THE FOURTEENTH ANNUAL MEETING

OF THE

ASSOCIATION OF EXECUTIVE HEALTH OFFICERS OF ONTARIO

HELD AT THE

CITY OF LONDON

ON THE

13th AND 14th OF SEPTEMBER, 1899.

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1899.

FIRST SESS

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FIFTH SESS

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Diseases.—R. V.

PROGRAMME

FIRST SESSION, WEDNESDAY, SEPTEMBER 13th, 11 a.m.

1. Opening Prayer.
2. Address of Welcome from the City Council.
3. Address of Welcome from the Local Board of Health.
4. Reading of Minutes.—By the Secretary.
5. The Odors of Well Waters.—J. J. Mackenzie, B.A., M.B., Bacteriologist Provincial Board of Health.

SECOND SESSION, WEDNESDAY, 2 p.m.

1. Is there a Tuberculous Diathesis?—Chas. T. McClintock, M.D., Detroit.

2. Tuberculosis in Cattle.—J. D. Macdonald, M.D., Chairman Provincial Board of Health.

3. The duty of Municipal Health Officers and Boards of Health in dealing with Tuberculosis.—F. H. Mitchell, M.D., Medical Health Officer, Deleware.

4. The need for Municipal Sanatoria for Consumptives based on the Number of Cases of Consumption in the Public Institutions.—P. H. Bryce, M.A., M D., Secretary of the Provincial Board of Health.

5. Inspection of the London Water Works and Sewage Disposal Works and Luncheon.

THIRD SESSION, WEDNESDAY, SEPTEMBER 13th, 8 p.m.

1. Address by the Mayor.—Dr. J. D. Wilson.
2. Address by Dr. Clarence T. Campbell, member Local Board of Health, London.
3. President's Annual Address.—J. J. Cassidy, M.D., Toronto, Member of the Provincial Board of Health.
4. School Ventilation.—John Dearness, Esq, London, County Inspector of Schools.

FOURTH SESSION, THURSDAY, SEPTEMBER 14th 9 a.m.

1. Inspection of the London Asylum Sewage Farm.
2. Need and Methods of School Ventilation.—A. B. Shantz, Esq., Caledonia.
3. The Distribution of Anthrax in Ontario.—W. J. Connell, M.D., Kingston.

FIFTH SESSION, THURSDAY, SEPTEMBER 14th, 2 p.m.

1. Recent Methods of Sewage Disposal.—W. VanBuskirk, Esq., C.E., Stratford.

3. Sanitation in Habitations in Relation to the Incidence of Contagious Diseases.—R. V. Bray, M.D., Chatham.

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FOURTEENTH ANNUAL MEETING

OF THE

ASSOCIATION OF

EXECUTIVE HEALTH OFFICERS

OF ONTARIO.

The Fourteenth Annual Meeting of the Association of Executive Health Officers of Ontario was held in the Council Chamber of the City Hall, London, on Wednesday and Thursday, September 13th and 14th, 1899.

Among those present were Dr. J. J. Cassidy, President, Toronto; Dr. J. J. Mackenzie, Secretary, Toronto; Dr. Bryce, Toronto; Dr. Kitchen, St. George; Dr. Vaux, Brockville; Dr. McCullough, Owen Sound; Dr. Hutchinson, London; Dr. Stephenson, London; Dr. Campbell, London; Dr. Bowman, London; Mr. Dearness, London; Dr. McClintock, Detroit; Edwin Grange, V.S., Detroit; Dr. Hall, Chatham; Dr. Bray, Chatham; Dr. Baker, Chatham; Dr. Sturgeon, Petrolia; Mr. D. McCrae, Guelph; Mr. Cavan, V.S., Princeton; Dr. Hotson, Innerkip; Dr. Mitchell, Delaware; Dr. Hyttenrauch, Appin; Ald. Taylor, London: Dr. McCrimmon, Palermo; Wm. VanBuskirk, C.E., Stratford; Dr. Baker, Stratford; Dr. Bell, Berlin; Dr. Hilleard, Waterloo; Dr. Molloy, Preston; Dr. Connell, Kingston; Dr. Wardlaw, Galt; Dr. Bradley, Bervie; Dr. Balfour, London; Mr. A. B. Shantz, Cayuga; Willis Chipman, C.E., Toronto.

First Session—Wednesday Morning.

The President took the chair at eleven o'clock, and after calling the meeting to order called upon Rev. Archdeacon Davis to open the proceedings with prayer.

Ald. Taylor, Chairman of the Local Board of Health, offered the greetings of the City Council and the Local Board. He was pleased to welcome the Association once more to the Forest City. He trusted that the deliberations of the learned body now convened would be for the benefit of the City of London, as indeed it would be for the amelioration of many ills and dangers in the Province at large. He hoped and believed that the members of the Association would find their stay in London both pleasant and profitable.

J. J. MACKENZIE, B.A., M.B., Bacteriologist Provincial Board of Health, then read a paper on "The Odors of Well Waters."

Dr. BRYCE: I would remark regarding this whole question of water supply that it frequently becomes a subject of a great deal of local dispute. For instance, in one case of water supply, that of Brantford, taken from beneath gravel some twelve feet deep on an island in the river, it was charged that the water was to blame for an outbreak of typhoid. The ground upon which the citizens complained was that a vegetable taste developed in this water during very dry and hot weather when a great amount of water was being used. Now the reason this water acquired a vegetable taste was a very simple one. The regular supply of water was ample for ordinary occasions, but in very dry times it was necessary to flood a low area with water from the Grand river by means of which the water, this extra water, reached the subterranean tiles. During the summer this area became grown up more or less with ordinary vegetation, and the water at the dry periods flowing over it took up some of the vegetable matter, and as the filtration was of necessity rapid, it had a vegetable odor and taste, while on examination the water proved to be absolutely sterile, and was good, potable water. We found that in nearly every instance the persons who had taken typhoid in that place were those who had been drinking well-water, preferring the water from wells to public water, on account of the former being cooler. We found also that a number of dairymen had been using impure well-water in washing their cans, and that in some instances whole families using this milk had been attacked. The case of the St. Catharines water is a somewhat similar one, owing to the fact that the waters in the Beaver creek were more or less ponded. They made a reservoir in the stream above the town, and in this grew the green algæ, which gave an odor to the water; and this, with a good deal of vegetable matter growing around the edge of the pond, frightened the people, until they were finally assured that notwithstanding the vegetable taste and smell the water was really a comparatively pure one. Many persons are surprised to learn that winter is the time of year when drinking water from public sources is most dangerous, particularly when taken from rivers. In winter there is an excess of vegetable matter in a condition to render the water more or less dangerous. During the summer the plants growing in the water are gradually taking up the products of decomposition which grow upon them. There is a free oxidation of the water, and the sunlight is constantly purifying the organic matter near the surface. In winter the case is exactly different. The water is covered with ice, and oxidation is largely prevented. Then, too, in the autumn there has been much destruction of vegetable matter along the banks of the stream, and this matter has been brought down, and is there under the ice in the winter, and not being oxidized it happens that more injurious matter is contained in the water then than at any other time of the year. A good many years ago settlers along the St. Clair were attacked in a pretty general way with typhoid fever. The river was frozen over at the time, and the explanation was that the sewage coming down the river was very largely unchanged by oxidation, and there

fore was a constant menace while in that state. The sewage in the river in summer, through oxidation, was comparatively harmless, but with the changed conditions in winter became a most hurtful thing. Dr. Clarke of the Kingston Asylum, some years ago, generally expected an outbreak of typhoid in February. He called it "vegetable typhoid." It is impossible to say whether the sewage drifted near the Point, or whether it was from vegetable matter on low lying land near by, but a pollution of water occurred. A purifying plant was put in, and Dr. Clark does not now complain of an outbreak to the same extent. And so it is in the Muskoka Lake region. These northern waters are full of vegetable matter, but they are comparatively pure and potable waters. But when a lumber camp is placed there it is common to put the stables and outhouses near the edge of some lake. Holes are made through the ice, and the horses are led there to drink. The site of the camp is soon a danger spot from a health standpoint. The result generally is an attack of enteritis, through organic matter from men and horses getting into the water, and there being little oxidation. A remarkable outbreak of this kind occurred in Windsor a few years ago, where by the breaking of a dyke, a lot of barnyard manure was carried down in the flood. Some two or three million gallons of this sewage went down, and an outbreak of typhoid occurred in Windsor within a fortnight afterwards. It radiated from the pumping house outwards. The sewage odor was quite noticeable in the water, and it is said that those who took their morning bath on that day, and those who were having their coffee or morning tea made, were driven out of the house by the odors from the boiling water. Regarding the odor of sulphur in water, I may say that at my residence we have a well about sixty feet deep. The water is cold, and ordinarily free from any odor. But in the month of August, when through absence of the family the well is but little used, if the windmill starts pumping after several days' rest, that water has developed a definite odor of sulphuretted hydrogen.

Dr. McCLINTOCK: In a Michigan mining town a few years ago some five or six cases of typhoid fever broke out. The drinking water was supplied from a shallow lake and many wells. The water from the town water-works began to smell, and all turned from that to the well water. Then came the outbreak of the fever. At first they were disinclined to blame the wells, but when the physicians came to tabulate the results all were traced to the water from the wells and none to the regular town supply. Dr. Remsen, of John Hopkins University, was once called to Boston to examine into a well-defined cucumber odor in the public water supply. He found that this odor came from a fresh water sponge which he found growing there.

Prof. BOWMAN: I was in Muskoka a few weeks ago, and while there I could readily detect the odor of the fresh water sponge. I brought home some specimens several pounds in weight. They were very prevalent in the Magnetewan. These sponges give out a disagreeable fishy smell. I would like to ask Dr. Mackenzie if there is any other method of developing these water odors other than by heating? In pharmacy we used to develop the odors of scent, etc., by using a little liquor potassæ.

Dr. MACKENZIE: In reply to Dr. Bowman's question, I would say that doubtless the use of liquor potassæ would help to develop odors in water, but we found the simple use of heat simple and sufficient in our case. In volatile substances, if you add a little salt you will develop the odor. As to heating the water, a popular illustration of its efficacy in developing the odor is to be found in the case of whiskey. It is claimed by many, and gentlemen present may be able to bear out the statement from their own experimenting, that if you add hot water to whiskey you can smell the whiskey more strongly. (Laughter.) Some time ago the waters of the Jamaica Lake and other Boston ponds developed a mouldy taste. Investigators found a growth of mould there under the ice. In fact they discovered that the mould was more common there in winter than in the summer.

A paper on "Tuberculosis in Cattle," by J. D. Macdonald, M.D., of Hamilton, was, in the absence of the writer, read by the Secretary.

Dr. MITCHELL: Medical Health Officers in rural communities have great difficulty in dealing with cases of tuberculosis in cattle, for, as a rule, there is no systematic management on the part of those owning the herds, and as these cases come under the care of veterinary surgeons they usually fail to report to the Health Officer. A cow may be affected with tuberculosis, and the milk is used, or even the carcass be disposed of for food, and yet the matter would not be brought to the knowledge of the health authorities. Most of the live stock in the country to-day is well taken care of—that is, according to the light the farmers have. The great danger to-day is that our barns and stables are kept too warm. If you go into a barn on an ordinary day you will find the heat and odor almost enough to knock you off your feet.

Dr. VAUX: This is one of the most important questions with which we, as sanitarians, have to deal to day. It is a question, however, that is not exactly fully understood, and certainly the laws in reference to dealing with the disease are not as full and as accurate as they should be. Some two or three years ago an Act was passed by our Legislature relating to the examination of milch cows, with tuberculin as a test. For certain reasons that Act was for a time nullified. This question has been postponed in this respect, but it cannot be kept down. It is coming to the surface steadily, and in the old country especially it is attracting the attention of the profession and the public as never before. When we take into consideration the number of cases which under the tuberculin test show evidence of infection, and then consider that the milk of these cows is used so largely as the diet of children and perhaps those in poor health, the question becomes one of great importance. Those who have been trying to improve the health of cattle in this regard have been endeavoring to bring pressure to bear upon the Government, and also upon dairymen, to enable them to consider the importance of supplying the public with as pure, wholesome and healthy milk as possible. It is in the interest of good government, and it is also in the interest of profitable dairying, that milk above suspicion should be used by the general public. It is now a question of how far the Boards of Health can go in this

matter. In Brockville, where I live, we have brought in a by-law to deal with this subject. The dairyman must take out a license before he can vend milk in the city, and he must report any sickness occurring in his herd, and he must furnish a proper certificate that the milk he supplies is free from tuberculosis, as shown by the tuberculin test. The dairymen complain that they have sometimes to borrow milk in order to supply customers; but this objection was overruled, and the by-law has been put in force as above described. There was a good deal of opposition engendered, and so much pressure was brought to bear on the local authorities that we are not able to say that the administration of the law has been a complete success. I have noticed that in different places throughout the Province where dairymen have been brought up and fined for furnishing milk without such agreements that the cases have been appealed and carried up to a higher court, and the final result has not yet been reached. We all have to admit that the cows which give us milk are largely tuberculous. I have been reading in the *Lancet* recently of a herd belonging to a high authority, consisting of forty cows, was tested with tuberculin, and thirty-five cows gave a reaction. The suspected animals were slaughtered, and out of the thirty-five animals thirty-four had well marked characteristics of tuberculous disease, and the other one had some disease of the uterus. Not long ago a veterinarian brought into my office the lung of a cow, from which the pus freely exuded on being cut, and he said that that cow had been furnishing milk within a period of three weeks.

Dr. HUTCHISON: I cannot conceive that all the cattle of the country are as bad as one would judge from the remarks of Dr. Vaux. Dr. Saunders said a few years ago that one-third of the cattle in the Ottawa district were tuberculous. I do not think that is the case in this section. We have not had many cases of cows dying from tuberculosis. A number have been suspected from the test, but not many have been really seriously affected. I cannot altogether agree with Dr. Mitchell, regarding cows being too warmly kept as a rule. Where bank barns are well kept no injury is likely to result to cattle kept in them. These barns in winter time are seldom over fifty degrees in temperature. I have taken the temperature of cattle and have noticed that when some that have gone up two degrees under the tuberculin test have been set apart they have become as fat and sleek as other cattle. We must not create unnecessary alarm regarding the number of cattle affected with tuberculosis.

Mr. D. McCRAE: I am pleased with the Doctor's explanation of the statement that the cattle of Canada were so seriously affected with tuberculosis. I suppose that most of the gentlemen here are aware that a recent paper read by Prof. Adami of McGill, before the Dominion Medical Association, gave the number of cattle suspected of tuberculosis at only five per cent. as re-acting to the tuberculin test, and he stated further that in this respect we were the most healthy country in the world. This is very assuring. From my own experience, also, I think I can say the same thing. I believe our cattle are not nearly so badly affected with this disease as other countries. At the same time, there is no use shutting our eyes to the fact that there is

a good deal of tuberculosis among cattle in some portions of Canada. Much has been said about stamping out this disease. I think that is nonsense. We shall have to know a good deal more about tuberculosis before we can begin to stamp it out, or have any great measure of success in getting rid of it. I believe there is no use starting the slaughter among herds that has been done in some of the American states, for already, in many cases, this practice has been abandoned over there. Why should Canada take up a plan that has been given up by other countries? We should know a little more about the disease—of how it is carried—before we take positive action. Regarding contagion, I believe there is more danger in buildings—stables in which tuberculosis cattle have been kept—than from any other source. Even if the animals are killed, the building which has become infected still remains as a point of danger. Horned cattle are not the only cattle subject to tuberculosis. Horses, sheep, pigs, rabbits, cats and other domestic animals also take the disease. I believe that if we got our cattle entirely free of the disease, and had men to attend them who were tuberculous and careless, it would not be long before our herds would again become infected. Compulsory slaughter, therefore, will not stamp out the disease. I think Dr. Macdonald's paper is putting the question along the line upon which we can do the best work when he suggests the use of pasteurized or cooked milk. I believe there is no real danger from tuberculous milk. Prof. Nocard has tried experiments over in France by feeding animals upon the worst tuberculous milk, where the germs were found thick, but with no injurious effect to the animals fed. After reading the evidence given before the Royal Commission in England, I have also come to the conclusion that there is comparatively little danger in the use of the flesh of tuberculous cattle. I understand that the germs have been found in milk where it was not clear that tuberculosis of the udder was present. I understand that it is very difficult to diagnose tuberculosis of the udder. As a proof of that I might state that the Royal Commission was anxious to examine animals that had tuberculosis of the udder. They got half a dozen cases, as they thought, but in the laboratory examination only three of these proved to be tuberculosis of the udder the other three had disease of the udder but not of a tuberculous nature. If these veterinarians, who are at the head of the profession in England, can make such mistakes in this regard, there is danger of Canadians making mistakes in the same way. Perhaps it is wise that there should be a good deal of care used in using the milk of tuberculous cows. Dr. Macdonald's paper has given us important statistics in this respect. We should try to control the disease as much as possible, but it should be done in a common sense way and not by putting too heavy a financial burden upon the people of the country. One great drawback to doing anything of a really beneficial nature at present is that our law is exceedingly bad. If you now know that your animal was tuberculous, and sell the hide or any part of the carcass, you are liable to a fine of $200. How can you ask a farmer to test his herd in view of the law? Some have had their animals destroyed after re-acting, and no trace of the disease have been found larger than the size of a pea, and thus h

been destroyed and wasted as fine meat as is being sold to-day in the shambles of your city market. Prof. Bang of Denmark, after testing cattle, merely separates those which have re-acted, and gives them opportunity to recover, and advises the sale of the flesh of animals mildly affected. Now, I ask a simple question, Why could we not allow meat of animals not seriously affected by this disease to be placed on the market and sold? This would mean no loss to the farmer and very little danger to the user of the meat. I think that if we work along these lines in Canada tuberculosis would soon be no menace to the health of the public.

Dr. GRANGE: There are so many ramifications of this question of tuberculosis that I hardly know how to approach the subject. I have investigated the matter of infection to some extent, and I have found that the disease is disseminated in a variety of ways; but if we are going to eliminate circumstantial evidence then I have very little to say about the dissemination of tuberculosis. If, however, we are going to admit circumstantial evidence, I have one or two things I would like to say. One is that in connection with the milk of tuberculous cows there has been a good deal of difference of opinion as to whether milk can infect an animal or person or not. I instituted an experiment a few years ago when I was in connection with the Michigan Agricultural College. I tested a herd of cows, and one of them had tuberculosis apparently. The animal was killed, and the flesh appeared to be loaded with the disease. I put some of the affected portion into a machine for chopping meat, and squeezed the fluid out of it. I examined that fluid under a microscope, and found it had the germs of tuberculosis in it. I put that into milk, and taking six hogs placed three in one stall, and three in another stall. To one set of three hogs we fed some of this milk charged with the germs of tuberculosis, while the other three hogs got the same kind of food minus this particular milk. The milk given to the first three hogs was consumed in four days. At the end of three months I killed two of the hogs fed on the tuberculous milk, and I found them loaded with tuberculosis. I also killed the three other animals, and the most careful examination that I could make with the aid of an accomplished assistant failed to discover any evidence whatever of tuberculosis. The third animal we held for a long period, and it also developed tuberculosis. I also carried on some other experiments with tuberculous hogs. I had some tuberculous cattle in my care once in which the disease could not be recognized by the eye or other natural observation. Sometimes animals which are badly affected may appear very healthy, being plump and sleek. I took some corn and mixed it with fecal matter from the condemned animals, and fed it to hogs, and the hogs became infected with tuberculosis. I made an investigation a few years ago in the city of Coldwater, Michigan, where I inspected a herd of cattle that appeared to have the most desirable sanitary surroundings, and careful treatment. I noticed that the stable was well ventilated. One animal had been condemned previously as it appeared to be affected with tuberculosis or actinomycosis. There were twenty-eight animals in the herd, and of those eighteen reacted. No man ever saw healthier looking cattle than all of these

eighteen animals were. There were no sick cattle, so far as appearance went, and very little coughing was going on in that stable. One of the directors of the institution said to me the night before these animals were slaughtered, "I think this is the rankest humbug." I replied that I only wanted to find out the truth. I added that I thought that the State, which owned the herd, could afford the loss in the interest of public health. I had the animals which had reacted killed, and they gave evidence of tuberculosis under the microscope without a doubt. Dr. Vaughan was asked regarding one animal, "How long would this animal live, doctor, if she were let alone?" The Professor replied, "I don't know for sure, but probably until she had eaten some of the grass growing on the grave of the man she had killed." (Laughter). We then decided to pick out a few of the animals which had not reacted, and examine their flesh for tuberculosis. I was asked to select them, and responded that I would be willing to do so with my eyes shut and still pick out a sound animal. We found that of the animals killed which had not reacted not one was affected with the disease, while all that had reacted were tuberculous.

Mr. McCrae: Have you had any experience in having animals which had reacted under the tuberculin test, and had afterwards got well.

Dr. Grange: Yes.

Mr. McCrae: How was it done?

Dr. Grange: By the sun, apparently. There was a good deal of talk about X rays about that time. I had the idea that these X rays might be in the sun, and that if they could be got to the germs of tuberculosis they would be put to sleep forever. The animals which recovered had an abundance of sunshine. They were "Rosa Bonheur" and "Sarcastic," both cows with great records. They have not since reacted, and the man in charge of them says that the two animals are now free from all sign of tuberculosis, though at one time they had reacted typically.

Mr. McCrae: There have been some experiments made in New Hampshire, where some animals which had reacted under the tuberculin test had been so taken care of and handled that they received all the fresh air and sun possible during the winter, and that 50 per cent. of these animals had recovered from the disease, and gave tokens of perfect health. When killed it was found that although they once had the disease it had been perfectly cured, or that all the old lesions had been so thoroughly isolated from the system that they were no longer dangerous.

The meeting then adjourned until the afternoon.

Second Session—Wednesday Afternoon.

The Association again met at two o'clock, when Dr. Charles T. McClintock, of Detroit, read his paper entitled, "Is there a Tuberculous Diathesis?"

Dr. F. H. MITCHELL of Delaware, Ont., followed in a paper on "The Duty of Medical Health Officers and Boards of Health in dealing with Tuberculosis."

Dr. BRYCE then read his paper on "Need for Municipal Sanatoria for Consumptives, based on the number of cases of Consumption in the Public Institutions."

The three papers were then discussed as one general subject.

Dr. J. J. MACKENZIE: I was very much interested in Dr. McClintock's paper; he has brought out a number of very valuable points, especially from a bacteriologist's standpoint. Regarding the presence of uric acid being contrary to the diathesis favorable to tuberculosis, there is much in what Dr. McClintock has said. Recent work in physiology has brought out the fact that the interchange and exchange of the various elements in the blood largely affect its condition and the possibilities of infection. Regarding the possibilities of uric acid, Dr. McClintock's paper has brought to my memory some experiments I once made with rabbits. I was interested in Haig's views in reference to uric acid, and in order to determine, if possible, the effect of uric acid in infections, I inoculated rabbits intraperitoneally in one case with staphylococcus pyogenes aureus, and in another with the same organism plus uric acid. The latter animal died, the former did not.

Dr. VAUX: It would be a good thing for Dr. Bryce to give us the law as it now stands with reference to compulsory tests of cattle supposed to be suffering from tuberculosis. Have we power as Local Boards to take action under the general provisions of the Public Health Act? And have we power to exact from dairymen the performance of certain specific duties before a license is granted to them?

Dr. MCCRIMMON: Milkmen, as a rule, are willing to have their cattle tested, but they object to paying for it. Dairymen, as a body, are desirous of producing a pure article. If a plan could be introduced by which cattle could be inspected free it would be an advantage. When the farmers and dairymen in our section heard that it was going to cost 75 cents per head to have cattle inspected they were ready to mob me, as I was blamed for the matter. Our stables in the county of Halton are in a first-class condition generally. They are chiefly new ones, to accommodate themselves to the city milk business, and are usually kept in a clean and sanitary condition.

Mr. MCCRAE: The Dominion Government is quite willing to inspect free of expense if the local authorities will request them; that is, by submitting themselves to certain regulations, and having the whole herd inspected, and separating all the suspected aaimals. They will order the separation only, and not the destruction of snspected cattle, but they will not make any allowance for the loss of cattle. We are accustomed to spend $5 for inspecting animals for tuberculosis. I was asked $25 for the inspection of three head of cattle by a New York veterinarian.

Dr. BRYCE: The whole difficulty in the situation is that after the testing nothing further can be done. The laws of the Dominion and Province must be made to harmonize, if effective results are to be obtained.

Mr. McCRAE: Until the law is altered so that a man may kill a animal which has reacted, and after proper inspection sell the meat as is permitted in Germany, and not as now in this country be liable to a penalty for offering that meat for sale, just so soon will the situation be cleared. I understand from Dr. Bryce's paper that there has been a marked increase in the number of patients from consumption in hospitals and other public institutions. I am sorry to hear this, as there has been a decided decrease in England and other European countries. This is strange, too, in the face of the fact that a larger precentage of tuberculosis exists among the cattle of Europe, especially in Germany and Denmark. I do think that there has been a very much larger effort made to throw the onus on cattle than is fair. And I also believe that a very much less effort has been made by even such societies as this in the way of practically fighting this disease. Our people are quite willing to fight the disease, and fight it effectually, when they know how to do so. Speaking from a farmer's standpoint I believe that we do not yet know just how the disease is carried. Where is the danger of tuberculosis from the sputum of a patient who is suffering from tuberculosis in the knee?

Dr. MACKENZIE: Perhaps such a patient would have no sputum.

Mr. McCRAE: That is just the point I have been trying to make. When does a person suffering from consumption become dangerous to others?

Dr. MACKENZIE: When does a tuberculous patient become dangerous to others? That question has often been asked. Or sometimes it is put in this manner: "When does the disease begin?" You would be surprised to find how often in cases of one month and under I have found the bacillus of tuberculosis in the sputum. As soon as bacilli of this disease are found in the sputum it is dangerous.

Mr. McCRAE: But how do you know it is a case of only one month? It may have been five or ten years.

Dr. MACKENZIE: The disease as a rule does not exist long before the sputum appears. The patient who has tuberculous coughing sprays out into the air minute particles of sputum with the germs in them clinging to them, and these particles may float in the air for six hours. Sometimes they come out in the talking of the patient. These are some of the ways in which the sputum may be dangerous. Flügge, of Breslau, makes the statement that dry sputum is not dangerous, but that this fine spray coughed out is most dangerous.

Mr. McCRAE: And yet in the Brompton Consumptive Hospital the nurses seldom contract consumption except from carelessness. That is the testimony of the authorities of that great English sanatorium. Then does Dr. Mackenzie mean to say that only those who have consumption of the lungs are dangerous to others?

Dr. MACKENZIE: I think so. I would not say so definitely.

Mr. MCCRAE: When at gatherings I am asked many questions regarding tuberculous cattle, and I am here to learn all I can about them.

Mr. GRANGE: About two years ago I was investigating this matter of tuberculosis in cattle, and was examining it from various standpoints. As a result of that work I was expected to inform the farmers of Michigan as to what had been done, and what recommendations I had to make. This appeared in a report issued by the State authorities, and with your permission I shall quote a few paragraphs bearing upon some of the points discussed in this gathering today.

Dr. BRYCE: In regard to the papers which have been read to-day, I desire to say that in our discussion of them we should bear in mind that our work is to study the subject from two great standpoints: first, how to determine the disease, and, secondly, how to cure it. It is not absolutely necessary for us to discuss whether there is as much disease among cattle as some say, or whether the cow is the prime factor in the spread of the disease, or whether that animal has little or nothing to do with it. We are here as a body of practical sanitarians discussing the whole broad question of the public interests in the matter of health. We cannot discuss human tuberculosis apart from the question of the distribution of the disease, and its possible checking, so far as it exists in Canada. We have to apply scientific principles as they relate to all diseases, and see how far they will lessen tuberculosis in Canada as it affects both man and animals. Dr. Grange has put concisely the question as it regards animals, and, it also applies as regards man. He has stated that the dissemination of the disease in cattle depended upon certain factors. If I were to consider the conditions in regard to disease in man I would say exactly the same thing. He spoke of the conditions, such as the food, the surroundings, and the dissemination of the disease by respiration,—by exhalations from the lungs and from the emunctories of the body. We are to discuss the question of how we are to eliminate it from all channels. I have referred you to statistics regarding our hospitals to show you the enormous proportion of this disease in Canada. Even if we could gauge the death rate of cattle from tuberculosis it would not give us the death rate from the same cause among human beings. But let us look carefully into the subject, and see where and how we may work to advantage. I have come to the conclusion from figures got daily by Dr. Mackenzie when making records of sputum, that infection from person to person is the great prime cause of the dissemination of tuberculosis in man, and that the same is the case among animals. Look at the records of deaths from this disease. How often the same family name occurs. A mother has been nursing a son or husband. A daughter has been nursing a father or brother, and so on. You will notice that in these families deaths have been following one another in three or four years. You may say that this may be due to the diathesis spoken of by Dr. McClintock. If cattle are free from the disease and are

put in clean stables, and no other cattle affected with the disease are brought near, are they likely to contract tuberculosis? But if tuberculous cattle are brought among them is there not a great likelihood of their contracting the disease? Now, what are we to do? I read a paper before the Huron Medical Society last month, taking the history of all deaths returned in that county in ten years reported, with all the cases of infection, and found that forty per cent. of the names of those who had died occurred twice. About 660 persons had died from consumption, and of these names of persons forty per cent. occurred twice at least. Look at this question from a broad standpoint. See what we are already doing in the schools We are constantly fighting disease in schools from infection. Dr. Anderson of Dundee has found that just as the air of the school is kept pure so in that proportion is disease among children lessened. A school with impure air is a generator of disease. With the question of food the matter of milk comes up, and even though we may admit it to be a minor cause of infection, still, if we are to preserve the health of our children, and even of the calves, close attention must be given to the quality of the milk given them. It is a matter of cleanliness and sanitation. We must watch our animals carefully for indication of the disease, and treat them by the Bang method. I think no one will seriously question whether a certain hereditary tendency to this disease will tend to produce tuberculosis when infection is introduced as other hereditary diseases produce similar tendencies. The question of consumption among our Indians referred to by Dr. Mitchell is worth noting. The Indians live largely out of doors, and one of their chief articles of food in winter is bacon, an animal food. But no matter what may be considered the ordinary tendency of animal food, the figures show that twelve out of every 1,000 Indians on our reserves die yearly from tuberculosis. So we have to come back to the question of what are we going to do with human beings who have tuberculosis, so as to save their lives and also save money to the state? We have to deal with the individual man so as to cope with the disease in the first stages in which it may be recognized, and do this along the most scientific lines, aiming at its cure in that particular patient, and also aiming to hinder its spread to others. In Germany they take thousands of patients and put them in upland homes where they can get good food and pure air, and a large proportion of them get well. So all the subjects upon which we have touched upon to-day regarding tuberculosis come back to sanitation—fresh air, fresh food, and living the simplest kind of a life. Such action will enable us to stamp out tuberculosis whether it be found in human beings or in cattle.

Dr. McCLINTOCK: A young man came into my office a week before last and I told him he had tuberculosis. That very night he had a hemorrhage. I gave full directions about disinfecting the sputum. He lived in a large boarding-house, and when the boarders heard of the affair they left as fast as they could. They were in as great dread as if it had been a case of smallpox. This occurred because of scare articles about consumption in some of the papers. I am afraid that sanitarians have been assisting in frightening the

people unduly regarding tuberculosis. Flügge's suggestion that affected persons should carry around a large cotton cloth or use a box for spitting into is a simple and practical one. This disease is not so rare as some people imagine. Most persons who reach any considerable age have had it in some form or to some extent. Those who have given close attention to the matter will admit that one out of three persons is more or less tuberculous. Some of the Germans would go further, and say that every man is more or less affected by the disease. I believe that tuberculosis is one of the easiest diseases to cure, and one of the most frequently cured. It is said that seventy per cent. of those who pass into the Paris morgue show lesions or traces of tuberculosis. We need sanatoria. We should have these places, where people can go and be cured, and we should have such places also in order that the disease may be more fully studied. Every sanitarian, every physician, should stand shoulder to shoulder in demanding these.

Dr. BRYCE in answer to a question stated: Col. McCrae has made an important point which needs to be emphasized, and that is the ridiculous position in which our law stands at present in relation to this matter of tuberculosis. We have a law in this Province which enables Local Boards of Health through the council to take very stringent action regarding the selling of meat and milk of animals. One section states that if the meat of an animal suffering from tuberculosis is offered for sale it may be seized, and the person who owns it may be fined $100. And the burden of proving that the meat is not diseased rests upon the person owning the meat. Regulations made by the Government at Ottawa provide that if any person wishes to have Government inspection of his cattle with the tuberculin test he may have it done free, provided that if the animals give symptoms of disease they must be separated, and cannot be sold for milk or beef except as dead meat, and only upon certificate from the Local Board of Health. There is no organization in the townships for inspecting cattle. Ordinarily they are taken to Toronto market; but under the Dominion law they cannot be taken out of the municipality. I trust a resolution will be passed at this Association, asking the Dominion and Provincial Governments to do away with the present anomaly in our law, and really get down to practical work in dealing with the meat and milk of animals in general. At present we are practically doing nothing in placing both these articles of food under proper restrictions. We have laws almost identical with those put in force by Dr. Bang of Denmark, but unfortunately they have been hung up pending this question of who is to pay the fee.

Dr. VAUX: I have found it almost impossible to get a statement from local veterinarians regarding the condition of cattle as regards tuberculosis. One veterinarian reported to me that there was no tuberculosis in a certain herd of cattle, but I found out that there was. It appears that he had found some animals affected, but had got them to separate the infected animals from the herd. When taxed with the matter he said: "Do you think I could do otherwise at only seventy-five cents a head? If I were to do otherwise I would lose my practice."

The following resolution was then moved by Dr. Wardlaw, seconded by Dr. Hutchinson, and carried unanimously :

"*Resolved, that in view of the generally expressed conviction of this Association that the present laws, whether Federal or Provincial, do not give opportunity for effective work in the inspection of cattle and meat, this Association desires its Executive to bring the matter of harmonizing such legislation so as to promote a common end, before both the Federal and Provincial Governments.*"

Dr. WARDLAW, in introducing the motion, said : We have fourteen dairies supplying Galt with milk. When the matter of the tuberculin test comes up these dairymen ask : "Who is going to pay for it?" They tell us that there is not much profit in the business for them. They also say : "At times we have to borrow or buy milk from other farmers, and who is going to inspect their animals?" Dairymen have also to change their cows frequently, and this would mean frequent inspection. I believe it would be well to leave the inspection to one person for the whole county.

Dr. HALL : Like Dr. Wardlaw, I have had many difficulties to settle around Chatham. When the law was passed by the Ontario Government—though afterwards withheld—our Local Board received the Act with a great deal of favor. They thought it was exactly what we needed. But when we went to put it into force we were surprised and chagrined to find that it had been "hung up." We have had a little practical experience with the tuberculin test in Chatham. I have listened with very much interest to the papers read, and I think I have picked up some practical points that will help me out in my work. We do not permit people to sell milk in our town without a license, and we do not grant a license without inspecting the dairy and the cows. If our inspector finds any cows that he thinks are not up to the standard as good healthy animals he makes a note of it, and we send a veterinary surgeon out to inspect the animals and make a report upon the same. In 1897 I accompanied the veterinarian, and had ten cows set aside. Of these ten animals three reacted, and they were in such poor condition that we insisted upon their being slaughtered. They were killed, and were buried. In another case an animal purchased near Brockville reacted to the test, and it was promptly shipped back to the man from whom it was bought.

COMPLIMENTARY LUNCHEON.

At 5 o'clock the members of the Association were carried in special cars to the City Water Works, and inspected the site of the proposed municipal sewage farm on the way. After the machinery and handsome grounds of the Water Works had also been inspected, the company was entertained to an excellent luncheon by the Local Board of Health. Before the party returned to the city felicitous speeches were made by members of the party representing the Board, the Association, and various city interests. The whole affair was greatly enjoyed by the members of the Association present, who voted the London authorities excellent hosts.

Third Session—Wednesday Evening.

It was past the regular hour for the meeting when the Association returned from the Water Works, yet an interesting session was held.

Dr. Wilson, Mayor of the city, made a pleasing and hearty address of welcome, first, as Mayor, representing the citizens generally, and also as a medical man. He alluded to the excellent health record of the city, showing how in a few years the death rate had improved from 20 per 1,000, to only 11 per 1,000. During the present year the city was putting down twenty miles of permanent sidewalks on approved sanitary plans. He invited the Association to visit the City Hospital, which had been built after the plan of the Johns Hopkins Hospital. The Mayor then said: The sewage question has been a great problem for years in this city. During the last few years we have constructed fully twenty-five miles of sewers. But we have reached a point where we must dispose of our sewage in some other manner. Some hold that the river Thames is the proper place for us in which to dispose of our sewage, but I do not think the Lord ever made streams with fish in them for men to eat, and then desired that the waters might be polluted with sewage to poison the fish. (Laughter and applause.) We have consulted with many eminent engineers, and they have told us that intermittent filtration is the best system for this city. Other views have also been given us by eminent men, some of whom have advocated chemical precipitation. I believe in this latter system myself, provided we could get rid of the sludge and the cost would not be too much. There is also the system in vogue at the Asylum for the Insane near this city. I am afraid, however, that that system would not be the best for a comparatively large city like ours. I would like to call your attention to one more point: I have noticed that many of the pupils in our public schools have imperfect vision. I would like this body to discuss that matter. There are many children in London to-day who are suffering from eye strain, and I think their case worthy of attention. The Mayor then repeated his welcome, and hoped the Association would come again to the city.

Dr. Ol. T. Campbell, a member of the Local Board of Health, followed with a few remarks endorsing the welcome of the Mayor. He regretted that the excitement of the Western Fair then being held in the city drew away public attention from the meeting of the Association. It was not enough for the sanitary authorities to make wise laws and endeavor to enforce them; it was of equal importance that the people should be educated to understand the value of sanitary work, and thus their hearty support be secured. The speaker also made reference to the earnest and unselfish work of the medical profession, who at all times freely gave their services to advance the public health. Some reminiscences were given of the Sanitary Convention held in London in 1883, and the good results which followed therefrom, and the hope was expressed that the meeting of this Association would be no less profitable to those who participated in it, as well as to the general public.

Dr. J. J. CASSIDY, the President, then delivered his annual address.

Mr. John DEARNESS, County School Inspector, followed with a paper on "School Ventilation." The meeting then adjourned.

FOURTH SESSION—THURSDAY MORNING.

At nine o'clock the members of the Association, accompanied by members of the Local Board and other leading citizens, took special cars for a visit to the sewage farm of the London Institution for the Insane. Dr. Bucke, superintendent of the Institution, met the party, and explained the mode of operating the farm. Other sanitary arrangements in connection with the Institution were inspected, and the members of the Association were pleased with what they saw, and the kindly treatment of the party by the officials of the place.

The party returned to the City Hall about eleven o'clock, when business was resumed.

DR. CONNELL, bacteriologist of Queen's University, Kingston, read a paper on "The Distribution of Anthrax in Ontario."

DR. J. J. MACKENZIE: The outbreaks of anthrax which we have had in Ontario have been interesting because of the peculiar connection with tanneries and woollen mills, which has been noticed in Europe also. I have not personally known of any case in which human beings have been infected, but Dr. Goldie has had a case in which a man in a brush factory was infected. It was not a fatal case, and I am happy to be able to say that it is seldom fatal in man. In regard to the uses of foreign hides, in investigating the Acton outbreak, I looked up the matter carefully, and found that the dry hides imported from South America and other countries are not first soaked in vats in a strong alkaline solution which would kill any bacilli. The dry hides are first soaked in water, and this water gets into the stream or creek, and so it becomes infected. In the Argentine Republic they have a good deal of anthrax, and they occasionally get an outbreak of human anthrax. They there advocate the use of sulphate of copper to destroy the anthrax spores; but I doubt if it would be strong enough to do so.

DR. BRYCE: There have been several outbreaks of this disease in Ontario. In 1886 there was an outbreak of anthrax in the neighborhood of Guelph, and for nearly two years I was investigating its cause. I suggested wool, and upon investigating in the suspected quarter I found that it was the probable cause. In one of the cases it occurred this way:—The veterinarian and his assistant had drawn two cows which had died from the disease into an old gravel pit, where grew nettles, and the farmer and his man assisted in the postmortem and had their sleeves rolled up, and were infected where the nettles pricked. The doctor who attended the cases had some difficulty in saving his patients, but finally did so. In the Acton outbreak I warned the people to be careful in handling the animals affected. In one case a farmer who had an animal die from the dis-

ease wanted to save a dollar or two on the hide, and skinned it. He had pricked his hand with some barley beards in the field, became infected from the skinning of the animal, and was laid up for several weeks, but was brought through. A man died in Acton a few months ago from anthrax poisoning. He had been working with foreign hides. They soak the dry hides, and scrape the hair off with a long knife, the hair being set aside. Now, while hair may not be a great cause of public danger, I think it is a matter of interest in this connection, and one which we cannot afford to overlook. Up to comparatively recently they used to carry the hair to the fields and plow it under, but now they are bringing this hair into commerce. It was once difficult to wash the hair, but now by a revolving machine they can wash it, cleaning it thoroughly with potash, and it comes into commerce as hair for mattrasses, etc. I have but little doubt from what I saw and learned at Acton that the washing and care of the hair is such that there is very little danger of anthrax going into the market in the hair. There is danger in scraping the hair off the hide, however, should there be any abrasion or cut on the hand during the process. If the disease increases in the Province, and the soil becomes infected, there may be endemic anthrax, as there has been in France and elsewhere. Some two years ago anthrax broke out in midwinter, and no cause for the outbreak was apparent at the time. It did not appear to have any connection with the tanneries at Acton, but it was found, upon investigation, that it might have come from such a source as the woollen mill, and the spores be carried on the wool. From a creek in connection with another tannery, and which overflowed one year, six cattle on a neighboring farm were supposed to have contracted anthrax. They died, and I understand that the owner received some compensation from those interested. Our Health Act is a very positive one with regard to the pollution of streams. There is no way in which a tannery or woollen mill can use these creeks directly without polluting them. I have no doubt that the towns will have to deal with the matter more fully, and thus prevent the possible infection of the flats on either bank of these streams. Mr. VanBuskirk has charge of the filtration basin there, which will likely keep the stream pure by controlling all the sewage coming from the tannery.

DR. WARDLAW: Is there not danger from wool brought in before it is handled in the tannery? May not the wool sorters also suffer?

DR. CONNELL: The disease would be the same in the case of wool sorters as in that of tanners. Since the system of fanning has been adopted in the mills there has been very little anthrax among workers.

DR. WARDLAW: Well, if the wool is safe enough to handle, it ought to be safe enough to wash.

A paper on "Ground Air in Cities and Towns" was then read by W. F. VanBuskirk, C.E., of Stratford.

MR. DEARNESS: I remember reading about a house in Southwark having experience in filtration of gas from underground sources. Although there was no connection direct with gas pipes, the house was demolished by an

explosion of the gas. The air of that house had become infiltrated with gas, and when a light was struck the air ignited, and the house was practically blown to pieces.

Dr. BRYCE: The matter has a very important bearing upon one question upon which we have probably never thought sufficiently, namely, the almost universal practice of sub-cellars. I have noticed how that old-fashioned idea still prevails, that the house should have a cellar no matter where situated, and this is a cause of much sickness to many who practice it. Sometimes these cellars are covered with water for a part of the year. I remember this being the case in Owen Sound when visiting there some years ago. There is another illustration of this danger in Dr. Wardlaw's town, the town of Galt. That place adheres closely to old practices. They have a pond on the hill-top, and appear to be greatly in love with it; but although this pond soaks away from time to time and fills their cellars they refuse to vote money to remedy the matter. I have seen whiskey barrels floating around in cellars in Galt in August. In a city like Toronto much of the soil about houses is made up from earth dug from the cellars; and often the earth surrounding these city cellars is full of impurities. In such cases organic matters brought in are in the worst stages of decomposition, being away from all sunlight. It is comparatively easy now to put in double flooring in houses and make cellars largely unnecessary, and it is also easy by this means to keep the air in circulation under the house. Why do we have cellars at all? An ordinary larder can be built next to the kitchen, and with double flooring and sheeting we can keep it as cool as a cellar. By this plan, also, there is no danger of the children falling down the cellar stairs, or the old lady tumbling down there and breaking her femur. (Laughter.) We do not need a cellar even for furnace purposes, as there is a simpler and purer way of heating by steam pipes. We must do what we can to stop the practice of putting cellars under houses. The cellar walls serve as avenues by which the damp is brought up into the house. Then the average cellar is so placed that it is almost impossible to get sunlight into it. With these cellars both dampness and ground air threaten the occupants of the house, and either of these is serious enough.

Dr. STURGEON: Why not have concrete walls extending out beyond the walls of the house, for proper ventilation and drainage?

Dr. KITCHEN: Basements can be kept thoroughly drained and dry. By the proposed plan of Dr. Bryce there is a danger of the foundation becoming a refuge for rats and mice. You can now have basement tiles put in which will enable you to control both air and water. I have had some experience in building, and speak from that experience.

Dr. BRYCE: If Dr. Kitchen lived where there is a good deal of heavy clay it would be different. How many of the houses inhabited by gentlemen here have the facility for an outfall for their drains? How are you going to prevent the flooding of low-lying cellars that is almost inevitable in the spring? If the air moves under the house as well as inside of it there will be

no dampness. If you make piers and put an iron sill around, you will save the expense of cellar drainage and concrete flooring. By the use of tar paper in building your pantry it can be kept just as cool as a cellar, and with but only a small portion of the expense of the latter. By a lattice-work around the air spaces under the house or building can be kept clean and safe from vermin. The double flooring and tar paper will keep the lower part of the house warm and dry. We have been following out the old English way in building lower regions, where they probably kept prisoners when they had no provisions. (Laughter.)

Dr. BAKER: I think that in flat sections of the country it will depend greatly on whether the cellar is a modern one or a black-hole, as cellars used to be. If a cellar is properly constructed it is an improvement to the sanitary conditions of the house, as well as a convenience to people living in cities where real estate is valuable. It is also a benefit to those living in country places, if properly built. Stove heat is not the best for fruit and vegetables. A well ventilated cellar is, I believe, better for general use than an air space.

Dr. BRYCE: How can we ventilate a cellar in winter without bringing in the cold outside air?

Dr. BAKER: I think it can be allowed in from time to time in sufficient quantities not to allow freezing, as in any other portion of the house.

Dr. BRYCE: What about the freezing of the vegetables?

Dr. BAKER: It all depends upon how you keep it ventilated; just as in other parts of the house.

Mr. VANBUSKIRK: I did not intend in my paper to condemn the use of cellars in a house, but merely to condemn the state in which many of them are kept. All the underground portion should be made of hydraulic mortar or cement. The floors are generally made with brick and mortar, or with brick alone. In such cases the air comes from the outside and through the brick. This system of flooring the cellars has prevailed in both town and country, but in towns and cities it is more dangerous on account of gas pipes in the street leaking. I venture to say that there is not one cellar in a hundred in the average town or city where you cannot smell gas. In winter that gas will be thrown up into the rooms by the ascending column of warm air. The gas companies are now nearly all making water gas, and if that gas gets into a house there will be more danger of poisoning than from ordinary coal gas.

Dr. BRYCE: Is there any reason apart from the storage of fuel for having cellars. Do you approve of cellars for general purposes?

Mr. VANBUSKIRK: The cellar is a need, I think, for the storing of coal, etc.

A paper was then read by Dr. BRAY, of Chatham, on "Sanitation in Habitations in relation to the incidence of Contagious Diseases."

Dr. HOTSON: Are all cases of typhoid reported to the Health Officer? Do you placard in all cases of typhoid?

Dr. BAKER: I do not think we are consistent in the case of typhoid fever. What is the use of placarding and disinfecting a house if it is not due to infection, but merely to bacilli in milk, etc.

Dr. MACKENZIE: There has been a danger of overlooking the possibility of house infection in typhoid fever. Dr. Hotson and I looked into an outbreak a few years ago in his section, from which there were eight deaths out of eighteen cases. It was an exceedingly virulent outbreak, and there seemed to be nothing to explain it except contagion from a sick room. It evidently cannot be carried far by the air, but it can be carried about on the clothes. At Chickamauga and Camp Wyckoff there were many instances of hospital infection.

Dr. HUTCHINSON: A young married woman had typhoid in Detroit, and they came to London soon after to visit friends. The London family all took it and two of them died. The woman who came from Detroit was a clean person, and the question is, how did the people here take it? At that time there was no typhoid prevailing in this city. I do not think we have yet got to the bottom of this matter of typhoid fever.

Dr. CONNELL: The possibility of air contagion in typhoid must be admitted, but it is difficult to find cases of proof. Linen or clothing is likely to carry the disease. In all cases the typhoid germ is carried into the system by the digestive tract.

Dr. BELL: I would like to state a case that occurred in my practice. A girl was working in Chatham and a case of typhoid occurred in the house. She also contracted the disease, and remained in Chatham during her illness. When she was able to go home her mother came for her, and shortly after the mother and one son were taken down with typhoid. They both recovered. They were living in the township of Raleigh then. They had built a new house in Tilbury, and they removed from Raleigh to that township. There the father was taken down with typhoid. Another son who came home at that time took typhoid and died. A third son also came to the new home, and he was also taken with the disease, and was ill for some time. One of the young men had spent only two nights attending to the family.

Dr. HALL: I attended the girl referred to by Dr. Bell. We have two or three cases in which nurses had contracted the disease from typhoid patients. But of course there are a great many channels other than air infection for nurses.

Dr. BELL: I received a telephone message some time ago asking whether children from a typhoid family should be allowed to attend school. I replied that I thought it was permitted.

Dr. BRYCE: We do recognize that typhoid is not placed in the same category in practice that diphtheria and scarlet fever are. Here is the practical question. There is a house in which there is a case of typhoid. Women in the house who are nursing, or are handling the soiled dry linen, may be exposed to danger. But if there are children who are not allowed in the sick room

and they are themselves well at the time, should they be kept from school? I am of opinion that such children are not likely to be practically dangerous to their schoolmates. When they become sick, of course they must be kept at home. Are we we not going to indirectly do harm by keeping the children home, and hindering the tendency to notification in all cases of typhoid? Are we not going to do more harm by placarding and keeping the children away than we are by encouraging notification, as we nearly always learn that there is a specific cause which can be investigated? The child is not going to be a source of danger at school unless it gets sick itself, and when it is sick it is not at school.

Dr. BRAY: It is generally understood with us that typhoid fever is to be reported, but we do not generally placard. In regard to air infection, I do not think that any here are prepared to swear positively that there is danger of air infection. Since I came to the city yesterday, I was talking to a gentleman who lives in the township of Lobo, and he told me that just east and west of his neighborhood for a series of seven years there have been outbreaks of typhoid fever. I wonder if the Health Officer of that township has reported to Dr. Bryce. If we had more definite information in these matters, in the way of observation and statistics, we could more fairly decide whether or not there was danger in air infection in typhoid or not.

Dr. HOTSON: Do you stop milk from being sent to cheese factories when there is typhoid in the family of the dairyman?

Dr. BRAY: I understand that there are precautions in such cases, but I am not certain what they are.

Dr. HALL: It is our practice in Chatham to withdraw the license for the time being in case typhoid fever breaks out in the family of any dairyman supplying milk to the town. There was an outbreak of typhoid on a certain street in Chatham, and by following up the cases we found that they had all been supplied with milk by a woman who carried a pail, and we found that there was a case of typhoid in her house. As soon as we stopped the woman from vending milk the cases ceased. We came to the conclusion that the milk was the source of contamination, and that bad well water used in washing the cans was the origin of the trouble.

The meeting then adjourned until two o'clock.

FIFTH SESSION.—THURSDAY AFTERNOON.

The proceedings of this, the closing session of the convention, were opened with prayer by Rev. Mr. Johnston.

Mr. R. A. SHANTZ read a paper upon "The Needs and Methods of School Ventilation," the paper being illustrated by a large diagram of the school building in which the system is practised. This diagram was explained very fully by Mr. Shantz, and many questions were asked by members of the Association, the full import of which, together with the answers, could be understood only by those who watched the speaker demonstrate the diagram.

Among the remarks made was a suggestion by Mr. John DEARNESS that the Government should have architects and others suggest plans for the for the improved ventilation of schools. Rural schools stood particularly in need of improved ventilation.

Dr. Bryce moved, seconded by Dr. Vaux, that a committee be appointed, consisting of the President (as convener), and Messrs. Dearness, Shantz, Chipman and the mover, to consider the question of bringing to bear upon the proper authorities the whole question of practical ventilation in schools and to report at the next annual meeting. The motion was carried unanimously. He said: Personally I feel that there is nothing at present more needed than an improved method of ventilating schools, hospitals, and other places where foul air is likely to be developed.

The following resolution was unanimously carried, the mover and seconder saying that the force of the resolution was so obvious that it was not necessary to take up the time of the Association in advocating its adoption:

Moved by Dr. Hall, seconded by Dr. Connell: "That this Association having noticed with pleasure the strong views expressed in resolutions adopted at the Canada Medical and Ontario Medical Association, recognizing:

"1st. The dangers at present arising from the treatment of consumptives in their later and dangerous stages in our General Hospitals.

"2nd. The urgent demand which there is for sanatoria for treatment at an early stage of the disease of cases of consumption, especially among the working classes in districts not too far removed from their homes.

"3rd. The generally expressed belief of the medical profession of the curability of many cases of this disease if dealt with promptly when first diagnosed.

"Does hereby desire to express its hearty endorsation of the views so expressed, and does hereby direct its Executive Council to co-operate in any work approved of by the medical profession of this country in furthering the views so expressed."

Dr. MACKENZIE suggested that a committee be appointed to make tests of disinfection during the year. There were now three or four practical bacteriologists in the Association, and these as a committee could do some practical work in the line named.

Upon motion of Dr. BRYCE, seconded by Dr. HUTCHINSON, the following committee was appointed to be known as the Committee on Disinfection: Dr. J. J. MACKENZIE, Dr. CONNELL, and Prof. SHUTTLEWORTH.

The election of officers for the ensuing year was then proceeded with and resulted as follows:

President.—Dr. Hutchinson, London.

Vice-President.—W. VanBuskirk, C.E., Stratford.

Secretary-Treasurer.—Dr. J. J. Mackenzie, Toronto.

Council.—Prof. Shuttleworth, Toronto; Dr. Connell, Kingston; Dr. Bell, Berlin; Dr. Hall, Chatham; Dr. Sheard, Toronto; Dr. Malloy, Berlin; Dr. Wardlaw, Galt.

It was moved by Dr. KITCHEN, seconded by Dr. MCCRIMMON, and unanimously carried, "*That a vote of thanks be tendered the City Council, Local Board of Health and the citizens, also Dr. Bucke and the officers of the Institution for the Insane, for the hospitality extended the members of this Association during their stay in London.*"

The President elect briefly responded on behalf of the municipality, and took occasion to thank the members for electing him to the position of President. He could assure those present that he would endeavor to be worthy of the confidence reposed in him and would do all he could to advance the best interests of the Association.

Dr. CASSIDY, the retiring President, was also presented with a cordial vote of thanks, which was acknowledged in a few fitting words. He in turn thanked the members of the Association for the courtesy he had always received from the members. The general public could not fully appreciate the work of the Association. Its members were looked upon as a mild form of sanitary cranks. However, much benefit was resulting to the public from the work of the Association. It was also a pleasant and profitable thing for kindred minds to gather together for two or three days out of the year, and in a social and business way encourage one another.

The Convention then adjourned.

PRESIDENT'S ANNUAL ADDRESS.

By J. J. Cassidy, M.D., Toronto, Member of the Provincial Board of Health.

Gentlemen of the Association:

Ladies and Gentlemen,—Of the many subjects which claim the attention of an Association such as ours, some have already been discussed at former meetings and some are comparatively new. One of the more important of the latter is the regular daily medical inspection of schools. As you know, according to Schedule B of the Public Health Act, it is the duty of a Medical Health Officer of a municipality, if thought advisable by the Board of School Trustees, to act as Medical Inspector of Schools, as well as advisory officer in matters pertaining to school hygiene. When a contagious disease, such as scarlet fever or diphtheria, attacks a number of pupils attending a school, the services of the Medical Health Officer are called into requisition by the Board of School Trustees, in order that the necessary preventive measures, such as isolation and disinfection, may be put into operation. As a matter of fact, in our own city schools at least, the services of the Medical Health Officer are frequently required, and the reason of this is based on a fact, which has long been known to exist, namely, that the public school is always a centre of infection toward which the contagious diseases, incident to child-life, make their way from infected homes and from which these same diseases are carried to other homes. The truth of this observation has been frequently shown in Ontario. Our present system of placarding houses in which the infectious diseases are located is only partially beneficial, even when all cases are promptly reported by the attending physician, for the reason, that, in most cases, a physician is not called to attend the patient, till after it has been possible for many of the child's mates to have become infected. The symptoms presented by numerous cases of diphtheria or scarlet fever, in the absence of an alarming epidemic, are not regarded by parents at the onset as being of sufficient importance to warrant seeking medical aid, or even detention of the child from school; so that for days, perhaps, the child is permitted to cough, sneeze or expectorate the germs freely, while coming in close contact with other children. The like is true of other infectious diseases to which children are especially subject.

In order to prevent the spread of the disease from the school, daily medical inspection of schools has been introduced. Work of this kind has been in operation for many years in the City of Brussels. The City of Boston in 1894, at a time when an epidemic of diphtheria showed the authorities that radical reform must be adopted, began a system of daily medical examination of the schools. Dr. Durgin, Medical Officer of the Boston Board of Health thus describes the methods by which the work is carried on in that city:

The Board of Health divided the city into fifty districts, giving an average of about four school-houses and fourteen hundred pupils to each district. No difficulty was experienced in finding well qualified and discreet physicians, who would undertake the duties prescribed, and the Board selected and appointed one physician for each district. His duty is to make a visit to each master's school daily, soon after the beginning of the morning session. The master receives from each of the teachers in his district early reports, as to the appearance of illness in any pupil in his charge. These reports are given to the visiting physician, who at once examines the reported children and makes a record of his diagnosis and action in books, furnished by the Board of Health for that purpose, and kept in the custody of the master. If the visiting physician finds the child too ill, from any cause, to remain in school, he advises the teacher to send the child home for the observation and care of his parents and family physician. If illness is from a contagious disease, the child is ordered home and the case reported to the Board of Health. The disposition of the sick child while at home, and the proper isolation in cases where contagious diseases develop in such children, as well as giving them a warrant for returning to school, depend principally upon the school inspector.

During the first two months 4,962 pupils were examined and 564 were found to be too ill to remain at school. Of these 212 suffered from contagious diseases, 43 being cases of diphtheria. Diseases of the throat were found in 1,749 pupils. Diseases of the eye, ear and spine were frequent. In 1896 the number of infectious diseases was found to be less in the Boston schools than in 1894.

New York began this system early in 1897. Of 8,960 pupils examined, 1,156 were too ill to remain at school. Among these there were :—

Of Specific and infectious diseases	.....	267 cases.
Oral and respiratory "	.....	3,934 "
Ear "	.....	66 "
Eye "	.....	382 "
Skin "	.....	628 "
Miscellaneous "	.....	3,687 "
Diphtheria "	.....	26 "
Scarlet fever "	.....	8 "
Measles "	.....	59 "
Mumps "	.....	54 "
Chickenpox "	.....	35 "
Croup "	.....	71 "
Tuberculosis "	.....	3 "

From these figures you will see the importance of medical inspection in connection with public schools. Its protective value to the public, and to school children in particular, cannot be overestimated. All know how easily the contagious diseases of children may be and are disseminated, and how indifferent parents and guardians are to the protection of their own children or others from infectious and contagious diseases in school and at home. All

know how these diseases in children lead to after results, impaired vision or hearing, chronic throat difficulties, diseased nervous systems, by which their effectiveness as pupils and students is impaired, and that thereby the work of education is seriously hindered, if it is not in the case of many pupils rendered altogether impossible.

As it would be impossible for a medical health officer in a large city to undertake school inspection, in addition to his other duties, a sufficient number of local physicians should be engaged by the School Board for the purpose. In small towns and rural municipalities, school inspection could be done by the medical health officer of the municipality, a reasonable salary being paid for this addition to his usual duties.

You will naturally expect me to say something of consumption, a disease, which for the people of most civilized countries, has, in the light of recent investigation and statistics, become a subject of the greatest interest and importance. It will not be necessary to discuss here the current opinions held by physicians, of the influence of Koch's bacillus in the causation of that disease. It seems, however, that, while the agency of the bacillus as a causative factor of consumption is proved, it is equally true that this microbe can only exist in persons whose vital resistance is low, and who thus offer a suitable soil for its growth. It is recognized to-day, more clearly than in the past, that the successful treatment of consumption is largely preventive in character, and in a great many cases it must be applied to the infant and young child. Children are in their lives much like plants, and thrive or fade according to the amount of intelligent care devoted to them. In their early years, sunshine, fresh air, warm clothing, and wholesome food are necessary to their very existence, and if these are generously provided, children grow up to become healthy men and women. Too often, however, their early lives are passed in crowded, unclean, damp houses; their food is unsufficient or innutritious; their surroundings are most hurtful, and anti-hygienic, so that it is no wonder if they become rachitic, scrofulous, anæmic, particularly, if, as is too often the case, there is an alcoholic or other taint on the side of at least one of the parents. Their emaciated and weakened bodies, wanting in proper vitality, form a favorable and fruitful soil for the propagation of the dreaded bacillus, of which they ultimately become the victims. Any agency, private or public, that will provide sunlight, pure air, wholesome food, and last, but by no means least, intelligent medical care for the children of the poor, will assist in remedying the formidable evils from which they suffer at the dawn of life, and will therefore lessen the number of children, who now pay a large tribute to the devouring monster, consumption. You are all aware, that the success of the experiment at Nordrach, in Germany, has powerfully illuminated the somewhat gloomy chapter of the treatment of consumption. Up to a very short time ago, climate was claimed to exercise a very important curative influence, to be, in fact, the curative influence in the successful treatment of this disease. Other things being equal, climate has a good deal to do with the case.

Dr. Douty, writing from Davos to the British Medical Journal, asks 'Why has phthisis been unknown in the Engadine and Pratigau? The na

ives live on miserable food, shut up for months and months in the most insanitary houses, yet they have not succumbed. They have had chances of being infected during the last 30 years. In Sicily, again, the natives live under almost worse conditions, with a very meagre diet, and yet the percentage of deaths from phthisis is one of the lowest in the world. The crofters of Scotland, the laborers of Devonshire, the peasants of Ireland live under similar but better conditions than the natives of Engadine and Pratigau, but they are decimated by tuberculosis in some form or other. How is this? It is climate that has to answer for it, and to take them away from their damp climate is the first essential in making a cure" Altitude is an important factor in climatic treatment, owing largely to the diminished atmospheric pressure and increased activity of the respiratory organs. Altitude is sometimes associated with treatment of phthisis by cold air and ozone, as practised at Engadine, but it can act quite independently of cold.

The Editor of the Indian Lancet, records an interesting observation made by a French physician, Dr. Bertillon, some twenty years ago, that pulmonary phthisis ceased making progress and that the symptoms disappeared if the patient went to reside at a mean altitude between the level of the sea and the line of perpetual snow; but that the symptoms would immediately return with increased violence, if he or she went down again to a lower level. He adds: "This theory has been amply verified, and the two following cases, which have never yet been published, fully confirm it. A French gentleman of fortune, after leading a very fast life in Paris, abandoning himself to every kind of excess, fell ill and soon displayed the characteristic signs of lung disease, cough and hemoptysis, nocturnal sweats, loss of appetite, general debility, etc. He consulted Dr. Bertillon, who told him plainly, that if he did remain in Paris he was a lost man and that his only chance was to take up his residence at Briancon, an important fortified town in the French Alps, which fills exactly the conditions of altitude above mentioned. He obeyed his physician and, in a very short time, all the symptoms of his malady disappeared, he recovered his appetite and good spirits, and remained a whole year in Briancon in excellent health. But, in an evil hour, thinking himself cured, he returned to Paris, and once more joined again in the pleasures of his former associates. But his old enemy was anxiously waiting for him; he began to cough as he had done before, and to spit blood, and had to take to his bed, from which he never rose again, dying after a short illness.

The second case is that of an Irish lady, who died in the City of Mexico, six months ago, aged sixty-eight, having always to the last enjoyed the best of health, although, when she went there twenty years ago, she was deeply consumptive, her left lung being almost obliterated, and herself given up as lost. But, being a sensible woman, and having heard of the altitude theory, and that the City of Mexico fulfilled the conditions of being at the mean altitude between the snow-line and the sea-level, she wisely remained there until she died of general debility and break-up."

In considering climate we consider *altitude*, the *dryness of the air*, the amount of sunshine, the diathermancy of the sun's rays, the absence of fog or

mist, the absence of wind, etc., and we must think what effect all these may have on the blood pressure, and therefore on the secretions of skin and kidneys, the pace and depth of respiration, the secretions of the tubes and of cavities, on the blood-making tissues, on the blood itself, and on the tubercle bacilli themselves. Are all these conditions and effects the same in England as they are 6,000 feet up in the Alps? Certainly not; and yet other things taken together have more to do with the cure of consumption than climate. As Dr. Douty says:—

"Fresh air is good and desirable in every disease; but fresh air will not cure consumption. You cannot get fat on fresh air. Overfeeding is the secret of the success of Nordrach—overfeeding, combined with the excellent judgment shown by Dr. Walther in the constant supervision of his patients, and the careful graduation of their daily exercise, whereby the heart is kept strong and healthy, and is able to maintain a brisk circulation through the somewhat obstructed channels of the pulmonary vessels, and the dropsical condition of the lungs induced by too much of the recumbent position in the *Liegehalle* of sanatoria is avoided. Thus, not only the lungs, but all the organs, including the heart and all other muscles, are brought into the condition of a gently but well-trained athlete, and the patients are ready to return to their work, if not absolutely cured, at any rate in such good condition that they can continue to be useful members of society, and if they have the sense to continue the high feeding and careful exercise can eventually live down their lung lesion and lose it. In too many cases it is a weakened heart, that prevents their doing so. I believe that the same excellent principles of treatment carried out in a totally different climate will give even better results than those of Nordrach, though they are, I believe, the best yet produced; *but they are produced by the system of treatment, in spite of, and not because of, the climate.* Hundreds of cases have been cured at Davos, without any rational system of treatment whatever."

There is good reason to believe, therefore, that, even in countries where the winter climate is severe, curative results can be obtained in the treatment of consumption. For instance, the following report from the Sanatorium at Gravenhurst, Ontario, is encouraging.

MEDICAL REPORT FOR THE YEAR ENDING SEPT. 30TH, 1898.

Number of patients treated during the year	116
Number at Sanatorium still under treatment	33
Number to be reported on	83

Of these 83 patients there were

Discharged apparently cured, 12; unimproved, 11.
" with disease arrested, 33; failed, 8.
" with marked improvement, 29.

Of the 83 patients 64 gained in weight an average of eleven and one third pounds.

Average stay of each patient, 98 days.

The altitude of the Gravenhurst Sanatorium is about 800 feet above sea-level. In British Columbia, however, residence can be obtained at stations having a suitable elevation above the sea, and, when climatic advantages, such as they possess, are made to co-operate with overfeeding, regulated exercise and medical supervision, the curative results to be looked for in Canadian sanatoria ought to be of the most satisfactory character.

An important feature in the prevention of consumption is the isolation of cases of the disease in sanatoria, thereby removing a considerable source of peril from healthy people, who meet them in all the vocations of life, and more particularly their families, who live in the same homes with them. The number of cases of tuberculosis in Ontario is, however, so large (probably 10,000, there having been 3,154 deaths in this Province in 1897), that the housing of all the cases in sanatoria, even if they were all willing to go to these resorts, cannot be realized. Disinfection of sputa, cleaning and disinfection of rooms occupied by phthisical cases are, however, better understood and more thoroughly performed than they were a few years ago; and intelligent people find it necessary to practice these sanitary methods, in order to protect themselves when their phthisical friends are housed with them. The proposal to make phthisis a notifiable disease has been received with indifference by some sanitarians and with positive objection by others. Some of the arguments used by the latter would indicate a misconception of the real object and scope of notification in phthisis. Neither placarding nor quarantine are required in phthisis, although antagonists of notification have imagined that they should be employed in that disease as well as in diphtheria. Such a view is quite erroneous. As Landouzy, of Paris, says:—"It is not the consumptive's body, nor his breath, nor his perspiration, nor the air of the room he inhabits which is harmful; the danger resides in the expectoration. After the departure or death of a consumptive patient, the contagion of his disease remains and survives, since his expectoration, which may have fallen in some corner of the room he occupied, dries up, mingles with the dust, and the bacilli contained in it are ready for a favorable opportunity and a suitable culture ground to renew the process of tuberculization in some other person. The use of spittoons should be enforced in the treatment of all cases of phthisis, and further, spittoons made of some combustible material should be provided in all places, private and public, and the people, young and old, should be taught to use them."

I do not think, that a tubercular patient, whose sputa are disinfected, whose person and clothing are kept clean, and whose room is tidy, well ventilated and exposed to sunlight is a source of contagion to his neighbors. In such a case quarantine is not necessary, and to place a placard on the door would be foolish. I support notification in phthisis, because it is the first and necessary step to obtain accurate knowledge of the phthisical infection centres in a municipality. A physician attending a case of phthisis should provide for the prevention of contagion, and should consider the interest of the other members of the patient's family. If physicians practised prevention in cases of consumption, as carefully as they do in cases of smallpox and diphtheria,

the proximate and distant results of their efforts would lessen the mortality from consumption, more than the best conceived medical treatment. If people are careless and imprudent in dealing with tubercular cases, it is largely due to the fact that they have not been fully instructed. Such instruction should be given by physicians, who would then be exercising one of the noblest functions of their office—that of guardians of public health.

It may be opportune to remind you, at this point, that the danger of inoculation with dust from rooms that have been occupied by consumptives may be obviated, if the windows are regularly opened. The antiseptic properties of fresh air are very great, and, if consumptives are taught to open the windows, they will help themselves and lessen the danger of infecting healthy people with their disease. Probably the best way of disinfecting apartments is by exposing them to the sun, after a thorough cleaning; but where this method is impracticable, formaldehyde gas infection or some similar method may be used. It is my pleasing duty to observe that Dr. Hutchinson, Medical Health Officer for London, has referred in his last report to the duties and responsibilities resting on citizens and municipalities, in opposing the spread of consumption. His advice is timely, and, if his recommendations are put into practice, there will be a considerable decrease in the prevalence of consumption in this city. As Dr. Hutchinson says:

"In London during 1897, out of 472 deaths, 99 were from consumption, and 54 from diphtheria, scarlet fever, and typhoid fever, so that twice as many died in this city from consumption as from all other infectious diseases. Two deaths in every nine were from consumption."

There are very many different opinions as to the money value of human life. The State Legislature of Illinois places it at $5,000. Assuming that a valuation of $1,000 is correct, the loss of ninety-nine lives per annum from consumption in this city means a direct money loss of $99,000, and an indirect loss of a very large sum besides. The financial method of appreciating the value of sanitary methods and legislation naturally appeals to every intellect, and, moreover, places the loss resulting from preventable diseases in a peculiarly effective way. That all must die at some time is a truism; but reliable statistics show that, with proper precautions, the evil day may be delayed. Lives now sacrificed to contagious disease might be preserved, if not to the scriptural "three score and ten years," at least for many years of useful and productive activity. In 1896 I reported to the Provincial Board of Health on the "Hygiene of the Canadian Railway," and referred, at considerable length, to the upholstering of seats in railway carriages, and also to the current methods of cleaning floors, seats, etc., in carriages. Preference was expressed for seats trimmed with leather, instead of the ordinary, well-stuffed seat, covered with plush, because plush is retentive of dust, and the dust of railway carriages is rich in bacteria. Quotations were made from a report of bacteriological work done in Germany by Drs. Petri, Kolb and Friedrich, who examined specimens of dust taken from railway carriages, and found numerous pathogenic bacteria. In nearly half the cases, there was obvious evidence that the passengers had expectorated on the floors of the

carriages, and the presence of the Koch bacillus was proved. In fourth-class carriages, which were unclean and rarely washed, the number of bacteria in dust, swept up from one square metre of the floor surface, was estimated at 12,624 ; in the third-class, 5,481 ; the second-class, 4,247 ; and the first-class, 2,583. On the seats and partitions there were fewer bacteria, from 2,646 to 29, and the ceiling was almost free. It is quite evident, therefore, that to keep the floors, seats and partitions of a railway carriage clean is to practically ensure its freedom from pathogenic germs, which gravitate with the dust toward the floor of the carriage. Now, leather trimmed seats can be washed with hot water and soap, and then wiped with a sterilized cloth, thus ensuring the disappearance of bacteria. Such seats are therefore superior for sanitary reasons to seats trimmed with plush, which have to be cleaned by compressed air or by brushing. For similar reasons, the floors of carriages, which are washed with hot water and soap and then wiped with a sterilized cloth, are also freed from bacteria, and, consequently, that method of cleaning floors is superior to sweeping. On account of its impermeability and the ease with which it can be cleaned, linoleum was recommended in my report as a floor covering for day carriages and sleeping cars instead of carpet.

Owing to the large window space in railway carriages and the free penetration of sunlight into them, together with ventilation, destruction of the germs of disease will take place to a great extent ; but, as the number of consumptive persons who travel by rail is considerable, the routine disinfection of day and sleeping carriages by formaldehyde should be regularly practised. A law, making the use of compartment carriages by such persons obligatory, would remove a source of peril from the general public, and make the work of disinfection more easy and economical for the railway company.

As the cubic space in a fully occupied railway carriage, viz., sixty cubic feet per capita, is small, its ventilation cannot be made satisfactory. Methods of cleaning such as have been described will, however, remove filth and the germs of disease, while the regular opening up of the clear-story windows will assist in the escape of impure and re-breathed air.

While British statistics show, that the phthisis rate in adult life has steadily decreased *pro rata* with sanitary improvements, the number of deaths among young children from tabes mesenterica has increased as steadily, and that, too, proportionately with the amount of milk consumed, particularly infants' milk. Thus tabes mesenterica shows a diminution of 8 1 per cent. for all ages, but a large increase (21 per cent) in the case of infants under one year of age ; and those statistics are only to be explained by the great and widespread danger arising from tuberculosis-infected milk. It is calculated that 25 per cent. of the milch cows of Great Britain are tuberculous, and it is clear that preventive measures as to milk ought to be tried in that country.

The tuberculin test and the regular inspection of dairy cattle are also called for in this country, and for the same reasons. Dairy herds in Canada have no better claim to immunity from tuberculosis than the herds of Great

Britain; and the first step to remove suspicion from the minds of the Canadian public with regard to the purity of the milk supply is to prove that all the dairy cattle are free from tuberculosis. It should also be shown, that the animals are kept in clean, well-lighted, well-aired stables; that the supply of water is abundant and of good quality; that their food is ample and of good quality; that the utensils of the dairy are in good order; and that the methods of handling the milk, from the act of milking itself until the output passes into the possession of the purchaser, are of the most hygienic character. In obtaining such a report as to the purity of a milk supply, a Board of Health is acting strictly within its right; nay, more, it is its duty to protect the infants of the municipality against poor milk. Every Board of Health in carrying into effect a by-law to secure good milk ought to have the co-operation of all dairymen.

Unfortunately, instead of assisting such a good cause, dairymen are sometimes a stumbling-block, fearing that inspection may lead to loss and infringement of their rights. The rights of a dairyman are, to sell a good quality of milk for a fair price, and the rights of the Local Board of Health are, to be satisfied that the output of his dairy is pure. A dairyman should invite and encourage municipal inspection, if for no other reason, because the demand for dairy milk will increase when its purity is assured. Under present conditions, manufacturers of condensed milk, malted milk, and other infants' foods are competing with the dairymen, and a good deal of money is paid for patent foods, which, if people were satisfied of the purity of dairy milk, would naturally find its way into the farmers' pockets. In presenting this side of an important question, it is to be hoped, that a word to the dairymen will be sufficient for them and that they will not be slow in taking the means to secure the confidence of the people.

It must not be concluded, however, that if lives are saved, which formerly would have been allowed to perish by consumption,—if mortality in child-life is diminished by isolation and disinfection, the saved lives are destined to reach old age. English vital statistics show, that the number of individuals living to thirty-five years has increased, that of those living from thirty-five to forty-five years the number is stationary, and that there is a diminution in the number of persons living from forty-five to seventy-five years. In other words, if young people in England have a greater chance to reach forty years of age, those who survive to forty or sixty years of age are more in danger of death than their parents were at the same age fifty years ago. Two hypotheses may explain this fact, the vitality of the race has diminished, or the conditions of existence in adult life are more defective than formerly. Dr. William Butler, who discusses this question in an article published in "Public Health," thinks it is principally the first factor which must be blamed. Turning to a second branch of the subject, he establishes a series of tables on mortality by groups of diseases, during the same period, and from the reading of these statistics the conclusion is drawn, that if deaths from consumption and zymotic diseases have become less in England, the gain has been balanced by an increase in deaths attributed to diseases of the circulatory system, the nervous system

and cancer. That there is a close relationship between tuberculosis and diseases of the nervous system is a view which has already been sustained by several observers, among others Dr. Stevens of New York, who wrote in 1897, that infections of the nerves and disorders of the senses,—principally alterations of vision,—are transmitted by tubercular ancestors. A child is not more tuberculizable than other children, simply on account of the blemish in its ancestry; but *is* a candidate for all the neuropathic disorders and myopia. The undoubted increase of myopia on the one hand and insanity on the other,—the number of patients in lunatic asylums having doubled during the past 50 years in England,—are closely connected with the diminished mortality in youth and also the diminution of cases of pulmonary consumption.

With the development of sanitation in our municipalities, the conviction must grow, that special and accurate knowledge of the science and art of hygiene should be possessed by Medical Officers of Health. So far, no organized effort has been made to train Sanitary Officers, unless we accept the lectures and instructions given by professors of hygiene in our medical colleges. In the June number of the "Sanitarian" I noticed that the Council of New York University has set apart buildings near First Avenue, between Twenty-fifth and Twenty-sixth streets for the use of a "School of Public Health," as provided by the law passed at the recent session of the New York State Legislature, and for which $25,000.00 was appropriated for maintenance for the year beginning October 1st, 1899. It is proposed to promote public sanitation in various ways, especially to instruct properly accredited medical men and lay sanitary officers, throughout the State, in methods and appliances for the prevention of disease. The public will be instructed in sanitary matters by university extension work. It is expected, that a hygienic museum will be established in which will be all forms of sanitary appliances, and models in plumbing, ventilation, disinfection, heating, clothing, and other kindred subjects, and will be open to the public.

In thus drawing your attention to what has been done by our neighbors, I earnestly hope that you and all citizens who feel interested in a similar enterprise will bring it to the notice of our representatives in the Ontario Legislature, and will urge the Government of this Province to make an appropriation for the use of a "School of Public Health" in Ontario. The second portion of the programme of sanitary education could be carried into effect, even if a school were not immediately established. Already the public are instructed in science and philosophy by university extension work; and the delivery of lectures on sanitary matters during the winter season would easily fit in with and become a useful part of such a programme of university studies.

A notion, calculated to do a great deal of harm, has long been disseminated by persons who are unwilling to admit the protective power of vaccination, and who try to explain the relative scarcity of small-pox in civilized communities by any theory except the right one. They contend, that small-pox depends on filthy local conditions, that it is a disease of the poor and

communities, who neglect sanitary measures. Dr. Tebb, who has recently published a work entitled, "A Century of Vaccination and What it Teaches," supports this view, quite forgetful of the fact that, in the seventeenth and eighteenth centuries, small-pox attacked the high as well as the humble. In the family of William III. of England, his Queen, his father, his mother, his uncle, and two cousins, children of James I., all died of small-pox, and the king himself barely escaped with his life. During the eighteenth century one Emperor and two Empresses of Austria, six archdukes, and archduchesses, an Elector of Saxony, an Elector of Bohemia, a Dauphin and a King of France, a King of Sweden, and a Czar of Russia, were all numbered among the victims. Surely all these distinguished persons could not be consistently classed among people who suffered from the prevailing ignorance and neglect of sanitary measures. Then, again, to show that it was an omnipresent plague in England, when Jenner began his experiments, Gilbert Blane estimated that "an adult person who had not had small-pox was scarcely met with or heard of in the United Kingdom." When servants were advertised for it was common to specify "they must have had small-pox in the natural way." In 1688, in an advertisement for a counterfeiter it was noted as a means of his identification that he was "without pock-holes" At the Institution for the Indigent Blind, two-thirds of the applicants were made blind by small-pox. Thanks to the genius and bold experimentation of the immortal Jenner, small-pox has been controlled to an extraordinary extent. In some countries it is so rare that in the opinion of German authors "it is no longer observed in really civilized countries, and may soon be considered an infection, which will possess a purely historic interest." So far this happy desideratum cannot be recorded of the United States, in which over 3,000 cases of small-pox occurred during the past year. In the Province of Quebec no considerable epidemic has arisen since 1885. Since that memorable year, when the Province of Ontario was also visited by the scourge, only trifling outbreaks have occurred among us. At present there are no cases of small-pox in Ontario.

Immunity to small-pox can be procured by having the disease itself or by vaccination,—a statement the truth of which few will be prepared to deny. That many parents and guardians in Ontario, while acknowledging its truth, have yet seemed careless about presenting infants and young children for vaccination has probably been due to doubts entertained by them as to the purity of the vaccine lymph in general use. The existence of a similar feeling has been noticed in England. On the occasion of a recent gathering in London, the President of the Local Government Board made an interesting announcement, relative to the effect of the new Vaccination Act. He quoted from a report sent him by the head of his medical department who said,—"The inspectors inform me, that there is distinct evidence of a general "increase in the amount of vaccination going on, and in a number of cases "the actual statistics recorded are highly satisfactory in this respect. In several such instances the increase in the number of certificates of successful "vaccination sent in has ranged from 25 per cent. to 100 per cent. The in-

"crease was attributed by this gentleman to the system of domiciliary vacci-
"nation, and the provision of a better and purer kind of lymph, which has
"relieved the apprehensions of a great many people, who were formerly op-
"posed to vaccination."

The lymph alluded to by the English sanitary authority is, as you know, the new glycerinated calf-lymph, which has largely superseded the older and now almost discredited forms of lymph. The new article can be readily obtained by practitioners in this Province, and it is quite likely, that, in a short time, it will be used exclusively. Any apprehension, which Ontario people may feel as to the purity of the lymph used, can therefore be promptly relieved, and, if the vaccinator will do his work in a clean, aseptic manner, no evil results should follow.

Let us hope, therefore, that encouraged by Local Boards of Health, vaccinators will do their work carefully and well, and that the public will, without exception, avail themselves of their services, thus hastening the advent of that day, when the people of Ontario will be placed in a position of actual immunity to small-pox, which for them would then possess a purely historic interest.

THE ODORS OF WELL WATERS IN THEIR SANITARY RELATIONS.

By J. J. MacKenzie, B.A., M.B., Toronto, Bacteriologist to Provincial Board of Health.

Gentlemen,—The subject which I have taken for my paper to-day is one which appeals to every one, it is a character of a drinking water which will more quickly lead to suspicion than any other, although in many instances it may not necessarily mean that the water is impure. It is a character, also, which does not require a chemical laboratory to enable one to appreciate it, which any one can test.

One ought, perhaps, to include with odor, taste, as the two senses are so closely allied that in many cases it is impossible to distinguish between an odor and a taste.

Absolutely pure water is without odor or taste so that when these characters are perceived, their presence is due to something in solution or in suspension in the water, and their occurrence should be a danger signal, warning us at once to investigate the cause.

The methods of determining the presence of an odor as practised in the laboratory are two, the cold method and the hot method. In the first instance the water is thoroughly shaken in a clean bottle, the stopper removed and the nose immediately applied to the opening. If an odor is present, even faintly, it will be perceived for an instant. In the other method about 200 c c. or 300 c.c. of water is placed in a beaker covered with a watch glass, upon a stove or over a gas flame, and brought almost to the boil, it is then set aside to cool slightly and the cover removed and the nose held over the water.

Sometimes no odor may be perceived when cold, whilst when hot it is easily noticed, an odor from the cold water may be intensified by heating or it may change its character so that it seems quite different. The majority of the odors and tastes which we find in waters are due to organic matter in solution or in suspension, undergoing decomposition or to living organisms, plants and animals existing in the water. The most peculiar and sometimes the most troublesome are those due to living organisms, occasionally becoming so offensive as to interfere with the use of the water. The organisms which produce these peculiar odors require, however, light in order to grow so that they are not met with in closed walls or covered reservoirs.

A well water should be without taste or odor, the process of filtration which the water has undergone in passing from the surface to the water bearing layer should have removed all the material which could give use to an odor. As a matter of fact odors are not common in well waters and I have been unable to perceive one in many samples in which I found the bacterial

llution high and the description of the well showed that it was evidently ntaminated. It is not, therefore, to be taken as an evidence of the tability of a well water if it is tasteless and odorless.

In wells the commonest odors which we meet with are earthy, mouldy those due to animal decomposition. The earthy odor is probably due to e soil through which the water has filtered and cannot be considered as rious. It is sometimes clayey especially in this region where the wells are equently sunk to a hard pan of blue clay. The mouldy or musty odor is e most frequently to decaying woodwork in and about the well. It is very mmon with the old wooden pumps, especially when there is a rapid rise and ll of the water so that the pump and woodwork is alternately submerged d exposed. The mouldy smell may also come from the woodwork and or-nic material lodged around the top of the well and washed in from the drip the pump.

Occasionally a mouldy or musty smell may be due to sewage contamina-on from a neighboring privy pit or manure pile and when present the cause ould be discovered.

The odors due to animal decomposition are, when present, most easily cognized and unpleasant and should at once lead to a thorough cleaning of e well and the secure closing in of the top, to prevent pollution from the rface by toads and similar animals falling in.

There is occasionally present in well waters a distinct odor of sulphur-ted hydrogen which I have found more frequently gives rise to suspicion pollution than any other odor. It may of course be due sometimes to de-mposition of animal or vegetable material, especially, to the anaerobic composition which sometimes takes place in the layer of mud at the bottom a well, but as a rule it is connected with a special condition of the water d may not by any means be an evidence of pollution. It is especially mmon in deep wells in which the water contains a percentage of iron.

In these wells the water, when pumped up, is perfectly clear and limpid d may have only a slight sulphuretted hydrogen odor. As it stands, how-er, it gradually becomes opalescent, then a precipitate settles to the bottom, hich finally becomes rusty in color and at the same time the odor becomes ore intense. The appearance of this iron is due to the fact that it is held in lution by the carbonic acid which is dissolved in the water, but when rought to the surface, the carbonic acid and sulphuretted hydrogen diffuse t whilst the oxygen of the air passes in. The resulting changes of gases uses an oxidation of the iron and it gradually drops to the bottom. These aters are practically destitute of dissolved oxygen.

The presence of sulphuretted hydrogen in such waters is apparently con-cted with another phenomenon of deep well waters, namely, the presence of high free ammonia. In both cases it is apparently due to a chemical reduc-n which takes place in the deeper layers of the soil, the result being the duction of nitrates to ammonia and the sulphates to sulphides. These aters with the sulphuretted hydrogen smell, and the iron precipitate are

usually very pure and when the iron and gas are removed by thorough aeration, for instance by pouring a number of times from one vessel to another they are fairly palatable.

The odors due to living organisms are as a rule absent from wells, entirely so from driven wells and usually so in pit wells. In pit wells, however, a partially open top may admit enough light to favor the growth of minute plants and infusoria and you may get unpleasant odors.

It is in open ponds and reservoirs that these odors are usually found and occasionally they give use to the greatest annoyance in public water supplies.

The American investigators have paid a great deal of attention in the past few years to the odors connected with these organisms and some very interesting facts have been observed.

Many of you must have seen examples of the so-called flowering of the ponds in the summer and autumn, when the water becomes almost green with minute plants suspended in it. As a rule the plant which causes this is the *Anabæna flos-aquæ*, and it does not give rise to anything more than a grassy odor, except when washed up on the shore in quantities, when it produces a most intensely unpleasant odor of putrefaction. There are, however, other organisms which produce unpleasant odors whilst living, which are very curious.

Boston has on several occasions been afflicted by a peculiar odor of ripe cucumbers in its water supply, and this has been traced to the presence of a small infusorian *Synura*.

There are a number of organisms which are responsible for peculiar tastes and odors, apparently always due to essential oils present in the cell, which pass out into the water during the process of disintegration. Whipple, in his work on the microscopy of drinking water, has divided them into aromatic, grassy and fishy.

The aromatic odors are chiefly produced by diatoms, notably by *Asterionella*, which when very abundant produces a peculiarly nauseating smell.

The fishy odors are usually due to certain algæ, or sometimes to infusoria.

The fishy odors are the most disagreeable, and the most intense is that produced by a form of animal called Modela, which may be so strong as to prevent the use of the water.

To sum up, a well water, with the exception of those deep wells, containing iron and H_2S, should be destitute of odor and taste, and its presence should lead to suspicion.

The presence of an odor in a supply derived from a pond or open reservoir may be without sanitary significance, but in every case should lead to an investigation to determine the cause.

TUBERCULOSIS IN CATTLE.

By J. D. Macdonald, M. D., Hamilton, Chairman Provincial Board of Health.

Gentlemen: For a dweller in a city, and of whom it may be said that he seldom comes in contact with a creature of the bovine race, and who, therefore, may be reasonably suspected of having little acquaintance with things pertaining to that race and its habits, it may seem presumptuous to enter into this subject of "Tuberculosis in Cattle," and that more especially as in dealing with it the chief duty will be to remark upon the habits of life imposed upon the race so largely; habits which it has to be said have much, if not most, to do with the relations subsisting among us, between the race and tuberculosis.

It may be said in excuse for here touching upon the subject that some of us in our day have seen the kindly submissive creatures, nay, have in our ignorant manner cared for them in their rural life, and have manifested our appreciation of their propensities in hurling missiles and opprobrious epithets at them when they may have manifested a desire to leave the path in which they should walk and to diverge towards forbidden verdure. With reference to the subject before us, it is thought, we may safely say, that the poor animals have more cause to complain of our race than have we of theirs; for we impose upon them habits of life which do violence to their welfare, greater perhaps than it would cause to our own, and we give them no choice. Of the liability of the bovine race to tuberculosis there is no doubt, but of any special liability on their part it cannot be said that there is any proof; but we cannot but admit that the conditions so generally imposed upon them are abundantly sufficient to account for the propagation in their tissues of those organisms the presence of which in the animal body is necessary to that of tuberculosis.

Whence have come these organisms? They and other structures like them may be among the earliest examples of organization, developed from some inorganic combination. If such a speculation is unscientific or worse, we may at least say that they are of all organized bodies the simplest in structure, and that throughout their being they have been flourishing after their manner in whatever medium has been suitable for them, whether that medium has been animate or inanimate. So far as it is known, the conditions most favourable to their increase are to be found in the bodies of living, warm-blooded animals, but not in the bodies of all animals in an equal degree. Cultivation of them proves that they can be made to increase in conditions made to resemble those of the interior of living animal bodies, and may we not conclude that conditions favourable to their multiplication exist elsewhere in nature.

It is not hard to conceive, therefore, that those organisms are what may be called primordial, and that though to us they are known only as agencies of destruction, their uses in nature are of importance, and not alone destructive. They at least prepare for reconstruction. In our day they have been useful in forcing on our attention the evils of a too artificial mode of life. Their warnings are first given, in men and animals, in the cases of those who by an unhealthy mode of life are doing violence to nature's order, and whose disappearance from among men is therefore for the good of the race.

It seems to have needed tuberculosis to impress upon men the necessity that a course of life such as nature prepared for them should be followed, both by man himself and by all the inferior animals with which he has surrounded himself for his benefit; that they all breathe pure air, eat and drink what is suitable for the sustenance of their bodies, and have such protection as they need from extremes of temperature. Of the cattle committed to our care it cannot be said that adequate protection is afforded them, and still less that at all times they have air as pure as they require. Of all the animals subjected to the use of man, there are none, perhaps, to which less thought is given than to his cattle. His horses and his dogs are much more rationally attended to. Neither of these are milked twice a day, and then either left to find the most comfortable side of a fence, or shut up in an impure enclosure, or in a not very well ventilated stable. These are, all of them, often the experience of his milk cow, and are all of them too favourable to the infection of tubercle, if the cause of it be near, which it commonly is.

It does not appear that cattle are the victims of tuberculosis by inheritance. According to Osler, of the many thousands of calves yearly slaughtered (15,400) at the Berlin abattoir, only four individuals were found tuberculous.

It would seem, therefore that cattle are much less apt to fall victims to tubercle than man is, and so if man suffers more from the propinquity of tuberculous cows or from ingesting their milk he may know the culprit on whom to lay his hand when he is disposed to claim damages. The human and not the bovine race it is that is at fault in the matter.

What, then, is to be the means of warding off the evil which constantly arises from the use of milk of tuberculous cattle. Of the reality of the evil there is proof abundant. The milk of a tuberculous cow has proved to be infectious in instances in which there appears no disease of the udder (Osler 1895 edition, page 191). It would seem as if from the constant claims on the udder the juices of the animal make straight for it on every demand, and pass through it without stopping to infect. To the use of such milk by children has been attributed the greater frequency in them, up to the age of ten years, of intestinal tuberculosis.

As to the means to be taken to obviate infection from bovine sources, it would seem that the first thing to be accomplished is to get the users of milk fully persuaded of its very possibly infected nature. The successful battle for pure or safe milk is to be fought by the users, and it is not a very hard battle.

The owners of the cows can hardly do much in the cause of purity. They have their premises clean, they do not know of elements of disease in their dairy, and they won't believe that there are such elements. unless their existence is proved to them; and for the most part that cannot be done. The users of the milk, however, have the safety of their children in their own power. They can render their milk harmless and have their minds made easy by a very simple process on their own part. Let them heat the milk up to a temperature of 170 degrees Fahrenheit. It would be well if all milk were so dealt with before being used. The 170 are a few degrees higher than necessary, but it is well to be sure that the temperature which is destructive to the bacillus has been attained, and there is no unpleasant taste of boiling. This Association should give its imprimatur to the taking this means of disinfection at all times. It seems to be the only effectual means to attain that end; while at the same time its attention need not be withdrawn from the duty of watching stabling and dairy and insisting on cleanliness, proper feeding, and perfect ventilation. The condition of the dairy in cleanliness and healthfulness is certainly a matter to be looked after by the public authorities, but it is not difficult to imagine conditions in which that, like other public duties, is not very fully and faithfully performed. Neglect on the one hand, or vexatious interference on the other, is sufficiently common. The personal interest of the parent or householder is here particularly called for.

THE DUTY OF MUNICIPAL HEALTH OFFICERS AND BOARDS OF HEALTH IN DEALING WITH TUBERCULOSIS.

By Dr. F. H. Mitchell, Medical Health Officer, Delaware, Ont.

Gentlemen,—Public sentiment in regard to the contagiousness of tuberculosis, especially that form known as pulmonary tuberculosis, is still in its infancy, but still rapid advances are being made, owing to the activity of the medical profession in all its several departments. In the days gone by, when sanitary laws were in their infancy, the lot of the consumptive was a helpless one, but be that as it may, all our energies must be concentrated on the present and future, and there is no doubt the percentage of deaths from this scourge will be lessened year by year till the future generations will only know tuberculosis from history. Since Koch's discovery of 1882 of the bacillus of consumption, the last remnants of obscurity so far as the cause was concerned have been dissolved away.

Koch's discovery brought a ray of hope to the afflicted which has and is growing stronger as medical science advances upon its triumphal march, but as great as have been the discoveries in the field of bacteriology, pathology and chemistry, a lack of concentrated energy has been very great, and it has been through this lack of concentrated efforts that the control of the advancement of tuberculosis has not been more effective. The new era is coming when the extermination of tuberculosis will be marked.

But it will require the combined efforts and active legislation of every national government. Legislation that will be actively enforced, for while a large percentage of consumptives will voluntarily carry out sanitary precautions there still remain those who will not comply with sanitary laws, and it is necessary to control those who will not assist and comply with measures adopted for their benefit and to control contagion. Why cannot consumption be controlled as completely as small-pox, typhoid fever, &c., but we are so used to its presence that we accept it as a decree of fate.

The main object of this paper will be to outline :

1. The duties of the medical attendant, the general management, which the experience of the profession, founded upon scientific data and considered orthodox which has yielded the best results.

2. To teach the tuberculous patient how to obtain the full benefits of the curative forces of nature.

3. To point out to those who from hereditary or accidental causes are susceptible to tuberculosis, to those who have recovered from the disease, and to those who will recover, how they may obtain an immunity against tubercular contagion.

4. To educate the tubercular patient in the details pertaining to the absolute destruction of all infectious matter generated by the disease, that he may not be the slightest danger to his family, or friends, or the public.

5. To interest the pulmonary invalid in his physical condition and general sanitary surroundings. To place information at his disposal, that he may easily understand the various effects of tuberculosis upon the system, so that he may co-operate with his medical attendant, in an intelligent manner, in the general management of the disease.

TUBERCULAR EXPECTORATION. This is a great source of infection, and for the present I would recommend such practical information as the following to be printed and distributed. I cannot see any practical method to follow for Medical Health Officers, as carried out in diphtheria and small-pox and other exanthems, except for the present to educate the public on the salient methods for their protection, and, having their co-operation, great difficulties will be surmounted.

I would advise the printing and distribution to the public, important rules for their guidance, similar to the following:—

1st. No method to be adopted for the complete destruction of sputa, except that which provides for the absolute destruction of the germs by fire. No person who has consumption, or is suspected of having it, should ever expectorate upon the sidewalk, street, the lawn, or any public or private place; the sputa contain exclusively the bacilli, and should be destoyed by fire. There are three reasons why the sputa should be destroyed by fire: first, to protect the public; second, to protect their families, and third, to protect themselves. How is this to be accomplished? The afflicted should purchase soft muslin or cotton, and have it made into handkerchiefs; they should discard all expensive handkerchiefs, and in their place use only the cheap ones, which after using should be destroyed; and, if the patient is away from home, fold the soiled cloth and place it in a tin box—not in the pockets, as this would lead to infection of the clothing. These cloths should be frequently changed, and burnt at the time of changing.

All handkerchiefs, except those which can at once be destroyed by fire, should not be used; if the sputa are destroyed while moist, the danger is gone, the moist sputa being inert.

The smallest particle of expectoration should not be allowed to remain upon the sheets, bed clothing, or any article of furniture.

Cuspidors that cannot be burnt should not be used. All cuspidors used by the consumptive should be made from cheap material, and be destroyed after using, and are superior to the many expensive ones in use, which cannot be kept perfectly aseptic. A cheap and useful cuspidor is obtained by purchasing small wooden boxes, such as are used for the dispensing of butter and lard, etc., and after use burning them. No other kind of cuspidor should be allowed about the house and grounds, and after use destroy by fire. But the cheap handkerchiefs, made from cheap material, will answer for all purposes, and are preferable.

Rooms which have previously been occupied by a consumptive must not be used until you know positively that the apartments, hallways and walks leading to them have been thoroughly cleansed and disinfected.

The consumptive should always have a room to him or herself; a wife should on no account occupy the same sleeping room with her husband, and *vice versa;* brother with brother, sister with sister, nor use the same dishes, towels and napkins or tableware in common with others.

Kissing under any circumstances is prohibited. The invalid should not allow herself or himself to be kissed or to kiss anyone while there remains the least trace of the disease. This may seem to be carrying preventive measures too far, and in home relations may be a severe trial; but when one considers the protection is for those near and dear, the incentive will drown all sentiment.

Animals should not be exposed in the slightest degree to the contagion of tuberculosis. Most domestic animals are susceptible to tubercular contagion, and, should they contract the disease, great harm would result before it was discovered.

A consumptive person should never handle live stock unless he follows out the sanitary measure regarding sputa. Milch cows are susceptible to tubercle, and the milk from cows who have contracted the disease have been proved to be a prolific source of contagion. A tubercular cow may do immense harm before the disease is discovered, particularly if the milk is consumed by those having a tendency to the disease.

The public should assist and not antagonize the adoption and enforcement of any just municipal or provincial legislation for limiting the disease. The influence of the public is necessary to assist in carrying out such measures for the prevention of this scourge.

The tubercular patient should have a room separate from the rest of the family, and one which can be properly ventilated.

The afflicted with tuberculosis have a duty to perform which will result in benefit to themselves, their friends and the public. Measures for the extermination of the disease have met with opposition, out of sentimental prejudice, morbid conception, or both.

Your influence will count, and therefore, tend to the cause of humanity. Let every one give their support to the passage or putting in force any existing laws for the protection of the public from the contagion of tuberculosis. Under existing conditions the public have no protection from wholesale exposure of tubercular infection, and hence the rapid spread of the disease. The consumptive can set a good example by living up to the rules for his benefit, and by so doing the chance for his cure is greater, as there is not the danger of reinfection. A consumptive may expectorate billions of tubercle bacilli in the twenty-four hours.

Before closing this paper, I would suggest the distribution of literature upon the subject of tuberculosis, written so that the public could easily understand, and especially placing useful knowledge in the hands of those who have the disease and those exposed to it, and this should at once be carried out.

THE NEED FOR MUNICIPAL SANATORIA—AS SEEN IN THE NUMBER OF CASES OF CONSUMPTION IN THE PUBLIC INSTITUTIONS OF ONTARIO.

By Peter H. Bryce, M.A., M.D., Sec. Prov. Board of Health.

Mr. President and Gentlemen of the Association,—It has been my privilege on several different occasions to bring before the public of Ontario through this or other Associations some phase of the problem of "How shall we lessen the prevalence of consumption in Ontario?" and to-day I trust that we shall approach it still a little more closely by dealing with some of the existing attempts which charitable institutions, whether governmental or municipal, are making to deal with consumptives. By thus presenting up-to-date information of an accurate statistical character, it is trusted that the actual situation of the public in relation to this disease may be yet more correctly estimated.

Through the kindness of R. Christie, Esq., Dr. Chamberlain and Mr. Noxon, inspectors of the Department of Public Institutions, I have been enabled to make an almost complete statistical summary of the disease and death statistics for the first three months of 1899 in our several public institutions. Thus I find the following cases:

Facts summarized from the Returns for Institutions for Insane.

Asylum.	Inmates.	Cases of Tuberculosis. Stage of disease— 1st.	2nd.	3rd.	Bronchitis.	Asthma.	Deaths. Total.	T.	B.	A.
Toronto	710— 7	0	2	5	1	1	19	4	0	0
London	1,013—13	Pulmonary .... 5 / Peritoneal..... 4			1	3	17	0	0	0
Kingston	582— 7	2	4	1	2	1	8	2	0	0
Hamilton .. .	1,028—23	12	10	1	0	2	22	2	0	0
Mimico	600—21	0	11	10	2	0	16	0	0	0
Brockville	515— 2	0	0	2	0	1	10	3	0	0
	4,448 73	14	27	19	6	8	92	11	0	0

These figures do not include the figures of the Asylum for the Feeble Minded at Orillia, not received. We gather, however, that 1.64 per cent. of the inmates were suffering from tuberculosis, and that of the total deaths 12 per cent. died of tuberculosis.

It may fairly be concluded that this relatively low rate is due to the improved means of supervision of the sick, since in reply to the question of how

isolated, the replies state that patients are either isolated in separate, or sleep in separate dormitories, or are sent to the institution hospital.

Of the 49 gaols of the Province from which returns were received, with their 460 prisoners, there were but three cases of tuberculosis, six of bronchitis and two of asthma. There were fifteen deaths from all causes during the three months, of whom but two died of tuberculosis, one from bronchitis and one from pneumonia. Or less than one-half of one per cent. died in the gaols of tuberculosis.

In 1898, in the 31 orphanages of the Province, 4,145 children were cared for. The special returns from these show very few deaths and no cases of tuberculosis in them. If any such occur, it would appear that they are removed to the children's hospital.

We have, apart from the penitentiaries, all of which have adequate means for isolation of both the sick and well, two classes of charitable institutions, to which the sick and infirm of the Province are sent, viz., the Hospitals and Refuges. The returns received from them are fairly complete, and I have endeavored to glean from them the special information we are in search of.

It is found that there was a hospital population under treatment in 47 hospitals in 1898 amounting to 21,828, or nearly one per cent. of the population of the Province. At the time of the returns asked for in April, 1899, nearly 2,000 were inmates of 39 hospitals making retnrns, a number larger than the 1,515 in all hospitals at the end of the hospital year, 30th September, 1898, by nearly one-third.

Of this 2,000 the returns give us the following numbers suffering from tuberculosis, bronchitis and asthma.

PATIENTS IN HOSPITALS OF PROVINCE SUFFERING FROM TUBERCULOSIS, WITH STAGE OF THE DISEASE IN JAN., FEB, MAR., 1899.

		Primary.	Secondary.	Third Stage
Tuberculized patients, excluding those in the Muskoka Sanatorium.....	183	43	40	69
		Balance not detailed.		
Muskoka Sanatorium	47	15	22	10
Bronchitis	35			
Asthma	10.			
Total deaths in Hospitals in January, February, March	278	Tuberculosis		
		Bronchitis		
		Asthma		

From the figures, it appears that of the total deaths in our hospitals, 50 or nearly 20 per cent. of the whole during these months was from tuberculosis; while there were at one time under treatment 183 cases, apart from the Muskoka Sanatorium. If, however, we assume this to have been the averag

for the three months, and that the average period of residence was, as in previous years, some fifty days, the number of tuberculized under treatment in all our hospitals during the three months must have been almost 300. If to this number are added the cases of bronchitis and asthma, we would have nearly 100 more in the period. That this number is nearly correct is probable from the fact that 50, or one in every eight of that number died. It will have been further noted that of the 183 tuberculized persons, 43 are set down as in the primary stage, and consisted mostly of bone, joint and intestinal cases; while 99, or more than twice as many, are set down as in the second or third stages, more than two-thirds of these being in the third stage.

The difference between these inmates of our general hospitals and the inmates of the Muskoka Sanatorium during the same period is most notable. Of the 47 inmates in the latter, 15 were in primary stage, 22 were in secondary, 10 were in third stage, or nearly one-third in the first stage; while during the three months no deaths occurred.

The other charitable institutions having infirm and sick inmates are the Refuges for the aged, and infirm poor of our cities, and correspond in many particulars to the Houses of Industry of the counties, except that they receive a per diem Government grant and are under inspection.

Of these Refuges, there were in all in 1898 some thirty-five, with a population for the whole year of 4,480; or at the end of the financial year 30th September, 2,224. It thus appears that this class are largely continuous residents, as but 247 of the number had died during the year. The returns of diseases and deaths from these in the special return are interesting. Of 1,678 inmates for whom returns are given, there were

		Stage of Disease.		
		1st.	2nd.	3rd.
Tuberculized	45	1	30	8
Bronchitis	29			
Asthma	25			
	99			

There were during the period 63 deaths.

Of these there were—11 due to tuberculosis.
9 due to bronchitis.
5 due to asthma.

Or of the deaths nearly one-third were due to these diseases. It is hardly necessary to repeat here, as shown in some of the returns, that (as remarked in the more exact returns of the Institutions for the Insane) nearly all these cases of chronic phthisis, since it will be noted that but one case is returned being in the primary stage.

If the figures for the quarter are taken as the basis for the year we shall that of the total deaths, 100 would die of these three chronic diseases.

Gathering up then the figures from the several tables we find at one time—

	Inmates.	Tuberculosis.	Bronchitis.	Asthma.
Industrial Homes	595	6	12	9
General Hospitals....	2,000	183	35	10
Refuges	1,678	45	29	25
	4,273	234	76	44

Total deaths in Hospitals	278
From Tuberculosis	42
" Bronchitis	6
" Asthma	2
Total deaths in Refuges	63
Tuberculosis	11
Bronchitis	9
Asthma	5

That is of a total population there were resident, and who died or continued sick during the three months of these three diseases,—Sick, 354; died, 84; or a total of 438, making a total of nearly 10 per cent. of those in residence, during one period as being sick of tuberculosis.

In the returns asked for in the special circular, the questions were asked:

How many are full pay patients?

How many are part pay patients?

How many pay nothing?

The answers are not complete and in a number the answer is made only regarding those suffering from tuberculosis.

From the answers given on the returns for hospitals, the following figures are, however, obtained—

Pay patients	168
Part pay patients	166
Pauper patients.....	1,248
	1,582

Assuming the proportion to be the same in those institutions whence no returns are given we find that—11 per cent. are pay patients; 11 per cent. part pay patients; 78 per cent. are pauper patients.

With regard to the per diem cost per patient in the hospitals, the annual report states it to have been 84.69 cents (Toronto General 83.21), while for the Refuges the daily rate was 24.16 cents. Now, if we take the sick from this disease already referred to in the hospitals at 228, as having been residents for 50 days we find that the expenditure for them in the hospitals was

$9,576 00 in the three months, or at the same rate nearly $40,000.00 a year; while the 99 sick in the Refuges, taken for three months at 24.11 cents gives in round numbers an expenditure of $2,227.00.

Adopting these figures on the basis for the whole year we find that in our hospitals $160,000.00 is spent on this class of disease, the total expenditure for 1898 having been $437,034.00, while the amount for similar purposes spent in the Refuges would be roughly $10,000.00, the total expenditure in 1898 having been $198,342.00.

We have thus, with some difficulty, collected the main facts from these reports, which, summed up, are as follows:—

That the 47 hospitals of the Province of Ontario, all receiving Government aid, are caring annually for 1,000 persons suffering from pulmonary disease, nearly all of which is diagnosed as tuberculosis, of which nearly 75 per cent. are in the second and third stages—that is, in the infectious stage—at an annual cost of $160,000, and that of this amount $130,000 is paid for caring for those unable to pay for themselves. Another notable fact appears from the returns, viz., that of the 13 hospitals out of the 47 which returned answers to the question, What isolation is practised? Eight state that no special isolation is practised, while five state the consumptives are kept in separate wards. Answers in much the same proportion are given for the Refuges.

Remembering the generally received opinion of medical science of the present day, that the disease in its later stages is highly infectious, comment on the facts thus set forth seems unnecessary.

The following are the statements given in cases where the question is answered:

1. Grace Hospital—Not isolated (spittoons and sputa disinfected).
2. Kingston General—Isolated wards.
3. Bethlehem Home—Are isolated.
4. House of Providence, Kingston—Isolated.
5. " Guelph—2nd and 3rd stages isolated.
6. Infants' Home—Isolated in small ward.
7. St. Joseph's, Lindsay—Are isolated.
8. General Hospital, Belleville—No separate ward.
9. House Providence, Toronto—Have separate wards.
10. House Refuge, Hamilton—Kept in sick ward.
11. St. Joseph's Hospital, London—Kept in separate building.
12. Berlin General Hospital—Isolated in separate ward.
13. Toronto Home for Incurables—Isolated in separate wards.
14. Rat Portage—No special isolation.
15. General Hospital, Ottawa—Worst cases isolated—new ward building.

16. St. Joseph's, Port Arthur—No special ward.
17. Orphanage Hotel Dieu, Kingston—Building separate ward.
18. Hotel Dieu, Kingston—No special isolation.
19. " " London—Isolated.
20. St. Michael's, Toronto—No special isolation—sputa cared for.
21. St. Vincent de Paul, Brockville—Not isolated.
22. City Hospital, Hamilton—Not isolated thoroughly.
23. Toronto General—Not isolated—sputa destroyed.

When I chose the subject for this paper I had not fully studied the returns from which these facts have been gleaned, and had but a partial idea of all the conclusions to which they would point.

One conclusion is very obvious, viz.: that the Province is maintaining at a high cost many institutions for caring for the consumptives. Remembering that in 20 years our hospital population has increased 500 per cent., and the number of hospitals nearly 300 per cent., there seems much force in the remark of Dr. Chamberlain, the Inspector, in his last annual report:

"It is to be regretted, however, that there is a tendency in many small places, and even in some cities, to establish more hospitals than the requirements of the population demand, thereby dividing the work to such an extent as to cripple the efforts put forth for their proper maintenance."

Another conclusion seems to me justified, viz., that while nearly one-third of this total hospital accommodation is for the benefit of the class we are discussing, it is being spent to bad advantage, both for the reasons Dr. Chamberlain has given, and, further, because it is being spent on consumptives at a stage too late, in most cases, to make a cure probable, and because it is being spent at present in a manner dangerous in many cases to the other inmates. In only one institution in the Province is public money being expended in a manner such as is likely to obtain cures in the case of consumptives, viz., at the Gravenhurst Sanatorium, which, at the rate maintained in 1898, will have treated some 200 consumptives in 1898-99. There, as the special report states,

15 cases were in the primary stage.

22 secondary stage.

10 third stage.

Or one-third are in the best position to improve, while the others, as the report states, have each a separate room. While most desirable from the individual standpoint, it is plain that where all are tuberculized the same need for isolation from the standpoint of infection is not necessary, and to-day it is not the practice in the foreign sanatoria, or those on this continent maintained for the consumptive poor, to maintain wholly such separation. Thus at the Graborsee Sanatorium, 18 miles north of Berlin, Germany, with 24 acres of land, established in 1896 for men, there are some 24 buildings,

established at first as light shelters, more permanent ones being gradually added, built of wood and linen-backed paper covered with oil-paint. Each has room for eight patients, and is furnished with beds, long lounge chairs, a table, washstand and stove, while the administrative block contains kitchen, scullery, larder, dining room, office and library; also a large fresh-air gallery attached.

The cost is three marks per day (75 cents). There are there, in marked contrast to our hospitals, but three free beds. That work of a similar kind is general in Germany may be learned from the fact, stated by Dr. Walters, of London, "That every large town, in fact, and every district in Germany now has its local sanatorium society, and often its own sanatorium, there being 60 at the end of 1898, and many were then being projected."

To-day, as already stated, we have in Ontario 47 hospitals, and we are spending in connection with them $160,000 annually for the consumptives, four-fifths of which is for the poor. Surely the charitably disposed, the municipalities and the Government can devise some plan by which better effect, from the curative standpoint, can be given to so large an expenditure. Let us give the poor an opportunity for sanatorium treatment before, through long sickness, they are forced to go to our hospitals to die as paupers.

Our death-roll for 1898 in Ontario was 3,291 from tuberculosis, while our sanitary organizations, with increasing medical knowledge, lessened in the same year the deaths from diphtheria from 967 to 632. Surely this Association, which represents in concrete form Preventive Medicine in this Province, will not rest till it has seen accomplished for tuberculosis what has been done for diphtheria.

IS THERE A TUBERCULAR DIATHESIS?

By Chas. T. McClintock, M.D., Ph. D, of Detroit.

Gentlemen: In my opinion many physicians are all but daft on the subject of bacteria. Give them germs and there are not a few amongst us who will explain any disease condition that may arise between the time of conception and death from old age.

Now, unfortunately it may be, the bacteria do have a large place in our affairs. But he who is content with his etiology when he finds specific bacteria in a given disease is satisfied with less than the truth. In studying consumption I have been gradually driven to the conclusion that we are putting too much emphasis on one of its factors; that we are becoming content with a partial explanation. The tubercle germ does not explain tuberculosis. It does furnish a reason for many of the phenomena of the disease; gives us an insight into the question of its transmission, illumines many a dark corner, provides a rational prophylaxis. But there remains that is unexplained, much that is still mysterious.

In the infectious diseases, the phenomena are those of a combat, a struggle between two opposing forces. On the one side disease germs, insatiate, at times all but innumerable—eating, devouring, poisoning—a pitiless foe.

Opposed, the body tissues, normally well equipped for defense—barrier walls of dead cells, impenetrable membranes, a marvelous ability to repair breaches, a soldiery instantly available,—poison and germ destroying agents, eliminative organs, reserve food and defensive powers.

This fight for supremacy is well shown in tuberculosis. The germ with its poisons killing the near-by cells—producing caseation, destruction. The opposing body forces quickly throwing around the focus of infection a solid wall of connective tissue, which, contracting, tends to shut off the food supply and throttle the invader. If this succeeds, the germs die and there remains only a cicatrix to mark the field of battle. Should it happen that the body has but little resisting power, caseation and softening are extensive, while there is little or no formation of connective tissue; giving an anatomical picture so different from that we have when there are innumerable tubercles that many of the old writers believed we had two diseases.

Is there a tubercular diathesis? A certain condition of the soil, in the absence of which the tubercle germ cannot thrive? It seems to me that there is. But what that diathesis is, on what chemic or physiologic properties it depends, is as yet unknown. I can only hope to direct your attention to the question, and to point out a few of the things that seem to indicate that there is such a condition.

The study of immunity and susceptibility in other diseases has produced much of value, despite the fact that we are for the most part still ignorant of the immediate cause of the one or the other condition. The etiology of any disease is interesting. In many diseases it is very important, because, as a rule, prevention is dependent on a knowledge of cause. Note how our knowledge of etiology enables us to avoid scurvy and lessen typhoid.

No one questions the predisposition to tuberculosis consequent on malnutrition, general debility, and the like. But these conditions predispose to all forms of disease. This is not my question. Is there a specific diathesis, such as we have in gout, rheumatism, and diabetes? When we study the distribution of the disease and the physiologic and chemic conditions which accompany it, we find many interesting things. From these I will select a few that appear to me to have a bearing on the question of diathesis.

Geographical distribution. "The disease is found in all countries. Toward the poles it is rare." This from Osler. Nansen, in his book of arctic travel, reports the disease very prevalent among the Eskimo with whom he came in contact. This is contrary to the report of most authorities. I have tried in vain to get accurate information on this point. Hirsch points out that of all countries the disease is rarest in Iceland. Along the coast where they come in contact with visitors and traders there is some tuberculosis, while in the interior of the island it is practically unknown. This is interesting. Here are people living for a large part of their time huddled together in foul air and in darkness. Place people in this climate under such conditions and tuberculosis will soon exterminate them. Note the food of these people. They are practically carnivorous animals. There is less tuberculosis among the rice-eating nations than one would expect to find when we consider the overcrowding, the poverty, and scantiness of food. These are conditions that with us markedly predispose to tuberculosis. The different food has, I believe, an influence. I will refer to this later.

Altitude has far more influence than latitude on the distribution of the disease. The inhabitants of mountainous countries and high plateaus are largely exempt. The rarefied air of high altitudes has less oxygen to a given volume, and deficiency of oxygen is one of our predispcsing factors. It has been shown, however, during the last few years, that if the newcomer to the high altitudes is not hopelessly weak, there is a rapid increase in the number of the red corpuscles and in hemoglobin. All sorts of explanations have been offered for the benefit derived from altitude, such as the increased work forced upon the respiratory system, dryness of the air, ozone, sunlight, diathermancy, absence of septic or putrefactive bacteria, outdoor life.

The zoological distribution of the disease. Although most prevalent in the mammalia, we find tuberculosis all down the animal scale, even among the fishes. During the past year a germ has been found widely distributed on or in plants that so far as its staining and form are concerned seems to be identical with the tubercle germ A report was promised on the pathogenesis of this germ, but in so far as I know it has not yet appeared.

There is much discussion as to the relationship of the germs obtained from the various sources. Most investigators hold that the avian and human germs are different species; others, however, cite cases wherein apparently persons have contracted the disease from birds. A few experimenters, as Smith of Harvard, stoutly maintain that the human and bovine germs are different.

The distribution within the body. Formerly it was regarded as a disease of the lungs, and occasionally of the bones and intestines. Now, owing to more careful study and improved methods, we find the disease anywhere, in every organ and in almost every tissue of every organ. No age, no race seems exempt. At first sight it would appear that this wide distribution of the disease argued against any specific diathesis. It may be that this is true; that all that is necessary for the production of tuberculosis is the one factor that we know, the germ, and a weakened, non-resisting soil. But before drawing this conclusion let us look a bit further. The disease attacks many persons who are not weak, who show average resistance and insusceptibility to other diseases. Again, mere weakness does not necessarily predispose to the disease. There follows in measles and whooping-cough an increased susceptibility, but this is not true of many exhausting diseases. The patient with tuberculosis of the peritoneum is weakened by the abdominal section, but the very exposure and weakening of the tissues in some way produces a condition hostile to tuberculosis, and often we note a disappearance of the disease. Every surgeon will agree that trauma, wounding, weakening the tissues, while it paves the way for the septic bacteria, is scarcely if ever followed by a local tuberculosis, even in the tubercular.

That infection alone will not account for tuberculosis, it seems to me must be admitted, else we would all be tubercular.

As I believe, the tubercle germ will thrive only on a special soil, be it in our flasks or test tubes, or in the body.

Looking again at its zoological distribution we note, speaking very broadly, that carnivorous animals and men are for the most part exempt from the disease. Whenever you find men living largely on meat and fats you will find little tuberculosis. The old Scotch physicians commented on the fact that in those districts where butter was plentiful and cheap there was less of the disease. The value of easily assimilated oils in the treatment of the disease is universally recognized. This, however, may have another explanation from what I am looking for. Fats of all foods are most completely absorbed. Again, an ounce of fat utilized in the body liberates about twice as much energy as an ounce of either proteid or carbohydrate; further, the end products of the fat are water and carbon dioxdide, both easily eliminated. It is to be noted that carnivorous men, hunters, trappers and arctic peoples, live under such different conditions from most people that it may be these conditions and not the food that is the determining factor in the case. It seems to me that the food has an influence. Why should the Icelander be exempt from tuberculosis, except for his food? Minnesota formerly had a better re-

putation as a resort for the tuberculosis than had Colorado, or New Mexico thousands went there and recovered from the disease; on the same soil, under the same climatic conditions to-day the disease is very prevalent. In those backwoods days game and fish was abundant, vegetables scarce; especially during the long winter season meat was the staff of life. In the little dark dingy cabin the tuberculous relative from the east certainly scattered an abundance of the tubercle germs. What gave the exemption? Admit for the sake of argument that meat-eaters have some exemption from the disease. Why is it?

For generations it has been noted that the rheumatic and gouty are largely immune to tuberculosis, while in lukæmia it is practically unknown. The celebrated English physician, Sir Andrew Clark, used to say: "When I was a young man I had to choose between gout and phthisis and I chose gout. Haig, in his great book on uric acid, says: "Now it appears to me that the changes in the pulmonary circulation which uric acid produces, may completely account for this antagonism between gout and phthisis. For while a man is eating largely of animal food he will have high acidity, his blood will be pretty free of uric acid, and his pulmonory circulation will be free, but he will have gout because he is storing and retaining large amounts of uric acid." Again: "On the other hand it may be possible, even after the bacilli have obtained a foothold in the lungs, to burn them up and destroy them by taking a large amount of animal food, which, as we have seen, keeps the blood free from uric acid, and makes the fires of life burn brightly.

I feel sure that I have seen in a number of cases of tuberculosis improvement, and in some cures, under the administration of nucleins. At first I credited this to some increase in the germicidal powers of the body, and this may be in part the explanation. But of late I have been inclined to believe that at least a part of the effect was due to the nuclein producing a gouty diathesis. It seems to be clearly shown by the investigations of Horbochvesky and others that the nucleins are the antecedents of uric acid.

Looking further into the question of food. A vegetarian diet decreases the acidity of the urine, increases the alkalinity of the blood. The blood of herbivora is poorer in hæmoglobin than that of the carnivora. Feed a dog on carbohydrates and his hæmoglobin decreases. So, too, there is more oxygen contained in the blood of carnivora. The arterial blood of dogs contains in one hundred volumes nineteen to twenty volumes of oxygen, whereas the arterial blood of sheep and rabbits contains from ten to fifteen volumes.

Again, note the formula for starch ($C_6 H_{10} O_5$). There is exactly as much oxygen in the molecule as is necessary to unite with the hydrogen. This proportion is true for practically all the carbohydrates. As the carbohydrates leave the body in the form of water and carbon dioxide, it follows that all the oxygen necessary to unite with the carbon atoms must come from without. Two atoms, that is to say, one molecule of oxygen, unite with one

atom of carbon to form one molecule of carbon dioxide. Molecules of gas occupy equal volumes ; therefore, the volume of carbon dioxide formed equals the volume of oxygen inspired.

Note, now, the composition of a fat, stearic acid for example (C_{18} H_{36} O_2). The end products of this also are carbon dioxide and water, but of the eighteen oxygen atoms necessary to oxidize the hydrogen only two are present in the molecule : sixteen are taken from the inspired oxygen. In the case of the carbohydrates all of the oxygen inspired must leave the body through the lungs in the form of carbon dioxide, whereas in fat, of the fifty-two atoms of oxygen required for its complete oxidation eighteen leave the body as water, leaving less carbon dioxide to be eliminated, less work for the lungs to do. This is also the case with the proteids. (Albumin in hæmoglobin C_{726} H_{117} N_{194} O_{214} S_3). Much more oxygen is taken in than is given back as carbon dioxide. Studying the respiration we find that these figures are true. The respiratory quotient, that is the proportion of expired carbon dioxide to inspired oxygen is in the herbivora practically one, one volume of oxygen taken in, one volume of carbon dioxide given off. In the carnivora the proportion is about three to four, that is, for every four volumes of oxygen inspired the lungs only have to handle three volumes of carbon dioxide.

There are still other factors bearing on the question. From one-twelfth to one-fifteenth of the carbon dioxide is carried from the tissue to the lungs in solution. The rest of it is in chemical combination, principally with the salts of sodium. In the tissues dibasic sodium phosphate (Na_2 HPO_4) gives one-half of its sodium to the carbon dioxide, forming sodium bicarbonate $HNaCO_3$ and (NaH_2 PO_4) acid sodium phosphate. In the lung the bicarbonate gives up the carbon dioxide and the dibasic salt is reformed. The acid sodium phosphate is eliminated by the kidneys, giving the normal acidity to the urine. According to our present theories, sodium chloride is in some way the source of the hydrochloric acid in the gastric juice. Now, when in solution in the blood the potassium salts tend to displace the salts of sodium. If we bring together solutions of potassium carbonate and sodium chloride there is a partial exchange ; chloride of potassium is formed and carbonate of soda. If we continue to add salts of potassium to the blood we rob the body of its sodium chloride—that which is necessary for the formation of gastric juice, for the solution of globulins and the like, and there accumulates potassium chloride, which seems to be no use in the body, and sodium bicarbonate, rendering the blood more alkaline.

Many vegetable foods contain a large excess of the potassium over the sodium salts. This is notably the case in rye, potatoes, peas and beans. These rob the blood of its sodium salts and cause the craving we have for salt with such food. The salt added to our food apparently compensates for that removed, but it entails more work on the kidneys and probably on the lungs. Rice contains only one-twenty-fifth to one-thirtieth of the amount of potassium found in the potato. It may be a mere coincidence, but, as

pointed out before, there is not as much tuberculosis among the rice-eating nations as one would expect.

The antagonism between leukæmia and tuberculosis is suggestive. In leukæmia there is always an excess of uric acid. The alkalinity of the blood is diminished. This we would expect when we find nucleated red blood corpuscles and the enormous increase in the white cells. Leukæmia is characterized by the undue multiplication of certain types of cells. Leukæmia gives a practically perfect immunity to tuberculosis. Therefore, the argument is a fair one, although not conclusive, that failure to produce the normal number of these cells or their products will produce a condition the opposite from immunity, that is susceptibility. It may be well to note here that authorities on the blood, such as Cabot, state that a large proportion of the white cells found in the leukæmic blood have no ameboid movements. They are not phagocytes, and the inference is allowable that the antagonism to tuberculosis is not due to increased phagocytosis. These cases often die of pneumonia or septicemia; therefore, we may argue that there is no increase in the general resistance or insusceptibility. There is a particular something antagonistic to tuberculosis, strengthening, it seems to me, the argument that, in conditions physiologically opposed to that we have here, there is a special influence somewhat favoring tuberculosis, if you please, a diathesis.

The mortality from tuberculosis in prison is remarkedly high. The mortality among civilized peoples is usually reckoned at one-seventh, that is thirteen or fifteen per cent., but the death rate from this disease in prison is often forty to fifty per cent. Why? A ready answer is, infection, bad air, confinement, general debility. Let us look at this closer. It is noteworthy that the mortality reaches its maximum only in the later years of confinement. Now, if bad air and infection are the essential factors, the highest death rate should be during the first years of confinement, but it is not. I do not believe that general debility will explain it. In most of our prisons, where the men have regular systematic works and hours, the general health is good. Note the food. The cheapest that will maintain life and strength; that means beans, peas, potatoes, cabbage and the like.

Note the many cases of bone and glandular tuberculosis, where despite the weakness, despite the repeated systemic infection that must take place, they often live out an average life.

It requires something more than weakness, something in addition to infection to produce tuberculosis.

For several years I have been impressed with the idea that infection alone will not explain the prevalence of this disease in dairy and farm cattle. But the limits of this paper will not permit discussion of this question.

Now, I would not be understood as believing that the explanations I have offered and suggested are the only ones, or even the correct ones. I have brought them forward as they seemed to bear on the question, irrespective of whether I believe them or not.

So that I am not contending that we should all become carnivora, that condition would be followed by its train of ills, possibly greater than those we have by living as we do. My contention is simply that because there is a hill there must be a valley, because there is a diathesis that gives some immunity to tuberculosis there must be a physiologically opposite condition, a diathesis that favors the disease. Fortunate will be the day when we know what that diathesis is, on what physiologic or chemic properties it depends.

VENTILATION OF SCHOOL-HOUSES.

By John Dearness, Esq., London, County Inspector of Schools.

Gentlemen,—Notwithstanding all that has been said and written on the importance of fresh air for school children, and indeed for all other persons, the truth relating to its hygienic value seems to permeate the public mind very slowly. Every intelligent person knows something of the virulently poisonous nature of human breath in a concentrated condition. There are such well-known records as of the death of 260 out of 300 Austrians poisoned rapidly by their own breath when imprisoned in narrow quarters after the battle of Austerlitz, and the similar poisoning of a number of passengers nailed down under the hatches of the steamer "Londonderry" during a storm. Every schoolboy has read of the horrors of that June night in an Indian climate when, of 146 persons confined in an apartment 20 feet square, having but two small windows to admit air, only 23 ghastly survivors saw the morning. To go further back, the old English chronicler quaintly relates that "spreading from the jail there arose such a dampe that almost all were smouldered, very few escaping, the jurors presently dying, and shortly after Sir Robert Bell, the Lord Chief Baron. All died in forty hours, the Lord Chief Baron and 300 more."

Although it is a matter of general history and, one might say, common knowledge, that air grossly contaminated by human breath is poisonous, yet very few people seem to recognize that protracted exposure to air moderately contaminated, as is usual in school-rooms, halls, churches, many sleeping-rooms and railway carriages, causes, in a slight or considerable degree, anæmia, nervousness ailments of the respiratory organs, a tendency to consumption and other ills. You are all probably familiar with a fact cited by Dr. Parkes, that in the ill-ventilated prison at Leopoldstadt in Vienna during a period of 13 years the proportion of deaths was 86 per 1,000, of which 51 of the 86 were due to phthisis, while in another comparatively well-ventilated prison in the same city the proportion of deaths during the same period was 14 per thousand, of which 8 were due to phthisis, thus showing that 43 deaths per thousand from lung consumption were directly due to lack of ventilation. Doubtless every one here could point to examples of impure air causing disease and of pure air curing it. (The speaker related accounts of two or three such striking instances that had come within his own knowledge).

Going, as I have done for many years, from school-house to school-house, some of them fairly well ventilated, others not ventilated at all, I have witnessed and experienced an accumulation of proof that in badly ventilated school-houses there are more complaints of headaches, the progress in the studies is less satisfactory, and it is more difficult to maintain diligence and

discipline among the pupils. I have many and many a time observed the effects of differences in ventilation of different rooms upon myself. The half-day in the stuffy, unventilated room invariably makes me feel more tired and less ready for a meal than the similar time in a ventilated room. Now and again I have heard of children whose health would not permit their regular attendance at a certain school who on removing to another section with a more sanitary school-house were able to attend regularly, and *vice versa*.

I repeat that many otherwise intelligent people seem scarcely to recognize the injury of living day after day in a moderately foul atmosphere. Here are samples of apt-made remarks: "Children are out doors so much that it doesn't hurt them to breathe each other's breath a few hours a day." "It is not the kind of air they breathe, but the pies and candy they put in their stomachs that make so many children delicate." At a crowded Christmas-tree entertainment in this city, at a time when grippes and influenzas were epidemic, the air became so foul that the lights went out. The chairman admonished the people who were poisoning each other with their breath not to be alarmed, as it was only the foul air that was quenching the lights. There is certainly great need for the general education of the people on the importance of breathing clean air. What a public boon he would confer if some Edison were to invent a foul-air alarm that would awaken sleepers and stop preachers, teachers and lecturers until sufficient clean air were introduced to stop its noisy tongue.

The British Day School Code at present in force demands that "apart from open doors and windows there should be provision for a copious inlet of fresh air; also for outlet of foul air." For securing the latter object it advises the building of a separate air chimney for each and every room, the same to be carried up in the smokestack with the smoke flues, and provided with motive power, heat or mechanical exhaust, to prevent its occasional action as a cold-air inlet. The Regulation adds "that the principal point is to prevent stagnant air. Inlets should provide a minimum of $2\frac{1}{2}$ square inches per child, and outlets a mininum of 2 inches, and, besides, the rooms should be flushed from the doors and windows once each half-day."

The less definite regulation on this subject for the schools of our own Province would be fairly satisfactory if it were enforced. It requires a minimum cubic content of 250 feet per pupil, with provision made to completely change the atmosphere every twenty minutes. The minimum requirement of our law is therefore 750 cubic feet of air per hour for each pupil, or, in other words, where hour and a half sessions are the rule, 1,000 cubic feet of space per pupil. That is to say, a school-room of 10,000 cubic feet capacity flushed at recess times complies with the regulations without mechanical means of ventilation when the attendance does not exceed 10 pupils, or, making a liberal allowance for natural ventilation,—that is the permeation of air through the material of the walls, a very considerable factor particularly in severely frosty weather—twelve to fifteen pupils.

When more pupils than from ten to fifteen are in attendance the requirements of the law to provide mechanical ventilation should be enforced. In the numerous cases in which the trustees do not see how they can provide the appliances for ventilating their school, or are unwilling to make any attempt to provide them, what should be done? Clearly a grave duty rests on school inspectors and health officers. A good many of the former are urging and assisting School Boards to do their important duty in this matter. If anyone here knows of instances of Boards of Health enforcing the provision of the law relating to ventilation, I should like to be told of them that I may make a list of such instances.

An officer once told me that, realizing the importance of pure air for children, he would do what lay within his power in urgent cases if he knew what to do. Could not every township officer be instructed by circular how to make the simple and approximately correct tests of the vitiation of air in inhabited houses, say with baryta or lime-water? And could not plans of ventilation applicable to different kinds of buildings be furnished every school board and health officer?

I beg to contribute a plan, almost as easily applicable to old school-houses as new ones, which has proved satisfactory in rural schools in this country. Besides providing for the changing of the air as required, it has actually economized fuel. Before proceeding to describe it I wish to criticize the method of heating and ventilating by a hot-air furnace. There is a school-house just outside the boundary of this county heated by such means, than which I know no worse ventilated one anywhere. The air is simply circulated and heated over and over again; it goes up-stairs to be cooled and down cellar to be warmed. This method of installing a furnace without fresh air supply is not unusual in private houses. A farmer told me that the furnace agent said that the air being circulated in this manner repeatedly over the hot iron would kill all the germs. Another fallacy is that the vapor taken up from the water in an ordinary furnace-pan maintains the natural hygrometric condition of the outside air. That opinion is not, however, so foundationless as the one that the air in a room heated by steam or hot water coils is moist. There is a difference in favor of the latter. What constitutes it? Steam or hot water coils seldom reach a temperature of 200°, they can never exceed 212°, whereas the dome and annular flues of a furnace may run up to two or three times that rating. Besides the great drying from the higher temperature, especially when the circulation is entirely internal, motes of dust, etc., carried in by the air current, are charred into minute angular cinders, which exercise an irritating effect upon tender or susceptible respiratory passages. Hence some people are continually hacking and coughing in a furnace-heated house. Again, the temperature of the furnace plates reduces all the ozone which comes in contact with them. What is ozone? The chemist would say it is an allotropic form of oxygen, ordinary oxygen $3O_2 = 2O_3$ ozone. It gets its name from the peculiar odor which it possesses. You may have heard persons, who were near the line of a discharge of lightning, say that they smelled sulphur.

It was not sulphur but ozone that their noses detected. The presence of this electrically produced ozone is the chief cause of that more enjoyable condition of the atmosphere we commonly feel after a thunder storm. Advertisements of some seaside and mountain health resorts inform us that their air is rich in this form of oxygen. Professor Andrews of Belfast, demonstrated that ozone is immediately reduced to ordinary oxygen at 458° F. It is clear, therefore, that the air in a furnace heated house is poorer in ozone than the air in houses heated by other means.

But the chief disadvantage of furnace heating is in the essential inferiority of conveyed heat as compared with radiant heat. The cooler the air by which we are surrounded, so long as we are comfortably warm, the more energy we feel. When the air is the warmest substance about us we say it is sultry, or oppressing. In a furnace-heated room the air conveying the heat is necessarily the hottest substance in the room, and it must be almost, if not quite solely, by contact that it imparts the heat to the occupants of the room. Standing before a brightly-burning fire-place, our bodies are warmed by radiant heat. The therapeutic value of this kind of heat is well known, but even to those who have given attention to such questions the alleged effects of the incandescent electric baths must be surprising. It is said that in an atmosphere of 75° F., perspiration is more quickly induced by the incandescent electric bath than in a Turkish air-bath of 150° to 175° F. The theory is that the skin being a poor conductor takes in the heat from air or hot water slowly while being translucent it admits light rays freely, which by resistance are converted into heat rays in the deeper tissues. There is a less penetrating radiation from dark surfaces, such as stoves, pipes and coils, but so far as it goes such radiant heat is preferable to conveyed heat.

From nearly every point of view hot air furnace heating is the least desirable, the exceptional circumstance being that it is economical. Hot air or steam heating by properly situated coils would be a very desirable method of heating if it did not necessitate so much expense for the introduction and circulation of temperate pure air. Without supplementary ventilating apparatus it is little better than furnace heating by exclusively internal circulation and not so cheap.

In a circular addressed to the trustees and ratepayers of my inspectorate, I answered several letters relating to furnace and other methods of heating and ventilating, as follows :

Heating and ventilating by a furnace in a basement is satisfactory when

1st. It is capable of maintaining a temperature of 67 degrees F. in every part of the room in zero weather.

2nd. It is fitted with exhaust (foul air) flues and inlet (fresh air) ones capable of changing the air in the room every 20 minutes.

3rd. It is fitted with slides or registers to control the circulation so as to make it, at the will of the operator, either wholly internal or the supply of heated air wholly drawn from out-door sources. and

4th. It is provided with means of cooling the room when overheated without opening doors or windows or closing the registers. Admitting cold drafts by open windows near children's heads or shutting the registers should not be tolerated in school or church.

Many of the schools are so situated that the installing of a furnace is impossible or very expensive. No. 7 Biddulph, No. 4 London and Lucan have tried a furnace on the floor, but the results have been unsatisfactory. A few schools in this division have experimented with coal base burners; these have all been abandoned. For a country school, wood at $6.00 a cord is as cheap as anthracite coal at the same price per ton, by the means of using each at present in vogue.

The method of heating and ventilating which, so far as I know, has proved the cheapest and given the best satisfaction is by fitting a fresh air drum on the rear end of a large box stove supplying a current of fresh, warm air and by the heat of a part of the stove pipe setting up an exhaust current of the foul air by flues led from near the floor on the sides of the room and delivered by a flue through the roof.

This diagram on following page suggests the general plan of ventilation as put in the schools named hereafter:

A is a heavy oblong box stove, 36 to 38 inches long.

B is a galvanized iron jacket (gauge 24), fitted over the rear 18 inches of the stove and around the base of the stove pipe. Air space 5 or 6 inches in depth.

C is a duct below the floor, running through from side to side of the school room under the floor, partitioned across under the stove, to divert the air upward into the jacket and to prevent its blowing on through and out at the leeward end. The part of C under the stove is lined with zinc as a safeguard against fire.

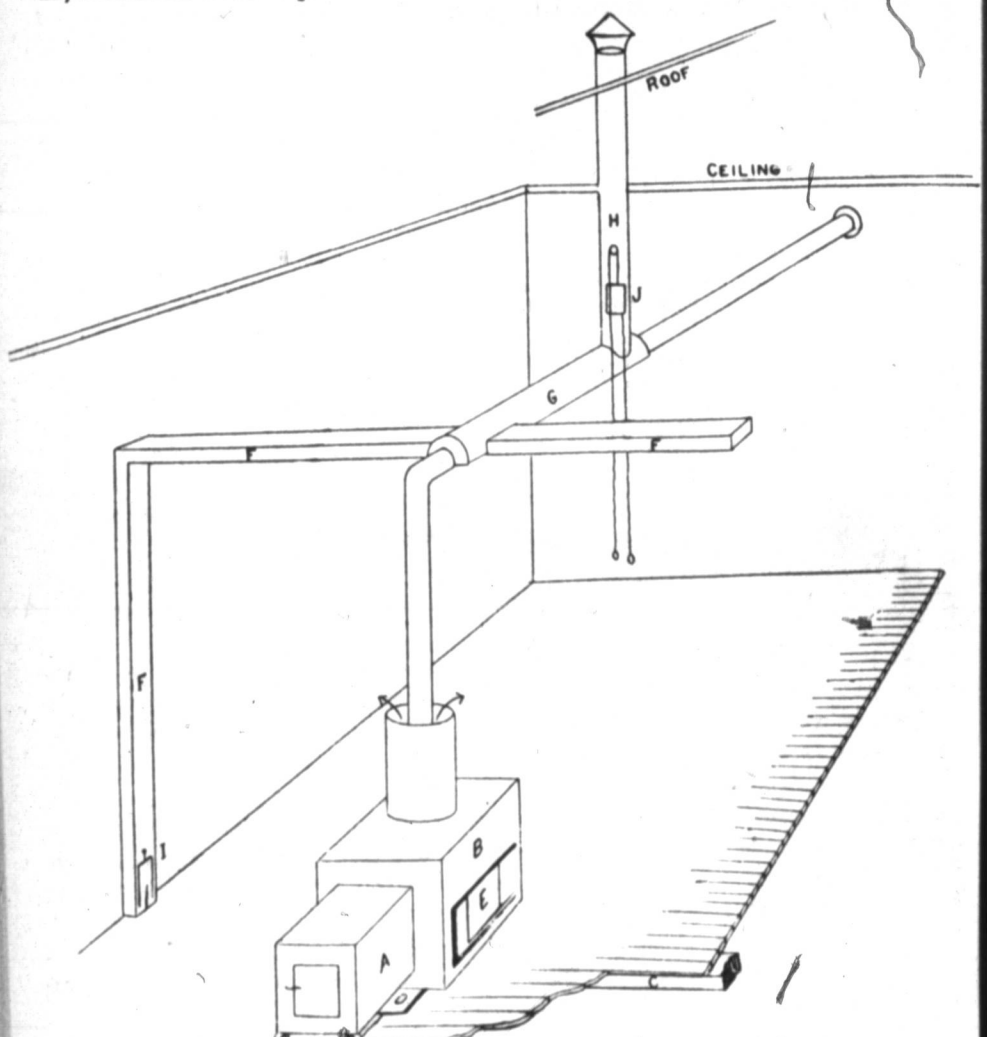
D is a heavy galvanized iron slide that regulates the inflow of air from C into the jacket. It is opened or closed by drawing the turned end of the iron handle shown under the stove damper. D slides over an opening of 1½ to 2 square feet.

E. A slide on each side of the jacket marked E is necessary for internal circulation of the air during the night and in severe weather when only a few pupils may be present.

F shows one half of the pair of flues leading from near the floor and behind the children's desks, drawing off the foul and cold air at the floor. These should be placed where children will not sit between them and the door, otherwise their feet will be in the line of cold drafts. The cross section of F should be from 72 to 100 square inches.

G is a drum eight or ten feet long, half encircling but not surrounding the stove pipe at its hottest part. The vacuum in this drum gives the exhausting power to draw the cold and impure air out of the room.

H is the upright flue discharging the air from the drum through the roof by a globe or other good snow-proof capping. The cross section of G, also of H, should be about equal to the sum of the two flues marked F.



I is a slide on each side of the room to close the outflow of temperate air from the room at night so as to maintain an exclusively internal circulation.

J is a slide in the flue H, at the level of the ceiling, to be opened when the room becomes too hot, and to be left open during the hot weather in summer.

In cold weather during school hours the two slides E are shut, and slides I and D are open more or less, according to the severity of the weather, force of wind and number of scholars present. From 4 p.m. until 9 a.m. the slides I and D (and J of course) are closed, and the slides E on the sides of the jacket are opened. This manipulation of the slides keeps the room, if well-built and tight, from getting cold during the night, and hence it is easily and quickly warmed in the morning.

The jacket B serves as a screen for the pupils seated near the stove, which should be placed near the door.

One of the two reasons why half the stove is left exposed is that children coming in cold in the morning may quickly warm themselves near the hot metal.

In some of the schools a slide is placed in the jacket just above the stove for the insertion of a cast iron evaporating pan.

In three instances this system has been tried and did not give satisfaction and the flues have been partially or wholly removed. I am not sure that I know all the reasons why these did not prove satisfactory. No ventilating apparatus can fulfil its purpose if neglected. Even a stove cannot regulate itself, it has door and dampers to be closed and opened. A door is at a large part of a stove, neither is a damper but a stove without either, no matter how good its sides, pipes, &c., would prove somewhat of a failure. Were a person to order a milk-pail and then accept it without a handle its use would not be very satisfactory. These illustrations suggest what seemed to me the chief reasons why the failures referred to above, occurred.

The officers of some of the schools where the system has had a fair trial has kindly sent me the following reports on the satisfaction it has given :—

Mr. D. Fitzpatrick, S. S. No. 15, N. Dorchester, writes under date Dec. 16th, 1898 :—

"From a careful perusal of the minute-book I find that the present system of ventilation was introduced into this school in October, 1880. As regards fuel, the average quantity used in 7 years previous to its introduction was between 11 and 12 cords per annum ; in the nine years since its introduction the average has been eight and one-third cords per annum. The system gives good satisfaction distributing the heat very evenly."

Mr. Thos. Harris, Rebecca P.O., who has been for many years trustee of S. S. No. 1, W. Nissouri, writes as follows :—

"Our school-house was ventilated 6 years ago by side flues led over the stove pipe and a jacket on the back of the stove warming a current of fresh air. Instead of one part of the room being too hot and another too cold, as it used to be, now all parts have an even comfortable temperature. Before the school-house was ventilated we bought from 18 to 20 cords (24 inch) a year, since then the quantity bought has varied from fourteen to ten cords (same length of stick.) Both economy of fuel and comfort depend to a considerable extent on the attention paid by the teacher to regulating the slides

in the flues. Within an hour after lighting the fire all parts of the room are always sufficiently warm for the comfort of the children, which, under the old way, would take in severe weather, the greater part of the forenoon. All the teachers have highly approved of the system both for the benefit of their own health and for that of the children. It also affords beneficial summer ventilation. The total cost exclusive of a new stove was $46."

Mr. R. Sterritt, Sec.-Treas. of S.S. No. 13, W. Nissouri, St. Marys P.O. writes :—

"Ventilation in our school house by side flues taken to the stove pipe and thereby heated and then going out through the roof and bringing fresh air in through a jacket on the stove was put in by Mr. Chalmers, tinsmith, St. Marys, in 1893, at a charge of $45.00. The system has given good satisfaction. Before that time there was frequent complaints of scholars having headaches; since then I have not heard of any such complaints. It used to be so hot near the stove that pupils could not sit on the nearest seats and at the same time too cold in the distant parts, now it is equally and comfortably heated in all parts of the room. Before the ventilating flues were put in the average quantity of wood required was 24 cords, short wood; since then we have needed only 14 cords, short wood, and last year only 12."

Mr. Arch. McDougald, Sec.-Treas. S. S. No. 3., Ekfrid, Melbourne P.O., writes :—

"By the system of ventilation in use all parts of the school room are evenly heated, the parts farthest from the stove being heated as much and as soon as the parts nearer. The system gives the best of satisfaction, the children's health being uniformly good, there being no reports of cases or headache since the adoption of the ventilation. The wood has cost on an average about $10 a year less."

Considering the large quantity of air drawn through the room one would not expect a reduction in the amount of fuel consumed; indeed the value of ventilation would be well worth a considerable increase in the bill for fuel. The reasons for the decrease are that the cold air is drawn off at the floor and thus the warmer strata from nearer the ceiling are brought down. 2nd, there is no need to throw open doors and windows at recesses to let out the fœtid atmosphere and chill the room by the inrush of frosty air. 3rd, the room, when the flues are fitted with proper slides attended to by the teacher, does not get down to freezing temperature at night and hence is more easily and quickly warmed in the morning. In Mr. McDougall's school some of the saving in fuel should be credited to the new school-house. In all the others spoken of above, the system was put in the old building and deserves all the credit.

Additional examples of this system of ventilation are offered in No. 2 Nissouri and No. 3, Dorchester. Another good example may be seen in S.S. No. 3, McGillivray, two miles S.W. of Lucan Crossing, Mr. W. Henry Sec.-Treas., Maple Lodge P.O. The last named section, at its last annual meet-

ing, December, 1897, decided to build a new school house. The lot was enlarged and during the holidays, at a cost of about $1,000, including what material of the old house could be used, there was erected a beautiful, single room school-house, lighted in the best manner, furnished with the latest seats and desks, having upwards of 200 square feet of black-board within reach of the youngest pupils, neat shelving, good out-closets, fine bell in belfry, well ventilated, and all paid off in one year. When the necessary improvements on the yard is completed this will be a model rural school property.

After careful observation and the study of experiments and opinions of the experts, I believe that an ordinary well-built room containing 10,000 cubic feet of space, by what is called natural ventilation, so far as fresh air is concerned, is sufficiently ventilated for fourteen persons. When the number exceed fourteen, appliances of some kind are requisite. If appliances are provided sufficient for 40 children in chilly damp days, it is evident that these should be under control. In windy severe weather, the ratio of natural ventilation increases; the frostier the weather and the smaller the attendance the less quantity of outside air need be admitted by the flues. This remark applies only in part to furnaces, as theirs is exclusively conveyed heat unless their smoke pipe passes through the room. A smooth heated flue will discharge a current of air at the rate of four (or more) feet per second. Cold air expands as its temperature is raised, say one-third. Calculating from these facts it is not difficult to find what capacity the ventilating flues should have for any school room.

"LONDON, 18th March, 1899.

"In the circular about ventilation sent you about Christmas, the prices mentioned, $40 to $46, were what was paid six or eight years ago. The apparatus as now put in costs only about $25 to $30. Some of the schools recently ventilated are:—

No. 23 Westminster, Mr. A. Nichol, Sec.-Treas., Wilton Grove P.O.
No. 7 Westminster, Mr. F. Elliott, Sec.-Treas., Pond Mills P.O.
No. 20 London, Mr. C. Coombs, Sec.-Treas., London West P.O.
No. 22 London, Mr. R. Sanders, Sec.-Treas, Ealing.
No. 5 Westminster, Mr. Wm. Boler, Sec.-Treas., Byron.
No 21 London, Mr. S. Clare, Sec.-Treas., London East.
No. 27 London, Mr. D. Bacon, Sec.-Treas., The Grove P.O.

"So far as I have heard, in these sections, all are well pleased with the working of the system. Not only those who realize the need for fresh air for growing children and who know the discomfort of sitting in the cold corners of the room and the greater injury from sitting for hours in the overheated atmosphere near the stove, but also those who neither know nor care much about the sanitary condition of their school, are pleased that there is a considerable decrease in the quantity of fuel consumed. Mr. W. M. Jones says that during that intensely cold weather in February they could raise the tem-

perature of the farther end of the room to 80 degrees. When the slides are properly operated there is no doubt that the results will be pure air, equable and comfortable temperature, absence of drafts and economy of fuel.

"Another important hygienic consideration is the condition of the drinking water. So many school wells become unwholesome on account of the stagnation of the surplus water that the plan tried by the trustees of No. 21 London is worth describing. Mr. Taylor, Elias Street, London East, the digger of the well, says he went through clay and veins of sand and gravel a sufficient depth below the spring, in all 29 feet. A pipe was then fixed in place and surrounded by large stones to a depth of 4 or 5 feet, then rough gravel, sand and clay to within 4 feet of top where the cylinder and pump top were fixed in place and the platform put down. Sufficient water is retained in the spaces among the stones to supply the school, and the quality is alwaps pure and cool. Mr. Taylor says by this plan he can make a success of a school well in quicksand or any other soil where he can get a spring.

"(Signed) J. DEARNESS, I. P. S."

Last year you reported the inspection by a committee of a method of circulating air in a school-room at Caledonia. I invite a similar inspection of one or more of the schools named above to test the efficiency of the ventilation obtained by the appliance therein provided.

NEEDS AND METHODS OF SCHOOL VENTILATION.

By A. B. Shantz, Esq., Model School, Caledonia.

Gentlemen,—Before proceeding to discuss the subject allotted to me I wish to express the satisfaction which it affords me to be present at, and especially to take part in, this gathering; for it seems to me that the health officers in convention here are certainly deserving of being considered humanitarians in the best sense of the term. I must confess that until I received the invitation of your Secretary to read a paper before your organization I was unaware of its work and even of its existence. Since then, however, I have read the report of your last annual meeting, and as a result have been more than pleased with this fresh evidence that amidst the apparent and often obtrusive selfishness and greed of our modern civilization there are to be found men and organizations with altruistic objects, quietly and unostentatiously doing works of kindness and performing labors of love, such as tend to strengthen one's faith in man and his future. In my humble capacity as a teacher it has been a source of great satisfaction to me, compensating in a measure for the small pay and many petty annoyances of the work, to think that I am helping along the grand work of evolving that condition of society when its sorrows shall have reached their minimum and its enjoyments their maximum: and it affords me no small pleasure to be permitted to participate, even in a slight degree, in the noble work of your beneficent organization.

The ventilation of schools has not in the past received the attention which its great importance merits; in fact I think I am safe in saying that rural schools as a class, and most urban schools, have no means of ventilation at all, except the very objectionable method of getting air in through doors and windows. Even this primitive method has been neglected or used, if at all, with small show of intelligence. The cause of this evidently is to be found in the fact that the great majority of trustees and teachers have not in the past realized the need of ventilation and the harm that results from the lack of it. But this ignorance has largely passed away, at least on the part of teachers, since the introduction of the study of physiology as a subject in the public school course. The chief difficulty now seems to be the lack of a system of ventilation which is moderate in price, suitable to any sort of heater, and reliable in all sorts of weather. I have been trying to produce such a system, and think I have succeeded, and I presume my presence here to-day is owing to the fact that your worthy President, Dr. Cassidy, who has examined the working of my system in the schools of Caledonia, deems the results of my experiments deserving of your attention; and assuming that you are well posted on the subject of the need of ventilation and on the current systems of ventilation, I shall devote myself chiefly to a statement of my own experiments and the results. I beg, however, that you will permit me,

without needlessly repeating to you well-known scientific data as to the need of ventilation of schools, to attempt to describe how this phase of the subject presents itself to the majority of teachers. To us, while not a matter of life or death, it is still one of vital importance; for while we cannot say that lack of ventilation causes either directly or indirectly the death of any considerable number of teachers, it is still quite true that it causes us very great discomfort, very considerably lowers our vitality, and consequently leads the way to serious bodily ills, and sometimes to premature decay and untimely death. That these results are not more noticeable is owing to the fact that most teachers find that after they have passed the time of youth, with its abounding and apparently superabundant vitality, they cannot stand the demands made upon their physical energy and vitality, and so they leave the profession for other occupations. Besides, the injurious effects of breathing impure air are brought about so insidiously that to the ordinary observer the connection between the two as cause and effect largely escapes notice; and many cases of more or less serious illness that have been reverently accepted as dispensations of Providence have really been the result, in part at least, of breathing impure air. But this ignorance on the part of teachers and pupils has passed away since the subject has been taken up in connection with the teaching of physiology in our Public Schools; and now, instead of unconsciously suffering injury from this cause, teachers and pupils are compelled to endure the added hardship of knowing the full extent of the injury to which they are compelled to submit by being forced to breathe vitiated air. I use the words forced and compelled advisedly, for the law compels them to attend school, but fails to compel trustees to provide the necessary change of air. True, the law states that the air of school rooms is to be renewed at least three times an hour, but the carrying out the law is left entirely in the hands of trustees, with well-known results; and I am convinced that until the ventilation of schools is placed under the supervision of medical men little improvement is to be expected. The average trustee is skeptical enough of the evil effects of lack of ventilation to be indifferent to the appeals of teachers, inspectors, and even of medical men. If the payment of the annual grants were made conditional on the ventilation of the school coming up to a certain standard, there would very soon be a great improvement in the ventilation of all our schools. A resolution passed by this association recommending some such change, for the consideration of the Minister of Education, would, I think, help along the good work. Most of you will probably recollect that the Minister, speaking to a convention of medical men in Toronto not long ago, suggested that the hygiene and sanitation of schools be placed under the supervision of the medical profession.

If the medical profession of Ontario and the health officers in particular can secure for the school of the Province thoroughly effective ventilation they will do the Province a most patriotic service, and confer on teachers and pupils in particular, a great blessing. Try to picture to yourself the nauseating effect on teachers and pupils, of being compelled day after day to breathe

—shall I say air?—which it is no exaggeration to describe as reeking with excremental filth. The excretions of one's own body are highly repulsive to oneself, how much more disgusting to others! No civilized human beings will permit the accumulation in their dwellings of intestinal excretions; and if the effete matter constantly being cast off by pores and lungs, were as evident to the senses, equal care would be taken to get rid of it; but unfortunately it is invisible and only slightly malodorous. To those, however, who are aware that in breathing vitiated air they are breathing effete matter cast off from every part of the body of every person in the room, healthy or diseased, the necessity of having to take into one's nose and mouth these repulsive excretions is almost unbearable. And yet this is what teachers and pupils have to endure day after day and year after year.

How careful, we as individuals and as a government are to keep our supplies of food pure, wholesome, and free from adulteration. Does it not seem strange then that the substance on which we are more absolutely dependent for life and health than on food and drink should be so neglected, that in our private houses and public buildings, we seldom find it pure and in a great many cases not only contaminated, but viciously and repulsively filthy. This seems all the more strange when we bear in mind that pure air can be had in unlimited quantities without paying tax or tribute to any one. There seems only one explanation, people do not realize what they are breathing. With what beastial and even fiendish depravity we would credit the man who would compel children to SWALLOW closet excretions; and yet the general public does not seem to see anything very wrong in compelling them day after day to BREATHE other human execretions which if not so repulsive are nevertheless decidedly impure and to the well informed teacher and pupil exceedingly obnoxious. We can hardly find words with which to express our loathing for those vile wretches, who slay and eat their fellows of the human race and who on occasion will devour human carrion; and yet the great bulk of our civilized fellow citizens seem to enjoy breathing each other, or rather each others' cast off selves; only a very little reflection will bring home to the consciousness of even the unimaginative the unwelcome fact that what we breathe in a crowded unventilated room is really a mixture of what once was air, and of what once formed part of the physical personalities of those present but has become devitalized and has been cast off as not only useless but positively dangerous, and which like all dead matter decays and becomes putrid. Of course the air also contains bacteria, some harmless, others very dangerous; but they are living things and therefore, while perhaps more dangerous than dead decaying excretions, are not half so repulsive and nauseating.

Mr. President I am not playing with words nor am I carried away with a desire to make strong statements; I am simply recording what I have time and again felt when compelled to breath the close polluted air of an unventilated schcolroom. It was my vivid realization of these things that led me to make an effort to improve the ventilation of rooms in which I had to teach;

I had no intention whatever of inventing a system of ventilation. If I have succeeded in devising a satisfactory means of ventilating schools and other buildings it is simply the result of meeting and trying to overcome the usual obstacles to effective ventilation.

And by way of introducing my system I may say that the essence of my system consists in a mechanical expedient to overcome the greatest of the obstacles, namely currents of air outside of the buildings; and on the contrary to make it an aid to ventilation. My system utilizes the force of the wind to get fresh air into a building and foul air out, but does not depend on wind, the wind when there is any always helps and never hinders. Before proceeding to explain how this is done I beg to disclaim having discovered any new scientific fact or principle; I have simply devised a mechanical expedient for bringing about a result which science has shown the need of and in a manner suggested by well-known facts of the nature of air and the laws of its motion.

Systems of ventilation may be divided into two classes (1) those that use fans or pumps, and (2) those that do not use fans or other mechanical power. A good fan system is certainly preferable to other system in the matter of reliability provided the fan has power enough to create a sufficiently rapid incurrent when the wind is blowing away from the intake opening at the rate of say 10 or 20 revolutions an hour. I am not personally able to say whether there is on the market any fan equal to such a task; but I have been informed that in buildings where fans are used the results are far from satisfactory on certain days when the wind blows away from the side of the building where the intake is situated. The same seems to be the case even when the intake is above the building. But even a fan system found to be thoroughly effective on the most unfavorable days is out of the question for any but city schools on account of the cost. Where electricity is not available a steam motive plant is necessary and also the services of a competent engineer. Anyone at all acquainted with the views of the average trustee, on questions of school finance, will at once agree with me when I say that the general adoption of a fan system is for many years to come absolutely beyond expectation. In the meantime other systems must be made to do the best they can.

In the case of other systems interference by adverse winds is much more marked than in the fan system; in fact I do not know of a single system of this sort now in the market in which at times the wind does not reverse the currents sending air out where it should go in and taking it in where it should go out.

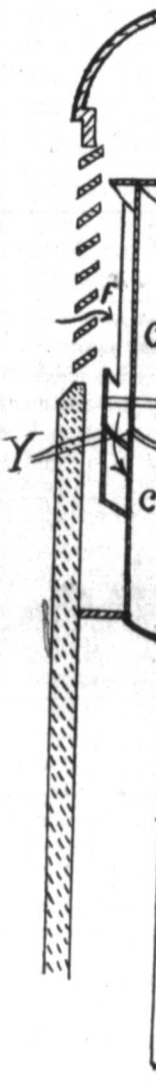
As I said before, the chief and only important obstacle in the way of securing reasonably constant currents of air into and out of fixed intake and outlet openings is the variable factor, the wind. If there were no winds, a very slight heating of the air in the outlet flue would be sufficient to produce the necessary out-current and a corresponding in-current; but when the wind is adverse it seems to be impossible to get the air to flow in the desired direc-

tions. This I have found out by experiment; and I have been fully confirmed in the belief by answers to enquiries on my part as to the working of systems of ventilation depending entirely on heat as a means of creating ventilating currents. That this fact has for a considerable time been believed by experimentors in ventilation is evidenced by the records of the patent office which show that a considerable number of patents have been granted for devices to utilize the wind as a ventilating agency; and also by the adoption of fans or pumps of some sort in important buildings in which a system of constant efficiency is demanded. That none of these inventions has been satisfactory is presumably evident by the fact that none of them has come into general use or even become known to the general public. And in spite of the fact that these attempts have not apparently been successful, I believe that any system of ventilation suitable to come into general use on account of moderateness of cost and constantly reliable efficiency, must include some expedient to overcome the obstacle of adverse winds and on the contrary to utilize the wind as an aid to ventilation I say *aid*, because no system of ventilation can depend entirely on wind. That it is possible to make the wind an aid to ventilation, and that with the wind converted from an obstacle into an aid thorough ventilation of schools and other buildings in all kinds of weather at small cost and even with a saving of fuel as compared with methods depending on heat alone, I have demonstrated to my own satisfaction; and in order that you may be able to form an opinion on the matter and still explain and illustrate the system which is the outcome of my experiments. Before doing this, however, I wish to state that the system in a crude form has been in operation in the Caledonia schools for several years in connection with wood stoves, with very good results, considering the disadvantages under which it has to work. These are (1) that it has to be put into an old building in which it had to be adapted to the building and existing heating appliances; (2) that the money at my disposal was exceedingly limited, compelling me to use the cheapest materials, and to put in the system not as I wished but as I could with the small sum at my disposal; (3) that, owing to scarcity of funds and limited heating capacity, the flues were made with a capacity of only nine-tenths of a square foot for each room, whereas they ought to have had a capacity of four square feet; in order to supply 1,800 cubic feet of air per hour for each pupil.

The working of the system has been examined by various more or less competent persons, and also on behalf of the Provincial Board of Health by your president, Dr. Cassidy.

High School Inspector Hodgson, in his last report to the Caledonia Board of Education, gave the High School the highest grading in ventilation, and added: "The system of ventilation which is in use serves its purpose excellently, and seems to me worthy of special commendation." I may say, that the day was windy and therefore very favorable to my system. Dr. Cassidy had a higher ideal of perfect ventilation and was more exacting in his test. He came on an unfavorable day when there was hardly any wind, and

so reported that while the system certainly did produce ventilating currents it was decidedly lacking in capacity, changing the air only about one-third or one-fourth times as often as required to secure perfect ventilation. Since then I have enlarged the inlet and outlet flues of one room to four times their former capacity with the result that the currents of air flow just the same as in the smaller flues; and I think that when Dr. Cassidy comes to Caledonia again he will find the capacity up to the mark, even if the day is unfavorable. Without further delay I shall now sketch by the aid of a drawing the construction and working of my system. I hope that you may not misunderstand any part of this paper as bragging, or blowing my own horn; it was not meant that way. Nor am I trying to advertise my system in this paper. I have of course no objection to its being advertised, nor to any help that any members of this Association may feel disposed to give towards having it adopted. If it commends itself to you, you will no doubt feel it a pleasure to contribute by your influence toward the improving of the ventilation of schools and other buildings. It will be a source of great pleasure to me to realize that I have taken part in improving the chances of some, perhaps of many, boys and girls to grow up healthy and vigorous in body and mind, and consequently to become happy, useful citizens of our fair and promising young Dominion, and of our beneficient world-wide Empire, and last but not least, of that great race, physically strong, intellectually vigorous, morally upright, politically progressive, world embracing and world uplifting—the English speaking people.



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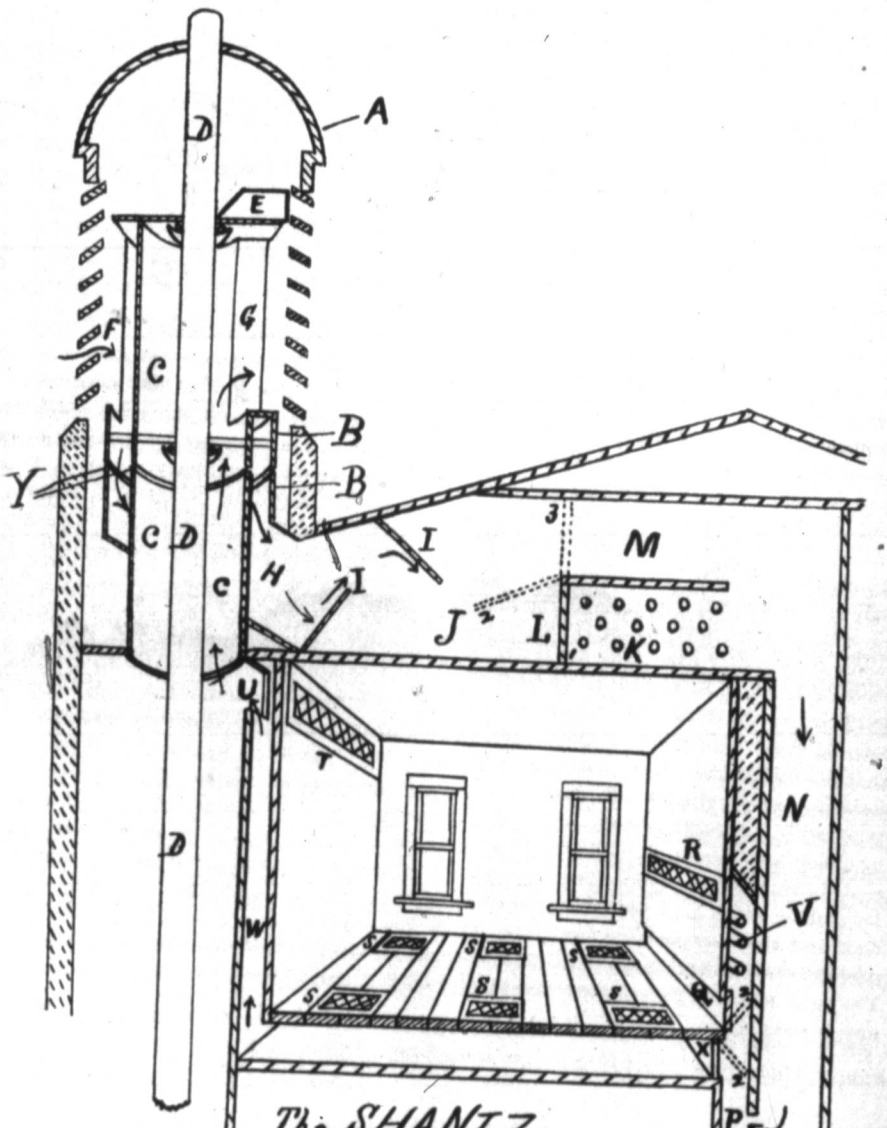

The SHANTZ
System of Ventilation

One Room of a Large Building

In the accompanying drawing the working of the system is illustrated. The upper parts of pipes B and C are disjointed at the Y and are supported on ball bearings. The wind acting on the vane E keeps the opening F always toward the wind which blows into the annular space between pipes B and C. From there it enters through pipe H the chamber J where impinging on sifters I it loses its coarse impurities if there are any. Chemicals exposed in J will deodorize, disinfect or otherwise purify the air when necessary. Passing in cold weather through passages M and N it enters P some distance below heater V, so that the air after being warmed cannot escape back into the inlet flue N. While the air is passing up through P, and especially while going past the heater, water regulated in quantity by a tap will be sprayed into the air from a pipe connected with a tank or waterworks. The warmed air naturally ascends and stratifies along the ceiling ; the outlet T will be closed in winter, being for summer use. The air is drawn off through outlets S and through W, U, C, and opening G which is always away from the wind. When there is no wind the flow of air is produced by the difference in weight between the warm inside air and the colder outside air. Several years' observation of the actual working of the system in Caledonia, Ont., has shown that days when there is no wind are exceedingly rare. In warm weather the air is *cooled* by passing through chamber K containing cooling apparatus of some sort, preferably a coil of pipes with a current of cold water passing through it. The temperature can be controlled by placing the valve L in any position so as to allow any desired proportion of air to be cooled, which when again mingling with the other air brings it to the desired temperature. By placing valve X in position Q the air is admitted through grates S ; it stratifies along the floor and rises up past the breathing line as the warm air escapes through grate T. When necessary fans or heat in the outlet flues may be employed to produce or accelerate the current. The chief merit of this system is that without it the wind *never hinders*, and when there is any, *always helps*.

GROUND AIR IN CITIES AND TOWNS.

By W. Van Buskirk, C. E., City Engineer, Stratford.

Gentlemen,—All soils contain more or less air between the surface of ground and the water table or permanent level of ground water. Loose porous soils may contain as much as fifty per cent of their volume, while the more compact soils necessarily contain less.

As might be expected from the known action of organisms in the soil, the ground air contains less oxygen than the atmospheric air, the oxygen combines with carbon derived from animal and vegetable matter of the humus producing carbonic acid.

Carbonic acid is also produced by the action of the putrefactive organisms contained in all soils. Ammonia, the sulphides of ammonia and hydrogen and marsh gas are also produced in most soils.

The composition of ground air therefore, always differs considerably from that of atmospheric air; and this difference is increased with the depth below the surface and with the quantity of animal and vegetable matter contained in the soil.

Ground air is not stagnant, since various natural agencies tend to keep it in constant motion. Thus, the wind blowing against the surface causes more or less movement; change in barometric pressure forces air into, or permits its escape from the deeper layers of soil; heavy rain forces air into the soil and also forces ground air from considerable depths to flow out at points where the soil remains dry; variations in level of ground water bring about corresponding movements in ground air.

Changes in temperature, which are constantly taking place, cause disturbance in ground air in a similar way to that caused above ground.

These movements of ground air are of considerable importance from a sanitary point of view, and among the forces causing them, change in temperature is that of most importance.

As an illustration of the effect of change in temperature, consider the case of the ordinary dwelling house during the winter months. The artificial warmth produced in the house, draws the cooler ground air through the foundations and cellars, and thence through the floors into the rooms. In this manner the impurities of the soil in the vicinity are brought into direct contact with the inhabitants of the rooms. Foul air from defective drains may in the same way contaminate the air, and illuminating gas from defective pipes is almost sure to find an entrance unless cellar floors and walls are built with cement and concrete.

The average householder has been trained to fear the entrance of so called sewer gas from the street sewer, but does not appear to mind illuminating gas so long as it does not leak on the house side of the metre.

The recent biological examination of sewer air, made for the London County Council, indicates that the fear of sewer air is without foundation. It should not be forgotten however, that the findings do not apply to defective drains and cesspools etc.

On the other hand a study of ordinary illuminating gas shows that its presence in the air of dwellings is not at all desirable.

The following table shews the constituents of the ordinary illuminating gases of our cities and towns as compared with atmospheric air.

	Illuminating gas.		Atmospheric air.
	Water gas.	Coal gas.	
Hydrogen	32.7	48.1	.....
Carbonic oxide	30.2	7.6	.....
Carbonic acid	2.4	0.3	0.04
Marsh gas	16.8	36.5	.....
Illuminants	14.4	4.3	.....
Oxygen	0.4	0.4	20.96
Nitrogen	3.1	2.8	79.00

The consideration of emanations from defective gas pipes on streets, lead to the consideration of pollution to air by defective and unsanitary pavement or roads.

It is perhaps not generally recognized that the air over an unclean stree may be contaminated by its exhalations in the same way that air is pollute by emanations from a stagnant pond.

Block pavements of either wood or stone as ordinarily laid, are full o openings which hold dirt, and we know beyond all question, that certain di ease-producing germs live and flourish in such filth. Of these germs, one the most fatal, which for obvious reasons is almost universally present in stre dirt, is the germ of tuberculosis.

With such pavements and with such air above them, it is obvious that t ground air will be in a still worse condition.

It appears therefore, that any pavement that is not made impervious water, and which cannot be thoroughly washed and cleaned without depositi filth in the subsoil can not be considered as thoroughly sanitary.

In addition to providing an impervious covering for roadways and streets, it is necessary to lay down drains for the drainage and aeration of the subsoil. When this is neglected, the circulation of air will be prevented, and it is to be feared that the ground air, contaminated by contact with a soil sure to have been polluted in the past, and containing large quantities of illuminating gas, will be forced to find an outlet through the cellars of buildings.

It is true that very few of the towns and cities of Ontario are provided with pavements such as those above described, but it should be remembered that during a considerable part of the year, the worst mud road becomes almost as impervious as the best asphalt pavement; and that the danger to health from polluted ground air is as great in the small town as in the large city.

W. F. VAN BUSKIRK,
A. M. Can. Soc. C. E.

THE DISTRIBUTION OF ANTHRAX IN ONTARIO.

By W. T. Connell, M.D., Bacteriologist to Kingston Dairy School, Kingston.

Gentlemen: In the Province we are commencing to realize that anthrax is not so uncommon a disease as has generally been believed. True, it has only been proven to exist in certain districts, but I am confident that were the matter carefully investigated it would be demonstrated that the present localizations would be found to occupy much too limited an area—and that some at least of those cases of rapidly fatal illnesses in cattle, looked upon as inflammation, dropsy, etc., (terms which to the scientific investigator mean nothing) would be found to be due to anthrax infection. I do not wish to be pessimistic in this connection, but the disease once seated is so hard to eradicate and so rapid in its fatality, that its occurrence even sporadically is a matter for serious consideration by sanitarians, dairymen and stockraisers. From the data already published by the Provincial Board in their annual reports for 1887 and 1891-92, together with that collected by the Board this summer and by myself, we are compelled to recognize the fact that the disease has gained a foothold in certain districts. When we consider the difficulty of its eradication, owing to the tenacity with which its causal agent clings to life and accommodates itself to almost any reasonably suitable environment, we will at the same time see the necessity for vigorous measures to prevent its further spread in the present recognized centres, and the taking of steps to prevent the seeding of other localities, either from the infected areas or from those causes which first seeded the centres now infected.

Before considering the outbreaks with which we are acquainted in Ontario, a few general remarks on the nature of anthrax may not be out of the way. Anthrax attacks nearly all stock animals. Sheep, cattle and horses are most subject to attack, sheep being the most susceptible. Hogs, too, are attacked, usually from eating the bodies of other animals dead of the disease. Dogs, cats and rats are fairly immune, yet not entirely so. Mice and guinea pigs are very susceptible.

Anthrax is one of the oldest of recognized diseases among cattle and is very widespread. In Continental Europe, in India, and the Argentine, it is very common. Compared with its prevalence in these countries, it is uncommon in England, the United States and Canada.

Anthrax is due to a spore-bearing bacillus first seen by Pollender in 1849 in the blood of sheep, but first described in 1850 by Devaine, also in 1863, who claimed it to be cause of the disease. His claims were fully established by the researches of Koch, who completely worked out the life history of this bacterium.

In the blood and tissues of animals dead of anthrax we can demonstrate the bacillus usually in vast numbers. Here we find only the rod forms—not the spores, as these are formed only in the presence of oxygen. Thus opening of the body and skinning of the animal determine the formation of numerous spores in the exposed organs and in the hide. The spores are quite resistant to external agencies such as heat and cold, but are readily killed by direct exposure to the sun's rays. Covered, the spores retain for long periods their vegetative power and virulence. In certain soils, with sufficient moisture and summer heat, the spores germinate with rods which rapidly increase in numbers and again sporulate, and so add vastly to the numbers of anthrax spores in the soil. From infected soil or material the spores are carried by water along the water-courses, lodging in the soil of a bank or on overflowed ground, there either to be destroyed, lie latent or to germinate, according to the environment. Consequently we find the disease most common on lands lowlying and along water-courses and possessed of a rich mould with good vegetation, as these are the most favorable conditions for its existence once infection has occurred.

Anthrax is not a disease contagious from animal to animal. Infection is mainly from the soil, rarely from water, and may be either by local inoculation, which is uncommon, or usually by infection through the digestive tract by taking in of food or water containing the spores. As might be expected, the disease will be most common on infected soils when these are close cropped by the animals.

In the common form of intestinal infection the disease is usually a rapidly fatal one—at least eighty per cent. of the animals die. Death in the majority of cases occurs within forty-eight hours, often within four hours after the animal is noticed to be ill. In the form due to inoculation we have local carbuncle formation with rapidly spreading gelatinous at times haemorrhagic œdema, soon involving the nearest lymph glands, and then terminating in septicaemia. In throat inoculation the local œdema at times suffocates before blood infection occurs. Death in nearly all cases occurs within six days.

It would be of no value to recite the symptoms met with further than to say that late in the disease bloody discharges may issue from the body orifices, and in these anthrax bacilli can usually be readily demonstrated. Hence such discharges may add to the infection of the field or stable in which the animal is ill.

The post-mortem appearances, while fairly characteristic to a trained eye, are often misleading to one not so skilled, so that in all suspicious cases specimens of the blood and tissues should be examined microscopically and bacteriologically for the bacillus. Its presence or absence must be the criteria upon which to base the positive diagnosis of the disease. Here in Ontario we have at present four recognized centres where anthrax has been proven to exist, viz., Guelph, Acton, Listowel and Kingston. Accounts of the outbreaks at Guelph and Acton will be found in the reports of the Provincial Board for 1887 and for 1991 and 1892 respectively. In Ontario the disease seems first

to have been recognized on the flat lands along the Speed below Guelph, between forty and fifty animals dying there during the summers of 1886 and 1887. The source of infection hinted at in the Board's report was infection from some foreign wool used in the woollen mills at Guelph, the washings from which make their way into the river above the infected flats.

The next outbreak we find noted is at Acton in 1891 and 1892, and evidence was furnished before a committee of the Provincial Board that connected the disease with the locality as far back as 35 years. Here we find that the disease occurred along the low land lying near a stream into which the washings from several tanneries had emptied for over 35 years. In one of these tanneries South American hides were used and we know anthrax is common there particularly in the Argentine. This summer we have had two outbreaks one at Listowel and one at Kingston on two farms some distance apart.

I have had the correspondence re the Listowel outbreak kindly placed at my disposal by Dr. Bryce. At Listowel there is evidence of the existence of the disease for the past few years but only this summer was the disease definitely recognized as anthrax and positive proof afforded by a bacteriological examination. The correspondence in this outbreak shows what I found to be the case in the Kingston outbreak, viz., a disagreement between the veterinarians as to the nature of the disease—one tracing the trouble to polluted water directly and the other calling it anthrax. In Kingston it was variously termed "weed poisoning," arsenic poisoning, acute peritonitis and pleuritis, inflammatory dropsy and several other probabilities. At Listowel the cases occurred on land bordering a creek into which the washings from both a tannery and a woollen mill emptied. No note is made as to the source of wool or hides used.

At Kingston we have, this summer, had cases on two farms. On one of these the disease has occurred annually for 11 years at least.—(Owner young man, far back as he remembers.) On the other the cases which occurred this summer are the first definitely known. On the first farm the disease was noted first in animals pastured on a point of land across the road from the main farm, this point being now Lake Ontario Park. This summer some of the cases occurred in animals pastured there, others in cattle kept on main farm. The dead animals were thrown into a deep crevasse in a limestone ridge which crosses the main farm. This crevasse drains out on several acres of flat pasture land and then crosses in a ditch the cultivated field of a neighbor to enter Little Cataraqui Bay. There is no doubt that this pasture land at the foot of the ridge is infected. As to the probable source of the infection it is hard now to say definitely though the seeding I think arose from a tannery which stood on a bay into which empties the Little Cataraqui creek. This tannery has not been operated for 25 years however, but I undertand it was a large one and used foreign hides. The current in this bay sets from the creek toward Lake Ontario Point and the shore on this side is marshy while

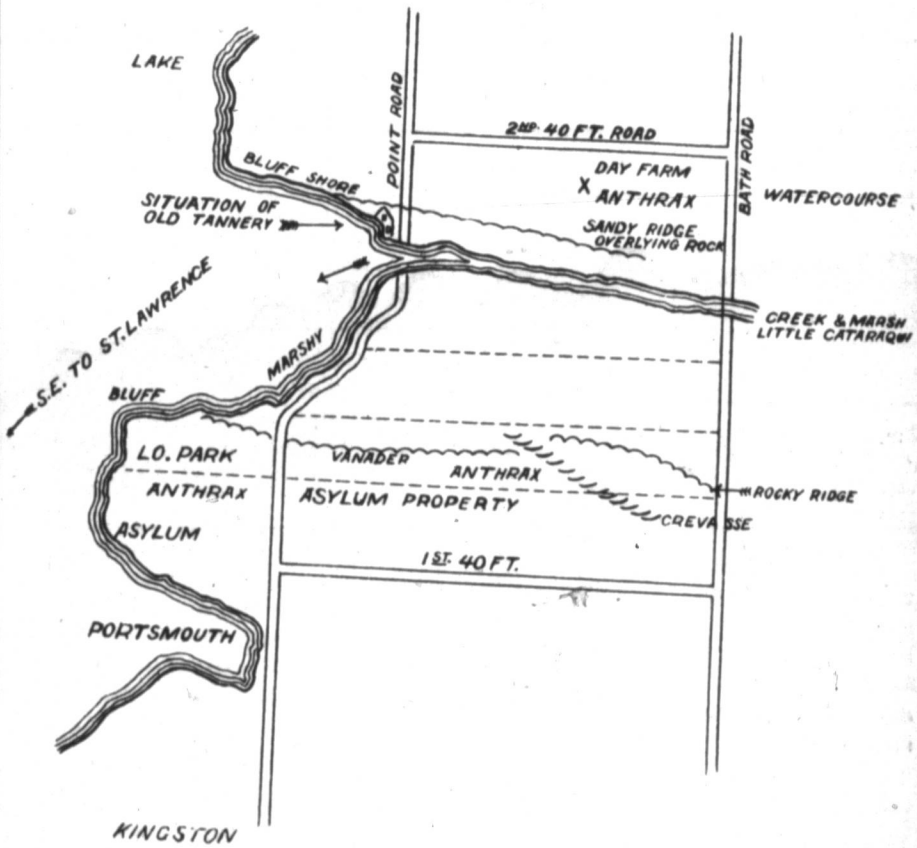

Diagram showing topography of area of anthrax outbreak.

the opposite bay shore is somewhat bluff and rocky. This latter point would account for the fact that anthrax is not known to exist on the opposite bay shore.

On the second farm I must confess that I am yet at sea in ascribing a cause for the seeding of the farm. The farm lies about half a mile away from the first and across the Little Cataraqui but not on its banks. The infected field is low lying, somewhat marshy, but is not flooded from the creek. I can learn of no communication between the farms but I have not had the time nor opportunity of carefully investigating the matter.

On the first farm during the last 11 years 42 head of cattle have died with a sudden and rapidly fatal illness and I ascribe the deaths occurring previous to this year to anthrax as was the case in the 5 cows and 1 horse which died this year. Only one of the cows attacked this year recovered. On the other farm 4 cows and 1 horse have died this year. I had an opportunity of examining one of the cows during the illness and post-morten and saw both the horses post-morten. All presented the typical post-morten appearances of septicemia by intestinal infection with anthrax, viz:—Hæmorrhages in skin and internal organs. All serum cavities containing bloody serum. (One horse showed 10 gallons of this in the abdomen.) Omentum and mesentery, the seat of a gelatinous œdema, in places however both were intensely hæmorrhagic. The intestinal walls were swollen and dotted with hæmorrhages, punctate, linear and sheet-like; spleen, large, dark and surface dotted over with hæmorrhages; urine, bloody. Heart and lungs also dotted with hæmorrhages and blood dark. Anthrax bacilli were readily demonstrated in all the organs. No men attacked.

On looking over the factors in common of these outbreaks we find that we can point as probable source either to woollen mills or more commonly tanneries. The tanneries are the only factors in Acton and Kingston outbreaks. Both are combined in the Listowel outbreak while woollen mills appear alone in the Guelph cases. The wool and hides used were partially derived from foreign sources and hence might readily be infected with anthrax spores.

Ravenel, in a paper read by title before the A. P. H. A. meeting in Ottawa last September, traces three outbreaks of anthrax occurring in Pennsylvania during 1897 and attacking the operators in tanneries and the cattle pastured along streams which received the tannery washings. Ravenel further shows that the dry hides as received are the most dangerous probably from the greater danger of scratching with such as no scratching would occur with the moistened hides. Ravenel's experiment shows that the tanning process does not suffice to kill anthrax spores.

Now these observations and experiments of Ravenel's together with the observations gathered by the Provincial Board prove clearly the connection between tanneries using foreign or suspicious hides and seeding with anthrax. What would apply to tanneries would apply as well to woollen

mills using wool from infected countries. We must look then to tanneries and woollen mills using such material as the source of infection with anthrax.

In conclusion I would say that we must take measures, 1st, to prevent further seeding from these outside sources; 2nd, to root out the disease in the now infected local areas.

For the first we must have (1) Some system of control over the importation of hides and wool particularly from infected countries. Absolute protection of import would be advisable at least till some efficient means of disinfection of these materials is devised.

(2) The washings from tanneries and woollen mills should be collected and treated before being allowed to flow into streams.

In rooting out the disease locally the following measures are advised:

(1) Exclusion of cattle from infected fields and the placing of these fields under cultivation for some years, best with crops requiring considerable stirring of the soil.

(2) The bodies of all animals dead of anthrax should be burned. Burial will not suffice as it has been shown that any formed spores may be brought to the surface by earthworms and so infect the surface soil.

(3) During the attack the animals should be isolated say in a rough paddock littered with straw. All litter should be burned.

(4) If the disease becomes epidemic the introduction of the Pasteur vaccination system or a modification of it might be considered.

At present however there does not seem to me to be sufficient reason for the introduction of the prophylactic measure as the disease can be controlled by the steps before advised and the vaccination is somewhat costly and not in itself free from danger.

SANITATION OF HABITATIONS, IN RELATION TO THE INCIDENCE OF CONTAGIOUS DISEASES.

By R. V. Bray, M.D., Chairman Local Board Health, Chatham.

Mr. President and Gentlemen,—In presenting to you to-day a paper on the above-mentioned subject, I feel that I am dealing with a subject which should have for its champion a more worthy exponent. This subject is a wide one and of much importance, and one which ought to concern us, as medical men, very deeply. To think that owing to carelessness, to absent-mindedness, to lack of personal interest, to utter disregard of the laws of health and various other causes, the lives of not only a few but of hundreds of people are being day by day placed in jeopardy, should make us shudder; but it should also make us resolve, as far as in our power lies, to take some steps to lessen the ill effects.

In our town during the past five or six years, we have had no serious epidemics of disease, and we attribute the healthy condition to three things: 1st, our better system of providing a purer drinking water for the people; 2nd, our improved sewerage system; 3rd, the watchful care of the Local Board of Health in relation to the housing and cleanliness of the poorer class of people. Our system of waterworks is, we know, working very satisfactorily. The water is pumped from the river into a settling basin (about 600 feet long, 80 feet wide, 18 feet deep); from here it is pumped through two filters, and then into the mains. In this way we claim to remove by sedimentation a great deal of matter, and, by double filtration, render the water not only palatable but comparatively pure.

We have been trying to formulate a plan for a trunk system of sewers, and the Board of Health has been urging upon the Council the necessity of these large sewers. In many cases their advice has been acted upon, but in many others the Board has had to recommend sewers in certain localities and on certain streets as a sanitary measure. Now, we have on the south side of the river Adelaide, William, Queen, and Lacroix streets, all running parallel, with trunk sewers, and at right angles to these, sewers on King and Wellington streets, so that all parts of the town on the south side of the river can be easily and thoroughly drained. In North Chatham we have Baldwin street and Victoria avenue, parallel with trunk sewers, and the lesser sewers drain into these two. All the sewers empty into the creek and the river, and the average fall is sufficient, and the average depth at which sewers are laid is 12 feet. The nearest outlet for any sewer is about 600 feet below the waterworks plant. The Board of Health arranged with the Council to thoroughly flush the sewers twice a year, clean all man-holes and intakes, and see that the outlets are kept free from debris.

Now we come to the third reason why we have had no serious epidemics, "the housing and personal care of the poorer classes." The Board of Health has an Inspector, whose duty it is to visit all houses in the city, report monthly on the condition of those in the district which he has visited, as regards their need of repair, the state of the yards, the closets and sewers, or whether too many people are living in these houses; and then the Board deals with the report. If certain houses are unfit in the judgment of the Inspector for human habitation, a committee of the Board is appointed to look into the matter and report on the conditions found, and the changes or improvements they deem necessary. The report if adopted is made note of by the Secretary, and the usual form of notice served on occupant and owner (see notice). If the conditions contained therein are not lived up to, then steps are taken to strictly enforce the same. In this way we protect the poorer classes, in that they are not compelled to live in tumble-down buildings, and, by causing windows to be put in rooms and doors cut, increase the amount of air entering these houses, and thereby improve the physical conditions, by not compelling these people to breathe over and over vitiated air. During my term of office on the Board of Health, several cases of this kind have been dealt with. Only a few weeks ago we found a colored family of eight persons living in two rooms, one about 12 by 10, the other 8 by 10. The larger room had two windows and two doors, the smaller room (which was the sleeping room) had no window and only one door, and that leading into the larger room. Now, how could you expect those people to be healthy (I know, as a matter of fact, they were not,) when they had no fresh air in their sleeping room? What did the Board do? They compelled the owner to repair the house, put a window in the smaller room, and in other ways improve the condition of these people. Another case occurred during this month, where twelve people were found living in three rooms. The plaster was off the walls, the floor covered with rags, on which some of the people slept, the roof leaky, the floors rotting away, and the air space far too small for the number of people. The Board served the usual notice, which was not obeyed, and now steps are to be taken to enforce the carrying out of the Board's request. Diphtheria occurred in this latter house about three years ago, and I am almost afraid that it would break out again, if the weather becomes very damp. I claim that by taking these active measures we are not only improving the condition of the people, but are impressing the citizens that the Board is active along sanitary lines.

Before our waterworks system was in good order, or our sewerage system so far advanced as at present, certain districts in the town were looked upon as being subject to outbreaks of typhoid fever or diphtheria. One section of the south side of the town, bounded by William, Park, Adelaide and Wade streets, seemed to favor the recurrence of typhoid fever year after year, and the reason of its recurrence, to my mind, is that the land was made or built up land. The situation was a low one, and earth off the streets or from house excavations was carted in to fill up the hollow; no sewers were in operation,

and dug wells, varying in depth from 8 to 18 feet, were the mode of water supply. Now it was only natural that the soil—if you could call it such—was of a poor kind, being a mixture of sand, clay and debris, and very porous, so that after a heavy rain the wells contained surface water and filth. In one house in this section typhoid fever occurred during three successive years, but since city water has been put into the houses in this district conditions have improved; and now that sewer connections are at hand we look for better things.

Another area which was prolific of typhoid fever was the district bounded by Princess street, the river, Adelaide street and the creek, and several houses in this district have a history of successive and repeated outbreaks of the disease. You ask, Why was this area a bad one? Not because of made up ground, but rather lack of sewerage, combined with the influence of the creek, which is not only shallow and narrow, with no current, but which receives one, if not two, sewers, and the debris from one slaughter house. The Board of Health have again done a good work in having sewers put down here, in having the slaughter house moved outside the town limits, and in having the existing sewers frequently flushed, and the outlets kept free from debris. Careful inspection and close questioning on the part of the medical man failed to bring to light anything of a nature foreign to the area, and therefore the conclusion arrived at was that the successive outbreaks were due to specific causes within the area itself. You can readily see how easy it is for a careless person to so deposit the excreta of a typhoid fever patient in a shallow pit, cover it over with loose earth, and then after a time this earth is disturbed, and the organism placed in a condition to thrive; or again, to spill some of the excreta on the ground before burying it, and neglecting to sprinkle any disinfectant about and upon it. I wish just here to say that I believe medical men are exercising more care in the orders given nurses or people in charge of these cases regarding the disposal of the excreta, and that they have succeeded in making people realize the nature of the infection, the cause of the disease, and the care necessary to be exercised in order to prevent its occurrence and spread. I wish also to say that I believe medical men should be more careful and exact in reporting cases of typhoid, and be more rigid in enquiring as to the probable source of infection. In both the districts in which typhoid fever was prevalent the houses were mostly of frame construction, containing five or six rooms, some of them very small rooms, and I believe the disease in some of them is due to what might be called sick room infection. In the *Sc. Med. Journal*, Sept. 2nd, 1899, there is a long article by Herbert Peck, M. H. O. Chesterfield, and in summing up he says: "Sick room infection is more common than is supposed, and its dangers do not receive the amount of attention they deserve; also that it is much more common in the crowded houses of the poor than in the larger houses of the well-to-do." We know that the linen used in the sick room, especially among the poor, is not changed as often as is necessary, and proves a source of infection; also that the excreta of patients in small houses is frequently subjected to a drying process, which allows of the diffusion of the typhoid bacilli and

its spores through the air. In the City of Nottingham, in ten years, ending 1896, 85.3 per cent. of the typhoid fever cases occurred in houses of five rooms or under. This fact tends to prove the theory of sick room infection.

Surface soils contain a large number of micro-organisms of different species. More organisms are found in made soils than in virgin soils, and the number varies also with the amount of certain organic matter in the soil. The largest number is found at a distance of from 12 to 24 inches below the surface. In the case of the typhoid organism planted at a depth, (Maitland Gibson, Sheffield), says: "There was an undoubted tendency to grow upward, and which appeared quite distinct from the upward diffusion of B. anthrax by means of earth worms; and further, organisms disappeared from surface soil long before they did from subjacent strata, and this would lead to the belief that the deeper layers sheltered the organisms during the winter months. It has also been proven by observation, and statistics have been compiled showing that with certain soil conditions the organism of typhoid fever slowly dies out. Conditions, then, which favor the growth of the organism are, 1st, badly paved or unpaved streets, which are constantly receiving small amounts of organic matter in the shape of slop water or fæcal matter; 2nd, the filth in and around privies and drains also favor the growth of the organism. Grass covered areas, so long as the ground is not disturbed, are not favorable to the growth or spread of the typhoid organism. We must also remember that there are different arrangements of the dwelling in these areas, differences in the habits of the people and differences in the care exercised by the attending physician and the nurse. So much for typhoid fever areas. Now, as to diphtheria. This disease is a treacherous one, and we cannot be too careful, both in our diagnosis and in the care of our patient, paying attention particularly to limiting the spread of contagion. Here, again, we find certain areas of our town subject to frequent outbreaks of the disease. It has occurred in the district first mentioned with frequency, and while we cannot attribute the cause of the disease directly to the made up soil, and its allowing of percolation, we can indirectly, in that owing to its not being drained it must be damp. Then, again, in many cases, the clothes of the patient are not thoroughly disinfected, and at once. People move into a house in which diphtheria occurred three or four years before, and in a short time it breaks out in this new family. How do you account for it? Simply in this way, that proper care was not exercised in destroying anything which might contain particles of infection; the walls and floors were not scrubbed, the windows cleaned, the paper on the wall removed, and other things left undone, all of which tend to harbor or spread disease. People dread this disease during its height, but often neglect simple precautions after the patient is convalescent.

In conclusion—after making these few imperfect and incomplete remarks—I would urge all Medical Health Officers to keep a record of all cases of typhoid fever, noting particularly the locality in which each occurs; and also impress upon the attending physician the absolute necessity of a careful and thorough enquiry into the cause of the case or cases he may have in hand.