effect on the vital centers, until enough uncinariæ are expelled to create a favorable reaction and enable us to use thymol. However employed, a dose of 2 gm. should not be exceeded and no more than three successive doses given, one each week.

In concluding this paper we desire to call attention to the possibilities for scientific investigation in the work which the Porto Rico Anemia Commission is now accomplishing.

The insular government is doing all in its power to conquer the reigning disease of its working classes but for some time this campaign must be vigorously pushed to restore health and to save life. Face to face with an enormous number of sick it would be manifestly impossible to divert funds for the further investigation of the diseases of the island in a well-equipped laboratory, yet such an institution is urgently needed, as none realize more fully than the commission itself. To the honor of the physicians of Porto Rico let it be said that they have equipped themselves with microscopes and a few of the more necessary clinical laboratory instruments, from their own personal resources. This is not confined to one or two but is general among the large number who see the necessity for recourse to so valuable an aid to diagnosis. This fact more than all others demonstrates the active and intelligent interest in medical progress in Porto Rico and bespeaks a spirit which merits support.

There is an aged physician in one of the small towns, all his life a scientist, who has secured a modern microscope from Germany a year ago at great personal sacrifice, that he might keep abreast of the advance of medical knowledge. This physician is now pursuing original investigation under conditions which would infallibly paralyze the ambition of the majority of young men and is setting an example to be emulated by all who bear the title of Doctor of Medicine in this country. The example is followed, however, and there are many who are making splendid use of the microscope in towns of the interior where one would least expect to find an instrument too commonly regarded as only fit for the laboratory.

Were a laboratory for research provided, it would be of incalculable value to the many who to-day have no adequate place where such scientific work can be done; the commission would receive a powerful weapon to advance its ever-widening sphere of action; and perhaps the foundation could be laid for a school of hygiene which would be valuable to American as well as to Porto Rican physicians, which may some day contribute to the knowledge of diseases affecting countries beyond its shores.

When we reflect on the real state of affairs, when we ask ourselves the question, "Where did ninety-nine of a hundred physicians practicing in the tropics receive their medical education?" we begin to see where the difficulty lies. Whether a man is an American or a Spaniard he has usually studied his profession in northern climates. The diseases seen in his clinical course

were those of temperate zones and he is apt to explain the phenomena of disease according to the light he received.

There should be some way of acquainting American and Porto Rican physicians with special features of preventable disease in that island where such efforts are being made to carry the principles of the science of medicine into practice.

As it is, men who are not satisfied to trust to tradition to solve the problem arising in their professional life grope aimlessly about for some center where they may work out for themselves, or have worked out, those facts which alone can be resolved in a well-appointed laboratory.

Such a center, by interesting all physicians who come in contact with the poor on the one hand and local officials on the other, would be able to carry the authority derived from facts and figures into their great task of sanitary reform.

THE EFFECT OF INDUSTRY ON HEALTH.*

BY WILLIAM C. HANSON, M.D., CAMBRIDGE.

THE recent investigation of health conditions of industrial life by the State Board of Health of Massachusetts is the first definite step in the development in America of industrial hygiene. For this step credit belongs to the promoters of the necessary legislation, to the legislatures of 1904 and 1905, to our efficient State Board of Health, but most of all to the secretary of the board.

No legal provision was made requiring the employment of scientific men for the investigation, but Dr. Charles Harrington, realizing the importance of preventive medicine and, therefore, of encouraging specialization in sanitary work, saw that just as an expert may trace typhoid fever to a polluted water supply of a workshop, so one versed in medicine and hygiene may trace chronic lead poisoning to improper devices for the removal of lead fumes from furnaces containing kettles of molten lead. In fact, Dr. Harrington even went so far as to announce to one of his classes in hygiene in the Harvard Medical School that only graduates of medicine or those receiving degrees on Commencement Day would be eligible for the work.

Moreover, no legal provision was made for the careful consideration of conditions from a commercial point of view in connection with the hygienic investigation, yet one of the points insisted upon by the secretary of the board was that no injustice should be done to employers.

In short, an attempt has been made to establish the factory inspection work on a scientific basis. In order to do this, it has seemed clear to the State Board of Health that special pains should be taken to assure the employers that the work is not only free from anything underhanded, but that it is of such a nature as to enlist their hearty co-operation.

*Read at the regular meeting of the Monday Evening Club, Feb. 18, 1907.

The subject of industrial hygiene is at once broad and complex, and the brief time allowed for the investigation has permitted only a preliminary basis for further study and development. At the same time, a sufficient number of establishments has been examined in several industries to warrant certain definite recommendations to the legislature providing for a more efficient protection to the health of the operatives than now exists.

Without entering into details it is necessary before considering our subject to define carefully just what is meant by "dangerous trades." One of the first things which ought to be done for the good of all is to revise the lists of the so-called "dangerous trades." A feature strongly to be condemned is the enumeration of a large number of occupations as being more than others conducive to disease, without discriminating between an entire industry, the greater part of which may be conducted within reasonable limits of safety, and the few trades which from their very nature are intrinsically dangerous. Moreover, with any classification there is need of an accompanying table of some sort to show that other causes as well as occupations have to be reckoned with.

Charts are arranged, and are frequently placed in the most conspicuous parts of exhibition halls, to show by their hideous black lines the death-rate from consumption of men in various occupations. Do the persons responsible for such displays realize that they are producing mental pictures in the minds of the young which are immeasurably wrong and difficult to erase? Do they not forget that overcrowded localities, such as the slums of large cities, furnish all the conditions which favor a high mortality, viz., "unsanitary dwellings, immorality, intemperance, high birth-rate, carelessness, ignorance, filth and improper and insufficient food"?

There is no question but some of the highest death-rates occur in manufacturing communities and that unsanitary conditions in industrial establishments are to a certain extent responsible; but it is undeniably true that the number of occupations, referring to the trade as a whole, which are directly accountable for ill-health and disease — at least in the State of Massachusetts — are few.

This fact by no means lessens the importance of protecting the health of our employees in workshops, and of protecting the public in their daily contact with the working people. It does, however, suggest that it is time to call a halt on the custom of stamping with condemnation many of our industries merely because of those trades which make up the dangerous minority and because of the recognized harmful conditions which, while existing, are readily amenable to law and an effective governing body.

From a sanitary point of view all industrial conditions may be classified for practical purposes into two main groups, as follows:

- I. Conditions which arise from the industry.
- II. Conditions which are in no way connected

with [the industry, — that is to say, conditions which are not indispensable to an industry.

Among the first group of conditions are dangers which are direct and obvious in their effects upon the health of the workers: some of these dangers, are avoidable; others are to a certain extent avoidable; while others are entirely unavoidable.

An example of unavoidable conditions may be found in the textile industry — an industry much abused by health critics who complain of the effects of textile processes upon the health and welfare of the workers. At times, for instance, in the carding-room of a cotton mill, the cotton dust, although always present to some extent, flies about the room like snowflakes and covers the hair and clothes of the workers. The reason is that the metal-toothed cylinders become clogged from time to time with waste fibers and need to be cleaned. It is the cleaning that scatters the dust. Attempts have been made, with more or less success, to obviate this objectionable feature, but until the machine manufacturers shall devise some practicable means for getting rid of the dust we must not blame the employers.

I am not saying that cotton manufacturers cannot improve present conditions; they can improve them, and they ought to be compelled to do so, but we must distinguish carefully between the changes which the employer cannot reasonably be expected to make for his employees at the present time and the changes which, regardless of his wishes, can be made and ought to be made.

It should be remembered that our best mills, with their large, well-ventilated workrooms, and the older mills which are under the ablest supervision, are progressively attacking from a commercial point of view the very problems which go hand in hand with improved hygienic conditions. The emphasis of danger, therefore, should be placed not upon the textile industry as an industry but upon those departments wherein the dangers arise.

An example of the *avoidable dangerous* conditions incident to an occupation was seen in a large wire manufacturing establishment containing, among other departments, a room for tempering wire. After the men harden the wire by running it into the crude oil, it is passed through kettles of molten lead inside the tempering furnaces to be "tempered." The lead is heated to the melting point and the wire is drawn through, heated red hot. In this room there were found a number of tempering furnaces where the work was conducted as described. The room was uncomfortably hot and was filled with a dense blue smoke arising from the furnaces. One employee, who had been here for thirteen or fourteen years, showed on examination distinct evidence of chronic lead poisoning, and on questioning him it was found that four years previous he had what is known as the "wrist drop," and that he had suffered from other symptoms of lead poisoning. Three or four other cases of lead poisoning were reported as originating in this room; one employee of five years' standing had been a lumberman, robust and healthy; he now

presented symptoms of chronic lead poisoning. All of the employees in this room worked eleven hours a day and had irregular hours for eating. There were no rules concerning the duties of the employers or those of the persons employed in order to avoid this serious danger. On the contrary, the hoods and blowers and top ventilators for the lead and other fumes were found to be distinctly inefficient, and over one large furnace there was no protection of any sort, — the appliances having been broken years before and none renewed, so that all the fumes mingled at once with the air of the room.

The more important of the two groups of conditions for our consideration this evening is the second — which includes those conditions that may give rise to injurious results because of the disregard of proper hygienic precautions. It is this class of conditions which is mainly responsible for the means of spreading disease in our workshops; and it is this class of conditions, which exists more or less in every industry, which is responsible for branding so many trades as “dangerous,” which so far as the processes are concerned are perfectly harmless! It is the very same group of conditions which exists in the homes of the working people.

The improvement of sanitary conditions in workshops is the great problem confronting us to-day. Its solution will prove to be the connecting link between the community work on the one hand and the social service and hospital work on the other; and equally energetic action is demanded for the protection of the working people in industrial establishments as for the protection against diseases caused by the distribution of impure and dirty milk. In both cases the welfare of the public is inevitably involved.

There is no better illustration of bad workshops, and of the unnecessarily foul conditions in the state of Massachusetts to-day than our bakeries. Bakers, again, are notoriously classed in the list of workers most subject to disease. But why? The reason is simply because the majority of rooms in which baking is done in our Commonwealth do not deserve the name of “bake-rooms.” Cellars, back storerooms, rear tenement quarters and sheds are by no means the exception, and so many of these contain toilet and dressing-rooms that one accustomed to examining them carefully becomes compelled to think of dressing-room and bake-room as one and the same.

In some of the largest cities in this state two thirds of the bake-rooms exist under conditions which are decidedly unhygienic and unsanitary. In one city two fifths of the bake-rooms show conditions which are thoroughly bad, and half of these have water-closets which are literally within or communicate with the bake-rooms! It would not require much imagination to suggest the possibility of an outbreak of typhoid fever from direct infection through the food substances handled by an employee who had become infected by contact with the stool of the original case, or himself had become infected with the disease. Even if it is

urged that baked goods have been subjected to a cooking process, the employee who handles them after they are cooked may have become infected through the original case. Outsiders, too, not uncommonly frequent the bake-rooms, and it is not too much to suppose that — as the water-closets are so handy — an epidemic might arise from such a source. At all events, a water-closet in or near a bake-room is positively uncalled for; it is filthy; and it is a gross violation of common decency.

Legislation should be enacted and enforced to remove not only all water-closets which are within or communicate with the bake-rooms in this Commonwealth, but those water-closets which lead out of bake-rooms, whether by one door or two doors, provided they are situated in close proximity to the bake-rooms.

The enactment of legislation, however, does not relieve us of our most important duty. It is by buying our bread of bakers who keep themselves clean and keep their rooms clean, and by refusing to patronize slovenly men who do their baking in rooms which are unfit for toilet-rooms, that we can do most to correct existing evils.

I recall a bake-room of the most deceptive type. A very attractive front store with its display of baked goods faces the sidewalk. As we enter the store the picture is a pleasing one. There is a new maple floor, the walls are sheathed with wood, and the ceiling is adorned with a fancy tin sheathing. Everything is in the open and is clean and neat. Now let us take a look into the room where the food products are kept and handled. It is situated in the rear in a back yard. It is an old room, low-studded, with a smoky and more or less broken plaster ceiling. The floor is old and dirty, and between the boards are large cracks filled with accumulated dirt and food materials. Beneath the oven and around and under the sink the amount of dirt is especially noticeable. A table near the sink is filthy. The light in the room is poor, and gas jets are made use of on cloudy days. The room is small and has several occupants. A trap door leads to the cellar, which contains — in addition to food stuff — thick masses of cobwebs, various kinds of dirt, and a foul water-closet.

It has been said that many conditions affect the health of bakers, *e.g.*, exposure to excessive heat, to the smoke in doughnut frying, to the constant smell of foods, the irregular hours for eating, flour dust, gas from burning coke, and the long indoor confinement. Any one who realizes that men are working under these conditions and in basements which are unventilated and absolutely foul need not wonder that bakers have a lowered resistance to disease and are especially prone to consumption.

Let us enter one of these bake-rooms; a subterranean kitchen which is, roughly, about 60 x 20 feet and low-studded. The poorly-lighted room necessitates the use of several gas burners throughout the day. The air is foul. In the room is a baker who has been in the business twenty-eight years, and in this shop thirteen years. He gives every appearance of a consump-

tive and admits that he has "some lung affection" and that he "raises something," and he is seen to spit upon the bake-room floor. This man's mother, four sisters and two brothers, all died of consumption. He has a brother living. The man says that he works in this dark, unventilated cellar from half past four in the morning until three or four o'clock in the afternoon, and that he goes out-of-doors only for about one hour out of every twenty-four hours. There are in this same room four other men and a boy.

But I would not have you leave to-night without the knowledge that some of the bakeries present entirely satisfactory conditions from a sanitary point of view. Of over 500 bakeries and similar establishments visited, 55 are in this class, and 11 of the 55 deserve special commendation.

Throughout the investigation of the State Board of Health the underlying principle has been to condemn where there is wrong but to praise where good work is done, and in nearly every industry investigated, including those properly regarded as "dangerous," it was found that "one at least and sometimes not a few establishments were carried on with satisfactory regard for the health of the working people."

All the establishments visited have, so far as possible, been graded from a sanitary point of view. In one or two of the largest industries the plants have been compared and classified with reference to age and construction of buildings, the grade and amount of stock used in them and the processes in vogue.

There are four distinct grades of establishments: the excellent, the good, the moderately bad and the distinctly bad.

In addition to the examination of the factories, attention has been given to the welfare of the industrial community. Thus the attempt has been made to initiate a well-defined system of factory inspection resting upon a scientific basis.

To summarize briefly what has been said, you have had called to your attention three main points. The first is that the initial step taken in the study of industrial hygiene shows ample proof of the need of physicians to specialize in sanitary work. Disease may spread not only through water and milk, but through the overcrowding and otherwise bad and unsanitary conditions in homes, factories and workshops; and equally energetic action is demanded for the protection of the working people in industrial establishments as for the protection against diseases caused by the distribution of dirty milk, since in either case the welfare of the public is involved.

It is your duty to encourage specialization in sanitary work, for preventive medicine is of greater importance to the people at large than is curative medicine. I quote from a writer in the *American Journal of Public Hygiene*: "No such encouragement exists at the present time. The medical man who chooses to take up a special line of work should feel that he is making an upward step in his professional life. The medical man who is bold enough to step out of general professional work into the position of a sanitary

executive — state or municipal — is, as a rule, placing himself in the hands of politicians who rarely appreciate the importance of the responsibilities resting upon them in dealing with sanitary problems."

The second point upon which emphasis has been laid is in behalf of the industries and the employers. The emphasis of danger in relation to a given industry should be placed where it belongs. If only one department of an industry is dangerous, the entire industry must not be condemned. Again, the harmful conditions commonly associated with many industries should not be so tabulated as to make it appear that the industries themselves are at fault.

So far as the employers are concerned, you should have the following considerations always before you:

First, that the employer, hampered by the nature and peculiarities of an industry and its processes, and by existing social conditions, may find that there are some things which he cannot do for his employees at the present time.

Second, that the employer finds that there are some things which he can do for the comfort of his employees to his own advantage, and

Third, certain conditions, regardless of the employer's wishes, directly or indirectly affecting the health or safety of the employees, can and ought to be changed.

Fourth, that while the employee is usually ignorant of the dangers to which he is exposed, and neglects to take necessary precautions, he may be subjected to conditions admittedly dangerous to health which though avoidable, are overlooked by his employer as well.

Finally (the third main point referred to) you must always consider whether outside influences may affect the health of an employee more than the conditions under which he is working.

In closing, I wish to add a few words from a physician's point of view. The physician can do more good to his patient and to the community if he keeps in mind his patient's work. At present he is unable to do justice to a large number of sufferers from want of a clear understanding of modern conditions in industrial establishments, — the effects of modern machinery and processes and of physical and mental labor upon the health of the workers. The whole nature of the individual needs consideration, — home life *plus* industrial life.

Social service work has, in one hospital, recently been made a part of the physician's duties in order to supply the missing information concerning the patient's home life, but as yet no opportunity exists for furnishing physicians with important data relative to the conditions of modern industrial life.

To diagnose and treat the disease is important, but to know the exact conditions under which the patient works for hours, days and years, and to know how he is treated as a human being, is of first importance.

I repeat, a proper development of this great branch of hygiene, now in its infancy, would encourage specialization in sanitary work. With

a more thorough state organization, sanitary problems would be dealt with by specialists, free from political restraint, who could emphasize, as has never been emphasized, the enormous importance of preventive medicine to mankind.

THE TREATMENT OF CHRONIC URETHRAL DISCHARGE.

BY BENJAMIN TENNEY, M.D., BOSTON,
Surgeon to the Boston Dispensary.

THEORY.

CONSIDERING how difficult it is to grow them outside the body, how short their natural life is in the incubator, and how easily their artificial growth is stopped by slight accidents of various sorts, it has always interested me to theorize as to how the gonococcus can exist so long and so prolifically in a canal which is thoroughly flushed with urine every few hours.

The most reasonable explanation to my mind is that within a very short time after infection, probably within a few hours, some of the bacteria which are very motile have penetrated some tiny duct where they are safe from the frequent flood of urine and can increase and spread to other ducts between urinations. In other words that there is a para-urethritis almost from the start.

Starting with the proposition that it is a possibility for a man in ideal health and surroundings and with a urethra of proper sort to acquire a specific urethritis for the first time and be free of all symptoms within three weeks, we are immediately faced by the fact that he has many brethren who are less fortunate, and the conclusion is plain that there must be a chemical or mechanical factor to account for the difference or else a combination of the two. Either the body fluids are lacking in the power to throw off the bacteria faster than they form or, in modern language, "the opsonic index is low" or else there is some mechanical obstruction to their escape.

That the former condition obtains with some patients I like to believe, because occasionally symptoms persist after weeks of attempt to smooth the way for the most remotely hiding diplococci to float away.

That the second is the almost universal cause for persistent urethral discharge as it is for persistent discharge from other and unnatural sinuses, I do believe, and so do most men if I understand their treatment correctly. A sliver, a silk ligature, a bit of necrotic bone or other tissue may keep up a continuous small discharge because the opening is not large enough for it to float out bodily. Enlarge the sinus or make a new opening through which the irritating foreign body escapes or remove it by pressure and the sinus closes and the discharge stops.

The analogy is not solely with the urethra which serves as a grand canal for the hundreds of little canals leading to the para-urethral glands, but with these canals and the ejaculatory ducts, the prostatic ducts, and the canals from Cowper's

glands all of which drain into the same channel. At the beginning of any of these canals the desquamated cells destroyed at the first invasion by bacteria may form necrotic masses too large to pass through the natural exit without greater force than the gentle urging of the leucocytes which are themselves of a size to pass out and attract attention.

The idea of a vaccine by which the removal of bacteria may go on more rapidly than their increase is fascinating. Could the masses of dead and dying cells be rendered sterile, the blood currents would doubtless build a wall about them or carry them away; but the essential element in the new therapy is the handicapping of a definite bacterium by a vaccine prepared from the dead bodies of his own kind, and it is by no means certain that any one bacterium is the cause of all the long-standing para-urethral inflammations. It is not very uncommon to find a smear without Gram decolorizing diplococci and Dr. Charles Duval assures me that many intracellular Gram decolorizing diplococci will show luxuriant growth on agar.

After the well-meant efforts of ourselves and our patients and considering the varied and abundant flora of the normal urethra it would not be surprising to find that some other organism was trying to fill the place once occupied by the gonococcus, and can we have a vaccine for each infection? Until we do we must continue to work along lines which have given results satisfactory though often slow in coming.

With the chemical treatment of chronic urethral discharge in the way of drugs swallowed or used by the patient, this paper has nothing to do because I seldom order them, and in my office I only use silver nitrate in very weak solutions, hot salt solution, and occasionally cocaine and adrenalin.

PRACTICE.

The first ground to cover is to find the highest point from which the discharge can come and the rectal examination is the first one to be made after inspection of the urine. Rarely does one of these patients fail to show some signs of a past acute and present chronic inflammation in prostate or vesicle or both.

The nodular feel of an infected vesicle, and the masses of cells, cell membranes, and motionless spermatozoa in the washings after gentle massage are evidences which cannot be mistaken. The unilateral enlargement, difference in consistency between the two lobes, and the smaller plugs and shreds with large numbers of mononuclear leucocytes in the expressed contents are the main points in locating the prostate as a constant source of discharge.

If either of these conditions has been present for six months or more we may expect to find the membranous urethra contracted. I was taught that stricture formation never followed the first infection. This is a mistake. Stricture formation is often very slow. In one case of mine