

PINKHAM, (J. W.)

FACTS,

CONCERNING THE PRACTICAL WORKING OF THE

SUB-SURFACE IRRIGATION SYSTEM, OF SEWAGE-DISPOSAL,

In New Jersey and Elsewhere.



A Paper read before the New Jersey Sanitary Association, at their Tenth Annual Meeting, in the Assembly Chamber at the State House, Trenton, N. J., December 4th, 1884.



BY
Dr. J. W. PINKHAM,
OF MONTCLAIR.

WILSON'S "QUICK CHARGING" SYPHON.

MYERS SANITARY DEPOT, 92 BEEKMAN ST., N. Y.

Instant in Action. Reliable in work Moderate in Price.

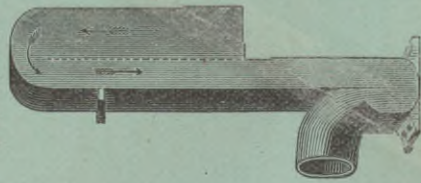


Fig. 1.

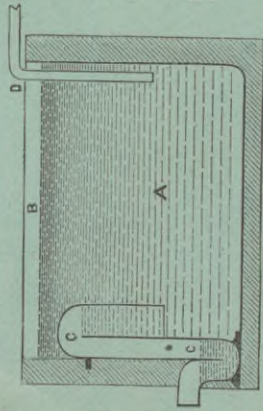


Fig. 2.

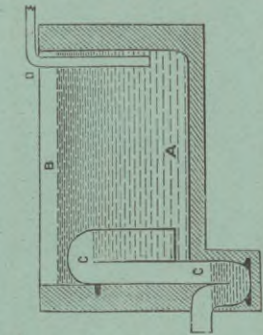


Fig. 3.

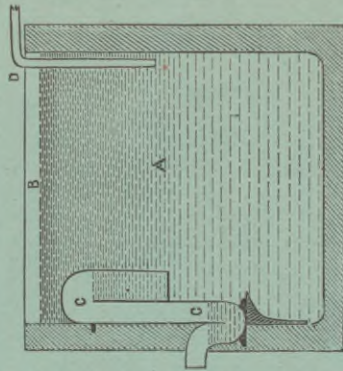


Fig. 4.

FIGURE 1 represents a four inch. Syphon. FIGURE 2 represents the Syphon placed in cistern. FIGURE 3 represents the Syphon in smaller cistern, for this size, a separate settling tank should be used. FIGURE 4 shows Syphon placed on a bracket to give larger space for settling.

The Syphon has a base and a lug to support it in cistern and can be easily set to its place against one of the walls of the cistern. D. represents the house drain, or supply to the cistern, the water will rise in the cistern to B, before the confined air between CC will be overcome by the weight of the water. The Syphon then goes into action emptying the cistern to A. The space between A and the bottom of the cistern serves for solids or sediment. The cistern should have a man-hole and be cleaned out annually. This form of Syphon is specially designed for the Automatic Flushing of Sewers and House Drains, and for purposes of Intermittent Filtration, &c. It is not dependent upon a waste of water for its start: the moment a given level is reached, however slow the feed, the Syphon comes into full work, discharging the contents of the Tank or Flushing Chamber, and thoroughly cleansing the Sewer or Drain to which it is connected. By the rapid flow of water, all sluggish matter is carried forward, and the deposit of sediment and formation of sewer-gas prevented. Where water is paid for by meter, or in dry weather flows of sewage, the economy effected by the use of this Syphon is very great, owing to the increased number of discharges obtained. It is readily built into tanks of masonry or brickwork, being sent out complete for fixing.

PAPER AS READ BY DR. PINKHAM, OF MONTCLAIR, N. J.

By the "Small Pipe System of Inland Sewerage," is meant [in this paper] that system of sewage disposal devised by Mr. Moule, and popularized in this country by Col. Geo. E. Waring, of Newport, by whose name it is quite generally known. It is designated by some the "Subsurface Irrigation System," and by others, the "Interrupted Downward Filtration System." It provides for the intermittent distribution of liquid sewage through a system of small unglazed earthen pipes, laid with open joints, from 8 to 16 inches below the surface of the ground, having such relation to each other and to the soil in which they are laid, both as regards its density and slope, that the liquid flowing through them will find its way readily into the ground, but, be sufficiently retained to reach the whole system of distributing pipes.

It is necessary for the success of this system that the ground employed should be drained, either naturally, or artificially, so that absorption will take place promptly, and that there should be a flush tank discharging its contents through an automatically acting syphon. There should be such relation between the size of this flush tank and the soakage area, that the whole system of pipes will be filled at one discharge of the tank, and such relation between the whole amount of sewage to be disposed of and the soakage area employed, that the liquid from one discharge of the tank will have become absorbed by the soil into which it is distributed, before a second discharge. To adjust all these requirements perfectly, demands a nice judgment and a skilful hand. The nature of the soil must be taken into consideration. A clayey soil may be too retentive, and a soil composed mostly of sand may be too loose for the perfect working of this system; but, as the area required is small, it would cost but little to add sufficient sand to the former, and sufficient clay to the latter to render it suitable. When organic matter is absorbed into the soil near the surface, as provided for by this system of subsurface irrigation, coming in contact as it does, in a state of minute subdivision, with the air and condensed oxygen* contained in the porous soil, it undergoes a rapid oxydation.

The change which takes place in every essential particular equivalent to that of combustion. The organic matter thus treated is just as much destroyed as if it were burnt, and the resulting products are as harmless as the products of combustion of wood or coal. Soil which has been used in this way for many years has been found to be but little changed, the liquid resultants of disintegration having evaporated or become absorbed by the roots of plants, while the solid resultants which remain, but slightly [and not in any essential particular,] differ from the original constituents of the soil. Theoretically this system is perfect, but, the question, "will it work in actual practice," is legitimate, and is constantly asked. The best answer to the question "will it work," is the answer to the question "has it worked." The principal object of this paper is to present to this association the testimony of those who have had practical knowledge of this system,—of the engineers who have constructed the works, and of the owners of places on which the system has been tried. The word "tried" has been used intentionally, for no system can be recommended for adoption, however perfect it may be in theory, until it has been subjected to the crucial test of prolonged trial, and it is important to know, not what a system will do under skilful management, but what it will do under the somewhat negligent management which it is likely to receive. A system which requires for its operation the constant supervision of an



expert, will fail on account of the impossibility of obtaining such expert supervision. In studying this system at the present time, we are fortunate in being able to form our conclusions concerning its merits, not from the reasonableness of its theory, nor the weight of opinion which supports, but from the testimony of those who have tried it.

In collecting this testimony, I have been aided by Mr. James C. Bayles, and Mr. Geo. P. Olcott, Civil Engineers of Orange, who have kindly furnished me with the names and addresses of their patrons. To secure the desired information I addressed the following circular to about 60 people, who for various lengths of time have employed the sub-surface irrigation system.

Dear Sir :

Wishing to collect facts concerning the practical working of the "Small pipe System of Inland Sewerage," and learning that you have had opportunities for observing its operation, and forming an opinion of its merits, I take the liberty of sending to you the enclosed blank, which I will ask you to kindly fill out and forward to me by return mail. Yours, Respectfully,

J. W. PINKHAM.

State.—1.—Size of family.—2.—Approximate first cost of system.—3.—Approximate cost of annual maintenance.—4.—Length of time in use.—5.—Is system free from nuisance?—6.—Is all house waste satisfactory disposed of?—7.—Have stoppages occurred!—8.—Is the soakage area underdrained?—9.—Is it superficially dry?—10.—Give any facts which you think may be of service in determining—10 what extent and under what circumstances this system can be recommended for general use.

The answers to these questions I will present to you as they have been received, omitting only the portions which are irrelevant. These answers constitute the testimony which I have collected concerning the practical working of the Sub-surface irrigation System, for the Disposal of House Sewage.

*Schubler says: [see Journal Royal Agricultural Society, vol. 1, p. 197.] The earths possess the remarkable property of absorbing oxygen gas from the atmospheric air, a phenomenon pointed out many years ago by A. Van Humboldt. . . . This property of the earths is confirmed almost without exception, provided they be employed for this purpose in a moist state. In the experiment which he instituted exposing one thousand grains of different earths for thirty days in vessels of 15 inches cubic contents [15 inches of air containing 3.12 inches of oxygen,] he found that sandy loam absorbed 1.39 inches of oxygen, clay loam absorbed 1.65 inches and garden mould 2.60 inches.

Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.

I believe it possible for the entire village of Montclair to be relieved, by disposing of its sewage matter by this system. The Women's Prison at Sherborn, Mass., uses this method, and there is a large amount of water consumed there. You are probably aware of the particulars in this case. The tanks discharge 15,000 gallons at a time, and they discharge alternately into two sets of drains of 10,000 ft each. At my own house I have had a switch put in the main sewer pipe so that I can use 200 feet alternately. By doing this I can distribute the liquid waste more evenly, and have a more uniform growth of grass on the surface of the ground. For in all cases the upper lines of pipe, (those nearest the Tanks), are apt to receive the larger quantity of waste, although they do not receive more than they can take care of. You's truly, C.M. MARVIN.

I consider the system in every respect adapted to suburban, or any residence having a sufficient area of garden or lawn.

So long as we have used it, it has been very satisfactory, and it seems to be the best system we have tried.

I consider this system as satisfactory as any if not more so

You have the facts above, to which I have nothing to add save the opinion that it is a perfect success.

It can be recommended

System is the best devised where there is sufficient room for pipes in dry lawn free from shade. I empty settling tank about twice a year, though it is not absolutely necessary.

The system I consider perfect, wherever the party adopting it controls sufficient area for adequate distribution of the "small" or distributing pipes.

NAME.	Size of Family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area undrained?	Is it superfluous?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
C. M. Marvin, Montclair, N. J.	5	\$ 200.	\$10	19 mos.	yes	no	no	no	yes	I believe it possible for the entire village of Montclair to be relieved, by disposing of its sewage matter by this system. The Women's Prison at Sherborn, Mass., uses this method, and there is a large amount of water consumed there. You are probably aware of the particulars in this case. The tanks discharge 15,000 gallons at a time, and they discharge alternately into two sets of drains of 10,000 ft each. At my own house I have had a switch put in the main sewer pipe so that I can use 200 feet alternately. By doing this I can distribute the liquid waste more evenly, and have a more uniform growth of grass on the surface of the ground. For in all cases the upper lines of pipe, (those nearest the Tanks), are apt to receive the larger quantity of waste, although they do not receive more than they can take care of. You's truly, C.M. MARVIN.
P. S. Attick, Bryn Mawr, Pa.	hotel	2,000	—	5 yrs.	yes	yes	yes	no	yes	I consider the system in every respect adapted to suburban, or any residence having a sufficient area of garden or lawn.
Chas. Schefflin, Plainfield, N. J.	8	—	—	5 yrs.	yes	yes	no	no	yes	So long as we have used it, it has been very satisfactory, and it seems to be the best system we have tried.
B. I. Tuthill, Montclair, N. J.	7	200.	—	6 mos.	yes	yes	no	no	yes	I consider this system as satisfactory as any if not more so
No Name.	10	200.	12	2 3/4 yrs.	yes	yes	no	no	yes	You have the facts above, to which I have nothing to add save the opinion that it is a perfect success.
S. C. Burdick, Brick Church, Orange, N. J.	14	1,000	10	3 yrs.	yes	yes	no	no	yes	It can be recommended
E. Eaton, No 19 Mercer St., N. Y.	6	350.	12	6 yrs.	yes	yes	no	no	yes	System is the best devised where there is sufficient room for pipes in dry lawn free from shade. I empty settling tank about twice a year, though it is not absolutely necessary.
C. Morgan, No. 83 Dey St. N. Y.	8	500.	25	2 1/2 yrs.	yes	yes	no	no	yes	The system I consider perfect, wherever the party adopting it controls sufficient area for adequate distribution of the "small" or distributing pipes.
J. P. Davis, No. 21 Maiden Lane, N. Y.	10	170.	—	2 1/2 yrs.	yes	yes	no	no	yes	
J. E. Pulsford, 45 William St. N. Y.	15	400.	20	3 yrs.	yes	yes	yes	no	yes	
J. W. Towne, 140 Nassau St. N. Y.	14	300.	10	10 yrs.	yes	yes	no	no	yes	
J. E. Knapp, 24 Pine St. N. Y.	9	250.	15	3 yrs.	yes	yes	yes	no	yes	
W. F. Havemeyer, 112 Wall St. N. Y.	6	200.	12	3 yrs.	yes	yes	no	no	yes	
Dav. Bingham, New Produce Ex- change, N. Y.	12	250.	—	5 yrs.	yes	yes	no	no	yes	

NAME.	Size of Family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste satisfactorily disposed of?	Have stoppages occurred?	Is the soakage area undrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
Ham. Wallis, 48 Wall St. N. Y.	9	350.	10	2 yrs.	yes	yes	no	no	yes	
Gard. P. Lloyd, 110 Broadway, N. Y.	8	250.	12	4 1/2 yrs.	yes	yes	no	no	yes	I think with good care in making this system—iron pipes, &c. from house to cesspool, that it will work well in all cases where the handgives sufficient fall to pipes.
J. C. Howes, 52 Wall St. N. Y.	8	250.	25	1 year.	yes	no	no	no	yes	I recommend it freely for general use where conditions and space of ground are favorable. The settling tank needs cleaning out by removing the solid matter twice a year or oftener, and the ventilation pipes need to be carried high above ridge of dwelling to prevent any odor being blown down by the winds.
R. C. Browning, 32 Cortlandt St. N. Y.	8	500.	15	4 yrs.	yes	yes	no	no	yes	
B. Shepard, 26 Worth St. N. Y.	7	—	—	5 yrs.	yes	yes	no	no	yes	
P. M. Pompelly, —	10	250.	10	2 yrs.	yes	yes	no	no	yes	
Rowland Johnson, 5 Mercer St. N. Y.	8	380.	10	19 mos.	yes	yes	no	no	yes	
Saml. Crump, Montclair, N. J.	10	175.	10	3 mos.	yes	yes	uo	no	yes	
E. A. Bradley, Montclair, N. J.	9	225.	—	4 yrs.	yes	yes	no	no	yes	During the last 3 years there has not been the least trouble with the system.
Francis Speer, 135 Duane St. N. Y.	8	250.	20	5 yrs.	yes	yes	no	no	yes	I have my tanks or brick cesspools, opened every three months and the solid matter removed and mixed with the manure heap.
Paul Babcock, Montclair, N. J.	8	—	30	2 yrs.	yes	yes	no	no	yes	Only fact I can mention is the very satisfactory working of the system at my home.
Chas. Cooper, Goshen, N. Y.	7	250.	—	2 1/2 yrs.	yes	yes	no	no	yes	As far as I can judge, where there is a fall sufficient for water to run freely it is without fault.
John T. Rockwell, 101 Duane St. N. Y.	7	400.	15	2 1/2 yrs.	yes	yes	no	no	yes	Have two 3 in. ventilating pipes extending above the house roof, one inside, and the other outside of the house, together, ventilating the entire system. The above is my only experience with this method of disposing of house waste. Thus far it is satisfactory.
W. W. Underhill, Montclair, N. J.	12	185.	None	18 mos.	yes	yes	no	no	yes	My experience and knowledge lead me to believe that this system might probably be safely recommended for general use in a town as thickly settled as Montclair; no facts leading to an opposite conclusions have as yet come under my observation.
Henry M. Oddie, 23 Nassau St. N. Y.	9	300.	12	3 1/2 yrs.	yes	yes	once	yes	yes	I can only speak from personal experience, that the system has been very satisfactory.
J. D. Palmer, Brick Church, Orange, N. J.	8	200.	—	3 yrs.	yes	yes	yes	no	yes	I regard the system as fairly successful, and the next best to the small pipe sewer system.

Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.

NAME.	Size of Family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste disposed of?	Have stoppages occurred?	Is the soakage area undrained?	Is it superficially dry?
Chas. A. Sterling, 55 Broadway, N.Y.	10	400.	12	1 year.	yes	yes	no	no	yes
R. C. Ryerson, Caldwell, N. J.	9	200.	10	3 yrs.	yes	yes	no	no	yes
Essex County Pen- itentiary, Caldwell, N. J.	150	500.	50	4 yrs.	yes	yes	no	no	yes
Geo. E. Simpson, Orange, N. J.	12	240.	15	3½ yrs.	yes	yes	no	no	yes
W. H. Jewett, Montclair, N. J.	4	225.	10	1 year.	yes	yes	no	no	yes
Mrs. G. W. Thorp. J. G. Thorp. Brick Church.	5 4	550. 450.	12 12	18 mos. 16 mos.	yes yes	yes yes	no no	no no	yes yes
Robt. Lane, East Orange, N. J.	6	250.	12	2 yrs.	yes	yes	no	no	yes
A. W. Greene, 51 Leonard St. N.Y.	10	350.	12	15 mos.	yes	yes	no	no	yes
J. R. Howard, Montclair, N. J.	14	190.	6	6 mos.	yes	yes	no	no	yes

I consider the system excellent if properly constructed, and sufficient area on the premises available for the distribution of the sewage. If the work is thoroughly and scientifically done I would recommend it for general use, but otherwise it (the system) would be worse than useless.—I have the system in use on my property, corner E. Park St. and Washington for about 4 years without any cost for repairs, and now working very satisfactorily.

The distributing pipes were first laid so that fluid from the tanks reached only a portion of the soakage area and there was consequently supersaturation. At present there is no difficulty with the system and it gives entire satisfaction, 5,000 gallons of water are used daily. Since the introduction of this system there have been no cases of typhoid in the institution; previously there had been cases.

I have studied the system and believe there is nothing in the world like it for suburban and county places.

Brickchurch, N. J. Nov. 28th, 1884.

Dr. J. W. Finkham.

Dear Sir.

I take pleasure in returning the enclosed blanks filled out, as per request of Mr. Geo. P. Oloro, of his own, and with which I sup-
discussion (with modifications of his own, and with which I sup-
pose you are acquainted) in my lots in East Orange. A third
place in Main St. is in working order, but has not had the test of
time as yet. I shall be glad to furnish you with any particulars in
regard to these three systems at any time.

Yours very truly,

MRS. GEO. W. THORP.
per J. G. Thorp.

My impressions are so favorable at this time, that I would not avail myself of public sewerage if we had it.

My family has used about 350 gall. of water per diem, (to the great grief of the pumper), so that I think the system has been pretty severely tested there. It cannot however be fairly judged until we shall have had both winter and summer experience of it, with the full alteration of discharges mentioned in No. 5, since we did have more or less foul odors for some time, where the ground was evidently oversoaked and could not take care of the water.

NAME.	Size of Family.	Approximate first cost of system.	Approximate cost of annual maintenance.	Length of time in use.	Is system free from nuisance?	Is all house waste disposed of satisfactorily?	Have stoppages occurred?	Is the soakage area undrained?	Is it superficially dry?	Give any facts which you think may be of service in determining to what extent and under what circumstances can this system be recommended for general use.
Orange Memorial Hospital, Orange, N. J.	40	1,000	\$35	2 1/2 yrs.	yes	yes	no	no	yes	Experience in this case shows that underdrainage is indispensable when an area not naturally well drained is expected to take up a large amount of sewage. With good natural drainage and a small amount of sewage to dispose of, the benefits of underdrainage are less apparent, though it is desirable in all cases. The soil is underlaid at the depth of 18 to 24 inches by a layer of hardpan, and the soil before the underdraining was continually water soaked during rains.
Jno. W. Handren, Dunellen, N. J.	8	—	—	3 1/2 yrs.	yes	yes	no	no	yes	I think it is the only system that can be used successfully for In-land Drainage, and in my opinion if it was universally used, we would have less levers, sore throats and throat diseases of all kinds than we now have.
E. O. Doremas, Newark, N. J.	8	10,00	10	3 yrs.	yes	yes	no	yes	yes	Think the system a good one, and invaluable to those who do not have city sewerage.
Rastus S. Ransom, 155 Broadway, N.Y.	6	200,00	—	2 yrs.	yes	yes	no	no	yes	I believe in the system thoroughly.
J. D. Cutter, 144 E. 14th St. N.Y.	8	—	—	8 mos.	yes	yes	no	yes	yes	I am not an expert; my landlord put it in; it is satisfactory; I have not been on the ground since the work was done.
Saml. Crump, Montclair, N. J.	Small	160,00	10	2 yrs.	yes	yes	once	yes	yes	Methodist parsonage can be rented any time.

In order that the negative and affirmative answers in the above table may convey no wrong impression, I desire to say that in the few cases where qualified answers were given, they are represented in the table by a "yes," which, in the answer was "yes to a small extent," and by a "no," which was "no not to any extent," or words of similar import. Without this explanation the tabular statement would be less favorable to the system than were the answers received, which in no case represented that there had been serious difficulty, or that there was dissatisfaction with the system.

J. W. P.

Dr. Whitehorne, Physician of the Essex County Penitentiary, in addition to his answer to question 10, further says :

I would say that the fact of the utility of the system is patent, and under proper conditions is available for the healthful disposal of the sewage equally of the smallest family or the largest public institution. Before the change was made here the solid faecal matters were composted and made use of on the farm, but a large portion of the immense amount of liquid, holding noxious matter in suspension, found its way into a neighboring brook, and contaminated both the air and the running water, being perceptible as far as Caldwell village, three-fourths of a mile distant. At present the solids are equally available for composting, and the saturated liquids, by means of the system of laterals, are disposed of without defiling the running water below. During Summer the ground above is made use of for a kitchen garden, and produces abundantly, so that thus controlled, these elements otherwise poisonous, are made subservient to the good of man.

Trusting that the foregoing may be acceptable to you, I am, Very truly yours,

H. B. WHITEHORNE.

I will add to this the opinions of several civil engineers who have had ample opportunities for observation.

Mr. Geo. E. Waring says: The subsurface irrigation system is much the simplest, the safest and the best, its cost is trifling, even where the water from the kitchen and laundry trays in the cellar has to be lifted with a pump to level of the drains.

My own system has worked perfectly, summer and winter for seven years, I have never heard of a case of failure.

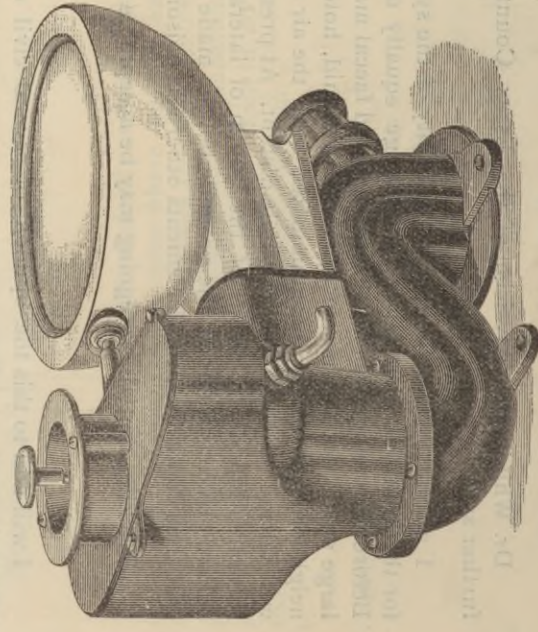
Mr. Edward S. Philbrick says: There are so many places where this system is applicable and its merits are so great in such places that a full and detailed description of it may be of interest. The limits of its application are as follows: Wherever a quarter of an acre of grass land is available for a single family of eight or ten persons, or an acre for an aggregate of eighty persons, so situated that the surface of the sod is five feet or more below the level of the house drain, where it leaves the house or houses, this system will dispose of all their sewage in a satisfactory manner, summer and winter with very little attention, for a term of years.

I now submit the question to you without argument. I will venture however to make the following summary of conclusions, which I think are fairly deducible from the foregoing testimony.

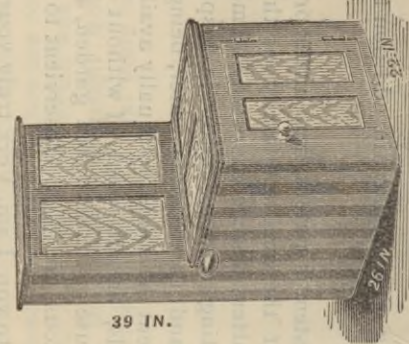
In Orange, Montclair, Caldwell and Dun Ellen, New Jersey, in Goshen, New York, and in Bryn Mawr, Pa., the system of sewerage known as the Sub-surface Irrigation System constructed under the superintendence of Mr. Geo. P. Olcott, and Mr. James C. Bayles, of Orange, and Mr. James Owen, of Montclair, has, after [in many cases,] prolonged trial, proved a success.

2. The first cost for a family and house of average size, is about two hundred dollars.
3. The cost of annual maintenance is about ten dollars for such a house.
4. The ground selected should be free from shade, and may be either lawn or garden.
5. By means of this system all liquid sewage from the smallest dwelling house or the largest institution, may be effectually disposed of without nuisance and without peril to health.
6. This system should take the place of cesspools in all suburban and country places which have sufficient ground for the distributing of pipes

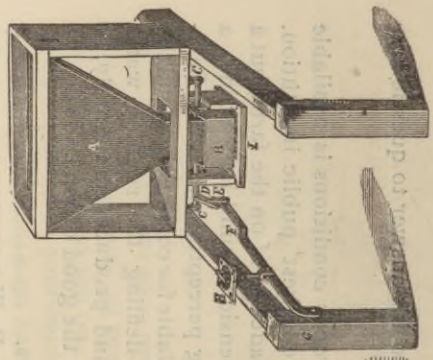
The following are a few of the specialties in Sanitary goods, Sold by Myers Sanitary Co., 92 Beekman St., N. Y.



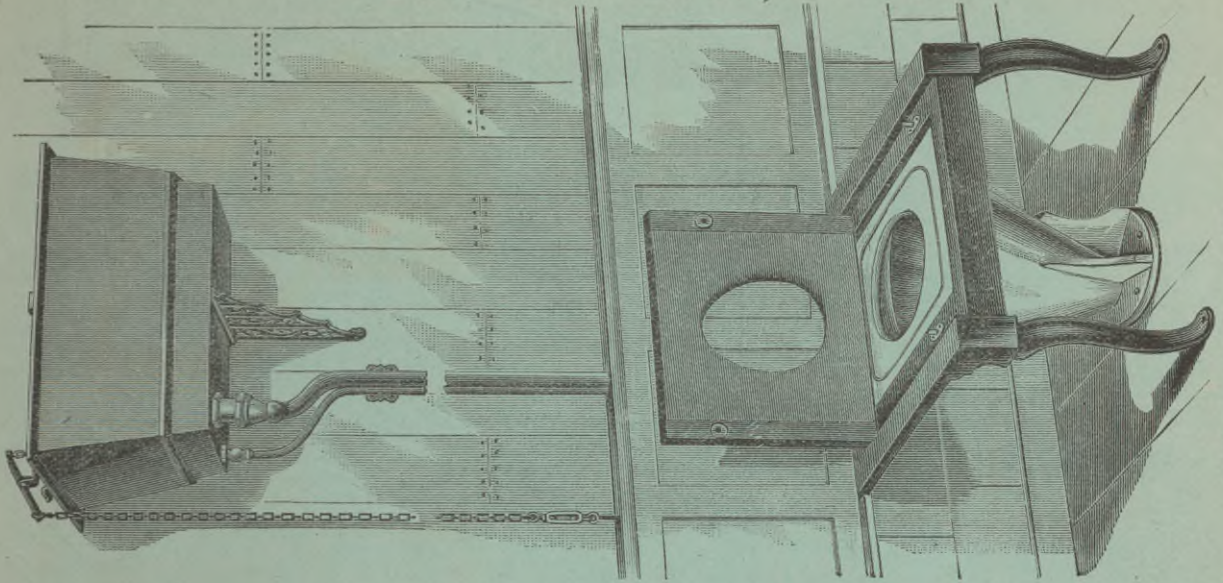
Egg-oval Water Closet.



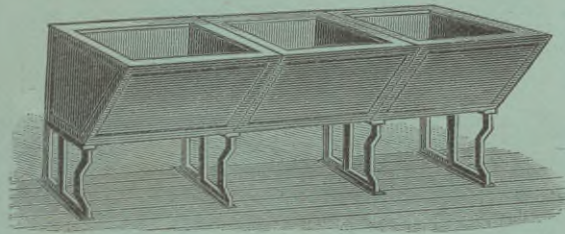
Moule's Earth Closet. (Inside view.)



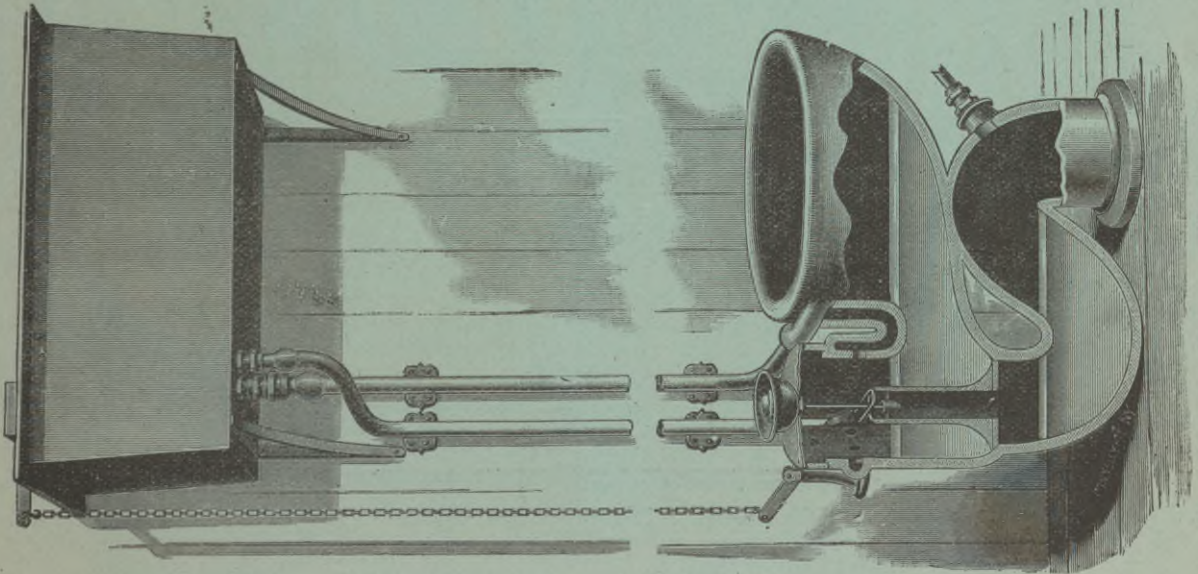
MYERS SANITARY DEPOT,
92 BEEKMAN ST., NEW YORK.



Niagara Long Hopper.

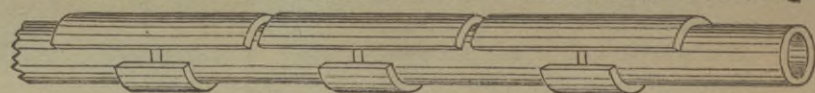


Cement Stone Laundry Tub, with
Galvanized Iron Frame.

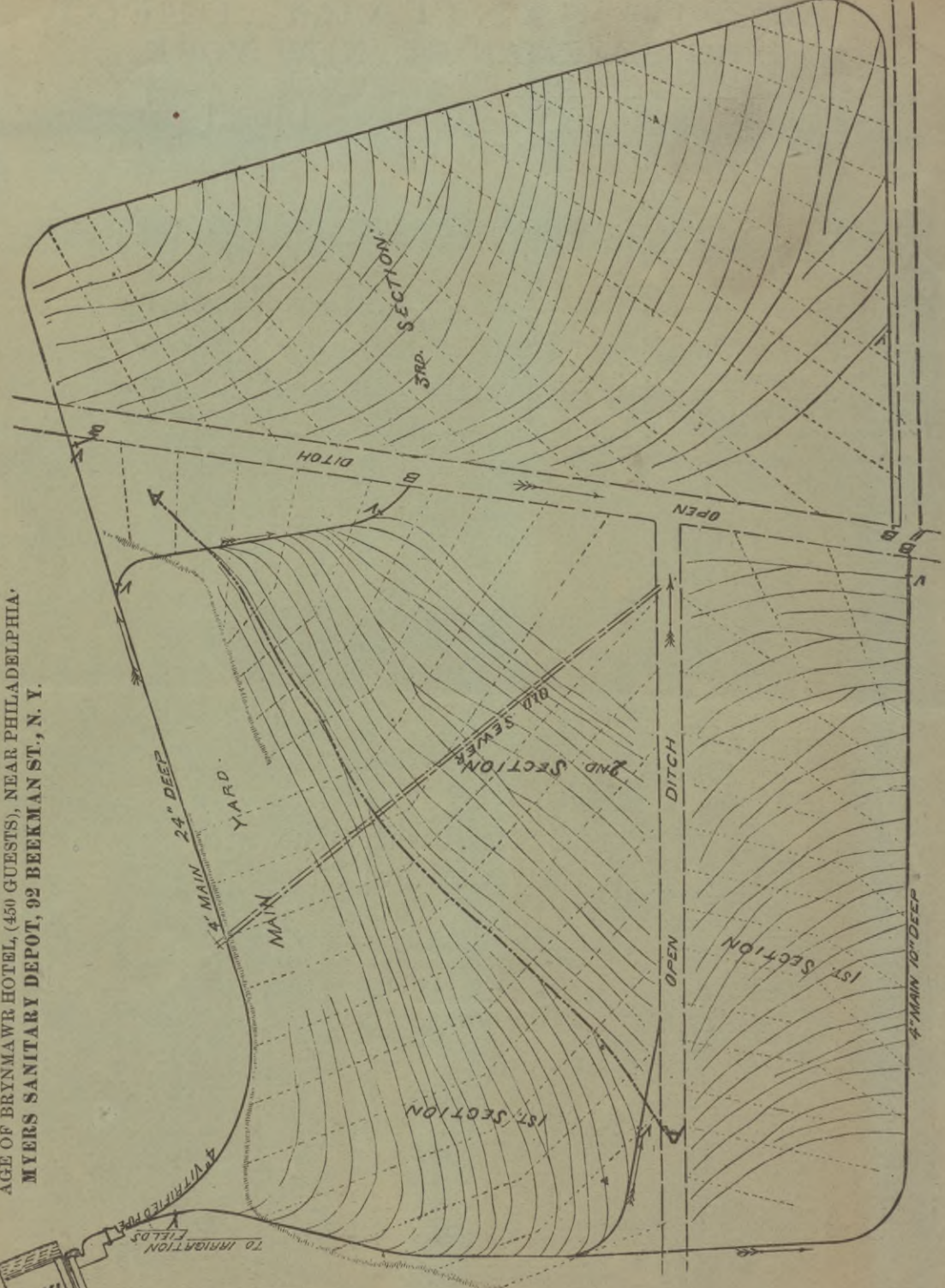


Myers All China Water Closet.

FLUSH TANK AND ABSORPTION TILE AS APPLIED TO THE DRAIN-
 AGE OF BRYNMAWR HOTEL, (450 GUESTS), NEAR PHILADELPHIA.
 MYERS SANITARY DEPOT, 92 BEEKMAN ST., N. Y.



PERSPECTIVE VIEW OF UNGLAZED 2 IN. TILES WITH TROUGHS AND COVERS.



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