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CANADIAN MEDICAL ASSOCIATION.—PRESIDENT'S ADDRESS.*

BY R. W. POWELL, M.D., OTTAWA.

GENTLEMEN,—When you did me the signal honor to elect me to the presidential chair of this association I naturally felt a sense of buoyancy and elation in my unexpected and newly-found distinction; but as time wore on, the sense of elevation began to diminish until the date of the meeting came within measurable distance, when I gradually became but the shadow of my former self, and have just escaped, I think, a total eclipse. If you know of any one of our members particularly aspiring, and thought to be suffering from that peculiar and subtle form of enlargement of the cranium, commonly known as "swelled head," just elect him president of this association for one year, and if he is not rapidly and permanently cured my capabilities as a prognosticator must be weak indeed. So far as I am concerned I found myself groping aimlessly about, and trusting that a miraculous light would penetrate the convolutions of my fast-waning mental faculties, and enable me to startle you with something novel and refreshing in the way of an address; but instead of this, gentlemen, you will, I fear, have to exercise a merciful forbearance for a very limited period of time, while I endeavor to touch on one or two matters that appear to me to be of general interest to us as a profession in these days through which we are passing.

*Delivered at the Annual Meeting of the Canadian Medical Association, Ottawa, Sept. 12th, 1900.

It is well nigh a hopeless task, gentlemen, to even begin to thank you for the great compliment you have paid me in selecting my name for this position, and thus to place me in the long line of distinguished men who have preceded me in this chair since confe' .ation. The honors which normally fall to medical men are few and far between when their lives are spent entirely in their professional calling, but the greatest of all honors are those which come at the hands of one's fellow-practitioners. Be assured, gentlemen, your generous and unexpected action towards me is especially gratifying, and will never be forgotten. Small wonder that I have, in some measure, attempted to requite you by using my best efforts to bring this meeting of the closing century to a successful issue.

This association has in the past been presided over by pains-taking and distinguished men, and it is to their past efforts and their unselfish devotion to our highest interests that we owe our life as a society to-day; and I would take this opportunity of according to them our deep sense of gratitude and admiration. This association has gone through many and trying vicissitudes. Its path has not by any means been "*couleur de rose*," but, on the contrary, has many a time and oft been beset with the briers and thorns inseparable from the early and struggling life of a plant of culture and refinement. After a nurtured infancy and successful and healthy early life it had its disorders of childhood; its ranks were depleted by that scourge of "non-attendance," which in society life is so horribly contagious, and its very life has been threatened more than once; but like many a healthy and well-born youth whose constitution and habits have been good, it has survived these storms and disasters, and has risen to matured life strong in its purposes, confident in its stability, and determined to fulfil its high functions.

Last year in Toronto the society evidently took a new lease of life, owing to the able presidency of Mr. Irving Cameron and the untiring efforts of the general secretary, Dr. Starr, also a Toronto man, aided to the full by a most capable and zealous local Committee of Arrangements.

Some 242 members registered, and it seemed to be the general opinion that never again must the interest in, and loyalty to, this association be allowed to flag. Do you wonder, gentlemen, that I have been anxious as to the successful outcome of the meeting for 1900? Ottawa loves the Canadian Medical Association, and has endeavored in the past to show her loyalty by affording a resting-place for the annual meeting. We met here in 1871, 1881, 1889 and in 1893. With the exception of the first year mentioned, 1871, when, indeed, I was in swaddling clothes, I have taken a more or less active part in the necessary arrangements;

but I take the greatest possible pleasure in saying to you now that never before have I seen such a unanimous desire to maintain the good reputation of the city as has been displayed by my confrères since I announced to them the society's decision to visit the Capital again in this the closing year of the marvellous century, through a part of which we have all been passing. No dissentient or croaking voice has been heard, but on the contrary, the utmost loyalty has been extended to me in this my hour of trial. It is thus my labors have been lightened, and if we have in any measure afforded you collectively and individually a pleasant visit, I trust that honors will be divided, and my colleagues in practice in this city will receive at your hands their just quota. We are but a handful as compared with our sister cities, the great business centres of Ontario and Quebec, but our hearts are overflowing with welcome to the members of our beloved and honored profession from the Atlantic to the Pacific.

Shortly after our return to our homes from the Toronto meeting the country was thrown into a flutter of excitement, when the diplomatic correspondence between England and South Africa was suddenly terminated by the memorable and pithy note emanating from Mr. Kruger, which set all England aflame. There was nothing for it but to resort to force as a means of backing up her reasonable demands, and so enlarged preparations were set on foot to plant the flag across the Vaal.

The world is not likely to forget the events of the autumn of 1899. From far and wide, throughout the habitable globe wherever Great Britain holds her mighty sway, came the same dutiful appeal to the motherland. This appeal was strong in its simplicity and earnestness. It is summed up in a few words: "Allow us to show that we are in very deed, and not only in name, a part of the British Empire. Let us reciprocate now for the early fostering care received during the trying days of our early existence, when we were struggling to establish something more lasting than a dependent colony." This appeal was not in vain, but was eagerly heard and allowed, and so it was that a purely volunteer contingent was mobilized and equipped and on the sea in about three weeks.

It was well known that the British army, with its organization resulting from long experience, would willingly and ably attend to the medical and surgical necessities of our men in the field, but the enthusiasm had spread beyond the rank and file of the combatants, and though the personal and pecuniary sacrifice was great, yet offers came pouring in from members of our profession, tendering their services to go with "the boys" to the front. It was known that the Royal Canadian Regiment would probably only require a modest surgical equipment, yet offers came from 120 surgeons to be allowed to volunteer for active service. It is only fair to

record also that to their honor be it said, over 190 trained nurses offered themselves when it became known that a nursing staff would be permitted to accompany the regiment. Very soon it transpired that certain distinguished men in civil practice in England had offered their services to the crown for purposes of the war, and that these offers had been willingly accepted in order that the sick and wounded should have the best advantages and the most modern and skilled advice at the base hospitals.

Our Canadian confrères were eager to be allowed to go and do likewise, and it is here, gentlemen, that a page of humiliation has to be written. "You are good enough to practise on Canadians, but having no registration in Great Britain you could not legally practise in South Africa." Our loyalty and devotion to the Empire are smothered in the mazes of legal technicality, and when the question was asked in the British House of Commons as to what positions the few Canadian surgeons who were permitted to accompany their own men did occupy, the far-reaching and honest reply was given by Mr. Broderick, I think, "that he really did not know, and that the matter was too complicated to admit of discussion."

Our antipodean relations were not so treated. Up to recently they were, as you know, self-governing colonies, each being able to treat direct with the General Medical Council, and to their credit and common-sense be it said that in the framing of their new Australian Commonwealth they have taken a lesson from the unhappy position of their Canadian brothers, and have seen to it that in matters pertaining to medical education and registration the central government has the control.

Gentlemen, it is my belief that we must take a step forward, and do something to erect a bridge over the provincial boundary lines—I use this phrase advisedly, as it explains what I mean as against breaking down the barriers. This latter is what cannot be done, but the bridge can be erected by consent, and this without doing violence to the rights of any within their own domain.

Eleven years ago, in the preface to a little book I compiled, I wrote the following:

"The 'B.N.A.' Act having consigned all matters affecting education to the various provinces of Canada, as distinguished from the Federal Parliament, these separate legislatures have, from time to time, passed certain Acts governing the profession of medicine and surgery, and it has often occurred to me that it would be a useful and interesting work to bring these various measures together into one volume for the sake of convenience as well as of comparison, anticipating, perhaps, the time when legislation governing our profession shall emanate from the central authority, and thus form a one-portal system of entrance. In saying this I believe I am only voicing the sentiments of a large majority of the profession in Canada who consider the method now in vogue to be cumbersome, expensive and unnecessary."

The majority I there referred to is now a vast wave, I verily believe,

of the general profession who, although the way is not yet perfectly plain, are hoping with a fervent desire that the obstacles may soon be overcome, and that those who desire enlarged pastures may have an avenue opened to them, whose lines will be sacredly guarded, and whose examination hedges will be high enough to secure it from being scaled by any but highly-trained provincial athletes. It is not to be inaccessible, but its dignity is to be secured by legal enactment, whereby it is not suffered to be lower in its requirements than the highest at any time existing in any province.

Surely this is fair. None are compelled to enrol upon its register, but those who wish to ought to have a way provided by which they can obtain a Dominion license, and so secure recognition in Her Majesty's Empire.

Provincial registration will still remain, and it will still be for each province to fix whatever standard it pleases for its own practitioners. It is this very difficulty of securing uniformity in the standards of so many provinces that has up to now effectually blocked all efforts at interprovincial registration. I, for one, am glad that such a scheme has failed in its accomplishment, because no matter how perfectly conceived and organized it would never do for the men of this country what Dominion registration will most assuredly do.

It is not for me to enter into details, but I consider a great responsibility rests upon us now in this matter. We are guardians of the higher interests of that army of young men forever pouring into our ranks. We must see to it that we give them the highest advantages. We must rise above all selfish interests, and not allow personal prejudice to stand in the way of so great an advance, whereby our men can have thrown open to them so great an empire at such a minimum of cost, time and personal inconvenience.

A question that is demanding increased notoriety and importance each year is that connected with the care and management of cases of tuberculosis, and especially that form of the disease commonly called consumption. Science has demonstrated that we must no longer continue to regard such cases simply as objects of our solicitude, sympathy and regret, but that each one, in its own sphere, is a direct menace to the health and continued life of those with whom it comes into direct relation in the ordinary walks of life. It is well established that hereditary influences, once regarded as so potent and far-reaching, are but a predisposing condition of weakened vitality; and, further, that the chief reason for the continual occurrence of phthisis pulmonalis among the members of the human race is to be traced to an infection from a preëxisting case.

The quiet spread of this wonderful news is having its good

effects in a miniature way, and the daily warnings and precautions of enlightened men to their patients and the patients' friends are slowly but surely extending this gospel over the whole universe. I have been struck often with the information possessed on the subject by even the ignorant and poorer classes, who with but a superficial smattering of knowledge eagerly seize upon the good news, and endeavor to carry out, even in a perfunctory way, the instructions laid down for their guidance.

It took a very long time, gentlemen, to inoculate the marvellous news of vaccination, often into an unwilling public, but if ever anything was proved, it has surely been put beyond cavil that a community properly protected by vaccination is practically fearless about small-pox. It has taken a longer time still to influence the ravages of syphilis, but the patient efforts of our profession, throughout all civilized countries, is having its just reward, and the poison has become gradually attenuated as each decade has come and gone, until now-a-days, except under unusual circumstances, we rarely see the revolting, disgusting and manifest lesions once so common and easy of daily demonstration.

Just so it will be, in my belief, with the white plague now a menace to the human race. The efforts of science—the revelations of the microscope and the patient work of the bacteriologist and the clinician—have given us sufficient information whereon we can base a practical standard of conduct, and even now we can observe the result of our earnest and painstaking efforts to prevent the spread of this dire malady from patient to patient. It is not for me, on this occasion, to weary you with details that are instilled into us all more surely and with greater vigor than our catechisms ever were; but I would take this opportunity to say that none of us are too humble or unknown to take, each one for himself, a fair share of this grand work.

The time has come when those of us who are connected with public institutions must steadfastly set his face against receiving consumptives into his wards. Such a change of demeanor towards the sick and suffering cannot be carried out too suddenly, lest we unnecessarily shock the refined but untutored sensibilities of a philanthropic public; but the more we fight against this practice, and the more we spread the knowledge, the sooner will philanthropists come to recognize the crying need of their open-handed aid to their afflicted brethren, fast coming into dire straits for a place whereon to lay their wearied frames.

Shunned by their neighbors; yes, by their intimate friends, to say nothing of their relations, passed on from hand to hand, refused admission here and there, strength fast waning, slender means, and opportunities for replenishing their financial resources rapidly fading from their horizon, their condition is indeed pitiable,

but beyond it all the stern sanitarian is forced to keep in view the greater problem—the protection from disease of the greater number. Self-interests are beginning to tell; the home of the merchant prince or millionaire capitalist is not regarded as sacred ground by the tubercle bacillus, who expends his unmerciful ravages wherever he is an invited guest, and once granted an asylum he is not easily dethroned or turned adrift by the forces of culture, ease, refinement or wealth.

The cry is now being heard to arise in the land: "Keep us free from contamination by this awful scourge which brings sorrow and disaster to so many homes. Do not allow consumptives to mix with well people. Prohibit them from public places. Shut the doors of our churches, our theatres, our railways, our public conveyances to them. Do not allow them to expectorate on the public streets, to say nothing of such a practice inside the four walls of a building; in other words, isolate them from all mankind." The answer is simple. It is impossible to work so radical a change immediately; but if those who are revelling in the enjoyment of sound health, and in the possession of this world's goods, will come to our aid we will gradually but surely bring about a wonderful amelioration of the conditions above referred to. Help us to erect sanitoria in healthy situations, accessible to the vast majority. Place these patients under suitable conditions by the expenditure of some of your overflow of means, and even a moderate lifetime will not be, by any means, too short to witness a revolution in the death-rate, and in the altered relationship that these afflicted patients now bear to their more highly-favored brethren. In a small way such institutions are beginning to raise their heads in this country. I believe their number will rapidly increase, and not be really felt as a burden on the public.

The Ontario Legislature passed a bill at its last session providing a way by which one or more municipalities may establish a sanatorium for the care and treatment of consumptives. The province offers to bear a reasonable share of the cost and, when in working order, will pay out of the public funds $1.50 per head per week to assist in maintenance; and the Act also provides that a further like sum may become a charge on the revenues of such municipality. This is a great step forward and shows at once the inevitable trend of public opinion on this subject.

One more question of importance to us generally as a profession and I am done. We continually have our attention drawn to the case of a brother practitioner being forced to defend a suit for malpractice or else submit to blackmail. I am sorry to say that, unfortunately, the conditions in certain individual cases are such that the latter alternative has to be accepted, and rather than be ruined, or perhaps have a reputation blemished, a settlement is

made out of court. Not so, gentlemen, in other cases. A man's honor is something very dear to him and cannot be rudely assailed. A firm consciousness of rectitude in his action overrides all appeals to a so-called common-sense, and so he calmly submits to an action, and is content to allow himself to be tried. Unhappily his jury is composed always of men who in the nature of things cannot appreciate the refinements and technicalities of medicine or surgery, nor are they trained in knowing the vagaries of the human frame when exposed to disease or accident. The plaintiff, often induced by low or sordid motives, or animated by jealousy or spite, perhaps goaded forwards by a hidden enemy of the doctor, takes his course with nothing to lose and everything to gain.

The defendant knowing full well the disastrous results of defeat in the withdrawal from him of public confidence, which is his only stay, uses every means to win. He is forced to employ the best available legal talent to fight for him, and eminent counsel with handsome retainers become necessary. Legal technicalities arise, and he is taken from court to court, while the bar and bench wrangle over abstruse questions of law and the original suit is a mere circumstance. The case finally is disposed of, and may be won or lost, but who do you suppose has supplied the sinews of war? Why, the doctor of course, and it oftentimes happens that he is absolutely impoverished, and has spent the savings or earnings of years in fighting for a principle and to uphold the honor and dignity of himself as a man, and of the profession to which he belongs.

Gentlemen, this ought not to be so; we ought and we must in some way stand shoulder to shoulder. It must be understood and published broadcast that our profession is too sacred a thing to allow it to be trampled upon with impunity. Actions for malpractice will surely continue, and if deserved cannot be defended, but unrighteous and unholy suits of this kind must be fought unhesitatingly and unsparingly, and when the public know that they cannot frighten a doctor into paying up hush money, but rather that he will be backed up and supported by his brethren and their action bring down on their own heads publicity and shame, and redound in the long run to the credit of him whom they are trying to disgrace, such actions will be few and far between.

This is not the place nor the occasion to formulate in detail a scheme for a Defence Association. Whether it is to be purely local, or larger and more provincial, or whether it should emanate from this association and be Dominion, are questions well worthy of your consideration and debate. An enlarged scheme, such as I have just hinted at, could be undertaken without any very great

difficulty, and an executive chosen for each province who would carefully investigate the merits of all cases submitted, and if defensible bring into operation the forces at their disposal through the various provincial channels.

This is but a rude outline of much that could be said and urged on this question, but I have no desire to weary you with a prolonged argument, nor to attempt to thrash out the details of organization whether Provincial or Dominion, but I want at this meeting to arouse in you a sense of its far-reaching importance, so that if it cannot be inaugurated now some of you may feel disposed, on thinking it over, to initiate a movement in the premises.

Gentlemen, I thank you for your reception of me as your President and for your patient hearing, and I hope I may be allowed to take my seat and enjoy myself for the rest of the session.

SEWAGE PURIFICATION BY BACTERIA.*

By Willis Chipman, C.E.
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During the past winter and spring the writer visited nearly all of the important Sewage Disposal Works in Great Britain, giving particular attention as an engineer to the practical experiments now being carried on at different places, and carefully inspecting recent installations of the Dibdin Bed System and the Septic Tank System.

The following paper may be considered as a summary of the results of the writer's observations:

The problem of Sewage Purification has been given more or less study by municipal engineers, chemists, sanitary boards and others interested in sanitary improvements for many years, in all portions of the civilized world, but in no country has it been given so close attention as in Great Britain. The density of the population, the great volume of the liquid manufacturing wastes, the small size of the streams into which sewage could be discharged, and the limited areas from which water supplies could be drawn, have all contributed to the development and extension of sewage purification works that have become models for the world. As a corollary to these conditions, the general public in England has been educated to the necessity of such works, and the vast sums now being expended on sanitary works by different cities and towns have been voted by the ratepayers ungrudgingly.

*Being a paper presented at the Annual Meeting of the Association of Executive Health Officers of Ontario, held at Kingston, August 15th, 1900.

In no country have so many experiments been made; in no country have so many failures been recorded as in England. Patented processes have from time to time been received with favor, but in most cases only to be discarded within a few years for simpler or less expensive methods.

Land treatment has been recognized for many years as the most economical method of disposing of sewage and as giving the best results.

There is probably to-day a larger area of land devoted to broad irrigation in England than at any other period, and the acreage is constantly increasing. Nottingham, with a population of 250,000, has a sewage farm with an area of 900 acres, about 200 acres additional are now being prepared for use, and 700 acres adjoining have been purchased for future requirements. At Leicester, population 217,000, the sewage is raised 170 feet to a sewage farm of 1,700 acres, and at Birmingham there is a sewage farm of 2,800 acres.

In most places, the cost of operating the sewage farms nearly equals the revenue derived therefrom, leaving the interest of the cost of works to be borne by taxation.

So satisfactory has been land treatment, and so unsatisfactory have been all other processes and methods, that to-day the Local Government Board (a Standing Committee of the Houses of Parliament), will not sanction a loan for sewerage purposes, except with the provision that a certain area of land is provided, and the effluent from all works must pass over and through land before being turned into a stream. This rule was adopted some years ago, and before the results of the experiments at Barking, Sutton and Exeter were known.

In many places, however, there has not been a sufficient area of suitable land available to treat the crude sewage by broad irrigation, and other auxiliary methods have been adopted. Sedimentation tanks were introduced by which a part of the solids in suspension were separated, the proportion depending upon the tank capacity.

The liquid part was then applied to the land or discharged into a stream, but the solids deposited in the tank, known as sludge, remained to be disposed of. In some places, the neighboring farmers would remove it or a portion of it, but such removal was intermittent, thus demanding storage at the works. Sludge, however, decomposes rapidly, and storage meant nuisance. By adding lime, copperas, alumina, ferric, or other precipitants, the amount of sludge deposited in the tanks was greatly increased, and its decomposition delayed, thus permitting of

storage for a limited time. By the introduction of sludge presses with air compressors and other machinery for operating the same, the wet sludge was compressed into cakes that could be handled and the volume was reduced to about one-tenth of that of the wet sludge, but pressing cost money, and did not dispose of the cakes.

At Glasgow, about ninety tons of cake are now produced daily from 13,000,000 gallons of sewage from the east portion of the city only. At London, Manchester and Salford, pressing has been abandoned and the wet sludge is now carried out to sea by specially constructed steamers, and doubtless this is the most satisfactory and the cheapest way for sea-coast cities.

At Sheffield, Birmingham, and many other places, the sludge is partially dried, then deposited in trenches and covered with earth, while in some places it is run into pits or lagoons and allowed to dry out slowly. Sludge is an abomination everywhere.

At Glasgow, and in a few other places, a portion of the cake is manufactured into "poudrette," a marketable manure, which in other places is made from the contents of tubs and middens. This is, however, exceptional, and it must be borne in mind that the cake is made into manure in order to dispose of it, and to prevent an accumulation at the works, not because there is any profit in the manufacture.

The enormous extravagance in permitting sewage to be wasted instead of converting it into a valuable manure, has served as a text for many a paper at sanitary conventions, but it will be found that, as a rule, they have been presented to persons who have had no practical training or experience in such matters—visions that may be realized some day, but at present we must be content with what is practical.

The experiments of the Massachusetts State Board of Health at Lawrence, which have been carried on continuously since 1889, have been studied very carefully in England as in America. These experiments clearly established the fact that the purification of sewage was performed through the agency of bacteria, the necessary conditions being the presence of air and the slow movement of thin films of water over the surfaces of the units of the materials composing the filtering materials.

In the United States and Canada, intermittent downward filtration has been generally adopted as a result of these experiments. By this method the sewage is purified at the rate of about 50,000 gallons per acre per 24 hours, upon specially prepared beds of sand and gravel, no attempt being made to raise crops.

The effluent is satisfactory with proper management, if the

beds are not overdosed, and there is practically no sludge to be dealt with.

In great Britain, filtration beds have been adopted in a few unimportant places. As the purification of sewage depends upon the action of bacteria, the term filters, which implies mechanically, removal of suspended impurities, should now be abandoned.

Between the years 1884 and 1896, experiments on sewage treatment were made by the Metropolitan Board of Works and the London County Council, under the direction of Mr. W. J. Dibdin, their Chemist, which may be considered as a continuation of those of the Massachusetts Board.

When Mr. Dibdin, in 1887, propounded the theory of microbian action in a paper read before a convention of engineers, and suggested that the proper way of treating sewage would be found in cultivating proper organisms, the whole audience laughed heartily. He persevered in his work, however, and in 1892 he was authorized to lay out a bed of one acre at Barking, which was filled to a depth of about three feet with pan breeze.

After many experiments and some failures, this bed was found to remove 35 per cent. of the impurities from sewage when applied at the enormous rate of 800,000 gallons per day. In 1898 the depth of material was increased to six feet, but the writer was informed by the present chemist in charge, Mr. E. Brooke Pike, that the increased depth of filling did not increase the capacity of the bed.

In 1894 Sutton (Surrey) laid out and built sewage disposal works at a cost of £66,000. The system adopted was one of chemical precipitation followed by artificial filtration through a patented material, the sludge being pressed into cakes.

In 1895 the Sutton authorities found that the works were unable to so purify the sewage as to meet the requirements of the Thames Conservancy Board owing to a failure of filters. Mr. Dibdin was then consulted, and in 1896 a coarse bed was constructed according to his design, to take the place of the chemical precipitation and the sludge pressing plant, all of the suspended matter in the sewage being destroyed in the interstices of the filling material. Additional beds have been constructed since 1896, and the sludge-pressing plant is now for sale, while the effluent is quite satisfactory.

Sutton soon became a Mecca to which deputations and sanitarians journeyed from all parts of the kingdom, and there are now dozens of cities and towns that are constructing bacteria beds, or converting their old sedimentation tanks into bacteria beds. The English engineer is so conservative and cautious that,

as a rule, he insists on conducting experiments with the sewage from his own town on small beds filled with various materials, before recommending the adoption of any general plan for all of the sewage.

The writer visited the experimental works at Manchester, Oldham, Huddersfield, Salford, Leeds, Sheffield, Accrington, Bristol, and other places, but as the final reports on some of these experiments have not as yet been published, it can only be stated in a general way that the results from bacteria beds are satisfactory in every respect.

In the Sutton system there are two sets of beds, the first filled with coarse material, the second with finer. The sewage is first roughly screened, then flows on the coarse beds, from which it is discharged intermittently on the fine beds which are at a lower level.

The following average of the analyses of the effluents for the year ending March 31st, 1899, may be of interest:

Effluent from	Ammonia.		Oxygen Absorbed.		Nitrogen.		Suspended Matters.	Chlorine.
	Free and Saline.	Organic.	At Once.	In four hours.	As Nitrites.	As Nitrates.		
Coarse bed	5.14	0.217	0.39	2.024	0.28	0.11	5.87	9.6
Fine bed	1.21	0.084	0	0.828	0.04	3.03	0	9.34

All in parts per 100,000.

The Sutton sewage is purely domestic, but is very concentrated and foul.

It will be noticed that all of the suspended matters have been removed, and that the amount of oxygen consumed falls well below the standard prescribed by the Local Government Board, which is one grain per gallon of oxygen absorbed in four hours.

Experiments have been continued during 1898 and 1899 upon the London crude sewage at the Barking and Crossness outfalls by treating it on coke beds of different depths, the results of which will be found in the reports to the London County Council by Dr. Frank Clowes, successor to Mr. Dibdin. The bacteriological experiments have been conducted by Dr. A. C. Houston.

By applying crude sewage at the rate of 1,665,000 gallons per acre per day to a six-foot coke bed, over 50 per cent. of the dissolved oxidizable and putrescible matters of the raw sewage was removed, and all of the suspended matter.

By a second treatment, about 20 per cent. additional was removed, thus giving a total average of purification 70 per cent. In these experiments the sewage had been roughly screened be-

fore reaching the beds, that is, it was free from what is usually described as filth, and free from coarse sand and heavy mineral road detritus, but it contained all the suspended solid matter termed sludge.

No trouble whatever was found in keeping the coke beds free, as they only required raking over occasionally.

The effluent from these beds was not offensive in character, and did not become so when kept, even when the sewage was poured upon the beds in a most foul condition.

Many engineers are now experimenting with deep bacteria beds filled with various materials, and some now believe that the best results can be obtained by a constant application of sewage in a spray to the surface of the beds and allowing it to trickle through the material, than by intermittently flooding and draining a bed. Several devices have been patented for distributing the sewage.

Where there is ample fall at the location of the disposal works the method of continuous application of the sewage to coarse beds of considerable depth will no doubt prove fully satisfactory.

Mr. Stoddart, of Bristol, has succeeded in successfully treating sewage at the rate of from two and a-half million to six and a-half million gallons per day upon one acre by means of his patented distributor, the depth of bed material being only five feet. The purification effected, as determined by the oxygen consumed, was 90 per cent.

Mr. Stoddard experimented upon different methods of distributing the sewage over the surface of the bed, and worked for some years on the principle of a perforated plate or tube, but ultimately abandoned it as impracticable, as he found that the liquid treated is never free from suspended solids, and gelatinous growths form that soon block up the apertures in the plate or tube.

The Candy and Whittaker distributors, which the writer saw in operation are, however, made of perforated pipes, and those who were in charge of the works where they were in use stated that there was very little trouble from the above causes.

Among the prominent variations of the bacterial process are the Scott-Moncrieff system, the Ducat system, the Adeney, the Waring, the Garfield and the Whittaker, all essentially Dibdin bacteria beds, with patented appliances added, some of very doubtful utility.

The purification is effected in bacteria beds principally by aerobic bacteria, or those that work when supplied with air, although anaerobic bacteria are also present.

In 1895, Mr. Donald Cameron, City Surveyor at Exeter, became convinced, as a result of experiments, that the solid mat-

ters in sewage could be dissolved and destroyed by anaerobic bacteria, and the first septic tank system was constructed to deal with the sewage from a small part of the city.

The system consists of a small grit chamber, a closed septic tank, and five small filter beds. The crude sewage flows into the septic tank with a capacity equal to twenty hours flow, in which the sewage stands about seven feet in depth, thence through a submerged outlet pipe to an aerating device, thence to the beds, which are operated in exactly the same way as the finer beds in the Sutton system.

Mr. Cameron has devised a most ingenious apparatus for automatically filling and emptying the beds in rotation.

Judging from analyses, the action of the septic tank is anaerobic.

The effluent from the tank is dark, and soon becomes offensive, that is, the solids have been broken up and dissolved, and the sewage is prepared for rapid decomposition or for immediate treatment in the finer bed.

Upon the surface of the sewage in the tank a scum or blanket forms, that varies in thickness and consistency with the temperature. The company claims that one cubic foot of gas per capita per day is also produced, that can be utilized for lighting.

The Exeter plant was put in operation in August, 1896, and the writer was informed that it had not been cleaned out since the works started. There was in March last about three feet of semi fluid, sediment, etc., in bottom, but the work being done in the tank was better than during the first year or so.

The effluent produced by this double process is satisfactory in every way, colorless, odorless, and not decomposing.

The effluents at Exeter have been analyzed by many chemists, the results being uniformly good. The following table gives the results by Messrs. Dibdin and Thudichum, in parts per 100,000:

	Ammonia.		Oxygen absorbed in four hours.	Nitrites and Nitrates.
	Free and Saline.	Organic.		
Tank Effluent.....	3.94	0.25	2	0
Final Effluent.....	2.43	0.11	0.55	0.864

The Septic Tank Syndicate designed the works for Barrhead, near Glasgow, which were completed in 1899. These works are intended to treat 400,000 gallons per 24 hours. The sewage is practically domestic, with some street water, which carries down dirt.

Two small grit tanks remove the road detritus. From these the sewage flows through four closed septic tanks, thence through aerators to eight beds, the filling and emptying being automatically regulated. The effluent from these works at the time of the writer's visit was exceptionally clear and odorless. The Septic Tank Syndicate has now under construction several works in Great Britain, and has established agencies in other countries.

The writer found many engineers in England who believed that an open settling tank could be substituted for the septic tank, and in several places sedimentation tanks were being experimented with as open septics, with results that were generally considered as satisfactory.

Very extended and practical experiments were made at Leicester during the years 1898 and 1899, under the direction of E. George Mawby, M. Inst., C. E., to prove the efficiency of the following:

(*a*) An open Detritus Tank of comparatively small capacity.
(*b*) A closed Detritus Tank of comparatively small capacity.
(*c*) An open Settling Tank.
(*d*) A Septic Tank of same capacity as (*c*).
(*e*) Coarse Bacteria Beds.
(*f*) Treating effluent from (*e*) on land.
(*g*) Treating effluent from (*e*) on fine Bacteria Beds, and not on land.

The capacity of the tanks was 144,593 gallons, area of coarse beds one-tenth of an acre, and area of fine beds 150 square yards. From 62,000 gallons to 429,000 gallons (in storms) were treated per day.

He obtained the best results by using either the detritus tank (closed or open) followed by treating the sewage on coarse bacteria beds, then on land, the beds being worked on the intermittent system.

The following table shows the degree of purification obtained, the quantities being given in grains per gallon:

	Crude Sewage.	Effluent from		
		Detritus Tank.	Bacteria Beds.	Grass Land.
Suspended Matters	43.7	20.32	4.87	0.385
Alb. Ammonia	7.182	0.893	0.343	0.156
Oxygen Absorbed	7.442	5.795	2.145	0.663

The Leicester sewage is strong, particularly in albumenoid ammonia.

The purification effected before reaching the grass land averaged 77 per cent.

Land purification is now recognized as being due to bacterial action, as in the Sutton system, but in the majority of cities and towns a sufficient area of suitable land is not available within a reasonable distance, or at such an elevation that the sewage can be conveyed to it by gravity.

At Manchester, the experts engaged by the city have advised the adoption of the double contact beds preceded by a septic tank, and state that this system is not only the best for Manchester, but for the whole world.

The construction of bacteria beds and of septic tanks are simple problems in engineering, but the areas and capacities of tanks and beds, the materials and grade of the filling materials, and method of working, must be determined in each case by an experienced sanitary engineer. Where the fall available at the works is limited, the septic tank method has advantages over double contact bacteria beds, but in most cases the cost will be greater and there are royalties to be paid. Either system will work satisfactorily during winter, no sludge is produced, no chemicals are used, and the effluent can be discharged into any stream without creating a nuisance.

One acre of beds four feet deep may be relied upon to remove 90 per cent. of the impurities from the domestic sewage produced by a population of 5,000 people, the works will cost less than precipitation works, the operating expenses only a fraction of those of the latter, while the effluent will be much purer.

Within the next few years the precipitation works now so general in Great Britain will, in the writer's opinion, be converted into bacterial tanks, the press-rooms closed and machinery sold. In several places visited, the pressing machinery was now idle, although the conversion of the works was not fully completed.

Reports of Societies

EXECUTIVE HEALTH OFFICERS OF ONTARIO.

The fifteenth annual meeting of the Association of Executive Health Officers of Ontario was held at Kingston, in Convocation Hall, Aug. 14th, 15th. The following delegates were present: Dr. W. Oldright, Toronto; Mr. A. McGill, B.A., Assistant Analyst of the Department of Inland Revenue, Ottawa; Dr. Walkem, Q.C., Dr. A. P. Knight, Dr. Herald, Dr. W. Connell, Dr. Chas.

Sheard, Toronto; Dr. Cassidy, Toronto; Dr. Bryce, Toronto; Dr. Vaux, Hamilton; Dr. Kitchen, St. George; Dr. Hall, Chatham; Mr. Dunlop, Chatham; Dr. Fee, Kingston; Rev. Jas. Cumberland, Stella; Dr. Kilborne, Oso, Ont. In the absence of the President, Dr. T. V. Hutchinson, Dr. Oldright, Toronto, took the chair. Mayor Minnes delivered the address of welcome, and extended a cordial invitation to the visitors to a complimentary trip among the Thousand Islands that evening. Dr. Oldright thanked the Mayor on behalf of the Association. It gave the members great pleasure to meet in Kingston, which was well known as an historic city, a city of education and of military fame. On account of the limited time of Mr. McGill, Ottawa, his paper came first. It was a brief paper on the effects of food preservatives on public health. The speaker took the stand that the use of chemicals to destroy the germs in milk was dangerous to human life. Dr. Sheard, Toronto, said that he had had several cases come under his notice where persons, especially young children, were poisoned by the refreezing of ice-cream. The second freezing of ice-cream, when it stood in the freezer, formed an acid which was dangerous to health. Dr. Bryce, Toronto, said that, according to Hon. Mr. Ballantyne, the importance of cleanliness in the dairy had not made the advances it should have in the last 25 years. Dr. Connell said that milk in which extracts had been put to preserve it was refused in the dairy school. The paper was also discussed by Drs. Hutchinson, of London, and Cassidy, of Toronto. Dr. Sheard read a paper on his experience in recent vaccination work. He said in Toronto there was little opposition to vaccination. Reports from many physicians came under his notice, and the result was highly successful. It was the duty of the health officers to see that people were thoroughly vaccinated. Dr. Bryce, Secretary of the Provincial Board of Health; Dr. Cassidy, Dr. Oldright, Dr. Hall and Dr. Hutchinson, took part in the discussion.

The fresh arrivals at the session of the Association of Medical Health Officers on August 14th were: Dr. Achland Oronhyatekha, Deseronto; Mr. Taylor and Mr. Steevly, London; Dr. Third, Dr. W. T. Connell, Mr. C. Y. Ford, Dr. Anglin, W. B. Crow, Trenton; Dr. McCrimmon, Palermo, and Dr. McCullough, Owen Sound. Dr. Cassidy, Toronto, read an interesting paper on tuberculosis and means for its cure. After going thoroughly into the statistics of the fatal results from the disease in this country, as well as in Europe, the doctor took the more cheerful side of the paper, namely, the reports of many cases which had recovered from this dreaded malady. A French professor experi-

mented in connection with the disease by feeding raw meat to dogs. He found that dogs predisposed to tuberculosis and fed on raw meat did not die, while those fed on cooked meat expired. Dr. Osler, Baltimore, believed that the cure for tuberculosis was nutritious food and fresh air. The patient should sleep in a room with a window open. Raw eggs was a good diet, and would cure severe cases of tuberculosis.

Dr. Bryce told of the treatment of tuberculosis among the working people in Germany. These people had a system of insurance which provided that people who became disabled were to be put in a sanitarium, and the percentage of those cured was so high that the movement resulted in the erection of sanitaria in the country. The cities in the Province of Ontario have mostly doubled during the last ten years. Industries were springing up, competition was keen, and people had to work overtime. The scarcity of food and long hours caused the spread of tuberculosis. It was time for the members of the Health Association to look carefully into the matter.

The Century's Improvements.

The President, Dr. Hutchinson, London, delivered the annual address. He thought that the members of the Health Association were fortunate in choosing the beautiful city of Kingston, whose history from the time of New France and Jacques Cartier was replete with startling events. In the latter end of the 18th century the death-rate of Great Britain and Europe was 88 deaths out of every 1,000 of population. Just one hundred years later it was only a fraction of that. He then said that up to the last century Jenner, Howard, and Captain Cook were the only three sanitary reformers of note. Up to Captain Cook's time, 1773, scurvy decimated the British army and navy. Capt. Cook inaugurated such sanitary and hygienic systems that in a three years' voyage around the world he lost but four men. These deaths were not due to scurvy, while Anson, in his famous voyage thirty years before, lost by scurvy alone in the three years 600 out of 900 men. The most difficult task for a health officer was to convince the public that they cannot escape disease without absolute cleanliness and pure water. The subject of greatest importance was that the milk supply for the use of the public should be pure. In order to get this, pure water would have to be supplied the animals. The milk should be boiled before using. There were a large number of streams in Ontario which were polluted on account of people living near them.

The authorities should pay more attention to the prevention of the pollution of the streams, the furnishing of good water to

herds, and force the use of proper sanitary arrangements in connection with dairies. There would then be less need for a continual begging of funds to build sanitaria for consumptives and for the accommodation of other sufferers from kindred disease.

Benefits of Cleanliness.

He referred to the low death-rate in London, Ont., which was due to the vigilance of the Board of Health. He strongly condemned the use of bread tickets, and old paper money. Last year there were 3,000 more deaths in Ontario from consumption than from all other infectious diseases. In Ontario one person in every one thousand of the population died annually from consumption. Last year the province lost 2,500 wage-earners from this disease, which meant a direct loss of $2,500,000, and an indirect loss of an almost incalculable sum. Besides, consumption was contagious, and therefore many deaths from this disease might be prevented if proper precautions were taken. The hygienic remedies for consumption were pure air and pure food. The managers of the free libraries and public and Sunday School libraries, should not issue books to those affected by consumption or infectious diseases. Spitting in conveyances, streets or public buildings, should not be allowed. There were too many studies in the public schools. Military drills and exercises were beneficial for children in public schools.

Dr. Bryce read a well-prepared paper on the education problem, viewed from the public health standpoint. He said, among other things, that the pupils were kept in rooms which had not sufficient air-space, and the children were sent to school too young. He believed that children should have larger play grounds, and should have military exercises.

Should Make Clean Butter.

Dr. E. E. Kitchen, St. George, Ont., delivered an address on "The Sanitary Needs of Cheese Factories and Creameries." He referred to the shipment of butter and cheese to Great Britain and alluded to the losses in curing the cheese. A great deal of Canadian butter only sold as second quality butter in the old country. In the city of London he saw in stores Danish butter and butter from other countries, and he was sorry to say that Canadian butter brought the lowest price. Cleanliness in making butter was the greatest necessity. First-class cattle were needed. Several farmers kept cattle which were not fit to milk. In Denmark pure water runs through the cow sheds. The milker should be clean. In Holland the milkman, while doing his work,

wears clothes fresh from the laundry. A good tin pail should be used, and the milk should run through a filter. Good, solid brick cheese factories should be built, with concrete floors. The walls should be finished hard, so that hot water could be turned on. The curing-room is more important than the factory. It was not necessary to build this of brick. Two thicknesses of boards would do. The floor need not be concrete, but a hard floor was necessary. The temperature of the factory should be right. It should be kept down to about 65. Air ducts of 150 feet do well enough. Two layers of earth tiles were needed. At the entrance a well should be built. Above should be galvanized iron pipe. The second week in August, when the temperature was 94, he visited a factory and found it only 68 by means of the air ducts. The butter should be packed in nice, tasty packages.

Whey Should be Separate.

In answer to a question, Dr. Kitchen said the practice of putting whey from the factory in the same can in which the milk is brought to the factory was damaging, and could not be too strongly condemned.

This morning the delegates visited the penitentiary, and after their return Dr. Cassidy took the chair at the business session.

Dr. Herald gave a brief outline of the sewer system of the city of Kingston.

Dr. Bryce read a paper by Mr. Willis Chipman, C.E., Toronto, on "Septic Tank Method of Sewage Precipitation."

Dr. W. T. Connell read a paper on "Vitality of Typhoid and Diphtheria Bacilli in Milk."

A paper on the "Use of Antitoxin in Toronto Contagious Disease Hospitals," by Dr. E. B. Shuttleworth, Toronto, was read by Dr. Bryce.

Dr. Herald moved, seconded by Dr. McCrimmon, "That while increasing the staff of the mechanical laboratories in connection with Boards of Health, branch laboratories be established at Kingston and London, as there are competent men to do the work at these places." Carried.

A motion by the Rev. Mr. Cumberland, seconded by Dr. Knight, "That this Association approves of the Act respecting municipal sanitaria for consumptives; that thanks are due to the Legislature of Ontario for the same, and we strongly urge upon members of this Association the necessity of forming local associations to co-operate with local Boards of Health in carrying out the terms of this Act," was carried.

Officers Chosen.

The election of officers resulted as follows: President, Dr. W. T. Connell, Kingston; Vice-President, M. Davis, Berlin; Secretary, Dr. Bryce, Toronto; committee, Dr. Kitchen, St. George; Dr. H. M. Cowan, Galt; Dr. Vaux, Hamilton; Dr. Oldright, Toronto; Dr. McCrimmon, Palermo; Dr. McCullough, Owen Sound; Dr. Herald, Kingston.

Brantford was chosen as the next place of meeting. Though there was a heavy rain, the delegates enjoyed the excursion among the Thousand Islands on the steamer "America."

Special Selections.

THE BACTERIOLOGICAL TREATMENT OF SEWAGE.*

By Mr. H. T. Scoble.

Mr. Scoble, in the course of some opening remarks, said he found that in the early days of the institution the important question of sewage disposal occupied a larger share of the attention of members than it does at present. With the exception of a paper on "Sewage Disposal for Country Houses and Estates," read at a junior meeting and published in "Professional Notes," vol. ix, Part III, and a "Note" on the "septic" tank system in Part IV of the same volume, the disposal of sewage had not been discussed for many years. There might be good and sufficient reasons for this apparent neglect, but he thought it was much to be regretted, as it seemed to indicate that members no longer took a professional interest in the subject. It would be impossible in the course of one evening to deal with all the discoveries that had been made in relation to the action of bacteria on sewage. He would endeavor to explain the composition of sewage and the nature of bacteria, to show how sewage is purified by them, and to give some general idea of the systems in use. Further reference would be made to recent important experiments, and the various arrangements for automatic working would be considered. He would make a few remarks on the preparation of schemes, and include a note on sampling and analysis, concluding with a word or two about the future of bacterial treatment. Briefly speaking, bacterial treatment was a return to Nature's method of sewage purification. The necessary microbes were always present and the aim of the

* Paper read at a meeting of the Surveyors' Institution, London, February 12, 1900. From "The Surveyor," February 16th and 23rd. 1900.

various systems was to afford the best possible conditions, consistent with reasonable expenditure, for the multiplication and action of these beneficent organisms. At the same time the works were under perfect control and were not liable to interference by excessive rainfall or frost. It would be well, before detailing the various processes now in operation, to answer two questions: (1) What is sewage composed of? and (2) What are bacteria? Mr. Scoble then proceeded as follows:

What Is Sewage?

As a typical case, take a town having a water supply and "combined" sewers. The sewage is the total water supply after use (except that employed in gardening), together with a large amount of rain water, plus the foul matters taken up or washed down. The chief constituent is water, and the impurities include human fæces and urea, soap, discharges from sinks, sand, mud, horse-dung, and, in so many places, fibres from the wood-block pavements. If, in addition, there are manufactories that discharge their waste into the sewers, by the time it has received all its component parts the sewage will be, indeed, complex in character. Unless the local factories turn out a large quantity of acid waste the sewage will be alkaline; this is due in no small measure to the soap it contains. Bacterial action is altogether stopped if the sewage is strongly acid. Practically all sewage, apart from manufacturers' refuse, is made up of various compounds of carbon, hydrogen, nitrogen and oxygen. Other elements are present, but only in very small quantities. The different combinations of three or four of these elements are very numerous and often extremely complicated.

What Are Bacteria?

Bacteria are minute forms of vegetable life allied to the algæ (sea and river weeds), and they can be roughly classified as (1) parasitic (needing a living host), (2) saprophytic (living on dead animal or vegetable matter), and (3) those who adapt themselves to circumstances and exist indifferently as parasites or saprophytes. They vary in size from one fifteen-thousand inch to one twenty-five thousand inch in diameter. Multiplication usually takes place by division. Each half grows to the size of the original bacterium and then splits into two. Occasionally reproduction is accomplished by spore formation. Given an adequate food supply and ideal conditions, a single bacterium will at the end of a week have a colony of descendants sufficient to occupy fifty luggage trains, each of fifty trucks capable of carrying ten tons. As Cohn puts it: "Let us assume that a microbe divides into two within an hour, then again into eight in the third hour, and so on. The

number of microbes thus produced in twenty-four hours would exceed 16,500,000. In two days they would increase to 47,000,000,000 and in a week the number expressing them would be made up of fifty-o.. figures." Professor Boyce has found 750,000,000 organisms in a cubic centimetre of fresh sewage.

Pasteur has demonstrated that all putrefaction, fermentation, decomposition and decay of animal and vegetable tissues, whether dead or alive, are due to the action of micro-organisms. The particular microbes we have to deal with in sewage disposal are, of course, the saprophytic and those of the third group acting as such. Bacteria are also distinguished according to the conditions under which they live and may be either anaërobic (living without air—that is, without free oxygen) or aërobic (existing with free oxygen). Anaerobes and aerobes are each subdivided into obligate and facultative forms. An obligate anaerobe cannot live in the presence of free oxygen, but a facultative anaerobe is able to do so; similarly, obligate aerobes need free oxygen, and facultative aerobes can exist in its absence. It will thus be seen that the line dividing them is no hard-and-fast one. All bacteria are destroyed if allowed to remain too long in contact with their own products. In the absence of water, or at least moisture, they are unable to multiply, and remain dormant.

The work bacteria do in the purification of sewage is first to break down and then to oxidize the foul matters of which it is partly composed. In the statement of Dr. Rideal's formulæ, the sign of addition should, of course, be omitted between 13 and CO_2, and the expression will then read $4N_2+19CH_4+13CO_2+2H_2$, the number 13 being obviously the coefficient of CO_2.

To effect thorough purification three separate processes are needed—viz., (1) anaerobic; (2) partly anaerobic and partly aerobic; and (3) aerobic. As I have already pointed out, the impure matter consists of four elements. Bacteria are able apparently to abstract one of these elements from a compound for their own use. There are many species of micro-organisms that decompose the various substances, and the same compound may be broken up in different ways. The following formulæ (Dr. Rideal) will give some idea of the changes which occur:

4 Albumin + 14 Water
$4C_8H_{13}N_2O_3+14H_2O$
$=$ 4 Nitrogen + 19 Methane + 12 Carbon-dioxide + 2 Hydrogen
$4N_2+19CH_4+13CO_2+2H_2$.

Or

2 Albumin + 26 Water
$2C_8H_{13}NO_3+26H_2O$
$=$ 4 Ammonia + 16 Carbon-dioxide + 33 Hydrogen
$4NH_3+16CO_2+33H_2$.

Nitrogen, methane (marsh gas), carbon-dioxide (carbonic acid gas), and hydrogen need no further change. The ammonia passes on and is converted into nitrous acid by the incorporation of oxygen from the air. The nitrous acid is, by a similar action, changed into nitric acid.

In addition to the elements already mentioned, some organic substances contain sulphur, and it is interesting to know how this is disposed of.

Dr. Rideal, referring to the septic tank, says: "I have found that a mercaptan (methyl-hydro-sulphide) and other ethereal compounds are undoubtedly present in small quantities. They are very soluble and fairly easily oxidized. Most of the sulphur, however, enters into combination with the iron present in the sewage, forming insoluble ferrous-sulphide and giving a black color to the suspended matters."

Unfortunately the word "filter" has been applied to bacteria beds, and its use is so extended that it will have to pass. No mechanical action takes place, and the sewage is therefore not "filtered" in the true sense of the word. The material in the beds is there to afford a resting place for the bacteria, which would in its absence be carried away with the effluent.

The Various Systems.

The systems in use can be divided into two classes, the first of which has as its object the destruction of the impurities by aerobic organisms, while the second consists of a primary decomposition by anaerobes and a secondary purification by aerobic action. The ideal system would probably provide for three separate stages of treatment: (1) anaerobic, (2) anaerobic-aerobic, and (3) aerobic. The cost of installations would, of course, be greater; but, as under existing systems an effluent of a sufficient degree of purity is readily procurable from any ordinary sewage, the advantages that might accrue would be more than overbalanced by the disadvantage of an increased expenditure.

In cases where the effluent will contribute to a water supply the adoption of this additional safeguard would seem to recommend itself. When manufacturing refuse in large quantities is discharged into the sewers, extra provision may be required for the successful treatment of the mixed sewage. Pathogenic organisms or disease germs are, as far as our present knowledge goes, either destroyed or enfeebled in passing through an installation. The conditions are inimical to their growth or nourishment, and the bacteria they encounter are, according to bacteriologists, very hostile. Where the effluent is discharged into tidal waters an anaerobic process only is required.

Bacterial systems have this strong recommendation, that they

produce a minimum of sludge. Where screens are used there is a certain amount of matter retained which must be taken away; but this state of things prevailed before. The residue from micro-organic treatment is inoffensive and may be termed "burnt-out ash." It accumulates very slowly, and its occasional removal is neither a source of great expense nor nuisance. This is, however, but a secondary point as compared with the quality of the effluent produced. It is only by bacterial treatment that water can be effectively freed from its unnatural burden—sewage. The effluent from any well-considered and properly executed scheme is pure enough to be discharged into a stream, ditch or pond without any risk whatever of subsequent putrefaction or injury to fish, flesh or fowl.

The annual cost of up-keep is, with automatic gear, a nominal amount; where it is not provided, constant attendance is necessitated. The beds require raking over from time to time owing to the production of a surface film and the growth of weeds, which in warm weather is very rapid. Some forms of gear need a little oiling at intervals—a few minutes' attention once a week would suffice for this and the change of filters. Where screens are employed the matter retained must be speedily taken away. An allowance might be made for the removal of the burnt-out ash. I doubt whether it is worth while to include this item under a heading of "annual expenditure." The septic tank at Belle Isle, Exeter, has taken the sewage, without screening, from 1,500 people for over three and a half years; no mineral residue has yet been removed, and the small quantity of matter in the tank in no way interferes with its efficiency.

Experiments are being made in the separate purification of manufacturers' waste of vegetable and animal origin. The refuse from a brewery, together with a little domestic sewage, has been treated with some measure of success, but the discharge from a jam factory has not hitherto yielded good results. An installation is now being put down to treat the sewage from the kennels of a hunt—the solid excreta are reserved as far as possible and sold to leather manufacturers. Many installations are in use or being constructed in connection with private houses, and if thorough preparation is made for the removal of all grease by proper grease-traps, success is assured.

The Dibdin System.

Under the Dibdin system the sewage first passes through a screen, which retains solid fæces, string, rags, paper, etc. It then flows on to a coarse bed of coke breeze, ballast or other similar material, the individual pieces of the same varying in size from one-half inch upward. The sewage is distributed by one or more

channels over the top of the bed, which is filled to within three inches or so of its surface. It is collected on the floor of the bed by rows of agricultural drain pipes joining one main collector. After a contact of some definitely arranged duration the discharge valve is raised and the effluent is received by a second filter. This is made up of the same material as in the first bed, but the particles are much finer. Dust, however, is rigidly excluded. Series of coarse and of fine beds are provided, so that each may have a rest after discharging. Assuming an eight hours' cycle and two hours' contact to have been settled on, the first bed will be filled (one to one and a half hours), stand full (two hours), empty (half an hour to one hour), stand empty (three and a half to four and a half hours), and then be filled, etc., again. The second filter will be filled while the first is standing full, and so on. It is an advantage to have a spare bed of each kind, so that a complete rest of some days may be given to all in turn. This prevents the beds from becoming "sewage-stick." These filters are very generally termed "aerobic beds," but as for many of the impurities in sewage an anaerobic process must be gone through before the aerobic bacteria can be of use, it is not unfair to assume that some anaerobic action takes place in at least the first or coarse bed. The fine bed is without doubt mainly, if not entirely, aerobic. At the screen there is a most objectionable smell, and the sewage is not free therefrom when being distributed over the coarse beds. On leaving them the taint is slight, and the liquid is cloudy in appearance. The discharge from the fine beds is clear, and has but little, if any, odor. The materials employed in the construction of installations on the Dibdin system are of widely differing character. Beds may be made by digging pits in clay and burning the same for ballast, which is then screened and returned, but such works cannot be considered of a permanent nature. Again, I have seen beds the walls of which were of clay, the floors of concrete rendered in cement, and the filling coke breeze. In this case the sewage was distributed by rows of perforated cast-iron (rain-water) pipes, laid on the surface of the coke, and it was collected in the usual method. To make certain that the works will last, the floors should be of concrete, and the walls of either concrete, brick or stone in cement, all internal surfaces should be rendered, and coke breeze or furnace clinker should be used in preference to ballast. Beds have been made of many different depths with satisfactory results. The amount of fall available usually fixes the depth that can be given to the beds, but where an unlimited fall is obtainable the time occupied in filling and discharging regulates this dimension. The filling of a 13-foot bed would occupy a considerable time when the flow was slight, and the sewage would therefore be kept in the bed too long. On the other hand, if the beds

were very shallow, the cost of construction would be much increased.

The Ducat and Scott-Moncrieff Methods.

Col. Ducat's method of purifying sewage is to expose it to air as much as possible. Instead of building solid walls round the filtering material (vitrified clinker one-quarter of an inch to one-half an inch in size) it is encased in agricultural drain pipes set in cement, the whole on a concrete floor. These pipes are tilted inward at such an angle that the liquid cannot escape. At intervals layers of three-inch pebbles extend right through the bed, the depth of which is about eight feet. During winter, owing to constant evaporation, the beds would freeze were they not enclosed in wooden shutters and warmed by a supply of hot air.

The Scott-Moncrieff system provides separately for each of the three stages of purification. Anaerobic action takes place in a chamber containing successive strata of flint, coke and gravel. The sewage passes up through a false bottom, rises between the flints, etc., and flows at its original level, or thereabouts, on to a thin layer of filtering material. It passes continuously through this, then falls a few inches and encounters other similar layers. The anaerobic action in the first chamber produces, among other substances, ammonia. This is converted by the bacteria in the upper filters to nitrous acid (nitrites). In the lower layers the aerobes present change the nitrous acid into nitric acid (nitrates). The results are very good, but the cost of constructing the trays must be taken into account when comparing with other systems.

The Septic Tank.

The septic tank system is so called because the purification of sewage is begun by a process of putrefaction. The products of this first stage are passed on to fine filters, where oxidation takes place. The installations on this system are uniform in character, but differ widely in extent. A scheme has recently been submitted to deal with a flow of 4,000,000 gallons per diem, the chief details of which are six tanks, each some 375 feet long by 29 feet wide and 8 feet deep below the springing of the roof arches, and twenty-four filters, each 100 feet long by 95 feet wide, filled to a depth of 3½ feet with furnace clinker (twenty filters—*i.e.*, five sets —only are worked at one time. On the other hand, the sewage from a country policeman's cottage is being treated by this system. The works are executed usually in concrete, but brick and stone in cement, if rendered, answer equally well. The tanks generally have arched roofs covered with soil and turf, but joists and concrete are sometimes used—manholes are built in to allow of inspection. The filtering material is broken furnace clinker

(preferable) or coke from one-eighth of an inch to one-half an inch in size. In a typical installation a grit chamber retains the road detritus. A storm overflow pipe from this chamber comes into operation when there is more than three times the normal dry-weather flow. The sewage is conveyed by special inlet pipes to some eighteen inches or so below the water level of the tank. The floor of the tank falls slightly toward the further end, and at the lowest point the burnt-out ash drops through a slot into a pipe embedded in the concrete. On removing a valve the residue is forced out by the pressure of the water above into a sump-hole at the side. The sewage or tank effluent, as it is now termed, passes out through a narrow longitudinal slot on the underside of a transverse pipe which communicates with the tank effluent channel. The slotted pipe is below the water level, and the walls of the tank effluent channel are carried up to form a trap. A main distributor then conducts the tank effluent to the automatic gear, and rows of half-channel stoneware pipes distribute it over the filters, which continue to receive the liquid until the filtering material is entirely submerged. Agricultural and stoneware drain pipes collect the effluent on the floor of the filter and lead back to the gear through which the final discharge is made. Under this system no screening is done. All the solids, other than road grit, enter into the tank, and are there liquefied or turned into gas by anaerobic action. There is, therefore, no smell from untreated sewage. The tank effluent is slightly opalescent in appearance, and some of the gases it contains escape, giving an ammoniacal odor, which diffuses very rapidly and is imperceptible at a few yards' distance. The final effluent is bright and without smell. In the tank a thick scum of floating solids and colonies of bacteria is formed on the surface of the water. The heavier particles encounter swarms of microbes on the floor of the tank, whence they rise to the surface, buoyed up by the gases set free, only to fall when these break away. A similar recurrent rise and fall may be observed when a "lemon squash" contains a pip—the only difference is that in this case the gas comes from the liquid, whereas in the tank it is produced from the substance of the object moved. As long as there is any organic matter left bacterial action will continue, either in the body of the tank or in the surface scum. The inodorous gases from the tank give a great deal of heat when burnt, and although at present they have only been employed to light incandescent burners, it may be possible to devise some way of using them so as to provide power for pumping. The tank holds from eighteen hours' to twenty-four hours' flow, and any particular discharge of foul matter soon spreads. There is a reserve capacity (the difference between high and low water level) to take the first rush of storm water with its accompanying scourings. The only condition necessary for the septic tank system is four feet to five feet fall.

Other Systems and Experiments.

According to Mr. Garfield, coal makes a most excellent filtering material. The beds are arranged so that the larger particles are at the bottom, those of medium size next, and the fine ones on the surface.

The chief feature of the polarite biological sprinkler system is the method of distributing the sewage over the beds. The description of the Candy-Caink gear will show how this is done. The sewage is first treated in a small detritus chamber, designed to hold the flow of half an hour. A screen at the further end prevents the solids from passing on, and it is claimed that they are broken up by bacterial action. Where sufficient fall is not available to allow of two filtrations, a "sludge-digesting bed" is employed; this is very similar to the first chamber in the Scott-Moncrieff system. The filters are made up of layers of polarite and gravel.

Variations of the Dibdin and septic tank systems have from time to time been proposed, and may in some parts be seen at work. Some time ago the author had a system described to him which appeared to imitate both the septic and Scott-Moncrieff systems in the preliminary stages, and the sewage afterward successively passed through four shallow filters of small coal. The only objection to such amplification is on the financial side; this, although a one-sided opposition, will be acknowledged to carry great weight.

For some time past the Leeds City Council has been endeavoring, by means of practical tests on a working scale, to ascertain whether bacterial treatment would effectively and economically purify the local sewage. The sewage contains a very large amount of iron, and the surfaces of the filters are at times completely coated with it. A large quantity of dye liquor also finds its way into the sewers. Several systems are being tried, and as recently as September last it was decided to extend the scope of the experiments. It is too early as yet to arrive at any definite conclusion, but the results so far have been very satisfactory.

An exhaustive report by Dr. Clowes, chemist, and Dr. Houston, bacteriologist, on the bacterial treatment at Barking and Crossness (the outfall for the sewage of London north and south of the Thames respectively) was published last October by the London County Council. A single and also a double filtration were employed, the coke used was "walnut" size, and depths varying from four feet to thirteen feet were tried. The thickness of the filtering material made but little difference to the effluent. The working capacity was considerably reduced (from one-half to one-third of the gross capacity of the beds), and this "appears to be mainly due to the fragments of straw and chaff apparently derived from

horse-dung and to woody fibre derived from the wear of the wood pavement." Want of time forbids a more detailed reference, but, according to Dr. Clowes, the points of advantage of bacteria over chemical treatment are: (1) It requires no chemicals; (2) it produces no offensive sludge, but only a deposit of sand or vegetable tissue, which is free from odor; (3) it removes the whole of the suspended matter, instead of only about 80 per cent. thereof; (4) it affects the removal of 51.3 per cent. of the dissolved oxidizable and putrescible matter, as compared with only 17 per cent. removed by chemical treatment: (5) the resultant liquid or effluent is entirely free from objectionable smell, and does not become foul when it is kept; it further maintains the life of fish.

THE MANCHESTER EXPERIMENTS.

The experts appointed by the Manchester corporation say in their report, issued last November: "To this end (the possibility of devising a more economical method) we felt that it was of the highest importance to carry out a searching experimental investigation of our own as to how the bacteriological processes can be most advantageously applied to a sewage possessing the special character of that of Manchester. Thus some of the more urgent points demanding elucidation were the following: (1) To determine whether the trade refuse in Manchester sewage seriously impaired the efficiency of the bacteriological treatment. (2) To determine whether a portion, at any rate, of the sludge can be destroyed by bacterial agency. (3) To determine whether the addition of chemicals to the sewage before bacteriological treatment can be dispensed with. (4) To determine whether the aerobic process (decomposition of organic matter by bacteria in the presence of air) or a combination of anaerobic (similar decomposition without air) and aerobic processes is the more advantageous."

It would occupy too long to follow in any detail the actual experiments that were conducted to satisfy the experts on the points so clearly raised in the preliminary statement. The conclusions they agree on may be briefly summed up as follows: The bacterial system is the system best adapted for the purification of the sewage of Manchester. The inquiry has shown that each bed may safely receive four fillings per diem, provided that the sewage has undergone septic preparation in tanks, and that the bed is accorded one day's rest in every week. The experiments show that the bacterial system of treatment is efficacious at all seasons of the year.

The recommendations are to the effect that the sewage be screened and then passed through the present open tanks; that these tanks should be provided with submerged walls and floating scum-boards, so as to retard the flow of the mineral and organic matters in suspension; and that the effluent from the open tanks

should be passed through the double contact beds. Particulars as to construction of works then follow. The last paragraph is: "Finally, we may state our confident opinion that, with the system of bacteriological treatment of the sewage of Manchester set forth above, an effluent will be produced which will not only conform with the Mersey and Irwell standard, but which will also materially improve the condition of the ship canal. Furthermore, as this system does away entirely with the use of chemicals, and at the same time, to a very large extent, reduces the volume of the sludge to be dealt with, it is obvious that much of the present expense will be saved by its adoption, and this saving may be taken as a material set-off against the cost of the construction of the proposed works."

Methods of Working and Automatic Gear.

It has been pointed out that each bed must have a period of rest after discharging before it is filled again. The work to be done consists of filling the first bed, diverting the flow when it is full to the next in the series, discharging it after the arranged time of contact, providing a period of rest and charging the first filter again when the last has been filled, thereby establishing a complete cycle. In addition, provision should be made for cutting out any filter for a rest of a week or so. With a continual flow of sewage constant attendance must be provided. In addition to the expense thereby incurred, the efficiency of the works will, to a certain extent, depend on the unremitting attention of the man whose duty it is to look after the filters at any hour of the day or night and in all weathers.

With automatic working it will be possible to deal with the sewage of a district by separate installations at different sites, without adding in any great degree to the cost. Extensive sewering and pumping will thereby often be avoided. The advantage of employing automatic alternating gear was first recognized in connection with the septic tank system. Where proper gear is used the filters cannot run over, be insufficiently filled, emptied too soon, nor allowed too long a period of contact, etc. The success attained by the gear naturally led to the manufacture of further apparatus, and I propose to refer to several types of gear in use.

The original automatic alternating gear of the septic tank system is still in use, but the forms now generally adopted occupy less space, and are designed to meet varying requirements. Thus one form provides for a timed discharge—that is, the interval between the filling and emptying of the bed is always the same; or, in other words, is not affected by the rate of flow. In another type of gear an overflow from the second bed, when that is full, fills a bucket, which then drops and raises the discharge valve of the first bed, and so on, each bed in a cycle of three or four being

emptied as soon as the bed next in order has been filled. Each set of four beds has its own gear, is separately supplied with tank effluent, and works independently. A further type of gear, designed for small installations, say for an asylum or country house, has for its object the control of the flow on to the filters. Were the flow not regulated the beds would receive the merest trickle at night and in the morning an altogether excessive amount. As this might impair their efficiency, the flow is stored in the tank until just enough has accumulated to fill a bed. With this gear three beds are generally provided ; any two work alternately while the third is resting.

Adams' syphonic apparatus consists of an air-controlled supply and a timed syphonic discharge. When a bed is full the supply is cut off by an air lock, in which pressure is automatically brought about. The discharge of the bed to which the apparatus is connected releases the pressure and allows the bed to be refilled. The discharge syphons deliver the contents of the coarse bed on to the fine bed, and a similar syphon finally discharges the effluent. The beds are dependent one upon the other for their supply and discharge when the withdrawing syphons are connected with other beds. A revolving barrel turned by a float supplies alternately to right and left when two beds only are used.

Ridgway's automatic distributor is operated by the rise and fall of a float to which a pawl is attached. The ratchet wheel moved by the pawl is fixed on the end of a long rod. This rod carries a number of cogs, each of which opens one of a row of valves. The sewage is thus delivered through the valves in turn and is conducted by special channels to the filters. I am not aware if any further apparatus is made to accompany the above ; if the beds are worked continuously none is needed, but if intermittently some means of discharge must be provided.

The Candy-Caink distributor consists of two arms, each perforated on one side and connected with a central bucket, which in turn communicates with and is fed from a trough. By another arrangement it is supplied direct from a tank which "ponds" the flow. The distributor revolves as the sewage emerges from the perforations, and the liquid is thus sprinkled evenly over the bed. The normal flow of four minutes is dealt with at once and causes the sprinkler to revolve for one minute.

The Question of Cost.

The first point in connection, perhaps, with any and every scheme is, What will it cost? I do not propose to enter upon the question of cost at any length or to compare the various systems with each other in this respect. Local facilities, both as regards material and labor, are of vital importance, and the fall obtainable will always be one of the chief considerations. In every case the

aim of the surveyor will be to avoid pumping if by any means he can do so. This may at times be accomplished by reducing the gradient of the sewer for some distance from the outfall. The levels of the proposed site or sites should be accurately taken and the invert of the sewer marked on the plan. The fall that can be allowed will then be ascertained, but it must be borne in mind that the effluent will have to pass over land whenever a local government board loan is wanted. Existing outfall works should be inspected, as it may be possible to adapt them.

When the sewage is purely domestic no difficulty will be experienced in effectually purifying it by bacterial treatment. If fibre from wood pavements has to be dealt with, it will require special provision, as it is essential for its speedy dissolution that it be subjected to a definite anaerobic process. Discharges from the breweries, galvanizing works and fell-mongers' yards, to mention three only of the many industries whose waste products are encountered in the sewers, must, if in any quantity, be most carefully considered. It will be well to secure the fullest information obtainable as to quantity and time of the discharges, and to know if the same take place at regular intervals.

The normal dry-weather flow should be ascertained by gauging, and it is best to do this over as long a period as possible. Readings should be taken each hour for at least twenty-four hours. It is a good plan to average the results from several days, as instances have been known where the data furnished as regards flow bore no relation to the actual amount of sewage delivered at the works.

In England the local government board's regulations are so severe in connection with bacterial systems that the cost is much enhanced. This applies to all schemes where loans are needed to carry out the work, and as it is practically impossible to pay for the construction out of revenue, many local authorities are waiting for the report of the Royal Commission. Why these regulations should be insisted on it is not easy to say. Scotland and Ireland have no such hampering restrictions, and in England, where installations can be put down out of revenue, some of the supposed necessary requirements need not be complied with. The conditions are :

(1) Each set of filters—*i.e.*, both coarse and fine—must be of sufficient capacity to contain the normal dry-weather flow for twenty-four hours. Coarse-grain beds can hold 25 per cent. sewage and fine beds 33⅓ per cent. sewage. This means, taking an eight-hour cycle, that the beds must be large enough to deal with three times the dry-weather flow—*i.e.*, one volume normal, two volumes storm water.

(2) Land has to be obtained at the rate of one acre per 1,000 population to take the effluent.

(3) Storm water filters of some coarse material—such as clin-

ker, burnt ballast or gravel—must be provided, in addition to the above, to treat a further quantity of storm water equal to three times the dry-weather flow. Instead of filters a special area of land can be set apart to receive storm water.

The policy of providing more than sufficient filtering accommodation for sewage has its good points, but it may be questioned whether it is necessary to do so on so liberal a scale. The insistence on final "land treatment" may be considered a mistake, as where proper filtering material is used no further purification is needed. Only in very exceptional cases, where it is practically impossible to obtain the requisite area of land, is this condition open to modification. Final land treatment entails additional expense for the purchase of the land, and also increases the difficulty of securing suitable sites for installations, as it is only after the sewage has passed through the filters and thereby fallen some four feet to eight feet that the land comes into use. Pumping machinery may even be required to raise the effluent so as to pass it over the land.

A reference to Hampton may be of interest. Here the urban district council, in order to more than satisfy the Thames Conservancy, decided to pass the sewage through three sets of filters. An unusually pure effluent is obtained. But the local government board granted a loan ; it must, therefore, pass over land and has to be pumped up for this purpose. The effluent on leaving the land contains more than twice the amount of impurities that were present in it when discharged from the filters.

Some General Considerations.

The consideration of the state of affairs at Hampton brings me to the next point—viz., the destination of the effluent. It is always possible by increasing the number of filters to further purify the effluent until a good potable water is obtained. This practically complete purification would very largely add to the cost, and I am afraid there would be a sentimental objection to drinking "sewage water." It is essential that the effluent should not putresce even when incubated. I have already referred to the treatment proposed where a water supply is in question.

When the sewage is very foul, or the effluent will become a part source of a water supply. it may be advisable to have a chemical and bacteriological examination made. This is more particularly needed when it is feared that chemical wastes will interfere with bacterial action. The samples should always be averaged, and it is important to bear in mind that the original samples of which the average is made up must be proportionate to the flow. The samples should be collected after a few dry days, if possible, and they ought to be labeled with name of place, date and time. Data as to the rainfall of the district for some time before and the water

supply per head of population should be obtained and given to the analyst. Trade discharges, if voluminous, should be independently sampled. If samples are taken from installations at work for the purpose of ascertaining the degree of purification effected, great care must be exercised to obtain proper figures, and sterilized bottles must be used. The rate of flow must be frequently gauged, and the time calculated that will elapse before the successive stages are reached. That is to say, if in a septic tank installation the flow is sufficient to fill the tank once in eighteen hours, the tank effluent must be sampled eighteen hours after samples of the sewage are taken, and samples of the final effluent must be obtained from the filter that receives the tank effluent already sampled.

Analysis should be left to chemists and bacteriologists, as it is essentially specialists' work. It is useless for any one to attempt delicate analyses with but imperfect apparatus and a limited experience of the work.

The Future.

The future of bacterial treatment and the future of sewage disposal are, I believe one and the same thing. A royal commission is investigating the subject at the present moment, and it is hoped the report, when it appears, will definitely state that, subject to certain conditions as to dimensions of tanks, beds, etc., bacterial systems may be adopted without subsequent land treatment. The report of the invaluable Manchester experiments, the results of bacterial treatment at Barking and Crossness, and the undoubted success of the installations on various systems now at work throughout the United Kingdom and abroad, warrant the inference that bacterial treatment is universally applicable. Not only is the cost less, but the results are far superior to any obtained by the use of chemicals, and the sludge difficulty does not arise. Further, as the nitrates derived from the nitrogenous substances are in such form and in such quantity as to be readily assimilated by plant life, it may be that, in time to come, this manurial value will be utilized by extensive irrigation. At any rate, it will not be necessary to flood the land at unsuitable seasons, nor will there be any risk of making it sewage-sick.

It is, of course, impossible to say anything definite as to the continuance of any one system in use at present, as extended research may enable us to improve on existing methods. Experience and the evidence of bacteriologists point more and more clearly to the fact that a preliminary process of anaerobic action is essential, and that, in order to obtain the best results, the two subsequent stages of purification should proceed independently. By a modification of its regulations the local government board could sanction two beds (successive), each of rather less than half the

capacity of those now used, to deal with the products of anaerobic activity. The cost would not be so much as at present (with land), and the result would leave nothing to be desired. It may be taken as certain that automatic working will be a *sine qua non.*

Different systems of sewage disposal have come into prominence and again receded from our view, because the working of Nature, the one abiding condition, has been disregarded. Sewage farms had too much work given them to do, and as an inevitable result were incapacitated from doing it properly by reason of "sewage sickness." Chemical precipitation, tried to stop putrefaction or decay, was followed by "secondary decomposition" in the effluent, and brought us face to face with a further difficulty—"sludge." Bacterial treatment is an application of the methods which observers have seen Nature make use of, and I trust that in years to come it will not be said that those who advocated its adoption were unduly optimistic, but that they advised the use of the only efficient and economical process of sewage disposal.

Discussion.

Mr. J. W. Willis Bund, Chairman of the Worcestershire County Council, proposed the accordance of a vote of thanks to the author for his valuable contribution. Proceeding, he remarked that he had been hoping that the paper would contain a proposal that would suggest some royal road for dealing with the difficulties connected with sewage treatment at those unfortunate towns in which a 1d. rate usually produced something under £20, and where compliance with the local government board's regulations for an efficient system of disposal could only result in pecuniary loss to the inhabitants. He had been disappointed, however. Mr. Scoble, he thought, had told them that the bacteriological system was probably most satisfactory in its results when the sewage being dealt with was undiluted with chemical matters. But in almost every little town a certain class of manufacture was carried on, and when engineers had to deal with the effluents produced by those communities, it became difficult to believe that the bacteriological system would, after all, solve the question. One matter that he was particularly interested in was that of the treatment of acid waste, as in the valley of the Stour there was a great deal of galvanizing work carried on. Under the Rivers Pollution Act that class of refuse had to be received into the sewers, but the contention of the local authorities was that that course only resulted in the destruction of the sewers, and, in fact, injury to everything with which the acid came into contact. Mr. Scoble had admitted that where any considerable quantity of acid was encountered the issue was very doubtful, and that brought him to this: Was it not equally a matter for speculation in the case of other manufactures? Did it not at once suggest the inquiry whether in towns

where there was something more than ordinary sewage to be dealt with, the mode of disposal should be decided upon according to the circumstances of each locality; and also whether the adoption of a universal system of disposal—which, in his personal belief, would be a mistake—was not a matter of impossibility? In regard to the rule of the local government board insisting upon various deodorizing matters being introduced into sewers during the hot summer months, he asked what effect such chemicals would have on the bacteriological system—whether the sewage tanks would remain unaffected? If the system was to work at all, it must remain in use all the year round without interruption; and in the respect he had alluded to he really was doubtful if it would not be rendered unworkable. Another point on which it was desirable that they should receive information was whether the application of the system to, say, half a dozen cottages in the country would result in a momentary loss. The success of the tanks in that particular direction would undoubtedly prove of great benefit to rural communities. He believed that as regards London the bacteriological process had worked very well, but he still wanted to know if it had been used on a large scale and had undergone a thorough testing. He saw so many points on which it appeared that if it were exposed to ordinary rough work it was likely to break down, and he therefore felt some hesitation in recommending its adoption by local authorities without knowing it to be an undoubted success and not likely to incur a waste of public money.

Mr. H. H. Collins, F.R.I.B.A., thought that the research shown by the author in the preparation of his paper was most commendable. Following Mr. Willis Bund, who was so intimately acquainted with the Rivers Pollution Act, and who had taken so much interest in the subject before them, it was difficult for him to speak with anything like the authority which his (the previous speaker's) words brought. He would like to congratulate Mr. Scoble on the way he had placed his views before the meeting; but it had been his hope that there would have been some diagrams to illustrate the paper. It was true that the question of the bacteriological treatment of sewage had been occupying the attention of experimentalists for a considerable number of years, but it was still essential that it should be known for certain whether there was in existence any process which might be considered both inexpensive in working and really worth adopting. He had seen hundreds and thousands of pounds wasted in the past in connection with the system, and he agreed with Mr. Willis Bund that before incurring any large expenditure on account of sewage works on bacterial lines one ought to be excessively careful.

Mr. A. M. Fowler, M.I.C.E., having been concerned with the construction of sewage works and dealt with the sewage of various

large towns for over thirty years—to be exact, since 1866—had consequently had some experience of all the new schemes which had come before the public during that period. There were at the present time some twenty processes by which sewage could be clarified, but the great difficulty in nearly every case was the cost. Probably most of them remembered the old A B C process. That was introduced when he was borough engineer of Leeds, and, although adopted by the corporation, was not completely installed, owing to the contractors failing to adhere to their agreement with the council. Some other advertised schemes were tried, but those were all subsequently abandoned in favor of the present simple process of lime treatment. The varying conditions of sewage must not be overlooked, and he agreed with the first speaker that it was impossible to specify a universal system for the whole of England, and that instead each kind of refuse required to be studied and treated according to its merits.

Mr. J. Nixon Horsfield said that, as an architect and surveyor practising on the Thames, he was particularly interested in the subject under discussion. He happened to live in a town where the A B C process had been in use for a number of years. It had been throughout an utter failure—so much so, indeed, that they were unable to produce an effluent that would satisfy the Thames Conservancy, who were not, as some people imagined, too particular in such matters. No one system, he agreed, could be applied universally, and he instanced a case in which he successfully provided for the treatment by means of what was practically an ordinary cesspool, of the sewage of half a dozen cottages situated on the crest of a hill, at the bottom of which ran a small stream. Not a single complaint of any kind had resulted from that particular work, and the stream was quite unaffected. He had visited the Exeter works himself, and was convinced of the exceptional purity of the effluent produced there. He desired to know, however, if an equally good effluent would result from uncovered tanks, and suggested that Mr. Scoble might be able to express an opinion in the matter. The author had alluded to a smell arising from roughing beds, but he was inclined to doubt that statement, as on inquiry at Exeter certainly no complaint had been made as to any offence of the kind.

Mr. E. W. Hudson, F.R.I.B.A., in the course of a few remarks, spoke of the need that existed for further information as to the success of the treatment carried out by the London County Council at Barking and Crossness, and, in closing, asked what influence separate systems of sewerage had on the bacterial process, and whether, in fact, it was advisable to separate the surface water from the ordinary sewage.

The discussion was then adjourned.—*Selected from The Sanitarian.*

MONTHLY REPORT.

Issued Sept. 22nd, 1900.
P. H. BRYCE, M.A., M.D., Secretary.

Issued by the Provincial Board of Health of Ontario for August, 1900. Showing the deaths from all causes and from Contagious Diseases in the Province, as reported to the Registrar-General by the Division Registrars throughout the Province.

YEAR.	MONTH.	Total population of province 2,283,182	Total municipalities of province, 777.	Total deaths reported from all causes.	Rate per 1,000 per annum from all causes.	Scarlatina.	Rate per 1,000 per annum.	Diphtheria.	Rate per 1,000 per annum.	Measles.	Rate per 1,000 per annum.	Whooping cough.	Rate per 1,000 per annum.	Typhoid.	Rate per 1,000 per annum.	Tuberculosis (Consumption).	Rate per 1,000 per annum.
		Total population reporting	Total municipalities reporting														
1900....	August ..	2,147,000 94%	718 92%	2,306	13	6	0.03	30	0.1	1	0.005	14	0.09	44	0.2	176	1.0
1900...	July	2,215,040 97%	718 92%	2,021	10.9	9	0.04	44	0.2	9	0.04	7	0.03	15	0.08	264	1.4
1900....	June	2,151,000 95%	715 92%	1,752	10.	6	0.03	30	0.1	1	0.005	7	0.04	11	0.06	200	1.0

YEAR.	MONTH.	Total population reporting.	Total municipalities reporting.	Total deaths reported.	Rate per 1,000 per annum from all causes.	Scarlatina.	Rate per 1,000 per annum.	Diphtheria.	Rate per 1,000 per annum.	Measles.	Rate per 1,000 per annum.	Whooping cough.	Rate per 1,000 per annum.	Typhoid.	Rate per 1,000 per annum.	Tuberculosis.	Rate per 1,000 per annum.
1899....	August ..	2,225,326 98%	730 94%	2,088	11.4	8	0.04	25	0.1	5	0.03	16	0.09	55	0.3	172	0.9
1899....	July	2,168,115 95%	670 86%	1,643	9.05	7	0.04	20	0.1	4	0.02	6	0.03	15	0.08	178	1.0
1899....	June.....	2,108,666 92%	675 88%	1,521	9.	12	0.07	22	0.	5	0.03	4	0.02	13	0.07	172	0.9

N.B.—Division Registrars will please make their returns on or before the 5th of each month, thus enabling the Department to have the monthly report compiled much earlier than heretofore.

DOMINION MEDICAL MONTHLY

AND ONTARIO MEDICAL JOURNAL

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LODGE PRACTICE IN BRITISH COLUMBIA.

In another part of this issue Dr. Ernest Hall, of Victoria, sets forth his views concerning that much vexed question—lodge practice. Dr. Hall has also been kind enough to furnish us with the correspondence in the daily press of that city regarding the position of affairs as between the doctors and the lodges, and the lodges and the doctors. On another occasion we have had something to say relative to the state of affairs out West, and perhaps it may not come amiss if we now enlarge upon the question, seeing that the facts of the embroglio have been placed within our reach. About the 1st of December last an agreement was entered into on the part of all the practitioners of that thriving city of the West whereby they one and all, with no exception, agreed to cease from all lodge or contract practice at the expiration of present and then existing agreements with the lodges. This was done, we presume, with perfect satisfaction to all practicing physicians in the city. Naturally, being deprived of a good thing, the fraternals felt sore over the action of the doctors; and as a result of the pain engendered, advertisements were booked calling for practitioners from the East and the old country to come to Victoria, where some glory and much hard cash awaited needy disciples of the Æsculapian art. Apparently, however, there were difficulties in the way of the fraternals carrying out their plans; but if they could not secure a single applicant from the East—all honor to the profession in the East—they were, it seems, able to secure two physicians on the spot, one of them being Dr. Hall himself, to take over the abandoned lodge work, which had now by this time begun to rust and languish for want of exercise. Now, it seems that this lodge work in Victoria is of intense interest to something like two thousand persons of some twenty different varieties, and that it nets the handsome sum of $4,000 per annum; and Dr. Hall and his confrère, in taking up the work, after having pledged themselves

to an agreement "not" to do this work—and we presume this must be correct, as it is not denied in Dr. Hall's correspondence—can certainly expect very little support either at home or in the East. The discussion of lodge practice is probably worn threadbare; it is now a very ancient question. As far as fraternals are concerned, we opine it was created for the sole and only reason of catching members for these self-same societies. These societies are kept up, and were brought into existence, for the place-hunter, for the office-seeker and his pocket. What is the condition of affairs at the present time? The great majority of the pushers in every lodge room has a similar interest in some other fraternal organization. Many of them are there for what there is in it and for what they can make out of it. It is a notorious fact that doctors are, by the laity especially, classified in this category. It is equally notorious that there are scores, yes, hundreds, in every fraternal organization who never think of employing their lodge doctor; and this is the case, too, when the lodge man belongs to several lodges. We think the signs of the times point to an early dissolution of the lodge practice. Take, for instance, the city of Toronto; it is a well-known fact that the best of the younger men who are winning their spurs in the profession in this city have never had, and never will have, anything to do with the work which brings depreciation of value of professional attainments both from public and professional men. That many of the fraternals themselves are becoming dissatisfied with the business there is no doubt; in fact, there are many societies doing a good business which have no lodge practice at all in their constitutions. These flourish and prosper without a clause in their constitutions calling upon medical men to degrade their professional honor and manhood for the per capita catch-penny. That a man who has been foolish enough to indulge in lodge work, but has ceased that practice, condemns it, is surely strong evidence in favor of the cessation of the system, if experience carries any weight with it at all. What, then, is to become of the poor laborer who is a member of a lodge which promises him medicines and professional attendance by the year for a nominal figure? We will answer this by saying that he is no better than his wife and children, for whom, the chances are, he does not provide in similar fashion, because very few of the fraternals cater to this practice. But whilst there may be some poor laborers to whom lodge practice is a boon, there are many in these lodges who can well afford to pay, and pay well, for doctors' attendance. At any rate, the care of the poor in times of sickness by the physicians, either at home, at the dispensaries or at the hospitals, is an evidence of the humanity in the profession of medicine. It is not our duty to attend them, but it is our humanity which makes us attend them. We are no more entitled to care

for the sick poor than the daily press is entitled to send these people a year's subscription gratis—an unheard of thing. The doctor should be recompensed for his attendance upon the sick poor by the municipality, so that all would then be bearing a part and a portion of this indebtedness. We sincerely hope that lodge practice in British Columbia is doomed, both for the sake of the honor of our profession, as well as for the sake of the poor lodge patient. The lodge devotee who is able to pay for his medicinal attendance—for him we have nothing but contempt. We express our sympathy for the physicians of Victoria who are fighting this battle. We feel that if they stand firm and true that theirs, which is the right, will triumph. We regret that Dr. Hall and Dr. Gibbs should have arrayed themselves against their professional brethren in that city in a cause that can have no good argument on its side. True, Dr. Hall may champion the cause of the masses, but with all due respect to his views on lodge practice—and we think he will hardly expect us to consider them as very strong arguments in favor of the continuance of the system—he is on the wrong side; and the sooner he acknowledges the corn and the error of his ways in this particular business, the sooner will a dying cause expire peaceably, if not the world over, at least in Victoria.

THE EXAMINATION OF SPUTUM FOR TUBERCLE BACILLI.

Whilst it may be at times a comparatively easy matter for the adept diagnostician to determine the existence of pulmonary tuberculosis before the appearance of the specific micro-organism in the sputum of these patients, it is a matter of the most vital importance to be able to do so immediately the bacillus can be demonstrated therein. It will create in the mind of the patient a confidence in the skill of his physician, which will be of undoubted advantage in the future treatment of the patient. All general practitioners, therefore, ought to qualify themselves in the methods necessary for the microscopical detection of the bacillus in a disease which is the paramount issue in present-day medicine. Were these methods of an intricate and delicate character, requiring much time and patient labor in carrying out their detail, there would be some excuse for not acquiring the requisite knowledge for the work; but when the knowledge can be easily attained, and the execution of the work quickly carried out, there seems to be no valid reason why all should not do the work for themselves. In the August number of *Medicine* Dr. Carl Weidner, Professor of Physiology and Histology in the medical department of Kentucky University, gives

a clear and simple demonstration of the plan of procedure. We can best give this in his own language:

1. Spread the sputum upon the cover glass, as a thin homogeneous layer. This is best done by means of a sterilized platinum wire loop fixed in a glass rod, because it is well suited to pick out the purulent masses from the sputum, and because it is cleaner than the common method of spreading small particles of sputum between two cover-glasses.

2. Dry the sputum thoroughly in the air.

3. Fix it by passing it through a flame three times.

4. Float the cover glass, with the sputum side downward, in a watch crystal full of Ehrlich's solution of either anilin gentian violet or anilin fuchsin.

5. Heat over a small flame until the staining fluid begins to boil.

6. Set aside for one minute to prolong the action of the stain.

7. Remove the cover-glass with the forceps, and, without washing it in water, place it in a solution composed of three parts hydrochloric acid and ninety-seven parts absolute alcohol. Leave in this solution for one minute, and rinse well in distilled water. The specimen ought to appear nearly free of all color to the naked eye.

8. Counterstain in a weak solution of methylene blue for several minutes.

9. Wash in distilled water, dry in the air, and if you want to keep the specimen, follow at once by passing it again through the flame. This is done for the purpose of getting rid of all acid which might have a decolorizing effect later on; then mount in xylol balsam and inspect with a good 1-12 oil immersion lens, using open condenser and maximum illumination.

Two points in this method are particularized by Weidner: First, the floating of the cover-glass with the smeared side down, instead of holding it with forceps, as usually done, with the stain on top; and the second advantage lies in the method of decolorizing by a weak solution of acid in combination with strong alcohol.

"THE FOURTH DISEASE."

In the issue of *The Lancet* of July the 14th, Dr. Clement Dukes, physician to Rugby School, gives a very interesting detailed account of the result of his observations and clinical experience regarding a kindred disease to measles, German measles, and scarlet fever, which, for the purposes of present differentiation, he denominates "the fourth disease." From time immemorial medical men have held conflicting views with regard to

German measles, which apparently even prevail at the present day in some quarters, although held to be separate and distinct by most authorities. To Dr. Dukes, however, there seems to be two separate and distinct trains of manifestations usually classified under one head as one disease; and his paper and observations endeavor to establish the fact of two well-defined affections instead of one as heretofore obtaining. The "fourth disease" apparently closely resembles scarlet fever, we presume the interesting feature of the differentiation, but has never been observed to develop into scarlet fever. We are led to assume, therefore, from the carefully prepared diagnostic table of symptoms and reports of cases that the cases of the scarlatinal variety are not German measles at all, but another affection to be included in the exanthem category. A reference to the rash in this disease may prove interesting. Whilst this may closely resemble measles well on in the course of the eruption in that it presents a somewhat diffuse punctiform appearance, it is not the same, because it does not pass through the maculation process ordinarily seen in morbilli, but apparently takes on the scarlet fever characteristics from the beginning. We are then told that in most cases the patient desquamates pretty freely, in brany scales mostly, but at times larger, resembling desquamation as in scarlet fever. An attack previously of German measles does not render the patient immune to "the fourth disease." The subject is one which will no doubt stimulate observation in this direction, and it may be that the time will approach when mild cases of scarlet fever now diagnosed as such will be placed under the heading of "the fourth disease," as such cases undoubtedly exist, and have probably occurred in the practice of most of us.

CHLORETONE.

Freeman F. Ward, M.D., New York, has been experimenting lately upon himself with regard to some of the more recent hypnotics; and as they concern a drug which has rapidly crept into popular favor, these experiments and his observations are interesting. Chloretone was found to be the most efficient and as well the freest from after-effects. He took chloretone for several nights in succession, the only after-effect noted being a slight headache in the morning which disappeared on taking a cup of coffee. This headache he considers chargeable to the effects of the drug, as he was not before the subject of this complaint. Experiments upon a large number of patients followed;

they not knowing what they were taking, and in only two of the patients was a slight headache experienced on waking in the morning. The drug is a product of the decomposition of equal parts of chloroform and acetone in the presence of caustic potash. He considers that the best method of administration is to give from three to five grains dissolved in alcohol or whisky, to be followed at bedtime by a glass of milk. The drug has now been tested for some years at Johns Hopkins Hospital, and is now commonly being used in general practice.

CANADIAN MEDICAL ASSOCIATION MEETING OF 1900.

SIX THOUSAND physicians in Canada, three thousand in Ontario alone, and only 153 at the annual meeting of the Canadian Medical Association.

WOULD it not be better for those who read papers to remember that they only have fifteen minutes to do this in and not write papers that would take an hour for their deliverance.

MANY of those who attended the 1900 meeting will never have an opportunity of reading the whole of these papers. They simply hear the head, while the body and the tail are forever lost to them.

COULD any president have been more successful in the conduct of the meeting than Dr. R. W. Powell? We opine not.

WHY not give the exhibitors a fair chance impartially, when you grab their money?

WHAT happened the large delegation from Toronto? An important section of the profession in that city was absent.

THE choice of president for 1901 is an extremely happy one. Dr. H. H. Chown is all the way.

A STEP in the right direction was that taken towards having the proceedings published in full.

TO those who had the privilege of hearing Dr. J. C. Mitchell's private demonstration on the liver of the cod and its products, it was quite apparent that there was nothing the matter with the doctor's own liver.

Dr. V. H. MOORE is a bright impromptu speaker. He was allotted for the time being a taking subject. No one will say that he did not acquit himself grandly.

IT was an amusing sight to see big John Malloch and our big Scotch friend from Truro, Muir, engineering a motion to have our tuberculous friend "locked up."

THE only thing the matter with the Academic Hall of the University of Ottawa is its draughts; these were not the proper kind to suit the taste of the audience.

WHAT is the matter with the country practitioner? A perusal of the programme reveals the fact that not a single country practitioner was down for a paper or a case report.

FUNNY to see Dr. O'Reilly stand quietly by whilst his old friend "iodoform" was being sand-bagged by Mr. Owen.

EVIDENTLY Professor Shattuck thinks "Dr." good enough for the most eminent surgeon.

LETS hurry up and corral the "vaster empire than has been" before the quacks and the "Christian Scientists" squat thereon.

"I'M the man who loosens the cravats," was not engaged for the banquet at the Russell.

THE chill of the weather was overwhelmed by the warmth of the Ottawans' welcome.

MAYOR PAYMENT is a "hale fellow well met."

THE sunny smile of Sir Wilfrid and the robust presence of Sir Charles were sadly missed, but the Mayor was "all in all."

CHOWN will no doubt make things hum next year, as he is something of a "hummer" himself.

OUR friend Starr must be something of a politician. The resignation idea was all right. All seemed to be satisfied, however, that the General Secretary would still be found at the "Biological Department of Toronto University."

THE smoking room, for a reason all its own, was a place of special attraction.

News Items.

THERE is a mild epidemic of whooping cough in Ottawa.

DR JAMES THIRD has resigned from the Superintendency of the Kingston General Hospital.

DR. GILLIS, Medical Superintendent of Brandon Asylum for the past four years, is to be removed by the Macdonald Government.

TRINITY Medical opened on the 18th inst. The Rev. Armstrong Black delivered the opening lecture.

DR. HARRY J. WATSON, of Ottumwa, Ia. (Trinity, 1896), has been appointed surgeon in the United States Army for service in China.

SOME deaths amongst children in Toronto have been traced to ice cream which had been subjected to the process of refreezing.

DR. HAIG, Campbellford, Ont., has been appointed Superintendent of the Kingston General Hospital, and will begin his duties on October 1st.

DR. P. H. BRYCE, Secretary of the Provincial Board of Health, has placed his views on record favoring swimming baths for the City of Toronto.

ARRANGEMENTS have been completed whereby Montreal will erect a crematory, to be built and endowed through the munificence of Sir William C. Macdonald.

AT the last meeting of the Medical Society of New Brunswick Dr. G. T. Smith, of Moncton, was elected President, and Dr. J. H. Scammell, of St. John, Secretary.

THE Medical Society of Nova Scotia offers a prize of $10 to the pupil under 16 attending the public schools of the Province for the best essay on "School Sanitation."

DR. GORDON BELL, Secretary of the Board of Health of Manitoba, is investigating outbreaks of typhoid throughout that province. He will issue a pamphlet on the subject.

THE Province of Quebec is now practically free from smallpox. The last case was disposed of about a month ago. A few cases of scarlet fever still exist, but they are well under control.

DR. LAMONT, Winnipeg, has arrived home after finishing a trip of 2,000 miles of Indian medical inspection on the Saskatchewan River, and Lakes Winnipeg, Manitou, and Winnepegosis.

DR. MORRISON, a graduate of Queen's, Kingston, has been appointed house surgeon of the New York Polyclinic Hospital out of upwards of fifty applicants from the United States and Canada.

RECENTLY the health authorities of Montreal found fourteen Roumanian Jews inhabiting one room. It was thought that this was not conducive to good health, so the landlord was notified to have them removed.

WESTMOUNT (Montreal) is contemplating the erection of a hospital for contagious diseases at a cost of $75,000, and the Medico-Chirurgical Society of Montreal will co-operate with the Town Council in the matter.

DR. E. PROSE, late of the Manitoba Medical College, writes from Cape Town, August 1st, stating that Dr. A. B. Bing, who was a fellow-graduate of the same college in the same contingent, died at Johannesburg of enteric fever.

THE regular annual meeting of the Dental Association of the Province of Quebec was held the last of August in Laval University. Dr. G. E. Hyndman was appointed examiner along with Drs. Rourdon and A. Scott Ives, of Montreal.

THE Board of Health of British Columbia is taking all necessary precautions to detect cases of the bubonic plague. All sickness and deaths amongst Chinese and Japanese must be immediately reported to the secretaries of the Board of Health.

WE have just received a letter from Dr. J. N. E. Brown, Secretary of the Yukon. He speaks of the splendid reception accorded the Governor-General and the Countess of Minto on their recent visit. The Doctor also had the pleasure of dining Dr. Montizambert when in that district.

THE Board of Health of St. John is having some trouble with the milkmen of that city. Dr. Christie, of the Board of Health, does not believe in tuberculin, but the board expects that he will see that infection does not arise through tuberculous cattle, and the milkmen do not wish to put their cattle to the test.

DR. A. J. DOUGLASS, of Winnipeg, has been selected from among about a dozen applicants for the position of health inspector for Winnipeg. The former inspector, Dr. Inglis, severed his connection with the Health Department on account of difficulties arising in connection with the recent smallpox outbreak.

BRITISH Columbia physicians have established a provincial medical society to be called the British Columbia Medical Association. Their first meeting was held in Vancouver on the 9th and 10th of August. Dr. R. E. McKechnie, Nanaimo, was elected President; Dr. R. E. Walker, New Westminster, Vice-President; Dr. J. M. Pierson, Vancouver, Secretary, and Dr. J. D. Helmeken, Victoria, Treasurer.

Correspondence

THE LODGE QUESTION.

To the Editor of DOMINION MEDICAL MONTHLY:

SIR,—Is there any just and sufficient reason why lodge or contract medical practice should be continued? Should or should not the contract system be encouraged? The principle has been conceded by the great railroad companies, the mining and lumbering enterprises and the collieries. These corporations have adopted the system and have found it a most satisfactory method of extending medical and surgical assistance to their employees. By this method the employee pays a small amount each month, which he practically never misses from his monthly wage, which amount entitles him to attendance in case of accident or injury, in short, is simply a legitimate method of insurance. Surely to the average wage-earner sickness or accident are in themselves sufficient misfortune without the additional burden of even a reasonable bill for medical services. For instance, supposed a man earned $2.50 per day with a charge upon him of a wife and four children, is stricken with typhoid fever. His little savings will soon find ample field for investment in household necessities during the period in which his income is stopped, which may be considered, counting sickness and convalescence, at least seven weeks; but now he finds himself face to face with a debt of say $75.00 for medical attendance. In addition to other necessary expenses incurred, would he not be placed under a somewhat heavy burden? Those who have never known what straitened circumstances mean cannot realize the force of what I am endeavoring to state, but by far the majority of the working people know of what I speak.

Under the co-operative system such a condition would be obviated by the financial burden being borne by the aggregate. By means of the contract system, habits of thrift are developed by the regular payment of a small sum monthly, while the medical attendant receives ample remuneration for his services, and experiences no trouble in collection, while under the direct system the attendant frequently remits the fee in cases of necessity, and as frequently is cheated out of it by those who could pay at least a moderate fee.

To say that it is unjust or unprofessional for $50.00 worth of work to be had for $3.00 per year, is to say that it is unjust and unbusinesslike for a life insurance company to pay a $5,000 death policy when only $50.00 has been paid in

premiums, or to say that it is an outrage that I can collect $2,500 from a fire insurance company in case of destruction of my residence by fire when my premium is about $10.00. But life insurance stock is an excellent investment, and fire insurance companies still remain in business. In fact, there can be but few arguments used against this system that cannot with equal force be used against all other kinds of insurance.

The question has been asked: "What if all business be conducted under such a system?" I answer that under such conditions there would be no waste of competition and greater economy in administration, and thus all concerned would be benefited. But between ordinary business and the practice of medicine there is this radical difference, that while your drygoods or hardware account is generally an indication of your prosperity your medical bill is usually the measure of your misfortune. We look forward to that time when the alleviation of suffering will not necessarily place the patient under financial obligations. The dispensation of relief from physical distress should be made as free as the services of the health officers or as the privileges of church associations are to the communicants. The private financial factor should be done away with, and the state assume control; the officers selected, the field of operations defined and the remuneration for services determined by the municipality; and such can be done in a highly satisfactory manner by our energetic and capable municipal health officer. But it is a vista of the future. Not a few of the leaders in the republic to our south are moving in the direction of state control of medical practice. It is but recently that an editorial in a leading American medical journal gave an expression to the hope that the day would soon be here when medical men would be educated by the state, paid by the tate, and after the required term of service pensioned by the state. Is it not as reasonable for the state to undertake the fighting of germs and the removing of tumors as to combat Boers and Boxers? A prominent American surgeon in a private communication to me, stated: "I have seen better and better the need of socialism as applied to the maintenance of the public health, and I hope to live to see the time when the health of each community (or commune) shall be looked after on the same plane as is its education.

My brother, Dr. Hall, Professor of Physics in Kansas City University, in discussing our present competitive system, thus refers to the medical problem: "The professions have all along asserted their independence of our commercial system, even when compelled to fall in with it. Doctors are independent of the

competitive system, except as the competition comes from within. But the multiplication of medical colleges and the freedom given in some places to unorthodox systems, has torn down the barriers beyond repair. Competition is in all the professions, though not yet in full force. They will follow the same course as common labor, namely, the doctors will lose their independence and become the employees of corporations and unions. There will be individual exceptions, but this will be the rule, because it is the most economical and equitable plan for the employers. The employed will have to submit to it. Then wages will have to drop, as in other cases, until they are down to the cost of subsistence (in the required style). In Germany now the services of a Ph.D. can be obtained for about the same wages as those as a good mechanic.

Unions among doctors to keep up the standard of wages are as legitimate as other trades unions, but can, in the nature of the case, be only a partial success. The physicians' unions may obtain some temporary success by fighting the unions, but such a course is suicidal, for it will throw the power more completely into the hands of the capitalists. All the workers must unite in the coming contest, and not waste their energies in fighting each other. I also give an extract from an essay by Dr. A. D. Watson, of Toronto, which appeared in a Toronto medical journal:

"The lodge is a combine; so also is the insurance company, the street railway, the department store, the trust, the railway, the city water-works, the street commissioner's department, and every partnership on the planet. Every man or woman who writes a letter to a friend is aiding the most powerful and highly organized combine known to history, and that physician who has a contract to attend the employees of any firm of merchants or manufacturers, or the workmen of any railroad or street railway company, and who at the same time opposes the principle of lodge practice, is a hypocrite. Let me hasten to say that the dear brother does not seem to know it, so we forgive him and leave him to think over it. The pale moon could as easily thwart the splendors of dawn as could the medical profession abolish lodge practice, except by supplanting it by introducing state medicine and surgery. This and all other combines, including the trust and the department stores, must be extended till they assume national proportions; for the combine principle is all right when viewed from the interior. Let us, then, all get aside, and there will be no lodges left, their uses having vanished in the dawn of a science of national sociology, a universal art of social life.

Victoria, B.C. ERNEST HALL, M.D., L.R.C.P., Edin.