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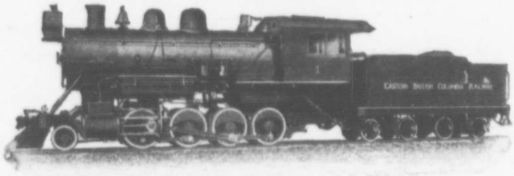

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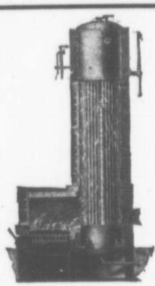

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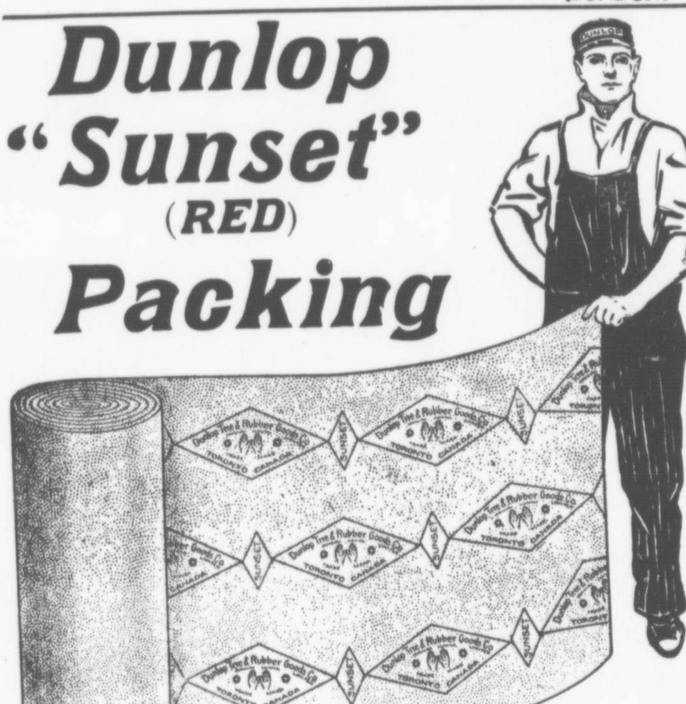

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OF CANADA

OFFICIAL PROCEEDINGS

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PROCEEDINGS OF THE CENTRAL RAILWAY AND ENGINEERING CLUB OF CANADA MEETING.

Prince George Hotel, TORONTO, March 15th, 1910.

The 1st Vice-President, Mr. Baldwin, occupied the chair.

Chairman,—

We will now come to order.

The first order of business is the reading of the minutes of the previous meeting.

As you have all had a copy of the minutes of the previous meeting, it will be in order for someone to move their adoption as read.

Moved by Mr. Herriot, seconded by Mr. Logan, that the minutes of the previous meeting be adopted as read. Carried.

Chairman,—

The second order of business is the remarks of the President

I might say that owing to the unavoidable absence of our esteemed President, Mr. Duguid, I find myself in the position of acting President.

I have one or two notes here that our Secretary has given me to read.

Mr. Fletcher, one of the members of the Reception Committee, is very seriously ill, suffering from typhoid fever, and I am sure we one and all hope he will soon be with us again.

The Secretary also asked me to make a few remarks about the Social Evening. I do not know that I can say anything about the Social Evening we had last month. If everybody did not enjoy himself, I am sure it was his own fault, as the Reception Committee spared no pains or expense to make the evening a success, and if anybody did not enjoy himself, now is the time for him to complain.

I wish to draw the attention of members who are in arrears with their dues for the years 1908, 1909 and 1910.

The paper at the next meeting will be on "The Physical Theory of a Dynamo," by Mr. H. H. Wilson, Chief Engineer, of the W. A. Murray Co., of Toronto, and I trust as many as possible will be present to take part in the discussion.

There was a notice of motion made at the last Executive meeting, but as the member who made the motion is not with us to-night we cannot bring it up.

Another notice of motion was made, "That representatives of firms be allowed to come before the Club and give papers on the wares they represent.

I may say in connection with this that other railroad clubs in New York, Buffalo and Montreal have given permission to representatives of firms to come before them and explain their wares. I think, myself, it would be a very good idea. Perhaps later on in the evening we will have a little discussion on this matter, and obtain the feeling of the members present.

If there are any new members here to-night, I wish to say on behalf of the Club that I extend you a very hearty welcome. We are always pleased to see new members, and would like them to know and feel that this is the most sociable institution in Toronto. It is the most harmonious club that I have ever been connected with.

I would like to make mention of the fact that we have with us to-night Mr. J. J. Fletcher, late Superintendent of the Manitowac Boiler Works, Manitowac, Wis. He is here partly on business, and partly on pleasure, and we are glad to know that although he no longer resides in Toronto he still takes an interest in the Club.

The next order of business is the reading of names of new members.

NEW MEMBERS.

Mr. A. T. Bliss, Machinist, Grand Trunk Railway, Toronto.

Mr. T. E. Greenshields, Machinist, Grand Trunk Railway, Toronto.

Mr. C. H. Patterson, Engineer, Dominion Government, Toronto.

Mr. H. Sayer, Clerk, Canada Foundry Co., Limited, Toronto.

Mr. Jas. Nicholson, Foundry Foreman, Canada Foundry Co., Limited, Toronto.

Mr. M. B. Horan, Superintendent, Pipe Foundry, Canada Foundry Co., Limited, Toronto.

Mr. W. M. McRobert, Chief Engineer, Power Plant, Canada Foundry Co., Limited, Toronto.

Mr. J. S. N. Dougall, President, The Dougall Varnish Co., Limited, Montreal.

Mr. G. F. Clark, Machinist, Consumers' Gas Co., Toronto.

Mr. W. B. Moss, Purification Foreman, Station A, Consumers' Gas Co., Toronto.

Mr. F. H. Jarm, Chemist, Toronto.

Mr. R. Stamp, Fitter, Canadian Pacific Railway, Toronto.

Mr. Thos. Honey, Fitter, Canada Foundry Co., Limited, Toronto.

Mr. Jas. Hughson, Representative, British American Oil Co., Toronto.

Mr. W. E. David, Architect, Toronto.

Mr. L. Davidson, Machinist, Grand Trunk Railway, Toronto.

Mr. E. Root, Salesman, Consumers' Gas Co., Toronto.

Mr. C. Winrow, Electrician, Grand Trunk Railway, Toronto.

Mr. J. Kennedy, Boilermaker, Grand Trunk Railway, Stratford.

Mr. J. A. W. Archer, Manager, Jeffrey Manufacturing Co., Toronto.

Mr. E. S. T. Gerow, Representative, Jeffrey Manufacturing Co., Toronto.

Mr. J. L. Wood, Superintendent, Construction, National Iron Works, Limited, Toronto.

Mr. G. Service, Resident Engineer, National Iron Works, Limited, Toronto.

Mr. H. Martin, Machinist, Consumers' Gas Co., Toronto.

Mr. J. A. McLardy, Trainmaster, Grand Trunk Railway, Stratford.

Mr. J. R. Leckie, Locomotive Foreman, Grand Trunk Railway, Palmerston.

Mr. R. S. Worboys, Machinist, Grand Trunk Railway, Toronto.

Mr. A. S. Doran, Machinist, Polson Iron Works Limited, Toronto.

Mr. A. Woodley, Foreman Moulder, Standard Foundry, Toronto.

Mr. G. Despond, Manager, Standard Foundry, Toronto.

Mr. W. C. Nickum, Naval Architect, Polson Iron Works Limited, Toronto.

MEMBERS PRESENT.

J. Bulmer.	J. G. Jones.	Geo. A. Young.
A. T. Cowpersmith.	M. G. Cowpersmith.	W. Philpotts.
J. Fellows.	C. G. Herring.	J. P. Law.
G. Kyle.	J. Mouldey.	D. Ross.
E. Blackstone.	W. E. David.	J. F. Neild.
C. F. Neild.	W. Dony.	R. Titlaw.
A. L. Jacques.	C. Chappelle.	G. P. Beswick.
J. Adam.	H. P. Ellis.	A. Gardner.
R. H. Brown.	G. S. Browne.	J. Bannon.
J. Herriot.	G. Baldwin.	J. W. Hetherington.
J. F. Campbell.	J. McWater.	G. Till.
W. J. Bird.	G. H. Boyd.	H. V. Armitage.
J. R. Armer.	T. T. Black.	W. Marchington.
W. T. Commins.	H. T. Massey.	T. E. Greenshields.
E. Logan.	F. R. Wickson.	J. H. Morrison.
J. J. Fletcher.	L. Salter.	W. R. Gardner.
W. A. Conroy.	G. Black.	E. B. Allen.
R. H. Fish.	W. Evans.	J. Barker.
H. Eddrup.	G. Cooper.	J. Dodds.
R. C. Hamilton.	L. S. Hyde.	C. L. Worth.

Chairman,—

I am very pleased to note that we have got such a list of new members. I suppose it is partly through the Social Evening, but perhaps it is through the hints that have been thrown out from time to time, to members of the Club, by the President, and the Executive. Because we have got a good big list to-night we do not want a small list at the next meeting. We can get in lots of new members if we only just try.

From the list you will see that somebody has been very busy, and I sincerely hope that those who have not been busy will get busy and get in more new members for the next meeting.

The next order of business is the reading of papers and the discussion thereon.

We have to-night a paper on "Suburban Sewage Disposal and Water Supply," and I wish to say that Mr. M. J. Quinn, Manager of the National Equipment Co., Toronto, who prepared and was to have read this paper, was called away by telegram to Ottawa last night, and Mr. F. A. Corns has kindly consented to assist by reading Mr. Quinn's paper.

I now have great pleasure in calling on Mr. Corns to read the paper.

SUBURBAN SEWAGE DISPOSAL AND WATER SUPPLY.

BY MR. M. J. QUINN, MANAGER NATIONAL EQUIPMENT CO., TORONTO.

It is, perhaps, no exaggeration to say that, having regard to the frequency with which it comes up for consideration, and many other circumstances, the question of properly disposing of sewage is one of the most important matters with which the health authorities throughout the country have to deal, and yet it is a remarkable fact that in these days of popular education, when the people enjoy the benefit of free literature and lectures on fruit-growing, dairying, domestic

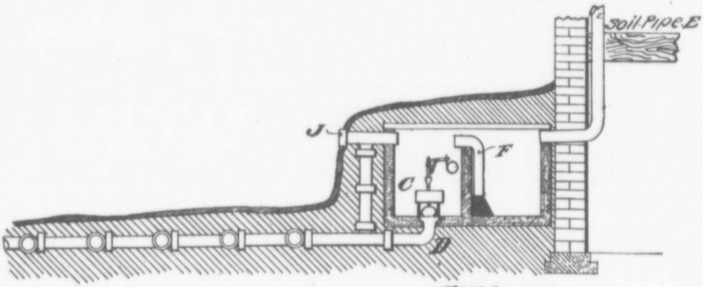

FIG 1

science, etc., that a knowledge of so important a subject, and one so closely allied to their physical and moral welfare is confined to a limited number.

True, a vast amount of experimenting has been done during recent years, and the matter has received a great deal of attention from scientific men, the results of whose labors have been freely discussed at medical conventions and reported in medical journals, but the valuable information so obtained has not reached the great mass of the people at all.

In the matter of public sanitation, the question of disposing of sewage in small towns and villages, as well as in less populated districts, where, by reason of its great cost, a general system of sewerage is impossible, is daily becoming of greater importance, and as the title of my paper would indicate, that is the phase of the question with which I propose to deal. The system to which I intend to refer is known as the septic tank system, and I believe that nearly all who have studied it are agreed that it is at once the most natural, most scientific, simple and economical system in use to-day, and, speaking from a personal knowledge of scores of these systems, I am in a position to say that it is worthy of all the good things that are said about it.

I have prepared a few sketches by means of which the fundamental principles that govern it may be the more easily understood, for the benefit of the layman who may be in need of information on the subject, and in order to emphasize the necessity of carrying out every detail, in constructing a system as hereafter described.

It is a matter of common knowledge that living earth—or top soil—is a powerful purifying agent, but comparatively few are aware that the presence in it of countless numbers of

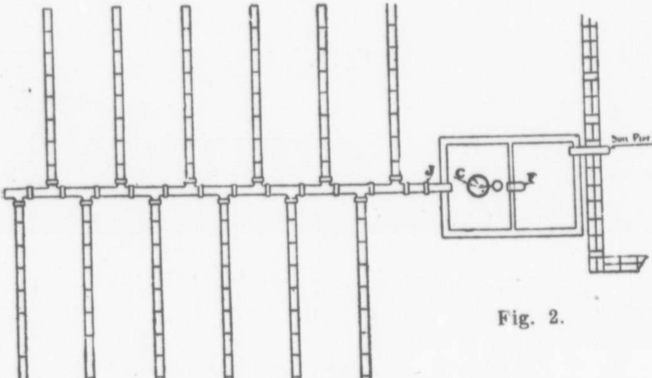

Fig. 2.

bacteria, or microbes, is alone responsible for the chemical changes brought about in waste matter placed beneath its surface, and that these bacteria, not only through their action remove and destroy the dangerous properties of such waste matter, but actually convert them into plant food, which, being taken up by the vegetation, is again consumed for the sustenance of life.

Pasteur divided these microbes into two classes, viz.:—Anerobes, or those which lived apart from air, and derive their oxygen from decaying compounds; and aerobes, or those which require plenty of fresh air for their development, and as both classes are considered necessary for the complete reduction of waste matter, it will be seen that if sewage is placed too deep in the earth, as, for instance, in a cesspool, where, owing to the absence of air, the necessary aerobic bacteria cannot exist, it may pass down deeper in a putrid state, and, finding its way to the water supply, not unfrequently results in an outbreak of typhoid fever or some other intestinal disease.

The two classes of microbes referred to have properties somewhat differing from each other, but the net result of their work under proper conditions is the breaking down of the solids in the sewage, the disintegrating of its constituents and the conversion of the whole into liquid and gases, in which form it leaves the septic tank, the former to be distributed under the surface of the earth, where, by reason of its contact with free oxygen, bacterial life is most active, there to be still further reduced and finally converted into nitrates, which are readily taken up by the vegetation on the surface, and the latter passing up high into the air, as hereafter described.

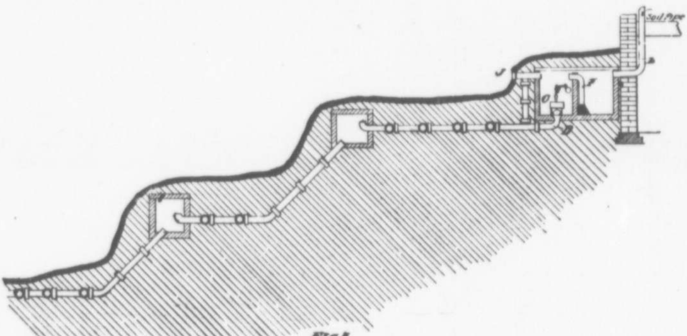

FIG. 5.

With this brief reference, then, to the principles which underlie what is conceded to be a most efficient system for the disposal of sewage, I propose to indicate how it should be constructed; and, in order that I may the more readily make myself plain, I present for your inspection a number of diagrams which I trust will accomplish the desired result.

In Fig. 1 is shown a section of a complete system built on level ground, with the tank placed close to the wall of the building—where, in fact, the large majority of those now in use are located.

The tank should be built of brick or stone, laid in and lined with cement, or of solid concrete, the main object being to have it impervious to moisture.

It will be noticed that the tank is divided into two compartments, an overflow pipe "F" being built into the dividing wall, the mouth of the said overflow being within seven or eight inches of the bottom of the tank, and being covered with a wire screen about the size of an ordinary pail, the mesh of which screen not exceeding three-quarters of an inch.

The main soil pipe is represented by "E," and should be directly connected with the closet, bath, sink, etc. It extends from the same compartment in which the overflow is placed to a point two or three feet above the roof, acting not only as a conductor of sewage to the tank, but also as a channel by which any gases in excess of those in solution may pass out to the atmosphere at a height which renders it impossible for them to inconvenience the occupants of the building.

"J" in the second compartment admits fresh air, which passes freely over the centre partition—spaces being left in

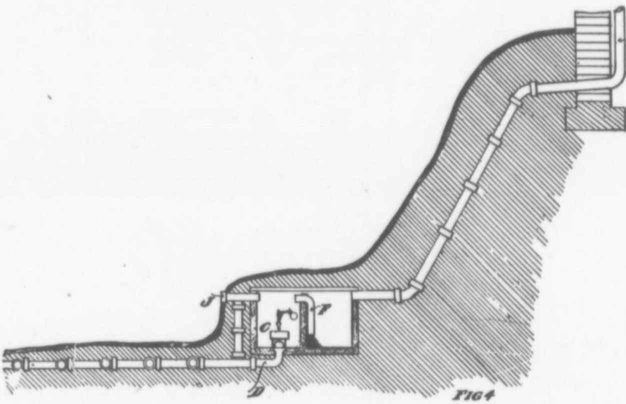

FIG 4

the top of the latter for the purpose—and up through the soil pipe to the roof.

In the centre of the second compartment is placed an automatic valve "C," which is caulked into a four-inch cast iron bend, as ordinarily used by plumbers, and which is securely built into the bottom of the tank during its construction. The top of the hub of the bend is usually left slightly lower than the level of the floor of the tank.

From the said iron bend is run a line of glazed tile pipe, four inches in diameter, having a connection with the fresh air pipe, for the purpose of ventilation, and a number of openings placed at intervals of two feet or more from which are run branches of four-inch field tile with loosely butted joints.

Fig. 2 shows a plan of the whole system and illustrates one way in which the tile may be laid, though, as will be manifest, they would do equally well if all laid on one side of the main carrier in any number of branches, of any length, providing a sufficient number in the aggregate are laid, and the rows are not placed closer together than two feet in light soil, and a somewhat greater distance in heavy soil.

The field tile should not be placed more than one foot be-

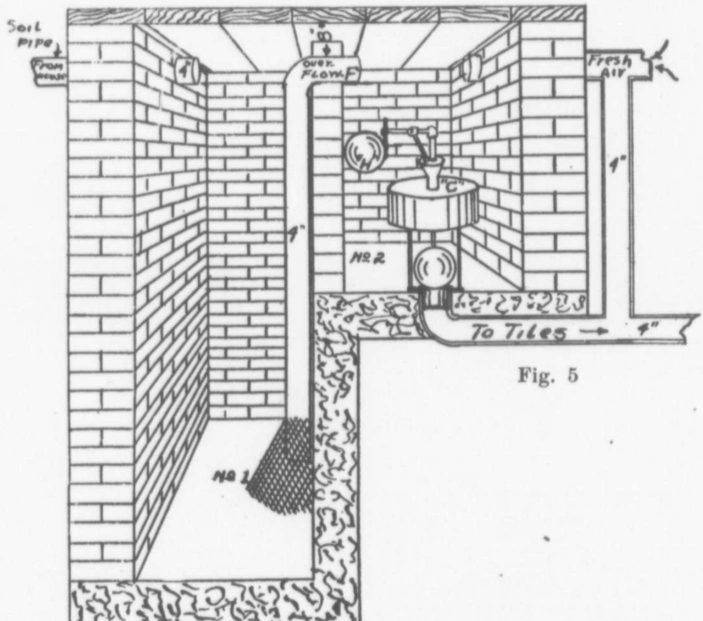

Fig. 5

low the surface, and must be perfectly level, for the reason that if given a fall the earth surrounding the low edges of the system would receive more than its share of liquid sewage, and might in time become fouled, while if level, the earth surrounding every tile has an equal amount of work to do, and will produce most satisfactory results.

Briefly, then, the operation of the system is as follows:—

The sewage from the building enters through soil pipe "E," filling the first compartment in which all the solid matter is retained until it is reduced by the contained bacteria which multiply and develop very rapidly. In a liquid form it is allowed to enter the second compartment through overflow "F," which is turned down because of the presence of the bulk of the organic matter in suspension on or near the surface.

When the liquid has risen in the second compartment to the height at which the unlocking float on the valve has been set, the valve automatically opens, and discharges the contents of that compartment, be it fifty or a thousand gallons, into the system of field tiles, through which it percolates into the surrounding earth, to be taken care of by nature as already described.

The valve is made to discharge liquid sewage at a maximum depth of 24 inches, and a minimum depth of 17 inches,

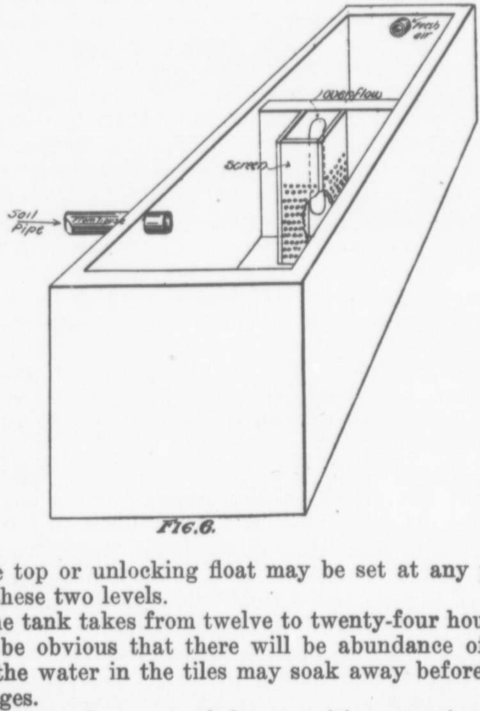

FIG. 6.

and the top or unlocking float may be set at any point between these two levels.

As the tank takes from twelve to twenty-four hours to fill, it will be obvious that there will be abundance of time in which the water in the tiles may soak away before it again discharges.

To prevent the gases of decomposition escaping through other than the proper channel, the tank must be covered first with rough plank, and then with five or six inches of earth, which in turn, if desired, may be sodded over.

In figuring out the size of tank necessary, the following may be taken as a safe rule, viz.: For every occupant of a private house or hotel, allow three cubic feet of space in each compartment, while for a school or factory, where, as in the case of a house, nothing but domestic sewage is to be treated, one-third less space will be sufficient, and for every cubic foot in one compartment (or one-half the tank) lay thirteen feet of four-inch field tile.

It will be obvious that, as in the case of ordinary stable manure, human excreta, if deposited in its solid state just below the surface of the earth, would entirely disappear in a very short time, and the system just described is merely a most convenient and sanitary way of automatically accomplishing that very desirable result, with the accompanying advantage of not only depositing it in the earth partially treated, but in a much more favorable condition to receive final treatment than could possibly obtain if the former method were adopted.

Anticipating the difficulty which will be encountered where there is a considerable fall in the ground surrounding the building to be drained, I would refer you to Fig. 3, which shows a number of terraces, each receiving a portion of the effluent from the tank.

It will be noticed that the end of the glazed tile is turned up a few inches on the brow of each terrace, the result of which arrangement being that all the field tiles at each level will fill before the sewage can rise and overflow to the tiles on the next lower level, where the same operation takes place, and so on for any number of terraces, and, as will be apparent, the sewage passing into the tiles on a high level cannot possibly escape to those lower down, so that the earth surrounding every tile will have its full complement of work to perform.

Fig. 4, the horizontal scale of which is somewhat exaggerated, shows the proper relative position of the tank to the house, where the field tiles have to be placed on a level considerably below that on which the building stands. In such a case it will be evident that were the tank placed in the high level, the discharge would come down with sufficient velocity to wash out both earth and tiles, while the discharge from the house to the tank, as shown, will not have any injurious effect on the latter.

It sometimes happens, where large tanks are required, as, for instance, in schools, factories, etc., that ground room is limited, and it would prove difficult to install a tank of the proper cubical contents and a maximum depth of not more than three feet.

In such a case it is permissible to build compartment No. 1 as deep as five or six feet, giving it the same cubical area as No. 2, which, however, in no case should exceed three feet in depth; such an arrangement is shown in Fig. 5, which also shows that the overflow pipe is carried to a point as near the floor as it would be if the tank were shallower.

The arrangement of the overflow screen shown in Fig. 6 has proven to be a very satisfactory one. As will be plain, it is merely three pieces of board, which, with the cement partition, make a box about ten or eleven inches each way inside; it is closely perforated with three-quarter-inch holes up to a height of about eighteen inches, and is secured in place by a couple of pieces of wood reaching to the opposite side of the tank, it has the advantages of longer life than the wire screen and of being easily removed should occasion at any time require it.

In answer to a question which arises in the minds of most people who have given consideration to the system, I may say that it will not freeze in winter, even when the frost penetrates the ground for several feet everywhere except where the tiles are laid, and, as may be expected, splendid results may be obtained in vegetables or flowers if the tiles are laid under a garden.

In conclusion I would simply refer to a few of the principal points which should be kept in mind in constructing such a system, viz.:—

Have the tank covered with a few inches of earth, to prevent the escape of gases, except through the soil pipe stack. See that the valve discharges at least once before the tank is covered in. See that no trap is placed on the main soil pipe to prevent the free passage of air across the tank and up to the roof, and that the necessary space for the air is left in the top of the centre partition, and, finally, take care that no disinfectants or chemicals of any kind are allowed to enter the tank, if the life of the bacteria, upon which the system depends for its success, is to be preserved.

As has already been noted, the tendency on the part of those living beyond the confines of thickly populated districts to demand facilities for the promotion of both comfort and health equal to those, which until comparatively recent years have been enjoyed only by those living in large cities, has been annually increasing, and to such an extent has success crowned the efforts of those who set about devising methods by which these very reasonable demands might be satisfied, that it may be safely said that in respect to sewage disposal, water supply, artificial lighting, etc., the rural resident may enjoy at no great cost all of the advantages possessed by urban residents.

The question of sewage disposal having been dealt with, a brief description of the most approved and up-to-date method employed to provide a first-class water service system may not be out of place, and I present herewith three illustrations, with the assistance of which the theory of what is known as the pneumatic water system is clearly demonstrated.

Until very recent years, where any attempt was made to introduce a water supply into a building, where a regular water service was not available, it was the practice to erect a reservoir on the top of either a house or barn, or else on the tower of a windmill, or on one built especially for the purpose.

This method, however, had many inherent disadvantages, among which were the absence of reasonable pressure, the effect of the atmospheric temperature during both winter and summer and, particularly where the tank was placed in the house or barn, of birds, bats, vermin, etc., being drowned and contaminating the supply, not to speak of the constant contact of the water with dust, bacteria and bad odors.

Another important drawback was the liability to leakage, and the consequent damage where the tank was placed under the house roof, to plaster and decorations below.

Then again, special protection had to be made for carrying the sometimes enormous weight of water stored in large tanks.

All of these difficulties and disadvantages have been overcome by the use of the pneumatic water supply system, which has been in use in the United States for sixteen or eighteen years, and is already becoming quite popular in many sections of Canada.

In figure seven is shown the simplest type of the system under discussion, which consists of a pump with necessary connections and a perfectly air-tight tank, to the bottom of which is connected two pipes, one to convey water from the pump to the tank and the other from the tank to the plumbing fixtures in the basement and upper floors. Such an arrangement constitutes a pneumatic system.

As the water is forced into the bottom of the tank and begins to displace some of the air, the latter is compressed into an ever-decreasing space, creating a force known as pressure, and if a tap connected to the discharge pipe in the basement were opened all of the water in the tank would be forced out by the compressed air again expanding to its normal volume. The inlet and discharge pipes from the tank being connected to the bottom thereof, absolutely preventing the escape of the air until all of the water has escaped.

As you are aware, for one pound of pressure indicated by the gauge, water can be forced up through a vertical pipe to a height of twenty-seven inches. Therefore, sixty pounds pressure will elevate water 135 feet above the tank. So that while all of the water would be discharged from a basement tap, a less amount would be discharged from the fixtures at a greater elevation.

With an absolutely air-tight tank the contained air can be

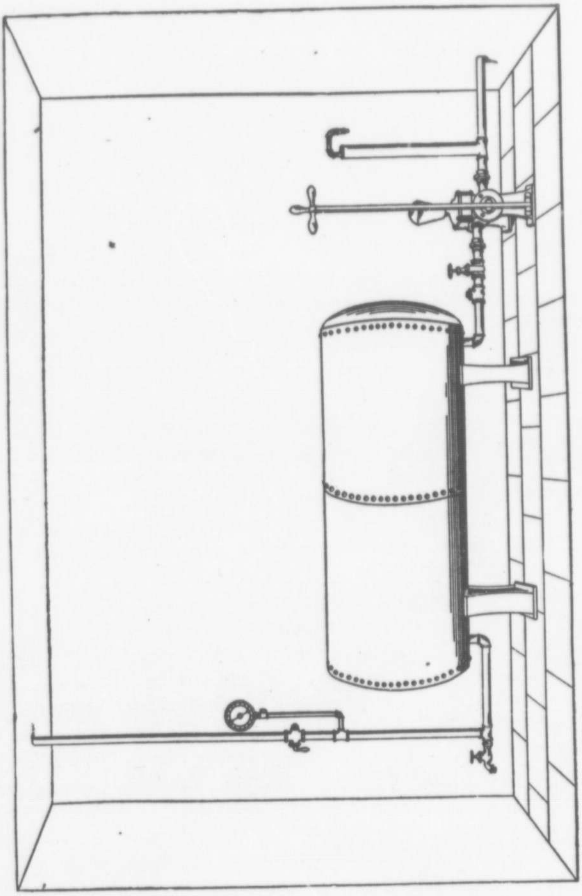

Fig. 7.

lost only in one way, viz.: Its absorption by the water due to temperature variations in the latter, and as a rule, loss due to this cause is almost infinitesimal. Provision is made, however, for the supply of more air when such becomes necessary, by one of three methods, viz.:

(First) At a convenient point on the suction pipe is a small stop cock, or check valve, which may be opened by hand when occasion demands, permitting the entrance of a small amount of air with the water being delivered into the tank.

The second method is by means of a combination water and air hand pump, which is ordinarily supplied with these systems.

The third method, which, however, need only be considered in connection with a system of considerable size, is a special air compressor, worked either by hand or from a countershaft, as may be desired.

The necessity for having an absolutely air-tight tank can scarcely be exaggerated, for as will be clear to you, the continued successful operation of the system depends upon retaining the air cushion at a high state of efficiency.

For example, if a tank loses a few cubic inches of air per day it will only be the matter of a short time until the efficiency of the system will be materially decreased; the amount of water which may be obtained from the tank being decreased just to the extent that the air has been allowed to escape, and every one familiar with the building of tanks is aware that the ordinary storage tank which would be tight under water pressure, is very unlikely to hold air, for the same reason that a wire basket which would hold potatoes would not hold sand.

One of the advantages of the pneumatic system is the fact that almost any desired quantity of water may be stored, because a foundation in the ground is easily obtainable, whereas a most expensive substructure may be necessary in the case of an elevated tank.

Another is its elasticity, for if at any time, owing to increased requirements an additional supply is needed, it is only necessary to connect up one or more tanks of any size that may be desired, using only one connection between the additional tanks and the previously established system, as will be obvious, the water will come back from the tank through the pipe by which it entered.

Another advantage is the possibility of having a considerable quantity of water at high pressure in case of fire. Every year many serious fires might be prevented if an adequate supply of water had been available during the incipient stage.

The pump shown in figure seven is of the type used where the source of supply is twenty feet or less below its base.

Figure eight illustrates the type of pump used where water is found at a greater depth than that mentioned, and is built on the well-known principal which permits the placing of the cylinder within a few feet of the water, no matter how far below the base of the pump it may be found.

Figure nine illustrates the conventional house plumbing system furnished with water from a pneumatic tank located in the basement. In this case a hot air engine is the motive power, but as will be obvious, a pump operated by hand, gasoline engine, electric motor, etc., may be substituted therefor.

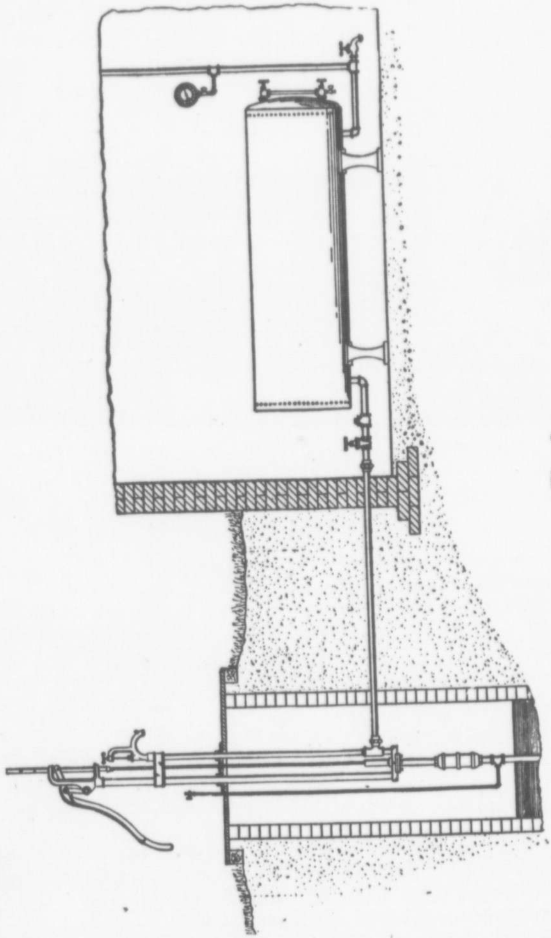

Fig. 8.

The electrically operated pump, equipped with an automatic controller, is undoubtedly the most convenient type of pumping apparatus used in connection with this system.

There are several types of automatic controllers, several of which can be absolutely depended upon to provide any range of pressures required, the usual deferential being twenty to thirty pounds, allowing for a maximum pressure of fifty pounds, and a minimum pressure of say twenty-five pounds. Thus the motor is not started too frequently, and the system requires no attention whatever on the part of the owner beyond oiling his motor and pump at regular intervals.

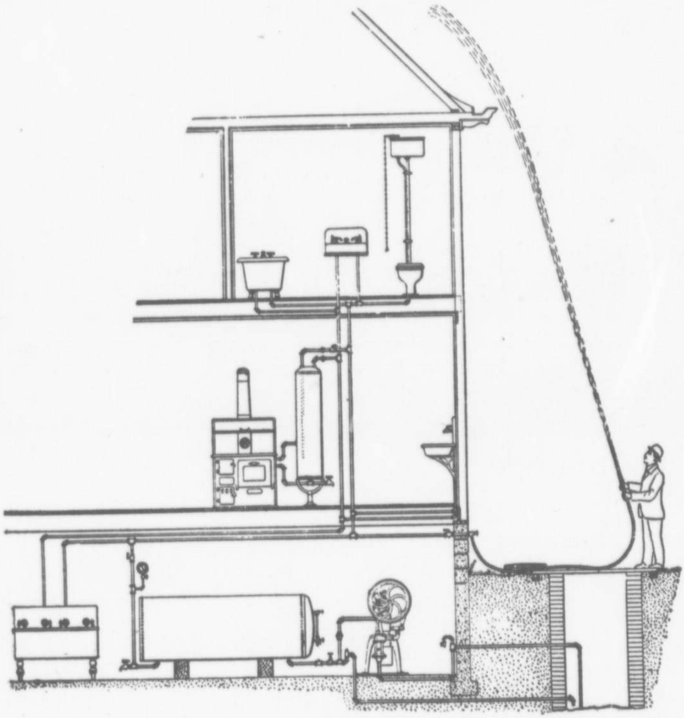

Fig. 9.

These systems are provided with tanks ranking from 140 gallons to 20,000 gallons, the larger size being the practical limit, so far as space is concerned, of the ordinary freight car, so that where greater capacities of water are needed, two or more tanks may be connected together.

Chairman,—

While all credit is due to Mr. Quinn, who is unavoidably absent, for preparing the paper, I think a word of praise is due to Mr. Corns for the manner in which he has read the paper.

I think the old saying is a true one, "One volunteer is worth a dozen press men." Mr. Corns volunteered to take Mr. Quinn's place.

We could have asked several members to read the paper, but Mr. Corns volunteered to read it, as it is a subject he knows something about.

I have no doubt that if any member present desires to ask any questions, Mr. Corns will oblige by answering them.

Mr. Bannon,—

I have been asked to take up this discussion, and although a copy of the paper was sent to me before the meeting, I have been unable to find time to read it through.

As far as sewage disposal is concerned, I must confess I do not know anything about it, but there is one question I would like to ask Mr. Corns.

Supposing the drains were placed ten or twelve feet below the surface, instead of eighteen inches, would the soil at that depth be able to get rid of the bacteria as well as the sub-soil?

Mr. Corns,—

At that depth the soil would be too heavy to absorb the liquid flowing from the tank and the sewer would become choked. You must have the drain laid in the light sub-soil to be operative.

Chairman,—

We have quite a number of temperance men here who might like to ask questions about the water supply.

Mr. Bird,—

There is one question I would like to ask in regard to the water system described in the paper.

When you open a tap would it not cause bubbles of air in the water?

When you open a tap in the bathroom there is always bubbles of air in the water; would this system not have the same effect?

Mr. Corns,—

In this system you take the water from the bottom of the tank. In the case you speak of the bubbles of air are in the water itself. There is always more or less air in water which cannot be eliminated.

Mr. Bannon,—

As I understand the water system, the idea of the tank is to compress the air. That is, to get the desired volume of water you must have the compressed air to force it out of the tank. For instance, if it took forty pounds pressure to carry the water to the top of the house, you could pump the tank up to eighty pounds pressure and still get the necessary amount of water; so that the idea of the tank is to maintain a pressure at all times; if the air was not there you would not get a flow of water at the top of the house when the pump is not running.

Mr. Corns,—

That is right. With the air system it obviates the necessity of having a pump running all the time. You could have a pump working all the time, with a control on it; but that is more trouble and it requires attention all the time, whereas with the pneumatic system, the tank is pumped up at night and it will keep filled all night. It is not necessary to have a motor, but it can be arranged to be run with a motor, and when the pressure goes down you can start the motor.

Mr. Herring,—

Can that system be applied to a filtration system. Take for instance a pressure system?

Mr. Corns,—

It has been applied to a certain extent.

At several sewage works, pneumatic pumps are used to force the sewage by air pressure from one tank to another to overcome the difference in level.

Mr. Herring,—

Was that in separate filter tanks?

Mr. Corns,—

In the case I have in mind it is entirely separate. I do not know but what it could be applied in another case.

In Liernwis Pneumatic System, the branch drains discharge into a receiver from which the sewage is sucked to a district reservoir. The vacuum is produced in the reservoir by means of steam, gas or electric power at the works and air enters down the ventilating shafts with a force sufficient to carry the sewage rapidly to the district reservoir. Provision is made to prevent the traps under w.c's. being exhausted. When the sewage reaches the central station it is subjected to heat which vaporizes the water, reducing the bulk, and the residue is carted to the land as manure.

Mr. Cowpersmith,—

In regard to the septic tank. Do the bacteria produce themselves in the first place, or do they have to be put there?

Mr. Corns,—

I think there is always a sufficient number of bacteria present. They multiply very quickly under favorable conditions.

Mr. Armer.

I just want to ask a question about the septic tank. I should like to know whether the solid matter was left in the tank or whether it was drawn off with the water?

Mr. Corns,—

If the system is perfect the solid matter is broken up by the bacteria and there is nothing but liquid left, but in practice there is generally considerable solid matter left and this has to be cleaned out.

Mr. Wickson,—

This is a very live subject in Toronto at the present time; both as regards sewage disposal and water supply.

It is not much use my trying to get up a discussion on that tank system, as it seems to have been written by an expert, and all the questions of interest have been answered.

There is one thing I would like to know. I notice the tank shown is on the side of a hill. I have been told of septic tanks in use in gardens, on the level, and they seem to work very well. Is it necessary to have the tank on the side of a hill?

Mr. Corns,—

They usually try to build them on the level ground. In fact a hillside is detrimental to the working of the system. The system is simple when it is on the level, as the flow of the sewage is slower and the earth surrounding each tile has an equal amount of work to do. The illustration shown was intended to facilitate the description of plants which had to be constructed on sloping ground.

Mr. Wickson,—

Are there absolutely no foul gases rising from it; or are they all taken up by the soil?

Mr. Corns,—

The gases are all absorbed by the earth. That is the reason why it must be placed below the ground.

Mr. Wickson,—

In regard to the water supply system. I understood you to say that it was only necessary to supply air to the tank to take the place of that which has leaked from the tank or was absorbed due to change of temperature.

I would think that water under a pressure of seventy or eighty pounds would absorb more air than when under a lower pressure and carry off some of the air with it.

Mr. Corns,—

It is a very small percentage under the conditions shown.

Mr. Cowpersmith,—

Is it necessary to keep the sunlight from the bacteria? Are the tanks containing the bacteria covered over?

Mr. Corns,—

Yes; they are always covered over.

Mr. Cowpersmith,—

There are the anerobes which do not thrive if there is air, whereas the aerobes require plenty of air. In fact some septic systems they have aerated water and let it run through the system.

Would this system be suitable for a city like Toronto?

Mr. Corns,—

There are many different systems. The one we have under discussion to-night, being designed especially for rural townships, it would hardly be advisable to open up a discussion as to the advantage of this particular system for large cities.

Mr. Cowpersmith,—

The principle is the same?

Mr. Corns,—

Yes.

Mr. Bannon,—

Mr. Corns is no doubt conversant with the tank at the Royal Muskoka Hotel.

I remember being up there to inspect some boilers. There are a series of tanks into which the sewage passes and the liquid runs down into the lake. Much to my surprise, the man who was showing me the tanks took a glass of water from where it was running into the lake and drank it. The water appeared to be pure.

Mr. Corns,—

I have seen water that looks quite clear, but it is a long way from being pure.

I have seen septic tanks applied on some of the steamboats on inland lakes, with the idea of preventing the water in the lake from becoming contaminated.

These are a modified form of septic tank, and, I think, partially successful. They are not entirely successful because they do not have large enough tanks. Even though they are not quite successful, it is certainly better to use them than to flush the sewage straight into the lake, as they save a large amount of solid matter from going into the water that would otherwise be there.

Mr. Wickson,—

At Grand Rapids, Michigan, the Grand river is about a couple of hundred yards wide, by an average depth of about three feet. Below the city the water is naturally very bad, and as many of the towns between Grand Rapids and the lake take their water from the river, I would consider their supply was in very poor condition. It is claimed, however, that this water purifies itself as it went along by being exposed to the sunlight and air.

Would like to know if there is anything in this?

Mr. Corns,—

There is no doubt that the sun and air are two of the best purifiers we have, and some of the solid matter would be deposited on the bottom of the river as the water flowed along, so that ultimately when it had gone a few miles the biggest part of the solid matter would be deposited, and the fresh water running into the river would, so to speak, dilute the water as it went along and freshen it up. Of course, a large amount of purification by oxidation, vegetation and animal life goes on, but these processes are limited and imperfect.

Mr. Wickson,—

You spoke of the solid matter being deposited by sinking to the bottom. Would not that foul the water that flowed over it? I should think the water would pick up microbes.

Mr. Corns,—

There is no doubt that the germs in the solid matter that came out of the filter bed would still be there, as they would not be killed by the bacteria in the water.

Mr. Bannon,—

Mr. Quinn came to see me last night, and showed me the wire he had calling him to Ottawa, and he said he would be very pleased to come here at some other meeting and continue the discussion.

Chairman,—

We will make a note of that and bring it up at a subsequent meeting.

I think it would be in order to tender a vote of thanks to Mr. Corns, and would ask Mr. Fletcher to move a vote of thanks.

Mr. Fletcher,—

I shall be only too pleased to move a vote of thanks to Mr. Corns for his kindness in reading this paper.

The subject is a little out of my line, but I daresay I could make the tank all right.

I do not think there is anything further that I can say, and I have great pleasure in moving a vote of thanks to Mr. Corns for reading the paper at this meeting.

The vote of thanks was seconded by Mr. Morrison.

Chairman,—

It has been regularly moved and seconded that a vote of thanks be tendered to Mr. Corns for his kindness in helping us out to-night by reading this paper, what is your pleasure? Carried.

Mr. Corns,—

It gives me great pleasure in being able to help the Club along at any time. As far as my endeavors to-night are concerned, that is practically nothing.

I think all the credit is due to Mr. Quinn, who wrote the paper and got the drawings up, which he must have spent a lot of time preparing.

I do not claim to be a sewage expert. It is just in my travels around that I have picked up what I know about it.

I think it would be well to take up the discussion at another meeting, when Mr. Quinn is here, so that the vital points can be brought out, and I think it would be much more satisfactory to Mr. Quinn to be able to answer the questions himself.

I have answered them to the best of my ability, although, as I said before, I do not claim to be a sewage expert.

Secretary,—

I would like to thank Mr. Corns for reading this paper. It was a simple matter to find someone to read the paper, but it was a more difficult matter to find someone who could read the paper and answer the questions asked, and I think Mr. Corns has ably held the standard of the paper to-night.

It is not an easy matter for one man to read another man's paper and answer the questions put to him, as his views may not be in accord with those of the paper.

Mr. Quinn had to go to Ottawa last night, and it was only last night that Mr. Corns had an opportunity of reading the paper over and becoming conversant with the illustrations, etc.

Mr. Bannon,—

I also want to thank Mr. Corns for reading the paper, as it was my suggestion that he be asked to do so. I thought probably he would do so, as I knew he understood the subject pretty well. Still, as the Secretary has said, Mr. Corns probably does not agree with some of the statements in the paper.

Chairman,—

With all due respect to the present speakers, I think a vote of thanks should be tendered to Mr. Quinn, he having, as Mr. Corns said, spent a good deal of time getting that paper up.

I think the Secretary should forward a letter to Mr. Quinn and tell him how much we appreciate the paper, and that we should be pleased to have him with us at a subsequent meeting to take up the discussion.

Proposed by Mr. Wickson, seconded by Mr. Fletcher, that a hearty vote of thanks be tendered to Mr. Quinn for his paper. Carried.

Chairman,—

A medallion of the American Federation of Labor was found by one of the members at the last Social Evening. The owner can have same by calling on the Secretary.

A short discussion took place on the advisability of having representatives of firms come before the Club and read papers on their wares. The matter was referred to the Executive Committee.

Chairman,—

Another question that was brought up at the last Executive meeting was the matter of obtaining advertisements.

You will notice that in the journal we have quite a number of vacant spaces for advertisements, and the Secretary seems to think that it would be an easy matter for some of the members to get a few more advertisements.

Moved by Mr. Bannon, seconded by Mr. Logan, that the meeting be adjourned. Carried.