States Public Health Service and found to contain approximately 20 percent free silica. All of the pottery processes in which clay is handled therefore have a potential silica-dust hazard.

The glazes used for pottery contain lead in one form or another. Hence, all of the glazing and glaze-firing processes have a potential lead poisoning danger.

Chest Film Survey

Three hundred and twenty-six persons were X-rayed in March 1947. Follow-up of cases was made by the Orange County Health Department. There were 41 persons (12.5 percent) whose films showed lesions which warranted further investigation. Of this group, one was found to have active tuberculosis and one was diagnosed as silico-tuberculosis. There were 13 cases of inactive tuberculosis, and 16 persons in whom further study was indicated because of increased lung markings or calcifications. Two of the latter were subsequently found to have healed coccidioidomycosis, a fungous disease of the lungs not related to pottery making.

There were nine persons found to have heart abnormalities as shown by their chest X-ray. Negative X-ray films were obtained on 286.

Urine Lead Survey

Normal values for urinary lead concentration range from 0.01 to 0.08 milligram per liter. Of the 73 workers

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*Bureau of Adult Health, California Department of Public Health.

***Silicosis and Lead Poisoning Among Pottery Workers*, Public Health Bulletin No. 244, U. S. Public Health Service, Washington, D. C., 1939.

whose urine was analyzed, 31 were found to have 0.08 milligram or more of lead per liter. Nineteen of these were rechecked and five new specimens were examined. Of these, 11 were found to have more than 0.10 milligram of lead per liter. Seven of these had very excessive amounts. Almost all of those whose first specimens showed excessive lead also showed high absorption on the recheck.

The occupational groups showing the highest lead absorptions were those engaged in glaze dipping, glaze spraying and kiln operating and those in general plant operations.

Meaning of the Chest and Lead Studies

The *chest film* findings indicate strikingly the great value of routine chest X-ray studies of industrial employees. This study accomplished the following:

1. Discovered two active cases of lung disease and nine cases of possible heart disease. These findings exceed the expected 0.2 percent of positive lung and 1 percent of positive heart diseases discovered in group surveys generally. In finding these cases, the persons were apprised of their illness in time to benefit from treatment, and their fellow workmen were protected from two potential sources of infection.

2. Brought to the attention of 29 persons the possibility of lung disease and the necessity for further examination.

3. Demonstrated in one case the close association of silicosis and tuberculosis. One cannot of course be sure that most cases of silicosis would not have been discovered had the employee population been a more stable one. Silicosis is a disease which usually requires years of exposure to silica-containing dust for its development to the point of clinical symptoms. However, an analysis of 325 pottery workers filmed in this study showed more than half had been in this occupation for only one year or less; forty between 5 and 10 years; and 14 for 10 years or more.

4. Established a base line from which to evaluate the safety of the working atmosphere. Since so few of those examined had had exposure of sufficient duration to produce X-ray changes, these films constitute a background against which future film studies can be evaluated. For example, those whose present films showed "increased markings," although in good health now, may later be shown to have been in the early stages of a disease process. Annual rechecks of these persons will record whether or not the working environment is safe, and at the same time will enable the industry to detect early any cases of tuberculosis or other chest disease.

The large proportion of cases of excessive *lead absorption* (42 percent) found among workers engaged in occupations having lead exposures indicates the need for renewed vigilance in the control of this hazard. Lead poisoning is notoriously a disease in which so-called subclinical symptoms such as headaches, weakness, loss of appetite, joint and muscle pains and gastrointestinal symptoms may be ascribed to other conditions. Only careful physical and laboratory examinations can produce a definite diagnosis. Proper engineering controls plus periodic laboratory checks of the employees exposed to lead operations are the key to control.

Because of these facts, a positive health protection plan for those engaged in ceramics work is worthy of consideration by the industry. The Orange County Health Department and the Bureau of Adult Health offer the following suggestions as a guide toward beginning such a program.

PROGRAM FOR HEALTH OF POTTERY WORKERS

A positive health program in industry will accomplish several objectives of importance both to the employer and the employee:

1. Better health of the individual by early detection of disease and prevention of occupational diseases.

2. Reduction in absenteeism due to illness.

3. Probable reduction in costs of workmen's compensation insurance.

4. Maintenance and improvement of efficiency of production.

A simple but effective program is recommended:

I. ***Environmental Hazards:*** Control of the dust and chemical hazards of the industry, chiefly for the prevention of silicosis and lead poisoning. Reference is made to the recommendations made in the report of the engineering survey August and September, 1946.

II. ***Medical Measures:*** *Preplacement, annual, and periodic physical examinations* for all employees are the most effective single measure of an industrial health program. To be of value, such examinations should include the following minimum laboratory procedures:

A. *Chest X-ray films.*
B. *Urine tests for sugar and albumen.*
C. *Serological tests for syphilis.*
D. *Special tests for employees in contact with leaded materials every six months:* Urine analysis for lead; examination of the blood for hemoglobin and basophilic aggregations.

Cleveland Industrial Nurses Welcome Help From City Consultant

Miss Ruth Eisermann, R. N., Industrial Nursing Consultant, having completed her first year of service in Cleveland, reports on her activities and progress in promoting better care for industrial workers. Excerpts follow:

"The first year of my services as Industrial Nursing Consultant for the City of Cleveland has ended. This is a new service in Cleveland, and, to my knowledge, only 7 other cities in the United States have Industrial Nursing Consultants, while there are 34 State Consultants.

"Not only am I given the opportunity to appraise the dispensary setup, but when I visit a plant I am frequently invited to tour the plant. I have had a very extensive education in manufacturing processes this past year. These tours have given me a good opportunity to further the standing and uses of the industrial nurse, to interpret to other personnel of the plant what she could do, and also to make a hasty survey of working conditions which could be relayed to other members of the staff of the Bureau of Industrial Hygiene. It also has given me the opportunity to explain the services of this Bureau to the personnel of the plant."

Miss Eisermann explains the methods she uses to convince physicians and nurses of the need for written standing orders. She also tells how she helps small plants to set up medical programs; how she arranges with local colleges to give lecture series on subjects of professional interest to industrial nurses; and where she gets literature for plant nurses. Miss Eisermann also stresses the importance of nurses' attendance at professional meetings.

MORTALITY RATES

(*Continued from page 2*)

Occupational mortality rates will give us more precise information concerning these effects. Data of this nature have been needed by public health workers, industrial organizations, and scientists doing research in such fields as cancer and tuberculosis.

One of the main purposes of this occupational mortality project is to provide data for the use of the workers in the field of industrial hygiene. The National Office of Vital Statistics welcomes any suggestions regarding the type of statistics on occupational mortality which would be of value to the industrial hygienist. Comment should be sent to the National Office of Vital Statistics, Washington 25, D. C.

COLLEGE LABS STUDIED FOR MERCURY EXPOSURE

The Division of Industrial Hygiene of the Kentucky State Department of Health, at the request of the officials of the University of Louisville conducted a series of tests for the detection of mercury vapors in the various laboratories of several of the colleges of the University of Louisville.

The study was made with the aid of a General Electric mercury vapor detector. The tests for mercury vapor consisted of thoroughly checking with the detector all possible potential exposure points. In conjunction with these tests ventilation checks were made of the exhaust hoods using the vane, alnor and thermo anemometers.

While no startling exposures were discovered, it was ascertained that certain of the laboratories in isolated localities had concentrations of mercury vapor near the maximum allowable concentration of 0.1 mg. of mercury per cubic meter of air.

The highest concentrations, generally speaking, were found in the sinks and sink drains, reaching in some cases (particularly the organic chemistry laboratories) concentrations of 0.12 mg. of mercury per cubic meter, with an average for sink drains in all laboratories of between 0.03 to 0.05 mg. of mercury per cubic meter of air.

The general floor area of the laboratories disclosed evidences of mercury lodged in the cracks and crevices, particularly around radiator and water pipes leading from one floor to another. The highest concentrations found were in laboratories having old, worn, unpainted wood surfaces. These concentrations ranged from 0 to 0.08 mg. of mercury per cubic meter of air with a general average of 0.02 mg.

The bench tops gave, in general, the lowest indications of mercury vapors, due perhaps to the nature of the surface which was of the standard stone top, well oiled and containing few cracks. The readings obtained ranged from 0 to 0.04 mg. of mercury per cubic meter of air, with a general average of 0.02 mg. where mercury vapors were indicated.

While the sampling, of a necessity, was in rather specific locations the general results showed that the concentrations were considerably below MAC level. At actual breathing levels in normal working positions there was no evidence of mercury vapor. However, since the presence of mercury was indicated in certain positions, the possibility of an exposure could not be overlooked. Consequently, recommendations for a thorough housecleaning were made with particular emphasis being placed on cleaning out the sink drains and traps, and scrubbing, smoothing, waxing or painting the wooden floors and scrubbing and waxing the table surfaces.

In the ventilation phase of the study the most important finding perhaps was the completely, for the most part, inadequate exhaust hood ventilation systems. Extensive checks were undertaken in all the hoods and results were consistently below the minimum recommended velocities. For example, in seven out of nine hoods in the chemistry laboratories of the Liberal Arts College, the velocity at the face of the hoods was zero and in the other two hoods the air flow was one-half of the minimal required velocity. Some sections of the exhaust ducts leading to the fans were completely corroded away. The laboratories in the other schools, although not as bad as those cited above, were, for the most part, completely inadequate and in many cases were operating at near zero velocities.

Recommendations relative to correcting the difficulties in the ventilation system followed conventional patterns of installing new ducts, sufficient fans of adequate capacities and a complete general overhauling of the exhaust system.—**Richard S. Kneisel, Chemist, Division of Industrial Hygiene, Kentucky Department of Health.**

PHOSGENE

(*Continued from page 13*)

ide. The upper respiratory passages are but slightly affected. With prolonged inhalation, however, sufficient carbonyl chloride is decomposed to produce marked inflammation and corrosion, particularly in the alveoli where the air maintains a maximum water content. Pulmonary edema appears very early. The injurious effects of carbonyl chloride are materially increased by physical exertion. Box and Cullumbine have investigated the relation between survival time and dosage with phosgene using rats and mice as experimental animals (3). They found that repeated exposures of rats and mice to sublethal concentrations of phosgene do not produce an accumulative effect (4). Weston and Karel (5) have recently evolved a biological method of assay of inhaled substances using the physiological response to phosgene as a means of measurement. The maximum allowable concentration value reported by the American Conference of Governmental Industrial Hygienists in 1948 for phosgene is one part per million of air.

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COST ANALYSIS

(Continued from page 7)

cost, similar to the careful operation of any other phase of the business. It is also time that the professional personnel in charge of a plant medical department extended more effort to change management's attitude. First, however, get the facts and one of the best methods is by means of cost analysis data.

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Patterns for Good Eating

GOOD FOOD CONTRIBUTES TO HEALTH OF PONTIAC EMPLOYEES
That wholesome food served on the job contributes to the efficiency of workers is a recognized fact. Many industrial establishments have installed cafeterias where their employees can be served regular meals. The photos show part of the modern equipment in use at Pontiac Motor Division of General Motors, Pontiac, Mich.

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