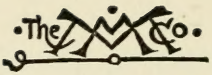
HEALTH SERVICE IN INDUSTRY



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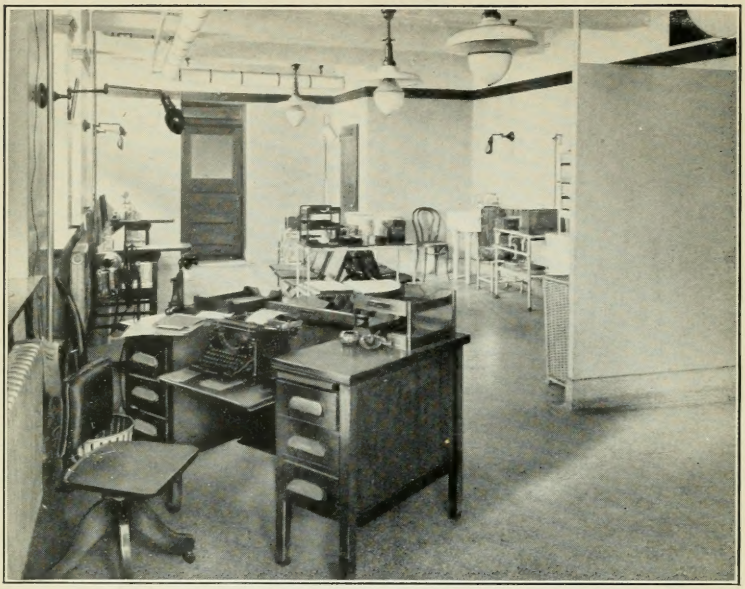

A CENTRAL DISPENSARY
Note Good Light, Unit Tables and Simplicity of Arrangement

HEALTH SERVICE IN INDUSTRY

BY

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TO
MY WIFE

PREFACE

The object of this book is to give to those having no actual experience in industrial medicine a short workable plan outlining the administration and methods of a health department in industry.

The author has not attempted to discuss more than one approved method of doing a thing. He has not attempted to give methods of treatment except as examples. Everything suggested has been tried and is in use in some large factory.

It is presupposed that the reader is either a doctor or the superintendent of a factory. Most of the text should be clear to either reader. As it is written for both doctor and layman, certain sections have been necessarily written with great simplicity. The book is based largely upon a course of lectures given by the author at Harvard Medical School.

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HEALTH SERVICE IN INDUSTRY

CHAPTER I

INDUSTRY AND ORGANIZATION

Industry represents one of the large groups of gainful occupations. It numbers millions in its employ. There are few parts of the country in which it does not exist, none to which its results are not vital.

Its tendency is always toward growth and expansion, thus gathering to itself an increasingly large proportion of the population. The products which are the end result of industry are infinite in variety, and the methods of production are equally varied.

Industry is made up of units called factories, very much as the body is made up of units called cells and just as the body grows and maintains its health when the cells are functioning normally, so the country as a whole prospers when factories are running smoothly with maximum production.

The country is dependent on industry and industry is dependent upon itself. This dependence has developed an interweaving network of interests between factories.

The object of industry is to convert crude substances into articles which can be used and to dispose of these articles by sale. A factory purchases

crude substances and by a series of machine operations produces a finished article. This process of conversion of crude substances into finished articles is known as production. The articles produced must be sold and the business managed and financed. From this simple analysis we see that in every factory there are three great divisions, administration (which includes finance), production and sales. Each one of these divisions is complete in itself, but each is closely allied to both the others.

There is, however, a fourth division which is quite separate from the other three. This division deals with personnel and its problems. It is closely allied to the other three divisions, since it has to do with the human factor in each, but inasmuch as it deals most intimately with production it is sometimes classed under this division. It should, however, be considered separately, as will be shown later, and operate as a separate division.

The basis of factory organization may be laid down somewhat as follows:

A board of directors which controls the policies and development of the company.

A division of administration which controls the actual work and development.

A division of production which controls all the actual manufacturing.

A division of sales which controls all the selling of the completed product.

A division of service which controls all matters to do with the personnel of the organization.

The above outline is diagrammatic. The organization of large factories is extremely complicated,

of small factories very simple, but if the plan outlined above be held in mind as a basic diagram, the complications are more readily understood. In the small factory the same idea exists except that two or more divisions may be represented in the work of a single man. The factory has but one object, to produce. If it fails to produce it dies. Production may, therefore, be said to be the life of industry. To quote Selby:[1]

"Anything which is capable of facilitating production is welcome to industry so long as its cost is not excessive. The test is its ability to increase the quantity or to reduce the cost of production without impairing the quality. Witness the manufacturer who pays an efficiency engineer $17,000 for three months' work in rearranging the machines in his factory in order that materials may be moved more rapidly from the raw state to the finished product, or the manufacturer who discards a whole battery of smooth-running, though antiquated, machinery in order that he may install improved machines capable of greater output. On the contrary, anything that retards or does not facilitate production is tolerated by industry only so long as it is unavoidable."

The ideal of production is a continuous output which can be raised or lowered at will to meet the demand and which will at all times be of uniform quality. If all machines were automatic such an ideal could be accomplished but there are many dis-

turbing elements all due to the necessity of employing men and women to run the machines.

As soon as the human element enters, uncertainty enters also. When thus considered the personnel assumes great importance and it is generally recognized that the more stable and efficient the personnel the closer to ideal is production.

The Service Division, as stated, has for its function the selection and care of the personnel. Like any other division it is divided into departments, each department being controlled by a foreman or manager. The departments may be divided into those having to do with the actual care of the employe, and those in which the general factors of welfare predominate. Actual care consists mainly of health supervision. According to Mock[2] this division may be made as follows:

1. Health Supervision of Employes.
   - (a) Medical Service
   - (b) Surgical Service
   - (c) Dental Service
   - (d) Nursing Service
   - (e) Safety Service
   - (f) Sanitation Service
2. Adjuncts to Health Supervision
   - (a) Employment Service
   - (b) Restaurant Service
   - (c) Recreation Service
   - (d) Welfare Service
   - (e) Insurance Service
   - (f) Banking and Loan Service
   - (g) Housing and Community Service

The interesting point demonstrated is the medical aspect of the majority of the services here mentioned.

The Service Division besides the functions outlined has numerous others which it is unnecessary to mention. It may be administered by a service director or a service committee, which is usually directly responsible to the general manager or a vice-president. Because of the distinctly medical character of the service department the logical man for its head should be a physician. This, unfortunately, is not often the case. Except in a very few factories the service department is controlled by a non-medical man. One of the reasons for this is the difficulty in finding a physician having the requisite administrative training. There is, however, a tendency toward appointing physicians to this position, especially since executive training was given many doctors during the war.

The medical, or health department, is therefore a part of the service division according to the plan above outlined. It is a complete unit in itself and consists of a medical and surgical service with all appurtenances necessary. It is in close contact with the other service departments and must co-operate with them in many ways. Thus the visiting nurses' service is often a separate department. This department must, however, work in the closest contact and sympathy with the health department to be of the greatest service. The employment department is in constant contact with the health department through

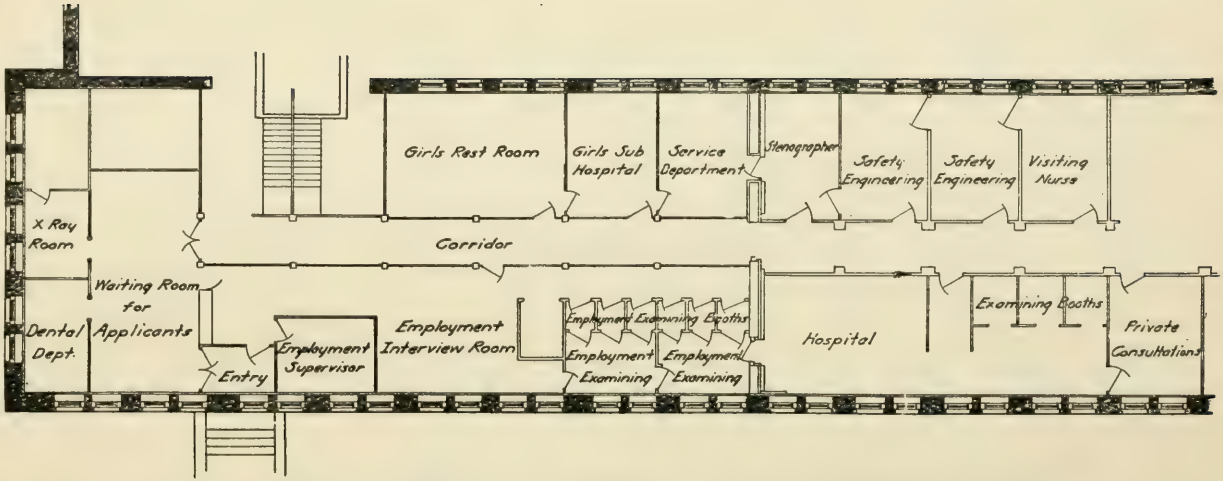

FIG. 1. LAYOUT OF SERVICE DIVISION IN THE AUTHOR'S FACTORY

the physical examination of applicants and transfers, and the placing of subnormal workers at work for which they are physically fitted. In fact every department of the service division is in some way correlated with another department of the same division and all must co-operate to obtain the results desired. Not only must these departments work smoothly together, but they must do their work in such a way as not to interfere with production. No department can exist which interferes with production unless the value to production of its end result is greater than the loss caused by the interference. Thus the treatment of all injuries at a factory dispensary takes a certain number of workers from production for a few minutes daily, interfering with production. However, the rapidity of healing, lack of infection and satisfaction of the worker altogether represent a factor of time saved and efficiency maintained which more than compensates for the interference with production caused by the visits to the dispensary.

The service division may be considered as a number of departments, each governed by a department head, all co-operating, and each endeavoring to accomplish its desired end with as little interference with production as possible. Each one of these departments has to do in some way with the health, welfare or interest of the employe. All are controlled by a service director or a service committee and these last are responsible to the general manager or vice president of the company. (Fig. 1.)

Since the health or medical department comes in close touch with many of the other service departments it is necessary briefly to outline the functions of the latter. In the majority of large factories they consist of the following departments:

Employment
Safety Engineering
Visiting Nurse Service
Commissary
Recreation—Games and Athletics
Housing
Mutual Benefit Associations
Banking and Loan Service

The employment department has for its function the hiring, transfer and discharge of all employes. Up to ten years ago in the majority of factories all employing was done by the foreman or superintendent. When it was done by the foreman each department hired and discharged on its own account. Experience showed that this method while on the whole efficient, gave the foreman the power of working off personal grudges and hiring men who were personal friends. Moreover, the time occupied in interviewing and entering the applicant was enough to interfere with the foreman's work in production. It was then considered advisable to establish a centralized employment department where all applicants were interviewed and then assigned to positions in various parts of the factory.

In order to show what positions are vacant each foreman needing a new man, either because one of his regular force has been transferred, discharged

or left of his own accord, daily sends to the Employment Department a form known as a requisition. This slip states that department number blank is in need of two machinists or whatever are the man power needs. These requisitions await the employment manager each morning and it is his duty and that of his department to fill each requisition from the men applying for positions at the factory employment department. Not only must he find a man to meet the requirements but he must select the man who in every way is best fitted for the particular work designated on the requisition slip. Now, it is evident, that men may fail in a certain position for one of two reasons, first, the training and past experience may have been insufficient or second, the applicant may not be in proper physical condition to do the work. While the employment department is competent to judge the former, the latter can be determined only by a doctor's examination and it is here that the employment and health departments come into close contact. The problems which arise by this contact and the method by which these are handled will be discussed at length later. The employment department also keeps a record of absenteeism. Absenteeism is one of the factors which plays an important role in production. It is determined by daily reports from all parts of the factory to the employment department, and the tracing of those absent for three days by a special agent of the department. The agent may be a visiting nurse or may be a man specially

trained in this work, but without medical knowledge. In the latter case, when a worker is found to be sick, he is reported to the visiting nurse service which takes the case in hand.

The safety engineering department has for its work the protection of the worker from accident. This is carried on in two ways, first, by the guarding of machines and appliances, second, by personal instruction of the men and foremen carried on by lectures, conferences and printed matter. The safety engineering department, because of its interest in accident prevention, investigates each accident which occurs and endeavors to institute means by which such an accident may be prevented.

The health department, therefore, sends a report of all serious accidents to the safety engineering department as soon after occurrence as possible.

Compensation for accidents under the Workmen's Compensation Act is frequently in the hands of the safety engineering department. The contact between this department and the health department is, therefore, a close one. The safety engineer is constantly in conference with the doctors of the health department on matters of interest to each. Thus, the determination of an employe's ability to return to work rests with the health department, but the actual placing of the man at work and arranging for his compensation rests with the employment manager and safety engineer.

The visiting nurse service is the connecting link between the employe's home and the factory. It

is an adjunct to the health department, but is run entirely independently. Its personnel consists of a chief nurse and one or more assistant visiting nurses. The duties of the service are:

1. To investigate all cases reported by the health, employment or safety engineering department and report back to the inquiring department.
2. To advise and assist those who are found in trouble.
3. To do any temporary emergency nursing found necessary.
4. To bring patients to the factory dispensary for dressings.
5. To take up social problems of the home with employes and their families.
6. To co-operate with the private physicians who are caring for employes at their homes.
7. To visit the sick and injured employes when they are at a general hospital and bring them any benefit or compensation or other monies to which they are entitled.

The visiting nurse service is in close contact with the employment, health, sanitation and safety engineering departments. The detail of its work will be given more thoroughly in another chapter.

In large factories a satisfactory restaurant service is a necessity. This department is always a separate entity and consists of one or more lunch rooms at which cafeteria or served meals are provided at cost. The type of food is usually simple and wholesome and the quantity sufficient. In some factories the service provides merely food to supplement the lunch men bring with them. In this case, coffee, milk, soup, fruit, cake and pastry are

served. In other factories a regular lunch of soup, meat, vegetable, dessert and coffee is served at a fixed price. Still another plan consists of providing an elaborate cafeteria similar to those found in business parts of any city. In all cases the cost of food to the employe is much lower and the quality higher than can be obtained outside of the factory. The lunch rooms vary from simple counters to elaborate and attractive dining rooms. The industrial physician is frequently consulted as to the quality of the food, the health of the kitchen attendants, the cleanliness of the milk and other sanitary matters.

Recreation has become a regular feature in the life of the employe of a large factory. The department controlling recreation and athletics is often large and is always busy. The work which was done by the Y. M. C. A. in army camps with such success is now being duplicated on the factory grounds, and at the noon hour hundreds of men can be seen playing volley ball, pitching quoits, playing basket ball, or passing baseballs. Factories now have their representative teams like colleges, and even rowing has developed with extraordinary rapidity. The athletic interest is good for the mind as well as for the body, and a well regulated athletic program has a great effect in stabilizing labor and overcoming the physical fatigue and lassitude produced by indoor factory work.

The difficulty of obtaining satisfactory and hygienic living accommodations for the workers has induced many factories to build small but comfort-

able houses for its employes. The housing department is another of the departments which often calls upon the health or sanitation department for assistance and advice.

Mutual benefit associations and a banking and loan service while of great importance to the worker are not departments in which the doctor is greatly interested except when he makes the examinations upon which the mutual benefit association settles its claim.

It will be seen that the service division covers a distinctly medical field and that while it may not be administered by a doctor, medical advice is needed to some extent in almost every department. It is obvious that the service division only exists in large factories, but many of its principles are carried out even in factories of twenty-five or fifty employes. In fact, the basis of most of these activities originated in the personal interest of the small shop owner in his workers. To quote from the preface of the service book of a large factory:

"No work is done which the owner of a small shop would not do himself on a small scale as a matter of duty to his employes. Growth of the shop is almost invariably accompanied by loss of touch between the management and the workman. These departments are simply seeking to re-establish the good feeling and tolerance which have so much diminished under modern management systems. Experience has convinced us that this is an economic

measure entirely aside from improvement in morale, because it costs less to conduct these activities through a centralized department than to accomplish the same thing by the effort of men whose whole time should be devoted to production."

CHAPTER II

THE MEDICAL NEEDS OF A SMALL FACTORY

From the general discussion in the last chapter, it will be seen that various phases of the practice of medicine play an important part in the organization of large factories. It is equally important in small factories which employ more than twenty-five men, but this importance has either not been recognized or the presumable expense has appeared too great.

The overhead expense of running a small factory is frequently greater proportionately than that of a large plant. The absence of one or more employes is more keenly felt and may seriously interefere with production, yet in the great majority no provision for ascertaining or caring for the health of the worker is maintained.

This is due partly to lack of knowledge on the part of the employer, partly to the difficulty of the problem, and partly to the insurance companies which cover the accident risk. The value of the doctor to industry has been recognized only recently and this recognition has been confined almost entirely to the large factories. The small manufacturer has not considered his problems those of the larger plants, although he has without realizing it,

in many cases, been personally acting as service manager in his factory. Because of his small personnel he has been able to keep in close touch with all of his workers, place them at the work for which they seem best fitted, and in case of sickness or accident, to see that proper attention was secured at once. With a small force the number of cases of sickness and accident are numerically so few that the regular employment of a doctor or nurse appears unnecessary. Accident insurance, which is now compulsory, in the majority of states, is usually carried through private insurance companies. These companies are forced to pay for any surgical treatment rendered in case of accident besides a definite compensation following a stated period of disability.

In order to fulfill their obligations and obtain the shortest period of disability the insurance companies usually appoint selected doctors in each industrial center and ask their insurers to send any cases of injury occurring in the course of employment to these doctors or in case of severe injury to send for one of them. The employer with his accident cases thus provided for feels that except for a first aid outfit at the factory no further provision is required. Although this arrangement appears satisfactory, when stated as above, on closer view it shows many weak points. These can best be shown by outlining the medical needs of a small factory and seeing how well they are cared for at present. Listed they are as follows:

1. Knowledge of physical condition of employes at time of hiring.
2. Knowledge of physical ability of employe to carry on the work to which he is assigned.
3. Provision of sanitary working conditions, including light, heat and ventilation.
4. Safeguarding the employes from special health hazards peculiar to the industry.
5. Advising and giving emergency or simple treatment to sick employes.
6. Giving prompt and adequate treatment in case of accident.

Of these, the last only is provided under the present system and in this case the doctor is employed by the insurance company, not by the manufacturer.

There are two methods which can be applied to carry out a complete system without great expense. The first consists of the employment of a part-time physician by the factory. The physician should live reasonably near the factory and should be at the factory a certain number of hours each week. The second method is a centralized employment department and dispensary, situated near the center of a group of small factories, which gives service to the group. Each plan will be considered in detail.

In the first plan, the selection of the right doctor is most important. He must have knowledge, ability, tact with men, and a sound knowledge of the basic principles of medicine and simple surgery. Moreover, he must be interested in the idea and consider his work at the factory as he would a much sought for hospital service. After the selection of a doctor he should be taken for a survey of the factory.

Specially dangerous spots and any poisonous processes should be pointed out to him and he should be given a short talk upon the product manufactured and the machines by which the work is performed. This will give the doctor a chance to size up the sanitary and hazard situation and make his plans accordingly. Next, a small section of the shop should be assigned to the doctor as a dispensary. This space may be a small room formerly used for storage or may be made by partitioning off a section of floor space where it can be most readily spared. Excellent work can be done in very small quarters. For a factory of between one and three hundred men a room having a floor space of 200 square feet separated into two parts by a partition at least seven feet high is ample. A first aid room of this size is required by law for factories employing 100 or more employes in the State of Massachusetts.

The equipment of such a room is not expensive. The following items are necessary:

(a) A glazed sink with hot and cold water always available.
(b) Electric, gas, or other suitable heating device and sterilizer.
(c) A table with a smooth top.
(d) At least two chairs.
(e) A couch or bed, preferably the latter.
(f) Two woolen blankets.
(g) Heavy rubber sheet 1½ yds. square.
(h) Two pillows, rubber covered, washable.
(i) Two enamelled hand wash basins.
(j) A waste pail.

(k) Individual drinking cups.
(l) A rubber or metal hot water bottle.
(m) A simple stretcher.
(n) A medical and surgical kit.
(o) A supply of individual towels.

Having made his survey of the factory, personally met the foremen and the older workmen, and established his dispensary, the doctor should seek for a competent lay assistant among the workers. In factories employing two hundred or more, a registered, trained nurse having some industrial training should be installed on a full-time basis. In the smaller factories this expense is unnecessary and one of the workers can usually be found who has had some experience and interest in first aid work. This man should be given a course of intensive training by the doctor, in which he is taught the proper method of cleaning a wound with gasoline and iodine, the sterile application of a compress, and proper bandaging. He should also be given a certain amount of general instruction in first aid. Following this, the doctor should call all the foremen together and give them a short talk on the ideas of industrial medicine, ending by a demonstration of the prone pressure method of resuscitation for electric shock and a plea for interest and co-operation. The employer or superintendent should be present at this talk to show his support and impress the foremen with his interest in the work.

From this time on all cases of sickness and accident should be sent at once to the dispensary to be

treated by the first aid man or nurse. If the case is serious, the doctor is summoned, if not, he is treated simply and returns to work. The doctor pays regular visits to the factory, once, twice, or daily each week, spending one or more hours, depending on the size of the plant. At this time he reviews the sanitary condition of the factory and reports to the superintendent any suggested changes or improvements. He next goes to the dispensary where he has sent to him any cases of sickness or accident which have occurred since his last visit, reviews, advises and gives any treatment necessary.

After a month of this type of work he should begin the physical examination of the workers then employed, beginning with the foremen and older employes and omitting any who have any objection to being examined. The examination should be complete and should give the examined man a feeling of confidence in the thoroughness of the doctor's work. In this way, the workers are gradually examined and each advised as to his physical condition. At the same time the doctor has an opportunity to advise a defective employe as to habits, diet, or any other change in his life which appears indicated. At this time also the doctor can arrange to take men off work for which they are not physically fitted and place them where they will be safer, without loss of wages.

After all the regular force has been examined, new men taken on to fill vacancies can be examined shortly after hiring. Unless the doctor is at the

factory daily it is impossible for him to examine applicants for work before they are hired.

Such a system has been carried on in a number of small factories with perfect success. It has been found that the workers appreciate the care they receive and that the prompt attention reduces the time lost from accident and sickness, keeps men at their work and improves the morale of the whole shop. There is no case recorded where a medical service has been dropped when once initiated. The insurance company is usually perfectly willing to co-operate by allowing the company to select its own doctor if he is a man of good standing, knowing that his effort will be to get men back to work early and to give the very best treatment possible.

The method of medical supervision by a centralized dispensary possibly connected with an Employment Department is a method which has been used in the Middle West. The central dispensary is conducted by a group of doctors. Someone is always on duty and there are also nurses in attendance. A doctor is sent daily to each of the subscribing plants, supplementing the work of the full-time nurse or trained assistant, and carrying out the duties outlined for the physician by the first plan. When such a group of physicians includes specialists and the work is carried on in a careful and scientific way there is no better method by which the small factory can supply its medical needs intelligently than by subscribing to such a service. Though theoretically such a service should be linked

with a central employment office which would employ for a group of factories, such a central employment office is seldom found. If these two services were grouped it would be possible for the small factory to receive almost as good a form of service as the large factory is now receiving from its own staff. The chief advantage from the medical standpoint would be the physical examination of applicants with proper placing, and the prevention of contagious disease entering the factory. A medical group of the type just outlined is known as a Health Bureau. Shipley[3] gives the following synopsis of the work:

> "Such bureaus should be prepared to give to industrial and mercantile concerns a well-balanced medical, surgical and sanitary service, which combines the emergency and preventive features in such manner as to produce the most effective results at minimum cost.
>
> "The field force should be under the direction and immediate supervision of men qualified by vast experience in the fields of medicine and sanitation, in order to insure performance of technical service of the highest character. Furthermore, the staff at headquarters should be constantly analyzing the work performed by the field force, and planning and developing new and more effective means of securing results. This overhead service should be available to all of the establishments for whom the bureau is giving service, thus assuring to the smallest industry all the advantages which the largest corporation can secure through the employment of full-time, high salaried industrial health directors.
>
> "The field force should include physicians, surgeons, industrial hygienists and sanitarians, nurses

> and nurses' assistants, and home workers. When the needs of a factory have been determined, the service should be arranged so that maximum results are obtained at minimum cost."

Selby, in the course of his studies, noted that two factories, one employing 400 and the other 500 workmen, maintained full-time medical services and in one the average number of workmen per physician was about 200. The majority of small employers, however, do not make any attempt to furnish an adequate medical service, and it is only by a stimulation of interest, health bureaus, as described above, or state bureaus, that the employes of the small factory will receive adequate care. Inasmuch as the number of factories employing under 1,000 workers is approximately 95 per cent of total number of factories in the United States, the need is obvious. To quote from Selby:

> "In several cities are buildings in which small manufacturing concerns may rent space and purchase power and light. Although the companies that usually avail themselves of these facilities are small, employing but few workmen, rarely more than a hundred, there may be in the aggregate 1,000 or 2,000 employes to a building, a number that certainly justifies the maintenance of a dispensary and the employment of one whole-time physician, two nurses and a clerk. By prorating the cost among the companies, perhaps according to the numbers of their employes, the expense would be in proportion to their means, yet they would have the use of a whole-time medical service and the benefit of its advantages."

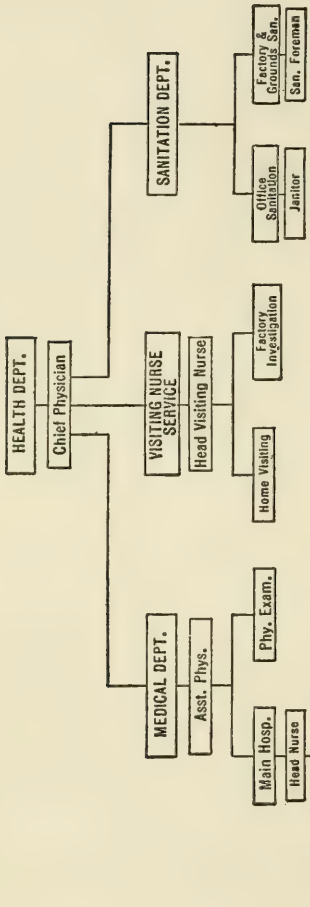

FIG. 2. ORGANIZATION CHART OF THE HEALTH DEPARTMENT IN A FACTORY OF 4,000 EMPLOYES

CHAPTER III

ORGANIZATION OF A MEDICAL DEPARTMENT IN A LARGE FACTORY

In the first chapter it was shown that in large factories the health department is part of the service division. It is organized in such a way that it is in close contact with other departments of the service division, notably the employment and safety departments.

The department is controlled by a chief physician who is responsible to the service director. The chief physician has as assistants one or more physicians and surgeons and a competent staff of nurses. This with clerical assistance comprises the basic personnel.

The work of the health department is carried on in one or more dispensaries depending on the size and shape of the factory. The largest of these dispensaries is placed next to the employment department and should be near the rooms assigned to the safety engineering department and the visiting nurses' service.

The department is divided into three sections, each controlled by the chief surgeon. These sections are the health, sanitation and visiting nurse sections. Each section is separate and separately managed.

The function of the health section is to preserve the health of the worker, to treat cases of accident and to prevent, diagnose and, to a certain extent, treat cases of sickness.

The function of the sanitation section is to provide and maintain the highest type of sanitation in the factory, co-operating in this with the engineer of the plant.

The function of the visiting nurse section is to visit, advise and assist the worker at his home, especially in case of sickness to himself or his family.

The organization of these sections is shown on the accompanying chart. (Fig. 2.)

The health section will be first considered. The equipment consists of a large, well equipped dispensary, centrally located, and, when the plant covers considerable territory, several sub-dispensaries. The equipment of each dispensary is controlled by a registered graduate nurse. In the central dispensary are all records.

Attached directly to the central dispensary or near it are an X-ray room, a dental department, and, if necessary, an oculist's room.

The chief surgeon is in charge of the entire system and has as assistants at least one full-time and one or more part-time physicians and surgeons.

In order to make a relatively accurate estimate of the needs of a plant, one nurse, at least, should be allowed to every thousand employes. In addition to the chief surgeon, one full-time doctor should be allowed for each two thousand employes. One

dentist can care for about two thousand employes and one oculist can be assigned to four thousand employes, provided that special attention is not required by the hazard of the business. The question of specialists will be discussed fully in another chapter.

The health section records are kept by one or more lay clerks who are to some extent assisted by the nurse or nurses in the main dispensary.

The division of the work of the personnel is usually as follows: The chief surgeon has his office in or near the main dispensary. At this dispensary are stationed all assistant doctors, and at least one nurse. As previously stated, all records and files are grouped at the main dispensary. At each subdispensary are stationed one or more nurses, depending upon the activity of the work.

The health department has for its functions:

1. The physical examination of all applicants for positions in the factory.
2. The re-examination of all employes transferred from one department to another.
3. The periodic examination of workers employed in departments where there is a health hazard.
4. A periodic examination of all workers who have physical defects needing following up.
5. The placing of physically defective workmen in departments where the work will not prove injurious.
6. The diagnosis and, in certain cases, the treatment of workers applying to the dispensary for medical care.
7. Co-operation where possible with the family physician of sick and defective employes.

8. Diagnosis and treatment of workers injured during employment.
9. Diagnosis and in some cases treatment of workers having surgical conditions not the result of employment.
10. Spreading health publicity by lectures, leaflets and similar publications.

The effectiveness with which this is done depends largely upon the initiative and vision of the chief surgeon. It is his duty to co-ordinate the work of the health department with that of the contact departments mentioned in the first chapter, to stimulate in his assistants scientific and accurate work, and to co-ordinate and render effective the work of his own department. In addition to this he must do a great deal of actual work, particularly along diagnostic lines. In some very large factories, employing over ten thousand employes, the work of the chief surgeon is largely administrative, but in the average large factory where the number of employes varies between three and five thousand, a great deal of actual work must be done.

The management of the health of the employes of a large factory is carried out somewhat as follows: Each applicant for work after having been interviewed by the employment department is sent to the health department for a complete physical examination. Following this examination the applicant is classified by the examining doctor as to his ability to work. The classification is usually confined to four groups. A man who is normal in every way is classified in the A group; a man who has

several slight defects, none of which are severe, is classified in the B group; a man who has defects severe enough to make his employment in certain departments inadvisable is classified in the C group; while an applicant whose condition renders it unwise to work in any department is classified in the D group. Few men fall in this classification. Burlingame has made it a rule to classify as D all men whose employment would be dangerous to themselves, to others, or to property, a most satisfactory and neat classification. The number of these workers is, fortunately, few. According to Mock, the number amounts to 10 per cent of those applying, but in the average factory, where there is a variety of work and no great hazards, as in a machine shop, the number will be found to be about 2.8 per cent of those approved by the employment department. The disposition of these men can and should be made, whenever possible, by the examining physician. Thus, a case of active tuberculosis is obviously a danger to himself and others in a factory and should be advised to make immediate application at the nearest tuberculosis clinic for care and advice. To simply reject such a man without telling him of his condition and advising him what to do is a social crime, exposing others to the disease and preventing the possible cure of the affected man.

But to return to the physical examination. After the examination has been completed and the worker classified, he is sent back to the employment depart-

ment with his letter classification. If the worker is an A or B class man, he is at once put to work. If his classification is C, he is held at the employment department until the doctor is able to confer with the employment manager as to the type of work for which the applicant is best fitted. In some factories besides classifying the applicant when he is in the C class, the doctor writes a prescription for the type of work desired. This prescription the applicant takes with him to the employment department, and from it the employment manager determines the work at which the applicant shall be put. It is considered advisable that the same relation of doctor and patient be maintained as strictly in industry as in private practice. The doctor should discuss the type of work the patient can and cannot do with the employment manager, but not the physical condition necessitating it.

The results of the physical examination are recorded on a special card, envelope, or sheet by the examining physician and this is then filed with the rest of the records. This card forms the basis of all future medical work upon the employe and is frequently referred to.

As a result of the physical examination, all workers are classed broadly into two divisions, standard and sub-standard. The sub-standard workers are placed at work for which they are physically fitted through the employment department. Their physical examination cards are flagged with a colored signal indicating the defect. Once in three

months these defective men are re-examined to see how they are standing up under their work, and any adjustments made in their work which appears necessary. At this re-examination the examining physician discusses with the worker the condition found and advises him. All men working where there is an industrial disease hazard are similarly managed, each one being called to the main dispensary quarterly and rigidly examined for signs of industrial disease or poisoning. This also gives the physician an opportunity to discuss freely with the worker the best methods of caring for his health.

All workers, standard or sub-standard, are re-examined on transfer from one department to another. This gives the Health Department an opportunity to check up any changes in the workers' condition and prevents a sub-standard worker from being transferred to work for which he is not physically fitted.

The applicant having become a worker comes under the medical supervision of the Health Department. This supervision is carried on as follows:

All workers when they start at work are shown the nearest dispensary and instructed to report there for any sickness or injury, no matter how slight.

If this is one of the branch dispensaries the following routine is carried out in case of sickness or accident:

1. Employe notifies foreman of sickness or accident.

2. Foreman directs employe to nearest dispensary.
3. Nurse at dispensary takes short history of case and examines into condition complained of.
4. If the condition is simple, as a scratch or constipation, the condition is treated and patient told to report back next day.

4a. If the condition is severe the patient is sent to the central dispensary for diagnosis and treatment, or a doctor is sent from the central dispensary for this purpose.

5. The case is entered on a card or slip which is forwarded to the central dispensary for filing and notation.
6. Patient's name, number and department are entered in a book; and a note made as to the day the patient should return to the dispensary for treatment.
7. Patient returns to work or in case of a serious accident or sickness is sent home or to a hospital.

7a. If patient is sent home or to a hospital, the visiting nurse service is notified.

8. When patient returns for retreatment, what is done is recorded, another notation is made in the book, and date when patient should return unless discharged is entered.

This in brief is the routine used in treating cases of sickness and accident occurring in the factory.

In order to obtain uniform results, routine methods of treatment have been adopted wherever possible. This applies more particularly to accidents, but it is also possible in treating minor cases of sickness. The methods adopted and the reason for them will be more fully outlined in a later chapter.

Certain routine methods of report to contact departments have also been found necessary. These

will be considered fully under the chapters dealing with the care of sickness and accident.

Sanitation is the second branch of the medical department coming under the control of the chief surgeon. Sanitation consists of the control of the following plant conditions:

Light	Water
Heat	Toilets
Ventilation	Locker Rooms
Dusty Conditions	General Cleanliness

Each of these will be discussed at length in the chapter on sanitation. The management of sanitation throws the chief surgeon in close contact with the plant's engineer, as many of the problems are those of engineering. The control of sanitation involves tours of inspection at regular intervals.

The Sanitation Department is administered by a foreman who has under him a corps of workers. The organization is similar to that of any factory department. The entire plant is divided into zones, and a certain number of workers are assigned to each zone, each one having a regular task. Thus, one man will take charge of the cleaning of a certain amount of floor space, another will care for the toilets and locker rooms, another will clean windows, while still another will collect and clean cuspidors if these are necessary. The sanitary workers in each zone are controlled by a sub-foreman who reports directly to the sanitary foreman.

It is well to supplement the inspections made by the chief surgeon with weekly reports made by the

Norton Company Worcester, Mass.

WEEKLY SANITATION REPORT

Dept._____

Date_____

LOCATION	CONDITION
Locker Rooms	
Toilet	
Floor	
Corners	
Windows	
Cuspidors	
Waste Cans	

Remarks:

If everything is satisfactory it is only necessary to write "O. K." in this space

Signed_____
Foreman

NOTE: To be filled out and sent to Service Director each Monday

FIG. 3. SANITATION REPORT
This Is Made Out Weekly by Each Foreman and Forwarded to the Chief Physician

production foreman of the various departments. (Fig. 3.)

Visiting Nurse Service is the third branch of the medical department.

The object of this service is to follow up at their homes, employes who are out because of sickness, accident, or sickness in the family. As soon as a case of sickness or accident is sent home by the health service, the Visiting Nurse service is notified and a visiting nurse visits the patient at his home. The object of these visits is more to render assistance than to do actual nursing, though in many large factories where there is a large force of visiting nurses, actual nursing is done. When a district nurse service exists in the community, it is not necessary for the factory nurse to do much actual nursing, though she should be prepared to take care of any emergency she finds. Her main function is to see that the patient has good surroundings and improve these if possible; to secure a physician or nurse if the patient is in need of one, or to send or transport the patient to a hospital if the patient is willing and surroundings are bad.

The visiting nurse also visits cases of accident who are at the general hospital and reports back their condition to the chief surgeon. In short, the service is a contact between the sick or injured workers and the health department.

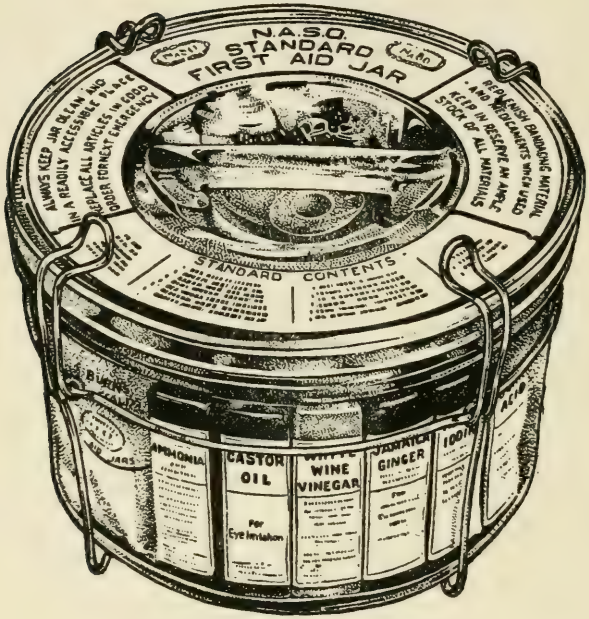

FIG. 4. N. A. S. O. FIRST AID JAR
Adopted as Standard by Many Large Factories

CHAPTER IV

FACTORY DISPENSARIES

The factory dispensary is the center for all medical work and should be situated as near the geographical center of the factory as possible. Like the base hospital in the army, it acts as the final point for diagnosis and treatment, and is supplied by the sub-dispensaries which correspond to the army field hospitals. The sub-dispensary in turn is supplied from the factory department first aid stations if the factory is large enough to require these.

The first aid station will be the first thing considered. It is usually represented by a box or jar which contains a few sterile gauze pads, Tr. of Iodine, burn ointment, and a tourniquet. This box is the equipment of the trained first aid man, usually a foreman or sub-foreman. Up to a few years ago these boxes, usually containing dirty bandages, some patent so-called "antiseptic," and a pair of rusty forceps, probably caused more infection than they prevented. Absorbent cotton was liberally used. Iodine or even soap and water shunned. Of recent years, however, all this has been changed and where the first aid box remains it is usually well kept up. The American Red Cross and the war train-

ing received by many of the factory operatives have combined to diffuse a large amount of sane, practical knowledge among the workers of the country, and the results are gratifying.

The best first aid outfit at present is that developed by the Conference Board of Physicians in Industry and adopted by the National Founders Association. (Fig. 4.) It consists of a heavy glass jar in a wooden case with the following contents:

1 Tourniquet
1 pair Nickel-Plated Scissors
1 pair Nickel-Plated Tweezers
1 Triangular Sling
1 Wire Gauze Splint
12 Assorted Safety Pins
1 2-oz. bottle Castor Oil
2 3-oz. tubes Burn Ointment
1 2-oz. bottle 3% Alcoholic Iodine
1 2-oz. bottle White Wine Vinegar
1 2-oz. bottle 4% Aqueous Boric Acid
1 2-oz. bottle Aromatic Spirits of Ammonia
1 2-oz. bottle Jamaica Ginger (or substitute)
1 piece of Flannel 24" x 36"
1 roll Absorbent Cotton (1.5 oz.)
1 roll 3" x 10 yards Gauze Bandage
1 roll 2" x 10 yards Gauze Bandage
2 rolls 1" x 10 yards Gauze Bandage
1 spool 1" x 15 yards Adhesive Plaster
6 sealed packages 6" x 36" Sterile Gauze
1 Teaspoon
1 Metal Cup
1 Medicine Glass
2 Medicine Droppers
3 Paper Drinking Cups
First Aid Record Cards

The advantages of a jar are that it is clean, the equipment can be seen at a glance, it can be used

to carry water. The instructions are incorporated in the glass cover. The Department of Hygiene of the New York Department of Labor has approved the N. A. S. O. Standard First Aid Outfit for Employes in the State of New York in lieu of the First Aid Outfit required by the department and similar action has been taken by the Massachusetts Department of Labor and Industries.*

The jar or box is in the hands of a trained layman who has been carefully taught to do little but do that little well. The following list of instructions thoroughly understood is sufficient:

Open Wounds—Abrasions, Cuts, Punctures

Drop 3% Alcoholic Iodine into wound freely, then apply dry sterile gauze to wound and bandage it. If necessary to cleanse greasy substances from wound, flush it with gasoline. Do not otherwise cleanse wound.

Severe Bleeding

Place patient at rest and elevate injured part. Apply sterile gauze pad large enough to allow pressure *upon, above* and *below* wound. Bandage *tightly*. If severe bleeding continues apply tourniquet *between* wound and heart and secure physician's services at once. Use tourniquet with caution and only after other means have failed to stop bleeding.

Nose Bleeding

Maintain patient in an upright position with arms elevated. Have him breathe gently through mouth and not blow nose. If bleeding continues freely, press finger firmly on patient's upper lip close to nose or have him snuff diluted White Wine Vinegar into nose.

*The N. A. S. O. First Aid Jar can be obtained from National Founders Association, 29 South La Salle St., Chicago, Ill. Price $7.25.

Bruises, Sprains

Cover injury with several layers of sterile gauze or cotton, then bandage tightly. Application of heat or cold may help; other means are unnecessary. If injury is severe place patient at rest and elevate injured part until physician's services are secured.

Eye Injuries—Except Eye Burns

For ordinary eye irritations flood eye with 4% Boric Acid Solution. Remove only loose particles which can be brushed off gently with absorbent cotton wrapped round end of toothpick or match and dipped in Boric Acid Solution.

Do not remove foreign bodies stuck in the eye. In that case and for other eye injuries drop castor oil freely into eye, apply sterile gauze, bandage loosely and send patient to physician.

Splinters or Slivers Embedded in Skin Except Eyes

If easily reached withdraw with tweezers, then treat as "Open Wounds"; otherwise let physician attend to it.

Eye Burns, Fire and Electrical Burns and Sunburn

Do not open blisters. Use burn ointment (3% Bi-Carbonate of Soda in Petrolatum) freely on sterile gauze applied directly to burn. Cover with several thicknesses of flannel or other soft material, then bandage, *but not* tightly.

Acid Burns

Thoroughly flush wound with water, then dry wound, apply burn ointment and bandage as above.

Alkaline Burns

Thoroughly flush wound with water, then flood with White Wine Vinegar to neutralize (dilute vinegar for alkaline *eye* burns), dry wound, apply burn ointment and bandage as above.

Dislocations

In case of dislocation of finger, except second joint of thumb, grasp finger firmly and pull it

gently to replace joint, then place finger in splint and bandage it. In all other cases place dislocated part at rest and promptly secure physician's services.

Fractures

Make patient comfortable and secure physician's services at once. Avoid unnecessary handling to prevent sharp edges of broken bones tearing artery. If patient must be moved place broken limb in as comfortable position as possible and secure it by splint. In case of severe bleeding apply sterile gauze and follow directions under "Severe Bleeding."

Dizziness, Headache, Nausea

Give patient teaspoonful of Aromatic Spirit of Ammonia in hot or cold water.

Chills, Cramps

Give patient 20 to 30 drops of Jamaica Ginger in hot or cold water. If improvement is not speedily obtained send for physician.

Frost Bites

Rub with ice, snow or cold water, then treat as fire burns.

Internal Poisoning

Immediately secure physician's services. Make patient drink large quantities of water, preferably warm, and make him vomit by sticking your finger down his throat or by other means.

Heat Prostration

Give patient teaspoonful of Aromatic Spirit of Ammonia in hot or cold water. In case body feels warm apply cold to it; if necessary give cold bath. In case body feels cold and clammy, apply heat to it and immediately send for physician.

Unconsciousness from Fainting

Lay patient on his belly and turn his face to one side. Loosen all tight clothing. Remove false teeth, tobacco, etc., from mouth. Apply cold to

head, warmth to hands and feet. If breathing stops treat patient as directed under "Electric Shock." Give no liquids by mouth until patient is fully conscious. Then give teaspoonful of Aromatic Spirit of Ammonia in hot or cold water.

Shock, Following Injury

In case shock is due to severe bleeding control it first as directed under "Severe Bleeding" and summon a physician. Lay patient flat on back and keep him warm with blankets, hot-water bottles, etc., and provide plenty of fresh air. Let patient inhale fumes of Aromatic Spirit of Ammonia. If fully conscious give hot drink or teaspoonful of Aromatic Spirit of Ammonia in hot or cold water.

Unconsciousness from Asphyxiation by Gas, Smoke or Water

Treat patient as directed under "Electric Shock."

Electric Shock

Immediately free patient from electrical circuit, using every care to protect yourself against electric shock. Then if patient is unconscious, even if he appears dead, lay him on his belly with arms extended forward, turn his face to one side, remove false teeth, tobacco, and so forth, from his mouth and draw his tongue forward.

Kneel, straddling patient's thighs, facing his head, and resting your hands on his lowest ribs. Swing forward and *gradually* bring weight of your body upon your hands and thus upon patient's back, then immediately remove pressure by swinging backward. Repeat this movement about twelve times per minute without interruption for hours if necessary, until natural breathing has been started and maintained.

The sub-dispensary as already stated is a small dispensary for the treatment of accidents and minor sickness. It is under the charge of a trained, regis-

tered nurse. In small factories it is the only dispensary necessary.

The dispensary should contain not less than 200 square feet floor space. If it is the only hospital in the factory it should be provided with a partition separating certain portions of the room. This partition should be at least seven feet in height and should contain a door. The floor and walls of the dispensary should be smooth, and the floor of some impervious material. The room should be ventilated directly to the outside air by a window or other suitable opening or approved exhaust system.

The dispensary should be centrally located in regard to the territory it is to supply and when possible should be so placed as to guarantee a maximum of quiet and privacy to those requiring first aid treatment or rest, as well as readily accessible to the persons for whose accommodation it is designed.

The equipment need not be elaborate. The following inventory was taken from a sub-dispensary in a factory which has been maintaining medical supervision of employes for ten years.

1 Table
2 Cupboards
1 Dressing Table—3 glass shelves
1 Swivel Chair
1 High Chair—Glass Arm (for dressings)
1 Flat Instrument Basin
1 Kidney Basin
1 Large board for folding gauze
1 Electric Sterilizer
1 Saw Horse
1 Pus Pail

1 Board for Adhesive
1 Army Stretcher
1 Steel Locker (2 coat hangers)
1 Metal Basket
1 Irrigating Can, 5'
2 Small Cupboards, 2 gl. Shelves
1 Solution Stand with 3 gl. Shelves
1 Solution Basin, glass cover
2 Hand Basins
1 Bedside Screen, cover
1 Razor Strap
1 Emergency Jar with sponges
1 Splint, Tourniquet, aro. spts.
1 Cot
1 Mattress
1 Pillow
2 Blankets
1 Rubber Sheet
1 Desk Clock
1 Folding Chair
3 Cane Seated Chairs
5 Bottle Racks
2 Sheets
2 Pillow Cases
5 Eye Bottles and Eye Droppers
1 Razor
2 Scalpels
4 Forceps
3 Scissors
1 Haemostats
1 Bandage Scissors
1 Large Scissors for Gauze
1 Glass Hypo. Syringe and Needles

The dressings include the following:

Sterile Gauze Bandages
Adhesive Plaster, 5 yds. x 1 foot rolls
1 package of wooden splints
Sheet Wadding
1 Thomas Splint, U. S. Army Model

Tin Cross Pieces for finger splints
Wooden Applicators
Tongue Depressors
Various boxes and bottles for holding equipment

The drugs include the following:

Chlorozene	Dover's Powder
Collodion	Essence of Peppermint
Creso-pinol	Ether
Gasoline	Ethyl Chloride
Lead Acetate and Alum	Glycerine
Tincture of Iodine	Glycerine and Iodine
Wax	Headache Anodyne
Acetanilid	Lassar's Paste
Alcohol	Rhinitis Tablets
Alum (powder)	Rhubarb and Ipecac Tabs.
Ammoniated Mercury (oint.)	Rochelle Salts
	Scarlet Red Ointment
Arom. Spirits of Ammonia	Seidlitz Powders
Bichloride of Mercury	Seiler's Gargle
Bismuth Subnitrate	Silvol
Blaud's Pills	Soda Bicarbonate
Boric Acid (ointment)	Soap Liniment
Boric Acid (powder)	Sodium Salicylate
Brown Mixture	Special Cough Mixture
Browntail Moth Lotion	Special Eye Drops
Capsolin	Tartaric Acid
Castor Oil	Tincture of Benzoin
Chloroform and Cloves	Tincture of Ginger
Cocaine (4% sol.)	Yellow Oxide of Mercury
Compound Cathartic pil.	Zinc Oxide (oint.)
Compound Rhubarb pil.	Zinc Stearate (powder)

The cost of the above equipment was about $250 before the war and now amounts to about $400. With the exception of the drugs and supplies the equipment should last five years before replacements to any extent are necessary.

The equipment standardized and approved by the Conference Board of Physicians in Industry is as follows:

1 metal combination dressing table with drawers to hold instruments and dressings
1 metal chair with head and arm rest
1 metal stool built in combination with metal waste can
1 small wooden or metal examination table with pads, with ends hinged to drop down
1 stretcher of the army type (canvas stretched over two round wood poles) or of the metal N. A. S. O. type
1 small instrument sterilizer arranged for electric, gas, alcohol or kerosene burner
½ dozen utensils, such as arm and foot basins, 3 or 4-quart ordinary basins, 2-quart dipper, bed pan, etc.
1 portable first-aid outfit (N. A. S. O. standard first-aid jar recommended)
Appropriate instruments, including a razor
Dressings, splints, drugs

Recently, the American College of Surgeons has been interesting itself in Industrial Surgery and is considering a recommended minimum equipment.

The central or main factory dispensary is sometimes called the clinic. As has been pointed out, it is the medical center of the factory and is operated by doctors and nurses. It is also the proper place for all records. It should be near the chief surgeon's office, and close to the X-ray room, pathological, dental and eye departments. The size and arrangement depends on the size of the factory. In such a great factory as the Ford Motor Company

in Detroit, not only is all emergency operating done at the plant hospital, but wards are ready for the reception of patients. The merging of a ward with the central dispensary is, however, rare and only confined to very large factories or to those which are at a long distance from a general hospital.

There are certain general principles concerning factory dispensaries which are of interest. First there should be no waiting room. The object of the dispensary is to return the sick or injured man to work at the earliest moment. It is necessary to give rapid and good service to do this, but it is much better economics to have more nurses or more dispensaries than to keep anyone waiting. Six good workmen waiting for dressings can cost the company much more than the nurse's salary in a very few days. The dispensary should, therefore, not only have no waiting room, but be so arranged that maximum speed in dressings and handling cases can be obtained. This is done by using a unit system of grouping. The medical and surgical sections of the dispensary should be separate and distinct. They will be described in detail.

The medical section of the dispensary is arranged so that workers may have an opportunity to consult the doctor with a certain amount of privacy, to have physical examinations, and to receive any advice and immediate treatment required. The medical section should therefore contain an office or partitioned space with a desk for the doctor and chair for the patient. There should be at least one booth

where the patient may be examined. Connected with this section there should be a recovery room with one or two beds where men who have an acute attack of sickness may rest, or an abdominal examination be made. A medical cabinet or set of shelves is necessary for holding the drugs, thermometers, urine bottles, and so forth.

The medical section has nothing whatever to do with the physical examination rooms where applicants for positions in the factory are examined. It is the purely medical part of the dispensary and should be considered only as a medical and diagnostic center.

The surgical section is separated directly by a partition or indirectly by an open space from the medical section.

Its work is divided into several different types and for this reason a careful arrangement by units will greatly reduce and simplify the work. A unit consists of all the appliances, apparatus and dressings needed for a certain type of surgical work. Each unit is so arranged that the doctor or nurse can reach the part to be treated, dressings and instruments, with the least possible lost motion.

The usual units consist of

1. Units for dressing clean wounds of the hand and forearm.
2. Units for dressing clean injuries of the foot and leg.
3. Units for dressing infections.
4. A unit for treatment of ear, nose and throat cases.

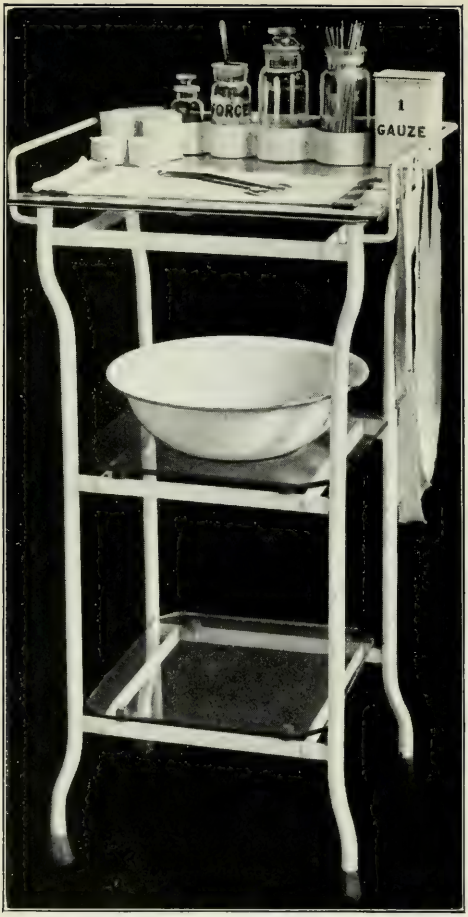

FIG. 5. A UNIT TABLE SET UP FOR HAND DRESSINGS

Contents of Upper Shelf
Left to Right

1. Bandages 1 in. and 2 in.
2. Tr. Iodine in glass stoppered bottle.
3. Thumb forceps in antiseptic solution.
4. Gasoline.
5. Sterile cotton swabs on wood applicators.
6. Sterile gauze 2x2 in.
7. Bandage scissors.

On side of table strips of adhesive. It is better to have these spread on a bread board.

5. A unit for treating eye cases, especially foreign body in the eye.
6. A unit for treating burns.
7. Units for the treatment of back strains.
8. A unit for the treatment of patients who must undress.

Unit for dressing clean wounds of the Hand and Forearm. (Fig. 5.)

a. One chair for patient, usually built high so that the dresser does not have to bend over. The chair is of the cafeteria type, having a broad arm which is covered with a glass plate or white enamel ware.

b. A small glass or metal topped table upon which are the following:

Top of Table

One wide-mouthed glass stoppered bottle containing Tr. Iodine, U. S. P., ½ or full strength, four ounces.

One wide-mouthed glass stoppered bottle containing Benzene or Gasoline, 8 ounces.

One wide-mouthed bottle containing Lysol or other aseptic solution in which one pair thumb forceps without teeth is immersed, handle projecting.

One wide-mouthed bottle containing sterile cotton swabs on wood applicators.

One metal box with cover containing folded sterile gauze compressors, 2x2 in.

One pair of bandage scissors.

Shelf of Table

One dozen 1-in. gauze bandages.

One dozen 1½-in. gauze bandages.

One dozen tin cross finger protectors.

The above can easily be contained in a low-sided tray.

Standing near or resting on lower shelf of table

One bread board covered with strips of adhesive plaster, ¼ in. wide by 2 ft. long, for reinforcing dressings.

Unit for dressing clean injuries of the foot and leg

a. One ordinary chair of metal or wood.

b. One leg rest of wood, usually horse type.

c. One table with same arrangement as clean hand dressing table except that lower shelf should contain a jar of zinc oxide ointment, and adhesive strips should be 1½ in. wide by 2 ft. long.

Unit for dressing infections

One ordinary chair.

One table as before but with following dressings:

One bottle Alcohol

One bottle Ether

One bottle Dichloramin T.

One jar of 4x4 in. gauze

Sponges soaking in Chlorazene or other antiseptic solution

One package of thin oil, sandwich paper or celusilk.

Assorted bandages

Cotton sponges in retainer

Instruments

Two pair Kelly Clamps

One pair Bandage Scissors

One pair Thumb Forceps in antiseptic solution

Unit for Treatment of Ear, Nose and Throat Cases

(This can often be combined with unit for treating eye cases)

One table as before

One specialist's chair

One strong focusing light

One head mirror

One bottle Tr. of Iodine and Glycerine, equal parts.

One bottle Silvol or Argyrol 25%.

One set nasal and throat sprays in rack with solutions.

One compressed air tank

One metal irrigating can, 2 qts., with attachments

One pus basin

Instruments

One nasal speculum

One set aural specula

One ear curette

One ear or nasal forceps

Absorbent Cotton

Unit for Treating Eye Injuries

A dark room 5x5 feet, inner walls painted black

Special bracket with light

Specialist's chair

Shelf for eye solutions in dropper bottles

Two cataract knives, eye spuds, etc.

Watchmaker's glasses or bifocal magnifying glass

Sterile gauze

Waste bucket

Unit for Treating Burns

Table as before

One jar Gauze Sponges 4"x4" soaking in saturated solution of Sodium Bicarbonate

Apparatus for wax treatment

Rolls of sheet wadding

Units for Back Strains and for Patients who must undress

Booths 6x6 feet with a swing door. A hole cut in door enables doctor to see when patient is ready.

Each booth should have a table equipped as *unit one.*

In addition there should be an electric plug so that heat-treating apparatus can be connected.

The physician should use his own judgment as to the type of apparatus desirable.

Broad straps of adhesive ready cut on a bread board for back strapping are desirable.

In addition to the units there must be an adequate number of sinks or basins with running hot and cold water. These sinks can well be placed in the center of the dispensary to be easily reached from all sides. When sinks are used instead of hand basins, white enameled basins placed inside the sink and kept in an antiseptic solution when not in use, are of value. There should also be one or two foot tubs available. The sterilizer should be centrally located and easily accessible from all parts of the surgical section. It should consist of a large dressing sterilizer and a medium sized instrument sterilizer. A container for sterilizing water is unnecessary and occupies valuable space. Near the sterilizer should be placed the instrument cabinet which contains instruments and frequently needed supplies. The cabinet need not be elaborate nor very expensive. Near each dressing table should be a receptacle for soiled dressings. There are many types of receiver in use. Selby describes an innovation which is strictly clean and not an eye sore. This is a "paper receptacle used in the dispensary of the Erie Forge Company, a cylindrical bag supported by a light metal stand."

At each sink there should be a towel shelf and soiled towel receptacle. This may be a cotton bag suspended from a metal ring or a hamper.

Many variations of arrangement of these units are now in use and there are numerous modifications. The General Electric Company in its West Lynn plant has a central dispensary with surgical arm and hand units in the form of a long bench with

arm rests covered with glass. Beneath each seat is a board which can be pulled out for a leg rest. On the back of each seat is a coat and hat rack.

Many other instances of ingenious arrangements might be cited but the principle of "units for treatment" remains unchanged.

It has been previously stated that the records of the medical and surgical work done at both branch and central dispensaries should be centralized at the main dispensary. Every factory medical service has its own method of making and filing records. There is no one best method as yet decided on. The record system will be discussed in a later chapter.

CHAPTER V

THE INDUSTRIAL PHYSICIAN AND THE INDUSTRIAL NURSE

The industrial physician must be a good general medical man and have had a hospital training in traumatic surgery. He must have executive ability and be able to handle men. In addition to this he must have interest in and sympathy for his patients, injecting the soul of the family doctor into his work. As a very prominent physician put it, the factory will get more from a 60% trained man with 100% interest and personality than from a 100% trained man with 60% personality. Geier[5] thus describes the industrial physician:

"The industrial physician is that man who gives up his private practice to enter industry for the purpose of using his knowledge of medicine and surgery to serve the worker and the management. Here again, just as in private practice, the man is going to be a relative failure or a great success, depending upon his ability and upon the extent to which he now qualifies as a specialist in this new subject. He may be the type of man that is satisfied merely to dress injuries and simply to prescribe for men who appear in his office; or he may make a thorough study of the plant conditions, the sanitation, safety, etc., for the purpose of creating a better

shop morale, raising their level of efficiency, and promoting their health, which will result in increased output. This last is the true industrial physician who really interprets the definition of industrial medicine, which states that it is the knowledge of medicine, surgery, oral hygiene, sanitation, hygiene, safety, economics, and psychology, daily promoted and intensively applied to groups of employes for the purpose of preventing or shortening the disability due to illness and accidents and for the purpose of adjusting unhealthful working and living conditions that surround the industrial job, as well as the community life, thereby increasing individual efficiency and mass production."

Industrial physicians may be whole or part-time men. In a large factory, the chief physician had best be on full time, but his assistant physician or physicians may well be on part time if the factory is in or near a city.

A part-time industrial physician is a physician or surgeon in general practice who gives part of his time to industrial practice. A great deal of excellent work has been done by men of this type who have seen and grasped the opportunity offered. Without them industry would be greatly handicapped for over 95% of the factories in the United States employ less than a thousand workers and such factories cannot afford the services of a full-time physician. Part-time physicians are also of great value as assistants to the chief physicians of a large factory. The contact they are constantly

having with private patients and general hospital work keeps their professional interest acute and forces them to study. Moreover it keeps them in touch with the more advanced forms of the sickness they see beginning in the factory dispensary.

An industrial physician who is in charge of a very large staff of full-time doctors told the author that he wished a high turnover among his doctors as the continuous handling of simple problems had a tendency to reduce the initiative and progress of the doctor.

The author feels that his summary in another publication covers the ground in a reasonable way. In factories employing under a thousand, one part-time physician; in factories of between one and two thousand, two part-time physicians; in factories of between two and three thousand, the same number if one is part time and the other full time.

Inasmuch as a factory is composed of many departments each one specializing in some particular work, it is necessary that the industrial physician have a general knowledge of these departments, and a definite comprehension of the detail work of the departments with which he comes in intimate contact. Without this knowledge he is unable to write letters and information to the proper department nor is he able to co-operate with departments with which he is in contact. The doctor has definite authority and in all medical matters his decisions will be accepted without question, but he must be able to show that he is right and produce results in

order to retain the confidence of man and management. He must initiate requisitions for all hospital supplies and equipment, and has it in his power to spend large sums of money wisely or foolishly as he wishes. The purchasing of medical supplies requires careful judgment in order that the maximum value may be obtained for each dollar expended.

He must be able to inspire his nurses and assistants with confidence, and stimulate them to high standards of work, and must be thoroughly believed in by the workers. Beginning slowly he must build up the dispensary service in just the same way as a physician acquires his private practice. The same thought, care and sympathy are required by the patient whether he obtains them from a private or an industrial physician and unless he gets it he will go elsewhere.

The records of the factory dispensary should be as carefully guarded as in a doctor's private office and the physical condition of a patient should not be discussed outside of the dispensary.

Careful attention to these details has a great deal to do with the ultimate success of the department.

The technique of examination and treatment of patients should be carried on as in a general hospital service.

Special emphasis is laid upon these simple details for unless they are carried out with great care the work of the industrial physician will not obtain maximum results.

One of the greatest privileges of an industrial service is the close and long-continued contact with a large number of men. The doctor has a wonderful opportunity not only for investigation work, but for teaching the worker the rudiments of healthful living.

The industrial physician finds that his work naturally divides itself into medical, surgical and what may be termed public health work. Owing to the early stage at which many diseases are encountered the factory dispensary probably presents one of the best fields now open for the study of beginning disease and its prevention. As the sanitation as well as the health problems of the factory are under the doctor's control, he has it in his power to act as a local board of health for the factory and to observe accurately the results of his action.

The doctor will always be measured by his results. Factory workers and management are both close observers, and unless the best kind of results are produced, there is bound to be unfavorable criticism. the doctor's control, he has it in his power to act as of time. In the case of accident, days of disability will be inexorably charted against him, and every infection comes out without possibility of camouflage. Therefore, careful work, good instruction to nurses, and a follow-up system are obligatory. He will find it necessary to standardize certain forms of treatment, both medical and surgical, in order to study the efficiency of the form adopted and to save time and space.

The element of time is constantly presenting itself to the industrial physician in some new phase. The length of time allowed for a physical examination, the time it takes for a worker to go to the nearest dispensary to have an injury treated and return to work, the time taken to make a diagnosis, the time taken for taking and filing records, the time lost by workers because of sickness and accident, all present themselves before him in what at first appears to be a limitless procession. He finds that the installation of an X-ray equipment pays because it saves the time of the worker which would otherwise be spent going to have the picture taken elsewhere, and the time of the nurse who would take him. He finds that men on piece work will not go far for medical or surgical care unless sorely in need of it, because of the time they lose from work. He wonders at first why time is so important and then realizes that in industry the old adage, "time is money," is the reason. As soon as he realizes this he begins to see that his whole department and many of its results can be measured by a common factor, dollars and cents, which can be understood by everyone. Many things that he does cannot be so measured, but many can, and instead of shrinking from the thought of work being so measured, he should be glad that there is some definite norm which can be applied to measure the results of his department.

The good industrial physician is constantly studying not only the results in his department, but new methods of diagnosis and treatment. For this rea-

son he should stipulate with the management that he be allowed to maintain any outside hospital connections he may have obtained before going into industry, and that he be allowed enough time away from his work to visit clinics and attend medical meetings.

In order to obtain good results there must be close co-operation between the doctor and the management. The interest and backing of the superintendent is almost vital to the success of the medical department, and the closer the mutual understanding between doctor and superintendent the more effective the work.

The foreman has been called the "top sergeant" of industry. He represents the company to the worker. It is, therefore, of great importance for the medical work to have the sympathy and interest of the foreman. Close co-operation between foreman and doctor is bound to bring most gratifying results and opens an easy contact with the worker. The worker to a great degree reflects the attitude of the foreman, and enthusiastic support of the medical department by the foreman makes the problems of the doctor much less difficult.

The industrial physician must be a good team worker and be able to co-operate with the heads of departments with which he comes in contact. He must study the detail of these departments in order to so arrange his work that it will not interfere with their routine or increase their difficulties.

The departments in contact with the health de-

partment have been enumerated in previous chapters and some of the points of contact and co-operation discussed.

The Industrial Nurse

The industrial nurse may fall into one of two positions, dispensary nurse or visiting nurse. The first of these resembles very closely the position of a nurse in a medical or surgical dispensary of a general hospital except that in industry her responsibilities are usually greater than in general hospital work. While under the general supervision of a doctor there are long periods when the sub-dispensary nurse must use her own judgment, and it is this faculty of judging whether or not a patient needs the doctor's care which determines the nurse's ability.

If we briefly review the method of dispensaries which we have laid down as a model it will be noted that while the central or main dispensary always has a doctor in attendance, the sub-dispensaries are visited by a doctor only once daily. At this time the nurse is supposed to have ready those cases which need a doctor's attention and advice. At any time she may send sick or injured men to the central dispensary to see the doctor there, or may in serious cases send for the doctor to come to the sub-dispensary.

It is the fifty cases of trivial sickness and accident using the sub-dispensary daily which test her judgment. Does the headache this man complains of

suggest eye strain, and should the doctor see him? Is this man's abdominal pain of any significance? Does that cough suggest the need of a complete chest examination? A good nurse who has had experience is very accurate in diagnosis as to whether a patient should be seen by a doctor or not. She should always play safe and err on the side of over-caution. The following general rules may act as guides:

1. Always take the temperature if there is the slightest reason to suspect it.
2. Always take the pulse.
3. In case of headache think of eyes. If headache persists have patient see doctor.
4. In cases of abdominal pain always take temperature and pulse. If patient is nauseated or has vomited call doctor.
5. Send to doctor any injury requiring suture or splinting.
6. Send to doctor any patient who has coughed a week.
7. Send to doctor any patient with temperature of 100.

Many other good rules may be added; the outline above will serve as a guide.

There has been some discussion as to the advisability of allowing nurses to take this responsibility. Theoretically, the industrial nurse may have more responsibility than the nurse elsewhere, but unless she is given this responsibility, it will be impossible to achieve real results in industrial medicine. If a doctor is called on to treat every scratch and mild coryza occurring in a factory of five thousand, the cost will prove prohibitive, and the results will be

no better than when good nurses are employed. The doctor must be always available and must visit each sub-dispensary daily, but he need not see every case treated.

The industrial dispensary nurse must be a woman of personality and some physical strength, as the work is frequently arduous. She must have an optimistic temperament, and while being quietly sure of herself must co-operate with and depend upon the doctor in all important points.

Her position in a sub-dispensary is one of marked responsibility, and she must know just what she can do and what should be sent to a doctor. Loyalty to her doctors, and team work with them, should be the keynote of her work.

The dispensary nurse has four definite duties:

1. The treatment of sick and injured workers.
2. Keeping her dispensary trig and trim.
3. Making supplies.
4. Keeping accurate records.

The treatment of sick and injured must be along lines laid out and standardized by the doctor in charge. The work consists in first taking and recording an accurate history of the sickness or accident, in the latter case using the technical terms occurring in industry. She should get the history in the man's own words and know enough about the work to realize what these words mean. In order that the history may be intelligent, the nurse should be shown machines, and be given a clear description

of the parts of the machine and the processes of manufacture. The worker who finds his story intelligently received has confidence in the work of the nurse. Moreover the nurse must be able to cull out of the story the important facts and construct a concise history.

In the case of sickness the nurse must always be on the lookout for something underlying the patient's story. She should not accept "headache," "sick stomach," or "cold" without enough investigation to be sure she is not in contact with a condition more serious than the worker realizes. Intelligent questions, common sense, and the use of the thermometer, will prevent mistakes. As the dispensary is visited daily by a doctor it is very easy for her to administer a simple remedy and instruct the patient to return at the doctor's visiting hour if she has any question as to the case. The drugs placed in the nurse's hands are always of the simplest type. They should not exceed ten in number and should include neither opiates nor poisons.

In order that there should be no temptation to elaborate surgical treatment the instruments provided at the sub-dispensary need be no more than a pair of bandage scissors, two pairs of small surgical scissors, two pairs of forceps, and two haemostats. The maintenance of a neat and clean dispensary is obligatory. The effect of neatness and cleanliness upon the patient cannot be overemphasized, and the nurse should take pride in the looks and equipment of the dispensary in her charge.

A great deal of unnecessary expense can be eliminated if the nurses during their spare moments make supplies. Gauze bought in large quantity through the purchasing department should be made up into appropriate sized sponges or other forms of dressing. Adhesive plaster should always be purchased in rolls five yards long by twelve inches wide, and sheet wadding in bulk.

Besides folding gauze, rolling sheet wadding, and cotton tipping applicators, the nurse should cut adhesive plaster in appropriate widths and attach it to a bread board, by far the easiest method of handling this rather tricky material. All sterilization should be done at the central dispensary by the steam fractional method unless the expense of an autoclave is justifiable.

The nurse in charge of the central dispensary should be in charge of supplies, requisitioning them from the general factory stores, and distributing them to the nurses for preparation. She should be personally responsible for sterilization under the instruction and supervision of the chief physician.

The keeping of accurate records of work done is one of the most important functions of the dispensary nurse. Not only must she take an accurate and brief history of each case, but she must enter a simple diagnosis and treatment on the initial report. All subsequent dressings and sickness must be briefly but accurately recorded and the follow-up sheet previously spoken of must be kept with minute care. A great deal of the value of the records

depends upon the accuracy and conscience of the dispensary nurse, and without her interest and co-operation records will be of little value.

The work of the visiting nurse is quite different. It is her peculiar function to act as a connecting link between the health department and the worker in his home. She also represents the company to the employe's family, and by her tact and kindness has it in her power to create good feeling for what is sometimes considered a soulless corporation. In the unique position she holds it is most important that she be a woman of tact, sympathy and judgment, as well as having a sound training as a nurse.

While the visiting nurse in very large factories often does definite nursing at the employe's home, in the majority of cases she acts more in the capacity of a social worker, investigating the needs of the employe or his family, and advising him how to meet the conditions under which he is suffering. Actual nursing is usually turned over by her to the local district nursing society. She must, therefore, be prepared to meet many social emergencies, and untangle family troubles, for in connection with the worker's sickness are a multitude of perplexing problems which must be solved.

The visiting nurse usually receives her list either from the employment department or the health department of the factory. The employment department sends her the names and addresses of those workers whom the tracer finds to be out because of sickness, accident, or sickness in the family.

The health department sends her the names and addresses of those it wishes visited for special reasons or to be brought to the dispensary for dressings.

The scope of the visiting nurse's work is so broad that it can only be outlined. It is limited solely by the time she can give to each case. Thus she may find the employe sick without a doctor, and his wife so harried by household affairs that she is unable to give him anything but scanty attention. It is then the nurse's duty to make the patient comfortable, take his temperature, and advise him to call in a doctor. If he knows of no doctor, being a stranger, she must be able to suggest some one who is competent, but whose charge will be commensurate with the patient's pocketbook. Perhaps it will seem better that the patient go to the hospital or the doctor in charge wishes the patient to go. The nurse then makes arrangements with the hospital and, perhaps, transports the patient there in her car.

If it is found that the wife is sick and the husband unable to work because there is no one to care for the children, she must arrange to have them taken care of by neighbors or some association. In cases of death the nurse has been frequently obliged to arrange for the funeral because of sickness among other members of the family.

Most visiting nurses have an emergency fund upon which they may draw in order to purchase coal or food for destitute families and tide them over a crisis. The visiting nurse also has a list of cases whom she visits regularly, bringing a word of

encouragement and keeping them in contact with their old associations. Such cases are those who have long-continued sickness, accidents of unusual severity and those who are in the hospital for operative or other treatment. Her function is to help, brighten and encourage, and the amount of real good she does for both worker and company has never been sufficiently recognized and appreciated.

CHAPTER VI

THE PHYSICAL EXAMINATION

The keystone of medical supervision is the physical examination.

> "The physical examination is the means whereby physicians acquire the information they deem essential to the procurement and maintenance of healthy, physically competent working forces. It is consequently the basis of medical knowledge in industry and is fundamental to the successful practice of industrial medicine." (Selby,[6] Scope of Physical Examination in Industry. Proc. National Safety Council, 1919.)

It represents the first contact of the employe with the health department. It has for its object the determination of the employe's physical fitness for the work for which he has been selected by the employment department, and the recording of his original condition for the private records of the health department.

The physical examination should be given before the employe is actually hired as part of the preliminary investigation. The examination is conducted in private by the physician in person, though the weight, height, eye and ear tests may be made by a nurse or trained layman. The method of procedure is as follows:

The applicant, having removed his shoes, stockings and all his clothes, in a booth, wraps himself in a blanket and steps into the examining room. He is immediately weighed and his height taken.

The eye examination follows. This consists in most factories in the simple distance test with the Snellen chart. In some factories where special work requires acute vision, a more complete examination is made. The card test having been made, the examining physician rapidly examines the motion of the eye, the color of the sclera, and the reaction of the pupil. He also notes the condition of the conjunctiva. All this takes only a few seconds.

The ears are next examined. This may be done as in the Army by asking the applicant to repeat a whispered number or word, or a more rapid test may be made with the standard Ingersoll watch. If deafness is noted the auditory canal should be rapidly inspected for discharge or impacted cerumen.

The examination of the nose is for obstruction or defects. These can be rapidly discovered by pressing with the finger on one nostril and telling the patient to breathe deeply through the other. If the breathing appears obstructed on either side a more careful examination with a speculum should be made. The patient is now told to open his mouth and with the aid of a wooden throat stick, the condition of the teeth, tongue, tonsils and pharynx noted. The lips should be examined on the buccal side for possible mucous patches.

It is not considered necessary to chart decayed and

lost teeth, especially if a dentist is on the health department staff.

The findings of the examination, as noted thus far, are briefly dictated to a clerk who enters them on the patient's physical examination card.

The neck is next inspected and then rapidly palpated for enlarged glands or tumors. The patient is told to swallow and the size and shape of the thyroid noted.

The examination of the chest is carried out as in general or hospital practice. Particular care is taken in the examination of the size of the heart, and the condition of the apices of the lung.

Speed in examination is essential so that, though the examination should omit nothing, it must be concentrated on the points of industrial rather than medical importance. By this we mean that we are interested in determining in the shortest possible time the defects which would make it necessary for the worker to be placed in a department other than that already selected for him by the employment department. Thus the examiner is most anxious to determine the functional power of the heart and lungs.

A quick method is to run over the apices of the lobes of both lungs with a stethoscope, telling the patient to breathe in, breathe out and then cough. This expulsive cough at the end of expiration is of great service in bringing out rales. In hearts which show enlargement, irregularity, or produce murmurs, a quick test of function is to have the patient

hop twenty-five or fifty times on one foot. Rapidity of respiration, breathlessness and irregularity of pulse should be noted and, if marked, indicate a myocardium inefficient for hard work. Further tests for the heart will be noted later. The hopping test is also of value in lung cases, as breathlessness is early evidence of tuberculosis.

After rapidly reviewing the condition of the heart and lungs and dictating any abnormal findings, the patient is examined abdominally. The examination is made with the patient recumbent, and is to determine the presence of inflammatory conditions or new growths. The patient is then told to sit on the edge of the table and tested for the condition of his knee jerks. He then resumes his upright position in front of the examiner. The umbilical, inguinal and femoral rings are rapidly but carefully examined for hernia. In examining the inguinal ring the patient is told to stand on his toes. The examiner invaginates the scrotal skin and places the tip of the index finger in the external ring, bidding the patient cough. This enables him to appreciate not only the descent of a sac, but the condition of the external ring and tension of the surrounding muscles. Following the examination of the inguinal region in which, of course, any enlarged glands or other abnormalities are noted, the external genitals are rapidly reviewed for venereal or other disease.

The examination is now complete except for the extremities, skin and joints. The condition of the skin and extremities can be noted at a glance, but

the joints should be tested out carefully. There are a number of methods equally satisfactory. The one here described is rapid, efficient and has been used for some time in a large factory.

1. Patient stands facing examiner, forearms flexed on arms, hands in supination.
2. Patient spreads fingers apart and brings them together, closes fists, opens fists, apposes tips of thumbs to little fingers, pronates and again supinates.
3. Flex forearms acutely until fingers touch shoulders. Raise elbows anteriorily as high as possible.
4. Abduct both arms in this position and rotate shoulders.
5. Raise hands straight up above head as high as possible.
6. Bend over touching ground.
7. Resume erect position.
8. Squat on heels and rise to original position.
9. Abduct first one leg and then the other.
10. Rotate head from side to side.

If these motions are gone through rapidly, they can be accomplished in about three minutes, and every important joint in the body will have been tested. It has been found that defective joints are more apt to cause trouble than other apparently more serious disorders in other parts of the body.

There is considerable difference between the examination of patients in a hospital and the examination of apparently normal men for work. In the former one knows that some pathological condition exists severe enough to require hospital care. In the latter the patient is applying for work as a nor-

mal man, and the examination is to determine as quickly as possible whether he is physically fitted for the work at which he will be placed. In general hospital work, time is of no particular importance. In industrial work it is of vital importance. The employment department is anxious to fill its requisitions at the earliest moment, employes object to waiting, congestion must be avoided at all costs. The usual time allotted to the physical examination is, on the average, five to six minutes. It is only by experience and system that an adequate examination can be made in this limited time. The physician must, therefore, concentrate on what may be called the industrial physical defects, expecting to discover those which are less serious at subsequent examinations when the employe is under medical supervision. The vast majority of applicants are standard men. They have numerous slight defects but none of enough severity to require special placement or rejection. A second group, much smaller, but still from 8 to 10 per cent, of all applicants are sub-standard and need placing. A third very small group from 2 per cent to 5 per cent cannot be placed anywhere in the factory without danger to themselves, others, or property. The object of the physical examination is to determine as quickly as possible those who are standard; sub-standard men require a much more careful examination to determine the extent of their defects, and it is usual to complete the examination of these men after the early morning hiring rush is over.

Sub-standard workmen may be divided into three classes: those who are sub-standard mentally, but standard physically; those who are sub-standard physically, but standard mentally; those who are sub-standard both mentally and physically. It is evident that the man who is mentally sub-standard but physically standard can usually be placed at heavy work requiring no particular ability. There are many places of this type open in every industry. When the mental condition is standard but the physical condition is sub-standard the problem of proper placement must be solved. When both mental and physical conditions are sub-standard, the applicant is usually unfitted to work in any department of the factory, and it is advisable for his own good and for the good of industry that he turn his work into other fields.

The method of classifying these groups of men has already been considered and the method of their placement briefly discussed in Chapter Three. In considering sub-standard workmen alone, those who are sub-standard mentally but standard physically can usually be safely classified as B. When the mental condition is standard but the physical condition sub-standard, the applicant is classified as C, and requires placement. When both mental and physical conditions are sub-standard the applicant is classified as D.

Physically sub-standard men usually fall into one of the following classifications: Cardiac, nephritic, pulmonary, hernial, syphilitic, special and general.

Cardiac.—The number of cardiac cases which are unable to work are relatively few. Workers with defective hearts, even though the heart upon examination shows marked murmurs and even irregularities, are able to stand moderate work for a number of years before showing signs of disturbed compensation. The industrial physician should determine as much as possible with the stethoscope, but should pay the closest attention to the condition of the myocardium. Though this is an extremely difficult thing to determine in a short examination, a functional test in suspicious cases will usually give a lead in the right direction. The simplest test is that of having the applicant hop fifty times on one foot, examining the heart before and after exercise, and noting particularly the effect upon the rapidity and regularity of the pulse, and the time for it to fall to normal. At the same time the reaction of the respiration to this moderately violent exercise should be closely noted. A patient who becomes breathless, or shows any signs of abnormal breathing after this exercise as compared with the normal man is one who should be studied with great care and who should not be assigned to work which will throw any strain upon the heart. This point of breathlessness has been emphasized by Lewis in his recent monograph on the Soldier's Heart and the Effort Syndrome. The exercise also brings to the examiner's attention any cases of that mysterious condition known in the army as neuro-circulatory asthenia, the familiar N. C. A. Such cases

are rare in industry, but if met should be immediately isolated as they have no business in the hard work of the average factory. Dr. William E. Robertson of Philadelphia in a paper delivered in Harrisburg at the annual Pennsylvania Safety Congress, 1920, reviewed the question of the cardiac in industry and outlined the best method of examining a heart from an industrial viewpoint. Some of his points are as follows:

> "Of first importance are the position and quality of the apical impulse of the heart. Normally in the fifth interspace in the mid-clavicular line, displacement means hypertrophy with or without endocarditis, dilation, or both of these, adhesions or mechanical displacement by effusion or new growths. . . . Having marked the outline of the right and left heart, make friction over the epigastric area for a minute, then percuss the heart area again. If the area was large and has been reduced, we are dealing with simple hypertrophy. If the area reduces only in part, we have both hypertrophy and dilation, or dilation alone when the area reduces to the normal. Within two minutes the heart area returns to the original outline. . . ."
>
> "Normally, after moderate exercise, such as hopping 100 times on one foot, the rate will increase 10 to 30 beats above the previous rate, but within two minutes will return to the normal. In proportion to the degree of deterioration of the heart muscle, the rate will increase and the greater the increase, the slower the return to normal. When to this increase in rate is added dyspnea, with a sense of substernal pressure, the muscle involvement is very definite. In such instances by auscultation the muscle quality of the heart sounds will be found weakened, arrhythmia may be induced, and

> not seldom a relative mitral systolic murmur. In the over-acting heart an induced mitral murmur may simulate mitral stenosis.
>
> "Morison has shown that inhalations of amyl nitrite will accentuate the organic lesion of the valve. Whenever in doubt as to the possibility of mitral stenosis in any case, this is an excellent diagnostic aid. When simple tachycardia is present, Benjamin and Brooks have shown that merely bending the head forward at an angle of 45° will promptly retard the heart rate. Fliessinger has reported similar results with respect to respiratory effort in paroxysmal tachycardia. Sustained respiration, deep inspiration and prolonged expiration will often slow the heart rate."

Nephritic.—Nephritic workmen can be most rapidly discovered by blood pressure determinations. A good general rule is to make a blood pressure determination on all applicants of forty years or over, and an urinalysis on all those showing a pressure of 140 systolic, 90 diastolic or over. Nephritic cases cannot stand the extremes of heat and cold which exist in many departments, nor have they the resiliency against hard work the normal individual has at the same age. The majority of these cases have more or less myocardial degeneration and the cardiac condition should always be investigated. A great deal can be done for the nephritic in the way of advice and diet. If he is hired he should be kept under medical supervision and re-examined at suitable intervals.

Pulmonary.—The most frequent pulmonary condition found among sub-standard men is a latent tuberculosis. This may be discovered by a combina-

tion of the patient's general build, physical signs in the chest and breathlessness on exertion. Again we see the advantage of putting the patient through the fifty hops on one foot, and by this simple method we are able to judge two conditions, cardiac and pulmonary. Applicants with latent tuberculosis can be employed in numerous departments in the factory, but should certainly not be put in a dusty, dark or humid workroom. If kept in a bright, dry workroom they are able to do excellent work without breaking down.

Re-examination of all workers with latent tuberculosis is essential. The examination should be made at least twice a year and the worker instructed to report for additional examination if he begins to cough, lose weight, suffers from dyspnoea, or feels unusually tired in the afternoon. Sputum examinations and the taking of temperature in the afternoon should be repeated several times in suspicious cases.

An X-ray is a great help in diagnosing difficult cases. Excellent chest pictures can be obtained with small machines such as the U. S. Army Bedside Unit.*

Hernia.—One of the most perplexing conditions which the industrial physician encounters is hernia. A general rule has been to be extremely careful about admitting men with hernias into industry. This is partly on account of the compensation risk in cases of strangulation, partly on account of the

*May be purchased from Waite & Bartlett, 252 West 29th Street, New York. $650.00. (1920.)

necessity of repairing the hernia if the man complains of pain after lifting, even if there is no increase in the size of the hernia, and partly because where there is a hernia on one side there is usually a tendency for a hernia to appear on the other side.* Compulsory use of trusses cannot be enforced, so that in the majority of factories there has been a strong feeling against the man who has a hernia.

In many factories, however, men with well-marked hernias have been employed and work for years without trouble. In one factory where a careful record has been kept for nine years, but one case of strangulation has occurred, and this took place while the man was not at work. The great majority of these old hernia cases appear to be a fairly safe risk provided they continue doing work of the same type, and are not put on a job which is much heavier. The real hernia risk appears to be among southern Europeans, and among men who having done only moderately heavy work are suddenly put on heavy work. It is very difficult to determine who will develop a hernia, but it is safe to say that all southern Europeans who have previously done light work are very liable to develop a hernia if put on a heavy job. A worker with weak rings and a slight bulge along the inguinal canal on cough is a man who should not be put at heavy lifting.

Syphilitic.—A diagnosis of tertiary syphilis is very difficult in the short examination which is given the average applicant. However, if the factory hos-

*Moorehead states that 80% of his operated cases show oblique hernia on both sides.

pital is used as it should be, cases are constantly appearing in which there is enough to arouse the doctor's suspicion and lead him to take a Wassermann. These cases, if the Wassermann is positive, should immediately have salvarsan, following which the type of work at which the patients are placed should be carefully investigated.

Special.—There are naturally a number of conditions which do not fall in any of the above groups, but which, nevertheless, require careful placing. These are too numerous even to mention, but will readily occur to any industrial physician. A typical example would be varicose ulcers of the leg. These cases may be placed at moderately light work, and with protection do extremely well, the ulcer healing up rapidly under daily cleansing at the hospital and proper support. Flatfoot is another condition in which a combination of placing and support gives excellent results. Our own experience goes to show that flatfoot is more a theoretical than a real detriment to good work.

General.—There are always a number of cases which present a combination of conditions which can only be cited as general. Many of these patients fall under class D group, and really have no business to work anywhere in the factory. Others may be placed and a moderate amount of good work obtained from them. Proper placement does not finish the doctor's responsibility. These sub-standard men must be examined from time to time to see that their defects are not increasing and that the

placing has been proper. Such an examination should be made as a routine twice a year; and at each examination a record should be made showing the patient's condition. The doctor should take enough time to discuss with the patient his findings, and to give advice as to how the patient may maintain himself in good condition. If the patient has confidence in the doctor and medical service, and the symptoms which mean beginning trouble have been thoroughly explained to him, he will present himself for examination long before there are any real signs of breaking down.

CHAPTER VII

ACCIDENTS AND THEIR TREATMENT

Accidents occurring in a factory may be classified as trivial, moderately severe and severe. Legally, they are classified as trivial, and lost time accidents.

Trivial accidents are those in which the worker is able to continue work immediately after treatment and which require but two or three dressings. They may be cared for by a nurse or trained layman.

Moderately severe accidents are those which require a doctor's care. The patient may or may not lose time.

Severe accidents are those which require a doctor, and usually general hospital care.

The treatment of accidents in a factory begins with the first aid treatment and is not completed until the worker is back at his original work or at other work approximating it as closely as possible in earning capacity.

First aid may be carried on at first aid stations scattered through the factory, or at factory subdispensaries.

The first aid station with its equipment has already been described in Chapter IV. As there stated, the equipment is usually in the hands of a

trained layman, either a foreman or sub-foreman. The treatment administered should be strictly first aid, that is, just enough to control the emergency features of the case and to prevent infection.

By far the largest number of accidents are trivial injuries, and these in turn are most frequently lacerated wounds of the fingers.

Every injury in which the skin is broken represents a potential infection, and the prevention of infection is one of the most important services rendered by the factory medical staff. The shorter the period elapsing between injury and treatment the more effective the result.

Mock has shown the remarkable results obtained by the early use of Iodine, and the Benzene-Iodine treatment of wounds has now become almost standard in industry. The results have been most gratifying. Hundreds of consecutive cases have been treated without a single case of infection, and when the working conditions and habits of the average factory worker are considered, the statistics are surprising.

In one company employing about 900 machinists there was but one accident in which time was lost from infection out of 4,869 accidents. The period covered was 23 months. The technique consisted in thorough cleansing of wounds and skin with commercial gasoline followed by full strength Tr. Iodine U.S.P. Mock bases the prevention of infections upon three points:

a. "Immediate application of an antiseptic to an open wound.

b. The earliest possible treatment of the wound by a qualified physician.

c. Protection of the wound by sterile dressings; regular and uninterrupted care until healed."

He goes on to say, "from a careful investigation of the kind of antiseptic used in accident surgery it is safe to say that at least 80 per cent of the surgeons use some form of tincture of iodine." It will be noted that in Chapter IV in the description of a first aid jar that benzene is not included. This is because the treatment is to be given by a layman and simple flushing with iodine is safer than allowing a thorough cleansing with benzene and iodine.

Where the first treatment is carried out by a trained nurse or doctor, the wound should always be thoroughly cleansed with benzene or gasoline before iodine is applied. Water should never be used prior to the gasoline-iodine. If the patient has been working in water the wound should be flushed with alcohol and ether before applying the iodine.

Whenever possible, the most satisfactory place to give first aid is the sub-dispensary where everything is at hand for proper treatment and where a trained nurse does the work.

The first treatment of the more common injuries can be readily standardized and equipment be at hand and ready for the immediate treatment of these cases. Such standardized treatment would be as follows:

Lacerated Incised and Abrased Wounds

1. Cleanse part freely with gasoline, using sterile gauze.
2. Wipe out wound thoroughly with cotton applicator dipped in gasoline.
3. Paint wound thoroughly with iodine, using a cotton swab applicator, or spray iodine into and around wound.
4. Apply sterile gauze compress.
5. Bandage.
6. Reinforce bandage with adhesive plaster strips.

Sprains

1. Shave.
2. Bandage.
3. Transport to doctor.

Burns

1. Cleanse gently with saturated solution of soda bicarb.
2. Apply 3% soda bicarb. ointment or in mild cases powder with Compound Stearate of Zinc.
3. Apply dry sterile dressing held in place by a not too snug bandage.

Strains (back)

1. Strap using straps 3" wide.
2. Bake with electric heater.

Fractures

1. Put injured part at rest by immediate immobilization in appropriate splint.
2. Summon doctor.

Haemorrhage

1. Paint rapidly with iodine.
2. Apply mass of 3 in. x 3 in. sterile gauze compress held snug with bandage.
3. Splint.
4. Apply tourniquet only if absolutely necessary.
5. Summon doctor.

Eye Injuries

1. Flood eye with 4% Boric Acid solution.
2. Wipe out loose particles with sterile cotton swab on applicator.
3. In case injury is severe or if foreign body is imbedded in cornea, drop castor oil freely into eye, apply sterile gauze, bandage loosely and send to physician.

Such standardized treatment when used by each hospital worker in exactly the same way inspires the confidence of the worker and rapidly proves to the medical staff the value of the treatment. Any method which does not give good results is immediately apparent and can be changed for a better.

While trivial cases can be safely treated by a specially trained nurse under the supervision of one of the medical staff, all cases of moderately severe injury should be seen by a doctor at once. The efficiency of the first treatment and accuracy of diagnosis plays a most important part in the rapidity of recovery and the functional end result obtained. As an aid to diagnosis and treatment the value of a small X-ray equipment cannot be overestimated. All injuries to the extremities of a twisting or crushing nature should be X-rayed as should all cases of sprain and strain. The number of slight fractures which occur as the result of industrial accident is striking. If treated by immediate immobilization, rest and early mobilization, they do well. If treated as minor injuries they produce prolonged disability. It is always advisable to X-ray the spine and sacro-iliac regions after alleged back strains. The author has found that the great major-

ity of incapacitating back strains are due to either a true sacro-iliac sprain or to an unsuspected chronic arthritis of the spine. When there is an underlying pathological condition, a very slight strain of the back is followed by marked spasticity of the back muscles and prolonged disability.

In cases of fractures of the fingers, proper reduction and retention are imperative if function is to be required. Fracture of the proximal phalanx, especially if comminuted, is the most difficult finger fracture to treat and the results are usually most disappointing even when good reduction is obtained. The industrial surgeon should study this type of fracture with great care for if a stiff finger results, as is frequently the case, amputation may be necessary.

Moderately severe crushing and lacerating injuries require a general anaesthetic and a surgical debridement similar to that used on war wounds. We have found that the French method of flushing the wound with ether following debridement, minutely careful haemostasis, approximation of deep structures in order that dead space be eliminated, and the free use of dichloramin T will produce a sterile wound in almost every case.

Puncture wounds of the foot caused by nails protruding from boards is a fairly common accident which should always be considered as moderately severe. Thorough treatment of the wound by injection of gasoline and iodine is usually successful in preventing infection.

The above are types of moderately severe injury commonly met in industry. In order to treat these and similar injuries properly, the surgeon should have an assistant capable of giving a general anaesthetic, unless he sends cases of this type to a general hospital for treatment.

Severe accidents require the immediate attention of a doctor. First aid should be given the patient at the point where the accident occurred, but this should be of the simplest type. Transportation should be done only under the doctor's direct supervision.

In each sub-dispensary or at each first aid station, there should be a stretcher, with blankets, a first aid outfit packed for immediate use and a Thomas hip splint. These three should be brought to the patient as quickly as possible.

The patient having been placed on the stretcher is transported to the central dispensary where further semi-definitive treatment is carried out prior to the patient's final transportation to a general hospital.

The arrangement of personnel for handling accidents may well be as follows:

At each sub-dispensary one or two nurses depending upon the activity and size of the zone covered.

Each sub-dispensary is visited daily by a doctor who makes an investigation of all trivial injuries which are not doing well and of all moderately severe injuries under treatment. At the central dispensary there is always a doctor and at least one

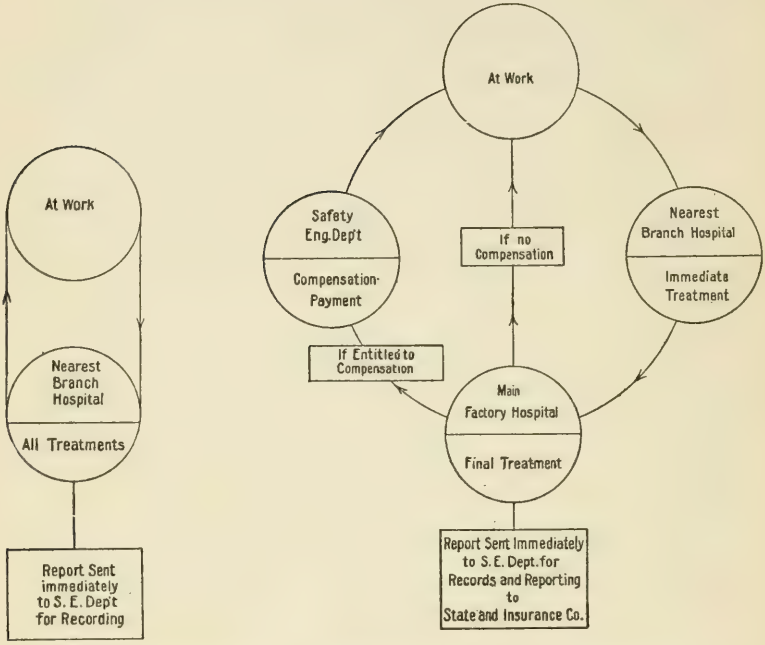

FIG. 6. (a) Course of a Patient Having a Trivial Accident
(b) Course of a Patient Having a Moderately Severe Accident

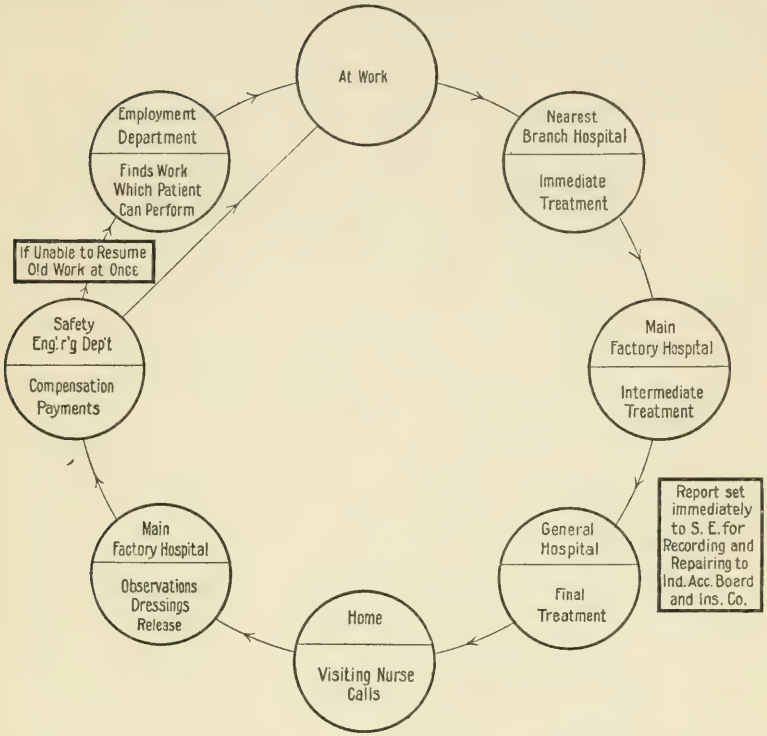

FIG. 6. (c) Course of a Patient Having a Severe Accident
(Courtesy of Oxford Loose Leaf Medicine)

nurse in constant attendance. All moderately severe injuries are treated there as well as those cases of severe injury which have been discharged from the general hospital.

To recapitulate:

1. All cases of slight injury are treated at first aid stations or sub-dispensaries and re-treated at sub-dispensaries by a trained nurse.
2. All cases of moderately severe injuries are treated at first aid stations or sub-dispensaries for first aid, and are transferred at once to central dispensary for definitive treatment by doctor.
3. All cases of severe injury are treated by doctor who supervises transportation. Semi-definitive treatment is given at central dispensary and final or definitive treatment is given at a general hospital.

Every case of injury establishes a contact with the Safety Engineering Department and whatever department reports accidents under the Workmen's Compensation Act. In many cases this is a branch of the Safety Engineering Department.

This contact consists of:

1. An investigation of the accident by the Safety Engineer to determine its cause and possible future prevention.
2. A report of the accident
   (a) to the proper state authority
   (b) to the insurance company.
3. Recording the accident from the point of view of time lost and compensation due.
4. Arrangement with employment manager for placement of injured worker, after consultation with doctor as to type of work the injured employe should do when able to return to work.

Every case of severe injury also establishes a contact with the visiting nurse's service. This contact consists of:

1. A report of the case to the visiting nurse with a request to visit the injured man at his home or at the hospital.
2. A series of reports by the nurse to doctor of the progress of the case. This is entered on the worker's medical record.
3. A report to the doctor when the patient is discharged from the general hospital in order that the doctor may visit the case if necessary.
4. The visiting nurse frequently brings moderately severe injuries to the factory dispensary for dressings and acts as a transporting agent.

At no time should the medical staff lose touch with the injured worker. His exact condition must be known and recorded from the time of the injury until he returns to work, and then any existing disability must be clearly stated.

The cycle of a severe type of accident is graphically shown in the accompanying cut. (Fig. 6.)

The Workmen's Compensation Act now in force in the majority of states makes accuracy of diagnosis and a close following of the case obligatory. The importance of a careful history and thorough examination is well shown in the following case of supposed back strain:

> J-H, 44 years old, married, machinist. Past History: Apparently normal man when hired Feb. 19, 1918. About two years ago severe pyorrhea for which all teeth removed. About a year ago, noticed he was losing weight and did not feel quite well. At the same time he noticed he was drinking large quantities of water and urinating

freely. He paid no attention to this and did not consult shop hospital or physician.

Present History: On November 6, 1920, at 11:30 a. m., while lifting welding tanks, felt a catch in his left back. On November 11 at 4 p. m., he came to the shop hospital complaining of pain in his back. He was strapped and baked. He was treated every other day until November 17, 1920, when he was examined by a doctor whose examination report is as follows:

"Patient stands with slight list to left, low dorsal and upper lumbar scoliosis. Motion: flexion forward, restricted to about one half, to the left about one third, to the right considerably less than one fourth. Diagnosis: Sacroiliac strain with possibly underlying infectious arthritis."

Patient sent next day to Memorial Hospital for X-ray of back and application of plaster cast. X-ray was negative. During routine examination urine was found to be four plus for sugar.

Diagnosis: Severe diabetes. Transferred medical. Patient put on anti-diabetic diet and further examinations made. Found to be a total diabetic with tendency to acidosis. Acetone and diacetic acid in urine.

Examination of abdomen at this time disclosed a feeling of resistance in left lumbar region. Patient since admission ran a low irregular temperature varying between 98 and 100, and a slightly increased pulse averaging 90.

Blood count showed 24,800 white cells. Differential 90% polys.

On November 29, the mass in the lumbar region had become pronounced extending from under ribs to anterior-posterior spine. It was slightly tender on pressure and pressure upon the mass elicited pain down left sciatic nerve. The pain is the same as that complained of since the back strain. The mass feels tense, seems to be present in the lumbar region posteriorily and suggests fluctuation.

Diagnosis: Perinephritic abscess in left kidney region possibly involving pancreas.

Operation of incision and drainage under local anaesthetic advised but refused by patient who left the hospital at own risk.

December 6. Accepted operation. Incision revealed abscess of left kidney and perinephritic region with about two quarts of pus.

December 12. Patient died in diabetic coma.

Comment: There seems to be no question but that this patient had diabetes becoming total, followed by secondary abscess of the kidney which in breaking down caused a perinephritic abscess. The history of back strain was false and the symptoms simulating back strain were due to the condition of the kidney.

The error made in the factory medical department was in not eliciting a complete history before sending the case to the general hospital. A well-taken history would have suggested diabetes at once, and the urine would have been examined. The close association of diabetes with infection might have suggested an infection as the cause of the back symptoms.

The importance of confidence in the surgeon and its effect on the psychology of the patient has been well brought out by Mock. Summed up he advocates handling each severely injured worker as a private case, explaining fully what is to be done and why, and following operation to constantly maintain the morale of the injured man by encouraging talks and some form of manual occupation which can be done by the patient while in bed.

The after-care of industrial accident cases is one of the most important and difficult duties of the

industrial surgeon, for in many cases the recovery is necessarily slow. No man can do well if he is worrying over the support of his family and his final ability to work. The industrial surgeon must see that aid is provided the family when necessary, or that arrangements are made by which the wife can add to the income. In this part of the work the services of the visiting nurse are invaluable. As fast as the injured worker is able to resume any kind of work whatever, it should be provided him, not only for the effect on his morale, but also as a therapeutic measure. The war has proved conclusively that restoration of function is more rapidly obtained by early active motion and consequent mobilization than by any other measure. The interest of the injured man in the work he is doing also plays an important part in the final result. A careful study by the industrial surgeon of the rehabilitation methods used in France, England and Canada, during and following the war, will be of great value as a guide.

CHAPTER VIII

SICKNESS IN THE FACTORY

Sickness is the leading cause of absenteeism in industry. It not only causes absenteeism but also poor work and abnormal fatigue. Its effect upon the working classes has resulted in drastic relief laws in many countries. It is equally disastrous in its effect upon worker and management. The object of the health department in a factory is to prevent as much sickness as possible; to abort beginning sickness when this can be done, to prevent contagious disease entering the factory, and if it appears, to prevent its spread, and to instruct the workers in all matters connected with their health and welfare. Its object is also to treat minor cases of sickness which would not otherwise receive medical attention and to give emergency treatment and advice in cases of sudden severe illness. It should endeavor in every way to co-operate with the family physicians of workers having chronic disease, and to carry out any suggestions made by the family physician as regards change of work or other matters which are under its control.

The medical work of the health department may, therefore, be divided into preventive, diagnostic, co-operative and curative.

Prevention of Sickness

The health department endeavors to prevent sickness in the factory:

1. By a complete physical examination of all applicants for positions.
2. By examining all workers who have been out because of sickness before they are allowed to return to work.
3. By examining all cases of sickness applying at the factory dispensary with symptoms suggesting beginning sickness.
4. By promptly isolating all cases of contagious disease.
5. By periodic examination of all workers having beginning chronic disease, cardiac, renal or metabolistic and advising them as to work and mode of life.
6. By periodic examination of all workers exposed to any special health hazard or poison in the factory.
7. By inspection and control of ventilation, heat, humidity, light and other general working conditions falling under sanitation.
8. By devising and controlling safeguards for special health hazards and poisons in industry.
9. By spreading among the workers simple facts about health and disease prevention by personal talks and leaflets.

The majority of these measures explain themselves. Their reason is obvious and the technique apparent. The physical examination of all workers has been described in a preceding chapter. Workers who have been out because of sickness should be obliged to report at the nearest dispensary before being allowed to return to work. The nurse can then determine whether or not a doctor's examination is

necessary. Whenever a worker applies to the dispensary for treatment, the nurse should take a careful, concise history and if there is the least suspicion of real sickness being present, the temperature and pulse should be taken and the doctor called or patient sent to him. When a patient presents himself with contagious disease he should, of course, be sent home, the City Board of Health notified, and those working near him examined and advised. Fortunately, contagious disease is rare in factories. In four years' experience of a factory employing 3,600 there were but two epidemics of contagious disease, one of mumps with 73 cases, 56 during the epidemic year, the other German measles with 27 cases about equally divided between two years. During the four-year record there was one case of small pox and 87 vaccinations were done.

The initial physical and subsequent examination is pretty sure to reveal any case of chronic disease in the worker. When such a condition is found the patient is given a very complete examination which is entered on a special form usually several pages in length. Following the examination the doctor discusses with the patient the condition found, and instructs him as to the general rules of life he should follow. If the patient's condition requires it, the doctor then arranges that he put himself in the hands of a private practitioner, and finally by consulting with the employment department so arranges the patient's work that he can carry it on with safety to himself and others.

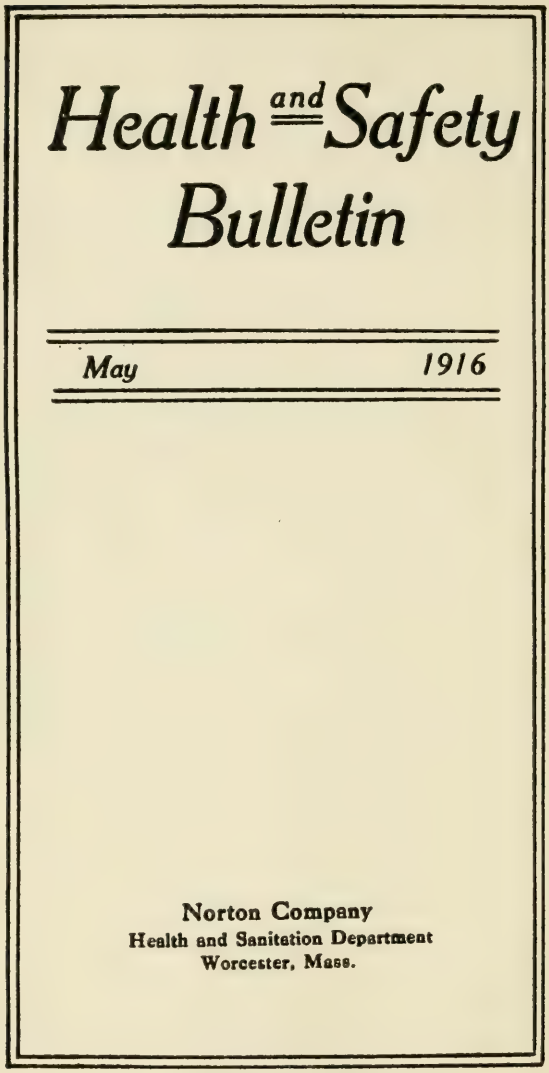

FIG. 7. A HEALTH BULLETIN

Many factories have in their processes of manufacture some distinct health hazard. The Metropolitan Life Insurance Company has analyzed these and divided them into the following classification: a. Dust, b. Heat, c. Humidity, d. Poisons. Whenever such hazards exist they must be carefully studied by the industrial physician and every effort made to protect the worker against their effects. Not only must the exposed worker be protected but he must be periodically examined to determine whether or not he is being affected by his working conditions. A complete examination once in three months is a good rule to follow.

A great deal of good can be done by quiet talking with the worker when he presents himself to the doctor at the dispensary. Every case should be treated by the doctor as he would a private patient. Many workers are foreigners and the doctor and nurse must use the simplest language in the kindest way if they wish to make the patient really understand the treatment he should carry out. In the majority of cases drugs play such an unimportant part that they may almost be eliminated, but the patient must be made to understand the importance of simple hygienic measures, diet, sleep and similar subjects.

Health bulletins in the form of single sheets or folders written in simple language, easily understood and distributed in pay envelopes are of undoubted value. Many factories have adopted this form of instruction. The subjects cover the common diseases and injuries. (Fig. 7.)

Accurate diagnosis is the basis of all good medical work. Poor diagnosis is more frequently due to carelessness than to lack of knowledge. In industrial work as in hospital dispensary work, there is a temptation to inaccurate hasty diagnosis because of the number of cases and the fact that many of the conditions presenting themselves are trivial. The industrial physician must always remember that he is in a unique position in medical practice. To him as to no one else is open the chance of studying disease in its earliest forms often before any pathology can be demonstrated. The general practitioner, according to MacKenzie, has the best opportunity of studying early changes in heart disease and following cases through long periods of time. The industrial physician has an even better opportunity for early diagnosis and continued study of cases. While it is true that there is a large turnover in every factory, it is also true that about fifty per cent of the workers remain employed over periods of from five to twenty years and can be re-examined and studied at any time convenient to the doctor. This opportunity for study should be used to its full extent. It is not as yet recognized by the profession at large. The great opportunities of industrial medicine from the physician's standpoint consist of facilities for the study of disease in its very early manifestations and the ability to follow definite pathological conditions over long periods of time. In order that definite diagnosis may be readily made, certain laboratory and diagnostic equip-

ment must be on hand, but this is never very expensive nor does it occupy much space. Except in isolated communities a general hospital is usually available at not too great a distance where the more intricate chemical and X-ray examinations can be made.

Co-operative Work

In order to in any way do adequate medical work, the health department and its personnel must co-operate with the foreman, the worker and the general practitioner. The method of handling patients must be modeled upon private practice, and yet the interminable waiting of private practice must be done away with. The worker must receive prompt attention, thorough examination, clear advice and be able to return to work in a minimum time. If the worker is given service of this kind he will use the dispensary freely and report back for further examination willingly when called for by the doctor, even when he is a piece worker.

The doctor must co-operate with the foreman by not calling a man away from his work for an examination unless the foreman says he can be spared. He must also obtain the co-operation of the foreman in changing the work of men who are handicapped by some physical disability. A foreman who is thoroughly in sympathy with the health department and its ideals is a constant source of help to the doctor.

Last and most important is co-operation between the industrial physician and the general practitioner. This relationship has only recently been

recognized. There has been a tendency in the past for the general practitioner to look askance at the industrial physician and the industrial physician to consider very little the problems of the general practitioner. For the good of the patient there should be close co-operation and this can easily be established if the problem is understood by both. If the practitioner is really interested in maintaining the health of his patient who is suffering from some chronic condition, or who has some physical defect, he can obtain very great assistance from the industrial physician at whose factory his patient works. A short letter or telephone conversation puts the industrial physician in touch with the wishes of the patient's physician and he is able to assist by arranging the patient's work and, perhaps, by giving certain forms of treatment at the factory dispensary. For instance in a case of chronic arthritis, the industrial physician can arrange that the patient's work shall not be in cold or damp work rooms, that he receive systematic baking of the affected joints, and that his mouth be kept in good condition by the factory dentist. Moreover, if the patient does not seem to be doing well, he can send him back to his doctor with comments of value because of his intimate knowledge of the patient's working conditions and reaction to environment.

The industrial physician should use specialists outside of the factory with great freedom. It is his duty to see that patients needing special work be urged to have this attended to. Here, again, co-

operation is of the greatest value. The specialist frequently has certain changes of work to suggest or treatment to be given which can be carried out at the factory dispensary.

In factories which exist in small towns the factory dispensary may easily become a medical center at which X-ray and laboratory work can be done at a trifling charge for the doctors in the community. Such work is now being done in a number of factories and does a great deal not only to promote cooperation but to help the local practitioners obtain diagnostic data which they could not otherwise obtain.

Curative Work

This is confined entirely to the treatment of trivial sickness in an effort to prevent something more serious from developing.

The most common diseases occurring in factory practice are those of the upper respiratory tract. This is the universal experience of industrial physicians. In the author's clinic an analysis of the sickness covering a period of four years resulted as follows:

Number of Cases of Sickness per 100 Employes

	1916	1917	1918	1919
Respiratory	74	68	139	140
Digestive	35	35	68	88
Infection, Inflammation and Skin Disease	26	24	40	53
Nervous	15	13	35	45
Muscular	14	9	17	21
Eyes	15	12	17	15

Ears	3	2	3	5
Miscellaneous	6	23	26	26
Total	188	186	345	393

The predominance of respiratory and digestive diseases is noteworthy. The startling increase in number of cases during 1918 and 1919 is due largely to the influenza epidemic following which not only respiratory but digestive and nervous conditions seemed to increase in number.

During the period the two leading diseases of the upper respiratory tract were rhinitis and tonsilitis. Influenza though epidemic and very severe in its effects ranked third in number of cases. The figures representing the total number of cases treated during the four years are as follows:

Rhinitis	5052
Tonsilitis	2654
Influenza	2356

In spite of the large number of cases of tonsilitis the number of cases of acute rheumatism and cardiac conditions was small, only 150 cases of acute rheumatism and 92 cardiac cases having been reported. The number of these which could be attributed to tonsilitis has not been ascertained. Of the diseases of the digestive tract, constipation was by far the most frequent condition with gastritis a poor second. The complete list is as follows:

Constipation	3060
Gastritis	1569
Indigestion	1426
Gastro Enteritis	493

Enteritis	855
Hemorrhoids	53
Gastric Indigestion	115
Appendicitis	28
Miscellaneous	119

The leading diseases in each of the other groups were:

Infections, etc.	Caries of teeth	872 cases
Skin Diseases	Furunculosis	1028 cases
Nervous Disease	Headache	2976 cases
Muscular Disease	Myalgia	1360 cases
Eye Disease	Conjunctivitis	1271 cases
Ear Disease	Impacted Cerum.	229 cases
Miscellaneous Disease	Dysmenorrhea	2269 cases

On going over these diseases and figures it is evident that except for influenza the majority can be more accurately classed as ailments than as diseases. It is also evident that they are of a character not only to cause considerable discomfort and disability but also to be in many cases forerunners of future more serious conditions.

When the large number of these cases is considered and the anxiety of both doctor and patient to arrive at a rapid but accurate diagnosis and some form of treatment recognized, it is evident that anything which will reduce time both in recording and dispensing is desirable. It has been found that a printed form, such as is shown (Fig. 8), is convenient and time saving, the history, physical examination, diagnosis and treatment being checked off with a pencil. The full advantage of this form of record will be shown when the general question of record keeping is discussed. In order that forms

Norton Company Worcester, Mass.

SICKNESS SLIP

Health & Sanitation Department

Name — No. — Time Treated
Address — Age — M. S. W. — Dept. — Date

Duration D. W. M.	Phy. Exam.	Diagnosis		Treat
Resp.	Resp.	Resp.		Ac. Comp.
Running Nose	Coryza	Coryza		Bismuth Subnitr
Cough	Spts. on tons.	Tonsilitis		Brown Mixture
Chills	Crepitant r.	Chr. Bronch.		Rhinitis
Expectoration	Negative	Ac. Bronch.		C. C. & C. R.
Sore Throat	Sub. crep. r.	Subac. "		Castor Oil
Feverish	Granular Phar.	Pharyngitis		
Hoarseness		Dry pleurisy		Chloroform & cloves
Night Sweats		Influenza		Capsolin or liniment
		Laryngitis		Dovers Powders grs.
		Dermatitis		
Abd.	Abd.	Abd.		Sod. Salicylate
Nausea	Distended	Gastritis		Local anodyne
Dizziness	Tympan.	Enteritis		Paint I. & G.
Vomiting	Tender Ap	Gastro ent.		R. & I.
Diarrhoea	Mass in caecum	Constipation		Seiler's Garg.
Constip.	Rash	Appendx.		Seidlitz Pulv.
Abd. pain		Indigestion		Strapped
Gen.	Gen.	Gen.		Sputum Box
Toothache	Cavity	Caries tooth		Sent home
Earache	Impacted c.	Otitis Media		Silvol
Conj.		Chr. Rheum.		Therap. lamp
Nose bleed	Ulcer of sep.	Nose bleed		Tr. Ginger
Malaise	T.	Malaise		Wash ears
Gen. Pains	P.	Myalgia		Massage
Pain Rt. Chest Lt. Chest		Headache		
Headache				

Remarks:

FIG. 8. A SICKNESS SLIP

Filled in by Nurse or Doctor with a Series of Checks and Used to Record Cases of Minor Sickness. More Serious Sickness Is Noted in a Full Report

such as this may be used and that dispensing be uniform, a certain amount of standardization must be employed.

Every doctor has his own standard treatment for minor sickness, but the general proposition of standardization can be carried out in any dispensary provided every one in the department uses the same method of treatment, and only a certain number of drugs are provided. At the author's factory clinic the following is the regular practice and is given in order to suggest the basic idea:

Respiratory System	*Local Treatment*	*Systemic Treatment*
Pharyngitis Tonsilitis	Paint with Tr. Iodine and Glycerin equal parts.	Pil. Rhei Comp. Pil. Cath. Comp. aa 1 pill at night. Soda Salicylate gr. v q. 3.h.
Coryza Trachitis Mild Bronchitis without Systemic Symptoms	Advise warm clothing and protection of feet. Alboline spray for nose. Argyrol 15% instilled in eyes S. O. S.	Pil. Rhei - Pil. Cath. Co. aa 1 pill at night. Pulv. Doveri gr. 10 with hot lemonade with above. Tab. Belladon. Dover's Powder Co. (Delafield) one q.h., for 4 doses then q.2.h. or Tab. Glyc. Co. for cough q.2.h. S. O. S.
Digestive System		
Indigestion Gastritis (Mild)	None	Pil. Rhei et Ipecac No. 3 (Roosevelt Hospital). 2 after meals with a cup of hot water. Very light diet.

Gastro Enteritis (mild) Enteritis (mild)	Advise mustard paste to epigastrium at night.	Very light diet. Bismuth Subnit. gr. 10 stat. with Tr. Zingiber dr. 1 in hot water. Bismuth Subnitr. gr. 5 q.3.h. or each time bowels move. Castor oil oz. ss at night if no vomiting.
Constipation	Advise regularity and special exercise.	Anti-constipating diet. Seidlitz Pulv. stat. Pil Rhei Co. Pil Cath Co. aa 1 pil at night follow by Extr. Cascara gr. 5 q.n.
Nervous System Headache	Paint forehead with local anodyne.	Pil Acetanilid Co. gr. 1 every hour for 3 doses. Treat constipation if present.

There are standard forms of treatment for other conditions which are common but the above should give a clear idea of the method. All standard forms of treatment should be at the doctor's hand and the pills and tablets should be ready in envelopes labeled with the name and amount of the drug and full directions as to use. Only a minimum number of tablets should be dispensed not only for economy but in order to have the patient return to the dispensary for further attention if a cure is not immediately effected.

CHAPTER IX

SANITATION

The control of sanitation is the third function of the health department. Sanitation comprises the use of sanitary appliances, and deals with the control of the external factors of environment which effect the health of the worker. The conditions requiring control are ventilation, illumination, temperature, humidity, drinking water, dust, and nuisances, especially those which may produce disease.

The setting up of sanitary appliances and their maintenance in good working condition is the duty of the engineering department. The selection of the type of appliance, the study of its efficiency, the maintenance of cleanliness and the study of the effect of environment upon the health of the worker are sanitary duties. The purely health side of this work must be carried out by the industrial physician, but the laborious portion should be placed in a separate sanitation department in charge of a sanitary foreman or inspector.

The sanitary foreman is directly responsible to the chief physician. He has in large factories sub-foremen, and each sub-foreman is in charge of the sanitation in a certain section of the plant. For the cleaning of this section he has under his control a

number of workers who give their full time to the work.

It is the duty of the industrial physician to investigate, and by co-operation with the engineering department, control:

1. Ventilation.
2. Illumination.
3. Heat and Humidity.
4. Dust.
5. Drinking water.
6. Disposal of sewage.

Each of these will be discussed in detail.

It is the duty of the sanitary inspector to control by the work of his force:

1. Cleanliness of toilets and locker rooms
2. Cleanliness of windows and electric lights
3. Cleanliness of all floor space in order that dust hazard may be reduced
4. Setting out and cleansing cuspidors
5. Collection and disposal of litter and refuse
6. Trapping of flies and extermination of vermin

Ventilation

When a number of individuals breathe air in a confined space certain chemical changes in the atmosphere of the space occur. There is a reduction of oxygen, an increase of carbon dioxide, and an increase of possibly slightly toxic protein substances which are emanated from the skin and lungs. There are also physical changes consisting of increase of heat and humidity. The reduction of oxygen and increase of carbon dioxide, which occur in the average factory even when poorly ventilated, are of no harm to the healthy worker. The carbon dioxide

content is, however, frequently used as an indicator of the general condition of the air in a given space. The protein emanations are the substances which cause the unpleasant odor, "stuffiness" and headache. The exact nature and degree of toxicity of these substances is as yet unknown. Physiologists lay special stress upon heat and humidity, the two physical factors, as being the true dangers of an overcrowded workroom. Combined they lower efficiency and are distinctly prejudicial to health.

The object of ventilation is, primarily to reduce abnormal heat and humidity and to remove the protein emanations. Secondarily, it acts as a stimulant by breaking up the warm stagnant air film which forms about the body, and by initiating currents of air which strike the skin at varying angles. This motion of air has been found to be most important, but must not be confused with the direct current of air which causes a "draught." The latter is uncomfortable and unhealthful.

There are three methods of ventilation in general use; by windows, doors, elevator shafts and other openings which occur in every building; by artificially sucking air from the part to be ventilated; and by forcing fresh air into the part to be ventilated. Frequently the last two are combined. Whatever method is used the industrial physician must see that it is efficient and that the air conditions in all departments of the factory are satisfactory. In those departments where there is question in his mind as to the efficiency of ventilation, carbon diox-

ide readings should be made, and where there appears to be an abnormal amount of heat and humidity an hygrodeik should be installed and changes instituted following its readings.

The special duties of the industrial physician in industrial ventilation consist of:

1. Routine inspection to detect poor ventilation.
2. Conference with the engineering department on questions of ventilation especially the installation of new ventilation when this is contemplated or repair of the old system.
3. Routine temperature and humidity readings in special departments and co-operation with the engineering department in reducing this hazard.
4. Inspection of hoods, suction apparatus, etc., for the removal of fumes or dust when these are in operation.
5. Special attention to the ventilation, and the elimination of offensive odors, in toilets and locker rooms.

To sum up factory air should not contain more than six parts of carbon dioxide in 10,000. This means a supply of 3,000 cubic feet of pure air per person per hour. The temperature whenever possible should not exceed 68° and the humidity should not exceed 72° wet bulb.

Illumination

There are two means of illuminating a factory, natural and artificial. Both are always employed. Natural illumination is obtained by windows, skylights, etc. It varies in different factories and in different parts of the same factory. The cause of variation is the amount of window or other lighting

space, the size of the floor space to be lighted, and the neighborhood of obstructions to light in the form of neighboring buildings, wings, and so forth. Where there are no obstructions there is little trouble provided the builders have allowed an adequate amount of window space. Where there are obstructions the angle of incidence of light, that is, the angle formed by the admitted beam of light and a horizontal line passing through the window, is greatly increased. The result of this is increasingly poor illumination as the center of the room is approached. This angle of incidence may be reduced by the use of ribbed glass or in extreme cases by the use of prism glass. During the greater part of the working day in the winter months, and during some part of every day artificial lighting must be used. This is obtained from electric or mercury vapor light. Most factories prefer the former, using the Tungsten bulb and a proper reflector as a standard unit. The placing of the artificial lighting is arranged by the engineering department. Its maintenance should be controlled by the industrial physician.

Illumination is measured in foot candles by a special apparatus called the photometer. "One foot candle is the intensity of illumination produced on a surface one foot distant from a lamp of one candle power, the surface being at a right angle to the light rays." (Shop Lighting, National Safety Council No. 22.)

Certain standards of lighting have been agreed on as good practice. The National Safety Council recommends these as follows:

Roadways and yard thoroughfares	1/10 to 1/4 foot candles
Storage spaces	1/2 to 1 foot candles
Stairways, passageways, aisles	1 to 2 foot candles
Toilets and washrooms	1 1/2 to 3 foot candles
Rough manufacturing, such as rough machining, rough assembling, rough bench work, foundry floor work	2 to 4 foot candles
Rough manufacturing involving closer discrimination of detail	3 to 6 foot candles
Fine manufacturing such as fine lathe work, pattern and tool making, light colored textiles	4 to 8 foot candles
Special cases of fine work, such as watchmaking, engraving, drafting dark colored textiles	10 to 15 foot candles
Office work such as accounting, typewriting, etc.	4 to 8 foot candles

There are three fundamental items of artificial lighting; intensity, distribution and absence of glare. Intensity can be measured, and to a certain degree controlled, by the industrial physician. This is carried out by controlling the maintenance and seeing that lights and reflectors are regularly cleaned, that burned out bulbs are replaced, and that dingy paint on the walls and ceilings is cleaned or renovated.

Distribution of light is in the hands of the engineering department, but the industrial physician should see that the distribution is sufficient for the field to be illuminated. Most factories are underilluminated. Absence of glare is most important

and can be controlled by the proper placing of shades and by selecting the proper type of reflector.

There are three types of artificial illumination, direct, semi-direct and indirect. The first is almost universally used and is present in some part of any factory. It consists of the shaded electric bulb light. Semi-direct light is produced by placing the bulb in a semi-transparent bowl surrounded by a reflector. A small part of the rays of light pass through the bowl, but the majority are reflected up to the ceiling and thence reflected about the room.

Indirect lighting is when the bulb is hung in an opaque bowl lined with a reflector. The rays of light are directed or reflected to the ceiling and thence throughout the room. Both semi and indirect methods of lighting are employed in factories, the former more than the latter. The advantage of indirect lighting is the absence of shadow, the disadvantage is the high wattage lamps needed and number of rather expensive fixtures plus the difficulty of cleaning. Indirect lighting requires a great deal of cleaning to be kept efficient. While many modern factories are using general lighting for all illumination, the majority still use local lights for machine illumination. When these are used special care should be taken that the operators' eyes are shielded from direct rays of light. The three dangers to be avoided are over-illumination, causing over-stimulation of the retina and contracted iris, under-illumination producing eye strain, and reflected light from brightly polished metallic surfaces which tends to

confuse and to produce the effect of over-illumination.

Heat and Humidity

The importance of this problem has been pointed out under ventilation. In many parts of most factories heat considerably above 68° Fahr. is unavoidable. Coupled with this is, frequently, excessive moisture making the working conditions most unsatisfactory. The more heated the air, the more moisture it will hold, and the greater the amount of moisture in the air, the more difficult it is for the human body to maintain its temperature equilibrium. The temperature of the body rises under these circumstances, causing an artificial fever, and resulting in a distinct menace to health. Every effort should be made to keep the air in such departments in active motion, using electric fans if other methods cannot be applied. The industrial physician must meet the particular problem as it presents itself and solve it to the best of his ability. Inasmuch as heat and humidity, far above the health limit, are necessary to many processes, attention must be paid to the personnel in these departments, and they should be re-examined and reconsidered as men working in any department where there is a distinct health hazard.

Dust

Many industries have dust as a health hazard in some part of production. Dust may be organic or inorganic. The former, though irritating, is not

seriously harmful, that is, it does not produce permanent change in the lung as is frequent after long periods of inhalation of inorganic dust. Inorganic dust is harmful, producing, if inhaled over a long enough period of time, a connective tissue infiltration of the lungs, closely resembling fibroid phthisis. The symptoms are those of phthisis without fever, there being cough, a gradual loss of weight and strength and rather marked dyspnoea on slight exertion. Except in special trades there does not appear to be a very serious danger from dust as it requires years of constant exposure to produce definite lung changes. Inasmuch as only those dust particles of 10 microns or less reach the lung, and as these fine light particles are for the most part removed by the exhaust system used in dusty trades, the hazard is further reduced. It is also important to note that the turnover is usually high in dusty departments, the workers preferring work elsewhere. This naturally prevents prolonged exposure. The most dangerous types of dust are the siliceous and zinc, of much less danger are dusts of softer substances as plaster of paris or coal.

While fibrosis of the lungs is not common it is far from being a rare condition, and is prevalent in certain trades especially among miners and stone cutters. Where the dust even when very hard can be removed by suction apparatus, the disease is seldom found. However, there is a tendency to an increase of respiratory disease in dusty departments as compared to non-dusty, and an irritating hard dust even

in small quantities will undoubtedly excite the lighting up of an old tubercular lung process.

The responsibility of the industrial physician in regard to dusty departments consists in an estimate of the hazard, a dust count if advisable, advice as to need of installation of an exhaust system, inspection of dust removing apparatus to determine its continued efficiency, periodic examination of men working continuously in dusty departments, and transfer to other departments of any who show a tubercular tendency even when no disease is manifest.

Drinking Water

The importance of a copious supply of clean drinking water in any industrial plant is self-evident. In those plants where the factory receives its water through the city water supply, there is naturally no problem except when city water is contaminated, a very rare occurrence.

When the factory is isolated and has its own water supply, the industrial physician should test or have tests made of the water at regular intervals. In some cases where the water supply is impure, chlorinating the water will be necessary and frequent routine examinations should be made.

The type of drinking fountain used is important. It is now considered advisable, when putting in a new installation, to use the type in which the stream forms an arc. The straight up and down fountain stream is not considered as clean, but it is more convenient to use and, therefore, generally preferred by the workers. The temperature of the water

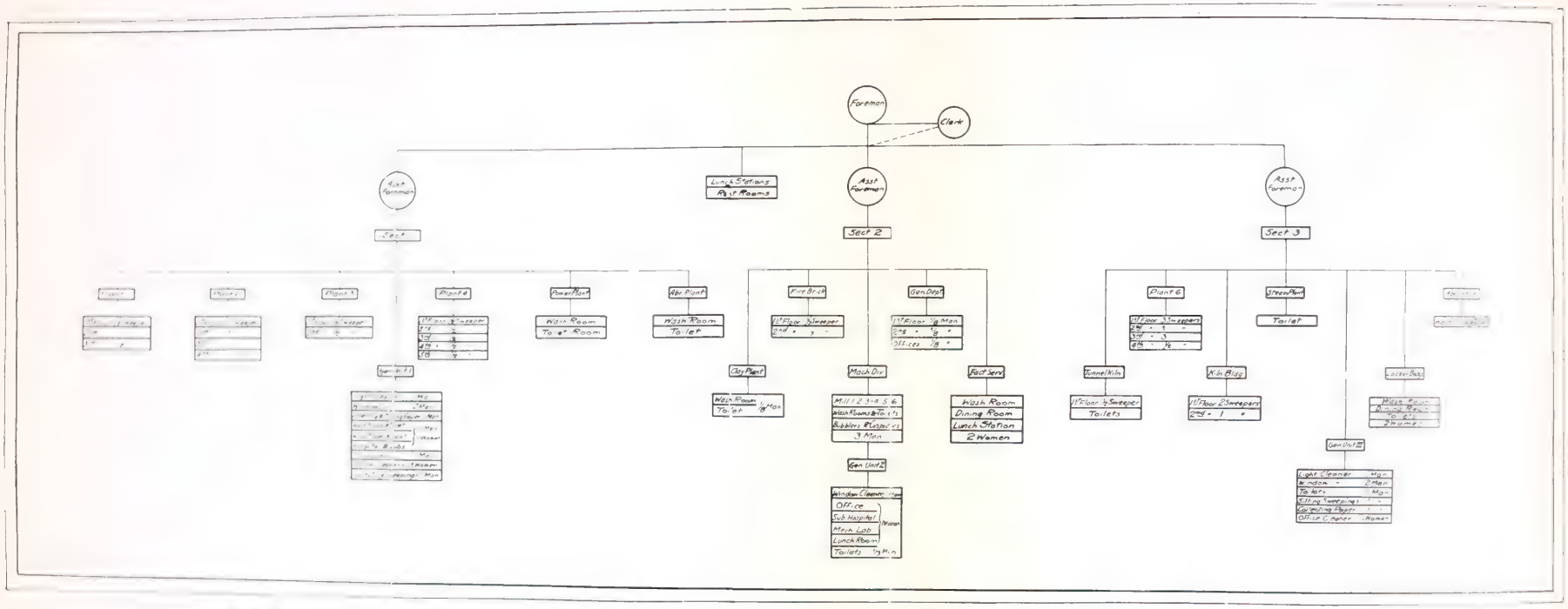

FIG. 9. ORGANIZATION CHART OF SANITATION DEPARTMENT IN A FACTORY OF 4,000 EMPLOYES

should be between 45° and 50° F. when possible. Too cold water is very apt to cause gastro-intestinal upsets when freely used by overheated workers in warm weather, while tepid water is unsatisfying and nauseating.

Disposal of Sewage

Here again the problem arises only in special conditions where there are no sewer connections. The industrial physician must co-operate with the engineering department in the installation and maintenance of any septic tank or other apparatus necessary.

The actual work of the sanitary department, as previously stated, is carried out by the sanitary foreman and his force of workers. The organization of this work is often elaborate as shown in Fig. 9.

The industrial physician will usually find a complete installation of toilets and locker rooms in the factory. These usually vary in quality in different parts of the works depending on the age of the installation. His first work will therefore be to get the already existing appliances clean. This is often very difficult. After continued use with improper attention—for the care of sanitary appliances is usually nobody's business—he will find much of the equipment in need of minor repairs and the bowls covered with a yellow scale which is responsible for the unpleasant odor. The preliminary cleanup given by the force under the sanitary foreman should be very thorough. Plenty of soap and water

for floors, walls and partitions, and a weak sulphuric acid solution to remove the scale from the bowls is the first step.

After this preliminary cleaning the bowl should be washed daily with a soap powder, special attention being given to the under side of overhanging edges beneath which scale collects. The condition of these places can only be seen by holding a small hand mirror in the bowl when many unsuspected catch places can be found covered with scale. After the washing, a spray of 1% Formalin should be used in the neighborhood. After a week's treatment following this routine, a daily wash up with soap and hot water is all that is needed.

If this routine is carried out a sanitary toilet is maintained such as is lacking in most factories. It is not the type of toilet but care and cleanliness which gives the sanitary result. Where new installations are contemplated the Engineering Department should consult the doctor before deciding on the type of toilet to be installed.

The National Safety Council makes the following recommendations:

"Closets: Water closets should be of the individual bowl type with individual water seal and should be made of white vitreous china or porcelain and not of enameled iron. Flush range closets which have been more or less extensively used are quite unsanitary and should under no condition be installed. The seat of each water closet should be made of wood or other non-heat-absorbing material

coated with varnish or water-proof paint to make it impervious to water. Seats made of enameled iron ware, porcelain or other heat absorbing material should not be used. For sanitary reasons it is recommended that the bowl be of the extended lip type and that the seat be open front and back.

"There is quite a difference of opinion regarding the best flush valve arrangement. Some companies which had installed seat-acting flush valve closets now favor a type in which the valve handle is placed alongside of and convenient to the user. A valve which may be tripped by foot-treadle has also been suggested."

"One closet for each 20 employes on the same shift is generally regarded to be sufficient. Where only a few are employed it is advisable to increase this ratio."

"Urinals: An adequate number of urinals should be placed throughout the plant convenient to work places to avoid loss of time required for men to walk to the toilet rooms. One urinal for each 40 males, or fraction thereof, is considered sufficient. Wherever urinals are provided they should be in a suitable enclosure. Provisions should be made for flushing out the rooms and keeping them in a sanitary condition. In each toilet room urinals should also be provided, the number depending upon their convenience to workshops, and the number provided elsewhere in the plant.

"Although the trough and basin urinals are used

in many plants, the vertical slab (individual stall) urinals are now recognized as best."

The equipment of locker rooms is usually some type of steel locker. The best type provides good ventilation and a slanting top on which articles cannot be placed. The lockers should always be on legs raising them from the floor in order that the floor beneath them may be readily flushed with a hose. A bench between rows of lockers is a convenience for those changing clothes. The locker room is often used for a washroom as well as for lockers. (Fig 10.) The type of wash basin depends on the age of the installation. The National Safety Council recommends as follows:

"The most desirable type of washing fixture for plant usage is a trough over which are placed hot and cold water pipes with faucets for washing, spaced not less than 24 inches apart, thus giving each man sufficient space for washing without splashing his neighbor. Double width troughs having faucets facing each side are in common use. Many companies place the single width troughs back to back; this arrangement providing a partition between washers on the two sides. The troughs or basins should be made of porcelain enamelled iron or other impervious material which may be kept clean easily."

The sanitary force should clean locker rooms daily and keep metal work on washing appliances well cleaned and shining. Each locker room should be provided with at least one large waste can for

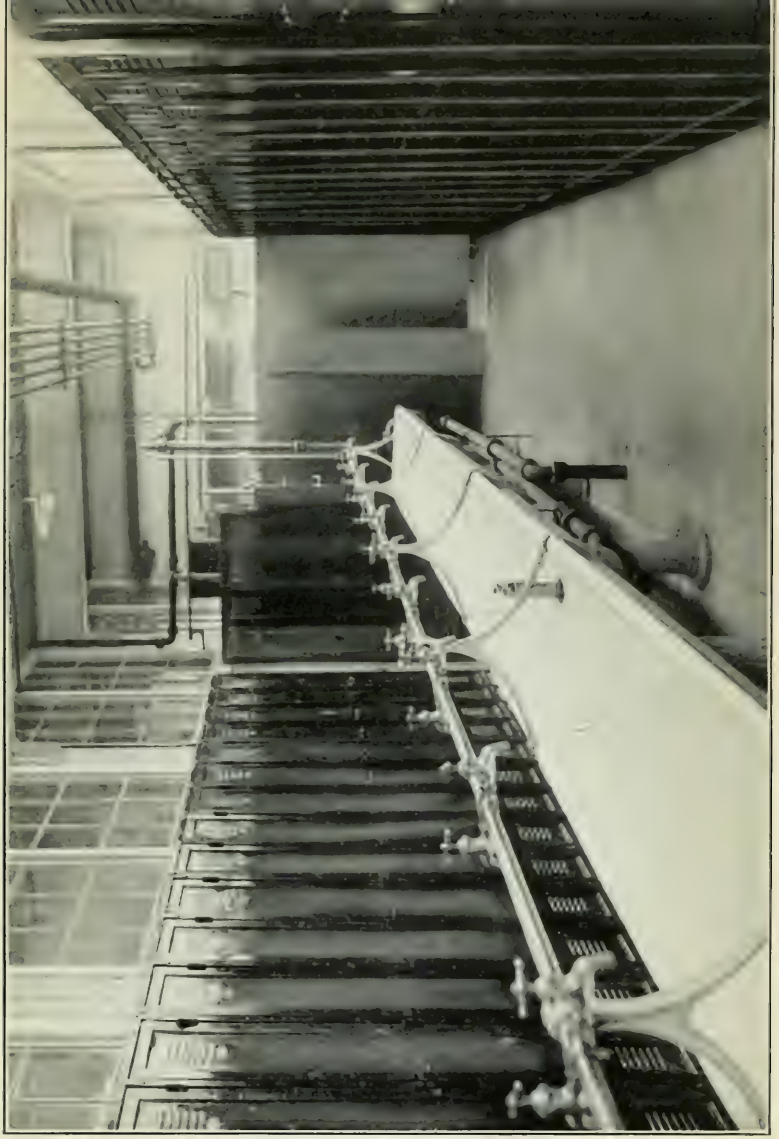

FIG. 10. A GOOD LOCKER AND WASH ROOM

Note

1. Good light and ventilation.
2. Steel lockers raised from floor.
3. Shower baths at end.
4. Faucets arranged for washing under stream of water.
5. Cement floor and drain allowing hose washing.

papers, soap tins and other refuse and this should be emptied daily.

Lockers should be cleaned once a month and whenever one is vacated. Each employe should have an individual locker. Ventilation, heating and daylight should be adequately provided. All these items require a certain amount of supervision and checking up by the industrial physician in addition to the actual work done by the sanitary force.

The importance of keeping windows and electric lights clean was pointed out in discussing illumination. The sanitary force should contain a certain number of window and lamp cleaners who should have a regular schedule of cleaning. They should also see that broken or defective lamps are replaced. In addition to cleaning toilets, locker rooms and lighting, the floor space of the whole factory should be thoroughly cleaned in order that dust may be reduced and tripping hazards eliminated. A certain amount of floor space should be assigned to each sweeper and he should be held responsible for his district. The same man should be responsible for the care and cleanliness of any cuspidors, drinking fountains, or other sanitary appliance. In most factories cuspidors must be installed. They may be of cardboard, but a large earthenware cuspidor with an inside glazed surface, half filled with a mixture of sand and chlorinated lime, is probably the most satisfactory. These cuspidors cannot be overturned, are easily collected on a hand truck, and can be rapidly washed out with a hose. The sanitary force

is also responsible for the collection of paper and refuse in the factory and the disposal of the same. It is often necessary to trap flies and rats. This is again a duty which must be divided through the sanitary force.

The sanitary foreman is responsible for the carrying out of these duties by his force and receives his authority from the chief physician.

In small factories no such elaborate system is necessary; one or two men can be assigned all the sanitary work, these men reporting to one of the foremen or to the doctor. The important point is that sanitation, to be properly and economically carried out, should be the definite work of one or more individuals who have no other work to do. The advantage is that better work is done, the cost of sanitary work can be exactly figured, and some one is responsible for the sanitary condition of the whole plant. In many large plants sanitation is coupled with safety and both are controlled by an inspector of safety and sanitation.

CHAPTER X

SPECIAL PROBLEMS

There are three special problems which the health department has to consider.

1. The physical condition of the higher executives.
2. The study of health hazards peculiar to the industry and their effect upon the health of workmen.
3. The study of early manifestations of disease in workmen.

The health department has excellent facilities for studying all three and if earnest in its efforts has an opportunity for some very interesting clinical research. In any factory the higher executives are the guiding hands which control the success of the business. If these men can be kept in good physical condition their work will always be the best they can turn out. If one or more is laboring under a physical handicap, work when kept up produces a nervous strain which eventually requires a prolonged rest.

Each member of the executive force should have a physical examination. This should be much more searching and complete than that given the workmen. The order of examination should be as follows:

1. History—past and present.
2. Physical examination—special attention to
   (a) Organs of special sense.
   (b) The heart—functional tests—electro-cardiagraph if necessary—blood pressure.
   (c) The lungs—X-ray all suspicious chests. Temperature every afternoon for a week. Three sputum examinations.
   (d) The digestion—special care to eliminate ulcer of stomach.
   (e) The kidneys—careful, complete, urinalysis one twenty-four hour specimen, further examinations if necessary.
   (f) The prostate and rectum.
   (g) The blood—in any cases where blood smear indicated. Wassermann when indicated.
3. Check up any abnormal findings one month later.
4. Re-examination and advice as often as indicated. Naturally special conditions found indicate special examinations.

The value to the company of routine examinations of this type is evident. The loss of a single executive may cause considerable difficulty in the management of any department. The knowledge that all executives are in first-class physical condition is a great asset, while it is equally important that a valuable executive who is physically slipping should appreciate his condition and co-operate with the doctor in warding off a breakdown.

The Life Extension Institute, through its writings, has called attention to the large number of men at or about middle age in whom degenerative processes of serious nature are just starting. These processes, if discovered, can usually be checked or

their progress greatly delayed by intelligent advice and management. The industrial physician is in a position to make examinations as often as they seem to be needed, and to supplement them by special examination at a general hospital if this seems necessary. This point, if no other, shows the great advantage of having the chief physician, or one of his assistants a member of the visiting staff of a neighboring general hospital.

Vexed problems of diagnosis can be rapidly solved by sending the patient to the hospital for twenty-four hours where special X-ray, chemical, or other clinical investigations can be made. If there is enough evidence of trouble to indicate such an examination the patient will readily assent.

The records of the examination of executives should be kept in a special file by the chief physician and no one else should have access to them. Each case should be handled like a private case and records should be as inaccessible as in a practicing physician's office.

The following examinations taken from the records of a large factory show the type of work which should be done.

Mr. A.

Date of examination, December 7, 1920.

Physical findings: Mouth and throat, mild pyorrhea. Several crowned teeth. Tonsils enlarged and ragged, no pus. Lungs, few coarse rales heard at left base, no change in breath sounds or in fremitus. Heart, sounds of rather poor quality. Pulse 120. Rhythm regular. Apex 1 c.m. outside of

nipple line. Blood pressure 180/80. Rectum, small internal hemorrhoids. Slight pruritis.

History: Complains at present of a slight pain in the small of the back. Pain worse after he has been on his feet for any length of time. Cardio-Respiratory—takes cold fairly easily, and notices he has a cough which hangs on following any slight cold. Frequent attacks of tonsilitis when young, none of late. Dyspnoea on exertion. Palpitation at times. Gets excited rather easily and at these times the palpitation is worse. Occasionally has a feeling of substernal distress. Genito-Urinary, Nocturia occasionally.

Laboratory: Blood tests, hemoglobin 90%. Wassermann negative. Blood urea nitrogen 12 mgm (normal). Two hour test for fixation of specific gravity, results given below. Tests show a tendency toward fixation of gravity in the afternoon, and it also shows a moderately increased night amount of urine. There was no albumen in any of the specimens and no blood, pus or casts in the sediment.

Time	Amount	Specific Gravity	Salt Excretion	Nitrogen Excretion
8-10	70 c.c.	1024		
10-12	110 c.c.	1022		
12- 2	465 c.c.	1006		
2- 4	490 c.c.	1009	13.1 grs.	10.7 grs.
4- 6	315 c.c.	1013		
6- 8	200 c.c.	1014		
8- 8	585 c.c.	1015		

Comment: This is a case of hypertension and apparently it is hypertension without any known cause. For lack of a better term these cases are called essential hypertension. As time goes on we can look for degenerative processes in the kidney, heart muscle or brain. A low salt, moderately low protein diet was outlined for this patient, and at the end of two weeks on such a diet his blood pressure was 140/80. It seems to me that he

should stick to this sort of a diet over a long period of time. Furthermore, he should be cautioned and should if possible rest for at least a half hour during the middle of the day. Examination of the heart should be made every few months. It is impossible to say whether or not the degenerative processes can be delayed.

Mr. B.

Date of Examination, November 9, 1920.

Physical Findings: Teeth — Considerable dentistry, few carious roots. Chest—Funnel shaped breast. Lungs—Slightly increased, normal signs right apex, no rales. Extremities—Knee jerks not obtained. Evidences of old infantile paralysis.

History: Complains particularly of nervousness associated with headaches. Unable to think straight. Condition getting worse. Mother died of Melancholia. Cardio-Respiratory—Occasional palpitation at night. No tendency to colds. Genito-Urinary — No nocturia. Neuro-Muscular — Headaches are frontal in type, more on the right side, not relieved by sleep, usually present upon awakening. Sleeps poorly. Nervousness began one year ago. Following a two weeks' vacation May, 1920, felt better for four months. Attacks of nervousness and headache generally come together. No gastric upsets. Slightly depressed mentally. In addition in 1912 had an attack of so-called sciatic rheumatism. Has an occasional twinge of rheumatic pain now. Twelve years ago slight inguinal hernia right, no trouble at present.

Laboratory—Urine, Specific Gravity 1010. Otherwise normal. Blood hemoglobin 90%. Smear normal. Blood Urea—Nitrogen 15 mgm. Blood Salt —645 mgm. Blood Uric Acid—1.5 mgm. These findings are normal with the exception of the Blood Salt which is somewhat elevated.

On the supposition that some of the symptoms might be due to kidney changes, in addition to the above mentioned blood tests, a 2-hour test was done

for fixation of specific gravity. The results of the 2-hour test are given below. It will be noted that there is a good variation in Specific Gravity but that there is a fairly large night amount of urine, somewhat higher than we normally expect. Specific Gravity fixed during late p. m. and night suggesting kidney fatigue.

Time	Amount	Specific Gravity	Salt Excretion	Nitrogen Excretion
8-10	280 c.c.	1008		
10-12	85 c.c.	1020		
12- 2	440 c.c.	1006		
2- 4	140 c.c.	1018	9.7 grs.	13.8 grs.
4- 6	225 c.c.	1012		
6- 8	270 c.c.	1012		
8- 8	625 c.c.	1014		

Totals..2065 c.c.

Slightest possible trace of albumen was found in two of the samples. The examination of the sediments was negative.

(1) Note that the mother died of Melancholia, and that the patient is mentally depressed.

(2) It is possible that some of these cases are due to kidney changes and for this reason a moderately low protein (60 grams) low salt diet was outlined for this patient with the hope that if adhered to over a period of time it might have some effect on the symptoms.

(3) A careful neurological examination is, it seems to me, indicated.

Each industry has its particular hazard and each factory has its share of these hazards. Processes are common in which toxic or mechanically injurious substances are used and frequently the signs and symptoms which the patient presents make an absolutely unknown picture. The harmful agents of these various processes are rapidly being eliminated

wherever possible, but the industrial physician must be constantly on the watch and investigate any group of symptoms which suggest poisoning. Usually the hazard is already known and the symptom complex recognized. It is then necessary to watch for early symptoms and to endeavor to prevent definite disease or poisoning by recognition of early pathological changes. Thus among lead workers absorption of lead can be discovered by urine and blood examination long before the appearance of symptoms.

Occasionally a group of cases will present a symptom complex suggesting a new disease. These cases should be very carefully noted, the symptoms classified, and an attempt made to determine whether there is some substance in the process which is causing the trouble. Thus obscure types of toxicosis such as manganese[8] and cadmium[9] poisoning have been recently investigated, their cause identified, and the method of their prevention determined.

The industrial physician is placed in a unique medical position. He has an opportunity as afforded nowhere else in medicine to study the effect of work upon the human organism, and to observe the very beginning of disease. Workmen will avail themselves freely of a well-conducted medical service consulting the doctor for a multitude of small ailments. As each visit to the factory dispensary and as at least one physical examination is recorded, the development of numerous diseases can be watched and an effort made to check them in their

early stages. There is also the opportunity for the observation of chronic disease conditions over periods of years, and the study of groups of similar conditions can be readily made. The amount of material and the ease with which this can be gathered together at any time is a thing as yet unappreciated by the majority of the profession. Thus, if the chief physician wishes to investigate the effect of work on hearts having a mitral systolic murmur, he can have the entire group sent to the dispensary at ten minutes notice. If he wishes to find out the end result in a series of fractures it is equally easy. A large factory with which the author is connected, is now reviewing the end result of all serious accidents of the previous year, and is making re-examination of all defective hearts, paying special attention to the functional power of the mycocardium and its reaction to different forms of work and exercise. Following this an investigation of hernia cases will be made, determining the end results in all operated cases and the condition of workers who have not had operation. The same factory will shortly start an X-ray lung examination of a number of its employes who have been exposed to abrasive dust over a period of years. It will be seen from this that the opportunities for investigation are almost limitless, and that lack of a sufficient force of medical workers is the only handicap. It is to be hoped that some of the problems of medicine will in future years be solved through the industrial medical department and laboratory.

The work of the health department will be incomplete without a good record system. In previous chapters the record system has been mentioned and its importance indicated. Unless very complete records are kept the mass of information which is being obtained is valueless. Every factory health department has a different system. In many ways they are similar but none are exactly alike. The important points in a system are:

1. Accuracy.
2. Brevity.
3. Availability.
4. Elasticity.
5. Economy.

It is hardly necessary to dwell on accuracy. The exact position of injuries must be stated and the exact result of the injury recorded. Similarly physical examinations and special investigation must be recorded with detail and accuracy.

Brevity means getting in all necessary facts in the fewest possible words. Positive findings only need be recorded. Date and time as well as name of the doctor, or the nurse, treating the case should be entered.

Availability means that a record can be found in one minute or less.

Elasticity means that the record system can be enlarged or contracted at will and that individual records can be added to indefinitely.

Economy means running a record system with the least trouble and clerical work, using the smallest number of clerks possible.

As there are many systems some good, and some

822-8-20-2500

Health & Sanitation Department, Norton Company, Worcester, Mass.

Name _____ Age _____

Address _____

Dept. _____ No. _____ Date _____

Gen. Appearance _____

Eyes: Vision Dist 10 Ft. {R- / L- _____

Ears: Hears Watch {R- _____ Inches / L- _____ Inches

Nose _____

Throat _____

Tongue _____

Teeth _____

Neck _____

Chest Contour _____

Heart _____

Pulse _____

Blood Pressure _____

Lungs _____

_____

Abdomen _____

Extrem. {Upper / Lower _____

Ing. Reg. _____

G. U. _____

Spine _____

Skin _____

Height _____ Weight _____

Joints _____

FIG. 11. PHYSICAL EXAMINATION ENVELOPE

bad, we will describe a simple system which is the result of ten years' actual experience and which has proved satisfactory and economical. The unit of the system consists of a single manilla envelope 5¼ by 8¼ inches on the face of which are printed the physical examination headings. The back contains space for recording transfers and date of discharge. Within the envelope, which opens end up, are placed the cards bearing the sickness and accident record of the worker, any letters from outside physicians, specialists' reports or other medical information. Thus each envelope has on its face the physical examination of the worker on entrance to the factory with his complete subsequent record within. (Fig. 11.)

The method by which the sickness and accident record is built up is as follows. In each sub-dispensary as well as in the central dispensary, there are two forms, one for sickness and one for accident. (Figs. 8 and 12.) Each form is so arranged that after the history is taken, the doctor or nurse can, by a series of checks, designate the injury, its site, diagnosis and treatment, or in case of sickness the history, physical examination, diagnosis and treatment. These forms are in a block and torn off as needed. Every dressing is thus recorded and initialed by the doctor or nurse treating the case. When more detail is needed in special cases the back of the slip is used for full long-hand notes.

Norton Company Worcester, Mass.

No.

ACCIDENT SLIP

Health & Sanitation Department

Name	Age	Dept.	Exp.
Address	M. S. W.	Date	Occ.
Location	Time Accident		
What patient was doing	Time Treated		

What happened

Injury	Site	Treatment	Condition	Return
Lac. wnd.	Rt. Lt.	G. & I.	Healing	Today
Abrasion	Eye. O'Clock	D. D.	Infected	Tomorrow
Contusion	Hand	W. D.	Clean	D. after T.M.
Puncture	Wrist	F. B. R. Coc.	Improved	See Doctor
Incised	Elbow	Sp. Drops	No Change	Report
Sprain	Forearm	Silvol	Lost Time	R. to work
Strain	Foot	Strapped	Released	Days
Burn	Ankle	Splint	Main Hosp.	Weeks
Foreign Body	Knee	Sutured	Advised Xray	Months
Fracture	1, 2, 3, 4, 5	Sutures rem.		Discharged
F. B. Conj.	Finger	T. Lamp		
	Toe	Massage		
	Back	Wax		

FIG. 12. ACCIDENT SLIP

For the Quick Recording of Accidents. It May Also be Used for Recording Treatments

Each nurse brings to the central dispensary at noon and at night, the forms she has filled out. These are immediately arranged in alphabetical order by the clerk. She then goes to the central file and takes from the physical examination envelope the last record card on each case. Upon these she transcribes the record on the form slips. These cards are then filed in a drawer near her desk as "live" cases. In case of redressing or retreatment the card is simply taken from this live file. When a case is discharged the card is transferred from the live file to the main file being replaced in the physical examination envelope.

The main file is cleared weekly from a list of discharges sent to the health department by the employment department. Monthly reports can be readily made from the cards in the live file by not re-filing until the monthly report statistics have been taken off.

Forms for special examinations as heart, lungs, special industrial diseases or poisoning, clinical reports, X-ray reports and similar data are filed in the individual envelope as received. It has been found that the space on any general physical examination form is much too small for detail. In order that adequate records may be made, there should be special forms for recording heart, lung, and special examinations.

Heart Questionnaire for Recording All Cases of Diseased Heart

Name Age No.
Address Dept. Date
Present Complaint
Family History
Past History *Date and duration of Illness*
Rheumatic fever
Tonsilitis
Influenza
Typhoid fever
Other illnesses
Habits
Appetite and digestion
Bowels
Kidneys
Alcohol (amount)
Tobacco "
Food "
Tea "
Coffee "
Sleep "
Physical exercise other than that of occupation — Gardening, Walking, Dancing, etc.
Venereal History
Gonorrhoea — Date of Infection
Syphilis — Duration and nature of treatment

History of Heart Trouble

Present Condition
Shortness of breath
Palpitation
Dizziness or giddiness
Precordial pain
Fainting
Swelling of ankles
Fatigue
Nature and Description of Present Work
How does it agree with patient

Physical Examination *Thyroid*

1. *Before exercise*

(a) *Inspection*
Respirations—Normal—Increased
Chest—contour
Cyanosis
Pulsations
Bulging precordium
Apex beat visible
Sweating

(b) *Palpation*
Pulse rate and character
Apex beat palpable
Thrill

(c) *Percussion*

(d) *Auscultation* (Breath to be held in expiration)
Heart sounds
Murmurs present
Effect of posture *Before Ex.* *After Ex.*

Blood Pressure
Systolic
Diastolic
Pulse Pressure

2. *After Exercise* A. *Simple* B. *Strenuous*
Pulse rate and character
One minute after exercise
Cyanosis
Breathlessness
Pain
Other symptoms
No. of hops No. of lifts
Rating (degree of tolerance)
Good Fair Poor Good Fair Poor

Final Diagnosis:
Prognosis:
Treatment:

Lung Questionnaire for Recording All Cases of Diseased Lungs

Name .....No. .....Dept. .....Date
S. M. W.....Age .....Residence .....
Family History of Tuberculosis or other Lung Disease .....
.....

Previous History
- Diseases of Childhood.....
- Lung or Gland Disease.....
- Other Severe Diseases.....
- Venereal Disease .....

Habits
- Tea .....Appetite .....
- Coffee .....Bowels .....
- Tobacco .....Catamenia .....
- Alcohol .....

Present illness
- Date and Mode of Onset.....
- Cough .....
- Expectoration .....
- Haemoptysis .....Pain .....
- Loss of Weight.....Weakness .....
- Afternoon Fever .....Shortness of Breath.....
- Chills .....Sore Throat or Hoarseness
- Night Sweats .....Insomnia .....

Physical Examination
- Height.....Weight.....Best Weight.....
- General Appearance .....
- Adenopathy .....
- Contour of Chest.....
- Symmetry .....
- Expansion .....

Lungs
- Tactile Fremitus .....
- Percussion .....
- .....
- Resonance .....

Auscultation .....
.....
Vocal Fremitus .....
Rales .....Description of .....
Sputum..... Positive..... Negative.....
Heart..... Blood.....
Urine .....
Diagnosis .....
.....
.....

Lead Questionnaire for Recording All Workers Exposed to Lead Poisoning

Name	Age	Address
Department		Experience therein and previous experience in handling lead
Health	good fair poor	
Appetite	good fair poor	
Digestion	good fair poor	colic eructation gas and regurgitation of fluid
Bowels	regular constipated or loose alternating constipation or diarrhea	
Strength	vigorous weak	
Swelling of ankles	present absent	

Physical Examination

General appearance		robust	frail
Pallor		present	
		absent	
	blue line	present	
		absent	
Mouth			
	teeth	good	
		fair	
		poor	
Heart	Murmurs	present	description of
		absent	
Arteries	rate of pulse	sclerosis present	degree
		absent	
		systolic	
Blood pressure		diastolic	
		pulse pressure	
		distended	
Abdomen		level	
		scapheid	
Peri-umbilical tenderness		present	
		absent	
Extremities		extensor weakness	present
		or wrist drop	absent
		oedema ankles	present
			absent
Blood		stippling	present
			absent
Urine		lead	present
			absent
		nephritis	present
			absent

The unit envelopes with their contents are filed alphabetically in a central file. Wherever the record notes a serious defect a colored marker or flag is attached to the upper edge of the envelope. Different colors indicate different defects. In this way

the clerk can rapidly gather the whole group of defective hearts, lungs, hernia or whatever is called for.

As men are being constantly discharged and frequently rehired, a large "dead" central file is needed in which are filed the envelopes of those men who are discharged each week as determined by a weekly list from the Employment Department.

The investigation of sickness and accident cases at their homes by the visiting nurse service has been noted. The record of these cases coupled with the record of individual time lost, as recorded by the cost department from the time clock cards, forms the basis of many interesting medical statistics.

In a large factory the following statistics were worked out in detail, charted and curved last year.

1. Report on sickness for 1916, 1917, 1918, 1919 presenting the record analysis of data covering the cases of illness reported as having occurred among the plant force during those periods. The extent of the disability discussed both with reference to the comparative amount from year to year and in regard to the measurement of the occurrence by disease groups within each year. These groups also compared for the four-year period.
2. Report on absence from sickness July, 1919, to July, 1920, presenting a record of the absence occasioned by illness during the year relative to extent of disability, nature of illness, period of absence, and comparative prevalence of certain ailments among departments where similar physical conditions attend the occupations. Data

also shows the occurrence of disability by months and the rate of return to work by those affected.

3. An analysis of the data pertaining to the dusty departments to derive the relation between the period of employment and liability to sickness.
4. Analysis of cases of hernia operated during past year, giving etiology, duration of stay in hospital, duration of inability to work, and end results.

Different problems of this type are constantly arising which can be rapidly analyzed, producing extremely interesting data.

CHAPTER XI

COST OF MEDICAL SUPERVISION AND ECONOMICS OF INDUSTRIAL HYGIENE

The cost of a health service in industry must be divided into the cost of the dispensary system, the cost of the visiting nurse service, and the cost of sanitation. Each will be considered in order.

The present cost of maintaining a complete, well-running medical department is approximately six dollars per position in the factory per year. Thus in order to find the cost, the average total number of employes for the year should be multiplied by six dollars. This is less than the most expensive medical services, but it is higher than many which are now being carried on so that it is a safe conservative figure. This figure does not cover the initial expense of dispensary equipment. It can only be used when considering the force as one in continuous operation. That is, if a force of 3,000 is suddenly reduced to 1,000 it takes quite a long time to make the corresponding reduction in medical department expense. On the other hand the force may usually be considerably increased before added expense is incurred. In other words it is easier to expand without added expense than to contract with reduction of expense.

Moreover these figures can be generally considered only as prices, salaries, etc., vary in different parts of the country. In the accompanying table an effort has been made to indicate the more important items of expense at the average of nineteen twenty-one.

Estimate of Expense of Medical Personnel, etc., 1921.

No. of Employes	No. of Full-Time Doctors	No. of Part-Time Doctors	Cost of Doctors	No. of Full-Time Nurses	Cost of Nurses	No. of Dispensaries	Initial Cost of Dispensary Equipment	Cost of Supplies 1 Year	Total Medical Cost Per Year
200	0	1	$360	0	0	1	$250	$240	$1,200
500	0	1	540	0	0	1	500	700	3,000
1000	0	1	1,200	1	$1,560	1	1,000	1,200	6,000
3000	1	2	5,400	3	4,680	3	2,000	3,600	18,000
5000	1	3	10,400	6	9,360	5	4,000	6,000	30,000

The cost of establishing and equipping a dispensary, and its running cost, are very difficult things to figure owing to the constant change in prices. The figures here given are decidedly estimates.

Salaries of Doctors

There is more variation in the salaries paid industrial physicians than in any other item.

Part-time Doctors

When working on a basis of two or three visits to the plant per week the average fee is three dollars a visit, each visit being about one hour. A special fee of three dollars is paid for calls to plant outside of visiting hours. When the part-time doctor visits the plant daily, spending approximately three hours a day, he receives $1,200 to $1,800 a year for his services, but if he is a highly-trained man, specially desired, his salary may go much higher.

Full-time Doctors

A doctor giving full time to industry receives from $1,800 to $5,000 a year depending on the size of the factory and the importance of his position. Thus a man just out of medical school or hospital, starting in industrial medicine, receives much less than a fully qualified industrial physician. In the large plants employing over four thousand employes the chief physician's salary may be $10,000 or more. It must always be remembered that salaries in industrial medicine are net, that is, all equipment, transportation, supplies, etc., are without cost to the physician. He has no expenses whatever.

The salaries of industrial nurses, whether dispensary or visiting, seem to average about $30 per week. This figure applies especially to the eastern states. It is said to be higher in the middle-western states.

In March, 1920, an investigation of nurses' salaries in twenty large factories in New England and elsewhere found the average wages as follows:

Yearly Average for Female Dispensary Nurse.....$1,438.00
Yearly Average for Female Visiting Nurse..... 1,441.00
Yearly Average for Male Dispensary Nurse..... 1,858.00

(Made by Secretary of New England Conference Board of Industrial Physicians.)

The dispensary nurse usually has the added perquisites of uniform, laundry, and expenses to any nurses' conference she attends. All nurses receive two weeks vacation per year with pay and indefinite sick leave when necessary. In all cases graduate nurses only are considered.

Each visiting nurse has in addition the use of a company automobile during working hours. The cost of the visiting nurse service will, therefore, be $1,441 per year for each nurse plus the cost of office space and fixtures, and automobile expense. The most satisfactory type of car has been found to be the Ford coupe which costs about $800 delivered.

The cost of sanitation is impossible to estimate for industry as a whole. At a large factory employing about 4,000 workers, it amounted to twenty-one dollars per year per position in the factory in 1920. This included every cleaning expense, floor sweeping, paper baling, etc. The expense in this factory was somewhat greater than the average because of the large floor area and the dusty character of the business. The average factory superintendent will be surprised to find how great is the expense of cleaning when it is separated from general departmental expense where it is usually carried and buried.

In the past four years three comparatively complete surveys of the cost of Health Supervision in industry have been made. The first was made by M. W. Alexander for the Conference Board of Physicians in Industrial Practice in 1917. This survey of ninety-five factories found the average annual cost of medical and surgical supervision per employe to be $2.21. The majority of these factories were not, however, carrying on medical supervision as outlined in this book, and costs have mounted steadily since the above statistics were compiled.

The second survey was made by Selby, in 1918. One hundred and seventy industrial establishments were visited. Though making a very complete investigation and discussing numerous costs found, no compilation of expense is made.

The third survey was made by Wright in 1920 for the Cleveland Hospital and Health Survey. Wright investigated 1,521 factories. He found 72 had some type of medical service. He says: "There are several plants in Cleveland efficiently applying cost accounting to medical departments and it is in these few plants alone that there is definite knowledge of the total outlay for medical work. Other firms may roughly calculate the cost by guessing at the value of medical supplies purchased or on hand and adding to that amount the salaries of personnel. A number of firms stated the cost to be in the neighborhood of five dollars a year per employe."

Wright rather doubts the accuracy of the above for reasons previously stated. He goes on to say: "In one large establishment the cost is $10.92 a year per employe and in another $11.23. Such amounts are probably not excessive at the present time if the service is comprehensive and of a high order." Drinker[10] in a review of the economic aspects of industrial medicine in 1920 says: "At the present time we know of two establishments where the cost is between $6 and $7 per employe, and there is certainly no disposition to curtail the service offered in either instance. It is probable that a figure of $5 per employe more nearly represents the average

total cost of well-administered industrial medicine at the present time."

From an economic point of view it is interesting to compare the figure of $6.20 per position in the factory, a rate of actual experience for the year 1920 in a large Worcester factory, with the expense of medical care estimated by the National Industrial Conference Board in its table of the average minimum cost of living at a fair standard for a single man in Worcester, Massachusetts, in June, 1920.

Medical supervision in factory one year including—
Physical examination on entrance and subsequent examinations.
Treatment (complete) of all accidents.
Treatment of all minor sickness.
Pathological and X-ray work.....$6.20
Medical care of single man in Worcester living at minimum cost at a fair standard, one year $18.20
The factory medical work which is very complete costs $12 per year less than average medical care for the same period in the same city.

Having considered the costs of medical supervision, what are the benefits? They may be divided into those which affect management and those which affect the worker. All authors who have written on this subject agree on the economic value of medical supervision to management and the difficulty of showing this in figures. Mock sums up the benefits to management as follows:

1. Reduces time loss due to sickness and epidemics.
2. Reduces compensation for accident, disability, deformities and death.

3. Increases output by steadier working force.
4. Decreases hiring of new employes at a great financial saving.
5. Increases the number of old employes with their constantly increasing value.
6. Increases general efficiency of force.
7. Secures good will of employes.

It will be readily seen how few of these advantages can be translated into monetary value. Mock[2] collected "statistics from ten large industries, having excellent medical staffs, which examine all applicants for work." These statistics show that 9.7% of all applicants (118,900) were rejected for work because of disabilities and that by this rejection alone $144,155 was saved. He bases these figures on Alexander's estimate of the cost of turnover at $35 per employe, believing that each rejected employe would have left the company within six months of being hired.

Howe[11] using the same figures has attempted to show the exact saving to a factory of 1,000 employes, resulting from a well-organized medical department. He bases his figures of saving on Mock's 10% rejection figure and Alexander's estimate of $35 per employe as the cost of turnover, and his expense figures on the investigation of the Conference Board of Physicians in Industry on the cost of medical supervision in 95 large factories. His balance sheet is as follows:

"In a Typical Plant of 1,000 Employes, Suppose the Value to the Employer of each Employe-Day, above Wages Paid, is $2.

A conservative calculation places the		A careful investigation in 95 representative plants places the	
Saving from lessened illness due to Medical Examination of Applicants at	$ 683	Cost of Medical Supervision at $2.21 per Employe per Year, or for this plant of 1,000 Employes	$2,210
Saving due to Prevention of infection at	2,442		
Saving in Workmen's Compensation Insurance Premiums	1,105	Balance Saved	2,020
	$4,230		$4,230

And besides this there are the many intangible savings due to such causes as lessened illness through dissemination of health literature, and through prompt treatment at the beginning; greater output through increasing physical vigor; and increased goodwill on the part of the employes."

The author believes that 10% is too high a figure for rejections and that rejections should not be used as a basis of determining the economic value of medical supervision. The real value should rest upon:

1. Reduction of absenteeism as a result of
   (a) Prevention of sickness.
   (b) Prevention of infection following injuries.
   (c) Proper treatment of serious injuries.
   (d) Assurance of worker in cases of exaggeration or imaginary illness.
2. Reduction of accident insurance rate as a result of a well-equipped medical service.
3. Preservation of the health of valued workers and executives.

4. Prevention of "unhealthy working conditions" and "lack of medical care" being used as a basis for strikes or other labor disturbances.
5. Increased "good will" of worker for company.

Considering each in a little more detail.

1. The experience of industrial physicians is that absenteeism due to sickness and accident can be reduced between 25% and 50% as the result of a well-run health department.
2. A definite reduction of rate is made by accident insurance companies when the policy holder maintains a health department.
3. The preservation of the health of valued workers and executives cannot be measured in dollars and cents. The early discovery of beginning disease and its prompt cure in the case of an important executive may be of more value than the entire cost of the health department for a year.
4. A well-run health department inspires confidence among the workers and content with their surroundings. No cause of dissatisfaction from working conditions is likely to arise. This is worth a great deal to the company.
5. A good medical service is always a source of satisfaction to the worker and a firm bond between man and management.

The benefits of medical supervision to the worker according to Mock[2] are that it:

1. Discovers disease early—more rapid and surer cure.
2. Discovers organic disease which can be controlled. Prevents overwork and hazardous occupations for these.
3. Prevents disease by discovering focal infections and danger signs.
4. Provides protection from contagious disease.

5. Provides suitable work according to physical condition.
6. Prevents accident by removal of cause in employe.
7. Provides better medical care when sick.
8. Provides better surgical care when injured.
9. Reduces suffering, permanent disability and death rate.

When we consider the results as a whole we see that the entire community benefits by the improved conditions of the worker, that the local board of health is assisted in its work, and that the lessons learned by the workers are carried to their homes and have a definite effect on the health of their families.

There are few manufacturers who, if they realize the all-round advantages of maintaining a progressive factory health service, will begrudge the six dollars per employe per year necessary to put it into operation. It is the author's belief that a well-run health service returns yearly a cash dividend from time saved and disease prevented alone without considering in any way the great value of many of the less easily estimated but none the less definite benefits. One of the strongest proofs that this is a reasonable statement is that the National Industrial Conference Board[4] upon investigation of a large number of industries found not only that the majority were providing medical service, but that the service was being enlarged. To quote the conclusion:

> "Judged by the experience gathered among New England industries, the value of certain phases

of industrial medical work is quite fully recognized. With few exceptions plans were under way for an expansion of the work, either by adding to the quarters, the staff, or the character of the work."

In the majority of states a Workman's Compensation Act is in force. This requires carrying of compensation insurance by the factory. One of the largest insurance companies in the East in a pamphlet entitled, "Surgical Service for Plants having Fifty to Fifty Thousand Employes" makes the following statement:

"The advantages to be gained by employers through the installation of a plant hospital or first-aid room are:

1. An increased production through:
   a. Saving in time by having injuries dressed and redressed at plant instead of at office of private physician or at public hospital.
   b. Practical elimination of lost time and labor turnover that result from neglected or improperly treated injuries.
   c. Saving in time by having doctor and nurses prescribe for slight illnesses that might otherwise take employes off the job.
   d. Improvement in physical condition of employes through advice of doctor and nurses.
2. A substantial reduction in compensation premium.*
3. A reduction in the amount of compensation payments, which under "Experience Rating" means a reduction in future insurance cost.
4. The promotion of friendly relations with employes through the services rendered by the hospital staff.

* Credits on premium are graduated according to equipment and surgical service, and the amounts vary in different states. Specific information on this point will be gladly furnished by our Underwriting Department.

It is quite certain that no such statements would be made unless the maintenance of a factory dispensary were of financial benefit to the insurance company and if to the insurance company, surely doubly so for the factory in which the service exists. The true effect of medical efforts can be determined accurately by the insurance companies who have the ability to make statistical studies of the effect of new work. The Metropolitan Life Insurance Company in an open letter to members of its field force makes the following statement:

> "The reduction in the mortality from typhoid fever among Industrial policy-holders between 1911 and 1919 was 69%. The acute infectious diseases of childhood showed a reduction of 46.7%. The death rate from tuberculosis of the lungs was reduced 33.1%; from organic diseases of the heart, 23.1%; from Bright's disease, 25.8%; from diseases relating to child-bearing, 6.5% and the external causes, including accidents, showed a reduction of 7.9%."

This reduction is ascribed largely to the work of the company's nursing service and "represented a saving of $2,605,625 in 1919 to the company."

Finally it is interesting to note the action taken on the industrial medical department by the British Health of Munition Workers Committee in 1916.[12] At this time Great Britain was making her greatest effort in production. The committee closes its report with the following:

> "The committee have received evidence and reports from all parts of the country of the economic and industrial value of the proper organization of

a medical service within the factory, and they are convinced that both on grounds of health and of securing improved output this subject demands the immediate attention of employers, and that adequate schemes of treatment, especially of minor injuries, are an important means of preventing loss of time and efficiency among the workers. They recommend, therefore, that provision for organized treatment should be made in every munition factory."

REFERENCES

1. Selby, C. D.
Studies of the Medical and Surgical Care of Industrial Workers.
Public Health Bulletin No. 99. Washington, D. C.
2. Mock, H. E.
Industrial Medicine and Surgery.
W. B. Saunders & Co., 1919. Philadelphia, Pa.
3. Shipley, H. E.
Health Service for Industries of Moderate Size.
The Modern Hospital. April, 1920. Vol. XIV, No. 4.
4. National Industrial Conference Board Health Service in Industry. Research Report No. 34.
5. Geier, O. P.
Modern Medicine, December, 1920.
Vol. II, No. 12.
6. Selby, C. D.
Scope of Physical Examination in Industry.
Proceedings National Safety Council, 1919.
Health Service Section.
7. Dublin, J. J. and Lieboff, P.
Occupation Hazards and Diagnostic Signs.
Proceedings National Safety Council, 1920.
Health Service Section.

8. Edsall, Wilbur & Drinker.
The Occurrence, Course and Prevention of Chronic Manganese Poisoning.
Journal Industrial Hygiene. Vol. I, No 4.

9. Stevens, G. A.
Cadmium Poisoning.
Journal Industrial Hygiene. Vol. II, No. 4.

10. Drinker, C. K.
Economic Aspects of Industrial Medicine.
Journal Industrial Hygiene. Vol. II, No. 2.

11. Howe, G. L.
Why a Factory Doctor's Salary Costs Less than Nothing.
Factory, March 1, 1920.

12. Newman, G.
Sickness and Injury.
Memorandum 10, British Health of Munition Workers Committee, 1916.

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