REPORT

OF THE

TENTH ANNUAL MEETING

OF THE

ASSOCIATION OF

EXECUTIVE HEALTH OFFICERS

OF ONTARIO

HELD AT BELLEVILLE, ONTARIO

14TH AND 15TH AUGUST, 1895.

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MINUTES OF MEETING.

The tenth annual meeting of the Association of Executive Health Officers of the Province opened in the City Hall, Belleville, on the 14th August, at 10 a.m.

When the hour for the commencement of business arrived, Dr. W. R. Hall, Chatham, 2nd Vice-President, took the chair in the absence of the President, and called upon the Rev. Mr. McLean to open the meeting with prayer.

Dr. BRYCE, the secretary, read extracts from the minutes of the last meeting as published in the printed report of the proceedings. Before doing so, he observed: These are the extended minutes of the Chatham proceedings, and I can hardly ask you to spare the time while I read some forty pages, which include those minutes. I shall assume that the minutes are correct, and simply read the beginning and end of them, and move their adoption. If any gentleman detects any error in the minutes, I shall be pleased if he will make a motion for their amendment when the proper time comes.

The minutes were then read, and on the motion of Dr. BRYCE, seconded by Dr. CASSIDY, adopted.

The SECRETARY: The programme will proceed, as printed, as far as I know at present. There will be an addition in one particular. Dr. Dean, of Brighton, has forwarded a paper which will come in at its proper place on the programme.

The CHAIRMAN: We have with us this morning, Mayor Walmsley, of Belleville, and I am sure you will all be pleased to meet him. (Applause.)

Mayor WALMSLEY: Mr. Chairman and Gentlemen of the Association of Executive Health Officers of the Province of Ontario. It affords me very great pleasure, on behalf of the city, to welcome you to Belleville and to these halls. We wish you to accept the freedom of the city in the fullest possible sense. In a recent communication Dr. Bryce stated that he had passed through many difficulties in Belleville. I hope that you, gentlemen, will encounter no difficulties, but that your stay here will be most pleasant, and that your deliberations will be to your profit and to our good. (Applause.)

The CHAIRMAN: The first paper on the programme is entitled: "Our Principal Foods, and some ways in which they may be rendered injurious," by Dr. Vaux, Brockville.

The SECRETARY: It has been our practice, Mr. Chairman, to continue the reading of papers bearing on the same subject, before the discussion of the group, and I would suggest that we also hear Dr. Kitchen's paper at this stage, and likewise a paper by Dr. Dean, if the latter gentleman is present.

Dr. VAUX then proceeded to read his paper.

Dr. KITCHEN, St. George, afterwards read a paper on "Sanitary preparation of the food products of Milk."

Dr. Dean not having yet arrived, it was moved by Dr. KITCHEN, seconded by Dr. TRACY, and resolved, that his paper be read by the Secretary.

The CHAIRMAN: These three papers on associated subjects are now before you for discussion. I notice that Dr. Sheard's name is on the programme to open the discussion.

Dr. SHEARD, Toronto, said: I have listened with great pleasure to the papers read by Dr. Vaux and Dr. Kitchen, and I think they have covered the subject so thoroughly and completely that very little is left to be discussed. The liability of milk to disseminate contagious disease is pretty generally admitted, and it is certainly a very important medium. So much is this the case, that a thorough and careful inspection of all places where milk is stored, becomes a

matter of importance and absolute necessity by every health officer. We in cities have to deal, besides other questions raised, with the subject of contagious disease, existing in houses or premises which are distributing mediums in the cities at large. The milk dealer, of course, draws his milk from the producer, from the dairy farmer, and it is then distributed, the farmer acting as the middleman or wholesaler. This milk is frequently housed in his cooling room, or sometimes in his own house, according to the extent in which he deals in the product. It is therefore a matter of great importance that the city dairies, or the premises of the wholesalers, and the smaller dealers should be regularly and periodically visited, so that in case of any contagious disease existing at those premises, it can be immediately determined, should it not be reported in the usual way. The regular and careful inspection of dairies in the country is also a matter of very great importance. This is a subject upon which we have spent a good deal of time and money in the city of Toronto. We derive our milk supply very largely from the county of York, and practically it covers the whole county. Last fall and during the winter, I had an inspection made of the principal dairy farms in that county, covering an area of something like 35 square miles. The reports we got from that district were fairly satisfactory, and there was a great desire on the part of those shipping milk into the city, to comply with the requests made. The greatest difficulty we experienced, however, was in regard to the water for cleansing the utensils which carried the milk to and fro. The shippers do not appear to have thoroughly realized the importance to themselves of using boiling water as a cleansing medium, and I think the suggestion thrown out here by my friend Dr. Kitchen is a very valuable one, viz.: that those who receive the milk in the cans—the wholesaler or the cheese manufacturer—should undertake the thorough cleansing of the cans, and not allow the curded milk to remain there, or any whey to be sent back in the same utensil. We all know how injurious that is to the milk itself.

While I was listening to the papers upon the subject of cattle and milk, it occurred to me there was one matter which had not been touched upon, and that was the existence of the product tyro-

toxicon. There was a case brought to my notice in Toronto where it was suspected the milk had actually been poisoned, and delivered, it was thought possibly, with homicidal intent. The symptoms were those of the action of tyrotoxicon, and it was quite possible that that product had been developed in connection with the milk, which milk, as far as we could learn, had been very rapidly cooled, after it had been jolted round in the streets for some time, and gave rise to the symptoms of acute poisoning. Some of the milk was carefully examined by Professor Ellis, and I saw him afterwards. He failed to find it, and we made some similar examinations, but did not discover any very satisfactory evidence of the existence of tyrotoxicon, although the symptoms were well marked.

Then as to the question of what constitutes healthy stock. I do not know that it would be very prudent for me to venture an opinion not being familiar with cattle and farm work, but we used to be told a great deal about the Jersey cattle. I think it has been pretty generally concluded that the Jersey cow is not suitable for the Canadian farmer. It is a cow which yields very delicious milk, rich in butter-fat, but it needs far too much care and attention for the ordinary farmer in this inclement country. The winter weather does not seem to agree with the Jersey; that is, as she is treated on the farm. If we can have her carefully housed and cleansed, as the doctor here has suggested, then we may get the full value. I think, without the Jersey cow is properly treated and cared for, pneumonia is very likely to develop in the lung, and possibly she may get tuberculosis and actinomycosis. I think that is in the main true. As far as I know from reports in my district, the Ayrshire and the Holstein combination seems to have the preference amongst dairy farmers, principally on account of vigor of constitution, and the less liability to evil influences from inclement weather. I have frequently been asked—I think a health officer should know pretty nearly everything—what cow would be best for a dairy farmer to have. Probably some of those who have had experience in country districts, and have made a careful inspection of cattle, which I have not, might be able to express an opinion. I think however, one point we might insist upon, through the Provincial Board, would be

valuable—that is to make it obligatory upon every veterinary surgeon to report cases of tuberculosis in cattle. We as health officers accidently stumble upon them, and they are very often casually brought to our notice, but I am pretty well convinced a great many escape altogether. The milk may be taken and distributed without your knowledge, even although you carefully inspect them. It is a simple matter to know when the health officer is inspecting a district, and then to put the cow at the far end of the farm or somewhere else, to escape observation, until the time is passed. Most of these cattle have been visited by veterinary surgeons. I do not see any reason why veterinary surgeons should not be as much compelled to report all cases of tuberculosis or actinomycosis in dairy cows, as a medical man is forced to report a case of scarlet fever, diphtheria or smallpox occurring in his practice.

With reference to actinomycosis we have had two cases of that to deal with in the city of Toronto lately. In one case we took it upon ourselves to deal summarily with the infected animal and practically had it slaughtered. The opinion however was given by a very eminent veterinary surgeon that actinomycosis, if found in the early stage of lump jaw, was simply a local affection, and it was his opinion, providing the animal was slaughtered, portions of the carcase might be used for meat. That is a proposition a health officer does not like to consent to, but the opinion was ventured to me privately, and the view was entertained that it was a a local disease, especially in the early period. I can readily see how a health officer, energetic in the discharge of his duty, might be involved in complications upon that question. We got out of it very well so far as we are concerned, because we took possession of the whole carcase and destroyed it. This, I think, is the right and proper course to pursue, because no one would like to get a portion of carcase affected by actinomycosis served up to him, and those that slaughter cattle do not always know, or do not care to know, these fine distinctions, so that it is better to be on the right side. Still these are questions which I know may come up at any time, and in some localities in this Province, I believe, actinomycosis is apparently on the increase.

I do not know that I can say more than to express my gratification at, and interest in, the papers which I have been pleased to listen to this morning.

Dr. CASSIDY: I have listened with a great deal of pleasure to the papers which have been read by my friends Drs. Vaux and Kitchen. The pleasure is all the more enhanced, because I think it is just as well to commence at the beginning, and if we can introduce our protective system at the very entrance into the body, I really think we shall have accomplished a very good work. We know that a man requires food, and we also know that the poison which attacks him from the cradle up to the grave, finds entrance through that food. Therefore the consideration of this question of food, and the preparation of the various forms of food, is one of the very first importance, and I think should be well entertained by medical men and sanitarians.

I listened with a great deal of satisfaction also to the very carefully prepared and original paper of Dr. Kitchen. The doctor no doubt has given a great deal of attention to the subject, and he appears to be fully competent to speak upon it; and it is interesting to us as Canadians to know in considering this matter in which the physiologist, the hygienist, and the agriculturist can all join hands, that it is one that not only touches our feelings and our pockets as men but at the same time our feelings as scientists and students of physiology. Anything that can advance the wealth of this country, is naturally of the first importance to Canadians, and if the sanitarians can unite with the agriculturist and help to bring about this desirable result and increase the food products of this country to a degree that will compare with Australia or Denmark, he will be doing something more than simply preventing the spread of disease.

I am inclined to think from my observation of sanitary matters since 1882, and I have been identified with them since that year, a great many people in this country—I do not say it in a critical sense—are inclined to think the meetings of sanitary officers are affairs that simply concern the doctors. They say: "This is a meeting of doctors The doctors are going to hear papers to be read," etc. I am sorry to see that impression still prevails. This is a matter that does

not concern the doctors alone; and one of the reasons why I listened with a very great deal of pleasure to Dr. Kitchen's paper was because he shows this is not a question which interests one section of the community only, but it is of importance to the whole of this country. We are all interested in the matter of our food products. It represents an enormous industry, involving millions of dollars, and the more therefore we can assist in the work of improving our food products the more we improve our *raison d'etre* as a nation.

There is one point that occurred to me as pertinent and it is a matter in which I am somewhat interested. Dr. Sheard, whom we are all proud to have in Toronto as medical health officer, showed he had been working far afield, and had studied the questions of milk. He has taken the trouble to make an investigation into the sources of our milk supply, and the dairies from which milk is supplied to the city of Toronto. No doubt the quantity that is constantly brought into our city, with its population of 200,000 and its enormous child population, is tremendous, and the circumstances under which that milk is produced, brought to town, and held before consumption, are of the very utmost importance to sanitarians and all parents who have children to rear. I am glad to see the doctor has taken that trouble, and I am sure it will be only another indication to the people of Toronto that they have a very valuable medical health officer, and one who pays great attention to the sanitary conditions and surroundings of their city.

Another point was in regard to actinomycosis. We know such a disease may prevail, and in some places is greatly on the increase. But there is another thing to which he did not allude, and that is tuberculosis. I know Dr. Sheard has great energy and if he puts his shoulder to the wheel and determines that something shall be done, I know it will be done. We as sanitarians would like to see him just endeavoring to work out this little problem of how we are to get an inspection of the meat market. I should not say in Toronto, but in Ontario, but I address myself to him as being the medical health officer of that city. I would like, seeing we are discussing the matter of food and food products, Dr. Sheard to take energetic action, or to see he felt inclined that way, in the matter of the inspection

of the meat markets. We Canadians are a meat eating people; we are not bread eaters. The Canadian eats meat twice, and perhaps three times a day. The meat he eats is therefore a matter of vital importance to him. We know from data obtained from Germany and England that there is a very considerable percentage of tuberculosis in the meat that finds its way into the slaughterhouse, and we have reason to believe the conditions which exist in European countries are not peculiar to them alone, but also prevail in other lands. I would like, if in the large city of Toronto, we could really have some attempt made to introduce a public abattoir. Years ago when the Provincial Board of Health first commenced its meetings, I, as a young enthusiast, felt very deeply on that matter. I am not quite so young now, but I feel quite the same in regard to this question. At one of our meetings, as far back as 1883 or 1884, I think, I spoke about the advisability of having an abattoir. It is not an expensive affair, and it certainly would be a good thing. If an abattoir were established it would enable the views of the sanitarian to be carried out, the wholesaler to receive his product in good shape, and the food, which was to be in a satisfactory condition, to be handed to the consumer in such a way as to do him the least harm, and probably the most good. I certainly think an examination of meat is of the very utmost importance. I remember at one of our recent meetings, I think the German Consul, Mr. Nordheimer, in his official capacity, wanted to know—he was really asking the question for the German Government—if there was any systematic inspection or examination of meat, or meat products, before they were exported. Canada is deeply interested in this question of the exportation of meat products, and before long we may have very important works going on in Toronto, or its vicinity. The Germans are an exceedingly methodical people and they are commencing to have serious doubts about the quality of our tinned meats. There is a feeling of apprehension that possibly canned meats may contain poisons which are destructive to life. When the enquiry was made we simply had to reply that as far as we knew there was no such examination in this country. Now there was the positive reply to a straight question, and the people in Germany know therefore as far as Canada, is con-

cerned, we do not make that inspection by which we could say this product is a clean and wholesome one. I think it is high time an examination was begun, and if any expression of opinion was given by a body like this, it would, in my opinion, have great weight with the proper authorities.

Dr. MACDONALD: I have to express my extreme gratification in common with other members, with the papers we have heard on meat and milk. But there is just one thing that we as medical men ought not to omit to mention. We must not only prepare meat for the eater, but the eater for the meat, in order that the evil resulting from the meat may have less opportunity of doing mischief, when it enters the digestive organs. I think that we all eat too much. That is my private opinion—I do not mind expressing it here, and on that account we often suffer from the effects of meat itself, which ought never to have been eaten, much more readily than if we were more careful in our diet.

I was especially pleased with the paper upon the preparation of milk. That is a matter, as has been said, of vast public importance. It is to be for a long time the foundation of our prosperity in this country, and every product of it must be watched with great care, otherwise we will lose our character for the excellence of our products, and our trade as well. Allusion has been made to the imperfect examination of meat on the markets. We have, I think, an example of the effect of that in the difficulty we are experiencing in getting our cattle imported into European countries just now. It is true one country in Europe has removed the prohibition from Canadian cattle, but I notice lately that having been apparently about to remove the prohibition in the United Kingdom, the British Government has hesitated upon that point and some other cases of pleuro-pneumonia have been found amongst Canadian cattle, which may for a long time prevent their importation again, and thereby do great mischief to us.

I feel greatly indebted to Dr. Kitchen for his paper. He has entered most thoroughly into the subject. It is clear he has studied

it long and that he understands it thoroughly, and if we have a leading place in this Association with regard to the advocacy of such matters we ought to place him there.

Dr. HUTCHINSON: I did not get here in time to hear Dr. Kitchen's paper, but Dr. Cassidy has shown the necessity of having an abattoir and a public inspection of meat. As some of you know, in London we have a large pork-packing establishment in London carried on by an Anglo-Danish company, who kill perhaps 1,500, or 2,000 hogs a week. Recently they sent over a cargo of pork to Copenhagen, and the meat was refused entrance there until it could be certified that some form of public inspection had been undergone in Canada. There was no such thing, and the pork lay there until another letter, or cablegram came back, and now the company get a certificate from me every time, that I have examined the pork. But it is unsatisfactory; we want a public inspection.

Dr. CASSIDY: Yes, certainly; that is the point.

Dr. HUTCHISON: I merely state this to show you how urgent it is that a public inspection should be made.

Dr. BRYCE: I would admit it is very desirable that in addition to the discussion of the general necessities for inspection in the matter of food products, that the Association should, if possible, go a little further and express its opinion in some very practical form. The reason I state this is, that for ten years now, since the creation of the Health Act, the Provincial Board has from year to year as local necessities gave rise to the opinion that legislation could be got, introduced amendments along various lines with the idea of improving the Act, so that it would cover conditions, which at the time the Act was originally passed, did not appear to have the same force, as later years have shown them to have. We have endeavored since that time, notably in 1890, in 1891, in 1894 and in 1895, to deal specifically, with the diseases of animals, and the inspection of food products. Last year you will remember there was a great deal of heated discussion—if I may be allowed to use that term with regard to legislative debates—on the subject of tuberculosis. We know that the debates took on not a scientific but a political form, and with a view to enabling the public as far as possible to know the circum-

stances in regard to tuberculosis, we published in a very extended way most of the known facts on the subject of tuberculosis, and the diagnosis of it in cattle. In that publication you will remember that various suggestions were thrown out, as to how the subject of tuberculosis was going to be approached from the practical standpoint, and the first point, apart from the inspection of stables and that sort of thing, was, as to how the actual inspection of the cows themselves that gave the milk for public use, and of the meat which was prepared for public consumption, was to be got at and carried out. The suggestion however was made that there should be district inspectors to examine herds of cattle, and that there should be in every municipality like our towns and cities, abattoirs, or large slaughterhouses, where every animal should be examined by a health officer or his deputy, with regard to its health anterior to death, and subsequent to slaughter. Nothing since that time has been done to give practical form to those suggestions, except so far as the continuance in Toronto and one or two of our larger cities, of a nominal inspection is concerned. I am just as well aware as any local health officer of the difficulties. He is not supplied, in the first place, with a sufficient staff. The staff supplied is not put in the position of true independence with regard to inspection. I have been endeavoring lately to find out what the methods were in our own slaughter yards in Toronto, and have asked those who are down there, and I find that more or less of the old conditions continue, which serve to make the inspection most ineffective. You will remember some four years ago—the year in which the clause dealing with actinomycosis was passed—that some four cattle came into the Toronto market one day, and the late health officer applied to the city solicitor for instructions with regard to the seizure of them, they having been diagnosed by the Dominion Inspector as having actinomycosis. At the time they were in shipment to Montreal. The city solicitor had doubt as to whether the Act covered the cases of animals in transit. I was then informed and went to the Attorney-General's Department to get information. I was told the law was all right; that the person who had the animals in charge was responsible for them; that they were under seizure by the terms of the Act; and that it was proper

they should be seized. After a good deal of trouble, as you know, they having slipped out of my hands as far as Belleville, and subsequently to Montreal, I got them captured in the latter city and killed there. Now one of our difficulties at that time, and I think possibly still existing, was this: There was the old time meat inspector appointed by the city council, and he had charge of the inspection of the cattle market, and as far as I know these officers did not then, and I do not know that they do now, come under the direct supervision of the health officer.

Dr. SHEARD: No, they do not.

Dr. BRYCE: Now the appointee of the council at the cattle market is supposed to be there at all times that carloads have come in, and any animal which has actinomycosis or tuberculosis is supposed to be seized, and any injured animal is supposed to be sent to the knackers and so on. Now the whole safety of Toronto is dependent upon this one man's action, as far as I understand it, under possibly a committee of the council which has charge of the cattle yards. I know for a fact it is not an uncommon thing, even with the law as existing, to see cattle suffering from actinomycosis on the Toronto market to-day. I have been informed by butchers that such cattle do appear there yet, and I know from reports throughout the county that many such are being constantly sent out of the districts, and shipped away on trains to destinations that are not always known. It seems to me that under such circumstances some very decided course must be pursued both inside and outside Toronto, if we are going to do anything in this matter at all. In Toronto the question is more difficult to deal with, owing to the fact, which is encountered elsewhere from my observation in the municipalities, that butchers and drovers form a very important element in many of our municipal councils. They are positive men, and evidently take a *positive* interest in public affairs. Now I have been told by butchers that they find it very difficult to get near the original shipper or introducer of cattle in Toronto. There is a certain set of men who get in between the shipper and the butcher, and the latter finds it is very difficult to purchase the best cattle, directly, and he has to take them pretty much as they are handed out to him. More than that two

or three have charge of the slaughter building on the grounds, and this building is the one in which cattle injured on the trains are slaughtered, and the meat from it is put on the market on a level with all other meats, so that the retail butcher does not know—has no power of knowing, except from his own individual observations—which class of meat he is getting for his customers, even although he is very anxious to learn, which I am not sure is always the case. Within the last two weeks a slaughter man got into trouble, I think with the city authorities, for killing an injured animal, and putting the meat on the local market. It occurred to me to enquire how it was an injured animal could get out into the township of York possibly away from the cars, there be slaughtered, and sent in as injured meat. I am not acquainted with the machinery of inspection but I understand that animal was brought into the city as slaughtered, was found to be injured, and the meat was confiscated. Now if that was the fact it would seem to me that at the yards, or where the cattle come off the train, was the point where that animal should have been dealt with and set aside. I only speak with regard to the general facts. I know of the Toronto cattle market, and the need there is for thorough reform in the whole proceedure. As Dr. Sheard has informed me, and I understand it to be so, the matter is not to-day, after ten years of health officership in the condition it ought to be.

Dr. CASSIDY: No.

Dr. BRYCE: We have in Toronto to-day this state of affairs: that no one of us can be sure that an animal has been brought either from the surrounding country or on the trains, and has been subjected, after death especially, to any sort of inspection which will insure to us that the meat is not affected with tuberculosis or actinomycosis, or that the meat is not that of an animal killed when dying from an injury. If these difficulties exist in Toronto where we have certainly money and men enough to do the work of inspection, it is quite plain they exist outside of the city to an increased degree. The health officers everywhere in the Province inform me that these animals are being slaughtered locally, and disposed of in the next town. We all know from what has been described here, the con-

dition of the slaughterhouses themselves, and I do not conceive to-day that we have any question bearing so closely upon the work of the association, of more pressing importance—not even milk, and milk is better handled than it was years ago—than this question of meat, not only in the feeding of it, but especially in the handling of the animals, when they come to be put on the market for slaughter. With regard to tuberculosis, most of you know the results of the last commission published this year in England. They only point out the absolute danger of tuberculosed meat, even although they point out that the muscles or lean meat in many cases might be used.

I will not proceed further, but I trust we shall, after further discussion have some resolutions taking positive shape in this matter, to be submitted possibly to-night at the public meeting, and that we shall not rest until municipal inspections of meat are on such a basis that we may have a reasonable certainty, at any rate, that we are not eating either diseased meat, or meat improperly killed.

Dr. SHEARD: It is true as Dr. Bryce has said, that in Toronto the duties of inspecting markets and meat are combined and that the inspector is not under Medical Health Department, although I think it would be better if he were. That official inspects the markets, and he has the licenses under his control, and therefore it is contended it is more easy for him to inspect the meat. In reference to the case of the animal that was slaughtered, to which allusion was made by Dr. Bryce, that animal died or was injured on the train. It was slaughtered by the men in the car, and prepared as if for the market. It got down to the Don station, or possibly beyond that and was seized. That would be unavoidable in any case. It was not slaughtered in the market, nor was it at the market at all. I heartily agree with what Dr. Cassidy has said. I think the construction and equipment of one or two abattoirs—say one in the eastern and one in the western portion of the city—where an inspector would be constantly in attendance, at all events during the hours when slaughtering was permitted, would be a very desirable thing. By this means you would be enabled to close up all the slaughterhouses in the vicinity and thus get rid of a nuisance, and you would

have a careful inspection of meat, its preparation and its handling prior to sale. Another difficulty we have to deal with is the case of the farmers bringing in a couple or three carcases on sleighs, or selling them in the public market, or on the street as they come down. That is a difficulty I think which it would take a very practical arrangement to overcome.

The question was raised about the inspection of meat for export. Surely that is not the duty of the municipality, but of the Government. It is surely the duty of a Government to protect its exports and the trade and commerce of the country, and I trust any recommendation by this association will be in the form of a request to the Government or Legislature concerned rather than to the municipalities.

Dr. DEAN: I would like to say a word or two about cheese factories. In the district of one of these I pointed out that fifteen cases of diphtheria had occurred. The ground around the factory was filled with putrescence where the whey had soaked into the earth. In one of the dirtiest mud holes around that factory I found the regular Loffler bacillus. Some I also found in the throats of children three and four miles away. I did not then know as much about the cheese question as I know now, or I would have tried to find it in the cheese. The first case that took the diphtheria was within about three rods of the hole I spoke of. In the case of the other factory to which I referred, there were any amount of hogs close by it, and you will not think me egotistical if I tell you I found a regular Eberth's bacillus there. With regard to the maintenance of a strict inspection and the enforcement of proper sanitary regulations, we have not in the rural districts the same machinery at our hands that Dr. Sheard has in Toronto. You will have trouble in this way. We say to a cheese factory: "You are perpetrating a nuisance." The case comes before a magistrate who has the milk of twelve or fifteen cows going into that factory. He is not going to pronounce it a nuisance. You see the difficulty. We must have a law saying to a cheese factory: "You must either clean up or shut up." If you will only do that we will keep our part of the country in proper sanitary condition.

Dr. HUTCHISON: I would like to illustrate the difficulties health officers have to encounter in the inspection of animals after they are killed. In London, a short time ago, we had some beef condemned on the market. I seized the meat and examined it, and had a bacteriologist examine it, and found it was good looking meat. Rumors got out shortly after this meat was sold that it was cancerous. We conducted an investigation and examined witnesses, and it was shown that this cow had had an immense cancer just near the anus. A local butcher bought it from a farmer for $2, and he sold the beef at $5 a quarter. The local butcher hired a man to kill the beef, and the man when he came near the beef was rendered so sick by the horrible stench coming from the cancer that he vomited, and had to relinquish the task. The cancer was cut away from the cow—I saw the place where it was taken out—and the beef was sold. Now, we could not find anything wrong with that beef, and these rumors did not come out until after we allowed the beef to be sold. I merely mention this to show how necessary it is that animals should be inspected before death.

The CHAIRMAN: Dr Hutchison's experience is a little different to my own. In Chatham a short time ago it was reported by the Harwich health officer that an animal was slaughtered and sent into a butcher's shop; that it was supposed to be healthy, but that it had a lump on its jaw. Our inspector went down to the hide factory, got hold of the lump, and brought it into the magistrate's room where the case was being prosecuted. The stench from it was pretty bad, and the presence of that lump had a great deal to do with obtaining the conviction of the man offering the meat for sale, who was fined $50. There is a great deal in having the right kind of magistrate to adjudicate upon a case of that sort.

Dr. SHEARD: Hear, hear.

The CHAIRMAN: And a great deal in making as good or as bad an impression as possible for the culprit. This meat question has to me another phase that has not yet been brought out in the present discussion. In the neighborhood of the baby city of Chatham, you all know, we have excellent grazing grounds, and we raise a great many cattle, but it is a notable fact that our markets are supplied

with a very inferior quality of beef. The shippers manage to buy all the best cattle because they are willing to pay better prices than the local butchers. The consequence is the best cattle are shipped away, and we have to take the poorer animals, and those that are diseased. That phase of the subject has been brought so prominently before the police magistrate that many of the members of our health board are making a strong effort now to establish a public abattoir. I mention this fact simply to show that the baby city is making efforts to do what Toronto, I am surprised to learn, has neglected to do—to establish a public abattoir.

Dr. BRYCE: I have thought that, taking the Toronto cases as a sample of the old-fashioned way of dealing with this matter, the Act provides, even now I think, a means by which the boards of health could deal more directly with the slaughterhouses, and even the creameries, than we have been accustomed to think it can. Supposing we take the sixty-third clause, which says that no person may establish any business within the municipality without its being licensed by the council, and even then it comes under the general rules and observation of the board of health. We have the right under that to control all classes of industries which are offensive or which may become offensive. It seems to me that clause is a very good general clause, under which the board of health could directly deal with almost any one of these food-producing industries. If we turn to the ninety-ninth clause of the Act, and the amendments which we have added to it, it says that "any medical inspector or health officer may, at all reasonable times, inspect or examine any animal, carcase, meat, poultry, game, flesh, fish, fruit, or vegetables, prepared for sale or intended for sale, and the proof that such was not intended shall rest with the party charged." While we want the abattoirs, that would be only one method of carrying on the inspection. It does seem to me that even to-day we are in a position to act. The cheese factories state their class of industry, then they come under the supervision of the board of health and require to be licensed. If the license is given on the condition of regulation, then the board of health is the party to regulate them, and if the factories

are not satisfactory the board can close them down. That, as I understand the law, would be very effective unless the council said: "I will establish it and your board of health must regulate it."

Dr. SHEARD: It has been proven in court lately that a license once granted cannot be revoked. We had it tried in the city of Toronto on two occasions.

Dr. BRYCE: Before a police magistrate?

Dr. SHEARD: Yes, and it was appealed and taken to a higher court; and it was held that once a license was given it was the business of the authorities to put the law into force with reference to controlling and regulating; that the privilege could not be revoked; that the municipality had no power to withhold a license unless they could show sufficient reason to satisfy the court. The question was raised in reference to a license granted to a restaurant, which comes under the same meaning, so I am advised. The license granted the restaurant was revoked.

Dr. BRYCE: Was that a liquor license?

Dr. SHEARD: The restaurant sold liquor, and it was held by the court that a license once granted could not be revoked, but that it held for the period granted. I had the same matter up before the city solicitor's department with reference to the dairy business, in cases where milk was found to be below the standard. We were advised not only by the city solicitor's department, but by outside legal opinion: "You have no power to punish by withdrawing a license." Your course is to bring the person to the police court, convict him on evidence, and have him fined. So with regard to a nuisance, you must specify what the nuisance is. It is a matter purely of evidence, and you have got to give the license, if it is applied for, or else give substantial reasons to show the court why it should not be granted. Then after the granting of the license if there is a nuisance you have got to show the nuisance exists and have the offender punished in accordance with the Act.

Dr. FEE: With reference to diseased cattle I cannot for the life of me see how it is a city like Toronto should not have public abattoirs. I cannot understand how it would be possible, in every

instance after the animal was slaughtered, to know whether the food was wholesome or not. For my part I knew some years ago of butchers having taken cattle to the market that had died after having been sick for some length of time. I would like to know how we are going to detect whether that meat is wholesome after it has been prepared and sent to market. I would certainly say the meat of an animal which had died and been slaughtered in such a manner would certainly not be wholesome. Reference has been made to cancer. I remember seeing a cow that had a large cancer under its jaw. It suffered that way for a very long time. That cow supplied milk, and the question that came to my mind was whether the milk of an animal suffering from cancer was wholesome or fit to be used.

Professor SHUTTLEWORTH: I would like to enquire does actinomycosis injure the meat or milk of a cow. As I understand the Public Health Act relating to cities, a medical health officer has no power to interfere with any animal suffering from actinomycosis unless the meat or milk is offered for sale. It does seem a little arbitrary to take and destroy that animal when the meat is not exposed for sale. With regard to the establishment of public slaughterhouses it appears to me to be the only way of controlling the supply of meat. To inspect a market by walking up and down and looking at the meat is utterly impracticable, but by the establishment of public slaughterhouses I believe the supply could be controlled.

Dr. BRYCE: Referring to this matter of actinomycosis, when named in the Act the disease had cropped out in a number of districts in the country. Very little was known about it until that time. What its relations to tuberculosis were, were only beginning to be regularly defined, some eight years ago. It was called the *wasting* disease in England, and that was all they knew about it. Then when the discovery of the fungus, or the lump in the bone, was made perfectly clear, the relation of that to the disease had to be perfectly established. One thing that has been, I think, sufficiently established for our practical work is this: that if the disease has got

firmly localized in a tissue very soon thereafter the animal begins to waste, when what we may style pyæmia begins to prevail. Pus will accumulate locally in an abscess, and the process goes on of general absorption and general wasting. I do not know what the opinion of others is, but I think the general opinion in Germany and England is that at that stage, at any rate the meat, no matter what the pus is from—whether actinomycosis or any other disease—cannot be considered wholesome. I do not think you can assume the disease is not infectious, because my information from different parts of the country is this: If it has got on a farm, an animal rubbing against a post, for instance, where the abscess is on the outside, will leave some discharge on the post. Other cattle in the barnyard will go and rub there, and whether it is infectious only by food or not, we do know that some farmyards will produce a disproportionate number of actinomycosed cattle. I think so far as practice goes we had better in the meantime leave the Act as it is.

Dr. VAUX: I was very glad to bring out remarks made by other members of the association with regard to the further inspection of meat. I quite agree with what Dr. Sheard and others have said with regard to the necessity of having public abattoirs. There is very little meat sold in the town of Brockville where I live, except that brought from the west, and if we knew this meat had been subjected to a critical examination before killing, it certainly would be very pleasing to us. I thank the association for the kind manner in which they have spoken of the paper.

Dr. KITCHEN: I am rather timid about saying anything further upon my paper, as we have taken up so much time. It is hardly fair to others who come after us with papers. There are one or two points, however, I would like to make a little reference to. With regard to the class of animals, I did not wish to enter into the debatable ground of "kind," but as medical men are frequently asked what kind of cattle are the best it might be well to be decided on the matter. It is not the kind of cattle, whether Ayrshire or Jersey,

but whether a cow is healthy and gives the greatest quantity of healthy, paying milk; and if a dairyman is looking out for the health of the people, and for his own pocket, he will select from his own herd the cows that give the greatest quantity of butter-fat milk, and lead to the slaughterhouse those that do not give milk in proper paying quantities. There is another matter in regard to the purity of creameries, etc. If you can touch the dairymen's pocket you will reach the right spot. Nothing will touch him so quickly as to show him that he is losing money by not being cleanly. What is wanted is that his butter shall be so put up that the buyer will say: "I want that man's butter; I know he has good cattle; his methods are cleanly, and therefore he has a good article." The dairyman will thus get a higher price for his butter. If that is brought home to him he will aim at cleanliness sooner than anything else.

Mr. W. F. Van Buskirk, C. E., Stratford, followed with a paper on "The Care of Our Public Water Supplies."

At one o'clock the meeting adjourned for luncheon.

Second Session.

The association reassembled at two o'clock, with the President, Mr. Ala Macdougall, who had arrived by the noon train, in the chair.

The President: I must apologize for my absence this morning. I regret very much I was detained in Toronto, and was not able to be with you at the opening of our meeting. I fear some mishap has occurred to Rev. Monsgr. Farrelly, who is not here to open with prayer. I see the Rev. Mr. Carey is present, and will therefore ask him to be good enough to open the proceedings with prayer.

After prayer.

The President said: I regret to say that Dr. Powers of Port Hope, who was to have read a paper at this morning's session, is not able to join us. We hope to see him later on at the meeting. The

first paper at the present session is "Purification of Water and Sewage by Filtration," by Dr. D. J. Macdonald, Chairman of the Provincial Board of Health.

The PRESIDENT: I think it would be better to read two or three of the papers before we have discussion, as the subjects are so closely allied to each other that discussion would naturally follow in the same lines for each one of them.

Mr. C. G. Horetsky, C. E., of the Public Works Department of Ontario, next read a paper on "Methods of Disposal and Purification of Sewage in Public Institutions of Ontario."

At this point Rev. Canon BURKE explained that he would be unable to fulfil his engagement to open the evening meeting with prayer, and he asked Rev. Rural Dean Carey to kindly undertake the duty for him.

Rev. Mr. CAREY replied that he would be most happy to do so.

Mr. W. C. CHIPMAN, C. E., Toronto, followed with a paper on "Progress and Practical Success of Separate Sewerage System."

Dr. MACDONALD during a pause in the proceedings, asked permission to move that the Mayor, City Council, and Clerk of Belleville, be made honorary members of the association. Dr. Kitchen seconded the motion and it was carried with acclamation.

Mr. HENRY CARRE, C. E., was then called upon for a paper on "Drainage and Disposal of Sewage."

Mr. CARRE: Unfortunately I lost the copy of the paper which I had prepared, and had to sit up all night trying to prepare another from memory. The only point I wish to make is as to the cost of proper sewage. It is supposed to be an enormous expense on each individual. I will shew it is not so great.

The discussion was opened by Dr. Cassidy who, in the course of his remarks, advocated the adoption of the "Amines" system for the dispcsal of sewage. Speaking as a sanitarian, one of the points that struck him most in connection with this system was that the sludge which was so difficult to manage in connection with other systems

for the disposal of sewage, with the Amines system was quite easy because it was not offensive. Under all other systems of which he had read or heard, the sludge was always more or less disagreeable and offensive. The necessity seemed to be apparent therefore of putting it away from places that are habitable, or else getting the sludge in such a shape by previous preparation that it could be readily disposed of by filtration. Concentrated sludge, or at least concentrated sewage could not be applied very easily to any kind of land. He would like to hear what the engineers had to say upon that point.

Dr. VAUX observed that after an experience, extending over ten or twelve years, of the *separate* sewerage system in Brockville, one was able to speak with a certain degree of assurance. Brockville felt a little proud of the fact that it took the initiative in introducing the separate system into Ontario. He had now to state that it had been a perfect success. When he said that, however, he did not mean that there were not some parts of the system which they would not improve if they had to construct it over again. In a place like Brockville where they had no further concern with the sewage after it left the pipe, the fact of its being wholly diluted was of no consequence, and on one or two occasions after very heavy rainstorms and the water had got into the sewers there had been an overflow. With that exception he thought they had had perfect satisfaction with the system.

Mr. H. J. BOWMAN, C. E., said he could bear out what Mr. Carre had said upon the economy of the separate system as regarded both the town and the household.

Mr. VAN BUSKIRK pointed out that according to the experience in Massachusetts there was no difficulty from the sludge, or from the sewage clogging the filter beds if it was properly handled.

Mr. BOWMAN thought the character of the sewage was the first question that presented itself in discussing the disposal of sewage on land. Different towns had different kinds of sewage. In Berlin

they had no trouble whatever in disposing of the sewage proper from the town. The only trouble they met was in disposing of manufacturing waste, and refuse from tanneries, woollen mills and so forth. There was no difficulty in running house sewage on to land, but with the refuse from factories and manufacturing works they might expect the ground to get clogged up in time, unless preventive measures in the shape of ploughing up the land and working it were resorted to.

Mr. CHIPMAN, speaking with reference to the filtration of sewage, said that when in Massachusetts last year he examined the beds he found in some places they were not in a sanitary condition and were very offensive. That he believed was attributable to the inattention or inexperience of the men in charge, because in an adjacent town where a similar process prevailed, everything was in perfect order, and there was no offence whatever. As much depended upon the men in charge or the quantity as upon the character of the sewage. With respect to methods of disposal, he preferred to see the sewage hastened on its way to decomposition rather than to have it retarded. He thought the proper way was to send it on its ultimate destination as soon as possible. It should be applied as soon and as expeditiously as possible to land far from where any damage or nuisance could be created. He desired to submit a question which had been asked him no longer than a week ago by a medical man. It was this: Does the continued and constant use of hard water tend to increase any of the diseases of the organs of man, or tend to form, within the arteries, carbonate of lime?

Dr. BRYCE replied that so far as the amount of lime in any class of water that any one person was likely to take was concerned, it would seem to be true, if compared with the ordinary amount of lime solids in his total food, that there was no evidence of any harmful results coming from it. Twenty years ago he analyzed the water of the town of Guelph, coming off limestones, which was always a hard water relatively, and so far as he knew there had never existed in the

district any disease which would lead to the conclusion that lime had anything to do with it. The origin, so far as he knew, of the theory that lime solids in excess were prejudical to health, as taken in water, was derived from the existence in the mountains of Switzerland of that unfortunate class of semi-idiots, *cretins*, who inhabited some of the valleys. It was understood the cretin was a semi idiot and that goitre was a very common part of his disease. It was supposed the lime solids in excess in the water had been a very important factor in creating this unfortunate disease. In later years it seems to have been shown that the water of these valleys was not at all different from that in the other valleys. The valleys inhabited by the cretins were on the north slopes of the Alps where the rays of the sun did not penetrate readily as in other parts, and where a dull, damp, unwholesome atmosphere invariably prevailed. Since it had been shown that similar valleys, except in so far as position went, had the same kinds of water, but no cretins, it was supposed the atmospheric conditions and not the excess of lime, formed the real cause of the development of this peculiar species of human beings.

Mr. THOS. WILLS then spoke upon the imperfect system of drainage possessed by the town of Belleville.

Mr. W. R. AYLESWORTH urged that before permission was given any city by the Provincial Board of Health to construct waterworks, the latter body should see that a proper system of drainage was provided for at the same time. He was not authorized to speak for the city of Belleville, but there was no complete supervision of the drainage system.

The President spoke of the extreme importance of the question of the filtration or purification of water supplies. In many places some form of dealing with this matter was forcing itself upon their attention. Last year when the association met in the city of Chatham the question of the water supply was a very important one. The supply at that time was limited and it was a question between the waterworks company and the corporation of the city, as to how

that was to be increased, and after much negotiation backwards and forwards the former eventually went to the river Thames and brought the water from that source into a large filter. As far as his information on the point went, he understood the system was one of filtration with sand of a particular nature brought from the United States. The water was treated by alum in the ordinary way, and when it passed through the filter, it came out into a large receiving well or tank, from which it was pumped into the water mains. The water supply was carefully examined by the board of health, proved satisfactory to them, and the board's certificate was given that it might be used. With reference to the point raised by Mr. Chipman on the hardness of water he had given considerable thought to the matter, and hoped at some future session to present to them another paper in continuation of the subject "Deep well supplies," with which he dealt last year. It was a question to which they might very well turn their attention. A large number of Canadian waters were very hard, and those not hard were more or less of a mineral nature. Moreover in many of their water supplies sulphur was very largely present, and the question was how far some means might be taken for the purification, and also for the softening of the water. The President th n went on to deal with the question of the disposal of sewage. He described the method pursued in the cities of Glasgow and Edinburgh. In the former city, works had been constructed for the northwestern district at an immense cost. These were capable of treating every day four millions of water. The treatment there was by lime and the same conditions to which reference had already been made, viz: refuse from tanneries, gas works and dye and woollen works were dealt with. Experience had shown that by increasing the quantity of precipitate put in, they were able to treat the conditions of the effluent matter as presented to them, and there was not a single day in which the preparation of the sedimentary matter was not altered. The system in vogue in Edinburgh was that of irrigation, and the sewage of the city was simply emptied

out of the sewers straight on to the grass. The whole object was irrigation, and the grass grew very well. The land was parcelled out and sold to dairymen who cut the grass and fed their cows with it. No case of diphtheria however had been proved to be connected with the milk from those cows.

Rev. Dean CAREY asked for an explanation of the powers of the Province in regulation of the disposal of sewage in rivers and streams.

Dr. BRYCE read the clause of the new Act forbidding the construction of a sewer or a system of common sewers, until communication has been had with the Provincial Board of Health, and plans and connections for such sewer or sewers has been submitted for the board's approval. He went on to say that in carrying out a general system of sewerage, the town council and officers had to begin the work of educating the public to the idea of its importance and necessity, and convince them a moderate amount of money must be voted for the purpose. The matter was then in the hands of the ratepayers, and no scheme which involved a large expenditure had been found possible during recent years. The question presented itself what method can be adopted by which the system, so far as it went, could be instituted at a minimum expenditure. That necessarily involved the question of where the sewage was going to be placed. The question came at once to the Provincial Board of Health, and that was where the important point came in; what effect upon the public health would the disposal of this particular sewage have. The board desired to be as practical as possible, and had endeavored in every case to enquire whether the temporary use of a stream was going to prove a pollution in the practical sense of the term. The board had thought it well in a number of instances to say to a town: "You can utilize a local stream in the meantime during the progress of construction, but you must remember you will be responsible for any damages, that can be shown to arise, to health, or property, or

cattle, from the pollution; and furthermore at any time when this can be shown to have arisen, the Provincial law requires, when demanded by the board, you will introduce a system for the disposal of the sewage."

Mr. H. J. BOWMAN read a paper on "Possibility of simple and safe house plumbing."

Dr. BRYCE said the association owed Mr. Bowman a very great debt of gratitude for his illustration of what could be done simply and yet effectively, and what could not be done effectively some times, even with a great deal of trouble and expense. Mr. Bowman's paper had been a very great object lesson to all of them, and illustrated how

"The thoughts of men are widened with the process of the suns"

as the Act was framed in 1884, and Mr Bowman's criticisms were made in 1895. There were at the time the Act, with the by-law attached to it, was made, divergent views as to what was the best method of house plumbing. The method illustrated in the diagram in Schedule A was at that time looked upon, in most respects, as fairly satisfactory and it was certainly in advance of the old methods of plumbing, even as they existed in Toronto. The Provincial Board, however, had long since seen the necessity for more modern and more simple methods of plumbing, and in the annual report for 1889, if he remembered correctly, the model plumbing by-laws, such as existed now in Berlin, Brantford, Brockville, and other towns where the separate sewerage system existed, were printed in full. Mr. Bowman should have taken those to illustrate the present views of the board in the matter, and he would have found out they too had advanced beyond the stage of 1884. While this was the basis upon which, for instance, the Toronto plumbing by-law as it now existed, was made, section 113 of the Act made it apparent the by-law was in force in every municipality, only so long as the municipality chose to use it. The by-law might be by the common council altered, amended or repealed in every particular, not violating the

principles laid down, so that ample room was left for the growth of knowledge in this matter, and for the practical extension of it to their town plumbing. He was very glad the engineers and plumbers had led them along by model by-laws, and he should hope that when the next edition of the Revised Statutes was brought out, the Provincial Board would have the advantage of the practical knowledge and experience of the best of our engineers.

Mr. CHIPMAN was delighted to hear the paper that had been read, and also to hear the statement that there was a possibility at the next revision of the statutes of the adoption of something very different from the present plumbing by-laws. He must say that the code, with the explanatory rules, had been more or less of a stumbling block to engineers in getting practical rules carried out in the cities and towns. The present regulations had been pointed to as being the best there were, whereas it was the most expensive, most cumbersome and most ridiculous arrangement of pipes he had ever seen. There was no question amongst engineers but that the trap on the main soil pipe should be abolished. It was not being specified in any new works in the country that he knew of because the uselessness and the expense of it had been seen.

Mr. CASSIDY: It is simple superfluous.

Mr. CHIPMAN: It is worse than that, it is a danger. It prevents ventilation in your house system. It is of no earthly use. Take it up and examine it and see what it is. Mr. Chipman agreed with Mr. Bowman's statement that he would not allow the ventilator of any drain to be connected with the chimney. Lead soil pipes, he furthermore said, were out of date in this country, and were not being used in England. Cast iron soil pipes were now in vogue. Refrigerator wastes should not be connected with any drain, but must have a free outlet into a sink or something of that kind. He favored the wash out rather than the syphon closet for general use.

The syphon closet used more water, and if the syphonic apparatus got out of order it was not so easy to get rid of the contents of the bowl as it was with a wash out closet.

The PRESIDENT pointed out that the discussion had taken the turn very much of whether there should be a trap or no trap. So far as a public system of sewerage was concerned, it undoubtedly was an advantage to have no trap at all on the house drain, or anything whatever to interfere with the free flow of air through the sewer, through the house connection, and out at the top of the house. In the case of a system such as had prevailed in Toronto for a long time, the question of having a trap in was one of expediency, relative to the position of an individual's house and the inside finishings. "If you are going to have no trap," continued the speaker, "on your drain, then have an iron pipe through the whole length of your house, and avoid putting your drain under your house at all. Bring your drain straight down and take it outside your house just as quickly as you can, but do not carry it through the whole length of your cellar, simply because your cellar is dug out, and you are saving the cost of digging a little bit of a trench outside. This is commonly done, and it is a fatal mistake in house drainage to do anything of the kind." The speaker discouraged the use of a double trap, and advised if one trap was being placed on the sewer, to construct a manhole so that it could be periodically examined—at least once a year.

Dr. BRYCE believed in the absence of traps, but said that in a combined system of sewers such as that which existed in Toronto, the use of a single trap was made an unfortunate necessity for some time to come under present conditions. Until things could be so arranged in Toronto that they could drain their sub-soil water and roof water into a system of sub-soil tiles, he at present saw no possibility of getting rid of that unfortunate necessity—a trap on the soil pipe.

Mr. CHIPMAN remarked that he had designed and constructed sewers on the combined system, and also designed and put in plumbing, in which the roof water, cellar or sub-soil water and sewage.

Dr. BRYCE: And led them into the common drain?

Mr. CHIPMAN: Into one sewer, and we found no difficulty about it.

Mr. BOWMAN closed the discussion, and in reference to the most suitable form of closet said Mr. Chipman misunderstood him with reference to the syphon closet. He himself preferred the "wash out" closet.

CITIZEN'S EVENING.

The evening session at eight o'clock took the form of a public meeting at the Opera House, over which Mayor WALMSLEY presided.

Prayer having been offered by Rev. Dean CAREY, the Mayor read the following address of welcome to the members of the association:

MAYOR'S ADDRESS.

The President and Members of the Association of Executive Health Officers of Ontario.

GENTLEMEN,—On behalf of the citizens of Belleville and vicinity, I extend to you a cordial welcome and greeting, on the occasion of your gathering in the City of the Bay.

I trust that your reception, and the impressions and recollections that you may carry away, will be such, that your visit may be reckoned among the most pleasant of your annual re-unions; and that the nature and result of your deliberations may be most profitable to yourselves, and to humanity, in the interests of which you are assembled.

Your association can and does wield a great influence, not merely in devising means for the prevention of infectious, contagious, and

insidious disease, and the preservation of health; but also in moulding public opinion, and securing the introduction, and enforcement of those beneficent laws, without which, individual effort would be of but little avail in large communities. Year by year you are causing people to realize the sacred trust imposed upon them generally; and upon municipal and representative bodies particularly, in maintaining and protecting that life that has been committed to us so that our days may not merely be long in the land; but also that that vigor, and health, and strength, may characterize us as a people; the results of which will be even more apparent in the future than they are in the present.

There is no more important factor in the "building of the nation," than the caring for the health of the individual and the public; and the preventing of the crime of public negligence, in protecting the weak and poor, and ignorant, against the consequences of their own or others' neglect and indifference. The complicated and advanced state of society, especially in large cities, requires scientific sanitary treatment, to enable us to avoid the danger entailed by our disregard of the laws of nature; and it is a great privilege to have a body of men such as your association, deeply interested and well skilled, both through experience and education, to whom we can look both for advice and practical illustration; and for the carrying into effect of the measures best adapted to remedy the evils, and ameliorate the condition of all classes, whether in crowded centres of population, or in rural districts.

We have in Belleville, as elsewhere, such problems as permanent sewerage, and drainage, and the economical disposal of sewage and garbage, consistently with a good healthy water supply and adapted to our natural levels. We shall be glad of any suggestion which the members of your association may make, having in view our exceptional situation, our needs, and our advantages.

With perhaps pardonable pride, we invite your attention to our tree-bordered streets; to the varied beauties of our Bay of Quinte, spanned by our splendid bridge; to the rich agricultural country surrounding us; to our educational institutions and public buildings;

to our Hospital and Home; and to the mineral springs which have already benefited many and which promise to be the basis of a large sanitarium in the future.

You will find in Belleville a sympathetic co-operation in your work as well as that hospitality which we have not in the past been slow to bestow.

We assure you of our appreciation of the objects and aims of your meeting; and of your continued labors,—largely labors of love,—throughout the year in your several municipalities, which are all drawn closer together by united humanitarian effort such as yours.

Again we bid you welcome to our city; and trust that you may soon again re-visit us, and that your stay here may be mutually both pleasant and profitable to yourselves and to us.

JAMES E. WALMSLEY,
Mayor.

Mr. JOHN FROST, Chairman of the Board of Trade, read the following address of welcome from that body:

ADDRESS OF PRESIDENT OF BOARD OF TRADE.

Members of Executive Health Officers Association, Tenth Session.

GENTLEMEN,—Representing the business interests I gladly acquiesce in, and cordially emphasize the greetings and welcome to you, expressed by our chief magistrate, and trust that your visit and mission may result in all the success and satisfaction the most sanguine amongst you may desire. In view of what you have in your united efforts as an association already accomplished, I appreciate the honor of being able without reserve to commend your efforts and bid you God speed in your high endeavors towards securing the public health.

It needs but brief reflection to comprehend some, at least, of the obstacles to a right status of sanitary conditions. You probably have but a too keen realization of the many drawbacks—the physical

often more readily overcome than the mental or human. Let me remind you, however, that real progress in such matters may be best accomplished step by step—with the end in view—though not always fully reached. If, as a result of your successive conferences you should succeed in moulding public sentiment in the direction of your desires—sanitary-based as I believe they are on scientific truth—the achievement will bear abundant fruit.

It is my hope that in this your session in the Bay of Quinte District you may meet not only no discouragement but be strengthened in your highest endeavors. Indeed I cherish the belief that the outgrowth of these yearly conferences will be multiplied achievements and successes, to the extent it may be of reaching a product of manhood surpassing, if possible, the best of all lands.

As Canadians we may well be encouraged to proceed; already the name is not without renown. In the arena of patriotism and statesmanship there are names honored in history and revered in memory. In arts and sciences good progress is being maintained. In the varied callings, professional and trade, there is sustained a high standard of integrity and a vigorous enterprise, but amidst all the activities there is thankfully enjoyed a trafficless, restful Sabbath. Should we not reasonably expect that Canadians shall continue to win eminence and renown, but the greater prize, not least among the rewards, is that well disciplined condition within, which makes prize winning possible, making steady the hand, keeping clear the brain, and filling the heart with good will and lofty purposes.

JOHN G. FROST,
President of the Board of Trade.

A third address from the Board of Health was read by Dr. TRACY :

ADDRESS FROM LOCAL BOARD OF HEALTH.

BY R. TRACEY, M.D., M. H. O. BELLEVILLE.

Mr. CHAIRMAN, LADIES AND GENTLEMEN,—On behalf of the local board of health I extend to you a hearty welcome to our fair city, and trust that we all may be benefited greatly from your meeting here.

Health matters have not received that attention in the past, which, from their great importance, they deserve.

The sanitary improvements of a city ought to take first rank in the deliberations of our city fathers; then, if these improvements are first-class, manufacturers, merchants, home-seekers and pleasure seekers will be drawn, as a natural consequence, to make their homes where the beauties of nature, combined with an up-to-date board of health, backed by a wide-awake council, seek to give health, and consequently happiness, to their families and employees.

Our city has of late wakened up to the necessity of drainage, and is now pushing on the construction of sewers in the various parts of the city in connection with the plan of the general system submitted and approved of by the Provincial Board of Health.

Our waterworks supply is coming more into use, and the more the water is used the better it is liked. I hope soon to see the city have full possession of the waterworks, and so extend the system that every dwelling may have a good supply far all purposes. Our experience teaches us that with plenty of good water and good drainage nearly all the so-called preventible diseases would disappear. And now, gentlemen, not wishing to take up any more of your valuable time, I again wish you a hearty welcome to our city and a very enjoyable visit, coupling with these good wishes another one along the line of your gathering here, and that is, that all our city councils

may, by these yearly gatherings in our towns, be led to see that boards of health are not merely formed to be thorns in their sides for the purpose of squandering the funds of the people, but that they, with them, are joint custodians of the health of their fellow-citizens, though we may perhaps seem to be too quick sometimes to act on the theory that "Prevention is better than cure."

In reply the President alluded to the gratification with which the invitation to visit Belleville was received by the association. He pointed out that the object of holding meetings annually in various parts of the Province was to arouse public interest in the great and important question of public health, and as a result great good had accrued to the districts in which the meetings had been held. In the case of the city of Belleville there was no doubt at all in the minds of members of the association that they should receive a welcome similar to those which had already been accorded them in other places, and in the address which the Mayor had presented to them they saw the manifestations and expressions of opinion which they could expect to come from a large, and influential and intellectual centre like the city of Belleville. The address from the City Council he could assure them was very greatly appreciated. The members of the association knew when they came hither they would find a community thoroughly alive to all the important questions of the day, and that in the matter of public health, although there might be some points in which Belleville had advanced to the position of other cities, still there was no doubt the day would not be far distant when it would have all the advantages that would place Belleville to be looked upon as a healthy and progressive town. Reference was made in the Board of Trade address to questions of public health, and these were very important questions for a Board of Trade to take up, because they were very great factors in the commercial advancement of a town. The city of Belleville, and the district of the Bay of Quinte had for years and years held a very important position in the commercial advancement of the Dominion. Here

many years ago when barley was a great and important source of agricultural produce, the Bay of Quinte barley was famed all over the United States, and he thought he was right in saying that it used to bring the highest price in the American market of any barley sent over there. Owing to the vicissitudes of trade the district had unfortunately lost this very important line of industry, but its energetic business men had turned their attention to dairying and fruit growing, by means of which they were helping to build up the prosperity of Canada, and helping to make their names known in a very large and important market. In the address from the Board of Health the association recognized the close intercourse with themselves which they expected to find. He thanked them again for the very kind manner in which they had addressed the association and for the hospitable way in which the association had been received. (Cheers.)

The PRESIDENT then proceeded to read his annual address.

The SECRETARY (Dr. Bryce) said: I regret indeed that Dr. Coventry, of Windsor, will not be present to-night to read the paper set down for him on the programme, as the subject is not only of the greatest interest and importance to everyone, but that, in a peculiar sense, Dr. Coventry is particularly fitted to interest you, and give valuable instruction while entertaining you. There is some special reason for his not being present, and I crave special indulgence for him in his absence.

Dr. CASSIDY then read a paper entitled "How shall we best resist Tuberculosis."

Mr. J. JOHNSTON, County Inspector of Schools, Belleville, followed with a paper on the subject of "Progress and Hindrances thereto on the heating and ventilation of School Houses."

Dr. MACDONALD, Chairman of the Provincial Board of Health, being called upon, said: He was pleased to echo the expressions that had fallen from the chairman with regard to the reception that had been accorded the association. It showed an interest in the work

of the association which was very gratifying and encouraging to the members. It was not a pleasant thing to be continually hearing of one's health, and how we should avoid disease, but disease would come, and it was advisable, prudent, and necessary at all times that we should be prepared for its advent, and do all we could to prevent it. One of the last two papers read had treated of the fresh air that was necessary for health, and the other to the results of the lack of that fresh air. Mr. Johnson had thought it necessary to apologize for his paper by saying he had very little time to prepare it. He (the speaker) could only say for himself, and for all present, that if Mr. Johnston had had but little time to prepare the paper, he had shown all the more knowledge of the subject. Dr. Cassidy had dealt with a subject of more melancholy interest. It had its dark side and its bright side. The dark side was when he painted to them the old trouble of humanity which he called tuberculosis. It was the old, old story. They knew the disease in all its varied aspects as consumption. The brighter side turned to them was when they learned that instead of the disease passing down from parents to children, like features, there was really no case, the symptoms of which he had spoken of in a general way, but had begun by infection. Every case of consumption was a case of infection, and the next thing for them to know was how to prevent that infection. Dr. Cassidy proposed to establish a home for persons affected with tuberculosis, but there was one difficulty in the way of putting this proposal into effect, which however, might be overcome in course of time, and that was to provide sufficient homes for the accommodation of all persons suffering from the disease. The suggestion had been made that the Government should establish a home for consumptives in a distant part of the Northwest Territories. The Government, however, he need not say, were not prepared to undertake anything of that description. One great drawback was the great distance at which such a home would be placed, and the unwillingness that would certainly be found amongst the greater number of persons for whom that Home was

intended to go so far away from their friends. The opinion seemed to be entertained that such a journey would be felt to be the first step into the *dark valley;* whereas if the patients suffered at home there would be many to sympathize with them, and they would receive attentions they could not expect to get in an institution and at such a distance away. Going to the country was understood to be an excellent thing for the consumptives. Whether or not it was a good thing for the country was another question. Unless the consumptives were separated from the country people there would be considerable risk of introducing the disease in the country districts. Already they heard that the Board of Health of the American States to which many consumptives resorted in great numbers, was afraid that their country was becoming infected and that it would no longer be a refuge to people suffering from tuberculosis. He hoped the fear was not well founded, and that the country would continue to be a home for consumptives and a refuge to many people who, while they had given undoubted symptoms of the disease, had apparently recovered after the change, and had had the enjoyment of good health for a long time. (Applause.)

The meeting then adjourned.

Fourth Session.

The Association met at 9.30 a.m., the President in the chair.

Dr. Hall, Chatham, read a paper on "Practical Experience with Serum Therapy."

The next paper was read by Mr. J. J. Mackenzie, Bacteriologist of the Provincial Board of Health, on "Principles underlying Serum Therapy."

Following came a paper by Professor E. B. Shuttleworth on "Laboratory notes on the Bacteriology of Diphtheria."

The PRESIDENT: In view of the great importance of the subject treated on by the three papers we have listened to this morning, we cannot pass over a certain amount of discussion upon it. I regret to say our time is limited, and in addition to the papers yet to be read, one by Dr. Hodgetts, and the other by Dr. Bryce, we have also the report of the executive to receive and officers to elect. We have to leave the building by a quarter past twelve, and I understand the programme of the afternoon commences at 1 o'clock sharp. I shall therefore ask that Dr. Hodgett's paper be taken as read.

Dr. SHEARD expressed great gratification at the result of the experience of Dr. Hall and his confreres in Chatham in serum therapy. They were not however in accord with the results obtained in the isolation hospital in Toronto; in fact he might say probably they were at the opposite extreme. In the isolation hospital they had a fair experience in the serum therapy and in every case in which it had been used, and in which the diagnosis had been confirmed by bacteriological examination, they found it exerted no beneficial influence, so far as could be seen, upon the rate of mortality in a given period. More than that, he thought he was justified in saying that serum therapy could not be applied in every case without care and consideration, and without some degree of risk. In some cases he had seen such cardiac depression in connection with its use, as to render its administration questionable. In reference to the diagnosis he took it that the majority of Dr. Hall's cases had been those of true diphtheria, but he submitted that some of the cases which had been included had not been those of true diphtheria. It had been shown that out of 188 cases treated at the isolation hospital, 27 per cent. had been simply tonsilitis. He himself had seen cases in which it was impossible to tell from an examination of the throat whether it was diphtheria or not. A bacteriological examination was required to determine the question, and in the absence of such an examination, any results they might have must be taken with some degree of caution. One death in 39 cases was a remarkable showing which

surpassed any results he was aware of, even in Paris amongst the most ardent exponents of the anti-toxine therapy. There was this fact to be remembered however, that not only did the virulence of the diphtheria epidemic vary very materially, but it also differed in different countries and different cities. Take our own experience in Toronto apart from serum therapy altogether. They had had a variation in the rate of mortality as low as 14 per cent., whereas in the Paris hospitals the rate of mortality had been given at 60 per cent. He might say as far as the isolation hospital was concerned they had now discarded the use of anti-toxine, unless specifically requested to administer it by the attending physician and the parents of the child. He was fully prepared, however, to accept the present question of the anti-toxine as a curative remedy as one yet to be determined.

Dr. SHEARD went on to advocate the establishment in towns and cities of bacteriological laboratories where doubtful cases of diphtheria could be determined. He pointed out that by this means a saving to the municipality would be effected and prompt measures could be taken to stamp out the disease in its early commencement.

Dr. DEAN said it would take 48 hours to send to Toronto and make the necessary bacteriological examination in a doubtful case of diphtheria, whereas he could ascertain the fact for himself in a few hours. When he came across a suspected case of diphtheria he disinfected the several houses of the school section from which children had attended school.

On the motion of Dr. BRYCE it was resolved that the papers of Dr. Powers, Dr. Coventry, and Dr. Hodgetts be taken as read and inserted in the printed report.

On the motion of Dr. MACDONALD, seconded by Dr. HUTCHINSON, it was resolved that the constitution of the Association be so amended as to permit any of its members, whether physicians or otherwise, to be elected to office.

Dr. SHEARD then moved, seconded by Dr. CASSIDY, the following resolution :

That whereas it is the view of this Association that the maintenance in a wholesome state of the food supplies of this country is a matter of prime importance to the welfare of the people ;

That whereas it has been shewn that in the matter of the meat and milk foods there does not exist in present methods adequate provision for their inspection, so as to insure their being always placed in the market in a wholesome condition ;

That whereas in the papers and discussions presented before this meeting, strong views have been expressed as to the necessity for bringing the existing state of affairs to the attention of the several legislative bodies directly concerned in supplying adequate machinery for the scientific examination of our food supplies;

Therefore this Association does hereby instruct its Executive Council to take such steps as will bring the views of the Association before the several authorities, Federal, Provincial and Municipal, with the request that they give practical effect to such laws as now exist, and make such amendments thereto or pass such further legislation as shall serve to maintain and increase the wholesomeness of Canadian food supplies, whether for home or foreign consumption. Carried.

Mr. L. J. CLARKE then moved, seconded by Dr. CASSIDY :

That a committee consisting of Medical Health Officers, Dr's. Sheard, Griffin and Ryal, and Dr's. Macdonald and Bryce, President and Secretary, respectively, of the Provincial Board of Health, be appointed to draft a *Model Set of Regulations* for the cutting, storing and sale of ice for domestic and other uses, the same to be forwarded to all the members of this Association, and to be further considered at the next meeting of this Association. Carried.

Dr. SHEARD did not object to the resolution. The ice question was a very touchy one, and one of the most difficult subjects they had to handle in Toronto.

Dr. MACDONALD offered some remarks concerning the cutting of ice at Hamilton, after which the resolution was concurred in.

Dr. BRYCE then presented the report of the Executive as follows :

THE REPORT OF THE EXECUTIVE.

To the President and Members of the Association :

Your Council beg leave to report that since last annual meeting, there having been no special occasion for calling a meeting, none was held ; the place of meeting having been arranged by correspondence.

The Provincial Board of Health published, as per request, the Annual Report, of which 1,500 copies were distributed. The report made a most satisfactory volume, showing on the whole a high standard of health work.

The amounts charged against the fund in the hands of the Treasurer have been that of $50.00 paid for the stenographic report of the two last years' meetings, leaving on hand a sum of $161.00.

The Ontario Medical Association meets in Windsor in June of next year, and it is the desire of the Windsor Local Committee to have this Association meet there at the same time, and hold its meetings simultaneously with sections of the Association.

The Council recommends that the invitation of the Mayor and Local Committee of Windsor be referred to the Executive Committee.

All of which is respectfully submitted.

ALAN MACDOUGALL,
President.

P. H. BRYCE,
Secretary.

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

President—Dr. W. R. Hall, Chatham.

First Vice-President—Dr. Charles Sheard, Toronto.

Second Vice-President—Dr. T. V. Hutchinson, London.

Secretary-Treasurer—Dr. P. H. Bryce, Toronto.

Council.—Dr. J. W. Coventry, Chatham; Dr. M. McCrimmon, Palermo; Dr. R. Tracey, Belleville; Dr. J. J. Cassidy, Toronto; Mr. H. J. Bowman, C.E., Berlin.

The following motion by Dr. RAE, seconded by Mr. W. CHIPMAN, C.E., having been carried unanimously, the meeting finally adjourned:

That the thanks of the Association be tendered to the Mayor and Corporation of the City of Belleville for the use of the Council Chamber in which to hold this meeting, and for the pleasant excursion and banquet provided by the Board of Trade and Local Board of Health, for the address of welcome and for courtesies extended to the members of this body.

P. H. BRYCE,
Secretary.

Belleville, 15th August, 1895.

THE PRESIDENT'S ANNUAL ADDRESS.

By Alan Macdougall, Toronto, M. Can. Soc. C. E., M. Inst. C. E.

Gentlemen of the Association: It is now nine years since we received in Toronto a visit from the American Public Health Association; during the progress of this visit a number of executive medical health officers, and others determined to form an association for the purpose of meeting together annually, to discuss those important topics which have such direct influence on all questions of public health. The object was to constitute an association of medical officers, with an associate class for those engaged in executive health work, who were not medical health officers. The natural result of this would be an expectation to see the presidential chair always occupied by a mdeical health officer; and yet, before the association is 10 years old, two engineers have occupied that honorable position. Before I go further, let me express my sincere thanks for the honor you have conferred on me, personally, by placing me in the chair, and on behalf of my profession give utterance to an expression of thanks to the medical profession, that they have paid such handsome tribute to the services rendered to the cause of public health, by my profession; it is a forcible demonstration of the good will existing between the professions, which is sure to be cemented by these acts of courtesy, and tend to draw us closer, as comrades in our battle against disease. We are workers in the same field; the duties of the medical health officer bring him into frequent contact with practical engineering questions, in which advice is sought from us, and, I hope, always is cordially given, for we, in our turn, require frequently to be advised on the pathological conditions of many subjects on which the information is always cheerfully supplied to us by our medical friends.

We are in the happy position of having passed through another year of good health in this Province; no serious epidemic has visited

us from foreign lands, nor have any complications or troubles over quarantine matters arisen between us and our neighbours to the south.

The most important cause of anxiety during the year which has passed since our last meeting has been an outbreak of smallpox, which was imported into the northern portion of the Province bordering on the lake. It was imported in some vessels sent for the conveyance of lumber from the American side. The chief centre for infection appears to have been in Detroit, where considerable laxity and want of organization seem to have reigned in the health department; several cases which occurred in the western part of the Province have been traced up to that city as the infecting centre.

Diphtheria appears to have been unusually prevalent in the fall; there were three centres existing in the Province. The number of deaths at Creemore, Warren in Nipissing, and Mattawa were too large in proportion to population, and caused the Provincial Board a good deal of anxiety. By enforcing rigidly the powers entrusted to them, the board confined the outbreaks to the centres in which they originated.

It is very gratifying to record the decrease in the number of deaths in Toronto from this fell disease. In 1893 the death rate was 18.32 per cent., and in 1894 it was 9.60 per cent., a splendid tribute to the efficient administration of our respected medical health officer, Dr. Chas. Sheard.

With these exceptions no outbreak of any disease has been permitted to become epidemic in our Province. This we can attribute to the efficiency and admirable administration of our various health officers. I know of no other department in the whole public service which costs so little, and gives so much value for the small sums expended on it, as the service of our executive medical health officers. They are truly guardians of the peace, their deep interest in the work entrusted to them, and their faithful recognition of the responsibilities and duties entrusted to them are important factors in the promotion

of our public health ; the effective administration of quarantine tend as much to the maintenance of peaceful relations along our border line, as the most earnest efforts of our statesmen.

An Act to be cited as the Public Health Act, 1895, was passed in the last session of the Legislature which will have an important influence on the administration of the public health. Local boards of health, as well as the Provincial Board, have had their constitution amended and powers materially increased.

Section 39 of the old (1887) Act is repealed and in its place is a section dealing with the formation of boards of health. The new Act creates a continuity of the board; it provides that the members, other than the reeve and clerk in small municipalities, and the mayor only, in towns containing over 4,000 inhabitants, shall be elected for a period of three years, one member retiring in rotation each year in the smaller, and two in the larger towns.

Section 30 of the old Act which has reference to water supply, sewerage and sewage disposal, is so much amended as to constitute practically new legislation. It places vastly increased powers in the control of the Provincial Board, defines their powers in plain language, and makes it imperative that their sanction shall be obtained before any water supply or sewerage system can be introduced into a municipality or town. It also places in the board the responsibility of deciding upon the important question of stream pollution from sewerage. The board is now endowed with full powers to deliver a judgment on these important subjects, and from the wording of the Act, there ought to be no difficulty in accepting its authority.

Section 99 of the old Act, which deals with the examination of food, animal, fish, fowl, game, milk, vegetable or otherwise, has been remodeled by section 4 of the new Act, six new clauses have been added, the changes have an important bearing on the sale of food stuffs, and call for immediate and careful study on the part of all vendors of carcases, and municipal officers entrusted with the examination of the same.

The last clause of the new Act amends clause 61 of the 1887 Act, which deals with the power to proceed, where the cause of nuisance arises without the district, and empowers the district affected by the nuisance to institute an inspection, and when necessary, cause proceedings to be taken against the person creating the nuisance.

I commend this Act to the careful study of all persons engaged in executive health work.

The purity of water supply and pollution of water are points on which this association is directly interested.

The question of sewage disposal is closely allied to that of water supply; many of our rivers are supplying water to the towns situated on their banks, which afterwards return the water, in a polluted form, to the river. The subject is no new one at our meetings; many of our members have been officially and professionally employed, in striving to solve the knotty points involved in this problem.

We have considered the probable effects of sewage contamination on the waters of such mighty rivers as the Detroit and Niagara by the cities of Detroit and Buffalo; the position of the Toronto water supply and condition of the bay have been brought before us, and in many of our smaller rivers the same question has appeared.

Since our last meeting, a trial of formidable proportion, and certainly the most important case ever tried under the Public Health Act, with reference to the probable effect of pollution of a fairly large river, from the discharge into it of a comparatively small proportion of sewage, was tried at Peterborough, in October of last year. The township of Otonabee sought to enjoin the city of Peterborough from discharging its sewage into the river Otonabee; the case was tried before Mr. Justice Ketchum, as sole arbitrator, an immense interest was taken in the proceedings. The judgment is a partial one in favor of the city, permitting them to discharge their sewage into the river for five years before taking steps to render it innocuous.

This subject interests the engineer probably more than it affects the medical health officer or board of health, as the engineer has to be designer and adviser in the matter of a sewerage system for a town. In the case of Peterborough, I was the engineer, and the proposed outfall and mode of disposal was recommended by me and sanctioned by the Provincial Board of Health.

Paying a brief visit to Scotland in February and March of this year, I took advantage of the opportunity to ascertain the practice in the south of Scotland, where the provisions of the Rivers Pollution Prevention Act 1876, are in full force. Making inquiries along the course of that queen of rivers the "silvery Tweed," I discovered that no effort is made at any of the towns on its banks to purify the sewage and manufacturing wastes before they enter the river.

On a distance of twenty miles there are four large manufacturing towns, the chief of which, Galashiels, is noted for its immense woollen mills. The refuse and dye stuffs enter the Gala and Tweed without any effort being made to purify them. This is one of the most famous rivers in Scotland for salmon fishing, and the one in which the disease known as *saprolegnia ferax* is so abundant; despite this undesirable condition of pollution, the supply of salmon continues to be ample, the fishing lodges are eagerly sought for, and curiously enough the edible quality of the fish is not affected by the peculiar disease.

There is one small river in the county of Midlothian, the river Esk, into which the waste water from the paper mills is discharged. The effluent in this case contains a large quantity of acid and other deleterious matters; this river is most rigorously watched. There is an official guardian, a chemist of high standing, Dr. Stevenson MacAdam, who has power to enter every mill at any time of day or night, and take samples and make tests. Fines are imposed and exacted without fear or favor, and the condition of this river is maintained at a condition of almost normal purity.

So far as pollution to rivers in this Province has extended, I know of no case which can be cited against the active watchfulness and prudent care, and judgment, of our ably administered Provincial Board of Health.

On the subject of water supply the most interesting problem since our last meeting, is found in the city in which we met last year, Chatham. At the time of our visit the supply was deficient and the city was urging the Water Works Company to extend the supply. This has eventually been effected by the company's drawing water from the river Thames, and filtering it by the simple process of an alum and sand filter. The water has been carefully examined and accepted by the Provincial Board of Health. This is the most important instance I know of filtration by the alum process, in this Province. I hope we may have some information about it at some future meeting. The purification of water for domestic purposes, is practised to a great extent in Europe and Britain, and in many cases has proved successful and satisfactory.

Since our last annual meeting the Dominion received for a second time a visit from the largest and most influential health organization in the world, the Amercian Public Health Association of the United States of America, the Dominion of Canada and Republic of Mexico. Few of us in mentioning or thinking of this association bring home to ourselves the vast work in which the association is engaged, and the exceedingly important and powerful influence it exerts on our daily life. On this immense continent which extends from a few degrees north of the equator to practically the north pole, and from the Atlantic to the Pacific ocean, (a distance of eighty deg. of longitude) equal in extent to the continents of Europe or Asia, the influence of this association spreads over an area equal to the continents of Europe or Asia. About seven-eights of this area is occupied by two nations having a common language and brotherhood, with constant inter-

course and close business relations, whilst the United States on their southern boundary have an equal interest in the nation to the south of them. Under the close relations existing it is a matter of prime importance that the three nations should have a common cause in matters of public health, and it is a gratifying fact that this good feeling exists abundantly.

In each of the three countries there are important centres at which large numbers of immigrants reach the shores from foreign lands. It becomes a matter of supreme importance to have the method adopted for inspection, fumigation, disinfection with the other details, carried out upon some systematic arrangement, known and accepted by each of the other nations, so that the certificate of health from a port of entry in Mexico would be acceptable in Canada or the United States. You can readily understand the opportunities afforded to an immigrant train to spread the seeds of disease as it conveyed its passengers from Quebec to Detroit, or even from Buffalo to Detroit. Cases have happened and trouble has frequently occurred on these through trains where our efficient health officers at Windsor, in particular, have been able to prove that the suspicious case was a delinquent who had not been properly examined at some United States port, and that he did not contract the dangerous symptoms while passing through Canada.

There was fruitful soil for plenty of trouble in working out the administration of quarantine between the three countries. It can be affirmed on good ground for belief, that the American Public Health Association has been instrumental in uniting all persons engaged in the administration of public health questions in a common cause. The membership embraces all the leading officials in the service of each Government, as well as all the prominent executive sanitary and medical practitioners in each of the three countries named. I think we can assert that the influence of the association is one of the greatest factors for peace on this continent; and it is a happy result of the work of the association, that through its meetings an ex-

tended knowledge has been gained of the daily life of each country, and the requirements necessary under the varying conditions of existence. This has led to the establishment of a simple, effective and practical general health system, which is exemplified by our existing quarantine regulations.

The association has shown its appreciation of the Canadian connection by placing the learned and most efficient superintendent of quarantine, Dr. Frederick Montizambert, in the presidential chair, at the Kansas City meeting in 1891.

A part of the programme of the Montreal meeting was the visit to the quarantine station at Grosse Isle. The trip was a most valuable one, as it enabled a large number of officers and especially those in charge of quarantine stations in the United States and Mexico, to satisfy themselves as to the efficiency of our quarantine system ; there was an unanimous expression of satisfaction at the splendid arrangements and the efficiency of the department. On the return of the party most flattering resolutions were passed in praise of the Dominion Government for its efficient arrangements,—and for the effective administration of the department.

The appointment of a committee for special investigation in the bacteriology of water supplies formed an important part in the work of the association.

The committee met immediately after its formation, and before the meeting adjourned had outlined a programme, apportioning the work as well as possible under several branches. Each of these branches thus became a sub-committee, to which the various investigators attached themselves according to the line of research in which each was individually concerned.

A meeting of this committee was held in New York, on the 22nd May ; there was a large attendance, which included the foremost bacteriologists on the continent. The addresses at the meeting, with the discussions following thereon, were of immense value to those

present. A prodigious amount of work was performed; no report can be issued for some months, consequently the record of this vast amount of research, so freely undertaken, and of time ungrudgingly given, must remain for the present unacknowledged.

It afforded me great pleasure and gratification to be able to be present and represent our association at Montreal.

On looking over the records of the association one cannot help noticing that no woman has ever contributed a paper, or taken part in any of the discussions at our meetings. This is a curious coincidence when we call to mind the large amount of work carried on by women in matters affecting public health. We have rather overlooked this valuable branch of our work, the membership and authorship of papers read at our meetings has been too closely confined to the sterner sex. On looking into the constitution there seems to me to be sufficient provision to allow women engaged in "executive health work" to become members. In the large list of graduates, as well as in the experienced superintendents of our hospitals—we have an ample supply of experienced and capable sanitarians who ought to be asked to join our association, and give us the benefits of their experience by placing the woman's side of many health questions before our meetings. The "new woman," as she is termed in the parlance of the day, has demonstrated her ability to manage public meetings, the well established excuse "unaccustomed as I am to public speaking" cannot now be received from her. This meeting is to take away the stigma, for I am glad to learn we are to be favored with a paper from the Lady Superintendent of your hospital. Our rules make provision for the membership of persons engaged in executive health work, we have too long been without the assistance of the gentler sex. I hope this meeting will mark the entrance of a new era, and enable us to enrol more than a solitary lady member on our membership.

OUR PRINCIPAL FOODS AND SOME WAYS IN WHICH THEY MAY BE RENDERED INJURIOUS.

By H. E. Vaux, M.D., Brockville, Member Provincial Board of Health.

Mr. President and Gentlemen: A big subject, Mr. Chairman, and one I propose only to touch upon, more for the purpose of inviting discussion than with any idea of being able to present anything very new; and I would like to say here that for much of what I have written I am indebted to Dr. Pavy's excellent work on food and dietetics.

Many of our ills and much of our mortality are due to ignorance and carelessness in the preparation and preservation of food. Perhaps I should say was due to our ignorance and is due to our carelessness, for we cannot plead ignorance at the present day concerning many of the causes of ill-health. We know full well we are not as careful as it is our duty to be in avoiding in our diet that which is harmful. We do not close the avenues through which the germs of disease can enter as closely as we might, and when preventable sickness makes its appearance we do not act with that promptness and thoroughness which the emergency calls for.

We derive our food nearly entirely from the organic world, and, chemically speaking, we find it made up, principally, of nitrogenous and non-nitrogenous substances as the carbo-hydrates, the former of which forms the basis of the structure possessing active or living properties, and the latter may be regarded as the source of power.

The animal body is in fact a machine in which a transformation of chemical into other forms of force is taking place: food on the one hand and air on the other being the factors concerned in the chemical action that occurs.

The nitrogenous foods supply the nitrogen which is essential to the building up and repair of the tissues. They are "histogenetic" mainly, although after they have undergone changes in the system, they may also contribute to heat production.

In the same way the non-nitrogenous foods, such as the fats, etc., whilst they mainly contribute to heat production, still, do act more or less as nutritives.

Our food, then, is derived from the animal and vegetable kingdoms.

The chief characteristic of the former is the large amount of nitrogenous matter it contains; it is therefore specially adapted for the building and repair of the tissues.

It consists of nearly all parts of certain animals and animal products, such as eggs and milk, with its products butter and cheese. A further division is again made into meat, poultry, game, wild fowl and fish.

Meat is generally derived from herbivorous animals, beef, mutton, veal, lamb, pork, bacon and venison. The flesh of young animals is more tender than that of old, but more difficult to digest, unless the animal is very old, when the fibres become tough. Sex, size, the period of the year when killed, the manner of killing, all affect the digestibility of animal food. All meats are not equally digestible; venison and mutton are perhaps most easily digestible, especially if well hung, *i.e.*, not used too soon after killing—until the *rigor mortis* has passed off. Pork is the most difficult. Bones contain considerable nutritive matter, seven pounds of bones giving about as much nitrogen as one pound of meat. Kidneys properly cooked are easy of digestion as are also tripe and sweet breads. Liver and heart are indigestible. Good meat according to Dr. Letheby in his "Lectures on food" has the following characters:

1. It is neither of a pale pink nor of a deep purple tint; the former is a sign of disease, the latter indicates that the animal has not been slaughtered, but has died with the blood in it, or has suffered from acute fever.

2. It has a marbled appearance, from the ramifications of little veins of fat among the muscles.

3. It should be firm and elastic to the touch and should scarcely moisten the fingers, bad meat being wet, sodden and flabby.

4. It should have little or no odor, especially when chopped up and drenched with warm water.

5. It should not shrink or waste much in cooking.

6. It should not become wet on standing for a day or two, but should be dry on the surface.

Unwholesomeness of meat may be due first to the condition of the animal before death, or secondly, to the effects of decomposition afterwards.

1st. Before death (*a*) meat may be injurious from the presence of parasites; (*b*) infectious diseases.

Parisites are frequently met with, especially in the flesh of the pig. One parasite, the *cysticercus cellulosae*, has a head like a tape worm and a bladder-like tail. It is surrounded by a cyst about the size of a hemp seed, and is easily seen. This parasite may be felt under the skin, and occasions what is known as measly pork. The cysticerci of beef and veal are much smaller and harder to distinguish. These cysticerci, unless destroyed by thorough cooking, develop in the alimentary canal of the person swallowing them into tape-worms. The cysticercus of the pig's flesh becomes the *taenia solium*, and the cysticercus of the beef and veal the *taenia medio cannulata*. Far more serious are the results produced by meat infested with another parasite, the *trichina spiralis*.

Pavy, in his work on "Food," says when meat affected by it is used "the first effect noticed is irritation of the alimentary canal "manifested by vomiting and diarrhoea. On reaching the stomach "the capsule in which the parasite is contained is dissolved. Thus "liberated from its previously imprisoned condition, and finding in "the intestines a favorable locality for its growth, the animal increases "in size, and in two or three days attains three or four times its "original dimensions.

"It may now be discerned by the naked eye looking like a small "piece of fine thread. The sexes are distinct, and the female gives "rise to a large progeny—from three to five hundred, it is said, of "little ones. These at once beg n to migrate from the alimentary "canal. They straightway pierce the walls of the intestine, pass "through the peritoneal cavity, and spread themselves throughout "the body. Now it is that feverish symptoms become established, "and that they produce the terrible affection of the muscular system,

"which forms so striking a feature of the sufferer's complaint. "From the state induced the strongest person may be carried off in "the course of a few weeks' time. But should the patient survive "the first effects of the parasite, a cyst is developed around it, and "this in the course of time becomes calcareous. Thus imprisoned "the animal appears to be perfectly harmless, and apparently may "remain for years without further betraying any evidence of its "existence, unless it happens again to reach the alimentary canal of "another animal, when there is a repetition of what has been "described"

Neither salting or smoking will kill these parasites. They must be submitted to at least the temperature of boiling water before we can be sure that they are rendered harmless.

The infectious diseases which render meat unfit for use are more especially the rinder pest (or murrain), anthrax and pleuro-pneumonia, and to this list, I presume, I might add tuberculosis and actinomycosis in advanced stages. The flesh from animals affected with these diseases might possibly be eaten if well and properly cooked, and no apparent ill effects follow, but it is unsafe and better to be avoided.

As a rule meat is unwholesome if decomposition has set in. Thorough cooking may neutralize to a great extent its otherwise bad effects, but unless accustomed to its use food that is at all "high" is apt to disagree through the retained products of decomposition.

Poultry, game and wild fowl all furnish most important foods, as a rule easily digested, nourishing and well adapted for the sick, where the appetite is apt to be weak.

Fish is easily digested and not so stimulating as meat.

Eggs are especially valuable as a food, containing everything necessary for the construction of the body. When fresh they are everything that can be desired, and when stale, well, we can at least do without them.

I have hurriedly glanced at the above articles of food, and must ask you to bear with me if I devote a little more time to the question of milk, as perhaps it is the most practical part of my subject, and one with which we as sanitarians have much to do.

Milk is evidently a typical form of food, containing everything that is needed for the development of the young animal for whose use it is secreted. Its specific gravity is generally about 1032. Its constituents are nitrogenous matter, fatty matter, sugar and water.

The nitrogenous matter is chiefly composed of casein, which is coagulable by acids, mineral and vegetable; also by pepsine, which is a neutral organic substance. It is casein which is the basis of cheese. The curd is thrown down, carrying with it in an entangled state the suspended fatty globules, not only by the addition of the agents mentioned, but through the action of the products of the multiplication therein of micro-organisms which milk undergoes when exposed to the air. The cause of this spontaneous coagulation is the development of lactic acid by a fermentation transformation of the lactine. As is well known warmth greatly favors this change. Contact with the smallest quantity of milk that has undergone this change also rapidly induces curdling throughout the entire bulk. Hence arises the necessity of exercising the most scrupulous care in securing the utmost cleanliness of the vessels used for the purpose of storage. And whilst on the subject of cleanliness in dealing with this most susceptible of animal products I would desire to emphasize the fact that too great care cannot be exercised in all departments of the dairy, especially as it is pre-eminently the food of the helpless child, and of the sick, and that it is relied upon by the physician almost entirely in fevers, and where the enfeebled digestion is incapable of assimilating other foods. I say these considerations should alone call for unwearied vigilance that its purity be not impaired. But when we remember that it has also been proved incontestably to have been the vehicle for the transmission of disease, when the line of death has been distinctly traced and found to be exactly that taken by the milk waggon, singling out its victim where the waggon stopped and skipping those houses supplied from another dairy; when we find that so susceptible is it to infection that the mere rinsing of the can in a stream which higher up in its source had become polluted with typhoid germs was sufficient to cause all

the terrible results which I have spoken of, surely we cannot be too wide awake in this matter. The following article, recently published in the New York *Times*, is of much interest.

A Curious Epidemic —(*New York Times.*)

"The very interesting investigation made a few years ago in the neighborhood of London, by Drs. Klein and Power, concerning the transmission of diphtheria and scarlet fever through the agency of the milk supply, is recalled by the recent report of Dr. Kenwood, published in London, relating to a curious epidemic of throat disease at Finchley. In a certain locality the inmates of a large group of houses of all classes and varying sanitary condition, were attacked, and careful inquiry disclosed the fact that all these houses obtained milk from the same source. The original epidemic was not one of diphtheria, although this disease appeared afterward. As soon as there was ground for the belief that the milk supply was the agent of infection, all persons in the infected houses were warned that they should boil the milk, and the epidemic was stayed only twenty-four hours after this warning had been given.

"It was then ascertained that none of the persons employed at the dairy from which the milk had come was ill with diphtheria or any other throat disease, but the udders of three of the cows were found to be diseased. The epidemic of throat disease was followed by one of true diphtheria, the same houses being invaded, and nearly all of the original patients being attacked by the more dangerous malady. It is believed that the first disease opened the way for diphtheria, by inflaming and weakening the throats of the patients, so that they became incapable of resisting the diphtheria bacillus. It was not ascertained from what source the diphtheria germs came, but this explanation is in accord with the teaching of bacteriological science. Fortunately, the graver malady appeared in a mild form. We have said that this report recalls the investigations made by Klein and Power. As we remember the results of their elaborate inquiries and experiments, suggested by the history of several local epidemics of diphtheria and scarlet fever, it was shown that when these diseases

attacked cows the effect was slight and the symptoms were unlike those which are observed in the human subject. The visible manifestations of the presence of the disease were an inflammation of or an eruption upon the surface of the udder, and the investigators proved, by a series of experiments, that scarlet fever or diphtheria could be transmitted by means of the milk taken from cows so affected. We have seen no reference to these experiments in the last two or three years, but they were fully reported at the time, and seemed to furnish conclusive proof as to the exceptional form of the diseases when cows were attacked, and as to the method of infection. The discoveries made then, and the history of this epidemic at Finchley, as well as the great mass of evidence concerning milk epidemics of typhoid fever and the prevalence of bovine tuberculosis, show that dairy farms and milk supplies should be subjected to sanitary inspection."

This is a subject, Mr. Chairman, which will bear much ventilation, and I trust those gentlemen here who have had large experience, will give us, and through us the country, the benefit of their experience, and create such a dread of impure milk that dairymen will be compelled to employ every sanitary measure to protect the purity and wholesomeness of their product.

This article of food is one which might take up the full limit of my paper. I might speak of the different grades of cows, the care of cows, the manner of milking, the cooling of milk, etc., etc., but I think I have said enough to arouse discussion on this important subject. Butter and cheese may both be classed as generally digestible when in an unchanged state, but butter when at all rancid is very apt to occasion gastric derangement, and cheese is liable to undergo a modified form of decay attended with the development of poisonous qualities. Cheese is a favorite article of diet amongst the poorer classes especially, where meat is not easily procurable, on account of its richness in nitrogenous matter.

Vegetable Alimentary Substances.—Of the vegetable foods which are commonly in use amongst us bread naturally must be given the first place. Properly made from good flour it is easily digested.

It must be light and porous, not too fresh and must not be adulterated with alum. Toasting it thoroughly increases its digestibility.

Wheat-flour and bread may pass into an unwholesome state as a result of being kept. Under the presence of moisture they are prone to undergo change, and to acquire a more or less strongly acid character. Good bread is only slightly acid at first, but if kept and allowed to become moist it becomes decidedly acid in the course of a little time. It may also become mouldy and in this condition may produce injurious and even fatal consequences. The potato, beet, carrot, turnip, parsnip, tomato, peas, beans, etc, are all highly prized articles of food, but there is nothing special in their mode of preparation or manner of storage which might tend to cause them to be unwholesome, and the time limit of my paper prevents my dwelling upon them.

A few words now on the sanitary condition of places where food is prepared and stored, and I have finished.

It must be remembered that our beef and pork and chickens are prepared for food not only when they are slaughtered but even when they are being fed.

Swine are by nature herbivorous animals, but we know that some of them are fed almost entirely with fermenting swill gathered from hotels and private houses, from the offal and blood at slaughter-houses, and from the carcases of animals that have died from various diseases. Chickens are fed on putrid meat, and cattle are shut up in dark and poorly-ventilated buildings, and fattened on brewers' grains, which in many cases have become soured and unfit for food. Milk is taken from cows with diseased and dirty udders, and oftentimes received into vessels not thoroughly cleansed; is jolted through our cities and towns on a hot day and then consigned to a refrigerator which frequently is connected with a drain or sewer in the cellar.

I almost despair, Mr. Chairman, of ever seeing the slaughter-houses in our towns and country places conducted on anything like sanitary principles. Any old building is made to answer the purpose. We are many of us familiar with them. Go to one of them the day after meat has been prepared for market and what do you see?

I will try and describe one I visited about a year ago.

A tumble-down building surrounded by an oasis of mud and filth, through which it was difficult to pick one's way. A large barrel at one corner of the building partly full of a greenish-colored water, ostensibly for the purpose of washing off the meat, as there was no other available source of water within reach. At the rear of the building 15 or 20 huge hogs knee deep in filth and fighting over the offal which had been pushed out to them; with no chance of obtaining water, except what might be caught in the holes where they wallowed when it chanced to rain. The inside of the building corresponded to the outside; flies and blood, with pieces of decomposed meat made the atmosphere unbearable. In a small room at one side was a poor beast which had been bled and was so weak it could scarcely stand, tied in one corner awaiting the morrow. This is a true picture, not a fancy one, and because I took strong grounds and notified the butcher that he could not be allowed to sell meat prepared in such a place, he was indignant and maintained that his slaughter-house was not objectionable.

Let us hope that such places are the exception, not the rule; but I am firmly convinced that although the above may be an exceptional case, sanitary precautions are very much neglected in the majority of our slaughter-houses and that stringent measures should be adopted for their enforcement.

As in the domain of surgery cleanliness has been found to be the keystone to success, so in the preparation and preservation of our food, the absolute exclusion of everything which can taint or cause putrefaction must be our constant study.

SANITARY PREPARATION OF THE FOOD PRODUCTS OF MILK.

By E. E. Kitchen, M.D., St. George, Member Provincial Board of Health.

Mr. President and Gentlemen: There is no more important matter before the agriculturalist to-day, from a financial standpoint, than the subject under consideration; while to the intelligent consumer, who values health and happiness above gold, the sanitary preparation of the food products of milk, becomes a burning theme. When it is considered that butter and cheese are fast becoming the chief revenue of the farm, it may safely be predicted, that before many years have elapsed, these articles will have a production many times greater than at present. It is estimated that over $175,000,000 is invested in dairy farming alone, in this Province.

In 1893, there were no less than 897 cheese factories, which had over 50,000 patrons supplying them with 1,000,000,000 lbs. of milk, from which was produced over 100,000,000 lbs. of cheese valued at $9,000,000. All this milk output was taken from 300,000 cows. Besides, we find that last year there were 74 regular creameries and 31 winter creameries in operation.

Although the correct output cannot be given, yet basing our calculations on the statistics of the previous year, there must have been not less than 3,500,000 lbs. of butter made, valued at over $700,000.

When to this large amount of food is added the milk product of over 400,000 cows used for drinking and home purposes, it will be seen to be high time that the sanitary preparation of the food products of milk be carefully looked after.

The butter industry, more especially that manufactured in winter creameries, is yet but in its infancy, and when our output is compared with that of Denmark, Australia, or New Zealand, a wide field of profit is opened before us.

Denmark, a small country, not half as large as Ontario, has increased her butter exportation to England, in 20 years, from *nil* to 105,000,000 lbs., while our whole Dominion export is only 7,000,000 lbs. In this great grazing land, where nature has been so kind, the production of good sanitary butter has unlimited possibilities, and so long as the demand for a first class article is so large in England and other countries, there must be a great source of revenue to our dairymen, as yet hardly opened. The grand desideratum, in accomplishing the very important business of supplying the immense demands of the world, is to have a commercial article, which is first class in every particular.

This cannot be done unless great care and intelligence is shown by every person who has aught to do in the preparation of the milk, which is the chief source of these articles. "Cleanliness is next to godliness" is as true in the preparation of food, as it is in the condition of the person, and it is true with the cow as of man.

This important animal should receive a daily cleaning, her udder especially, and all hairs thereon removed. Her diet should be healthy and good, and all articles which have a tendency to alter the natural flavor of milk should be avoided, or given at times when the effect is at its minimum. She should have a plentiful supply of pure water. The food and drink should be given at regular intervals, and by the clock. The cow should also be milked at stated times and by the same individual. She should be kept quiet and not have her temper interfered with. She should be from good healthy stock, and capable of giving a paying quantity of milk, with butter-fat of as large a quantity as possible.

The stable should be warm in winter and well ventilated, and as comfortable in summer as it can be made. The use of a plentiful supply of clean straw and dry muck, is indispensable for keeping the cow and stable clean and disinfected. Nor should the milker forget that well washed hands and clean apparel are very necessary, until the genius of man invents a suitable machine by which this work can be accomplished. Those which have been used here are failures, although I notice one in operation in Scotland, which is spoken of highly. Nor should the cow's tail be forgotten, but should

be tied to one side, or as I have seen in Holland, a cord fastened to it and run over a pulley in the ceiling, thus easily controlled by the hand.

Great cleanliness should be observed with the pail. One made of tin, and well scalded with boiling water and having a cover to it and a spout containing a strainer, in which the milk thrown from the teats could enter, would be an improvement over those in general use.

The milk should be removed from the stable as soon as possible and aerated. It is not necessary to have a machine for this purpose, but it can be poured, slowly, at a height, from pail to pail, and then into the can in which it is conveyed to the factory.

This aeration should not be done by using unclean dippers and wash dishes, as is often the case, but if these are used complete scalding is necessary, as well as of the can, with boiling water. A great deal of the gaseous uncleanness may be got rid of by this method.

If the collector is punctual in his arrival, and the milker prompt in his duties, the time will be short, before the milk is at the factory, and not as many have it at present, for hours in the hot sun.

And now comes an important time. By some factories, these cans are returned to the patrons after being emptied, without any cleansing, while others simply turn in a little cold water into the can, which in this condition is taken home. This is very wrong. If the factories would make it a rule that all cans should be suitably cleansed with boiling water and steam before replacing them on the wagons, great assistance would be given towards having milk in a much improved sanitary condition. The return of cans filled with whey should not be tolerated. The whey should be fed while fresh, in well appointed piggeries, at a suitable distance from the factory.

A short time since, I visited one of the cleanest and best equipped creameries in the Province. The milk passed through two cloth strainers and one metal strainer after entering the factory and then through the separator. After 8,000 lbs. had been passed through, the butter-maker opened the separator, and removed about two pounds of a lining to the cylinder, which upon examination, proved

to be about $\frac{3}{4}$ casein and $\frac{1}{4}$ filth, slime and bacteria. When it is considered that so much solid filth is extracted it is not very agreeable to contemplate the large amount of dirt, which was held in a state of solution, in this batch of milk. A large amount of this could have been avoided, by using care in the preparation of milk, to which I have just referred.

Even after the butter is collected and taken from the churn, much is spoiled, by not removing ever particle of fluid from it, thereby soon causing it to become old and rancid.

Cheese does not perhaps need such careful handling, as a few weeks, is always necessary for it to come to perfection, while with butter it is different. It should, however, be put on the market with as little delay as possible. In the meantime it should be kept in a refrigerator, perfectly free from odors. If our shippers would be prompt, and our sellers prompt, in offering their sales, so that but little time could intervene, until it was on board a refrigerator car, (for our railways would be glad to supply these cars at stated periods) and have a cold storage on the ocean steamships, then we might cope to advantage, with our Danish friends, though double the distance, and would be away ahead of our antipodean opponents, with their 12,000 miles of hot ocean traffic, before the European market is reached.

I have been thus minute in connection with the cleanliness part of the subject, as it a well known fact by bacteriologists that the milk made impure by its filthy surroundings, forms a good home for those micro organisms or bacteria, which are known to be the chief factors in causing many of the effects in the physical world, which were formerly unexplained. So common are they, that no air is entirely free from them,—no portion of organic matter but has these little tenants. Every stagnant pool, every accumulation of filth, contains millions of them, and they are reproduced in countless numbers in a few hours.

Nitrogen, carbon, oxygen and small particles of organic salts are essential, for food elements, to their existence. Organic compounds, such as milk, are well adapted for them. Their increase

is very much affected by temperature. Each species has a minimum and maximum point, below which it ceases to grow, and above which its life is destroyed. Extreme heat or extreme cold, as a rule, will put an end to their existence, or prevent their development. Free atmosphere is necessary to supply a sufficient amount of oxygen for a large number of forms. These are called aerobic. A large number are destroyed by a liberal supply of oxygen. These are called anaerobic. The larger number met with in milk belong to the former class, still quite a number of the latter class are likewise there.

These minute organisms are reproduced by the division of their cells or by the formation of what are called "spores." The majority of the former are destroyed by a temperature of 130° to 140° F. The latter require a much higher temperature to destroy them, often from 230° to 240° and to be kept up for a considerable time.

The casein or proteid is the most important part of milk for germ development, because of its nitrogenous nature. The butter fat, though commercially valuable, is not of any value for food for bacteria. It is found in milk serum in the form of minute globules and the peculiar combination of elements by which it is produced afford no room for germ development. On the contrary, sugar of milk supplies suitable material for the growth of bacteria, especially those forms which bring on fermentation changes like lactic acid. The mineral salts in milk, though small in quantity, are essential to the growth of the germ life.

As is well known the milk of cows is secreted by the milk glands and flows from these to the four receptacles provided for its reception in the udder. The milk as formed in the glands is free from germs in a healthy cow, and if it could be taken direct from them would be free from bacterial life, and would thus keep sweet for an indefinite time, if kept absolutely free from the atmosphere. But as the atmosphere is full of them, these micro-organisms get into the external ducts where the temperature is favorable for their growth. Thus the first part of the milking will contain a large amount of them, while the last milk will flow into the pail nearly free from

them. Even should they be absent from the milk as it comes from the cow, the air is so charged with them and they are reproduced so rapidly, that it is estimated that no less than from 6 to 1,000 have been found in a cubic centimetre in one or two minutes after it has been taken from the cow. In fact so readily do they reproduce that from 2,000,000 to 6,000,000 have been found in a cubic centimetre of milk but 6 hours old.

The various kinds of bacteria which thrive in milk and their effects, cannot be largely dwelt upon here. At any rate a large number are known to thrive well in milk, with various effects. The most common form is that which produces sour milk, the principal germ in its production being the *bacillus acidi lactici*. It changes the sugar of milk into lactic acid. If this compound is sufficient in quantity the casein will be affected and curdling will be the result. If milk is very sour the germ will stop its growth but will not be destroyed, and when changed to a suitable medium will again grow. This germ commences to grow at a temperature of 50° and ceases growth at 140° F. The conclusion to be drawn is, if you keep your milk at a temperature below 50° or above 140°, it will not sour quickly. These lactic germs are a necessary adjunct in butter and cheese-making if kept under control, as a certain amount is necessary to produce sufficient lactic acid in the preparation of these articles.

Then there are forms which cause peptonizing fermentations in milk, the result being thick milk which is not sour. Not much is known of them, but they are supposed to give assistance to the curing of cheese, by breaking the casein up into soluble compounds. Other forms of germs produce butyric acid fermentations, bitter, slimy and alcoholic fermentations, etc. The forms producing bitter milk, usually form spores which are very difficult to get rid of by boiling. Therefore it is often found that milk is bitter when boiled if allowed to set for a length of time. This is owing to the great resistance of the contained spores of such forms.

It will thus be seen that these spore-bearing forms are very difficult to get rid of. The forms causing the alcoholic fermentation are not true bacteria, but are nearer the yeast ferments. Slimy and

bitter milk is not always due to bacteria, but often from other causes. Slimy milk is often caused by inflammation of the udder, errors in feeding, etc. Not only will bitter herbs impart their taste, but advanced lactation will often cause the milk to be bitter. But as a rule these conditions are due to bacterial growth. An opinion may often be formed of the causes of these taints, as the taint from food, etc., is more distinct from first milk, while those from bacteria become more distinct as the milk becomes older. Few substances absorb or give off gaseous impurities, more readily than milk. When it is warmer than the surrounding atmosphere, it will give off the odors peculiar to it, but when cooler than the air surrounding it, it will absorb the odors from it. If the milk is heated, this taint will be the more readily observed. Sulphur burned in the presence of moisture, quick lime, etc., are good disinfectants to purify places of foul odors before placing therein milk or butter. There is nothing better than a solution of vitriol to be placed in drains and waste pipes of factories to make them sanitary.

I have already pointed out carefully, the routine work necessary in the preparation of milk ; it is contained in the one word cleanliness, whereby the number of bacteria admitted into the milk may be kept at a minimum. To keep them entirely from it is impracticable. The microbe may be destroyed in the milk by chemicals, but these injure the flavor of it. The most practical method is to take advantage of the effect that an extremely low temperature or an extremely high one has upon bacterial life. The cooling of milk down to within a few degrees of the freezing point will check germ life and enable the milk to be kept sweet for a long time. Very high temperatures are more practicable to the dairyman, and to carry this out it is necessary to resort to one of two methods, viz., pasteurization or sterilization, two methods that are quite different, although ofttimes used indiscriminately as meaning the same thing. By the former it is necessary to raise the temperature of the milk from 135° to 160°, while by the latter it is necessary to raise the temperature to the boiling point, from 212° to 220° F.

Sterilization will destroy the large number of germs, but unfortunately changes the normal condition of milk and is therefore unsuitable for dairy purposes.

Pasteurization is more practicable and will not only destroy a large number of germs, but will check the growth of a large number as well.

To do the work effectively, the machine should be so constructed that the milk may be heated thoroughly and evenly, and if it is desirable to preserve the milk for a long time there should be attached to it some arrangement whereby the milk may be lowered to a low temperature and that quickly. It could be utilized to great advantage in our creameries, in preparing the cream for a "pure starter."

It is not expected that dairymen can become bacteriologists, but it is a duty that they owe to the large consumers of milk and its food products, that they should have a general knowledge of the results of these scientists' labors, and apply it in a practical way to their work.

Medical men, more especially medical health officers, could easily devote a little attention to this department and impart some valuable information to those preparing these foods, and although they might not receive any remuneration for their labor it would go to assist in that great work of good to our fellow man, for which our profession has ever been foremost, and although our bank account may not be the larger for the grand work thus accomplished, perhaps, in that great Day, our Crown may be adorned with an extra jewel for the blessed work done in the name of humanity and charity.

CARE OF WATER SUPPLIES.

By W. F. Van Buskirk, A. M., Can. Soc. C. E., Stratford.

Mr. President and Gentlemen: Water when pure is transparent, tasteless, inodorous and colorless except when seen in considerable depth. The solvent powers of water exceed those of any other liquid, and in consequence, entirely pure water is unknown outside of the laboratory. Most of the ordinary impurities are comparatively harmless when taken into the body, while others are dangerous to health and life. The stomach of a man or an animal becomes capable in time of resisting to a certain extent the evil effects of some of the dangerous impurities that may be found in drinking water, but they are, nevertheless, harmful to the constitution.

The proper care of water supplies is a very wide subject, and it will be impossible in a short paper to refer to more than a very few of the more objectionable impurities found in drinking water. The most objectionable are, of course, germs of disease, and in what follows, it is proposed to consider the means by which they gain access to water, and the most effective way of keeping them out.

It is necessary, in the first place, to understand why certain impurities are dangerous. Different conditions, such as ill-health, unsuitable climate, heredity, etc., etc., may of course cause predisposition to diphtheria, typhoid fever, consumption, and many other diseases, but there can be no doubt, at the present day, that the communicable diseases of both men and animals are caused by the presence of living organisms, capable of living both within and without the animal body, each particular disease having its own specific germ, which must be present before it can be developed. Many of these organisms are capable of living and doing damage in both men and animals, although it does not appear to follow that a particular species of germ will cause the same disease in man that it will in an animal.

Bacteria gain entrance to the system by ingestion, inoculation, or by inhalation, and there can be no doubt that the specific germs

of some diseases—typhoid fever and tuberculosis for instance—are communicable in more than one of these ways. Once introduced into the body, they take possession of the particular tissue most suited to them, where they grow and multiply to an almost incredible extent; so that, while a single germ may cause a disease in the first place, the contagious matter produced during the course of the disease may be sufficient to spread it to thousands. Before the bacteria of any particular disease, or their spores, can gain entrance to the system by ingestion, they must of necessity be present in either water or food, and it therefore becomes of primary importance that water used for drinking be kept free from all possible sources of contamination by such organisms.

Of the water which falls from the clouds, part sinks into the ground, another part flows off the surface in streams, and part is evaporated. That which sinks into the ground reappears in springs, wells, and small streams, and is the main source of water used for drinking purposes.

The upper surface of ground water, technically known as "the water table," varies in height in different soils, being generally nearer the surface in clay soils than in those of a more pervious nature. It rises after rain falls, and sinks again owing to evaporation and the tendency to flow toward the nearest depression or watercourse. The level of the water table in any district is marked by the height at which the water stands in the wells. The lateral flow, or movement along the upper surface of the water table, keeps up the supply of wells and springs, etc., and the water may become purified or polluted, according to the nature and condition of the soil through which it passes before reaching them.

Springs appear at the outcrop of an impervious stratum underlying a more porous stratum of earth, and the water has therefore undergone a certain amount of filtration in its passage through the overlying porous strata. Wells, on the other hand, are nearly always filled with water from the soil immediately adjoining them, are more or less stagnant, and are certain to contain some of the impurities of the soil surrounding them. The flow of water into a

well, after it has been pumped out, or after a heavy rainfall, comes both from the bottom and sides, and after a time, fissures are created in impervious soils, so that old wells in clay soils are liable to become as much contaminated as those in more porous soils.

Now it has been established beyond question, that the surface soil is absolutely crowded with different kinds of minute organisms, whose lives are devoted to the promotion of putrefaction, decomposition, fermentation, etc. Many forms are undoubtedly harmless, while others are found capable of living in the tissues of the animal body, and of producing disease. Further, it is found that certain of the better known disease germs are capable of living and propagating in the soil when conditions are favorable. For instance, typhoid fever germs placed on the surface of frequently moistened ground, will penetrate nearly two feet into the soil, and will there retain life for nearly six months. They multiply rapidly in badly drained soil, live for an indefinite period in privy vaults, and have a much longer existence in cisterns and wells than in running water.

A soil favorable, if not essential, for the life and growth of bacteria, must contain some organic substance, as some species are incapable of obtaining carbon and nitrogen from the air. The soil must be damp, as without moisture non-spore bearing organisms are not able to live, and the spores of spore-bearing organisms are prevented from germinating. All species, however, are not killed by drying, but are benumbed or crippled, and their vitality may remain unchanged for weeks under such circumstances. In pure water they also remain torpid, and do not increase although still living.

All organic matter in refuse, excrement and sanitary water, is subject to changes of both a chemical and physical nature before it is left in the form of inorganic compounds. These changes are either of oxidation or of putrefaction. Many substances must decay before they can be oxidized. Decay occurs in wells containing stagnant water, in privy vaults, heavy damp earth, etc. Oxidation takes place in porous or dry earth or flowing water with free access of air. Wherever there is putrefaction there is sure to be a bad odor.

Corresponding to the difference between oxidation and putrefaction, is a difference between the bacteria attending them. One kind requires the presence of air, and are therefore prevented from penetrating into any tissue of the body; while the other kind, being able to live without air, are capable of living in the bodies of men and animals.

It will be evident from the above that we must look upon the surface soil under ordinary conditions, as being a place where disease germs live and increase in number. It therefore becomes important that the surface soil in the neighborhood of wells, springs, streams and reservoirs, used for supplying or storing water, be kept free from pollution by refuse and filth of all kinds, and that the water table be lowered and kept low by underdrainage.

Underdrainage lowers the level of ground water and renders the soil porous, allowing air to enter the soil both from the surface and from the drains, so that it becomes possible for the bacteria of nitrification to live and perform their work of purification.

Efficient underdrainage will do much in the way of preventing pollution of water by disease germs, but when we consider that even with the most perfect sand filters, it is found impossible to remove all the bacteria of sewage, it is seen that the ordinary soil cannot be depended upon to entirely purify water passing through it. Moreover, years of neglect of the first principles of sanitation have rendered the soils of our towns and cities peculiarly favorable to the spread of infectious diseases; we are daily breeding the bacteria which poison us, and the regular round from intestine to soil, soil to water, and back to intestine, goes on with the most tragic uniformity. "The drinking of water containing human excrement is a most disgusting and dangerous practice, and we cannot hope to be free from communicable diseases until it is discontinued."

The only sure way of getting rid of disease germs in water, soil and air, is by systematic and persistent disinfection of rooms, clothing and dejecta of patients suffering from infectious diseases.

It must not be lost sight of, however, that there is considerable, if not as much, danger of contamination to water by animals as by

man. A stream to which animals suffering from any of the communicable diseases, have access, is not a safe source of drinking water for human beings; neither, on the other hand, is a filth-polluted stream or well a safe source of water supply for animals.

From the foregoing considerations it will be seen that water-borne diseases are in the fullest sense preventable in so far as they may be spread by public water supplies. It therefore follows that the responsibility of keeping water free from the germs of such diseases rests directly upon the health authorities within whose sphere of jurisdiction any particular supply of water may be situate; and it is probable that, in the near future, the public will be compelled to pay damages for every case of sickness that can be shewn clearly to have been caused by neglect in these matters.

That there is neglect, no one acquainted with the facts can deny. It is the rule, rather than the exception, throughout Ontario.

Cattle are allowed to drink at streams, at or near the intake of water supply pipes, and at streams polluted with sewage and filth.

Water is used from wells in the immediate vicinity of privy vaults, leaky and badly laid house drains and sewers, etc.

All kinds of filth are deposited upon the soil in the immediate neighborhood of wells and streams. In fact, each individual does pretty much what he pleases, without reference to the damage he may do to the health of the community.

A man has no more right to commit manslaughter by poisoning his neighbor's family with infectious disease germs, or with sewer gases, than by using a shot gun, yet he is allowed to do the former without protest.

The average town of 10,000 inhabitants produces yearly about 8,000 tons of refuse containing organic matter. What becomes of it?

It cannot be that the people of Ontario, with the most expensive system of free education in the world, are not sufficiently educated to understand the importance of enforcing sanitary laws.

The legislation seems to be good and sufficient, except that it is permissive to a large extent.

It would appear, then, that the fault must lie in the machinery provided for the distribution of power supplied by the statutes.

A careful inspection of this machinery may serve to shew wherein it is defective.

The board of health of the average municipality is appointed by the council, and exists only to satisfy the requirements of the statutes. It makes recommendations and regulations of the most impracticable kind, and in which it has not entire confidence. Such regulations are, of course, only compulsory in theory, and are, in fact, generally disregarded. If the death rate of the municipality happens to be low, the board congratulates itself; if higher than usual, they call it a visitation of Providence.

The medical health officer receives his appointment directly from the council. He has not time, nor is he sufficiently paid, to give practical attention to all matters in connection with the health of a town; and whatever work he does, is at the expense of his private practice, and at the risk of offending the body which reappoints him. The amount of work done usually varies inversely as the length of his report.

We rely, in practice, for protection to health, almost wholly upon that ignorant and officious personification of sanitary science, known as the sanitary inspector. He also receives his appointment from the same source, and anything like energetic work on his part will doubtless endanger his reappointment.

It would appear, then, that the council possesses all the power of instituting and carrying out measures for the good of the public health, while the responsibility is borne by the board of health and its officials. This distribution of load works smoothly and well in practice, but unfortunately there is one drawback—the public health suffers.

PURIFICATION OF WATER AND OF SEWAGE BY FILTRATION.

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

Mr. President and Gentlemen: At an hour so late since the public awakening to the advantages of sanitation and to the importance of adopting the best means for the enjoyment of its benefits, it may be matter for surprise, that it should be needful to advance anything on a subject so trite as that of the title of this paper; yet the questions of a pure water supply and of a safe disposal of sewage are still so unsettled and the source of so much anxiety in many localities, that there seems an excuse for asking attention to this manner of dealing with both the obtaining water of good quality and in sufficient quantity and the riddance of it when it has served its purpose.

Nature's mode of the purification of water having been under men's eyes since the race has been upon the earth, it would seem to be more than time that we should apprehend its excellence and its wide and varied application to our daily necessities. The aggregation of men into large cities, nearly the world over, renders care for the purification of water, of more urgent necessity than at any period of man's history, and so also, the regard for human life, which is a distinguishing mark of Christian civilization, renders it more and more an object of general interest, that water, the substance so necessary to life, should not be that which becomes the bearer of the greatest and most abounding evils.

Possibly there are not wanting those who are ready to say that here we have one of those instances of compensation which are everywhere in nature, and that the difficulty, which in an increasing degree threatens us, that of obtaining wholesome drinking water, is, on the part of nature, a protest against the gatherings of men into large communities, after our modern fashion. And who shall venture to say otherwise? But there is no hope of stopping these concentrations

of people, and the manifest tendency to their increase only impresses more urgently the necessity for measures to prevent the outbreak and prevalence among crowded populations of disease of which the most common manner of approach to its victims is by the water which they drink.

Those gatherings of men, gathered for the most part on the banks of streams, render the water which flows past them disease-producing; having done so they can in turn, if they choose, keep back from it what they may have hitherto been adding to it and can let the stream pass on for the use of men below; therefore it is but a reasonable and just contention that before passing it on to their neighbors, they should perfect the purification of the out-flow from their town into the stream on which they border.

There are not many now living, who remember an early enthusiasm, manifested on the subject of drainage, when the good effects of its thorough application had come to be observed and appreciated in agriculture. Poor and rich were in admiration of its results. The former saw in these, the promise of an increase of wholesome food, which in some countries, for example Britain, was being felt to be becoming insufficient. The rich producer, on the other hand, recognized in drainage, an agent for the obtaining of more abundant products and higher rents.

The effects of drainage on vegetable health and life were soon recognized. It was a little time before men came to think seriously of the effects of like precautions upon animal health, least of all did they think of human health as influenced by them. Many a rich proprietor or cattle owner had his stables well drained, who never thought of doing as much for those who occupied his cottages. We almost all attach greater importance to, and place more value on, wealth than upon human life, in the abstract that is to say, and rich crops were being gleefully, if not thankfully, reaped, and due credit was given to drainage therefor, but in the meantime sickness and mortality had their harvest in centres of population both great and small, no care being wasted on growing human kind there, nor thought of possible good from a process the same with that which did so much for plants in the country.

In those early days of improved plant cultivation two things were manifest, to wit, the green and healthy appearance of the crops in fields which were drained, and the clearness and purity of the water which, having percolated through their richly organic soil, issued from their deep drains. The water had truly carried with it into the soil the organic matter which had been spread on the surface, but it had to part with it to the earth, in passing through, leaving it to be decomposed and rendered fit for the sustenance of vegetation, and the water at last, going deep enough to be freed both from dead and living organism, flowed away, and emerged at a distance, as it seemed, a clear fountain.

This, nature's mode of freeing water of what is to us unwholesome and odious, is especially deserving of interest in our own country, for we seem much more dependant on this way of purifying than some other countries whose plans are cited to us for imitation.

In Ontario not a few important towns stand on the banks of rivers, which, though of tolerably long course, do not always contain much water. Many of those towns, if not all of them, let their sewage run unchanged into those streams, or, as in the case of Hamilton, into its closed bay, and there is thus much annoyance to the dwellers on the banks, whether of the closed bay or of the stream. Possibly enough the cause for this annoyance may, in the meantime, be somewhat exaggerated in the minds of the sufferers, but there can be no doubt of its existence, and that it will become intensified as time goes on, and as population increases. Further it is to be desired that immediate and general attention be given to this matter, because already some corporations trusting to the weight of their wealth and influence are manifesting the most absolute indifference to the comfort and welfare of more imperfectly organized and weaker neighbors; some carrying the filthiest portion of their sewage, that portion so bad that nothing but putrefaction or scattering it among other people can enable them to be rid of it, carrying this portion in barges into the rivers which flow past, and dropping it for the purpose of diffusing it through the stream, and for the use of course, of the dwellers lower down.

And with regard to thought for others, there seems to be no difference between corporations, Canadian or American, small or large. All are equally regardless of the welfare of any beyond their own limits. Buffalo in New York, and Hamilton, Galt and Peterboro' in Ontario, and other places which might be mentioned, all sin in the same manner; and the townships equal the others according to their opportunity. It is true that these last have to manifest their unreasonableness, as opponents to the efforts at drainage of the inhabitants of the towns, but they shew the same narrow disregard for all but their own immediate interests; as if in a sanitary point of view the interests of all were not one and the same, as if the interests of all did not run together, whether in sickness or in health, in adversity or in prosperity.

If a city or town discharges its open-mouthed sewers into the stream passing it, and so rids itself of the unpleasantness of its own creation, transmitting it at once for the domestic use of its country and other friends down stream, these latter take little or no notice apparently. They do not really waken up to the nature of the benefits thus bestowed until the urban community has been aroused to look at the indecency of its proceeding, or to a sense of its own interest, and so initiates means for the correction of the evil which it has been causing. Then, quickly, an alarm is raised in the townships below. Something new is going to happen, and it must be impeded. Every means is taken to thwart the endeavor to render the town sewage harmless. The town is invited to keep its own filth within itself. The townships will not hear of its flowing along their river, whether purified or unpurified. A suit at law may result and a decision be given on unexpected grounds. Operations are stopped and the country folks congratulate themselves on their victory. Yet the fruits of the legal triumph are that they go on as before in the use of the water of the river, contaminated by the excrementitious discharges of the men and animals of the town.

From such misunderstandings between town and country have arisen some of the greatest difficulties of the Provincial Board of

Health. The townships get into a panic regarding the transference of the town filth to their cattle on the river. The inhabitants of the towns have no objection to the continuance of the panic, or to the obstruction arising from it. They are saved the expense of new sewering for awhile. They use the river as a receptacle for their sewage as before, and sanitary measures, which might have been accomplished in a few months, are put off for years.

In endeavoring to induce corporations to adopt effective means suitable to our local and climatic conditions we are often met by objections drawn from the experience of European countries, where the experience gained is thought necessarily to have been greater than with us, and with regard to sewage we are told about settling tanks, and precipitation, chemical treatment and electrolysis. No doubt those means suffice there, for the precipitate can be manufactured into material useful in the arts, and the partially purified fluid material can be allowed to flow into some stream or estuary into which the tide from the sea enters twice a day and leaves it as often. Or if they desire to do as our neighbors of Buffalo, they can do so without danger to anyone, by sending the worst portions down their rivers, and out to the sea and dropping it there.

In place of their sea we have to do with tideless lakes, in the purity of which, along their shores, we all have a very deep interest, for from them must come the water supply of the many increasing towns living upon them.

No doubt there are high authorities against the wisdom of looking to the large lakes and rivers for a water supply for large towns; but recent enterprise in water purification makes it probable that those must be looked to as sources of supply for our various uses, as well as receptacles for the same water after it shall have come to assume the form of sewage.

Therefore it will be necessary for the common safety that both the intake of water and the outflow shall be purified by filtration; and the probability seems to be that before long this will receive general acknowledgment.

I have been induced to bring this subject before the Association because of our experience of the difficulty of getting this system of water purification to be regarded with favor in some instances in which it has been thought to be a suitable procedure. It seems necessary therefore to continue to press it upon public notice; and as a means to that end there can be no better course than to bring the system under the attention of this Society. The clear pure springs which appear from beneath beds of sand and gravel lying upon clay are open evidences of the effect of the percolation of water through those substances; and it will come in as great purity, through similar beds artificially laid, as through those deposited by natural agencies.

By the State Board of Health of Connecticut of last year there is a report of the success of this mode of the purification of the water of the Merrimac river for the supply of the City of Lawrence. The Merrimac is by no means a clean river when it reaches Lawrence, having already passed through and received sewage and other outflow from a number of manufacturing towns, having among them a population of 150,000. Yet the water from this river, filtered through sand, and supplied to the city, is pronounced by the state health authorities to be "*satisfactory.*" The state is that of Massachusetts, which in the Connecticut report is said "to have taken the lead in the United States, in fact in the world, in the matter of thorough and systematic investigation of the problems involved in the purification of sewage, polluted streams and public water supplies."

After inspecting the Lawrence water supply plant, the Connecticut committee with its engineer, from whose report the preceding extract is taken, visited the town of Brockton, likewise in Massachusetts, to view the works there in process of construction for sewage purification, by means of filter beds; and it gives a description of these works which may be studied with profit.

It may be mentioned that one of the reasons assigned by one of the towns to which the filtration system was recommended for the

purification of its sewage, was, that in Massachusetts the frost had interfered with the filtration. It may be pointed out that in this the last annual report from Connecticut no mention is made, nor fear expressed, of hindrance from that cause; though there well might be, as the sewage is forced to the field of distribution, through a cast iron pipe, for three and a half miles. There is always heat enough contributed to sewage from its various sources, to enable it to resist the effects of our coldest weather, if it is made to run sufficiently deep.

METHODS OF DISPOSAL AND PURIFICATION OF SEWAGE OF THE PUBLIC INSTITUTIONS OF ONTARIO.

By C. A. Horetzky, C. E., Toronto Public Works Department.

Gentlemen of the Association of Executive Health Officers of Ontario:

Five years ago at Owen Sound, I had the pleasure of reading you a short paper upon the then recently completed sewage farm at the Asylum for the Insane at London, Ontario. The term, "sewage farm" may be misleading, inasmuch as the entire tract of land hitherto used for irrigation purposes comprises but four and a half acres, one-half of which only is under cultivation. The farm had been a couple of years in use, but had only been operated in the most desultory manner. In the paper to which I refer above, I adverted to the strange dilatoriness of the asylum authorities in making use of a very excellent thing. The fact was, that strong prejudices existed against this scheme, and the idea of using crops raised, as it were, from the foul wastes of the institution, was not well entertained. Gradually, however, the "sewage farm" began to find favour in the eyes of the authorities, and finally, in 1893, the whole tract was put under systematic cultivation, and yielded a crop of garden produce, up to that time unequalled in the vicinity of London for quality and quantity. The two acres produced a value of $800.

During the following year the value of the produce from the same area had increased to more than $1,000, and I am credibly informed that, in 1895, still better results are looked for, and that the superintendent of the institution intends to enlarge the farming operations considerably.

For these results, much credit is due to Mr. R. Flynn, the asylum employee who looks after the farming operations, and who, at first, like many others, chary of hopes of success, has ultimately become a firm convert to the advantages of sewage farming.

Doctor Bucke, in his report of 1893, states, regarding this irrigating tract at London, that only an eighth of the sewage is used.

I presume he means that the other seven-eighths are allowed to filter down from the bottoms of the ditches, and are thus lost for manurial purposes. It is to be hoped that this is the case, and that the ditches are not showing symptoms of clogging.

As mentioned in a former paper, the population of the London Asylum is about 1,100, and the daily flow of sewage is 60,000 gallons.

The undoubted success of the London sewage tract has, however, had its drawbacks, in this way, that, whenever the question of sewage disposal elsewhere has since arisen, the remedy generally recommended, and insisted on, has been "a sewage farm," without regard to locality, soil or other conditions.

It may be taken for granted that, in every question of sewage disposal, the choice of methods must be dictated by common sense. The soil at London farm is of a very sandy, porous character, of great depth, easily drained, situated on a commanding elevation, and is probably the ideal for a sewage farm. One might search for a long time before finding such a combination of favourable circumstances elsewhere. So far as my experience goes, I can say that nowhere else have I found them. Clay, clayey loam or rock, have almost invariably been met with instead; and expediency points, in such cases, to some process by which an indifferent soil may be relieved, by the removal of as much of the heavy organic matter of the sewage, as possible, before its application to the land, or indeed, to the rejection of land disposal altogether, in extreme conditions.

Clays, clay loams and shallow soils, generally speaking, are entirely useless for sewage farming purposes; and as these prevail extensively in Ontario, we must look to precipitation methods, and use them wherever necessary, either as adjuncts to land disposal, or alone, if we wish to prevent nuisances and curtail expense.

Before leaving the subject of sewage farming, I may point out one other essential to its success, besides suitableness of the soil, and this is the absolute necessity for the sewage to be brought to the farm in a perfectly disintegrated and liquid form; otherwise failure will result. This can only be accomplished by pumping, or by special mechanical means, to which I shall not now revert.

Within the last few years, it has fallen to me to construct for the Ontario Government several sewage disposal works.

The first attempt, simultaneous with the laying out of the London farm, was at the Agricultural College at Guelph, where a combined precipitation and land filter system was introduced. Not having seen this for several years, I cannot say how it is being carried out.

At Mimico Asylum, and at Belleville, precipitation works, and artificial polarite filters were put in about four years ago; and lastly, within the past year, works of a very modern character, and complete in every respect, have been installed at the Kingston Asylum, where the population is about 600; and a brief description of which may be of interest to you.

Two years ago I made surveys for this purpose; and also, for the construction of more than 2,000 lineal feet of modern sewers, the conversion of the pre-existing antiquated stone drains into storm water conduits being also intended; and since carried into effect.

The excavation for the sewers and for all the work, was entirely in rock, which prevails generally all over the asylum property, and entirely precludes sewage disposal upon the natural shallow soil.

The elevation of the asylum drains, where they leave the buildings, being generally about 24 feet above the normal lake level, it became necessary, when planning the works, to provide for steam power to get rid of the sludge, the slight grade obtainable admitting the application of gravity for other operations.

All sewers converge at the screening chamber, whence their contents flow through a mixing race, where the precipitant (of whatever kind it may be) is added to the sewage, either by properly arranged mixers, or by simpler means. The sewage thence flows into the settling tanks, of which there are two, side by side, each in turn receiving the flow. All solids are intercepted at the sludge outlet end of each tank by a wire cage. Each tank has a capacity of about 20,000 gallons. At the other extremity of each tank a floating

arm is used for decanting the partially clarified sewage (after sufficient precipitation) from the tanks, either to one of the three polarite filters, or into the effluent drain, and thence to the lake. The filters are, however, amply sufficient to admit of continuous use, and it is not intended that the effluent shall pass to the lake unfiltered. There are three filters, each (1-121 acre) having an area of forty square yards, a depth of 45 inches, and they are built of layers of broken stone, (resting upon a concrete floor), gravel, sand, sand and "polarite" mixed, while a 12 inch layer of sharp sand forms the top.

Ample provision is made for the ventilation of each filter by means of 6 inch pipe communicating with the open air outside the filter house, and with the tiles at the bottom of the filter.

Each, or all of the filters, can be used at once; but it has been found that, with careful management of the preliminary precipitation process, and of the decantation of the effluent liquor, one filter can be used continuously during ten days and is capable of filtering the whole of the daily flow of asylum sewage in the short space of six hours. This averages about 25,000 gallons.

By an arrangement of penstocks, which open or shut off, communication between the filters at the bottom, each, or any two filters, can be made to cleanse the third one by an upward flow of filtered sewage effluent. The cleansing operation periodically required is thus greatly facilitated, and the labour reduced to a mere raking of the surface, supplemented by occasional scraping and removal of from one to two inches of the top of the filter; the material taken away being replaced by fresh, clean sand.

The rule should be, however, to avoid removal of the top layer of sand, even though it be considerably fouled, so long as filtration goes on at a reasonable rate.

It will thus be seen that each filter, after a period of eight or ten days' service, can be left at rest during sixteen or eighteen days, thereby obtaining the necessary intermission and aeration.

The sludge remaining in the tank after decantation of the effluent liquor, contains 95 per cent. of water, to get rid of which has ever

been a serious problem in all sewage works; pressing into cake, or running the foul liquid into shallow trenches in the fields, and allowing it to dry out, are the usual alternatives; cremation in specially devised kilns is also sometimes adopted.

As none of these methods was advisable, in the cases with which I have had to deal, I devised a method of duplicating the precipitation process, and of concentrating the sludge, thereby getting rid of a large percentage of water.*

The watery sludge having been run by gravity into a deep sludge well is thence pumped up into a reservoir of about 2,000 gallons capacity, elevated upon a trestle outside the works, under which a tank cart can be brought for removal of the sludge. In this tank precipitation again takes place with great rapidity, and the supernatant water is drawn off from time to time automatically, back to one of the settling tanks. This process works extremely well, and I may add that without such means of drawing off the sludge water, it would not be possible to operate any precipitation process here, without creating a very great nuisance, and interfering seriously with the character of the effluent.

At the end of each week, there remain in the sludge tank, from 1,000 to 1,200 gallons of highly concentrated sludge, which is drawn to the farm or garden for manure.

In conclusion I may say that the works at this asylum (Kingston) are as nearly automatic as possible, but it must be borne in mind, that even so, great care and intelligent management are absolutely necessary on the part of the attendant and his assistants, in order to keep everything in proper order and to insure good results. With a careless or incompetent manager, works of this kind are sure to depreciate, and become a nuisance.

The works went into operation on the 10th June last, and during the ten following days, they were still kept under the charge of the Department of Public Works, and were operated by a very careful man, with very fair results.

*This, as Santo Crimp says in his preface, is of first importance where precipitation processes are used.

The process used during this time was that known as the "*Amines*"* in which precipitation and deodorization are brought about by the use of "*Herring Brine*" and "*Milk of Lime.*"

It was intended to give the "Amines" process a month's trial, but owing to the deterioration of the herring brine, it had to be given up *pro tem;* the ferrozone process being substituted, the latter as you all know being a "ferrous sulphate" process, from 8 to 12 grains of the salt being added to each gallon of sewage.

The works were turned over to the asylum authorities on the 24th June. It is, however, intended, later on, to resume experiments with the herring brine and lime.

Under these circumstances, no definite conclusions as to the merits of the "Amines" method of treating sewage can be reached. It may, however, be said that, during the ten days trial, satisfactory results were obtained; an apparently inert and odorless sludge having been precipitated, while the effluent was neither better nor worse than that derived from ferrozone treatment. I am confident, how-

*Extract from a paper on "Recent Progress in Sewage Treatment," read before the Civil and Mechanical Engineers' Society, on the 5th February, 1890, by C. H. Cooper, Esq., A.M.I.C.E., M.S.I., etc., Assistant, now Chief Engineer to Wimbledon Local Board.

In the "Amines" process a mixture of lime and an Amine (Ammonia compound) is added to the sewage before it enters the settling tank in which the sludge is deposited, the "Amine" being supplied with other substances in the form of herring brine.

The proportion in which these re-agents are added, averages two and one-half tons of lime and one-fifth ton of brine to the million gallons of sewage.

By the addition of so large an amount of lime, the glutinous nature of the sludge precipitated is destroyed, so that it can be pressed without a further addition of lime.

A layer of this sludge nine inches deep lost 75 per cent. of its bulk while exposed in a pit for three weeks during September last. The cloths used in the filter presses last longer when pressing "Amines" sludge than in the case of ordinary sludge, to which hot lime has been added.

The clarification of the effluent in this process is remarkable, for in almost every instance within twenty-five minutes after the sewage is admitted into the tanks, the supernatant liquid from which the sludge has precipitated is transparent to a depth of nearly six feet.

A great point in the "Amines" process is the absence of unpleasant smell from the tanks, effluent, sludge, or even press liquor. These products have been kept for months, and exposed to most trying tests without any sign of decomposition or bad smell. The patentee of the "Amines" process, Mr. Hugo Wollheim, claims peculiar antiseptic properties for his treatment, which is fully borne out by the investigations of Dr. E. Klein, F.R.S., who has found that not only are the effluent, sludge, and press liquor free from microbes, but that they remain free from such organisms.

Many people have thought that the antiseptic properties of the effluent and sludge would render them injurious if applied to growing crops, but after a trial of four months on the Wimbledon Farm, no bad effects have been noticed.

ever, that with good lime and strong brine, we may in all probability look for good results from the "Amines" process. This is more especially to be hoped for, inasmuch as the inventor of the process claims for it a perfectly *sterile* effluent.

Before closing this paper, I think it proper to state that efficient as the polarite filters are for the treatment of the partially clarified sewage effluent, they become practically useless whenever the saponaceous waste liquids from the laundries, are run upon them.

At Mimico Asylum, where the laundries are at work during four days of the week, it has been found necessary during that period to send the effluent into the lake unfiltered, in order to avoid clogging.

As the average daily flow of mixed sewage and laundry waste at this institution is about 70,000 gallons, it may be seen that a weekly discharge into Lake Ontario, of at least 250,000 gallons of unfiltered sewage effluent, from which only 50 per cent. of the organic matter has been removed, must take place under these conditions.

Even such an effluent properly treated in the tanks with iron and aluminum salts, will not produce a public nuisance; but, unfortunately in this instance, appearances are unfavorable, inasmuch as, previous to the construction of the sewage works, the asylum discharged its sewage upon the shore, at this very spot, and the results are still well *en evidence*., the present low water having exposed a large area of beach upon which to-day the foul deposit of former years remains to assail the senses, throw discredit upon the present precipitation works, and very materially mar the advantages of the fine situation, more especially with an easterly wind.

Here, then, we have a case for the application of combined precipitation and land disposal, such as I have already adverted to.

The soil adjoining the present sewage works is clayey, and unsuitable for such a system as obtains at London; but by working this soil up into a fit state, by underdrainage and perhaps an admixture of more permeable material, we can adapt it for the reception and disposal of partially clarified *tank effluent*, either by broad irrigation, or by a method of beds and ditches.

The asylum has the land, and can command the labor necessary to carry out this innovation, while a trifling expense will suffice for the few additional feet of suction and discharge pipe required to connect the present pump with this proposed land tract. A good site for irrigation is obtainable close to the works.

Two acres are necessary for daily treatment of 70,000 gallons of tank effluent, during the four consecutive days of laundry work.

The rest of the week's sewage can easily pass through the polarite filters. Such a scheme would entirely obviate the present difficulty.

NOTE.—"Polarite" is a pure and absolutely insoluble mineral substance, specially manufactured for the filtration of water, fluids and gases. This mineral has been carefully examined and tested by analysis by one of the greatest living authorities, Sir Henry Roscoe, M.P., F.R.S., LL.D., etc., etc., who reported that the "porous nature of the oxide, its complete insolubility and its freedom from rusting constitute its claim to be considered a valuable filtering material," and he gives its percentage composition as follows:

Magnetic oxide of iron	53.85	per cent.
Alumina	5.68	" "
Magnesia	7.55	" "
Water, with a trace of carbon	5.41	" "
Silica	25.40	" "
Lime	2.01	" "

It contains, therefore, no poisonous metal; it is very hard, porous and absorptive. It extracts iron and lead from water, and destroys organic matter in solution. It is a powerful decolorizer and deodorizer by virtue of the polarized oxygen contained within its microscopic pores. It it extremely durable and magnetic to a remarkable degree, and notwithstanding that iron is the chief element in its constitution, *it will not rust.*

The polarite filters filter at the rate of nearly three millions gallons per acre in 24 hours, being 7½ times faster than filter No. 19 referred to by the Mass. State Board of Health, page 11 of this paper.

"Sewage filters resemble living organisims, in that ventilation and respiration must be maintained; otherwise their functions are interrupted, and their lives as filters come to an end.

When sewage passes through a filter, a portion of the insoluble matter or sludge is deposited upon or near the surface. The result, eventually, unless preventive measures are adopted, is a clogging at the surface, which, owing to interrupted ventilation, causes a deterioration in the quality of the effluent, and subsequently, owing to the increased capillary attraction and frictional resistance to the passage of sewage a reduction in the quantitative efficiency of the filter.

Unless care is taken, sewage will in time clog any filter." 25th Annual Report State Board of Health, Mass., U.S.

Permanency of Sewage Filters.—It is well known that, with filters of suitable material, sewage may be purified at a rate of more than 100,000 gallons per acre daily, with a removal of more than 90 per cent of the organic matter.

Some of the organic matter is stored at, and near the surface of the filter, and, under some circumstances, there is a certain amount of storage for some distance below the surface.

After filters have been regularly filtering sewage at a high rate, it is eventually necessary to spade up the surface in a manner corresponding to ploughing, and later to remove the clogged surface layers, and replace them with fresh material.

It follows from the experiments of the Board that the permanency of sewage filters depends largely upon the treatment they receive.

In 1890 it was learned that the interruption of the ventilation of a filter, owing to clogging by the stored organic matter of the sludge at the surface, was prevented to a great extent, by a systematic weekly raking to the depth of about one inch.

Eventually raking no longer suffices, and it becomes necessary to remove the clogged material and to replace it with fresh.

When new material is put on to old to replace clogged material removed, it is always advisable to mix the old and new together, in order to prevent clogging at the junction of layers of unlike capillary attraction.

Note by C. G. Horetzky.— Outdoor land filters are here referred to, and not the small polarite filters. The latter should be treated in a similar, but much modified way.

The several methods of managing filters may be summarized as follows :—

1. Systematic raking.

2. Systematic scraping when necessary, (followed by raking to loosen the material) gives good results.

3. The more rest a filter gets the less scraping of material will be required.

Another aid to prevention and relief is the removal of as much of the sludge as possible before the application of the sewage to the filter. This may be done by different treatments, as follows :

1. By *rapid filtration through coarse gravel* by the aid of a current of air drawn through the gravel.

2. By *chemical precipitation.*

3. By *sedimentation.*

4. By mechanical devices, such as very fine screens or wire cloth. (Results incomplete.)

After treating sewage by one of the *first three methods*, it was in each case applied to a filter of sand sixty inches deep, having an effective size of 0.17 to 0.19 millimetre.

(*First Method.*) *I. Filters 15 B and 16 B.*

These were *coarse gravel filters*, 65 inches deep.

Filter No. 12 A.

A sand filter, 60 inches deep, received the effluent from 15 and 16 B, and filtered 900,000 gallons per acre daily for six days in the week, during the whole of 1893.

(*Second Method.*) *II. Filter No. 19.*

Also a sand filter, 60 inches deep, received the supernatant liquid from sewage after *treatment with alum* (1,000 lbs. per million gallons, with 4 hours settlement.) It averaged about 400,000 gallons daily per acre during 6 days in a week, during the whole of 1893.

(Third Method.) III. Filter No. 13 A.

Also a sand filter, 60 inches deep, received the supernatant liquid from sewage which had been *allowed to settle four hours.* It filtered 416,000 gallons daily per acre from October 1st, to December 31st., 1893.

We find that the average rate of filtration for the combined area of filters 12 A, 15 B and 16 B was 320,000 gallons per acre daily for six days in the week. This is the best result yet obtained from the experimental filters; and this system of double filtration with the aid of a current of air appears capable of application to sewage purification on a large scale.

QUALITATIVE EFFICIENCY OF THESE THREE METHODS.

Average percentage of Removal of Organic Matter and Bacteria.

	Jan. 1st to Dec. 31st., 1893.	
	Albuminoid ammonia.	Bacteria.
From effluents of filters Nos. 15 B and 16 B, by filter No. 12 A. (First method)	81.2	98.9
From sewage by chemical precipitation	52.4	84.3
From clarified sewage (after chemical precipitation) by filter No. 19. (Second method)	89.0	95.8
From sewage by sedimentation from Oct. 1st. to Dec. 31st, 1893	18.2	12.0
From clarified sewage (after sedimentation) by filter No. 13 A, Oct. 1 to Dec. 31, 1893. (Third method)	89.4	98.6

At the World's Fair, the process of purification adopted was precipitation by copperas, lime and alum.

The results were not up to expectation, being slightly less than indicated for the Worcester plant, by the examination of the board in 1891. About one-half of the total organic matters of the sewage

was removed by the precipitation; while the experiments made at Lawrence in 1889 had shown that chemical precipitation might remove 60 per cent of the total organic matter.

The low efficiency of the World's Fair plant was attributed to the unfavorable conditions for sedimentation, caused by the method of delivery at the works.

It succeeded however in holding back from Lake Michigan 1,300 tons of sludge removed from the sewage treated, and prevented a nuisance along the lake front; besides reducing the danger from infection of the water supply.

PROGRESS AND SUCCESS OF THE SEPARATE SYSTEM OF SEWERAGE IN ONTARIO.

By Willis Chipman, C.E., Toronto.

Gentlemen,—It will be unnecessary in this paper to describe the separate system of sewerage or to point out its advantages and its disadvantages.

It has now been in operation for seven years in Ontario, and it is not too much to say that there are to-day several cities and towns enjoying the comfort and cleanliness that follow the introduction of sewers, that would still be practically "privy" towns if they had not adopted this system.

Brockville.—In 1887 the town of Brockville adopted the separate system of sewerage, after spending two years in investigating the problem. The writer had the honor of first bringing the advantages of the system to the notice of the town authorities, and at his suggestion Col. Waring, M.I.C.E., the father of the separate system in the United States, was invited to visit Brockville and report. His report was considered so extremely favorable to the separate system that the town authorities considered it advisable to call in another experienced sewerage engineer, Geo. S. Pierson, M. Am. Soc. C.E., to report upon the proposed work before commencing construction. This report being also favorable to the separate system, construction was commenced and in 1888 the use of the sewers began.

From the first all plumbing has been done in accordance with a strict by-law, which provides for a rigid inspection of all work and a careful record of such when completed. The connections with the houses are also laid under the supervision of the town inspector, all being under the direct control of the engineer.

The adoption of the separate system in Brockville was not accomplished without a long and hard fought battle, but it was a skirmish as compared with the struggle to enforce the by-laws respecting plumbing and house drains. It was only by patient persistence and by treating all parties alike that the opposition from architects, builders, landlords and plumbers at last disappeared.

It may be here stated that Brockville was the first place in Canada to adopt an efficient plumbing by-law, hence the opposition to the infringement on individual rights, and the invasion of every man's "castle."

Old plumbing was only allowed to be connected with the sewers upon such changes being made as the engineer might deem necessary.

The Brockville system was designed according to experience gained in the construction and operation of similar systems in central New York, where the climate differs but little from that of Brockville.

Every variety of soil was met with in Brockville, granite rock, limestone, clay, sand and quicksand. Every foot of sewer was laid under careful supervision of competent assistant engineers and inspectors.

The town has now nine miles of sewers, and about 600 house sewer connections. The system has worked satisfactorily from the first, the cost has been moderate and the sanitary condition of the town improved as an examination of the mortuary statistics will prove. B. J. Saunders, Esq., M. Can. Soc., C.E., is now town engineer and in charge of the sewer system and all plumbing.

Cornwall.—The next town to adopt the separate system was Cornwall, where the writer was called upon in 1888 to design a system. Owing to local conditions the main sewer was made of sufficient size to admit roof water from the business portion of the principal street. In all other parts of the town the separate system was recommended and there are now about six miles of sewers constructed. Cornwall, however, did not pass any plumbing by-law, and consequently cannot make as successful a showing from a sanitary standpoint as Brockville.

Barrie.—Barrie was the next place to adopt the system, one sewer being of sufficient size to take the roof water from the business street.

About three miles of sewers have been constructed, two under the supervision of the writer.

A plumbing by-law was enacted by the town similar to the Brockville by-law, but it has never been rigidly enforced. In the writer's opinion no town can enforce a by-law of this kind except

through a competent town engineer, who cares less for his salary than for his professional reputation. Barrie, however, has no town engineer.

The works are giving good satisfaction to the citizens, the sanitary condition has been improved and this year the works are being extended upon the writer's plans and specifications.

Brantford.—In 1890 the city of Brantford engaged the writer to design and report upon a system of sewerage, which report, etc., were duly adopted and work commenced the same year.

Brantford adopted the strictly separate system, no rain water whatever being allowed to enter the sewers. This was imperative as the purification of the sewage may be demanded in the near future.

Brantford has about thirteen miles of sewers and several hundreds of house sewer connections.

A very carefully prepared plumbing by-law was adopted and all work placed under the supervision of the city engineer, T. Harry Jones, Esq, M. Can. Soc. C.E. who has strictly enforced the by-law.

Some improvements were made in the details of the Brantford system, as experience with the Brockville system appeared to demand.

The working of the Brantford system has been eminently satisfactory, and there are few, if any, places in Ontario to-day that can in the writer's opinion, compare with Brantford from a sanitary standpoint.

Berlin.—Berlin was the next place to adopt the separate system, the greater portion of the works being constructed in 1892 and 1893. These works were designed by H. J. Bowman, Esq., M. Can. Soc. C.E., and were constructed under his supervision as town engineer.

The works are similar in nearly every respect to the Brantford works.

Berlin also adopted a plumbing by-law, almost identical with the Brockville, Barrie and Brantford by-laws. At Berlin the sewage is disposed of by applying it to land, the sewage farm having been designed by the writer with Mr. Bowman in charge of construction.

The system in Berlin has worked satisfactorily in every respect.

Toronto Junction.—This beautiful suburb of Toronto engaged the writer to report upon a sewerage system in 1890, but the works were not commenced until 1892.

Under the writer's supervision about seven miles of sanitary sewers, and about four miles of storm sewers were constructed in 1892 and 1893.

By-laws regulating plumbing and the laying of house sewer connections were passed early in 1893, and during that year the supervision of the house sewers was under the direction of the writer, but the plumbing inspections were made by an official not under the control of the engineer.

In this place the separate system was vigorously opposed from the first, and the by-laws regulating plumbing, etc, differed so radically from the by-laws in Toronto that they were passed with the greatest difficulty.

The Toronto Junction system is, in the writer's opinion, the best example of the separate system in Ontario, but unfortunately the town's affairs are now controlled by those who were in "opposition" in 1890, 1891, 1892 and 1893, and consequently every attempt has been made to discredit the system and its working.

In 1894 the maintenance of the works was taken out of the hands of the town engineer and placed under an inexperienced and incompetent man; and in 1895 the town decided to do without a town engineer, the mayor, however, drawing a salary sufficient to keep the sewer system in perfect order. Until 1894 the Mayor demanded no salary.

Notwithstanding the unreasonable hostility to the system by a few persons who have axes to grind, no changes of importance have been made in the by-laws, and no change whatever in the system, and there is no probability that such will be made. No fault whatever is found with the sewers proper, but objection is made to the "unnecessary stringent" provisions of the plumbing by-law, and to the fact that the sub-soil tiles cannot be used for purposes for which they were not designed.

Waterloo.—The town of Waterloo, adjoining Berlin, is now constructing a system of sewers under the supervision of Mr. Bowman, the writer acting as consulting engineer. The sewage will in this case be purified by application to land.

If the separate system had been a failure in Berlin, Waterloo would not have adopted it, and the same argument applies to the method of disposing of the sewage.

In several other cities and towns in Ontario the separate system has been recommended, but those described are, the writer believes, the only systems that have been constructed.

CONCLUSION.—From an intimate acquaintance with the separate system in operation extending over a term of nearly ten years the writer's conclusions were stated as follows at a recent meeting of engineers:

(1) That in Ontario the system has given entire satisfaction when intelligently looked after and properly maintained.

(2) That cellar drainage is a much more important matter here than in warmer climates requiring modifications in the separate system as recommended by Col. Waring and others.

(3) That in the colder parts of the Province and in hilly towns where storm water floods basements and cellars, direct connections with the sewer became necessary and in these places glazed pipes should be substituted for porous tiles.

(4) That where practical the street sewers should be laid at least three feet lower than cellars or basements to permit direct connecting of drains if found necessary at any time in the future.

(5) That the only practical system of thorough ventilation of sewers in this climate is through the house soil pipes unprovided with main traps, "breathers" and other devices.

(6) That automatic flush tanks perform their work when periodically examined by competent inspectors.

(7) That as the sewers in this system are smaller than in the combined system, the cost is much less, consequently a larger area can be sewered and a greater population served with the same amount of money.

A PLEA FOR GOOD DRAINAGE.

By Henry Carre, Belleville, M. E. Soc. C. E.

Gentlemen: Amidst the ruins of the most ancient cities of which we have any historical knowledge, may be seen at the present day the remains of old sewers, showing wonderful skill in design and workmanship and proving conclusively that the necessity of a thorough system of sewerage was deemed as necessary then as it is now.

Sewerage works are no new fad. Babylon, Nineveh, Carthage, Jerusalem and Rome still show the care which was taken to do the work well, and that the contractors of those days knew how, *and did*, honest work, is plain to be seen from the fact that after thousands of years have passed away, those portions which have not been ruthlessly destroyed by man remain sound and strong. How much of the vaunted work of to-day will stand the same test? Very little, I fear. The archæologist of A.D. 5000 will find few traces of our sewers, when delving among the ruins of the cities of the present time. Still although the work done to-day is not in many cases as durable as that of old, we can show great improvement in design. Science has solved many things which were hidden in those days when microscopes were unknown, and not even a microbe was to be *seen*.

How many ages had passed away, what terrible plagues had ravished the country, before men's eyes were opened to the necessity of cleansing their cities we cannot tell exactly. But man has not changed so very much since the days of the Grecians and Romans, but that we can judge in part of the existing state of public feeling then, by the examples to be met on every hand in our own time.

During what is know as the Dark Ages, there would seem to have been a regular falling away from the state of civilization existing in other matters besides religion, and it is only within the present century that the world is awakening once more to a sense of the necessity of cleanliness, not only of our persons and homes, but of our cities.

Thousands of dollars have been spent in the Old Country as well as in the New World in experimenting on sanitary matters. The best chemists have turned their attention to the question of "*sewage disposal*," and engineers have done their best to design the most perfect system of drainage. "Systems" have been designed to suit almost every case. We have the now well known "combined" and "separate" systems with their perfectly laid brick sewers and salt-glazed pipes, forming a perfect underground net-work of pipes, the size of each portion accurately calculated to convey the estimated amount.

Volumes have been written showing the dangers we run from the want of due care in removing at once the refuse which is collected around our dwellings. 'Tis not sufficient that we are notified once or twice a year to clean our back yards, for it is a well-known fact that three or four days are sufficient to produce putrefaction, and therefore that it requires daily care to remove everything that may become noxious, from around our houses. The danger is increasing from year to year, never decreasing, until the proper course is adopted and each one is not only enabled, but compelled, to keep clean. Should we not then take lesson from the experience of others and not wait until the plague comes before applying the remedy, "a stitch in time saves nine."

The general excuse for not doing so is poverty and hard times. "We cannot afford the cost." "Why the engineer tells us it will cost $200,000 for a complete system of sewerage for the city; how could we ever stand that? We are overtaxed as it is."

Now let us look into this frightful bug-bear; 'tis the best way, I think, in every case to look every trouble square in the face. Take out your pencil and find a small bit of paper, an old envelope will do; now then set down the frontage of your lot—60 feet you say. Well a nine inch tile pipe costs on an average $1 per foot, including man-holes and flushtanks. Sixty feet at $1 a foot is $60, but as your opposite neighbor has to pay one half of this, your share is then only $30, which can be arranged to be paid off gradually in a number of years.

Now, compare this with your water tax, for instance, which will soon be universal, and may rise. Here in our City of Belleville we pay $6 a year for every tap in our house or lawn (and it is well worth the money), that is $30 in five years, $60 in ten years, and so on with compound interest, doubling and tripling itself. Now you see that five years of water tax on one tap, would pay your sewerage tax *in toto*—no more to pay, though the benefit still goes on. 'Tis like a paid up insurance policy, and even better, for it goes on after you are dead and gone and your property also rises in value from the day the sewer is built.

There is however another point which we must not forget, and that is this, a nine inch pipe is not sufficient in all sections of the city. As we approach the outlet the volume of sewage increases. Intercepting sewers must be provided along certain streets, and an expensive outlet sewer must be put in. How is this to be paid for? Are those living on the street where an 18 inch pipe has to be laid, to pay the full price, on the same principle as the street with a nine inch pipe? To this we say, *certainly not.* It would not be fair to do so. The enlarged pipe is necessary for the *common good*, and the excess of cost should be paid out of the public treasury, and included in the municipal tax, each one bearing his share, so that those living on a street where a main or intercepting sewer has been laid would only pay for the cost of laying a nine inch tile, as on any other street, and their due proportion of the outlet and main sewers when divided among all the tax payers. It might be a good idea, in this age of business, to offer a bonus to the street that first built a sewer, as an inducement to get the thing started.

If then, I say, we look at the comforts which without sewerage we cannot have, such as bath-rooms and W. C.'s in our houses, as well as the decrease in the death rate, which has been clearly proved to be consequent on the adoption of sewerage, and compare the cost of all this with what we have to pay for other necessary things, there is little doubt but that every sensible man will vote for sewerage every day and twice on Sundays. But above all things if you do decide on a system of sewerage let us copy the ancients and let it

be well done. Let there be no bad work—see that the pipes are laid true to a regular grade, so that water entering the sewer at any point, will never rest till it reaches the outlet, no matter how far away, and thus avoid the danger of turning portions of your sewers into long cess-pools; because a danger is hidden and out of sight, it does not lose its sting, but like a coward it stabs you in the dark and it attacks the weak and delicate first.

For the sake then, of our wives and children and our aged parents let us have sewerage.

POSSIBILITY OF SIMPLE AND SAFE HOUSE PLUMBING.

By Herbert J. Bowman, C. E., Berlin, Town Engineer.

Mr. President and Gentlemen: In the Statutes of Ontario, 47th Victoria will be found "The Public Health Act, 1884," and appended thereto a by-law, the enactments of which are in force in every municipality till altered by the Municipal Council.

Sections 15 and 16 of this by-law are practically the plumbing regulations in force all over the Province, except in the cities and towns that have adopted plumbing regulations of their own.

In order to see whether they are so framed as to admit of the "Possibility of Simple and Safe House Plumbing," it may be interesting to examine these enactments which are as follows:—

Sec. 15. The following regulations regarding the construction of houses shall be in force within this municipality:

Rule 1.—No house shall be built in or upon any site, the soil of which has been made up of any refuse, unless such soil shall have been removed from such site, and the site disinfected, or unless the said soil shall have been covered with a layer of charcoal, covered by a layer of concrete at least six inches thick and of such additional thickness as may be requisite under the circumstances to prevent the escape of gases into such proposed house.

Rule 2.—The drain of every house which may be connected with a sewer or cess-pool shall be ventilated by means of a pipe extending upward from the highest point of the main soil or waste-pipe, and also by a pipe carried upward from the drain outside the walls of the house according to the principles shewn in the appended diagram. These pipes shall be of the same dimensions as the said main soil or waste-pipe, and shall be constructed of the same material or of stout galvanized iron, and no trap shall intervene between the said ventilating pipes. In case a trap shall intervene between the sewer or cess-pool, and the ventilating pipes already described, then a four-inch ventilating pipe of the same material as above described shall be carried from a point between such trap and the sewer. All such

ventilating pipes shall be carried above the roof of the said house, and shall open above at points sufficiently remote from every window, door, sky-light, chimney or other opening leading into any house.

No pipe carrying air or gas from any drain or soil-pipe shall be connected with any chimney in a dwelling-house, unless the same be a furnace chimney used exclusively for the purpose of ventilating such soil-pipe or drain.

Rule 3.—Every house-drain shall be constructed of vitrified earthenware or iron pipe; and every soil and waste-pipe, of iron pipe rendered impervious to gas or liquids, the joints thereof being run with lead and caulked, or of lead pipe weighing at least 6 lbs to the square foot; and the waste pipe from every closet, sink, tub, wash-basin, safe or other service shall have as near as may be to the point of junction with such service a trap so constructed, vented and furnished, that it shall at no time allow of the passage of gas into such house. All joints shall be so constructed as to prevent gas escaping through them.

Rule 4.—The construction of any closet or other convenience which shall allow of the escape into the house of air or gas which has been confined in any part of it or from the drain or soil pipe, is hereby prohibited.

Rule 5.—No refrigerator waste shall be allowed to connect with any drain.

Rule 6.—No pipe supplying water directly to a water-closet or urinal, shall be connected with the pipe supplying water for drinking purposes.

16. Every person who erects, or causes to be erected, any building shall, within two weeks of the completion thereof, deposit in the Registry Office of the Registry Division in which the building is situated, plans of the drainage and plumbing of the same as executed; and in the case of any alteration of any such plumbing or drainage, it shall be the duty of the owner of the house, within two weeks of the making of the alteration, to deposit in the same manner the plan and record of any such alteration; if such alteration is made by a tenant, it shall be the duty of the tenant or lessee to deposit, or cause to be deposited, the plan and record of such alteration.

In examining these statutory plumbing regulations it must be remembered that they were compiled at least as far back as 1884, and that since that time considerable progress has been made toward simple and at the same time safe plumbing, and the methods of good plumbing practice have become more uniform.

Upon looking at the diagram appended to the Health Act, it will be seen that a trap is placed on the drain between the house and the sewer, but it is also indicated by the dotted lines that this trap may be omitted. Thus it will be seen that the views of both the opposing schools of plumbing experts have been met, one insisting upon a trap on the house drain and the other insisting that no such obstruction should be placed there.

The diagram, however, can scarcely be taken as illustrating a typical Canadian house, as comparatively few houses have two bath rooms.

It would have been better to have shewn the necessary arrangement for a kitchen sink on the ground floor and also to have shown the cellar excavated, as is now usually done under the greater part of the house, affording a convenient place for the laundry with its stationary wash tubs or the less expensive slop hopper.

Rule 1, dealing with the soil of building sites, does not come within the scope of our present inquiry, so it may be passed over.

Rule 2, requires the extension upwards of the soil pipe (*a*) through the roof but goes on to state that this extension may be of galvanized sheet iron. A sheet iron pipe is a cheap and temporary make-shift and should not be allowed in connection with house plumbing. Nothing but cast iron soil pipe and lead or brass waste-pipe are now used in good plumbing. This rule requires an outside ventilating pipe, (*b*) which is quite unnecessary where no trap is placed on the house drain, and where a trap is used, this ventilating pipe, then called the fresh air inlet, is not usually extended above the roof, but only about two feet above the ground. It is very unlikely that the fresh air inlet would act at all were it constructed bending over the roof as shewn in the diagram. This rule calls for still another ventilating pipe (*c*) in case a trap is placed on the main drain. This pipe is to

be carried from a point between the trap and the sewer and extend up above the roof and is an outlay placed upon the householder to ventilate the public sewer. Any bend in this pipe, as shewn in the diagram, will cause it to freeze up during our Canadian winters and even a straight pipe will sometimes freeze up at the top. Partly on account of this, but perhaps more on account of the additional outlay, from which the householder receives no benefit, this pipe is usually omitted in Ontario.

In most of our cities and towns having plumbing regulations of their own it is now required, or permitted, that a house have but one continuous iron soil pipe from the outer connection with the house drain at least three feet outside the wall, up to the opening at least four feet above the roof, the trap and other ventilating pipes being dispensed with. This is certainly the simplest arrangement and quite as safe as any other. It would be better to cut out the proviso that closes this rule and leave it "No pipe carrying air or gas from any drain or soil-pipe shall be connected with any chimney of a dwelling house."

Rule 3, requires that every house drain shall be constructed of vitrified earthenware or iron pipe. By house drain is evidently meant the private drain connecting the house plumbing system with the public sewer, and vitrified clay sewer pipe is almost invariably used, as outside of the house it answers the purpose equally as well as cast iron soil pipe and costs less than one quarter as much. Inside the house, however, nothing but cast iron soil pipe and lead and brass waste-pipe should be used. The minimum weights per lineal foot for the different sizes of lead waste-pipe should be given as nothing but drawn lead pipe is now used. The old method of making lead waste-pipe by hand from sheet lead has been entirely discarded, so that the rule should be amended where it says "lead pipe weighing at least 5 lb. to the square foot." The requirement that iron pipe shall be rendered impervious to gas or liquids was probably inserted in this rule to ensure a liberal coating of coal tar to the cast iron soil pipe. It has been found, however, that the coal tar varnish covered up sand-holes and other defects in the pipe, so that now untarred pipes

and fittings are mostly used after having been immersed in linseed oil to prevent them from rusting. The only proper way to render cast iron soil pipe impervious to gas or liquids is to require a good thickness of metal, and a standard for the different sizes should undoubtedly be laid down in the Public Health Act. This would please the manufacturers, because they would require but one set of patterns; it would please the wholesalers because they would require to stock only the standard sizes; it would please the master plumbers because they would then not fear the dishonest rival under-bidding on light pipe; it would please the plumber because it would lessen the danger of having to remove cracked pipes and fittings when the water-test is applied; and last of all it would be a great benefit to the house-holder as he would have the foundation of a good plumbing job ensured.

The requirement that the waste from every fixture should be trapped and vented, is a good general rule, although there are some cases where trap-vents are not necessary. The word "safe" must have crept into the list of fixtures unawares, as it has long been considered a violation of the rules of good plumbing to connect a safe-waste direct with any drain. Safes of sheet lead were usually placed under the old fashioned boxed-in plumbing fixtures to prevent water from leaky or defective baths, etc., going through the floor and injuring the ceiling below. It is quite possible that sufficient water might never be caught in a safe to fill a trap on its waste, hence it should not be connected direct with the plumbing system, but empty openly into some lower fixture. Fortunately safes are now seldom required since all fixtures are left open and if any water leaks on to the floor it may be easily seen and mopped up. The conclusion of rule 3 is somewhat indefinite, viz: "All joints shall be constructed so as to prevent gas escaping through them." The section of the Toronto plumbing by-law governing this matter is much more practical and is as follows: "Every connection between lead and iron pipes shall be made with brass thimbles or ferrules, having properly wiped joints, and the ferrules shall be properly gasketted, leaded and caulked into the said pipe. Ferrules for four-inch pipe shall weigh

not less than two and a half pounds; for three-inch pipes not less than one and three quarter pounds, and for two-inch pipes not less than one and a half pounds; each ferrule to be not less than four inches in length. All lead pipes shall have properly wiped joints. When the trap to closets is above the floor, the connection of the same with the soil-pipe shall be made of brass and rubber, said brass flange to be not less than three-sixteenths of an inch thick and cast.

Rule 4 is a good general rule, but, in spite of it, the writer has recently found in one of our Ontario towns a new plumbing job with the universally condemned pan closet fitted up. The water closet is perhaps the most important plumbing fixture in a house and the styles made are innumerable, although but two types of closets are now generally used. The older of these is the "hopper" closet, consisting of a straight hopper discharging into an S trap, and forming a good closet from a sanitary point of view, although objected to by the fastidious as its walls are not easily kept clean without almost daily attention. In an attempt to remove this objection, the washout closet was designed, being in reality a distorted hopper discharging into the same form of trap. This arrangement does not remove the filth, but puts it out of sight and where it is more difficult to get at. The true solution of the problem was the construction of a hopper closet in one piece with the walls more nearly perpendicular, and a larger and deeper pool of water in the trap. This forms what has been termed the "wash-down" closet now coming into general use. The remaining type of closet is used in more expensive work and is composed of the various forms of "syphon" closets. These have deep pools of water and have various devices to start syphonic action to remove the contents rapidly.

Tinned copper baths are now the most frequently used, and when "steel-clad," require no wood work around them and are just as good from the sanitary standpoint as enameled cast iron or the expensive porcelain baths. The ordinary porcelain basin is defective because there is no means of cleaning the overflow pipe. A removable strainer on the overflow is much more desirable. Kitchen sinks of cast iron, steel and porcelain are in common use. The waste pipe

from an ordinary kitchen sink should not be more than 1½ in. in diameter and have an ordinary lead trap properly vented to prevent the seal being syphoned out when the rush of water goes down the soil pipe from the closet.

Rule 5 is a wise one, as no refrigerator waste should be connected direct with the plumbing system. During the winter no ice is placed in the box and the water seal of the trap would soon be lost. There is no objection, however, to have the waste water from the refrigerator discharged openly into the kitchen sink or into any plumbing fixture in the basement below, or it may discharge into the trap on the cellar drain. No mention seems to be made in the rules of how cellar drainage should be arranged where it is required.

Rule 6 is intended to prevent contamination of the drinking water in case the water should be turned off in the street main and a partial vacuum thus caused.

Section 16, requiring owners of houses to file in the county registry office plans of the drainage and plumbing of same as executed, seems to be entirely ignored. House plumbing should be constructed so that every detail may be easily examined without a plan, but of course a plan of the outside drainage should be on record somewhere, and if every town had a registry office no better place could be found.

From the foregoing comments the conclusion may be drawn that when the statutes are revised in 1897 some changes and additions are required to bring this portion of the Public Health Act up to date.

SANITARY CONDITION OF CHEESE FACTORIES AND SLAUGHTERHOUSES.

By N. B. DEAN, M.D., BRIGHTON, M. H. O. BRIGHTON TP.

To the Executive Health Officers of Ontario:

Gentlemen: May I ask your honorable body to kindly assist me to solve the following.

There is in the Township of Brighton a cheese factory situated near the gravel road within one quarter of a mile of a small village. The whey runs from the vats through pump logs into a tank about forty feet distant. These logs are very defective and allow the whey to run over the ground, which is thoroughly saturated. The chemical action caused by the heat of the sun fills the air with a most lovely perfume very unlike new mown hay or the sweet scented geranium.

We have within twenty feet of the building about one dozen full grown hogs wallowing in mud composed of dirt, water and whey; the gas from this, which appears to be (if you will allow me to use the word) *complementary*, combines with the preceding to make up all that is necessary to perfect that "amber scent of odorous perfume" which would "smell as sweet by any other name." This is wafted on the gentle breeze and distributed gratis to all the people in the vicinity of that factory; yet the ungrateful population there, not having been properly educated in the "science which treats of the beautiful" nor the latest esthetic ways of Oscar Wild, consider the aforesaid the "rankest compound of villainous smell that ever offended the nasal organs" and are not satisfied to allow it to continue.

They were just as unreasonable a few years ago with another cheese factory when they made great complaints to the board of health, who ordered the medical health officer and sanitary inspector to visit the section and find the cause of this wonderful turmoil.

True they had diphtheria in the neighborhood, but before the thirteenth child died out of fifteen taken ill they commenced to

busy themselves in that unfriendly manner, and the municipality put to the outrageous expense of seventy-five dollars by that abominable board of health.

On arriving within sixty rods of the building we were delighted with the pleasing effect on the olfactory nerves. We found within ten rods of the factory about twenty well fed hogs; the pen had not been cleaned for weeks. You can well imagine the sanitary condition of the mud in which they were wallowing. They appeared as contented as if they were in their haven of rest and why should people grumble. The ground under and around the factory was thoroughly saturated with whey. There was a drain about one hundred feet long and twenty inches wide with the lowest end under the factory. That drain contained one hundred and fifty cubic feet of maggots in active motion and I submit that it is far better to have them in the drain than in the cheese. The owners of the hogs will tell you that they have rights and can keep things where they please on their own lands. Perhaps you may have a Solomon in the community, who has the confidence of all, to tell them "When I was a boy there was no board of health, that the pig pen was put in the most convenient place for feeding, and only cleaned once a year when they wanted the manure for the land." "That the hog was never happy without a full stomach and a mud hole to lie down in." "That people had some liberty in those days and they never heard tell of diphtheria either."

Be that as it may, you are well aware that there is nothing more powerful to absorb bacteria than milk. That milk appears to be a natural medium for the growth of the Loeffler bacilli. That the milk while being transferred at the factory, where the air is saturated with gas, must take in large quantities of microbes. That milk when heated for the purpose of making cheese has not the high temperature continued long enough to sterilize it. That curd will absorb bacteria.

If milk were heated long enough to kill the microbes, the vats are constantly exposed to the gas within the building, and the milk on cooling would imbibe sufficient to make the cheese dangerous to those who are susceptible to any of the bacteria.

The bacilli of diphtheria and typhus abdominalis are to be dreaded as they are facultative anaerobics; can live and grow in cheese and remain for months until liberated into natural culture media more suitable for their development.

While we are looking after the slaughterhouses, streets and water supply, we suffer food to be sold to the multitude which is undoubtedly the source of many an epidemic when the blame is laid to local causes.

The people living in the vicinity of a filthy cheese factory are not in half the danger of those living in thickly populated cities eating the cheese. We will find a large majority of the factories in a perfect state of cleanliness, but now and then things will be permitted to go at loose ends and become a nuisance.

Since cheese from such filthy factories is liable to be widely distributed throughout the Province and is extremely likely to carry death dealing bacteria with it, if my assertions are correct, a law should be passed providing for the closing of any factory that is allowed to get into an unsanitary condition. We would then have its patrons looking after their own interests who would compel the owner to see that things were kept clean.

METHODS FOR DISPOSAL OF SEWAGE OF LONDON.

By T. V. Hutchinson, M.D., Medical Health Officer, London.

Mr. President and Gentlemen: I may premise what I have to say on the subject of the disposal of the London sewage, by stating the fact that any system which does not return to the soil that which was taken from it, is wrong in principle, and it is only a question of time when from the universal impoverishment of the soil now taking place, by pouring decayed vegetable matter and sewage into rivers and lakes, the disastrous effects of this foolish and shortsighted policy will become manifest. We should not only return to the soil those constituents we take from it for the sustenance of our bodies, but to make things even the carcass or body must be given back as well. This impoverishment of the soil is not only taking place in cities and towns by the action of man, but the fertilizing constituents of the soil are continually being washed down hillsides and slopes into streams and lakes, and eventually deposited in the bottom of the sea where they can do no good. The consequences of this may seem remote, but not so remote as some would think. A German thinker has recently demonstrated that, through enforced modern sanitary measures in saving and prolonging life, and the natural increase of population,—and this last factor can certainly be depended upon,—in 188 years the maximum population which the earth is capable of sustaining will be reached, the struggle for subsistence will become more and more severe, and the race in consequence deteriorate. Some of us may not live to see these changes, but in these days of condensed Methuselahs 188 years will not be long passing away. It may be asked why should we concern ourselves about posterity, what has posterity ever done for us? Some here no doubt have made laudable efforts to contribute their quota to this natural increase of population, and this posterity might have some grounds to reflect unpleasantly on the wisdom of their ances-

tors. This method of pouring sewage into rivers and streams, called the water carriage system, is the easiest method of getting rid of it. But do we get rid of it? To a certain extent we do, but only by depriving the soil of that which should be restored to it as plant food, while the evil remains in contaminated rivers and streams, in other words, converts them into open sewers.

The sewage flowing into the Thames at Ingersoll, Woodstock and St. Marys, contaminates the river at London, and that which flows into the river at London contaminates it at Chatham. This sewage eventually becomes destroyed by oxidation, but the distance it flows and the time required for its destruction are uncertain factors in determining its innocuousness.

Pouring sewage into rivers and streams is only removing the evil from one place to have it work out its evil effects in another, and as population increases the danger becomes greater. Sewage is a fertilizer, but when poured into streams it is not only wasted but worse than wasted; the proper place for sewage is upon the land, and irrigation is the only method which not only meets all the requirements of modern sanitary science, but gives back value for the cost of outlay.

In London we never really had a system of sewers, we empty into the most convenient ones, and make the sewers empty into the outlets provided by our predecessors. The first and main sewer, that in King street, was put down in 1852. The tile drains are from eight to eighteen inches in diameter, and the large sewers from four feet to five feet, are oval in shape and made of red brick.

Our sewers were constructed originally for a town of five or six thousand inhabitants, and no provision was made for increase of population. The consequence of this was that many of the sewers had to be reconstructed at great expense. You will see by the map that Carling's Creek runs through the north and eastern parts of London and thence to the north branch of the Thames, and drains about two-fifths of the city. The sewage from the military barracks

and from some private houses also empties into the creek. It is so convenient that it is almost impossible to keep sewage out of it, until now it may be called an open sewer. I proposed a plan some years ago that a small trunk sewer be laid down along the bed of the creek from East London to the river. This would be used solely for sewage purposes. Let the creek flow over it and let the storm water take care of itself. The expense, however, was the great objection, and the sewer was never constructed. You will also see by the map that the sewers north of King and east of Adelaide street, with the exceptions of Hyman, Wellington (the two latter clear water drains) and Richmond streets, which empty into the Carling Creek, find their outlets in the King street sewer which enters the River Thames near the forks. The York street sewer, Talbot West, empties into the river at York street, Bathurst street, Talbot south, enters the river at Bathurst street, Horton street west, and Talbot, Bathurst to Simcoe, empty into the mill race at Horton street.

Bathurst, Talbot to Clarence, Clarence, Bathurst to Horton, Horton street, Clarence to Richmond, Simcoe street, Talbot to Clarence, empty into the Richmond street sewer, which extends southerly to King street and finds its outlet at Hunt's dam. All sewers east of Richmond and south of King, not mentioned in the foregoing find their outlets in the Wellington street sewer which empties at Wellington street bridge.

St. James street sewer empties into the River Thames at the foot of the street. Wellington, Sydenham, Colborne, Thornton avenue, Oxford, Maitland, William, Elizabeth, Lorne avenue, English and Quebec streets, all clear water drains empty into Carling's creek.

In the 6th ward, Briscoe, Wray, Langarth, Edward avenue, Henry, Bruce and Askin streets (all drains) empty into Mill creek, and eventually reach the river through the Coves. Alma, Maple and Wharncliffe Highway sewers empty into Hut's Gully and through the Coves to the river. Beecher street empties into the river

opposite King street outlet. Stanley street and Wortley road drains empty into the river opposite York street outlet. Craig and Queen streets empty into the river at Victoria Bridge. Hight street and Maple avenue drains empty into the river in the rear of Maple avenue school, London South.

Some years ago proceedings were taken against the city by a neighboring municipality for creating a nuisance by pouring sewage into the river. Judgment was obtained against the city in the courts and a fine of $1,000.00 and costs imposed. The costs were paid but by the intervention of the Attorney-General the judgment was withheld, upon the city promising to remedy so far as it could, the mischief being done. The matter has several times since been brought up and some kind of a compromise effected to obtain a stay of proceedings. One of the conclusions to be drawn from this litigation is, I think, that a large corporation cannot be forced against its will to abate a nuisance, but the proper way is to educate the citizens to the consciousness of the offence committed. Subsequently to this the city council, upon the recommendation of the board of health, engaged Mr. Willis Chipman, civil and sanitary engineer, of Toronto, to report upon the best method of disposing of our sewage.

After a careful survey of the city he recommended the construction of two main sewers, one for the north part of the city and one for the southerly part, uniting near the east end of the bridge leading across the south branch of the river, from which point a trunk sewer was to be constructed westerly to the low lands lying along the south bank of the river below the Coves. The soil and sub-soil at the proposed point of disposal was very suitable for receiving a large quantity of sewage. This plan, with the overhauling of some of the city sewers, and making necessary connections with the mains proposed, would have cost about $90,000.00 exclusive of the land required. With the present price of labor and material it is probable this could be somewhat reduced. This is the system adopted by the

London asylum and has been in operation for some years. The system works well and so far no fault can be found with it. One acre of land is sufficient for 2,000 people, 18 acres would be sufficient for London.

The practice of pouring sewage into rivers, streams and lakes is wrong; it is more convenient and less expensive than some other methods, but this policy is both shortsighted and unwise, and might be classed as a crime against posterity, as it will undoubtedly reap whatever we sow.

HOW SHALL WE BEST RESIST TUBERCULOSIS.

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

Mr. President, Ladies and Gentlemen: In this paper, I shall present, in a cursory manner, for your consideration, some of the means, which have been deemed to be, and have proved to be most successful in restricting tuberculosis.

In such a study preventive treatment, necessarily, takes the foremost place. To accomplish the prevention of tuberculosis, which the onlooking world is demanding of sanitarians, necessitates the concession of the means to accomplish that end. The statesman, and the political economist must each contribute his quota to the sum, by helping to regulate the struggle between capital and labor, so that food supplies may be cheap and plentiful. The legislator, backed by the church and temperance reform must, strenuously, oppose the manufacture and sale of strong drink, which plucks food from the mouth of the drunkard's child. Sanitary authorities should demand, that tuberculosis be made a notifiable disease, watched for as closely as typhoid fever, and when discovered, that the patient be sent into the country, or so treated at home, as not to become a menace to friends and neighbors. Local sanitary authorities should be allowed to thoroughly disinfect hotels, dwellings, railway cars, upholstery, bed-clothing, etc., should, through their inspectors, control and direct the construction and repair of buildings, together with the drainage and concreting of the soil, upon which they are built, should prescribe and enforce rules for ventilating and heating dwellings and public buildings and for preventing the overcrowding of the same, and should induce people generally to adopt such changes in their methods of living, such reforms in their environment, as would mightily tend towards the reduction of feeble health and the increase of bodily vigor.

But someone perhaps will say "This is surely Utopia." My reply is, that the present condition of preventive medicine in Ontario is Utopia to any man who recalls the unhygienic condition of affairs, which prevailed in this Province thirteen years ago. And, as from small beginnings, gropings as it were, light transmitted to us by the sanitary legislation and scientific teachings of England, France and Germany, we have built up our sanitary walls, so we must in order to be consistent, continue to raise the pyramid still higher, until amongst other things we shall so improve the conditions of life among Canadians, that tuberculosis shall cease to be the largest contributor to our death-rate. Our surroundings make us what we are. Everyday experience proves that this is true, in the affairs of the body, as well as those of the spirit. So true is this in relation to the public health, that, if sanitary science had its way, if the hygienist could begin his treatment with the birth of the child, continuing it through childhood, youth and manhood, in 99 per cent. of cases there would be no tuberculosis to treat in after life, no matter what the family history may have been.

If, on the contrary, a child is born of an anæmic, ill-nourished mother who is unable to suckle it, and who stills the cries of its indigestion with paregoric, if it is kept indoors seven months in the year, in a small, not overclean, unventilated room, the dust of which is richly seeded with the germs of tuberculosis from the last tenant, is it any wonder, that, before the third year, the child dies of meningitis or enteritis, or if these acute forms are escaped, that, later on, hip-joint disease or a spinal curvature is developed? And here, I wish to pay a well deserved tribute to a sanitary improvement, in the saving of infant life, rarely if ever mentioned as such, which has been instrumental in rescuing thousands of children from premature graves. I allude to the baby carriage. I remember well when the babies in Toronto had no other outing that what could be got in the arms of mother or nurse. Unless the child of rich people, the little one might plead to be taken out of the hot, close air of the house, it might

point to the leaves and branches waving outside, its own instinct might teach it, that fresh air was better than foul; but few mothers cared to walk the streets with their babies, and nurses soon got tired, so that in summer, except through the open door or window, the infantile Torontonian got little fresh air, and in winter scarcely any at all. In summer, diarrhœa was very common, and proved to be extremely hard to treat; whooping cough prevailed endemically, when combined with diarrhœa, in summer, often proved fatal. The baby carriage, by enabling the little ones to breathe, at ease, pure air, far removed from the pestiferous surroundings of home, (reeking privy, littered yard and uncleaned lane), helped them to recover from enteritis and whooping cough more powerfully than the best devised prescriptions of the physician. Without wishing to enlarge on this branch of the subject, I would say that, by enabling the young child to obtain the boon of fresh, pure air, to an extent unattainable up to the time of its invention, the baby carriage has been a most potent factor in the prevention of tuberculosis.

Ever since 1883, when Koch demonstrated that the bacilli tuberculosis are the true cause of this disease, the medical world has accepted the truth, while at the same time clinging a little to the old-time doctrine of hereditary transmission from sire to son. Evidence continues to accumulate showing that heredity contributes a small share, the principal part being played by infection. The more frequent the exposure to infection, the more likely is an attack to occur. Owing to the far-reaching effects of modern travel, few places, even the most remote, can be said to be exempt from this disease. Observation, however, confirms what would seem to be a reasonable view, that the bacilli tuberculosis are more generally and widely diffused in the large centres of population. It is also precisely in these centres that physicians and statisticians find a relatively greater number of cases of tuberculosis.

Owing to the fact that a considerable number of those attacked by this disease ultimately perish from it, or some intercurrent com-

plaint, people think that tuberculosis is almost always fatal. This is certainly erroneous. Dr. Biggs tells us that in Charity Hospital, New York, 30 per cent. of all deaths show old lesions of tuberculosis, now becoming stationary. He quotes a Vienna hospital pathologist to the effect that he finds similar, old stationary lesions in 85 per cent. of all post mortem examinations. This leaves but 15 per cent. who have not suffered from tuberculosis. In the light of these statistics would it not be hazardous to declare that 35 per cent. or even 30 per cent. of all who die have a hereditary predisposition to tuberculosis. Is it not more reasonable to think that it is an infectious disease, and that heredity plays but a small part in its growth and development?

I believe, that there are thousands of persons in this country, who have been attacked by tuberculosis, and have recovered from it or are struggling back towards health, and when to these persons you add an unknown number of susceptible individuals, who have not yet taken tuberculosis, you get an idea of the primary importance of preventive measures, owing to the vast number of persons who have to be protected from the ravages of this disease.

Is it just, then, that these invalids and weaklings should be exposed to an intense form of infection, from the ingestion of the milk or flesh of tuberculous cattle, when sanitary authorities can prevent it, by having more thorough and scientific inspection by experts, of both meat markets and dairy farms?

Is it too much to ask that cars, sleeping-cars, hotels, dwellings or public buildings, bed-clothing and upholstery, shall be periodically disinfected? Is it interfering with private liberty to instruct patients to use cuspidors containing a five per cent. solution of carbolic acid? Is it right that consumptive patients should be allowed to handle food supplies?

So much then with regard to the most potent agency in causing tuberculosis, to wit, a pre-existing case of that disease. Inasmuch, however, as poverty, filth and bad hygienic conditions predispose to

tuberculosis, so a clean, well-drained soil, a clean, ventilated house, a clean body and clean clothing, clean air to breathe, clean water to drink, and abundance of nourishing food from the dawn of life, are powerful to prevent it.

Religion, education and general culture, which are powerful influences, and, happily for us, widely diffused and respected in Ontario, inculcate personal and domestic cleanliness. Sanitary law, which is beginning to thrive amongst us, provides for the removal of filth from streets, lanes, etc. But to remove the ills of poverty, from which so many suffer, is not an easy task, and at any rate, could scarcely be considered at length in a paper like this. I mention poverty, however, because it is always the powerful ally of disease, and of none more than tuberculosis. In trying to overcome one of its surest results, and probably its worst evil, the sanitarian may not always point to the means by which an abundance of nutritious food is to be made available for everyone; but he can join hands with the temperance reformer, and urge the people of Canada to declare against the manufacture and sale of alcohol. For, among the evils which follow in its train, the habitual use of alcohol hastens the death of the tubercular patient, lessens his ability to purchase food for his family while he lives, and destroys both the will and the power to provide for them after his death. The sanitarian can help to preach the holiness and the necessity of manual work, done with skill and will, in contrast with the best devised schemes for earning a genteel livelihood, without toil, known in this country. He need not anathematize the loafer, the tramp, and the poor mechanic, but he can extol the ideal worker, the king of men, who, in shop and field, produces wealth and food for his fellowman.

"But all work and no play makes Jack a dull boy," and so the sanitarian must become a patron of sports. He must not encourage the scholar, who, with no sufficient reason, sits demurely in the shade, while others are skipping or playing foot ball. He must deify physical culture as the Greeks of old, and from the kindergarten up, encourage and instruct the scholar to cultivate and strengthen the powers of his body, and particularly to cultivate that

full and methodical expansion of the lungs in which the candidate for tuberculosis is singularly deficient. He must not abandon the youth to his own methods of taking exercise, after he has left school, and the battle of life is begun. He must advise him to become a volunteer and to learn the noble trade of arms, so that he may strengthen his body and be useful to his country in the hour of danger. He must advise him to save his spare money, and instead of lounging on the sidewalks, perhaps with a cigarette between his lips, purchase a bicycle and partake of the glorious freedom of the sons of the wheel.

He must laud the glories of the foot-ball field, and the triumphs of lacrosse and baseball, so loudly indeed, that even the fair sex may pause to listen, and perhaps in fast-coming and more regenerate days, emulate, after a fashion, the athletic prowess of the men. To those, who have entered on middle life, to whom the pastimes of youth and early manhood are unsuited, to those whose muscles and blood-vessels are no longer pliant, he should counsel regular walking exercise, or the gentle daily use of the bicycle.

And what must he say of cleanliness. In season and out of season he must call for the cleansing of the soil about our dwellings, the cleaning of the cellars and outhouses, the opening of doors and windows, so that pure air may penetrate, and the bright sunshine from Canadian skies may show where filth is industriously accumulated in our dwellings. He must speak of the charm of the daily bath, and show how cleansing of the skin relieves congestion of the lungs and prevents the foul exhalations of the body from helping to poison the air.

These and many more suggestions may be thrown out to show how, from the cradle upwards, all of us, the predisposed in particular, may be saved from the ravages of tuberculosis, which annually counts among its victims 12.24 per cent. of all who die in this Province.

But there is yet more.

In the March number of the Dominion Medical Monthly, I published a translation of Professor Verneuil's great paper on emigration from town to country and vice versa, in the prevention and treatment of tuberculosis.

The gist of his argument, which is very eloquently and cogently expressed, is, that emigration to and a continued residence in the country serves to prolong the lives of persons, who have already contracted tuberculosis, and prevent the taking of that disease by those who through heredity or acquired delicacy of constitution are prone to catch it.

The following is an extract from his paper, in which certain data are presented, in the form of questions, replies and conclusions: "Is tuberculosis more common in cities than in the country? Certainly it is. Does it assume a graver form, and more rapid course in cities? Certainly it does. Is it cured in cities, does it improve in them more rapidly or in a larger proportion? Certainly it does not. Do slight tubercular lesions tend to perpetuate themselves and become more grave in cities? Certainly they do. Is it just the same in the country? Certainly not. Grave forms of tuberculosis scarcely ever improve in cities. In the country one observes, pretty often, remissions in the disease, a chronicity, and survivals which are almost equivalent to cure. The mean duration of life in tubercular patients who live in cities, is less than that of similar patients living in the country. No process of reasoning and no objections to the way in which the facts are put can invalidate these conclusions."

Professor Verneuil qualifies his advocacy of a country life in the treatment of tuberculosis when he says: "Cities differ, however. The transfer of a tuberculous patient from a large, unhealthy city like Paris, to a small healthy city (Saint Cloud) might realize a large part of the advantages of emigration to the country." It is true that the air of a small town is not so impure as that of a large one; but on the other hand it is less pure than country air. As Professor Verneuil himself says, "Cities in fact only vary according to the more or less considerable degree of impurity or contamination of the respirable atmosphere. In country places the air is free from morbid germs."

Even in this new country where the largest city dates back but a hundred years, where overcrowding such as prevails in Paris, with its population of 2,424,705, is unknown, vital statistics confirm the accuracy of Professor Verneuil's conclusions, and show the salubrity

of the country air of Ontario as compared with the not populous cities of the Province. For instance, the death-rate per 1,000 of population from all tubercular diseases in 1893 was in,

Cities.	Population.	Deaths from Tuberculosis.	Rate per 1,000.
Toronto	190,216	527	2.77
Ottawa	45,085	116	2.57
Brantford	13,020	32	2.45
Guelph	10,758	25	2.32
Belleville	10,124	18	1.77
Total	269,203	718	2.66

Cortrast these rates with the following :—

Counties.	Population.	Deaths from Tuberculosis.	Rate per 1,000.
Algoma	44,912	36	
Muskoka and Parry Sound	53,499	32	
Haliburton	6,481	6	
Bruce	65,966	58	
Grey	72,716	62	
Simcoe	73,240	43	
Total	316,814	237	.74

Evidently tuberculosis is rare in the pure country air of Ontario; here, as in Europe, it thrives in cities. Emigration of the tubercular class from the city to the country is therefore just as imperative in Ontario as in France.

Owing, however, to the severity of our winter climate, it is necessary that great care should be given to the housing of tubercular patients. Few country houses are so built as to satisfy the requirements of correct ventilation ; in some light does not penetrate into every room, and in many there are no verandahs, which permit exercise to be taken, out of doors, even in stormy weather. The water supply is not always above suspicion, and the odors which occasion-

ally permeate the rooms, when the windows are opened, are more suggestive of bucolic life than of balsamic healing.

How charming would it be if "far from the madding crowd ignoble strife" on some well-drained acclivity, surrounded by pine groves, we could place our sanitarium for the tubercular patients. A beautiful rural retreat, with the best that our country can give to charm the eye and the ear, attractive to the casual visitor, and a safe retreat to those who are beginning to wrestle with the scourge of the race!

Such a spot can surely be found, not by the damp shores of the great lakes, for vital statistics show, that the dwellers by the lakes die in greater numbers from consumption, than those who live in the inland counties, not too far removed from the great centres of population, for such a sanitarium should be accessible to a large population, but situated at a good elevation, some 1,100 feet above the Atlantic Ocean, a place, already enjoying, even in its uncultivated state, a high reputation for salubrity. Such a spot, improved by the hand of man, could be made an earthly paradise. Even during the long winter days, the evenly-heated, well-ventilated cottage home, with its glass enclosures, providing a splendid solarium, in which the flowers can bloom, and the patients can sun themselves to their heart's content, would be an immense improvement on the material advantages and comforts of even the best appointed town mansions.

Then, in addition to providing skilful nursing and treatment for those in delicate health, or even for patients already suffering from developed tuberculosis, the sanitarium would soon become a school for the training of the people, in the best modern methods of preventing the growth and development of that fell destroyer.

Even educated people, nowadays, listen incredulously, when sanitarians speak of the bacilli tuberculosis. I dare assert, that, in the near future, the learned and the unlearned alike shall go to the sanitarium and learn that the bacilli are carefully looked for and assiduously suppressed. They will see, that, without, in any way, hurting the feelings of the patient, the seeds of his disease, the deadly seeds which would poison other lives, are industriously disin-

fected and destroyed. The sanitarium for tuberculosis will thus become a great school for the people of the Province, and, as Canadians are a reading, thinking people, what they note and observe, or what they read of the observations of visitors, as communicated through the press, will lucidly instruct them in the best methods of resisting this omnipresent plague.

To recapitulate then, I would say, in addition to the notification of cases, with disinfection of houses, sputa, etc., and expert inspection of meat and milk, we shall best resist tuberculosis by (1) waging a relentless war against alcohol; (2) by providing a sufficient quantity of nourishing food for our families, particularly by paying great care and attention to the dieting of the mother of the family; (3) by providing that every infant shall be nursed by its mother, unless for good cause, and (4) that the infant shall have fresh air in the house, and shall, in fine weather, be sent out in a baby carriage; (5) by seeing that the child is kept clean in a clean house, and as it advances in age fed on suitable food, not over rich, so as to make it dyspeptic, nor too poor so as to make it poor blooded and rickety; (6) that, when of school age, it shall not be taught in small overheated, unventilated rooms, when it is the duty of the school trustees to provide the best that can be got; (7) that suitable sports shall be indulged in at recess and in play time; (8) that the scholars shall not be asked to learn more than a reasonable curriculum calls for; (9) that the delicate, over anxious child, who loves books more than play, shall not be encouraged to visit the lending library, and waste valuable time over a novel, thereby laying the foundations for a weak chest and short sight, instead of playing or doing some useful work about the house; (10) that the weak-chested child, for the tubercular are always small chested, shall not be apprenticed to stone-cutting, knife grinding, printing, dress-making, school-teaching, or any dangerous, sedentary occupation; but made to earn a livelihood by means of a calling, which admits of exercise in the open air; (11) that he shall be encouraged to become a volunteer, to engage in games and sports, to work moderately at a trade or profession, dissuading him from selecting a sedentary one; (12) should misfortune

overtake him, his health decline, his weight decrease, do not let him waste his money, in buying quack medicines, allowing the precious moments of the first stage of tuberculosis to deepen into that other stage, from which but few return to sound health; but bring him to a physician, skilled in the treatment, not merely of chest disorders, but of the diseases incidental to young life, who can intelligently decide on the proper management of the case.

(13) A girl, while a school-girl, should emulate the boys in all suitable sports and amusements, and when a woman grown, should use her influence, and later on, her vote, when she has won the right to vote, for pure air in house, shop, factory, school, church and hall, cleanliness in and about the dwelling, the abolition of strong drink, and the improvement of child life among the indigent. As far as her own personal habits are concerned, a woman, if rich, should cultivate health and strength by taking abundant exercise in the open air; if of moderate means, she should work moderately in a healthy place, so as to be able to earn good food for herself and children. Steady work brings good appetite and sound rest, and earns the price of food, which is a powerful foe to tuberculosis.

(14) Later on when some enlightened philanthropist extends a helping hand to the victims of tuberculosis, cottage homes may be erected for the tubercular, in some suitable place, in this Province. In these retreats, a perfectly rational treatment will, I feel confident, result in a great saving of life, a notable increase of the pleasures of existence to the unfortunate victims, and a means of instruction to the public generally, who may thus be informed, how tubercular cases may be managed at home, so as not to be a source of peril to their relatives and friends.

By these means we shall best resist tuberculosis, and as Mrs. Browning fitly says:

"Who being man, can stand calmly by,
And view these things, and not tease his soul
For some great cure."

PROGRESS AND HINDRANCES THERETO IN THE HEATING AND VENTILATION, ETC., OF SCHOOL HOUSES.

By John Johnston, Esq., Belleville, County Inspector of Schools.

Gentlemen: Statistics fully demonstrate that of all ordinary causes of disease, none is so productive of sickness and death as impure air. How important, therefore, that everyone should understand and put into practice the remedies, which are thorough ventilation and cleanliness. Ventilation is the exchange of impure air of a room or inclosure, for the pure, fresh air of the external atmosphere, and the main object to be attained is the greatest possible interchange of air, compatible with the safety of the occupants. The only danger which can arise from the too free admission of air is the possibility of producing a cold in the head, sore throat or some such affection.

The composition of atmospheric air by volume is as follows:—nitrogen 79.12 per cent., oxygen 20.80, carbonic acid .04, carburetted hydrogen .04, and ammonia a trace. Oxygen is the sustaining principle of animal life and of ordinary combustion. When an animal is placed in a vessel of pure oxygen its heart beats with increased energy and rapidly; it soon dies from excess of vital action. Many substances, also, that are not at all combustible under ordinary circumstances burn when placed in pure oxygen with extraordinary brilliancy and vigor.

Nitrogen, on the other hand, supports neither respiration nor combustion. In the atmosphere, it serves the important purpose of diluting the oxygen and thus fitting it for the function it is designed to perform in the animal economy. Carbonic acid is a highly poisonous gas, formed by the union of oxygen and carbon (charcoal). It is produced in large quantities during the processes of animal respiration, common combustion, fermentation, volcanic action, and the decay of animal and vegetable substances. Although when inhaled, it rapidly destroys animal life, it constitutes the chief source

of food to the plant. Animals take into the lungs air loaded with oxygen, and throw it off so charged with carbonic acid as to be incapable of again serving for the purposes of respiration. The green parts of plants, on the contrary, absorb air, decompose the carbonic acid it contains, retain the carbon and give off air containing no carbonic acid but a large amount of oxygen. This is a most beautiful illustration of the mutual dependence of the different orders of created beings upon one another. Were it not for plants, the air would become so vitiated as to cause the total extinction of animal life; were it not for animals, plants would not thrive for want of the food now supplied in the form of carbonic acid by the living animal. As it is, the one order of beings prepares the air for the sustenance and support of the other, and so admirably is the matter adjusted that the composition of the air is, within very narrow limits, invariably the same. The amount of carbonic acid varies from 3.7 as a minimum to 6.2 as a maximum in 10,000 volumes.

Carburetted hydrogen is produced during the decay of animal and vegetable substances. It is one of the chief ingredients of common illuminating gas, and is poisonous to animals when present in the air in large quantities.

One of the most remarkable characteristics of gases, is the property they possess of diffusing themselves among one another. Thus, if a light gas and a heavy one are once mixed, they exhibit no tendency to separate again, and no matter how long they may be allowed to stand at rest, they are found upon examination intimately mingled with each other.

This property called *gaseous diffusion* has a very intimate bearing upon the composition of the air. If either of the constituents of the air were to separate from the mass, the extinction of life would soon follow. Besides, were it not for the existence of this property, various vapors would accumulate in certain localities, as large cities, manufacturing districts, volcanic regions, etc., in such quantities as to render them totally uninhabitable.

In addition to the gases already mentioned, atmospheric air always contains more or less water in the form of invisible vapor. This is derived partly from combustion, respiration and decay, but chiefly from spontaneous evaporation from the surface of the earth. The golden tints of sunset depend upon the large amount of aqueous vapor held in solution by the air.

Scientific men tell us that all infectious diseases, such as typhus and typhoid fevers, diphtheria, measles, scarlet fever, cholera, small-pox, yellow fever, are communicated from one person to another by very minute germs or seeds. Each disease has its own germ and propagates only its kind. A typhoid germ produces typhoid, not scarlet fever, just as a grain of corn produces corn, and no other plant. These germs escape from the lungs in expired air, from the skin, or in the excretions of the air passages, kidneys or bowels of the diseased. They float unseen in the air, or make their way into the water or food used by man, and thence into the blood where they multiply with enormous rapidity; and the effort of the system to relieve itself of these germs constitutes the disease.

In the act of respiration or breathing, the air passes into the lungs through the wind-pipe. This tube commences just below the root of the tongue, and runs down the front of the neck to the upper part of the chest. Here it divides into two branches, one leading to the left lung and the other to the right. These branches divide and sub-divide in the lungs many times, until they finally terminate in small cavities, named lobules, whose walls are lined with little depressions called cells.

The walls of these cells are largely made up of very minute blood vessels whose coats, or coverings, are extremely thin, so thin that portions of the air readily pass through them into the blood, and certain impurities of the blood pass out into the air cells. The dark or venous blood which comes to them gives up (1st) carbonic acid; (2nd) watery vapor; (3rd) organic matter, and in exchange for these, taken oxygen from the air and thus becomes converted into bright-

red or arterial blood. It becomes purified. But what change does the air undergo? 1st. It loses oxygen. 2nd. It gains carbonic acid, the increase being from 80 to 100 fold. 3rd. It gains watery vapor. 4th. It gains organic matter in an invisible form, which gives to respired air its disagreeable odor.

With this constant loss of oxygen and increase of carbonic acid, air breathed by many persons in a close room soon becomes injurious, because it contains too much carbonic acid and too little oxygen to convert the dark into the bright red or pure blood; consequently impure blood must circulate through the systems of those who breathe such air. But blood supplies food to all parts of the body, and if impure, the food is impure, and the various organs are badly nourished, and therefore debilitated, and much more liable to disease; and, if attacked by disease, it is sure to assume a more serious type, hence it is that almost all forms of fever delight to enter crowded and badly ventilated houses, and then take on their most malignant and fatal forms. This is equally true in regard to erysipelas, and diseases of the lungs, and more especially consumption.

It is estimated that there are in the skin 2,300,000 minute openings, or sweat pores. These are the terminations of small tubes which run into or through the skin, and end in coils which constitute the sweat glands. They secrete about two pints of perspiration during the twenty-four hours. This fluid, mainly composed of water, holds in solution many impurities which are poured out on the surface of the body, and some escape into the air and aid in no small degree in producing the disagreeable odor observable in crowded and badly ventilated rooms.

The decomposition of the contents of sewers and drains gives rise to many poisonous gases, which, being light, readily ascend from cellars or basements into the rooms of dwellings, and often take with them the germs which produce typhoid and other fevers. These

gases and germs are very readily absorbed by milk, meat and other articles of diet, and by their use, disease may be introduced into the system.

In adopting means for the removal of impure air from a room or building, abundant facilities for its escape should be secured. It is said that the air that has been exhaled from the lungs contains a large per cent. of carbonic acid, and this gas is known to be heavier than common air. It is asserted by many that in the process of ventilation, the exhaust should be from the bottom of the room, because this gas settles there; but it has been shown that foul air will rise to the top of a heated school room, and that this part needs ventilation not less than the bottom, but this ventilator should be closed during the day or else the heated air of the room would pass out rapidly at the top.

School Sites.

Too little attention has sometimes been paid to the location of schoolhouses. The ground selected for a school site and school grounds should be level or slope gently towards the south; it should be dry, free from obstacles that would interfere with the children's play, and susceptible of a reasonable degree of ornament. The air ought to be allowed to circulate freely about the schoolhouse and the school grounds, and the sunlight to baptize them with its healthful beams. The surroundings of a school are to be considered of almost as much importance in locating it as the grounds. The work of the school cannot be well done amidst noise and confusion. The clatter of a mill or factory, the frequent passing of railway trains, the noises of the busy street or the thronged highway,—all are apt to divert the mind from study. It is best to locate a schoolhouse a little distance from the street or the public road, and away from other buildings.

Healthiness of the Neighborhood. This point needs only to be stated to secure assent; and yet it is not uncommon to find school-

houses located amid the dense population of a city, where children are compelled to breathe the impure exhalations arising from streets, stables, sewers and thousands of lungs; near marshes, stagnant bodies of water or rivers whose subsiding waters leave vast accumulations of vegetable matter to decay in the autumn sun, or in low, damp situations, where heavy vapors hang about them in the morning long before the glad sunshine has begun to play all over the neighboring hill-sides, or the chill night-dews fall before the day's work is done.

School Grounds. It is very important that the school should have connected with it appropriate grounds, and that the schoolhouse itself should be well built and properly furnished.

Twenty-four years ago there were but very few schoolhouses in South Hastings or in Ontario that had grounds fenced, and proper out-buildings. At the present time and shortly after 1871, every schoolhouse had at least half an acre of ground and proper out-buildings. The law of 1871 made it compulsory upon all boards of trustees in rural sections that every site should be upon a well travelled road, as far removed as possible from swamp or marsh, and so elevated as to admit of easy drainage, that the school grounds should be properly levelled and drained, planted with trees and enclosed by a substantial board fence, that every school should be supplied with a woodshed, that there should be a well or other means of procuring water, that the area of the school site should be not less than half an acre in extent, that the water closets for the sexes should be several feet apart, and under different roofs, and that their entrances should be screened from observation.

Since Arbor Day, the first Friday in May, has been set apart for the planting of trees, making flower beds, and otherwise improving and beautifying the school grounds, much has been done to make the grounds around our schoolhouses beautiful. School grounds properly kept and planted with trees are necessary parts of our school system in this Province, for the success of school government,

and even of teaching, depends very much upon the knowledge the teacher possesses of his pupils' dispositions. It is on the playground that pupils first encounter opposing desires and clashing wills, and the teacher can see manifested there, much better than in the school room, all that play of passion and all those springs of action and diversities of character incident to social life. Each individual is himself on the playground, and the teacher, if he freely mingles with his pupils (and this he should do, while in play), can scarcely fail to gather information that will aid him in his schoolroom duties and prove beneficial to the school. The circumstances of the playground may be used to impart important moral lessons. On the playground the real character of pupils shows itself, and the quick judgment of the true teacher will tell him when he may give a hint that will awaken attention to the right and the wrong, or plant the seed of a moral truth that will grow up in the heart and produce fruit a hundred fold. I am a firm believer in the presence of the teacher on the playground. In all my experience I found good results by taking part with the pupils in their games. I have run footraces with them, played ball, cricket, and took part in all the amusements, and my presence did not detract anything from the fun or frolic, but was beneficial in elevating the general tone of the enjoyment. Unkind words will not be spoken, nor selfish deeds be done, when the teacher is present, and good qualities will soon grow habitual.

Ventilation. We have many excellent schoolhouses well supplied with maps and apparatus of all kinds, necessary for the thorough and proper teaching of all the classes. Many of them are supplied with the most approved seats and desks. The old seats and desks are gradually giving place to more modern ones, and I am glad to say that in a short time every schoolhouse in my inspectorate will have desks and seats of the most approved pattern. But while this can be said, there is much need, in many cases, for improvement in ventilation.

In no time of our lives are we so susceptible to disease as in our school days. The rapid growth of the child, the mental strain, that our forcing system of education requires, and the bad sanitary condition of many homes, all tend to weaken the constitution at this period, and render it particularly liable to the contraction of disease.

The schoolhouse, where the child spends from four to six hours each day, demands our direct attention. We should endeavor in the schoolroom to supply the pupils with pure air, uniform temperature, plenty of sunlight, cheerfulness, refinement and comfort.

All the windows of a schoolroom should be hung with pulleys, in order that they may be easily raised or lowered. When the window is lowered, the top of it should come in close contact with a narrow sash about one and one-half feet wide filled with glass, and slanting in towards the ceiling, as in the Central School in this city. There should be a board at the bottom, so that when the window is raised the air will not strike upon the heads of the pupils. Mr. Wills, who has paid a good deal of attention to the ventilation of the rooms of the Central School, thinks that it would be much better to have, instead of a board at the bottom of the window, a screen of glass, as this screen would not interfere with the light. If the room is to be heated by a stove, it should be surrounded with a sheet-iron casing, made to extend from the floor to about one foot above the top of the stove. There should be a door in the casing for putting in the fuel; and a trunk for the conveyance of fresh air, should start outside of the building, run under the floor, and communicate directly with the stove. This arrangement will distribute the heat much better about the room, and avoid those cold currents of air which always, in a room heated by an ordinary stove, sweep along the floor from the bottom of doors and windows, and openings in the floor and walls.

If windows and doors are skilfully used a tolerably good degree of ventilation can be secured if the school is in charge of a teacher who is careful about the health and condition of his pupils. The

ventilation will be much more perfect if a ventiduct, starting at the floor of the schoolroom, is carried up in front of the smoke-flue and separated from it by a sheet-iron partition. In this way the smoke in the flue will heat, and of course expand the air in the ventiduct and make it rise in a strong current, while the air in the ventiduct will not interfere with the draft in the flue. The ventiduct should have two registers, one at the ceiling and the other at the floor, though during the school sessions, unless the room be too warm, the upper one should be closed. Impure air is heavier than other air and will generally find egress from near the floor.

A good method of heating by ordinary stoves is to surround the stove with a jacket of sheet-iron extending to the floor, and having a door in front through which to regulate and feed the stove. Beneath the stove an opening may be made in the floor or base and connected with the outer air. The air is heated by contact with the heated iron of the stove, and its volume being increased by the rarification which heat produces, the air immediately rises to the top of the room and is replaced by the denser and colder air and this in turn becomes heated to rise and be replaced by more cold air. The air passes under the jacket and up between it and the stove, and becomes heated in passing, and if the exhaust is near the stove and through a flue extending to the floor, the conditions are considered excellent, provided that the stove, the air supply and the ventilating flue are of sufficient size. The pupils who sit nearest the stove are by this jacket relieved from the too great heat directly from the stove. Seats near the stove and those in the farthest part of the room thus become equally comfortable. If the register in the ventilating flue at the top of the room is kept open, then the warm air from the stove will pass up and directly out of the room as surely as water will flow from a hole in the bottom of a barrel, and the room will be neither heated nor ventilated, and more especially will

this happen when the windows are lowered so that all the heated air may pass out, leaving teacher and scholars shivering around the stove as we so frequently see. The upper register should always be closed when the room is to be heated.

Such a system of heating and ventilation is in use in the Central School in this city, introduced by Thos. Wills, Esq., County Treasurer and member of the Board of Education for many years, and the results are very satisfactory to the teachers and pupils, giving good heating and excellent ventilation.

The Smead Dowd System of Warming and Ventilation.

This system of heating and ventilation is in use in the Deseronto High School and the Union School, Trenton. I have always heard that, in Deseronto it gave good satisfaction to the trustees and teachers. It was put into the Trenton Union School about nine or ten years ago, and as there are five public school teachers in the lower part of the building, I have had ample opportunities to know of its workings. I always found the air in all the rooms pure, and on any kind of a day in winter, the warmth of the rooms was all that could be desired. The teachers have never had any difficulty in securing, for their rooms proper warmth and an excellent supply of pure air. The janitor, Mr. McCammon, has been in charge for the above time, and thoroughly understands all the parts of the system. I went up to Trenton a few days ago to look carefully into the workings of this system of heating and ventilation, and received much valuable information from him. In connection with this system is the dry earth closet system. These closets are in the basement of the building and near the furnaces, and are very complete and satisfactory, and giving off no odor at any time, and scholars do not have to leave the school building in bad weather.

In this school, there are eight teachers, and, in everyone of these eight rooms as well as in all other parts of the building, the warmth and ventilation are uniform. This system aims to make the house

breathe. From what I know of the Smead Dowd system, and from the opinions of numerous educationists, in the States of New York, Ohio, Illinois, Wisconsin, Nebraska, Kansas and other States, I can safely say that I believe it to be the best system of any now in use, and hope that it will be put in the schoolhouse soon to be built in this city.

Many of our oldest school buildings are extremely faulty. The progress made within a few years past has been as great as at any other period, and types of edifices, which were unchallenged models of excellence years ago, are now superseded. In schools containing several rooms, one of the commonest faults used to be the parsimony of space, which cut down the room for entries to a minimum, and packed class-room behind class-room without breathing space.

The school law of this Province requires that, in each room, the area occupied by a pupil's desk shall be at least twelve square feet per pupil, and at least 250 cubic feet of air space for each child. The law in 1872 required nine square feet for each pupil, and the average space of 100 cubic feet of air for each child.

In addition to what has already been said I may state my opinion: That five is too young an age to send children to school, and that, up to nine years of age, pupils ought not to spend more than four hours per day in school. That the tasks assigned to pupils for home preparation and school work are commonly too long and too indefinite; the child is not taught how to set about their preparation, and his crude and misdirected efforts result in physical and mental exhaustion, without being productive of success, except perhaps in the very unsatisfactory direction of committing words to memory. We want in many of the schools of to-day less setting of tasks and hearing of recitations and more thorough teaching; less pouring in and more drawing out; less surfeit of memory and more development of faculty. Too much use is made of note books in nearly all our schools. It is advocated in our Model Schools that everything that is taught must be written down, and note books are filled with

geography, grammar, history, physiology, arithmetic and with most of the other subjects. In some schools, slates are not allowed to be used. It costs a good deal to supply several children of a family with note books; it is an unnecessary expense. If some teachers would do more teaching, and question as they proceeded, all this writing of notes would be unnecessary. They should endeavor to get the minds of their pupils to retain the information given and not the note books.

The physical conditions of many schools are still lamentably defective in many respects. Systems of ventilation, which read well on paper, are found in practice to be worthless. In the modes of heating schools, there is room for indefinite improvement. The admission of light, the toning of paper for use in the school books, the arrangements for cleanliness both of school and out-houses; the *moral government* and *oversight* of children in the playground and *offices*, the construction and arrangement of school furniture. No prescribed positions while sitting or standing; the locality of the school and nature of its surroundings, the whole subject of school amusements, etc., are among the more obvious circumstances in regard to schools, which demand much more attention than they have heretofore received.

WHAT SHALL BE CLASSED AS DANGEROUS INFECTIOUS DISEASES?

By Chas. A. Hodgetts, Toronto, M.D., L. R. C. P., Lond.

Mr. President, Ladies and Gentlemen: That all infectious and contagious diseases are dangerous to the community, not only from the deaths caused thereby, but also from the suffering and ill health they occasion, must be admitted, and that in estimating the degree of danger in any particular disease, the mortality rate alone should not be the only factor considered, will be allowed; what the other factors are will be indicated when discussing the several diseases.

The progress made during the past two decades in the prevention of the spread of infectious diseases, which hitherto had caused such destruction of life, forms a page in the history of the world which may be profitably considered; no brighter spots can be found in medical annals than the sanitary victories gained in the suppression, nay, almost total annihilation of what have been the dreaded scourges of the world; and posterity will cherish no nobler and worthier names than those who have been foremost in the good work, those who have devoted their lives to the advancement of preventative medicine. The history of smallpox, which* "from 1750 to 1800, caused nearly one-tenth of the total number of deaths (96 out of every 1000 deaths from all causes) and in epidemic years nearly double that number" is perhaps the most important to be mentioned. The periodicity of this disease has been lengthened from once in three years to ten years, and the death rate in Great Britain alone has been reduced to 10 per 1000 of the deaths, for the years from 1854-1892. Epidemic cholera, too, which previous to its crossing the Atlantic in 1832, had, in a series of widespread epidemics, paralyzed trade and commerce and carried off its thousands, the mortality ranging in different epidemics from 20 to 30 per cent. to 70 to 80 per cent. of those attacked. Again

* Parkes, Hygiene and Public Health, page 415.

there was known to our immediate predecessors the deadly typhus, that disease of "poverty, hunger and rags" a frequent scourge in the large cities and towns of Europe.† The death rate in England alone in 1869 was 0.193 per 1000 of the living, whilst from 1886 to 1890 it had fallen to .0066, that is one-thirtieth of its former rate. The history of typhoid which had, previous to 1813, been classed as typhus, shows a marked decrease both in its outbreaks and its effects on the death rate.

A thoughtful consideration of the less dangerous position these and others of the same class of diseases occupy to the people than in the years preceding the introduction of sanitary laws for their control and suppression cannot fail to impress one with the fact that an enforcement of the means adopted in protecting life in these most virulent diseases, would be followed with a like good result in the case of some which now claim a rather too high death rate and are frequently followed by troubles which do not find a place upon any mortuary statistics, the patients dying at more or less remote dates from the attack of the infectious disease, of the one secondary to it. Not that we would claim all the credit, as sanitarians, for these happy results, for much has been accomplished by more precise diagnosis and improved therapeutics; these latter have been no mean factors to the progress thus far made and they are destined to be of further assistance. Without the first we are indeed powerless, and the latter guided by science and skill, must ever be a means to the good end we are looking to.

The sanitary measures adopted to secure the success thus far attained are, briefly, notification, isolation, quarantine, disinfection and medical inspection; these severally or collectively enforced as the occasion called for, and to their adoption in a wise, judicious and scientific manner by the Provincial Board of Health, we owe the very satisfactory condition of affairs in this Province.

† Reynolds' System of Med., Vol. 1, p. 165.

The diseases classed as "dangerous" and mentioned in the Public Health Act, R. S. O. 1887, are smallpox, diphtheria, scarlet fever, cholera and typhoid fever, although provision is made for "any other contagious disease dangerous to the public health" and for which, as well as for those named, the five sanitary measures just mentioned are essential for their prevention and extermination. Regarding the diseases named in the Act there exist no two opinions; but there are others of the same group which it would, I think, be advisable to place there too; the very placing of a disease in the group has an influence to make the local authorities more alive to the necessity of acting in a firm manner when notified thereof.

The Academy of Medicine of France,* in 1893, recommended to the Minister of the Interior, the following as the list for compulsory notification, viz.: cholera and choleriform affections, yellow fever, plague, smallpox and varioloid, scarlatina, sweating sickness, diphtheria, typhoid fever, typhus fever, dysentery, puerperal infections, ophthalmia neonatorum; this, though comprehensive, does not, we think, go far enough, and should have included, measles and cases diphtheritic, as recommended to the Academy by the committee. I am not wishing to apply the list just given to this Province, for some of the diseases mentioned are strangers to this clime. One there is, however, of which we have in portions of the Dominion at least felt its effects. I refer to typhus fever. The report presented by Dr. Montizambert† shows that during the years 1838 to 1891 there were but eight years in which cases of the kind were not reported at Grosse Isle Quarantine Station, and as recently as 1877 there happened an outbreak in Montreal, assignable to the chief predisposing causes, overcrowding, lack of cleanliness, bad food and intemperance, there having been found, according to Osler,‡ no trace of infection. Considering the fact that in some of our cities we have had, during

* Med. Week., Vol. 1, 1893, p. 504.
† Tenth Annual Report P. B. of H., 1891.
‡ Osler, Practice of Med., p. 39.

the past few years, an influx of settlers whose habits and mode of living are not of the highest sanitary order, who on the contrary rather revel in some of the causes looked upon as predisposing to this disease, and the disease itself being so highly contagious, with a mortality of 12 per cent. to 20 per cent. of those attacked, it would be as well to place it upon the dangerous list.

All are agreed upon the dangerous nature of diphtheria and the necessity of enforcing the most strict sanitary measures whenever it appears, but what course should be followed in the large class of cases known as diphtheritic, those regarding which the diagnosis is doubtful? a large percentage of which never develop symptoms typical of the disease, yet result often in such outbreaks of diphtheria that we are forced to the conclusion that, had strict precautions been taken with the early cases, a different result would have been arrived at. Where bacteriological examination is possible and has been taken advantage of, these "diphtheritic" cases occupy a less menacing relation to the general public than heretofore; but throughout the Province there must ever remain a large number of cases to which this test is not possible. For the protection of the public therefore against these, and for the adoption of better provisional precautions in all doubtful cases, it would be advisable to call for the notification of all "diphtheritic" cases.

The same arguments hold good in cases of choleraic diarrhœa, when cholera appears; so closely allied are the early symptoms at these times, certainly this peculiar form of diarrhœa should be notified.

The two diseases erysipelas and puerperal fever, although demanding the greatest care on the part of the medical and other attendants in the way of antiseptic precautions on their part, would hardly come under the class dangerous.

There are, however, two diseases which up to the present have not been considered as of sufficient importance to require notification, *i. e.*, measles and whooping cough.

The sanitarian who is a careful reader of medical literature and thoughtful observer of outbreaks of these diseases must be impressed with the parallel in their history to what has been recorded of some of the dangerous ones whose character has been favorably altered by the enforcing of wise sanitary measures, epidemics occur less frequently and the mortality has been markedly reduced. That "fatalism" is so rampant among the general public, and in a smaller degree among the medical fraternity, in respect to these two diseases is to be regretted, for there is no more reason why children should be afflicted with either than with scarlet fever or smallpox; what sanitary regulations have done in others of the infectious class will be followed by as like happy results in the case of measles and whooping cough if carefully applied. Just how far to enforce notification, isolation, etc., it is not in the province of this paper to discuss, but that more attention should be paid to them by The Health authorities is apparent—to convince of the fact is but to arouse them to action.

Those upon whom these two diseases most heavily fall are undoubtedly the poor and unhealthy. In writing of the former of the two diseases, an English authority says:* "In the tubercular and wasted, to be found among the lower classes, the mortality is enormous, no disease more certainly being attended with a fatal result" and places the mortality at 9-10 per cent.; of the latter disease, reference is made in a similar strain, the mortality quoted at 7.6 per cent., and the author closes this portion of the article with the significant sentence:—"It is certain that those figures do not represent the total mortality, as they do not necessarily include those who die some months later of tuberculosis and gastric intestinal atrophy." That this expresses the true condition of affairs in Ontario must, I think, be allowed, but in a smaller degree, yet still none the less true.

There are several points to be especially noted in these diseases, which make more difficult the placing of restrictions upon them: (*a*) their infectiousness during the incubative stage, and (*b*) the great

*Ashby & Wright, Dis. of Children, p. 258.

diffusibility of the former and the prolonged period of quarantine, six weeks after the commencement of the "whoop," in the case of whooping cough; but, above all, the great difficulty that the cases are always treated at their own homes, where the maladies are looked upon as of little importance, and every opportunity is given for the spread of the infection. Until such time as the public are convinced of the seriousness of these diseases, even under a system of combined notification and medical inspection, we can hope for little good in the enforcement of isolation and other sanitary precautions essential to their suppression.

There remains but one other infectious disease of which we in Ontario are but too familiar; it exists in all sections of the province; for years past it has been the "vulture at its vitals," slowly yet surely carrying off* 1 in 500 of the population every year, the death rate per 1,000 in the years 1892-3 ranging from 1 in the city of Stratford to 2.6 in Toronto, and in the rural districts of Algoma, Muskoka, Parry Sound and Haliburton 0.71 to 1.23 in Ontario, Northumberland, Durham and Prince Edward, and these mortality rates show little or no decrease under the existing condition of affairs, indeed the same report says that at least "1 in every 250 is suffering from tuberculosis." We cannot estimate the financial and other losses to the community by reason of this disease, the sufferers from it becoming a burden upon their friends, upon charity or the state, often leaving issue who in like manner live out their day.

In respect to this disease the argument may be advanced that the danger is not the same as in the more acute infectious diseases; that, by reason of its chronicity and its apparently less infectious character, sanitary measures are more difficult to adopt and carry into effect, and are not necessary. Which is the greater menace to the public health, a disease that at varying periods appears in epidemic form or one that pursues its deadly work in an insidious and destructive manner? With the knowledge we now

*Report of Dep. Reg. General Ont. 1893.

possess of tuberculosis being infectious in character although slow in its development, we must acknowledge its dangerousness; it is certainly more difficult to handle; but sanitarians will not have done their duty to the public until some measures are adopted with a view to the arrest of tuberculosis in our midst. Experimental the methods may be at first and the returns for the work done will of necessity be slow in making themselves apparent, but the ultimate is certain to prove of permanent good.

The public has become familiar with the wise provisions of our Public Health Act, it has faith and confidence in the authorities when dealing with outbreaks of smallpox and diphtheria, diseases of which they have felt the terrible effects and to which their attention is more particularly directed by sanitarians by reason of the satisfactory manner in which the work has been done; then why should we not direct attention to the diseases which I have indicated as coming under the class "dangerous"? In the towns and cities where sanitary police are employed, the extra work could be carried on with but little increase of cost, and were but suitable means adopted, the public would ultimately be as appreciative of them in the diseases indicated as they have of the system of notification, isolation, disinfection, quarantine and medical inspection as carried out in dealing with those now classed under this head.

SOME PRINCIPLES UNDERLYING SERUM THERAPY.

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

Mr. President, Ladies and Gentlemen: In the study of infectious disease, bacteriology strikes so deeply into the root of the matter that persons not acquainted with our science may be said to be in a continual state of expectancy in regard to its results. In spite of conservatism and professional inertia, there exists, I believe, throughout the medical and lay public, a feeling that, in dealing with infectious diseases, medicine has been depending upon, more or less empirical methods, and that when a natural and scientific treatment shall be discovered it will be the result of bacteriological investigation. The consequence of this condition of expectancy is that as soon as any new bacteriological discovery bearing upon the treatment of disease is published, it is at once telegraphed over the world, and not only the medical journals but even the daily newspapers devote columns to describing and discussing it.

On account of this confidence in bacteriology, the public suffered a severe disappointment as a result of the premature publication of Koch's work upon tuberculin, but this disappointment was not due, I take it, so much to any too sanguine hopes held out by Koch himself as to over-confidence in the public itself. The world knew that all the so-called remedies for tuberculosis were not to be depended upon, they felt also that if a remedy was to be found it would be the result of study of the biology of the bacillus which caused the disease, and, unacquainted with the difficulties which beset this study, they leaped to the conclusion that the problem was solved when, as a matter of fact, only the first step had been made.

Tuberculin will doubtless never be heard of again as a remedy for tuberculosis, but when, as the result of bacteriological investigation,

such a remedy is discovered, I do not hestitate to say that all the work which led up to tuberculin and came as a result of it will occupy a prominent place in the development of this remedy.

The disappointment at the failure of tuberculin as a remedial agent has had the effect, however, of casting a doubt upon all subsequent bacteriological work, and its effect has been shown in the way in which serum therapy has been received by the medical profession. It speaks well for the scientific basis underlying serum therapy that, in spite of this prejudice, it has won its way so far with the profession.

If there was undue haste and premature publication in the case of tuberculin, the same cannot be said in regard to the anti-toxin treatment of diphtheria; the first work on the subject appeared in the bacteriological journals in 1890, and from that time forward every month added new facts, and in 1892 Behring and Wernicke had immunized a sheep against diphtheria, so that its blood serum could be used for the cure of experimental diphtheria in animals. The method which they used then, is practically the method employed to-day, so that the time between Behring's first publication and its first use in hospital cases was occupied in testing and controlling in every way the scientific basis of the treatment. The consequence was that, when the treatment was applied to actual cases, bacteriologists, who were familiar with the literature, looked for just those favorable results which were obtained.

The principles which underlie serum therapy are at present fairly well known, but there are many points which require elucidation, and I have no doubt that when a few years are passed we will look back to our present methods as crude indeed.

The whole basis of serum therapy, to no matter what disease it is applied, rests upon the knowledge of the germ which causes that disease. To say that we know that a certain germ causes a certain disease, according to Koch, there are three points to be considered: 1st, the germ must always be found in the diseased tissues; 2nd, we

must be able to cultivate it outside the animal body; 3rd, when reintroduced from its cultures into the animal body, it must give rise to the disease from which we obtained it. This, in the case of diphtheria, tetanus, tuberculosis and a number of other diseases, has been done; so that as soon as bacteriologists had this sure foundation upon which to work, they were able to carry on the work of studying the life condition of these germs with the assurance that every new fact added, brought them a step nearer the goal of successful treatment.

Before, however, we knew anything about the causation of infectious diseases, we recognized the fact that recovery from certain of them meant an inability to contract them a second time, that one attack established immunity against a second attack, and it was in looking for the cause of this immunity that the discoveries were made which led up to serum therapy.

Repeated investigations showed that animals which had recovered from the effects of the inoculation of a certain germ were to a certain degree immune to that germ, and it was also discovered that this immunity could be produced by inoculating the animal, not with the germ itself but with the toxins or poisonous life products of the growth of the germ. This immunity, when conferred by the inoculation with toxins, depended upon the amount of toxins introduced, and it was soon found that the animal became rapidly tolerant of very large doses of the toxins, this tolerance being something quite different from the tolerance to alkaloidal poisons. The next step was the discovery by Behring and Kitasato that the blood of an animal so immunized against disease germs or their toxins (they worked with diphtheria and tetanus) conferred immunity upon a second animal when it was injected into it, and that this immunity of the second animal was proportional to the amount of immunity in the first and the amount of blood injected into the second. This immunizing principle was found to be present not in the cellular elements of the blood but in the blood plasma, and it could

be collected in the serum; to this immunizing principle Eholich gave the name of anti-toxin, and upon the amount of anti-toxin present in an anti-toxic serum depends its value in treating the disease for which it is intended.

In order to prepare an anti-toxic serum for diphtheria, for instance, the following conditions are necessary: first, a pure culture of the diphtheria bacillus; this is obtained from a case of diphtheria and purified from other germs which may be mixed with it by our ordinary laboratory methods; second, this germ must have a maximum degree of virulence, *i.e.*, when reintroduced from cultures into an experiment animal, it should kill that animal rapidly with certain definite symptoms. All cultures of diphtheria have not the same virulence, and frequently it is necessary to intensify their virulence in various ways before we can use them for anti-toxin production. A pure culture of a virulent diphtheria bacillus once obtained, it is cultivated in beef-broth for three or four weeks under conditions which will ensure it producing the greatest possible harvest of diphtheria toxins or poisons. These conditions are not yet well known, and we find frequently that many flasks of beef-broth from the same original culture will not contain sufficient quantities of the toxins; an essential point, however, is plenty of oxygen. A beef-broth culture, to be of what is called normal strength, must contain so much toxin that when the bacilli are filtered out from it, the clear liquid should kill guinea pigs of 300 grms. weight, when given subcutaneously, in doses of 1-10 c.c. and in the maximum time of 48 hours.

When we have a culture containing toxins to that extent, the whole culture is filtered so as to remove all, or nearly all, the bacilli and then 0.5 per cent. carbolic acid is added to it, to preserve it.

This normal toxin is taken and injected into a large animal, such as the horse, in gradually increasing doses until the animal can withstand enormous amounts.

Perhaps the best idea of how this is done at present may be obtained by quoting from a paper by Dr. C. B. Fitzpatrick, of the New York City Health Department.

Nov. 16.—A horse is tested with a small dose to find its susceptibility. It then received toxin as follows:

Nov. 22.—1 c.c. toxin ($\frac{1}{3}$ normal strength).
Nov. 28.—2 c.c. toxin ($\frac{1}{3}$ normal strength).
Dec. 2.—5 c.c. toxin ($\frac{1}{3}$ normal strength).
Dec. 6.—5 c.c. toxin ($\frac{1}{3}$ normal strength).
Dec. 15.—5 c.c. toxin (normal strength).
Dec. 21.—15 c.c. toxin ($\frac{1}{3}$ normal).
Dec. 29.—20 c.c. toxin ($\frac{1}{3}$ normal).
Jan. 3.—40 c.c. toxin ($\frac{1}{3}$ normal).
Jan. 8.—80 c.c. toxin ($\frac{1}{2}$ normal).
Jan. 14.—160 c.c. toxin ($\frac{1}{2}$ normal).
Jan. 29.—120 c.c. (normal toxin).
Feb. 19.—120 c.c. (normal toxin).
Mar. 5.—200 c.c. (normal toxin).

By this time the anti-toxic value of the blood serum had reached 1 to 200000.

From these figures it will be seen that there are certain factors of special importance in the production of a good anti-toxic serum. The first of these is a toxin of sufficient strength—unless a strong toxin is used, altogether too large doses are necessary when the animal begins to have a high degree of immunity, doses so large, in fact, as to seriously affect the health of the animal, simply from the bulk of fluid introduced into the circulation. The second factor is a proper regard for the gradation of the doses and the introduction of the same at the proper time. When the doses of toxin are introduced in too close succession, the animal is apt to die, as it has been found that after each dose its susceptibility is increased for a number of days. When the desired degree of immunity is reached,

the tissues of the animal require to be continually stimulated by periodical doses of toxin, otherwise its immunity will tend to decrease and the anti-toxic value of its serum to fall.

When we have an anti-toxic serum of a certain strength we can, in the laboratory, with fair accuracy determine this strength against a given quantity of normal toxin or against a given dose of a particular culture of the diphtheria bacillus, and this relationship is fairly constant; but when we come to consider the use of the anti-toxic serum in the treatment of disease in man, we are brought up at once against three unknown factors which we have not to deal with in the laboratory. The first of these, virulence of infecting germ is exceedingly important, as upon it depends the amount of toxin which forms into circulation. The second unknown factor is connected with the first, viz., the amount of toxin in the system.

The third factor is perhaps the most important of all; it is the possible presence of mixed infection. In our laboratories we study the relation of antitoxin to immunized diphtheria poison, but in practice the diphtheria membrane very frequently contains other bacteria whose products have a complicating effect upon the course of disease, not only on account of direct action of the toxin of these other bacteria upon the system, but also on account of the tendency it may have in directly increasing the virulence of the diphtheria germ.

When injecting anti-toxic serum for prophylactic purposes, however, another factor is to be considered, viz, the excreting of the anti-toxin from the healthy system. It is pretty certain now that the prophylactic value of an injection only lasts for about two weeks. At the end of that time, all the anti-toxin has been excreted and the protection of the system steadily decreases. Behring, in a number of experiments on animals recently published, has come to the conclusion that 3 c.c. of his medium strength serum is the optimum dose for this purpose; if more is introduced, it is more rapidly eliminated, and at the end of two weeks' time the result is practi-

cally the same as with the smaller dose. This, of course, does not apply to the use of the serum in treatment, as there the antitoxin must be continually introduced in quantity in order to enable the tissues to combat the toxin in the circulation.

We are just beginning to understand the meaning of these mixed infections, but it seems pretty certain that the most important is that of the streptococcus pyogenes.

Having all these unknown factors in view, I think the most important conclusion drawn, in treatment with serum therapy, is to use the strongest serum to be obtained and to be liberal with the dosage.

What must be kept in mind in serum therapy, either in diphtheria or in any other disease where it may be applied, is that we are using the serum to combat an unknown dose of poison of an unknown strength, and that the danger to be feared is not over dosage but under dosage.

LABORATORY NOTES ON THE BACTERIOLOGY OF DIPHTHERIA.

By E. B. Shuttleworth, Phar. D., F. C. S., Bacteriologist to the Board of Health, Toronto, and Professor of Bacteriology, Trinity Medical College.

Mr. President and Gentlemen: A considerable amount of bacteriological work relating to anti-toxin experiments was performed in the laboratory of the Toronto Board of Health during the closing months of 1894, but it was not until February 1st last that the examination of diphtheria exudates was carried on in a regular and systematic manner. The importance of such investigations was clearly demonstrated by the results obtained in the hospitals for infectious diseases in Berlin and Paris, and the extensive researches of the Health Department of New York. It was, therefore, determined by Dr. Sheard, Health Officer of Toronto, that similar work should be undertaken in connection with the Isolation Hospital, an institution entirely under city control, and in which the greater number of patients are the victims of diphtheria.

The objects sought were: 1. To confirm clinical diagnosis, and determine doubtful cases; 2. To distinguish between cases of true diphtheria and those caused by cocci, so that patients affected by the latter could be isolated, and more speedily discharged; 3. To demonstrate the absence of the specific bacillus from the respiratory passages of convalescents from true diphtheria, with a view of shortening the usual twenty-eight days' detention in hospital; 4. To assist in the diagnosis of outside cases, thus saving isolation and disinfection, with their attendant inconvenience and expense; 5. To afford a means of contributing towards a knowledge of the disease.

The purpose of this paper is that of presenting a brief account of the work performed, and summarizing such facts as seem likely to be interesting or useful. To this end the same general plan has been

followed as that adopted in the joint report of Drs. Park and Beebe, of the bacteriological laboratory of the New York Health Department, and presented to Dr. Hermann M. Biggs, Chief Pathologist.* Results may in this way be more advantageously compared than with those of Berlin and Paris, where a type of disease of greater severity seems to prevail than either in New York or Toronto.

From February 1st to July 1st there were admitted to the Isolation Hospital 188 patients said to be suffering from diphtheria. My records also embrace, for the same time, 60 private cases in which the exudates were submitted by city physicians. The details of these 248 cases are complete, as far as the examinations are concerned, and are included in the statements made as to organisms present, but, as these outside cases could not be readily traced, no further particulars were sought.

With regard to the hospital cases, it may be assumed that the clinical diagnosis was sufficiently conclusive to warrant the admission of the patients, and it may also be noticed that, as most of them belonged to the poorer classes, they cannot be considered as being amongst the most hopeful. In other words, the hospital clientage may be taken as consisting of apparently pronounced cases, with an unfavorable history, and any statistics gathered from such records will certainly not lead to an underestimate of the diseases commonly classed as diphtheria.

Collection of the Exudate. The infected material is taken by the attending physician, by passing a swab firmly over any patches of visible exudate on the tonsils or pharynx, and at once sent, for examination, to the laboratory of the Health Department. This method is deemed preferable to that commonly practised, in which a culture is at once made by the physician, as it affords an opportunity for the bacteriologist to make an examination of the exudate as well as the culture, thus forming a check of some value, and also often

*Medical Record, vol. 46, Nos. 11 and 13.

enabling a reliable diagnosis to be at once pronounced. Another advantage is that the condition of the culture medium can be guaranteed, and the manipulation be in more experienced hands.

The swabs are prepared by cutting No. 15 steel wire into six-inch lengths, roughening one end by a few strokes of a chisel-edged hammer, and firmly winding on a little ordinary cotton wool, so as to make an applicator of about a quarter of an inch in diameter. The other end of the wire is then passed through a tapered cork, of best quality, which fits into the non-lipped mouth of a stout, well annealed test tube, of 15 mm. external diameter by 100 mm. in depth, (say five-eighths of an inch by four inches).

The object should be that of preventing the infected material from soaking into the swab, and preference is therefore given to ordinary cotton wool, rather than the absorbent kind hitherto recommended. A cork will also be found an improvement on the usual plug of cotton wool, and is practically a sufficient protection from extraneous germs. The tubes, containing the swab, are sterilized by one and a half hours' exposure to a dry heat of 150 degrees C. The swabs are supplied free to any physician requiring them.

Culture. Experiments have been made with various media, but Loeffler's blood serum mixture, prepared by the quick method, has been found to best answer the requirements, though, when recently made, and bearing water of condensation, it does not appear to give such good differential staining as when dry, or older. The white and yolk of an egg, with one-third its bulk of bouillon, containing one per cent. of glucose, may on occasion be used, as also glycerin-agar, which is, however, slower than serum, though yielding much better macroscopic preparations. Park and Beebe claim that glycerin-agar is not so reliable for diagnostic purposes as is serum, and I have noticed that the growth of Loeffler's bacillus on this medium is less luxuriant, while the cocci appear to develop more rapidly and vigorously.

In making a culture, the infected swab should be lightly but firmly passed over the surface of the slanted serum, but not with such force as to abrade it. The infected tubes are then kept in an incubator, at 35 to 37 C., for say 12 hours, when the growth will be easily recognized. As a matter of fact the cultures are set one day and examined next morning.

Cultural characteristics are of value as affording collateral evidence of the presence of the specific organism, and on transparent media the colonies are more or less easily recognized. It is, however, in morphological characters, and peculiarities of staining that reliance must be placed.

Staining. A smear from a swab is made directly on a slide, and is dried, fixed, and stained with Loeffler's blue. In making a preparation for a culture a small drop of water is put on a slide by means of a platinum loop, and a portion representing the entire growth on the surface of the serum is removed by a platinum needle and evenly distributed in the water, and is then dried, fixed, and stained. A drop of cedar oil is put on the slide, and the examination made by a one-twelfth oil immersion lens. Staining directly on the slide, as in the recognition of bacillus tuberculosis, is quicker and handier than using a cover glass, and, with proper skill in using the objective, is practically safe.

Characteristics of the Diphtheria Bacillus. It will be unnecessary to repeat the well-known descriptions of this organism, and I would only emphasize its great liability to variation in form and size. This sportive tendency is sure to puzzle the inexperienced observer, though, when understood, it becomes diagnostic. The organisms found in the exudate are often presented as diplobacilli, which stain more or less uniformly, and, at most, show polar darkening, while in other, and much rarer cases, they are exceedingly characteristic, resembling those grown on serum, and possessing strongly marked interruptions. The cause of this variation may possibly be found in the condition as to reaction, or composition of the mucous membrane

or secretion in the throats of different patients. This seems likely, as under artificial cultivation the character of the medium greatly influences the appearance of the bacillus. I may say that I have found these characteristic specimens most frequently in the exudates from adults.

The variations shown in the bacilli of cultures are not, however, to be wholly accounted for by the character of the medium, nor the temperature or staining manipulations. Cultures of different exudates grown together, under conditions precisely similar, and stained in like manner, often show very different results. In some the bacilli may be uniform in shape, size, arrangement and diagrammatic staining, while other specimens exhibit wide differences in all respects, presenting extremely long rods, with wide interruptions, or clavate, fusiform, or even pyriform organisms, of the most bizarre description. It is thought that these are involution forms, or, according to Klein, that they represent a relationship to a mycelial fungus. The variations are very interesting and invite further study.

Relation between the Length of the Bacillus and its Virulence. The results of Park and Beebe are not in accord with some others, who hold that the longest bacilli are the most virulent. The observations of the above named authors show that the greatest mortality occurred in those instances in which the rods were shorter than the average, while there was a diminished death rate with the long forms, and a still lower rate with the evenly-stained short forms, with badly marked characters. Opportunity was afforded by the records of the Isolation Hospital for learning the clinical history of the cases there, and, from a comparison of such data with those obtained from the bacteriological examination, the conclusion to be formed is in accord with that arrived at in New York, viz.: that the size of the bacilli affords little on which to base a prognosis, but, if anything, the longer rods produce less fatal results than those of average dimensions.

Relation between the Pseudo and True Bacillus. In view of the uncertain state of knowledge in regard to this point, and also taking into consideration the fact that the work at the Isolation Hospital was designed to be of a practical character, free from risk, no advantage was taken of the differentiation of these forms. All cases were treated as diphtheria in which an organism was found possessing the ordinary recognized characters. The results obtained have fully justified this course, and any observations or statistics given in this paper must be understood as being subject to this condition.

It may be noted that a bacillus, identical in most of its characters with the true bacillus, but not possessing virulence, or at least not producing disease in the individual in whose throat it is found, and incapable of proving virulent to animals, has been detected in the throats of a considerable proportion of healthy persons. Hoffman, who identified these forms, was unable to decide whether they were merely attenuated diphtheria bacilli—or ordinary harmless saprophytes. The experiments of Roux and Yersin pointed to the former conclusion, but Escherich leans to the latter view, and the work of Park and Beebe, which included cultures from 330 healthy throats, showed the presence of bacilli of three kinds: 1. Virulent diphtheria bacilli, characteristic in growth, producing acid in bouillon, (8 cases). 2. Bacilli identical with Loeffler's bacillus in cultural and acid forming power, but non-virulent, (24 cases). 3. Bacilli not having all the characteristics of the true organism, producing alkali in bouillon, and non-virulent, (27 cases). These were all furnished in dispensary or hospital practice in New York, and in which there was no history of direct contact with diphtheria.

A further set of experiments, on cultures from the throats of persons belonging to fourteen families in which there had occurred diphtheria, revealed the fact that the true bacilli were found in 50 per cent. of the cases, and forty per cent. developed, later, to a greater or less extent, the lesions of diphtheria. The examination

included forty-five children. These experiments have an important bearing on isolation, and this must be my excuse for a digression in a direction in which I have nothing original to offer.

Persistence of the Bacilli in the Throats of Patients. Some observations have been made on this point. The shortest period for the disappearance of the bacilli, after the patient's admission to hospital, was five days and the longest forty-two days. A somewhat interesting case was that of patient No. 1820, an adult, in which, by the thirteenth day, the bacilli had entirely disappeared, and recovery was progressing rapidly. On the thirteenth day after this, and within one day of the termination of the stipulated period of convalescence, reinfection occurred, as evidenced by the clinical signs of the disease, and confirmed by bacteriological test. By the thirteenth day the bacilli had again disappeared and the discharge of the patient followed shortly after. This was a clear case of reinfection, and, taken in connection with the ascertained variability in the persistence of the bacilli, shows conclusively that a definite time limit cannot be placed to the period of convalescence, and that though a detention of fourteen days after the disappearance of the exudate is a fairly well chosen term, it is sometimes too long for the safety of the patient, and often not long enough to prevent infection being carried by those who are discharged. Park and Beebe think that the isolation of patients should continue until cultures prove the absence of bacilli, and when such examinations cannot be made, at least three weeks should elapse after the disappearance of the membrane. During the past two months, as confidence has been established in bacteriological results, considerable advantage has been taken of such tests, as governing the discharge of patients, and in no instance has there been any reason to doubt the correctness of the conclusions.

Diagnosis by Examination of the Exudate. The question is often asked whether, by a microscopical examination of a smear of the exudate, it is possible to make a diagnosis. In many cases a reliable conclusion can thus be formed, but, in others, it is quite impossible.

Failure may arise from the fact that the bacilli are few, while other organisms are very numerous, and, as I have before stated, the characters of the Loeffler bacillus are, in the natural medium, often very difficult of recognition.

On looking over the records of the last hundred exudates examined, I find that the bacillus was noted as being undoubtedly present 36 times, and as being probably present 39 times. In the other cases the organism was either not present or unrecognizable. According to this, it is possible to make from the exudate a sure diagnosis, in at least one-third of the cases, and to form a fairly correct idea as to the nature of about three-quarters. Negative results have not any diagnostic value, as failure to detect the bacilli does not necessarily prove their absence.

Number of Species of Bacteria found in Cultures. Considering the apparently fertile source, it is quite remarkable that so few species are found in serum cultures. Miller isolated more than 100 species from the juices and deposits of the mouth, and it does not seem unlikely that a large proportion of these might reach the tonsils or pharynx. The greater number of such bacteria are derived from food or air, and the mouth organisms, proper, were found by Miller to be strictly parasitic, and not capable of cultivation on artifical media. This may possibly account for the small number of species represented by cultures from the throats of diphtheria patients, and the temperature at which cultures are grown no doubt exercises an inhibitory influence on many species. I have found that the range is confined to about 20 organisms, and the occurrence of some of these is quite rare. The species include Loeffler's bacillus, and pseudo form, the pyogenic staphylococci and streptococci, micrococcus tetragenus, white and pink yeasts, the diplococci of Frankel and Friedlander, Pfeiffer's bacillus, streptococcus articulorum, bacillus mesentericus vulgatus, and other spore-bearing organisms.

Character of Pathogenic Organisms found. The following table shows the general character of the organisms present in 188 hospital

cases and 60 in private practice. The results are calculated in the nearest whole percentages :—

	Hospital Cases.	Private Cases.
B. Diphtheriæ	36 per cent.	21 per cent.
" and Streptococci	11 "	18 "
" and Staphylococci	10 "	6 "
" with Strepto. and Staph.	19 "	15 "
Streptococci only	4 "	16 "
Staphylococci only	6 "	7 "
Strepto. and Staphylo	12 "	14 "
Other organisms	2 "	2 "
Loeffler's bacillus present	75.5 "	61 7 "
" " absent	24.5 "	38 3 "

It is commonly supposed that Loeffler's bacillus is much more generally associated with cocci than is indicated by this table, but I can only give the facts as observed. It may, however, be explained that there is a bare possibility that the cases of combination are under-stated, on account of the somewhat slower growth of cocci on serum. Observations of the cultures were in all cases made after 24 hours' development, except those set on Saturdays, when twice this time elapsed. Cocci were found to grow in the shorter period, and there is no definite reason to conclude that a longer time in the incubator would have produced a different result.*

The fact that nearly one-quarter of the cases admitted to the Isolation Hospital, as diphtheria, were really not so, is a most important one, and points strongly to the necessity for "suspect" wards in institutions of this character. The isolation should be perfect, and all patients should be detained in such quarantine until the results of a bacteriological examination are known. This seldom requires more than 24 hours, and, by the exudate, may sometimes be decided in a few minutes.

* The above table has reference to pathogenic cocci, only, and does not include U. tetragenus.

In the 5,611 cultures made in New York, from May, 1893, to May, 1894, and representing hospital, dispensary, and private cases, the specific bacillus was found to be absent in 27 per cent. of the cases. This agrees fairly well with the results obtained here.

Occurrence of Staphylococcus Pyogenes Aureus. All cultures were laid aside for fourteen days after microscopical examination, so that the golden staphylococcus might reveal itself by its chromogenic character. It was found in 27 out of 188 cases, or about 14 per cent. It is significant that it was present in nearly 19 per cent. of the fatal cases.

Occurrence of Micrococcus Tetragenus. The frequency of this organism in diphtheria exudates and cultures calls for special remark. As judged by morphological characters, I have found it to be present, either in the exudate, or cultures, in 91 per cent. of the hospital cases examined. This is, I think, a greater proportion than observed in health, but whether the fact is of any pathological importance I am not in a position to say.

Susceptibility as Influenced by Age and Sex. The following table affords some data for arriving at conclusions on these points, but it is to be regretted that cases of true and false diphtheria are not separately enumerated. The percentages apply to the ages of hospital patients only :—

7 years and under.....	50 per cent.
Between 7 and 14 years.....	21 "
" 14 and 21 years.....	14 "
" 21 and 28 years.....	10 "
" 28 and 51 years.....	5 "

The tables of Parke and Beebe cannot be compared, item by item, with this, but it may, however, be concluded that young children are here much less liable to the disease, while adults are more susceptible than in New York.

The proportion of females to males was 56 and 44 per cent., respectively, figures which approximate very closely to those applying to New York.

Mortality. The type of diseases prevalent in Toronto appears to be, relatively, of an average character. This is shown by the observed death rates in various American cities, as given in the last report of the Toronto Board of Health. A few of these figures may be reproduced :—

Cleveland, Ohio	63.5	per cent.
DesMoines, Iowa	44.8	"
Brooklyn, N.Y	36.9	"
Rochester, N.Y	33.3	"
Boston, Mass	32 3	"
New York, N.Y	30.6	"
Philadelphia, Pa.	29.0	"
Detroit, Mich.	28.6	"
Toronto, Ont. (1894)	27.9	"
Toronto, Ont. (1892-3-4)	22.1	"
Duluth, Minn.	19 0	"
Harrisburgh, Pa.	12.0	"
Toledo, O.	11.7	"

General health returns cannot be accepted as being as accurate as those of hospitals, where the facilities for obtaining statistics are complete and under perfect control. It will, therefore, be better to class the death rate of the isolation hospital with other institutions of the same kind, of which a few records are at hand :—

Sick Children's Hospital, Paris, average of 5 years	51.7	per cent.
English hospitals, quoted by Drs. Washbourn, Goodall and Chard, average	38.9	"
Trousseau Hospital, Paris	32.0	"

Willard Parker Hospital, New York, average of 4 years	23.77 "
Willard Parker Hospital, New York, 1894	27.00 "
Isolation Hospital, Toronto, 1893	19.32 "
" " " 1894	14.05 "
" " " February to June, inclusive, 1895	18.08 "

In the Toronto returns there have not been any deductions for cases which were in a moribund condition when admitted, but every death occurring in the institution has been included. The low rate is highly creditable to Dr. Tweedie, the physician in charge, but, nevertheless, I think the conclusion may be formed that the bacillus is less virulent or the subjects more resistant in Toronto than in many other cities.

Organisms Present in Fatal Cases. Of the 34 deaths which took place during the last five months, there were 33 examinations of exudates, as in one instance the patient died a few minutes after admission, and a swab was not taken. In another case, that of an infant 12 months old, in a moribund condition from membranous croup, the swab was unsatisfactory. The records of the 32 remaining cases were as follows :—

Loeffler's bacillus only	37.5 per cent.
" " with streptococci	25.0 "
" " with staphylococci	18.7 "
" " with streptococci and staphylococci	18.7 "

The staphylococci were, in all cases, S. pyogenes aureus. No fatal results took place when only cocci were present.

Sex and Age in Fatal Cases. The proportion of males and females was respectively 44 and 56 per cent., being precisely identical with the ratio of affected cases.

Age is represented by the following percentages :—

Second year	26	per cent.
Third year	12	"
Fourth year	17	"
Fifth year	15	"
Sixth year	6	"
Seventh year	15	"
Eighth year	3	"
Tenth year	3	"
Thirteenth year	3	"

It will thus be seen that the mortality was 91 per cent. during the first seven years, while the number of patients under that age was 50 per cent. Of the 29 per cent. of patients over 14 years of age not a single death occurred.

Sixty-seven per cent. of the deaths took place within five days after admission to the hospital, and 88 per cent. within eight days. The longest period from admission to death was 14 days.

Relation between Organisms Present and Severity of the Disease. I offer, with great hesitancy, any remarks on this subject, as some of the results indicated by my investigations are as surprising to me as they, doubtless, will be to others. I have, however, no reason to question the care with which the bacteriological observations were made, though, in regard to the records of the character of the disease, it may be explained that such were not specially kept for this purpose, but were partly obtained during conversations with the Medical Superintendent, and partly from his rough notes of cases. Further experience and more perfect records may throw additional light on this subject, but, in the meantime, I venture to submit what I have up to the present observed.

In the appended table the cases have been classified as mild, severe, very severe, and fatal, and the proportion with reference to each organism, or combination, is given in round percentages :—*

	Mild.	Severe.	Very severe.	Fatal.
B. diphtheriæ	46.5	11.2	22.5	19.3
" and streptococci	32.1	17.8	21.4	28.5
" and staphylococci	27.2	18.1	22.7	31.8
" with strepto. and staphlo.	54.3	11.4	20.0	14.2
Staphylococci only	97.3	2.7	0.0	0.0
Streptococci only	100.0	0.0	0.0	0.0
Staphylo. and strepto.	100.0	0.0	0.0	0.0

The general belief that the most fatal cases result from the association of Loeffler's bacillus with staphylococci, or with streptococci, is confirmed by the above figures, and the former combination is the most serious. It is, however, extraordinary that when both cocci are present with the Loeffler bacillus the death rate is apparently reduced by one-half. This would indicate an antagonism between the combined cocci and the bacilli—a supposition which I do not care to urge until further evidence is obtained, and this I shall take particular pains to procure. There are other interesting deductions which might be drawn from the above statistics, but I shall not further trespass on patience which must be already overtaxed.

* The table has been drawn up so as to exclude U. tetragenus, and only refers to pyogenic micrococci.

PRACTICAL EXPERIENCE WITH SERUM THERAPY IN DIPHTHERIA.

By W. R. Hall, M.D., M. H. O., Chatham, Ontario.

Mr. President and Gentlemen of the Association: Diphtheria is always a serious toxæmia; add to this, at times, mechanical obstruction to breathing with a tendency to the occurrence of secondary inflammations of the air passages, and acute renal trouble, and the conditions are indeed very formidable to meet with any therapeutic means formerly at our command.

Diphtheria cases differ very much in severity during the progress of an epidemic of the disease; and diphtheria epidemics have their own characteristics, some being comparatively mild while others run a deadly course.

An epidemic which occurred in the City of Chatham, during the last four months of 1894 and first four months of 1895, seemed to be of the latter variety, that is, the symptoms were exceptionally severe and the death rate unusual, in our experience with the disease.

In 1891	19	cases	were reported and	1	death.
" 1892	17	"	"	1	"
" 1893	8	"	"	1	"
" 1894	120	"	"	6	deaths.

Out of these 120 cases reported in 1894, 72 were reported in the months of September, October, November and December, with 6 deaths, a fatality of 1 out of every 12.

About the first of the year 1895, the Local Board of Health purchased a supply of anti-toxin serum from the Provincial Board of Health, through its efficient secretary, Dr. P. H. Bryce, and sold it to physicians of the city at cost price for pay patients, and free for patients unable to pay for it.

During the months of January, February, March and April of 1895, forty-nine cases were reported, and in thirty-nine of these the diphtheria anti-toxin was used for treatment, and in fourteen cases to give immunity to persons exposed to the disease.

Anti-toxin being quite expensive and the sentiment somewhat against a remedy so novel in its application, and, as yet, to the people uncertain in its efficacy, was used only in severe cases where danger was apprehended, while the mild ones received other treatment.

Out of this large number of cases only one death occurred, that of a child, from laryngeal stenosis, three hours after the injection, but death seemed inevitable before the injection and the case should not count as a failure. Two other children of the same family, with distinct laryngeal symptoms, were injected and recovered.

The Chatham Medical and Surgical Association at its last meeting in December, 1894, appointed a committee of the following members of the society, Drs. Bray, Fleming, Duncan, Charteris and Hall, to select a suitable case or cases to try the new remedy and report back to the society.

A few days afterwards Dr. Duncan reported a case which the committee considered a suitable one, and I give in full the report made out by Dr. Duncan, approved by the committee and submitted to the society.

James McKie, aged ten years, a generally healthy boy, though subject to bronchial cough on taking cold, which he takes readily. Was called to see him December 21st, 1894. Temperature then was 103, pulse 90, throat red and swollen, with leathery patches on either side; made cultures from throat on white of egg, with marked diphtheritic growth in eighteen hours; put on iron and potchlorate mixture. 22nd.—Temperature 102, pulse unchanged, membrane looser, no croupiness or other bad symptoms. 24th.—Decidedly

better, membrane mostly gone. 25th.—Father came down in afternoon, saying that throat was clear and child feeling well, and if anything further should appear he would let me know.

For some days he seemed to do well, but the cold became intense, and his room, which was not well heated, became very chilly over night; patient felt the cold and in the morning was slightly croupy. This gradually increased for two days, when, on the 30th December, I was called again. I found patient pale, pulse 130, respirations labored and voice husky, croupy cough, heart's action feeble, a good deal of sweating, thin adherent, very white membrane on left tonsil. I at once recognized most serious danger, put patient on iron again, and calomel inhalations every three hours, and called the committee together, having received from the M. H. O. the necessaries for the anti-toxin injection.

Our Medical Society's Committee for testing and observing results in the anti-toxin treatment met on the 31st. Patient's condition was more urgent than on the 30th; heart very weak. The livid color, so painfully characteristic of these croupy cases of diphtheria, was very distinctly marked; heart's action very weak and rapid, temperature slightly over the hundred.

The committee was unanimous in the opinion that the patient would die, unless some more potent means could be employed than had been used hitherto in Chatham.

Fifteen c.c. of anti-toxin were injected inside the lateral abdomen early in the afternoon. Only a trace of albumen present in urine, which had disappeared by following day. Temperature and pulse rate rose considerably from three to six hours after injection, but patient felt more comfortable, and symptoms seemed less urgent by evening; during the night cough seemed looser, and breathing easier, and a membranous cast of the trachea was coughed up before morning.

Second injection made of ten c.c. twelve hours after the first. Committee visited case twenty-four hours after first injection and were astonished to find patient so decidedly improved.

Patient improved steadily, membrane separated from tonsil January 2nd, or the third day after first injection. January 10th.—A slight rash was reported, and on the 12th slight swelling of ankles with pain and stiffness and slight elevation of temperature occurred. These symptoms disappeared by the 14th and recovery was uneventful beyond that time.

ANOTHER BY THE SAME REPORTER.

No. 2. Frank Shaw, a pale delicate boy of six or seven; was called to see him February 12th, and removed him at once to isolated ward of St. Joseph's Hospital. Throat much inflamed, both tonsils swollen, a leathery patch of diphtheritic membrane on left tonsil, glands swollen, temperature 103, pulse 100. Used ordinary remedies till 16th when no improvement was manifested. Injected twelve c c. of anti-toxine that morning, temperature rose in two hours about two degrees, and remained up for twenty-four hours, pulse also more rapid, though patient felt more comfortable. Urine was free from albumen at the time of injection; a trace appeared next day; complete separation of membrane on third day after injection, followed by uninterrupted recovery.

Dr. Duncan says of the remedy:—"My cases have been too few to be a basis for conclusion, but my experience has been markedly calculated to convince me that anti-toxin has a decided influence for good upon the course of diphtheria, and that it seems to arrest all further developments of the disease, leaving nature to fight with the damage already done."

The next two cases are selected from Dr. Fleming's reports:—

Case 1. M. B., female, whose brother died of the disease a short time before, she was aged six; thin, but active membrane on both tonsils when first seen. January 14th, 1895, at 8 a m, parts much inflamed, pulse 120, temperature 102; at 2 p.m, pulse 120, tem-

perature 102; at 7 p.m., pulse 116, temperature 101½. January 15th, 9 a.m., pulse 116, temperature 99⅝; at 3 p.m., conditions the same; membrane on this day considerably spread; at 5 p.m, with the assistance of Dr. Hall, gave 12½ c.c. of anti-toxine, before giving it, found pulse 120, temperature 99⅜; at 9 p.m., pulse 120, temperature 99½. January 16th, 10 a.m., membrane gone on right side, pulse 100, temperature 98½; 7 p.m., pulse 100, temperature 99⅛. January 17th, only rags left of the membrane, pulse 98, temperature 98⅜. January 18th, 11 a.m., pulse 84, temperature normal, right tonsil has a trace of membrane reappearing. January 19th, much as yesterday, in evening showed a little more membrane. January 20th, membrane has quite disappeared and patient rapidly improved, with a perfect recovery. This patient was never apparently dangerously ill, but improved at once after injection.

Case 2. C. B, a lad of thirteen, very stout and short, weight 140 lbs, pharynx closed from being so fleshy. February 2nd, 1895, found appearances of diphtheria this p.m., pulse 100, temperature 100. February 3rd, much membrane on both tonsils and on the uvula, pulse 75, temperature normal, nasal voice; at 5 p.m., with Dr. Hall, injected sixteen c.c. of anti-toxin; this was on the 4th February, with much membrane. February 5th, injected eight C.C. of anti-toxin, throat about as yesterday. February 6th, membrane fast disappearing. February 7th, membrane all gone.

February 8th. Paid last visit; patient's throat only showed a little lividity. In this case, as in my other cases, I believed that the speedy improvement was due in a very great measure to the injections.

Dr. Bray says:—Anti-toxin should be used early, and he is satisfied that it cuts short the disease and causes the membranes to disappear much more quickly than when other remedies are used to its exclusion. In laryngeal cases, so far as his experience goes, it is almost a specific. Has seen no ill effects follow its use. Of course stimulants, iron and other remedies should be given as well.

The next case is given pretty fully on account of its severity and happy results. Jennie R., aged 12 years, strong and rugged, sickened with croup, fever, etc., at 2 p.m., January 20th. January 22nd, at 12 a.m., I was sent for, and found rapid, labored breathing, croupy cough, pulse 130 and intermittent, lips and face cyanosed, temperature normal and symptoms all very urgent; no membrane visible in the throat. The onset of the croup was gradual and progressive; inspiration and expiration were equally difficult, and there was a distinct history of exposure to the disease. Diagnosis, laryngeal diphtheria. I promptly injected twenty c.c. diphtheria anti toxin in the lateral abdomen two hours after; symptoms seemed less urgent; pulse 130, regular; temperature 102, at 10 p.m. Same day injected ten C. C. more. During the night two large pieces of membrane were coughed up; one piece was burned before examination; one I have preserved, and it is quite a perfect cast of bronchus. Morning of January 23rd, temperature 100, pulse 120, blueness of face and lips gone, breathing still coarse and croupy, but recovery was steady and rapid, until the fifth, when a rash came out, with fever 101; rash and fever disappeared on the seventh day and patient well. This was a very severe case, and I firmly believe that if anti-toxin had not been used promptly it would have had a fatal termination. Dr. Rutherford has used anti-toxin in several cases where the fauces and tonsils were covered with a thick leathery membrane. He found the membrane softened, ragged and peeling off within twenty-four hours after using the remedy. He thinks convalescence was hastened in his cases from four to eight days. He used fifteen c.c. first injection, and ten c.c. in twenty-four hours, second injection. Recovery was rapid and satisfactory in all his cases, and he has no doubt the good results were due to the remedy.

Drs. Holmes and McKeough used the remedy in twenty cases for treatment, and in eleven for prevention in children exposed, of whom

one only contracted the disease three weeks after the injection. Most of the cases treated were quite serious. They say of the treatment :—" We are thoroughly satisfied that it is a marvellous remedy, if used early in the disease." They used from fifteen to twenty-five c.c. at an injection ; only twelve of the cases had a second injection of ten c.c. ; no albuminuria follows the use of the injection ; urticaria followed in six cases, paresis in one case.

Our experience in Chatham is thus :—Thirty-nine cases treated with the diphtheria anti-toxin serum, out of forty-nine reported in four months. One death from laryngeal stenosis three hours after the injection should not be considered, for the patient was practically dead before the injection. Thirty-eight cases then without a death is a good record. Of these six were laryngeal cases, two at least of which would have died in a short time, I am convinced, with any other form of treatment. Twelve cases were followed by an urticaria of short duration, two by painful swelling of the joints, which disappeared in a few days, and one by paresis. The after symptoms are not severe and should not stand in the way of its adoption. Albuminuria is not caused by, nor increased by, its use. I used it myself in a case of diphtheria which developed in a twelve-year-old child, who had been for eight months suffering with chronic nephritis. Careful observations were made. The amount of albumen did not increase or diminish perceptibly. The child recovered from the diphtheria, but died three weeks after of nephritis. The remedy is endorsed and praised by every physician in Chatham who has used it for treatment. The amount injected first was in no case less than twelve c.c. or greater than twenty-five c.c. ; second injections were given in the majority of cases.

Most of the serum used was purchased through the Provincial Board of Health ; some was imported from Berlin by Colonel Bishop, U. S. Consul at Chatham, an enthusiastic student of hygiene and a believer in the efficacy of diphtheria anti-toxin serum, and some from the laboratory of Park, Davis & Co.

Gentlemen, I admit that exception may be taken with good ground to the admission of my cases as matter of safe record, for in a strictly scientific investigation the presence of the Klebs-Loeffler bacillus should be demonstrated in every case recorded to prove the remedial power of the diphtheria anti-toxin. With us this would have been difficult indeed, but I admit that reliable statistical records can only be made by the help of bacteriological examination in every case. My cases were all diagnosed by practical physicians of long standing and experience with the disease, and I have every reason to believe that the diagnosis was correct in every case.

Should there often be a mistake in the diagnosis of diphtheria? Ordinarily, with a physician of experience, I think not, but often it is one typical feature that is disguised or out of sight. Classical cases occur in text books; its diagnosis is very easy on paper, but at the bedside the picture is often obscure.

The prompt diagnosis of diphtheria is often very difficult. Acute follicular tonsilitis, accompanied by fever, enlargement of the cervical glands and prostration. Add to this picture, points of exudation from the crypts of the tonsils coalescing and forming a continuous sheet of deposit, and diagnosis is not so very clear. Cases of doubt very frequently arise. We have a sure way of removing the doubt by proving the presence or absence of the specific bacilli, but laboratories for these investigations are few and far between. Would it not be practical to equip every city and county town with the means for making these investigations?

Diphtheria, in spite of all remedies both local and general, and all improved forms of treatment hitherto used, has proved itself a terrible scourge and the mortality has been very high.

Intubation and tracheotomy will still have to be practised, if only as aids to this treatment, but the objections to tracheotomy are very serious. It facilitates the development of bronchitis or pneumonia, and the wound is very liable to become diphtheritic.

It is my firm conviction from even my limited experience that we have in this treatment of the disease with the serum, good quality, sufficient and early use, under proper antiseptic precautions, a remedy that will take from this terrible scourge its terrors, and make it one of the dangers passed, one of the victories won by science over disease.

THE EXPEDIENCY OF THE CHANGE FROM MUNICIPAL TO COUNTY MEDICAL HEALTH OFFICERS, FOR PROMOTING EFFICIENCY AND ECONOMY IN THE PUBLIC HEALTH SERVICE.

By P. H. Bryce, M.A., M.D., Secretary Provincial Board of Health of Ontario.

To the President and Members of the Association of Executive Health Officers of Ontario:

Gentlemen: I propose in my paper to urge some reasons for giving our medical health officers a special training in chemistry and biology; but before doing so I shall make some remarks concerning a phase of the problem upon which the practical results of any facilities made for the training of health officers must necessarily depend. This, as may naturally be supposed, is the position and present status of the Medical Officer of Health in Ontario.

It will be remembered that at the annual meeting of this Association held in Trenton in 1891, Dr. J. Coventry, Medical Health Officer of Windsor, read a paper on "Auxiliaries to the Health Office," and, amongst the many apt remarks therein made, I quote the following:—

"At the other end of the line legislators have been most lavish with the executive powers conferred upon him (the M. H. O.); but at this point they have deserted him and left him at the mercy of the municipal council to remunerate him for his services."

And again, "the Medical Health Officer should become familiar with the methods of examining foods and other articles of daily use, and his salary might be made contingent on his ability to pass an examination, a reasonable time being given him to enable him to fit himself for the work.

"All the foregoing anticipates an increase of the burdens of the most overburdened and unremunerated of public servants, and I

will breathe easier if I am assured that there is not present in the audience a member of the Society for Prevention of Cruelty to Animals, otherwise I might be ordered under immediate arrest.

"If you will bear with me for a few minutes longer I will tell you a tale of unrequited love. I have for a long time felt a great curiosity to know just what the Medical Health Officer received for his services, and how long a so-called Christian people would stand by and see him grow fat on the east wind.

"For the purpose of getting information on this subject, I recently addressed a circular to thirty-five cities and towns in the Dominion having a population of 5,000 and upwards. Replies from twenty-seven of these give Medical Health Officers' salaries ranging from zero to $3,000:—

1	gives	$3,000
1	"	2,400
3	"	1,000
1	"	800
1	"	400
1	"	300
1	"	250
4	"	200
1	"	120
4	"	100
1	"	25
1	"	1
7	"	0

"The last of these, no doubt, are men who have discovered some pabulum other than bread and butter on which to sustain life in this cold, cold world.

"The aggregate sum paid to Medical Health Officers is $11,496. The Inspectors fare a little letter. There are more of them. Six manage to maintain the dignity of their office on no salary. The whole sum paid Inspectors is $25,326. But it is the secretary who

is the Crœsus of the health office. This officer has actually absorbed $2,725 of the people's money, and nineteen of them 'cut no figure at all' on pay day.

"The population on which these figures are based gives a total of 809,061, representing an assessment of $418,160,672. This would show five cents per capita, and one-tenth of a mill on assessment to sustain our present municipal health organization. If the public ever blushed this statement should make its face scarlet."

These statistics sufficiently illustrate the situation as it existed in 1891, and which has not, so far as I am aware, improved since in any notable degree in the matter of increased grants as salaries to Medical Health Officers, although a general improvement in the character of the work of Local Boards can, I think, on the whole be seen.

Comparison of the health work of our municipalities with that of other branches of municipal work during the last ten years, may, I think, be made, and I believe it may be fairly asserted that progress in it is as great as in other directions; but we have only to examine into the details of the work in any except our cities and perhaps larger towns in order to see how little exact health work is done.

Let me summarize the work of a Medical Health Officer as it exists in England and elsewhere.

(*a*) To inform himself respecting all influences affecting or threatening to injuriously affect the public health within the district.

(*b*) Ascertain causes and distribution of diseases actually existing within district.

(*c*) He shall inspect periodically, and as emergency may require, his whole district.

(*d*) He shall advise the Local Board on all matters and supply data for prosecution wherever nuisances exist.

(*e*) Shall advise in the framing and execution of by-laws.

(*f*) On being informed of infectious disease, he shall investigate and take such action as shall limit its spread.

(*g*) He shall superintend the Inspector of Nuisances.

(*h*) He shall inspect meat, fish, vegetables, etc., personally if the occasion demands it.

(*i*) He shall examine into all classes of offensive trades within the district, as factories, dairies, cow-sheds, milk-shops.

(*j*) He shall report of all matters from time to time, giving such returns of outbreaks and causes as is possible.

(*k*) He shall report to the Central Board any dangerous outbreak, and annually on all matters, including schools.

In France the district Councils of Hygiene are charged in addition to such as above, specifically :—

(1) With powers for formulating plans for the suppression of epizootic diseases of animals.

(2) The spread of vaccination.

(3) The care of the indigent sick.

(4) Local inspection of hospitals, asylums, prisons, etc.

(5) Construction of public buildings, as schools, prisons, reservoirs, sewers, cemeteries.

(6) Obtain statistics of mortality, morbidity, topographical conditions, etc.

This is certainly a very liberal bill of fare for a local health authority, and one cannot fail to think that if such matters demand public attention at all, they will demand not only all the time, but all the energies and intelligence of a Medical Officer of Health with accomplishments of no mean order.

If we group the work we see that it includes :—

1. General inspection. With regard to drainage, an officer must know accurately about soils and ground water ; with regard to mill-ponds, standing water, and organic deposits and refuse, he must be in a position to positively state what conditions are and have been proved, scientifically, positively injurious and give his reasons.

2. Suppression of contagious disease. He must have method and nerve enough to see that dangerous contagious diseases are

reported to him, whether of men or of animals, and must have so thoroughly the confidence of his medical confreres and the public as to his disinterestedness, scientific attainments and practical abilities, as that all excuse from any standpoint for oversight on the part of practitioners or public will be removed. To dwell on this for a moment, we see that his work demands (*a*) medical experience; (*b*) training and skill to diagnose in the laboratory by microscope, bacteriological cultures and chemical examinations, the special cause and source of diseases, principally the following:—Diphtheria, typhoid, tuberculosis, actinomycosis, trichina, cysticercus (measles in hogs), hog cholera, ptomaines in cases of poisoning from cheese, meat, milk, etc.

It is needless to say that this work not only demands the highest skill, but it also demands laboratory facilities. (*c*) The isolation, and, where necessary, the removal of infectious disease to hospitals, the destruction of infected animals, and the disinfection of infected centres, whether houses, schools, workshops, stables, etc. This necessarily demands isolation hospitals and sufficient assistance by Inspectors to have work systematically carried out.

3. Inspection of foods, noxious trades, etc. This work, both difficult and constant, demands that slaughter-houses and their surroundings, cheese factories, cow byres, piggeries, knackeries, and other specially noxious trades be kept under the strictest supervision. The Medical Health Officer must know, and have Inspectors who know, diseased meat, and how diseased, must be able to accurately state what foods are injurious to milch cows, what stable surroundings are good and what bad, and be able to diagnose diseased conditions in cows. He must be fully informed on the most recent appliances for testing milk as to quality, butter-fat, and its general fitness for children's food, and must know what to suggest for the reduction to a minimum of the effects arising from noxious trades.

4. Inspection of schools and public buildings as to dampness, plumbing, heating, ventilation, overcrowding, lighting, etc.

5. The regular supervision of the public water supply of the district, and the control of drains, sewers, as regards the direct effects upon health, from sewer-gas in streets, etc., and the disposal of excreta.

Enough then has been indicated to show that the work to be done is extended and of a most exacting character. At present we have this work distributed over the municipalities as given in the following table :—

1894.—Table showing number Boards of Health and Health Officers to population in Ontario.

Total organized municipalities in Province.	Total number of Boards reported organized.	Total M. H. Officers.	Total Sanitary Inspectors.	Total population.	Rates of population to number of M. H. Officers.
743	425	374	205	2,167,460	1 to every 5,795

Returns from Reports received in 1894.

—	Total number of Boards reported organized.	Total M. H. Officers.	Total Sanitary Inspectors.	Total population.	Rates of population to number of M. H. Officers.
Cities	9	9	.....	384,303	1 to every 38,700
Towns	58	50	.....	189,190	1 " 3,780
Villages	87	87	.....	81,431	1 " 1,000
Townships	271	235	.....	663,494	1 " 2,822

In England, by the Local Government Act of 1888, the population necessary for a County Council (Health District) was 50,000; but as the area of England, compared with that of the organized municipalities in Ontario is 32,554,880 to 23,154,551 acres in Ontario, while the

population is 29,000,000 compared with 2,167,460, in Ontario, it is plain that the extent of area must in a large degree limit the extent of population for which a medical health officer's services would be available. That 20,000 of a population seems to be a practical working limit in Ontario is seen in the following comparison:—

Members of House of Assembly for Ontario numbered in 1893—

94 in population of 2,167,460.

Inspectors of schools—

Cities separate from counties..	8 in 358,972	of population.
Towns	7 in 35,694	"
Counties (less cities and towns).	60 in 1,772,794	"

Included in their respective county inspectorates are, Brantford, Belleville, Stratford, St. Catharines and Windsor. Excluded from county inspectorates are, Chatham, Forest, Collingwood, Oshawa, Peterboro', Waterloo, Welland and Niagara Falls.

I find that in 1894 there was expended upon our educational system $5,233,115.00, this includes $89,490.00 as salaries to county school inspectors.

Assuming then that we have some 550 organized townships in Ontario, it would mean that there are now nominally in office some 400 medical health officers in the Province in 750 municipalities. We have seen to what extent the public moneys are expended in matters of education, and by comparison with the following we shall be able to estimate what is spent specifically in an average county on public health work.

Under the heading, Local Board of Health, in the municipal returns made to the Department of Agriculture for the year 1893, from two of our oldest and most prosperous counties, we have the following:—

The Expenditure under Local Boards of Health in the county of Oxford varied:

In 11 townships, from 0 to $97; total, $481.

In towns and villages, from $5.97 to $481.

In the county of Grey it varied:

In 16 townships, from 0 in 4 townships to $75, with a total of $286.

In towns and villages, from $6 to $344.

Roughly calculated, therefore, we may say, that, excepting the large cities, the total expenditure in the counties of the Province would amount, on the above basis, to some $50,000 per year, to which we may add some $2,500,000, assuming there are 2,500 physicians in the Province, and that they receive $1,000 per year.

Now, these figures mean either that almost no attention is given to public health in these districts or that the amounts of money thus expended have not been returned under the proper heading. As a matter of fact, both explanations are correct. With regard to the returns, I find in those for one of our largest villages, which I visited in 1894, on account of a serious outbreak of diphtheria, that the return under local board was but $24, while under poor relief were charged sums for diphtheria, nurses, etc., amounting to $121.95. This will doubtless explain how in many places the amounts returned for public health work are so small.

When, however, I find $5 for the sanitary inspector and $5 for the medical health officer, in examining details of expenditure in a village, it must be concluded that the public health of such municipalities has been most satisfactory, or that Local Boards of Health in many instances exist only in name. When I find such amounts set down, however, for townships where correspondence shows public funerals to have taken place in cases of diphtheria, and where schools finally were closed on account of the disease, it would seem a fair inference that, from the public health standpoint, improvements are not only possible but seem to be greatly needed.

From the figures and comparisons which have been made, it must be very apparent that, while the number of medical health officers in the Province is nominally very considerable, under existing conditions they are not in a position to effectively accomplish the work,

the extended and scientific character of which has been briefly indicated. It is probable, however, that were the remuneration received by them sufficient to secure their active services, and the municipal grant enough to carry on their work, difficulties would arise, owing to the uncertain tenure of office under the present methods of appointment, which would seriously affect their independence of action. According to the usual interpretation of section 47 of the Health Act, the medical health officer is appointed annually at the time of the appointment of the Local Board of Health. While it is difficult to frame a clause which would make such an appointment independent of the prejudices which too frequently affect the status of any official who has served under a council, succeeded by another hostile to it, especially politically, nevertheless it does seem possible that some court of reference should be appointed, such as a standing committee of this association, which might be called in instances where temporary feeling was liable to injuriously affect the independent action of an efficient officer. This might be supplemented by legislation, to the effect that some per capita basis of remuneration of medical health officers be established, preventing the possibility of a hostile council by reducing the salary of an officer to thereby force his resignation. A provision at present exists in the School Act whereby a county inspector cannot be dismissed by a county council without the assent of the Department of Education, without the danger of a withdrawal of the governmental portion of his salary.

We may now very properly discuss the desirability and possibility of a change in the appointment of medical health officers, which has been provided for by the following amendment to the Public Health Act, contained in the Ontario Statutes of 1891 :—

"Whereas it may be desirable, in the interest of the public health, that there should be instituted a system of health inspection more thorough than is at present practicable, owing to the expense

attendant upon the appointment of an active and efficient medical health officer for every municipality, any county council may appoint one or more county or district medical health officers.

"Where a county council appoints a county health officer or officers, the powers now possessed by medical health officers within the county or portion of a county, for which such county health officer is appointed, shall be deemed to be thereby transferred to and vested in such county health officer or officers, and all sanitary inspectors within the jurisdiction to be defined in the by-law appointing a county health officer shall be subject to his direction and control."

From this it will be seen that while the change is purely voluntary on the part of the several municipalities in any county, its insertion in the Act is upon the assumption that public health work can in some, if not all, instances be made more efficient by transferring to one medical health officer the public health work of a number of municipalities. Assuming that a number of the larger cities be excepted from the general operation of the clause, as is the case now where a number of city and town inspectors of schools exist, we would say that, with the present political division of the Province, we have roughly the unit supplied of 20,000 of a population as a possible health district. At present, even with the paltry sums paid to medical health officers in the municipalities, we have a total expenditure in some counties equal to what would be a minimum salary for a medical health officer who would devote all his time and energies to public health work. It is to be regretted that all purely scientific work is at present so inadequately remunerated; but I think we may, from experience, find grounds for the belief that a sufficient number of young, active and trained applicants for such positions could be found willing to accept opportunities as county or district medical health officers, with the hope of their salary being gradually supplemented, if the primary condition of permanency in the position were supplied. Allow me to briefly summarize the advantages of such a change.

1. The position would be permanent during good conduct and efficiency.

2. The devotion of all his time to the duties of the position would serve largely to remove one of the greatest of existing difficulties to effective action on the part of medical health officers, owing to their being in general practice, and therefore professional rivals to other practitioners, who are naturally sensitive to interference on his part.

3. By being engaged in investigations in a laboratory equipped for the purpose, he would be brought into friendly intimacy with local practitioners, whose time and opportunities are too limited to enable them to satisfactorily prosecute microscopic, chemical and bacteriological work.

4. By being within easy reach of all parts of his district he could, without delay or expense, have sent to him specimens of diseased tissue, membrane, sputum, suspected water, milk, etc., and promptly determine the true nature of the disease, or its cause.

5. His laboratory would become a local depot of supply for vaccine, anti-toxin, culture tubes, disinfectants, etc., and the means for their prompt and efficient use.

6. He would be within telephone call or an hour or two's ride of the several municipal sanitary inspectors, who would be placed under his authority, and prompt action in any outbreak of disease would be possible.

7. He would systematically attend to and practice vaccination in all the schools of his district, and be in a position to attend the occasional cases of smallpox, which from time to time occur, to the great relief of the local practitioners, and the notable saving of expense, such as during the past year, amounted occasionally to $20 per diem for attendance upon a single case.

8. He would gradually accumulate data for the preparation of a sanitary topographical map of the Province, in which the character of the soil, the drainage areas, the height above sea-level, the mill-ponds, and much other invaluable information, from the sanitary standpoint, would be supplied.

9. He would, through his inspectors, be able to obtain an accurate registration of mortality and morbidity statistics, and thus supply the only means by which we shall ever be able to adequately interpret local conditions in their effect upon the public health.

I am afraid to add further details, for fear that we shall not be able to find anyone to apply for such onerous positions; but surely enough have been supplied to illustrate what I believe the situation demands, and the many good reasons why this Association should lend all its influence to the attainment of the end in view.

Where, it may be asked, shall we now find men fitted to do this work, or schools provided with means for their instruction and training? On enquiry, I am led to the conclusion that none of our medical schools are supplying such training as would be required by such positions; but, in justice to them, it must be stated that there have not hitherto been any such positions to look forward to which young men could profitably devote their time in preparing for.

I learn that in two, at any rate, of the medical schools in Toronto, short courses of bacteriology are given; and I have little doubt but that special chemical courses in water analysis, etc., would be instituted if demanded. We have, in addition, in the provincial laboratory, a centre of work which could readily be made available for giving practical direction to such courses of instruction.

Remembering the starting point of our public health work, some thirteen years ago, and the achievements which, even under the imperfect conditions which we all have been familiar with, have been attained, I do not believe you will think me too sanguine if I look upon this work as an accomplished fact within this the second decade of organized public health work. Most here are more familiar than myself with the crude character of the educational system of the Province prior to our present system of county inspection and organization under a provincial department, and this, too, in a matter as old as the centuries. Have we not a right to expect not only that

the public will assent to but demand that public funds, whether provincial or municipal, shall be devoted to the adequate development of the practical means for controlling so much that is preventable in disease, of accurately diagnosing its character when present, and of supplying, at the earliest moment, the most scientific agencies for the successful treatment of it.

I believe this Association has a good right to look upon itself both as an educator and guide of public thought in health matters, and I would conclude by suggesting that in this matter we take the King's advice in "All's well that ends well."

> "Let's take the instant by the forward top;
> For we are old, and on our quick'st decrees
> Th' inaudible and noisless foot of time
> Steals ere we can effect them."