No. 826,654. PATENTED JULY 24, 1906.

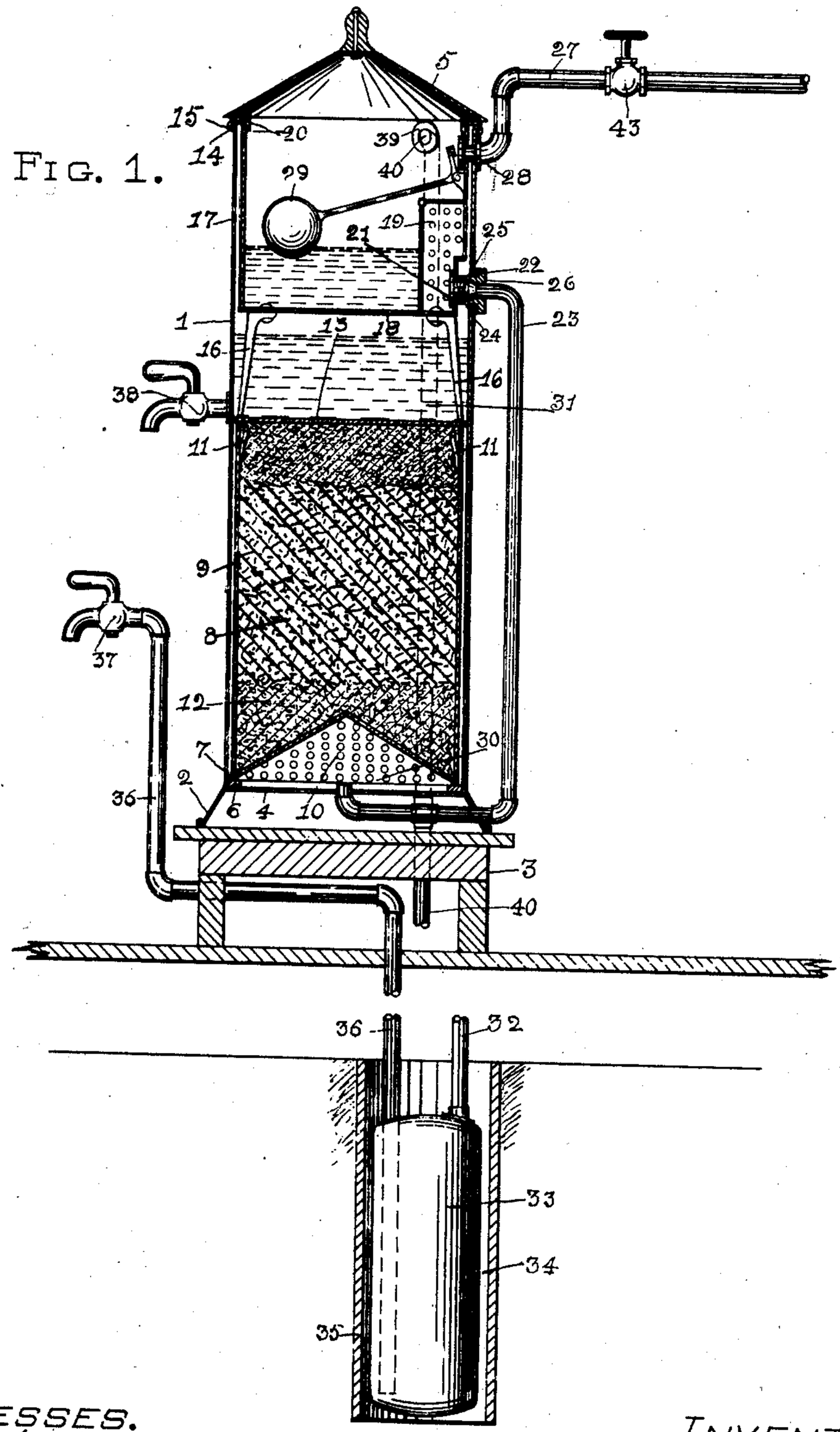
F. E. FIRTH.

SELF COOLING FILTER SYSTEM.

APPLICATION FILED APR. 18, 1906.

2 SHEETS—SHEET 1.

FIG. 1.



WITNESSES.

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2 SHEETS—SHEET 2.

FIG. 3.

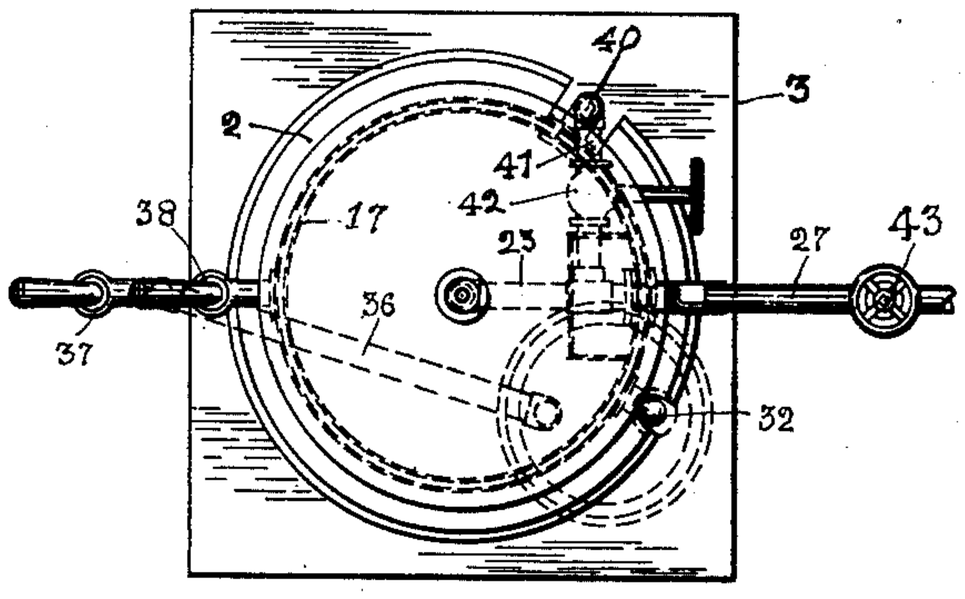
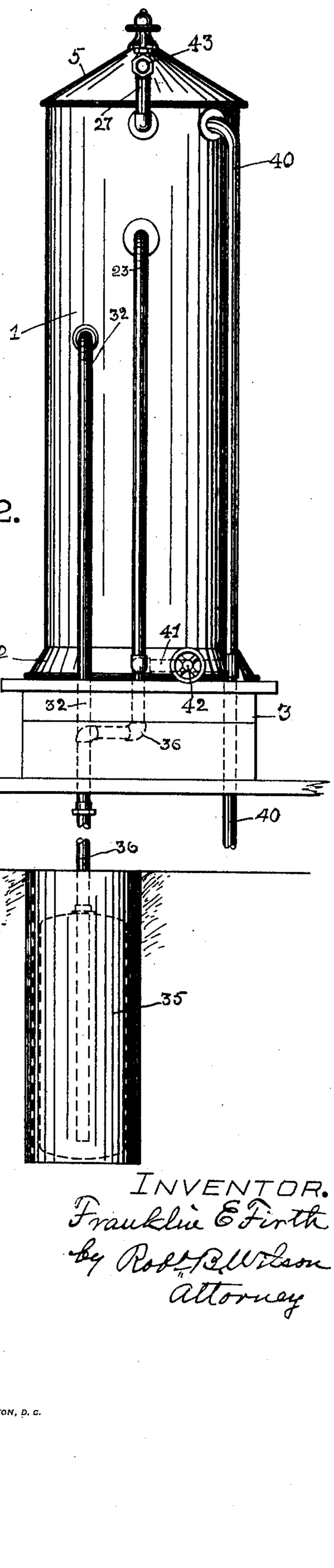


FIG. 2.



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SELF-COOLING FILTER SYSTEM.

No. 826,654. Specification of Letters Patent. Patented July 24, 1906.

Application filed April 18, 1906. Serial No. 312,312.

To all whom it may concern:

Be it known that I, FRANKLIN E. FIRTH, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented a new and useful Improvement in Self-Cooling Filter Systems, of which the following is a specification.

My invention relates to a self-cooling filter system for water, and has for its object to provide an automatic system of the kind that is simple, inexpensive, and convenient and in which the water after being filtered is cooled by earth radiation. I accomplish these objects by the construction, combination, and automatic operation of parts hereinafter described, and illustrated in the drawings, in which—

Figure 1 is a vertical longitudinal section of the filter-tank and cooling-well, showing the supply and siphon pipes of the cooler-tank broken through. Fig. 2 is a side elevation of the same, also showing the supply and siphon pipes of the cooling-tank broken through; and Fig. 3 is a top plan view of the same.

In the drawings, 1 represents the filter-tank, which is provided with an integral flared base-flange 2, by which the tank is mounted on a suitable support 3. The tank 1 is cylindrical above the base-flange 2 and is preferably constructed of sheet metal. The tank is provided with a bottom closure 4 and with a removable cap-closure 5 at the top. Within the tank 1, resting on the bottom 4 and closely fitting the cylindrical wall of the tank, is provided the annular packing 6, upon which rests the bottom rim 7 of the filter 8.

The filter 8 comprises the cylinder 9, having the perforated conical bottom 10 and the interior top handles 11, by which the cylinder is lowered into and lifted from the tank 1, the diameter of the cylinder 9 adapting it to telescopically enter within the tank and the filter material suitably packed within and filling the cylinder 9 and comprising the bottom layer of coarse gravel 12, a body of charcoal superimposed on the gravel, and a top layer of sand. Above and resting on the top of the cylinder 9 is provided a perforated diaphragm 13.

In the top portion of the tank 1 is supported by its concentric flange-rim 14, which engages the rim 15 of the tank 1, and by the legs 16, which rest on the diaphragm 13, the supply-tank 17, which is provided with the bottom 18 and with the perforated sponge-pocket 19 at one side. The top, which is open, is adapted to be closed by the cap-closure 5, which rests on the flange-rim 14 and is provided with a flange 20, which fits into the top portion of the supply-tank.

Near the bottom of the sponge-pocket 19 there is provided an orifice in the wall of the supply-tank, in which is fitted a flanged nipple 21, which is both interiorly and exteriorly threaded, and opposite the nipple there is provided in the wall of the tank 1 an enlarged orifice 22, through which extends one end portion of a pipe 23, which is exteriorly threaded to permit the nipple 21 after being inserted through the orifice in the supply-tank to be run on the threaded portion of the discharge-pipe. The outer end of the nipple is conically reduced to fit into the conically-reduced inner end portion of the bore of a coupling-sleeve 24, which is mounted on the discharge-pipe and has an inner end portion 25, which is adapted to enter the orifice 22 and which is interiorly threaded to run on the exterior threads of the nipple 21, and an outer squared head-flange 26, adapted to be engaged by a wrench, by which the parts are drawn together to form a water-tight connection of the discharge-pipe to both the supply-tank and the tank 1.

Through suitable opposite orifices near the tops of the tanks 1 and 17 there is detachably coupled in a similar manner as described for the pipe 23 a supply-pipe 27, which is connected to a main supply under head-pressure, and in the coupling 28 is provided a valve which is controlled by a float 29, which closes the valve when the water in the supply-tank reaches a predetermined level and opens it when it falls below, whereby the supply is made automatic and according to quantity used.

The pipe 23 extends from its connection with the supply-tank downward to the base-flange 2, through a suitable orifice in which it extends to and through the center of the bottom 4 of the tank 1 into the chamber 30, formed between the bottom 4 and the perforated conical bottom 10 of the filter-cylinder 9. The tanks 1 and 17 being thus connected, the pressure of water in the supply-tank gradually forces the water upward through the filter 8 into the middle chamber 31 between the filter and the supply-tank.

Above and near the diaphragm 13 is tapped into the chamber 31 of the tank 1 a discharge-

pipe 32, which extends downward and is connected to the top of a closed cooling-cylinder 33, which is at the bottom of an incased well 34 of slightly-greater diameter than the cooling-cylinder and of sufficient depth in the earth to insure a uniform low temperature, the casing 35 of the well being preferably formed of porous tiling.

The cooling-cylinder is provided with a pipe 36, which extends from near the bottom of the cylinder 33 upward through its closed top and through the well to a point that is below the level of the chamber 31, where it is bent horizontal and provided with a suitable faucet closure-valve 37. There is also tapped into the tank 1 opposite the chamber 31 a faucet-valve 38.

Above the established water-level of the supply-tank 17 through suitable opposite orifices in the tanks 1 and 17 there is coupled by a detachable coupling 39, similar to the coupling for the pipe 23, a waste-pipe 40, which extends downward along the outer wall of the tank 1 and is connected in any suitable manner with a drain-pipe.

Below the bottom 4 of the tank 1 there is provided a flushing-pipe 41, which is coupled to both the pipe 23 and the waste-pipe 40, and the pipe 41 is provided with a closure-valve 42. The supply-pipe 27 is also provided with a closure-valve 43. Thus constructed and connected and the flushing-valve being closed when the closure-valve 43 is opened the water will flow into the supply-tank 17 and thence through the sponge-pocket and the pipe 23 into the chamber 30 until the resistance of the filter causes the chamber 30 and the pipe 23 to be first filled and then the supply-tank to be filled to the level where the float will shut off the valve of the supply-pipe. Gradually the water under the pressure of the water in the supply-tank will be forced up through the filter 8 and the diaphragm 13 until it reaches the outlet-pipe 32, which will drain the filtered water from the chamber 31 until the cooling-cylinder 33, the pipe 32, and the pipe 36 are all filled, the float-valve being automatically opened from time to time to supply the necessary quantity of water for such filling of the system, after which the water will rise in chamber 31 through gradual filtration until the level of the filtered water around the supply-tank reaches the level of the water in the supply-tank, which closes the float-valve of the supply-pipe.

When the system is once filled and the temperature of the water in the cooling-tank has been reduced by radiation to the normal earth temperature at the bottom of the well, (which is about 45° Fahrenheit,) water under the pressure of the greater height of the column of filtered water in pipe 32 and in the chamber 31 of the tank 1 may be drawn off through the faucet 37 from the pipe 36. After a quantity equal to the cubic capacity of the pipe 36 has been drawn therefrom, which may be returned to the supply-tank, the water will be of the temperature of the water in the cooling-cylinder.

It is obvious that my system is automatic and continuous, and that after being once filled a quantity of water will be automatically supplied thereto equal to that withdrawn. In order that filtered water for culinary purposes may be drawn therefrom without using the cooled water in the cooler-tank, I have provided the faucet 38, whereby filtered water may be drawn from the chamber 31 before it has passed through the cooler.

By closing the valve of the supply-pipe and opening the flushing-valve 42, the water in the chambers 30 and 31 is discharged through the flushing-pipe 41 into the waste-pipe 40, whereby any sediment in the bottom of chamber 30 is flushed out.

In the event of a leak in the float-valve of the supply-pipe which would cause the water in the supply-tank to rise above the level at which the float closes the valve such excess water therein will pass out through the waste-pipe 40.

In order that the repacking of the filter-cylinder 9 with fresh material may not interrupt the use of the system, a duplicate of cylinder 9 is preferably provided, which may be kept suitably packed and ready for substitution, which requires only the closing of the valve 43 of the supply-pipe, the detachment of the couplings of the waste, supply, and discharge pipes of the supply-tank, and the removal of the supply-tank and diaphragm, after which the filter-cylinder 9 may be lifted from the tank 1 and the duplicate inserted in its place. The diaphragm and supply-tank being again placed in position and coupled to the waste, supply, and discharge pipes and the valve 43 being reopened, the system will be ready again for withdrawing water from the cooling-tank as soon as the chambers 30 and 31 are refilled by the automatic action of the system. The removed cylinder 9 may be then repacked in readiness for use when its duplicate requires repacking.

It will thus be seen that I have provided a convenient and inexpensive system whereby filtered water cooled to potable temperature by earth radiation is continuously and automatically supplied as needed for use.

A sponge is preferably packed in the sponge-pocket of the supply-tank to prevent the heavier sediment or impurities of the water from being deposited in the chamber below the filter.

What I claim to be new is—

1. In a self-cooling filter system, the combination of a filtered-water tank, a closed cooling-tank sunk in the earth below the filtered-water tank, a pipe connecting the filtered-water tank to the cooling-tank, and a

delivery-pipe extending downward into the cooling-tank from a level below the water-level of the filtered-water tank, and a closure-valve for the upper end of the deilvery-pipe, substantially as set forth.

2. In a self-cooling filter system, the combination of a filtering-tank, filtering material removably packed in the lower part of the filter-tank, a water-supply tank detachably mounted in the top end of the filter-tank, a pipe connecting the lower portion of the supply-tank with the lower portion of the filter-tank, a closed cooling-tank sunk in the earth below the filter-tank, a pipe connected at its upper end to the filter-tank above the filtering material, and below the supply-tank, and at its lower end to the top of the cooling-tank, a delivery-pipe extending downward into the cooling-tank from a level below the level of the top of the filter material in the filter-tank, and a closure-valve for the upper end of the delivery-pipe, substantially as set forth.

3. In an automatic filter system, the combination of an outer cylindrical tank, a filter-cylinder, provided with a recessed perforated bottom and filled with filtering material, telescopically inserted in and supported on the bottom of the outer tank, a packing between the filter-cylinder and the outer cylinder, a perforated cover for the filter-cylinder, a supply-tank supported within the top portion of the outer tank, a supply-pipe connected to a water-supply under head-pressure and detachably connected to the supply-tank, a valve in the supply-tank normally open, a float in the supply-tank adapted to close the valve at a predetermined level of water in the tank, a closure-valve for the supply-pipe, a filter supply-pipe detachably coupled to the supply-tank and connecting the bottom portion of the supply-tank with the bottom portion of the outer tank, and a draw-off faucet for the outer tank located above the filter, substantially as set forth.

4. In an automatic filter system, the combination of an outer cylindrical tank, a filter-cylinder, provided with a recessed perforated bottom and filled with filtering material, telescopically inserted in and supported on the bottom of the outer tank, a packing between the filter-cylinder and the outer tank, a perforated cover for the filter-cylinder, a supply-tank supported within the top portion of the outer tank, a supply-pipe connected to a water-supply under head-pressure and detachably connected to the supply-tank, a valve in the supply-tank normally open, a float in the supply-tank adapted to close the valve at a predetermined level of water in the tank, a closure-valve for the supply-pipe, a filter supply-pipe detachably coupled to the supply-tank and connecting the bottom portion of the supply-tank with the bottom portion of the outer tank, a closed cooling-tank located in the ground below the level of the outer tank, a pipe connected at its upper end to the outer tank above the filter-cylinder, and at its lower end to the top of the cooling-tank, a delivery-pipe extending downward into the cooling-tank from a level below the level of the top of the filter-cylinder, and a closure-valve for the upper end of the delivery-pipe, substantially as set forth.

5. In an automatic filter system, the combination of an outer cylindrical tank, a filter-cylinder, provided with a recessed perforated bottom and filled with filtering material, telescopically inserted in and supported on the bottom of the outer tank, a packing between the filter-cylinder and the outer cylinder, a perforated cover for the filter-cylinder, a supply-tank supported within the top portion of the outer tank, a supply-pipe connected to a water-supply under head-pressure and detachably connected to the supply-tank, a valve in the supply-pipe normally open, a float in the supply-tank adapted to close the valve at a predetermined level of water in the tank, a closure-valve for the supply-pipe, a filter supply-pipe detachably coupled to the lower portion of the supply-tank and connecting the bottom portion of the supply-tank with the bottom portion of the outer tank, an overflow waste-pipe connected to the top portion of the supply-tank, and extending below the outer tank, and a valve-controlled flushing-pipe connecting the filter supply-pipe with the waste-pipe below the bottom of the outer tank, substantially as set forth.

In witness whereof I have hereunto signed my name, in the presence of two subscribing witnesses, this 11th day of April, 1906.

FRANKLIN E. FIRTH.

In presence of—
I. E. MAUMLER,
ANNA M. FRIEDRICHS.