No. 848,279. PATENTED MAR. 26, 1907.

B. J. ASHLEY.

APPARATUS FOR SEWAGE DISPOSAL.

APPLICATION FILED SEPT. 18, 1906.

3 SHEETS—SHEET 1.

FIG. 1.

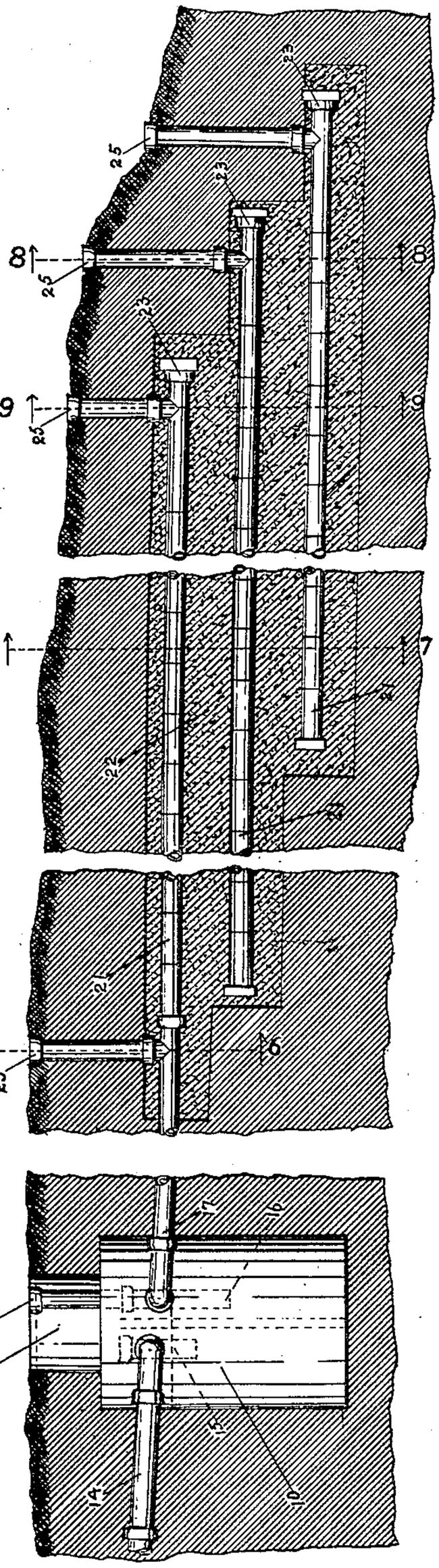


FIG. 8.

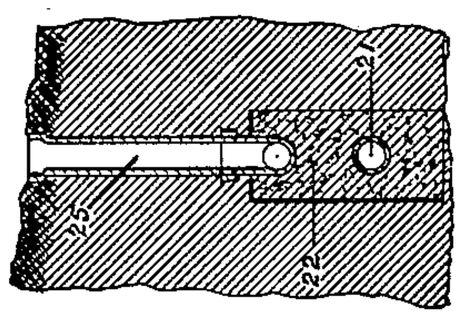


FIG. 7.

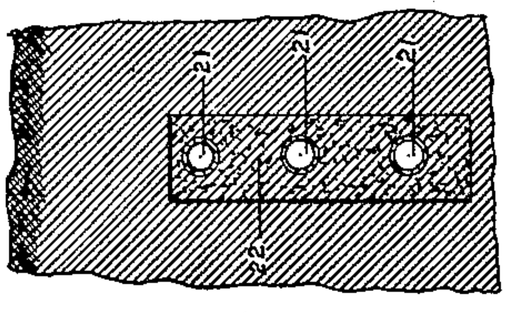


FIG. 6.

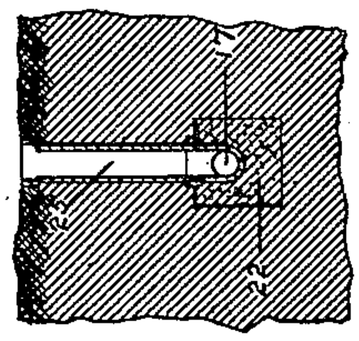
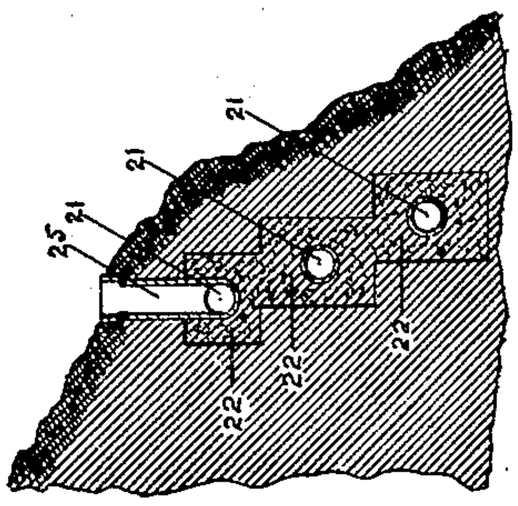


FIG. 5.



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3 SHEETS—SHEET 2.

Fig. 2.

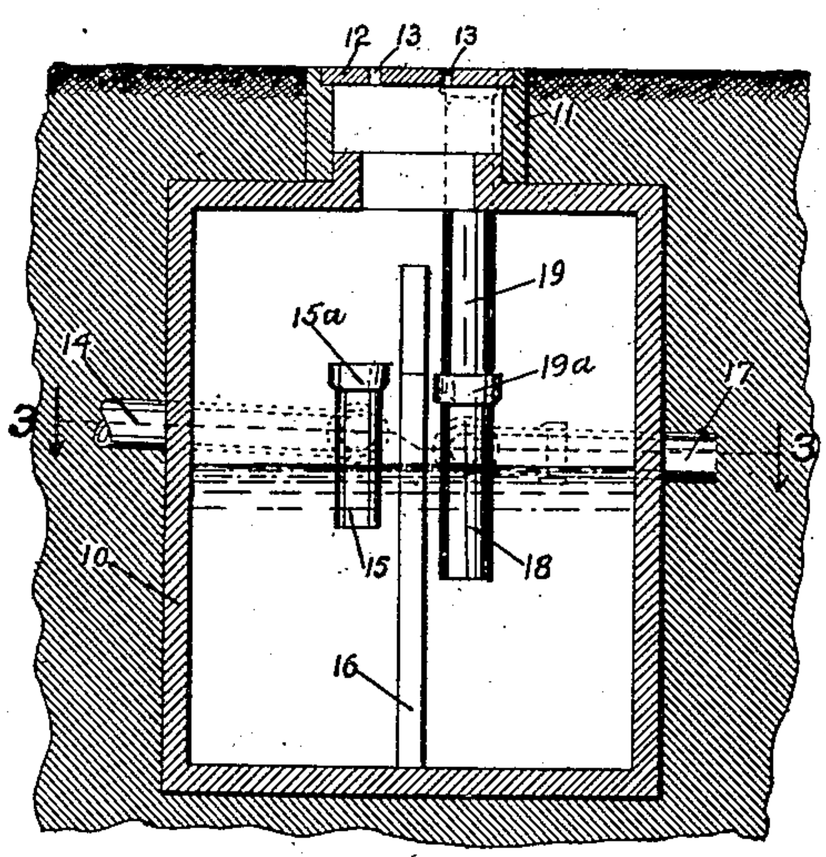
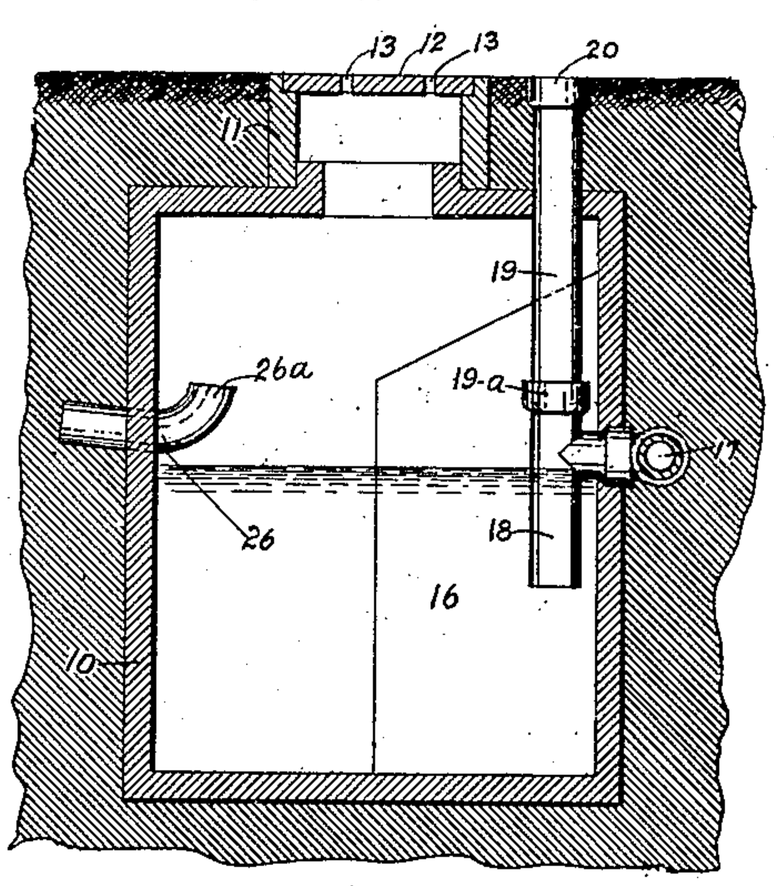


Fig. 4.



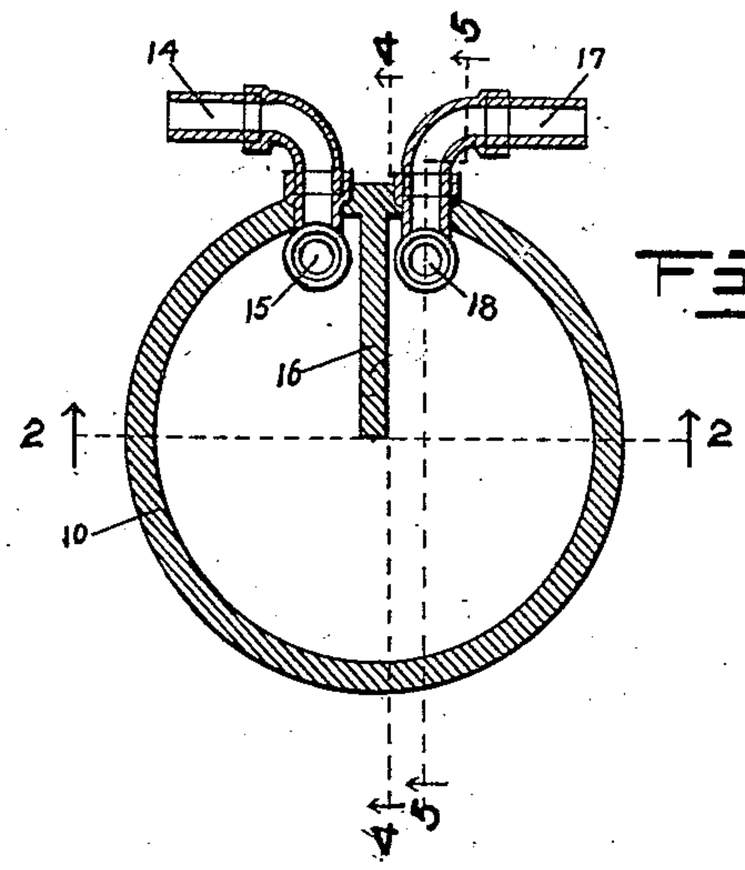
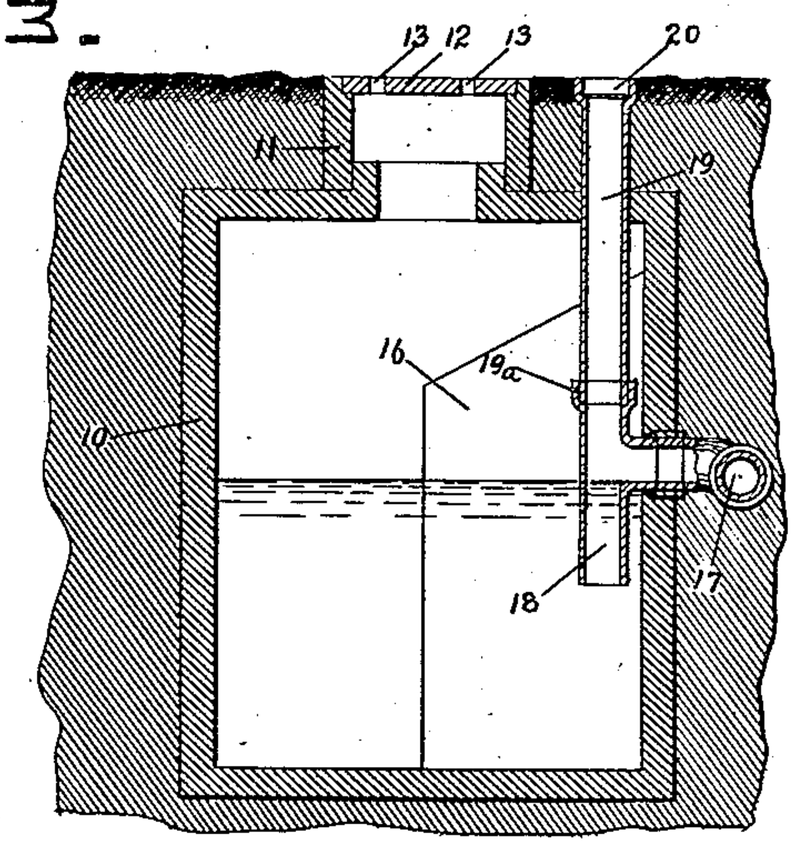


Fig. 3.

Fig. 5.



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APPLICATION FILED SEPT. 18, 1906.

3 SHEETS—SHEET 3.

Fig 10.

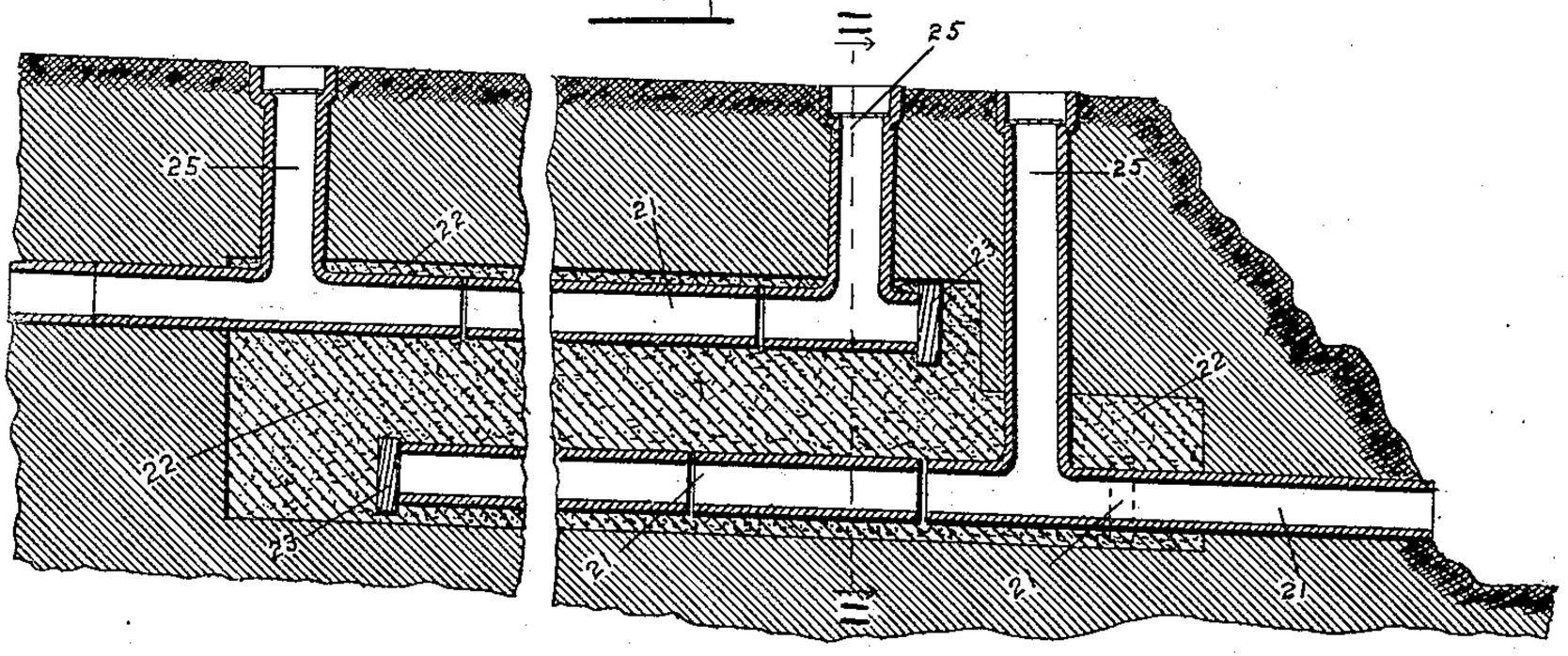
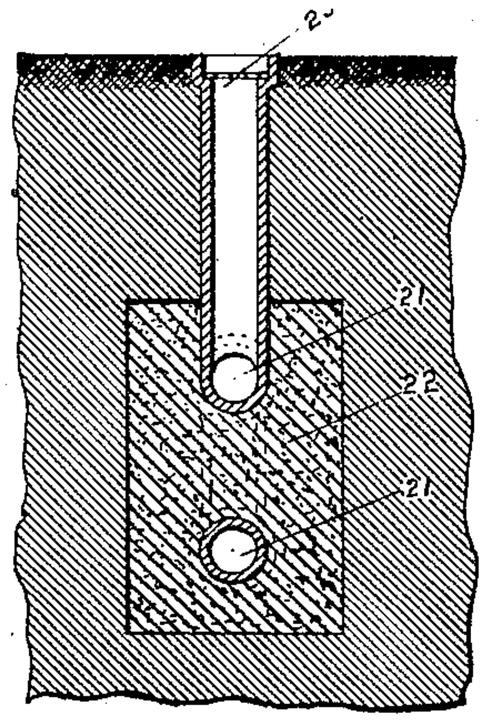


Fig 11.



WITNESSES
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UNITED STATES PATENT OFFICE.

BURTON J. ASHLEY, OF CHICAGO, ILLINOIS.

APPARATUS FOR SEWAGE DISPOSAL.

No. 848,279. Specification of Letters Patent. Patented March 26, 1907.

Application filed September 18, 1906. Serial No. 335,109.

To all whom it may concern:

Be it known that I, BURTON J. ASHLEY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Apparatus for Sewage Disposal, of which the following is a full, clear, and exact specification.

This invention relates to improvements in apparatus for sewage disposal, and has for its primary object to provide an improved means for receiving and disposing of sewage, and is more particularly adapted to be used in connection with private residences, farm-houses, and country estates which are remote from municipal sewage systems and have no natural outlet or other means for disposing of sewage wastes.

A further object is to provide an improved means for sewage disposal that is simple and cheap in construction, employing common materials in connection with the natural surroundings of earth and air, and at the same time being constant and efficient in its operation, so that when the apparatus is installed little or no attention is required to keep it in operative condition.

To the attainment of these ends and the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination, and arrangement of the several parts hereinafter more fully described and claimed, and shown in the accompanying drawings, illustrating an exemplification of this invention, and in which—

Figure 1 is a view in elevation, partly in section, of a complete installation of one embodiment of my invention. Fig. 2 is a vertical section of the tank shown in elevation in Fig. 1, the view being taken on line 2 2 of Fig. 3. Fig. 3 is a horizontal sectional view of the tank on broken line 3 3 of Fig. 2. Fig. 4 is a vertical sectional view of the tank, taken on line 4 4 of Fig. 3, but showing the discharge-duct and ventilator-duct in position in elevation. This view also shows a modification of my invention in the form of a water-inlet or flushing-duct. Fig. 5 is a vertical sectional view on broken line 5 5 of Fig. 3. Figs. 6, 7, and 8 are vertical sectional views on lines 6 6, 7 7, and 8 8, respectively, in Fig. 1. Fig. 9 is a view showing a modified form of my device, corresponding to a view on line 9 9 of Fig. 1. Fig. 10 is a vertical longitudinal sectional view of a modified arrangement of my filtration and nitrification apparatus; and Fig. 11 is a vertical sectional view on line 11 11 of Fig. 10.

A cesspool or tank 10 is provided as a temporary receptacle for sewage wastes. This may be constructed of any suitable material, such as concrete, reinforced concrete, brick, or stone. It should be made watertight by washing the inside with several coats of pure cement or by applying some form of a coat that is impervious to water and not easily affected by the action of the materials to be contained therein. I construct this tank entirely under the ground, and it differs from the ordinary form of cesspool in that the walls are so constructed as to prevent the escape of the contained fluids out into the surrounding earth. This tank may be of any desired shape. Its size is to be determined by the quantity of sewage to be taken care of. I preferably construct it either rectangular in cross-section or cylindrical in cross-section, as shown in the drawings.

I terminate the top of the tank a short distance below the surface of the ground, preferably just below the frost-line, and construct on the top thereof a manhole 11, leading from the surface of the ground to the interior of the tank, said manhole being covered by a removable door or trap 12. This door may contain a number of small ventilating-holes 13. The house drain-pipe or intake-duct 14, conducting the sewage into the tank, enters at a distance below the surface of the ground, in order to be well below the frost-line, and terminates on the interior of the tank by extending downwardly a given distance below the place where it enters the wall of the tank. This may be accomplished by the introduction of a T-joint of sewer-pipe on the interior of the tank, as indicated by 15, Figs. 1 and 3. The top of 15 may be closed at 15ª by an air-tight lid. 16 is a baffle-wall on the interior of the tank, preferably extending from a point in the wall adjacent to the intake-pipe toward the center of the tank. I prefer to continue this baffle-wall at least to the center of the tank, if not slightly beyond, but do not continue it to meet the opposite wall, as it is not desired that the tank should be divided into two distinct compartments. On the opposite side of the baffle-wall 16 and adjacent thereto I provide the outlet-duct or drain-

pipe 17. This pipe should leave the tank in a plane slightly below the entrance of intake-pipe 14. I also provide the interior end of outlet-pipe 17 with a T-section 18 of sewer-pipe similar to 15, except that it preferably extends somewhat lower in the tank than the discharge end of pipe 15. The vertical branch of 18 may be extended by the addition of sewer-pipe 19 through the top of the tank to the surface of the ground and a screen or closed lid 20 provided at the upper end thereof.

Inlet-pipe 15 should be extended some distance below the water-line, but not so far as to prevent the lighter particles of sewage entering the tank from being carried downward through the pipe by reason of the pressure of the fluid therein. This arrangement permits sewage to enter through the intake-pipe into the tank in a mild manner, preventing the stirring up of the contents. It also prevents new sewage from becoming mixed immediately with the old and causes a slow travel of the contents from the inlet to the outlet, which effect is further augmented by the baffle-wall interposed, as described, between the intake and outlet pipes, as this arrangement compels all of the materials entering the tank to make the circuit at least around the outer edges of the baffle-wall. This quiescent movement in the tank permits the heavier particles in the sewage to settle to the bottom and the lighter particles to rise to the top, so that the zone of greatest fluidity may exist somewhere between the water-line and the bottom of the tank. It is at this zone of greatest fluidity that I prefer to locate the intake end of pipe 18, which communicates with outlet-duct 17.

As before stated, the size, diameter, and depth of the tank can only be determined by the amount of sewage that is to be disposed of, and if the construction be very much elongated the inlet and outlet ducts may be placed at opposite ends of the tank and the baffle-wall dispensed with.

The discharge-pipe 17 conducts the overflow from the tank, preferably by a water-tight pipe, to any desired distance from the tank before entering my system of nitrification and purifying ducts. This filtering system may be constructed at any desired distance from the tank. In order to get the best results, it is necessary that the premises have sufficient ground space and subsoil of sufficient porosity to absorb the fluids discharged into the tank.

I preferably use for my filtering-ducts ordinary farm-tiles 21, surrounded by a section of filtering material 22, consisting, preferably, of clinkers or cinders which are the waste product from the combustion of coal. If such material is not available, I find that coke, crushed stone, and burned clay, such as broken brick and tile, have a certain value for this purpose. Sand and gravel may also be used, but are not as efficient as clinkers or coke. The tiles employed for conducting the overflow from the tank are open to some extent at their joints and furnish a means for the escape of a restricted amount of the fluid into the surrounding filtering material. If the ground be somewhat rolling or declining from the tank, I prefer to elongate my filtering and aeration system in the manner shown in Fig. 1, employing a succession of ducts, one below the other. In Fig. 1 I show a series of three such systems, the second one extending beyond the first one at the outer end any desirable distance, while the third is made to extend beyond the second likewise. As a means of securing the best results I find it very necessary that these ducts and the surrounding material should be kept well supplied with air. To this end I provide the upwardly-extending aerating-pipes 25, which terminate at the surface of the ground and should be provided with screens to keep out foreign substances and vermin. At the extreme outer end 23 of each of the filtering-ducts I preferably provide a closure and near the end of each duct an aerating-pipe 25. If the surface of the earth, however, will permit, a modification similar to that shown in Fig. 10 may be employed to good advantage, in which I show the extreme outer end of the last duct of the series opening to the exterior or surface of the earth.

The aerating-pipes 25 may be multiplied indefinitely, but in order to give the best results I find it is not necessary that they be located nearer than from forty to one hundred feet of each other. The purpose of closing the ends of the ducts, as shown at 23 and at other places, as will appear from the illustrations, is not to prevent the fluid contents in the ducts from entering the surrounding purifying material, but is only to prevent such contents from leaving the ducts in undue quantities, thereby flooding the purifying material at the different localities, and at the same time not being able to take advantage of the purifying action of other sections.

In Fig. 1 I have shown an arrangement of filtration-ducts in a vertical plane. Where the surface of the earth will permit it, I find a modification, such as illustrated in Fig. 9, may be used to good advantage, by which the ducts are shown in trenches extending around the edge of a hill and conforming somewhat to the surface thereof, a construction which is found much cheaper in installing and may be made to require somewhat less pipe in the construction of the aerating or surface ducts.

In a tank of the character described a large amount of decomposition of the solids and suspended matter discharged into it is observed to take place within a very short

period of time. This result, due to the action of well-known bacteria which attack and immediately tend to decompose all refuse matter, especially where light and air are wholly or partially excluded, reduces the solid matter to a fluid. After the tank is filled for a brief period a mat may form on the surface of the contents of the tank. Solid matter is also thrown down or precipitated and to a certain extent occupies the bottom or lower zone of the fluid. The zone therefore of greatest fluidity lies between the surface of the contents of the tank and the bottom, and it is from this zone that the fluid is taken into intake-pipe 18 and discharged through outlet 17 into the filtration and nitrification ducts, where it is further submitted to purifying means, consisting of the combined action of the air and the purifying effects of the filtering materials. If the filtration and nitrification ducts be of sufficient capacity to care for the discharge from the tank, the resulting fluid is rendered colorless, odorless, and harmless, in that it is resolved into its component parts before being given to the earth to absorb.

As a modification of my device, I show in Fig. 4 a flushing-pipe 26, which enters the tank at a point just above the normal level of the liquid and which has on the interior of the tank an upwardly-extending discharge-nozzle 26ª. This flushing-pipe may extend to a water tank or reservoir or may be the overflow-pipe of a cistern, so that through it at intervals considerable quantities of water in a more or less pure condition may be thrown into the tank. The upward direction to the discharge-spout 26ª is given for the purpose of directing the stream upwardly and permitting the water to fall on the top of the liquid contents of the tank. I have observed that the action of water thrown into the tank in this manner, particularly rain-water, has a tendency to cause disintegration and decomposition of the mat on the top of the fluid contents of the tank and causes a new and beneficial renewal of bacterial activity to take place within the tank.

It will be apparent that manhole 11 on the top of the tank is provided for the purpose of permitting entrance to the interior. Reference has also been made to screens or closed lids, that may be provided at 15ª and 20. When modern plumbing is used and the soil-pipe of the residence is carried out through the roof of the house, the draft in the soil-pipe has a tendency to create a suction through intake-pipe 14, and when such conditions obtain I do not seal the pipe 15ª. Under such conditions perforations, as at 13, in lid of manhole must be provided. In the event that upper section of outlet-pipe 19 be omitted and said pipe terminated within the tank at joint 19ª then the perforations 13 in manhole 11 should be closed, which will cause the air to be drawn through the tank and through the aeration and purifying ducts, a result I find to be very desirable.

When modern plumbing is not used in the residence, and consequently the soil-pipe is missing, I close or seal upper branch of inlet-pipe at 15ª, which forms a trap, preventing the discharge of gases from the tank into the residence through the intake-pipe. Under such conditions gases from the tank should escape from perforations 13. If upper branch of outlet-pipe be terminated at 19ª, circulation of air from the filtration and nitrification ducts into tank and upwardly through vents 13 will take place. If branch 19 be extended to the surface of the ground, as illustrated in the drawings, then the circulation of air from the outlying ducts does not enter the tank, but escapes at 20, which should be screened as a protection against foreign substances and vermin.

In the construction of the auxiliary or underlying filtration and nitrification ducts I prefer the form shown, consisting of the tile drains or pipes closed at each end and having one aerating-pipe 25 near their outer ends. The air entering at pipes 25, which is particularly noticeable when the soil-pipe of the residence is available, as previously described, passes toward the tank through the perforated walls of the ducts and into the surrounding filtering material, thereby greatly hastening the filtration and nitrification processes.

In order that the invention might be fully understood, the details of an embodiment thereof have been thus specifically described; but

What I claim is—

1. In an apparatus for the purification of sewage the combination of a temporary receiving-tank, provided with an inlet-duct, and having an outlet-duct below the level of said inlet-duct, and aerating and purifying means adapted to receive the overflow from said tank, said means comprising a perforated passage surrounded by a bed of filtering and purifying material and means for supplying air to said perforated passage.

2. In an apparatus for the purification of sewage the combination of a temporary receiving-tank, provided with an inlet-duct, and having an outlet-duct below the level of said inlet-duct, a baffle-wall within said tank between said inlet and said outlet ducts and operating to delay the flow of liquids between said ducts, and aerating and purifying means adapted to receive the overflow from said outlet-duct, said means embodying a perforated passage surrounded by a bed of filtering and purifying material and being provided with means for thoroughly aerating said perforated passage.

3. In an apparatus for the purification of sewage the combination of a liquid-receiving

tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, a downwardly-extending branch on said inlet-pipe terminating below the normal level of said outlet-pipe and an upwardly-extending branch communicating with said downwardly-extending branch and terminating within said tank and above the normal level of the liquid therein, a downwardly-extending branch on said outlet-pipe terminating within the tank, and purifying means adapted to receive the overflow from said tank.

4. In an apparatus for the purification of sewage the combination of a liquid-receiving tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, a downwardly-extending branch on said inlet-pipe, terminating below the normal level of said outlet-pipe, and an upwardly-extending branch terminating within said tank and above the normal level of the liquid therein, a downwardly-extending branch on said outlet-pipe terminating within the tank, a baffle-wall within the tank interposed between said inlet and said outlet pipes and adapted to delay the flow of liquids between said pipes, and purifying means adapted to receive the overflow from said tank.

5. In an apparatus for the purification of sewage the combination of a liquid-receiving tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, a downwardly-extending branch on said inlet-pipe terminating below the normal level of said outlet-pipe and an upwardly-extending branch communicating with said downwardly-extending branch and terminating within said tank above the normal level of the liquid therein, a downwardly-extending branch on said outlet-pipe terminating within the tank, an upwardly-extending branch communicating with said outlet-pipe and its downwardly-extending branch, said upwardly-extending branch being continued through the wall of said tank, forming a means of communicating with the air on the exterior of the tank, and purifying means adapted to receive the overflow from said tank.

6. In an apparatus for the purification of sewage the combination of a liquid-receiving tank, provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, and a filtration and nitrification means adapted to receive the overflow from said tank, embodying a perforated pipe or passage buried below the surface of the soil; the said pipe or passage being surrounded by a bed of filtering and purifying material and provided with one or more aerating-pipes leading to the surface of the soil.

7. In an apparatus for the purification of sewage, the combination of a liquid-receiving tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, and a filtration and nitrification means adapted to receive the overflow from said tank, said means embodying a series of perforated pipes or passages buried below the surface of the soil, each of said pipes or passages lying in different horizontal planes as they progress from said tank outwardly, said pipes or passages being provided with aerating pipes or ducts leading to the surface of the soil, and being surrounded by beds of purifying and filtering material.

8. In an apparatus for the purification of sewage, the combination of a liquid-receiving tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, and filtration and nitrification means adapted to receive the overflow from said tank, said means embodying a perforated pipe or passage buried below the surface of the soil, and provided with one or more aerating-pipes leading to the surface of the soil.

9. In an apparatus for the purification of sewage, the combination of a liquid-receiving tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, and a filtration and nitrification means adapted to receive the overflow from said tank, embodying a series of perforated pipes or passages buried below the surface of the soil, said pipes or passages extending outwardly from said tank in the same general direction, each pipe or passage being situated in a lower horizontal plane than the preceding member as they progress outwardly and away from said tank, and a series of aerating ducts or passages leading therefrom to the surface of the soil.

10. In an apparatus for the purification of sewage, the combination of a tank and pipe adapted to receive the overflow therefrom, a filtration and nitrification means embodying a series of perforated passages formed of farm-tiles buried beneath the surface of the earth and provided with aerating-passages leading upwardly therefrom, and communicating with the air at the surface of the soil.

11. In an apparatus for the purification of sewage the combination of a tank and pipe adapted to receive the overflow therefrom, and filtration and nitrification means embodying a series of perforated passages formed of farm-tiles buried beneath the surface of the earth in beds of clinkers, crushed

stone or burned earth, and provided with aerating-passages leading to the earth's surface.

12. In an apparatus for the purification of sewage, the combination of a tank, a pipe adapted to receive the overflow therefrom, a flushing-pipe entering said tank above the normal level of said outlet-pipe, and filtration and nitrification means embodying a series of perforated passages beneath the earth's surface adapted to receive the liquid contents of the tank from the overflow-pipe thereof, and being provided with a series of upwardly-extending air-ducts or passages communicating with the atmosphere at the surface of the soil.

13. In an apparatus for the purification of sewage, the combination of a liquid-receiving tank provided with inlet and outlet pipes piercing the walls thereof, the normal level of said outlet-pipe being lower than the normal level of said inlet-pipe, a downwardly-extending branch on said inlet-pipe terminating below the normal level of said outlet-pipe, an upwardly-extending branch on said inlet-pipe communicating with said downwardly-extending branch and terminating within said tank and above the normal level of the liquid therein, a downwardly-extending branch on said outlet-pipe terminating within the tank, an upwardly-extending branch on said outlet-pipe communicating with said downwardly-extending branch and extending into the outer air on the exterior of said tank, a baffle-wall situated between said inlet and said outlet pipes and adapted to retard the flow of liquids therebetween, a flushing-pipe entering said tank at a point above the normal level of said outlet-pipe, and means adapted to receive the overflow from said tank.

14. In an apparatus for the purification of sewage, the combination of a receiving-tank, and aerating and purifying means adapted to receive the overflow from said tank, said means comprising a pipe or passage extending beneath the surface of the earth being provided with perforated walls and embedded in a body of filtering material having direct contact with the surrounding soil.

15. In an apparatus for the purification of sewage, the combination of a receiving-tank and aerating and purifying means adapted to receive the overflow from said tank, said means comprising a pipe or passage provided with perforated walls extending beneath the surface of the soil and surrounded by a bed of filtering and purifying material the said filtering and purifying material having direct contact with the surrounding soil.

16. The combination in an apparatus for the purification of sewage, of a perforated pipe or passage buried below the surface of the soil, a body of filtering material in contact with said perforated pipe or passage, the said filtering material having direct contact with the surrounding soil and means for supplying air to the perforated pipe or passage.

17. The combination in an apparatus for the purification of sewage, of a perforated pipe or passage buried below the surface of the soil, a body of filtering material in contact with said perforated pipe or passage, the said filtering material having direct contact with the surrounding soil, and an aerating-pipe leading from said perforated pipe or passage to the surface of the soil.

18. In an apparatus for the purification of sewage, the combination of a temporary receiving-tank, provided with an inlet-duct, and having an outlet-duct below the level of said inlet-duct, and aerating and purifying means adapted to receive the overflow from said tank, said means comprising a perforated passage extending beneath the surface of the earth and embedded in a body of filtering material having direct contact with the surrounding soil.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 13th day of September, A. D. 1906.

BURTON J. ASHLEY.

Witnesses:

E. C. SEMPLE,

A. L. SPRINKLE.