N. W. GREEN.

Water-Supply System for Cities, &c.

No. 218,875. Patented Aug. 26, 1879.

Fig 1

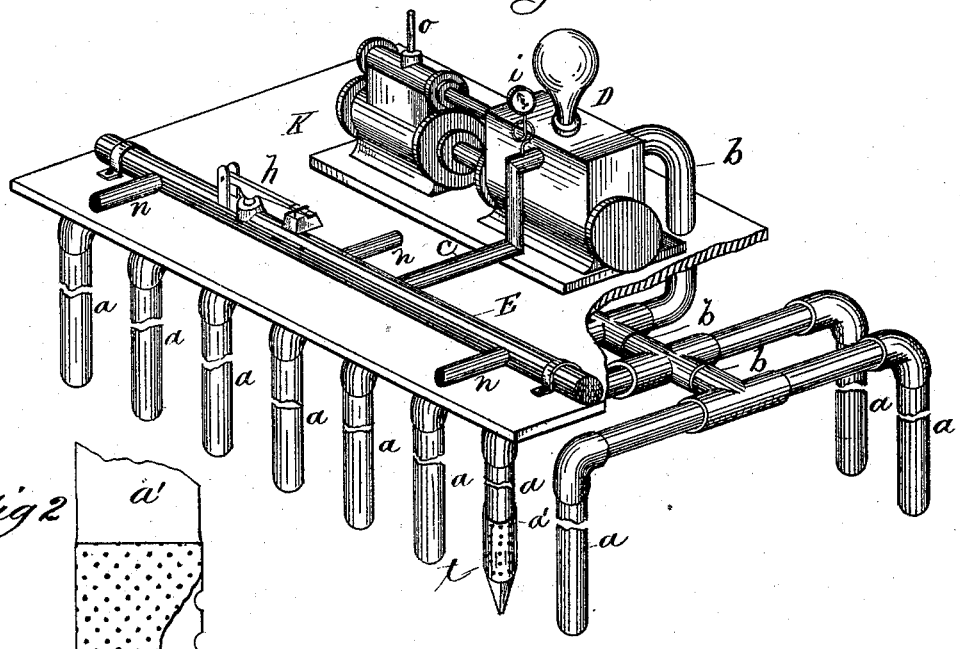
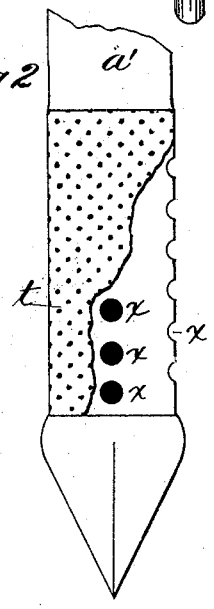


Fig 2



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UNITED STATES PATENT OFFICE.

NELSON W. GREEN, OF NEW YORK, N. Y.

IMPROVEMENT IN WATER-SUPPLY SYSTEMS FOR CITIES, &c.

Specification forming part of Letters Patent No. **218,875**, dated August 26, 1879; application filed April 14, 1879.

To all whom it may concern:

Be it known that I, NELSON W. GREEN, of the city, county, and State of New York, have invented new and useful Improvements in Water-Supply Systems for Cities, Towns, Villages, and Manufactories, which improvements are fully set forth in the annexed specification and in the accompanying drawings.

My invention has for its object the furnishing of an inexhaustible supply of perfectly pure water for the use of cities, towns, &c.; and consists of a water-supply apparatus constructed by connecting a series of driven wells with a common suction-pipe which leads to a pump or pumps; of suitable pumps for drawing water from the earth through the aforesaid wells and pipe; and of proper water-mains for conveying said water from said pumps through the streets of a city or town, whereby the general subterranean water-deposit of the earth is utilized for furnishing large quantities of water, by causing a subterranean flowage toward the exhausted district penetrated and drawn upon by the action of said pumps through said series of driven wells connected thereto.

The drawings consist of two figures.

In Figure 1, *a* represents driven wells. *a'* is one of said wells completed. *b* is the suction-pipe. D is a steam-pump. *c* is an eduction-pipe leading from pump D to the street-main E. *n n n* are branches on main E. *i* is a pressure-gage. *h* is a waste-valve. *k* represents the surface of the earth or the floor of a pump-house. *o* is a steam-induction pipe. *t* is a perforated metallic shield on the exterior of one of wells *a*, just above its pointed end.

Fig. 2 illustrates the manner of constructing the lower end of the well-tube, in which a portion of the perforated sheet-metal shield *t* is shown broken away, showing the larger holes *x* in the tube *a'* covered thereby.

The drawings illustrate clearly the general construction of my apparatus, showing how the driven wells, suction-pipe, pump, and street-mains are combined.

The main purpose of my invention is to provide suitable means for utilizing the subterranean water-deposit of the earth from which to draw large supplies of pure water for the purposes above specified, in contradistinction to the common gravitation and pumping systems, in which the sole dependence is upon a greatly varying supply (in quantity) of surface-water, which can rarely be used without filtering, and which, when most scarce, is most unwholesome.

My driven wells are constructed in the usual manner and are each provided with a metallic shield, *t*, attached thereto over the perforated portion of tube *a'*, which is constructed of a finely-perforated metallic plate. I find that such a shield is a great improvement over a wire-netting shield, as it is less apt to get torn and injured in being forced against hard earth and stones while the tube is being forced into the ground, and its perforations are never seriously obstructed by matter from the earth. I do not, however, claim the combination of this shield and the pipe as my invention.

I construct the tube portion of the driven wells *a* in the manner described and shown, and drive them in a suitable locality adjacent to the district to be supplied with water, driving such a number of them as the required water-supply may demand—sometimes but a single series or gang and sometimes several series—connecting each series or gang to a suction-pipe, as shown, leading to a pump driven by any convenient motive power.

Where the nature of the service requires a water-supply greatly varying in quantity, I find it preferable, where several gangs of wells are employed, to draw the water from each gang of wells by a separate pump for each gang; but the product of two or more gangs may be delivered into the same mains or receptacle. Ordinarily, it will be found more convenient to employ a steam pump or pumps, as shown.

From said pump leads an eduction-pipe, *c*, discharging water into a street-main, E, supplied with branches *n n n*. On the eduction-pipe *c* is set a pressure-gage, *i*, and in street-main E is set a waste-valve, *h*.

In practice I build a suitable boiler and pump-house, locating it near where I drive the wells. This house is supplied with suitable steam-boilers for running the pumps, of which there should, preferably, be two to each gang of wells, so that a reserve of pumping force

beyond ordinary wants may at any time be available. The wells and pump or pumps are connected together as shown and described.

I extend the water-main E from the pump-house through the streets of a city or town and connect fire-hydrants and buildings therewith in the usual way for supplying water.

The operation of my apparatus is as follows, viz: I provide such a number of wells for the supply of a town as will deliver, say, three times as much water as will be required for its ordinary consumption, and provide a pumping capacity for said wells which, at a low speed, will supply the regular demand, pumping directly into the mains. By the pressure-gage *i*, attached to the eduction-pipe *c*, the pressure in the delivery-pipe is indicated, showing what "head" is maintained on the mains. Should the supply of water exceed the quantity drawn temporarily, such excess of supply would escape through escape-valve *h*, and thus prevent any undue pressure upon the mains.

My purpose in arranging such ample pumping capacity as to be able to supply the town with the pumps running at a low rate of speed is to keep always in reserve a considerable pumping capacity for use in case of fires. This reserve can be provided in two ways—viz., by running all the pumps constantly at a low rate of speed, with the ability to increase said speed up to that which would deliver water enough to give an ample supply for all the fire-hydrants that would probably be opened at any one time, or a certain number of pumps may be run at full speed to supply ordinary demands, and reserve-pumps, which can be set to work at a moment's notice in case of fire, be provided.

It should be observed that I propose to draw from a certain number of driven wells, by the employment of my apparatus, either an ordinary or an extraordinary quantity of water, as circumstances may require. This contemplates a subterranean supply equal to the draft that may be made upon it, and this result I obtain in practice, demonstrating that the water-supply is not alone from a local source, but that forces are at work which compel a flowage of water through subterranean channels toward the driven wells to replenish the district immediately drawn upon by the pumps and replace the local water by that drawn from a distance, so that practically the water-supply is inexhaustible and freed from local objectionable qualities.

One force above alluded to which compels the subterranean water-deposit to flow toward the place where the driven wells are located is one which has long been recognized as developed by the action of wells driven tightly through the earth's surface into the water-bearing stratum beneath, and which consists of a vacuum there produced, by which said flowage toward the wells is compelled—that is to say, by a force equal to the weight of the atmosphere indirectly intervening in favor of the water-supply.

The second of said forces, in my opinion, is the resultant of the earth's centrifugal and centripetal forces acting impulsively upon the subterranean water-deposits and tending to force them into and through the natural channels of the earth, and hence into an artificial channel which may by chance penetrate to any of these water-bearing strata; but by the system described exactly these relations are established between the pumps and subterranean water-deposits, and hence this resultant force is subordinated to urge the water to the pumps.

The within-described system of water-supply possesses obvious and decided advantages over the gravity system and over the ordinary pumping system, as well as over any open-well system, or one in which dependence for pure water is upon the filtering capacity provided therewith, for, drawing as I do upon a subterranean deposit of water, I obtain, first, absolutely pure water, needing no filtering; second, an unlimited supply, as if drawn from a large river; third, that if the water found at the point where the wells may be driven should possess any objectionable local quality such is soon removed by the water-supply which is derived from distant sources attracted to the pumps by the forces heretofore explained; fourth, my apparatus furnishes a new means of water-supply for the purposes specified at a minimum cost and at a greatly reduced expense as compared with the cost of any system whose dependence is upon a gravity or surface-pumping supply, thus furnishing more than an equivalent for the indispensable artificial reservoir in a water-supply system.

Gangs or series of driven wells have heretofore been connected with a common suction-pipe of a pump; but such gangs or series have not been combined with water-delivery mains and adapted to replace the heretofore specially-constructed reservoirs in water-supply systems.

I am aware of the Holly system of water-supply, and make no claim thereto.

What I claim as my invention is—

1. In a water-supply apparatus for cities and towns, the combination of one or more series of driven wells penetrating into the water-bearing stratum of the earth, a common suction-pipe connecting said wells at their tops, a force pump or pumps having its or their induction port or ports connected with said suction-pipe, and one or more water-mains connected with the eduction of said pump or pumps, whereby said mains and their connections are supplied with a copious supply of water under regulated pressure.

2. In a water-supply apparatus for cities and towns, the combination of one or more series of driven wells penetrating into the water-bearing stratum of the earth, a common suction-pipe connecting said wells at their tops, one or more force-pumps connected with said suction-pipe, and one or more water-mains connected with the eduction of said pump or pumps, whereby the general subterranean wa-

ter-deposit of the earth is caused to flow to said wells, thereby rendering them a substitute for a reservoir, and local impurities of the water are eradicated.

3. In a water-supply apparatus for cities and towns, the combination of one or more series of driven wells penetrating into the water-bearing stratum of the earth, a common suction-pipe connecting said wells at their tops, a force pump or pumps having its or their induction port or ports connected with said suction-pipe, and one or more water-mains provided with an automatic waste-valve and connected with the eduction of said pump or pumps, whereby said mains and their connections are supplied with a copious supply of water under regulated pressure.

NELSON W. GREEN.

In presence of—
H. A. CHAPIN,
WM. H. CHAPIN.