

(No Model.)

2 Sheets—Sheet 1.

P. BALL.
APPARATUS FOR PURIFYING WATER.

No. 513,473.

Patented Jan. 30, 1894.

FIG. 1.

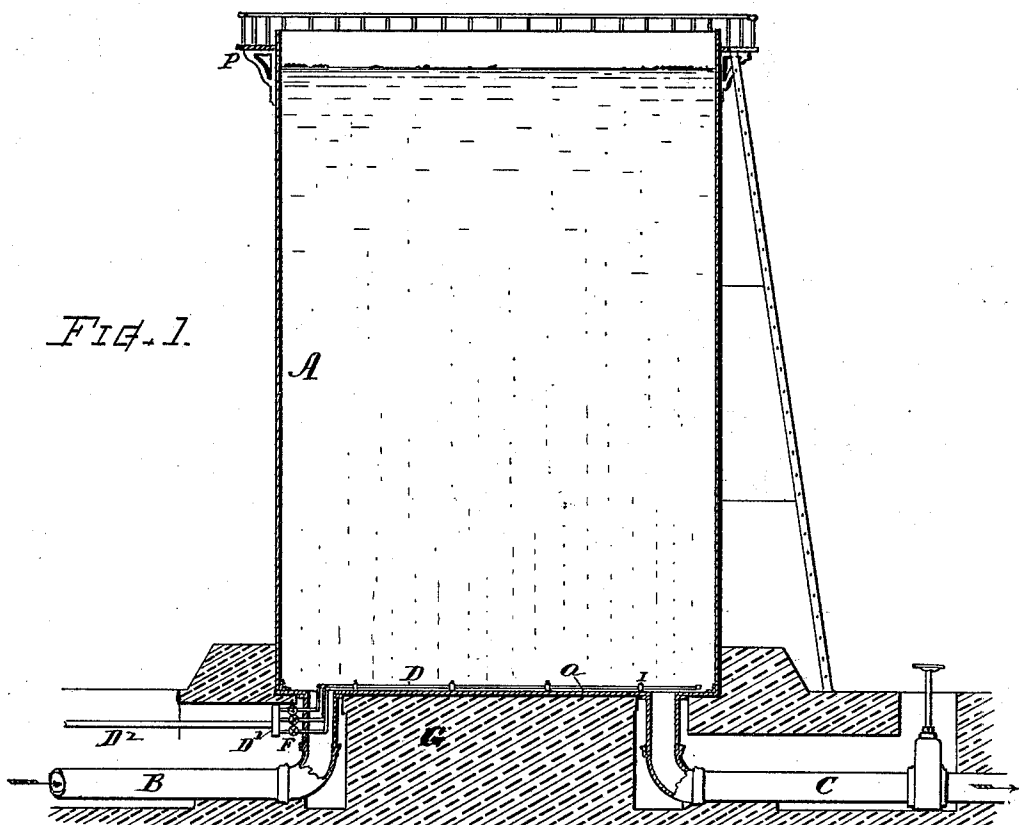
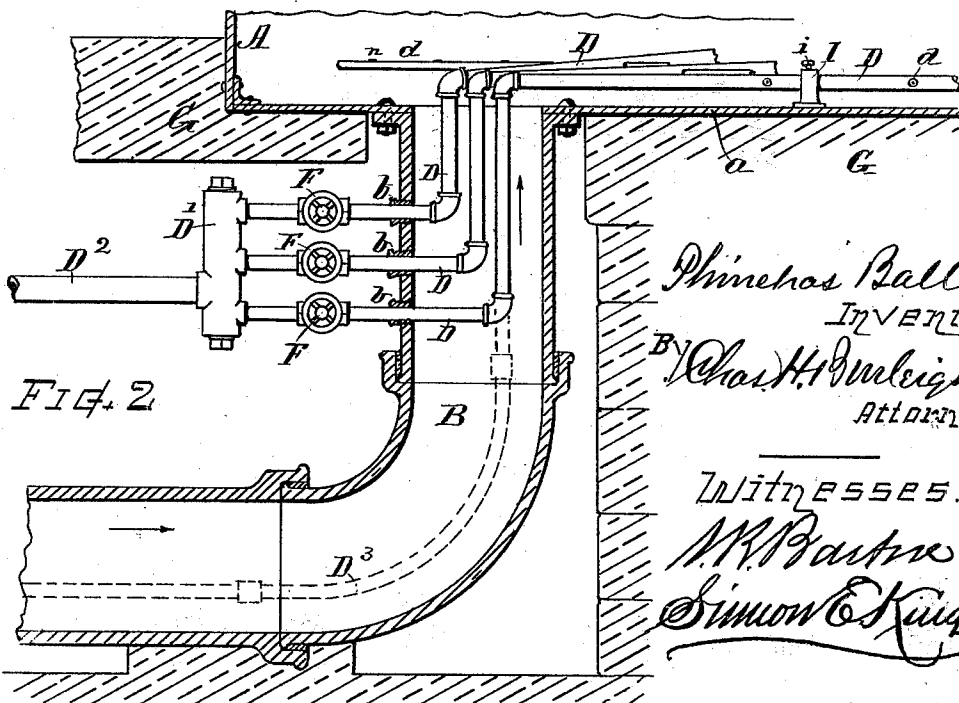


FIG. 2.



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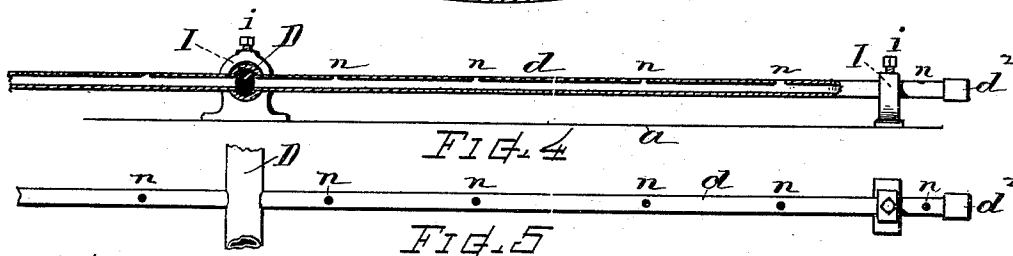
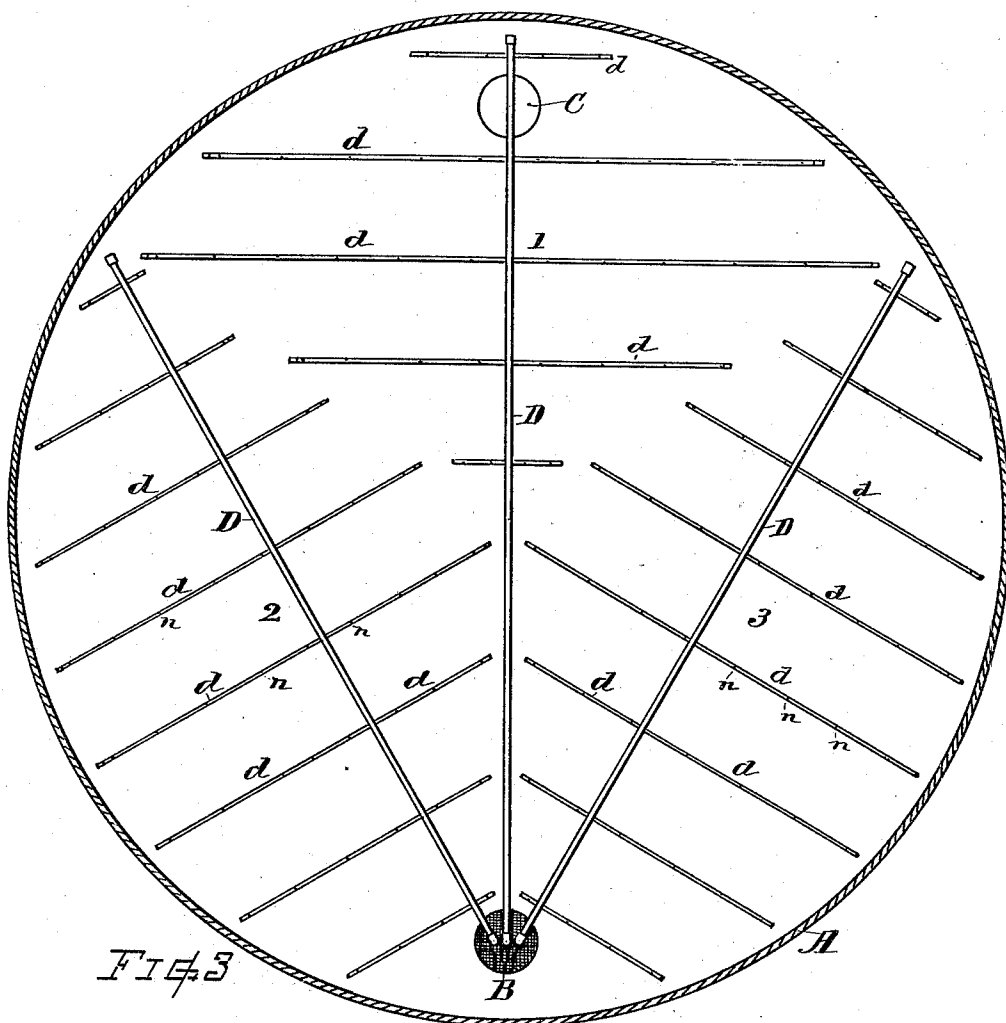
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2 Sheets—Sheet 2.

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APPARATUS FOR PURIFYING WATER.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PURIFYING WATER.

SPECIFICATION forming part of Letters Patent No. 513,473, dated January 30, 1894.

Application filed December 31, 1892. Serial No. 456,918. (No model.)

To all whom it may concern:

Be it known that I, PHINEHAS BALL, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Apparatus for Improving Water in Water-Works Stand-Pipes or Containers, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

The objects of my present invention are—first, to provide a simple and efficient mode of removing impurities from potable water in the stand-pipes or head-tanks of water-supply works for cities, towns or habitations; second, to afford a practical and desirable mode of introducing, arranging and connecting a system of air-injecting pipes, in combination with the water-way and interior of a stand-pipe or tank in the water-supply works from cities, towns or villages, in a manner to prevent injury thereof by frost, and adapted to be economically applied to stand-pipes already erected, as well as in construction of new water-works plants; third, to provide an arranged system of air-pipes adapted for the circular bottoms of water-works stand-pipes, and in which the pipes are disposed in separate individually controlled sections, and the sections adapted to be severally shut off from operation, or their pipes taken out for repairs independently of the other sections. These objects I attain by the apparatus illustrated, and as explained in the following description; the particular subject matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a vertical section of a water-works stand-pipe illustrating my invention as practically applied in connection therewith. Fig. 2 is a vertical section, on somewhat larger scale, showing the manner of introducing and connecting the air pipes and water-mains in combination with the stand-pipe. Fig. 3 is a plan view showing the arrangement of air pipes in separately operative sections or groups. Figs. 4 and 5 illustrate, in section and top views, the constructive detail of the air injecting pipes.

Referring to parts, A denotes the stand-pipe, tank or containing receptacle, such as

employed in the water-supply plants for cities, towns or places.

B indicates the inlet-way or main by which water enters the stand-pipe from the pumping station or supply source, and C the exit-way or main by which the water passes out from the stand-pipe to the distributing service throughout the town or place of use.

The form, size and construction of the stand-pipe A and its relation to the pumping station or works can be substantially the same as heretofore employed; the example here shown being made of iron, say about forty feet in diameter, and sixty-two feet in height, more or less, containing a depth of say sixty feet of water when filled.

D indicates the air-delivery pipes arranged across the bottom of the stand-pipe, and each provided with a series of branch pipes *d* disposed as shown, and provided with small holes or escape orifices *n* formed therein at intervals of about three feet apart, more or less, from which air can be injected into the water. The pipes D and their branches *d* are preferably arranged in the form shown in Fig. 3; one of the main pipes extending from the place of its entrance directly across the bottom space, and the other two main pipes delivering from the place of entrance respectively to the right and to the left in the same horizontal plane. The perforated branch pipes *d* connect at right angles to their main pipes D in the same plane, and are disposed in groups, as at 1, 2 and 3, each group occupying about one-third of the area of the bottom *a*, thereby dividing the air-injecting service into three separate sections or separate parts that are independently controlled by the valves or gates F. The air pipes D are best carried into the stand-pipe within the inlet water-way or main B; or, if in any instance more convenient, through the outlet water-way C in equivalent manner.

The arrangement of the air-pipes in their relation to the inlet water-way is illustrated in detail by Fig. 2. The air, supplied from a suitable air-forcing mechanism (not shown), which may be any well known kind of air compressor, blowing engine or other wind-inducing apparatus, is delivered through the pipe D². Said pipe leads into a branch-head or fitting D' with which the several pipes D

are individually connected in suitable manner. Each of the pipes D is provided with a stop-gate or valve F externally of the water-main B. The pipes D are carried through the
 5 shell of the water-main from its exterior to the interior and properly packed to make a close secure joint, as at *b*. They then extend upward within the water-way to the interior of the stand-pipe and are there turned horizontal at the positions desired. The air-pipes
 10 D and *d* are best sustained at a short distance above the bottom *a* by means of rests or bearers I that stand upon the bottom *a* and are provided with openings and set-screws
 15 *i* for embracing the pipes, as indicated in Figs. 4 and 5. The ends of the pipes *d* are closed by screw-plugs or caps *d*². If in any instance it is found more convenient or desirable to enter the pipes D into the water-way at a
 20 greater distance from its junction with the stand-pipe bottom, then said pipes D can be extended within the water-way, as indicated by dotted lines at D³, to any convenient location, and the connections D' and stop-valves
 25 F arranged at such location in similar manner to that above described.

By introducing the air-supply pipes to the interior of the stand-pipe or container through the water-way or main B (or C) the pipes are
 30 protected against injury by frost; and my improved system and mode of purification can be applied to stand-pipes already erected without cutting into or injuring the body of the tank or stand-pipe, and without taking
 35 out or disturbing the foundation G upon which the stand-pipe rests. In some instances where required, the several pipes can enter through the side or base of the stand-pipe, separate from the water-way; their arrangement and operation within the stand-pipe being substantially the same as herein shown
 40 and described. The stand-pipe is open at the top, or so that the water therein contained is subjected only to the natural atmospheric
 45 pressure. A gallery or platform P affords access to the top surface to facilitate the skimming or removal of floating matter.

The operation of removing impurities is as follows:—The water is pumped or flowed into
 50 the stand-pipe or container A where it is held within the defined limits of the same, and air is forced in through the pipes D *d* and injected into the water from the numerous orifices *n* of the pipes *d*. The quantity of air
 55 injected per hour may be preferably about four per cent. of the cubical contents of the container, more or less, as required for different waters or conditions of impurity; and the action continued for such length of time
 60 as may be in any instance necessary for thorough treatment. The air is disseminated through the mass of water in bubbles of all sizes, from the dimension of a pin head, or less, to an inch or more in diameter, and these
 65 bubbles rise naturally to the surface producing a mechanical ebullition or agitation of the

entire contents of the stand-pipe or container uniformly over the whole area thereof, and these air bubbles seize on all suspended matters in the water, buoy up and bring them directly to the surface as risings or scum. After
 70 some hours continuance of the injection of air the risings or floating matters are removed by hand or mechanical skimming of the surface at the open top of the stand-pipe.
 75 This operation submits all particles of the water to the buoyant action of the air, which latter acting thus intimately on the water and suspended matters contained therein removes all odors, taste or color, as well as all
 80 floating matter of a contaminating nature.

The removal of the foreign matters or recreation from the surface while buoyed or floating, by the skimming operation in connection
 85 with the air injection, eliminates the impurities in a very complete, thorough, and positively efficacious manner, and the contaminating substances are not allowed to become sediment to sink and settle in the distributing
 90 pipes, or be carried forward with the water to the place of its use.

I do not claim broadly the aeration of water, nor the use of perforated pipes for the injection of air into masses of liquid irrespective
 95 of construction, organization and method of operation.

I claim as my invention herein, to be secured by Letters Patent—

1. In combination with a water-works stand-pipe or container, the main air-pipes D entering
 100 the stand pipe through the waterway and arranged in divergent directions from their place of entrance, each having the perforated branch pipes *d* disposed in connection therewith as shown, and comprising a
 105 series of groups or sections for independent control, and a stop-gate or valve in each main or pipe accessible from the exterior of the apparatus, substantially as and for the purpose set forth.
 110

2. A water works stand-pipe or container having arranged in connection therewith, substantially as shown and described, air delivery-pipes D with perforated branch pipes
 115 connecting therewith disposed in a series of separately controlled sections or groups, said air delivery-pipes being entered through the shell of the water-main and led into the stand-pipe or container tank within the water-way,
 120 a principal air-supply conductor D³ having a head or fitting D' with which the delivery pipes to each section severally connect, and a stop valve F in each of said pipes between the fitting D' and its point of entrance to the
 125 main, for the purpose set forth.

Witness my hand this 29th day of December, A. D. 1892.

PHINEHAS BALL.

Witnesses:

CHAS. H. BURLEIGH,
 ELLA P. BLENUS.