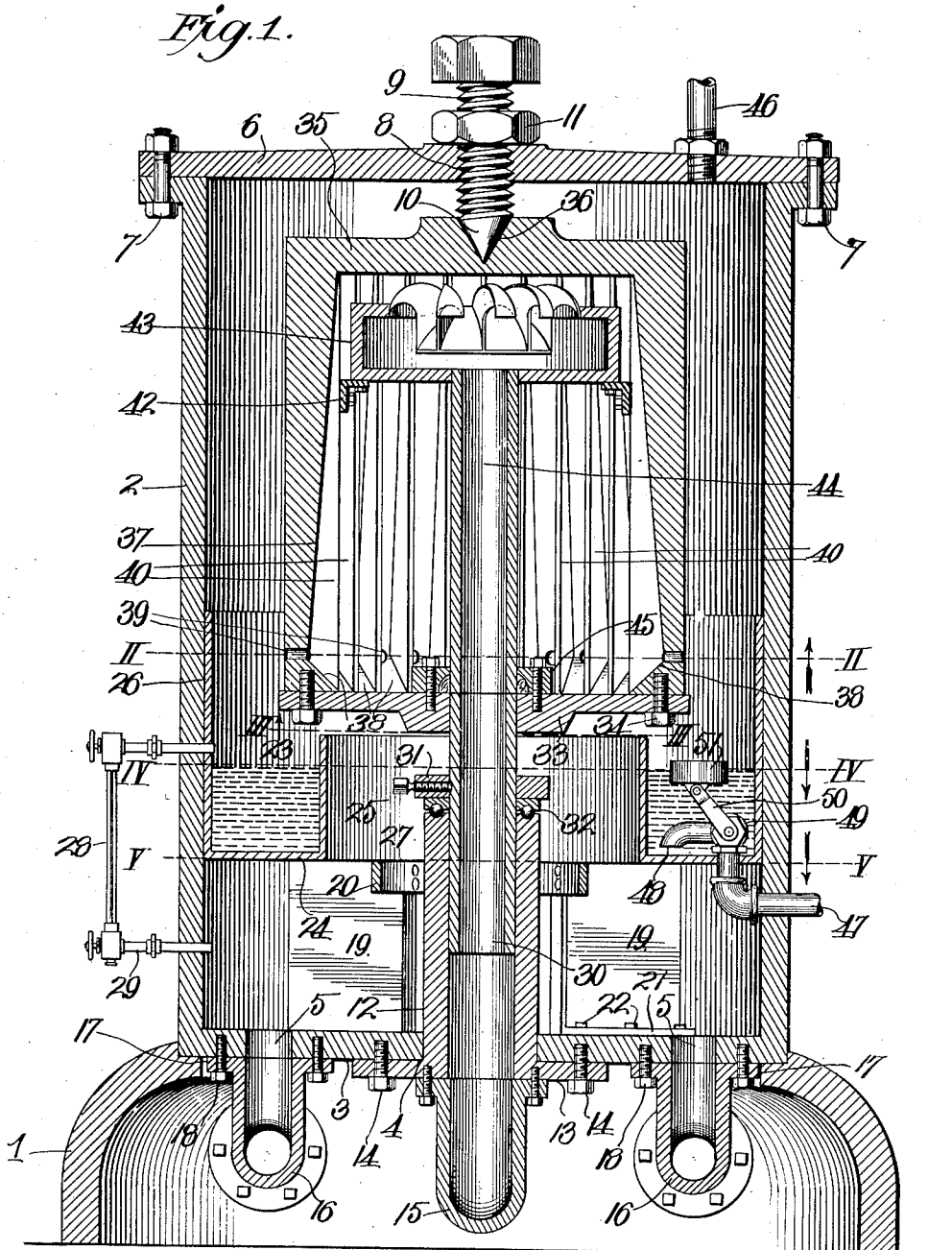


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CENTRIFUGAL WATER PURIFIER.
APPLICATION FILED MAR. 9, 1909.

958,770.

Patented May 24, 1910.

2 SHEETS—SHEET 1.



Witnesses
Frank R. Glom
H. C. Rodgers.

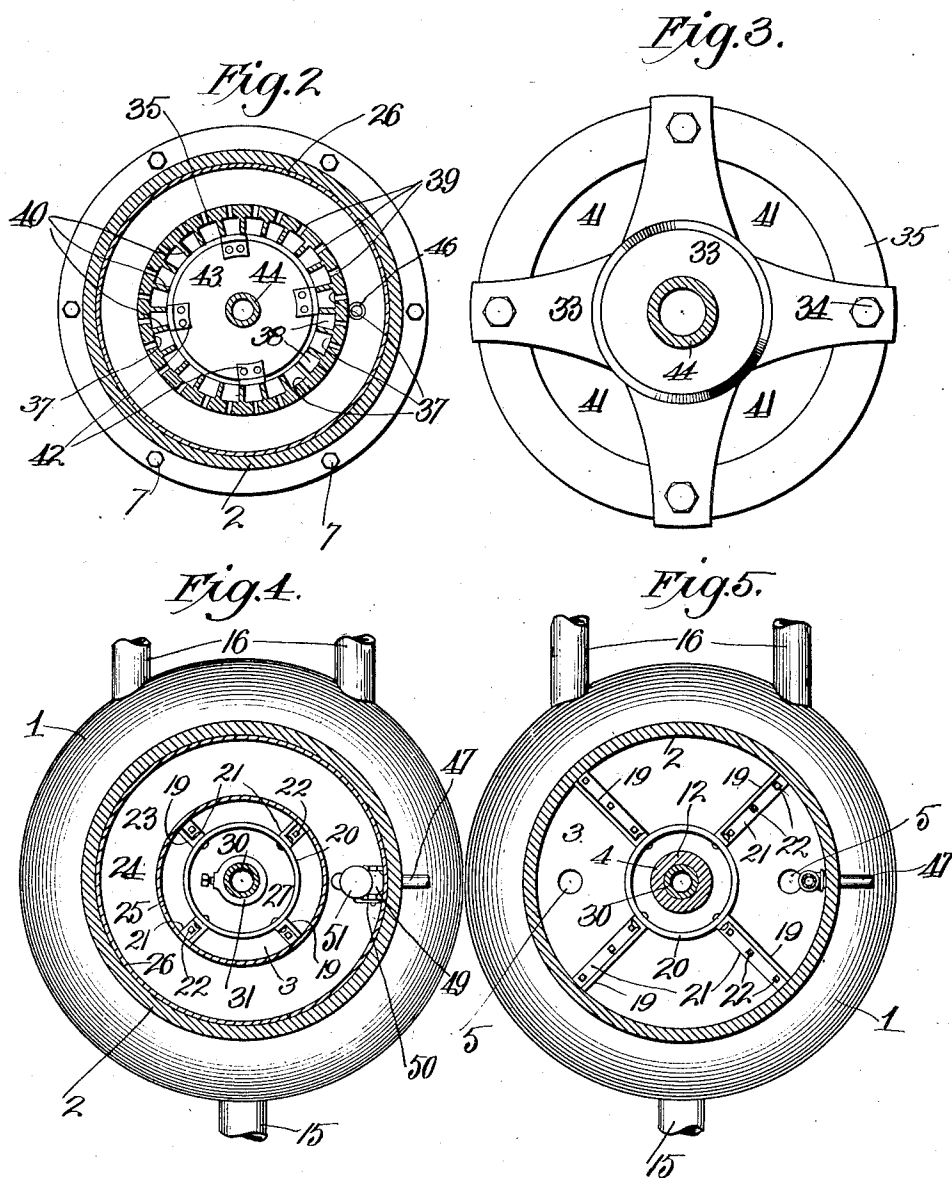
Inventor
W. K. Richardson
By George F. Thorpe Atty.

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UNITED STATES PATENT OFFICE.

WILLIAM KING RICHARDSON, OF LEAVENWORTH, KANSAS.

CENTRIFUGAL WATER-PURIFIER.

958,770.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed March 9, 1909. Serial No. 482,210.

To all whom it may concern:

Be it known that I, WILLIAM K. RICHARDSON, a citizen of the United States, residing at Leavenworth, in the county of Leavenworth and State of Kansas, have invented certain new and useful Improvements in Centrifugal Water-Purifiers, of which the following is a specification.

This invention relates to centrifugal water purifiers and has for its object to produce a machine by which all solid and organic matter held in suspension in and of greater specific gravity than water, may be efficiently and reliably separated from the major portion of such water, by centrifugal force.

A further object of the invention is to utilize the head-pressure of the water supplied to the purifier, to operate or drive the machine and to utilize air, under pressure to effect the discharge of the water from the machine.

A still further object is to produce a machine by which pure, clear and wholesome water may be obtained from unclean or unpurified water economically and expeditiously.

With these general objects in view and others as hereinafter appear, the invention consists in certain novel and peculiar features of construction and organization as hereinafter described and claimed; and in order that it may be fully understood reference is to be had to the accompanying drawings, in which;

Figure 1, is a central vertical section of a centrifugal water purifier embodying my invention. Fig. 2, is a section on a reduced scale on the line II—II of Fig. 1. Fig. 3, is a section on the line III—III of Fig. 1, with the shell omitted. Fig. 4, is a section on a reduced scale, on the line IV—IV of Fig. 1. Fig. 5, is a section on the same scale as Fig. 4, on the line V—V of Fig. 1.

In the said drawings where like reference characters identify corresponding parts, 1 indicates a hollow base of ring-form and stepped in said base is a vertical shell 2 having a bottom 3 provided with a central opening 4 and a pair of openings 5 at opposite sides by preference, of the central opening. The shell is provided with a top or cover 6, bolted in place as at 7, and provided with a central threaded opening 8 receiving an adjustable headed-screw 9 pro-

vided with a conical bearing-end 10, a lock-nut 11 engaging the screw and bearing upon the top or cover 6.

12 is a vertical water-tube or stand-pipe projecting up through and fitting in opening 4 of the bottom of the shell with a liquid-tight relation and provided at its lower end with a flange 13 secured by cap-screws 14 or otherwise against the underside of the bottom, and communicating with said water-tube or stand-pipe is an intake pipe 15 leading from a suitable source of water-supply not shown.

16 indicates a pair of discharge pipes extending through the hollow base and communicating at their intake ends with the openings 5 in the bottom of the shell, and provided with flanges 17 at such ends through which cap-screws 18 extend to secure such discharge pipes to the bottom of the shell with a liquid-tight relation.

19 is a series of baffle-plates arranged radially and extending inward from the wall of the shell to the vertical plane of a ring 20 loosely surrounding the water-tube or stand-pipe 12, and secured rigidly at their inner upper corners to said ring and provided at their lower ends with flanges 21 secured by cap-screws 22 to the bottom of the shell, as shown in Figs. 1 and 5, and resting upon said baffle-plates is an annular water-receptacle 23, consisting of a bottom 24 and inner and outer vertical walls 25 and 26 respectively, wall 26 being of materially greater height than wall 25. The vertical passage 27, formed by the annular water-receptacle establishes communication between the lower and upper parts of the shell for a purpose which hereinafter appears.

28 is an ordinary or any preferred type of water column connected at its lower end by a tube 29 to the lower part or chamber of the shell below the water-receptacle 23, to indicate the depth of water on the bottom of the shell.

30 is a tubular stem fitting rotatably in the water-tube or stand-pipe and equipped with a collar 31 overlying said water-tube or stand-pipe, a ball-bearing 32 being interposed between the collar and the upper end of said water-tube or stand-pipe for the purpose of reducing friction to the minimum. Secured rigidly in any suitable manner on the upper end of stem 30 is a cross-bar 33 fastened by cap-screws 34 to the

lower end of an inverted bowl 35 of external diameter slightly greater than the inner wall of the water-receptacle 23, and said bowl is provided with a conical bearing-recess 36 receiving the conical bearing-end 10 of screw 9. The wall of said inverted bowl tapers downward and outward from its upper end nearly to its lower end as shown at 37, and then downwardly and inwardly to its lower extremity or margin as at 38, and at the junction of or angle formed by said oppositely-tapering surfaces, is provided at suitable intervals with orifices or ports 39, the adjacent orifices being separated by vertical ribs or partitions 40 extending from the upper end of the interior of the bowl to its lower extremity or margin, the said ribs or partitions forming a plurality of internal channels or waterways communicating near their lower ends with the orifices 39 and at such ends with the openings 41 formed between the inner edge of the bowl and the arms of the cross-bar 33, it being noticed in this connection that the said openings are vertically above the passage 27 formed by the annular water-receptacle 23, so that water passing down through openings 41 shall pass through said passage 27 into the lower part or chamber of the shell, it being also noticed that water or other matter passing outward through the orifices 39, enters the said annular water receptacle.

Secured within the inverted bowl near its upper end and spaced from the same, by means of brackets 42 or equivalent support, is a combined penstock and turbine 43 of the type shown or any suitable or preferred type, and rigidly secured to and communicating with and depending vertically from said turbine is a tubular stem 44 of the same diameter as the stem 30, to which it bears a superposed relation, and secured to the upper side of the cross-bar 33 is a packing-gland 45 which fits around the lower end of stem 44 at its junction with the upper end of stem 30 to establish a watertight joint between the same, it being necessary to employ the two stems 30 and 44 instead of one and pack the joint between them, because the cross bar of the inverted bowl is rigidly secured on the upper end of the stem 30.

For the purpose of supplying air under pressure, to the shell, a pipe 46 is secured at one end to the top or cover 6 and communicates with the interior of the shell and for the purpose of conducting from the shell unpurified water which collects in the water-receptacle 23, a discharge pipe 47 extends into the lower part of the shell and up through the bottom of the said water-receptacle and is provided with a pipe 48 having its receiving end turned downward to avoid as far as possible the entrance of air due

to eddy currents formed by the rapid flow of water through pipe 47, a valve 49 of common and well known type, controlling the passage of water from pipe 48 to pipe 47 and having a crank-arm or lever 50 equipped with a pivoted float 51, to automatically rise and fall and thus impart opening or closing movement to the valve, as the volume of water in the receptacle 23 is augmented by an increased discharge from the bowl through orifices 39, or diminished by a decreasing supply of water from said bowl.

The valve-controlled discharge-pipe is of such capacity that it will provide for the escape of water from receptacle 23 in volume equal and at a speed proportionate to that discharged into the receptacle by the bowl when the machine is operating at its fullest capacity so as to guard against any possibility of unpurified water overflowing the inner wall of the receptacle 23 and becoming mixed with clear or purified water contained in the lower part of the shell.

In operation, air is first forced into the shell 2 until it attains the required density, determined by the pressure of the water to be admitted to the purifier. Assuming that the water from the source of supply is forced by a pump into the purifier at the usual pressure of city-service pumps, say one hundred and fifty pounds, it will be seen that such water passes from the intake pipe 15 up through the water-tube or stand-pipe 12 and stems 30 and 44 and impinges against the turbine and therefore revolves the same and the bowl, the water revolving the bowl under a pressure corresponding to the difference between the head pressure and the pressure of the air within the shell. Assuming that the head pressure is one-hundred and fifty pounds and the air pressure one-hundred and twenty pounds, the difference viz., thirty pounds, will be consumed in revolving the turbine and bowl.

As the water escapes from the turbine, it flies outward under centrifugal force into the channels of the bowl and while exerting an outward pressure against the bowl due to its rotary travel with the latter, it flows downward and outward against the downwardly and outwardly-tapering surface 37, the solid matter held in suspension by the water, being precipitated by centrifugal force directly against surface 37 because of its greater specific gravity is deflected down the outwardly inclined surface 37 by the components, centrifugal force, erosive action of the water and gravitation so that when it attains a position opposite orifices 39 it will be projected through said orifices into receptacle 23, the filtered or purified water moving downward inward of and to a plane below said orifices and being deflected by the downwardly-converging surface 38

through the openings 41 and the underlying passage 27 into the lower chamber or part of the shell, and passing thence through the discharge pipes 16.

5 The ribs 40 are for the purpose of maintaining the water in position to be subjected to centrifugal force and to insure a uniform rotary velocity of the water in the bowl. The orifices or ports 39 are of relatively
10 small cross-sectional size in order to restrict the volume of water flowing from the bowl into receptacle 23, that is to say, in order to permit of the passage of a minimum quantity of water necessary to abrade and
15 carry the foreign particles of greater specific gravity than the water, from the bowl into said receptacle, from which receptacle the passage of this unpurified water is controlled by the automatic valve as hereinbefore ex-
20 plained.

The purified water flows through the discharge pipes 16 at a pressure equal to that of the air in the shell, and such water while confined in the lower part of the shell is held practically stationary by means of the baffle-plates.

From the above description it will be apparent that I have produced a centrifugal water purifier embodying the features of advantage enumerated in the statement of the
30 object of the invention, which is susceptible of modification without departing from the spirit and scope of the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters-Patent, is:

1. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an
40 outlet for unpurified water and an outlet for purified water, a receptacle within the said shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to
45 deliver purified water into the shell and provided with orifices to deliver unpurified water into the said receptacle within the shell, and means whereby the water supplied to the intake shall revolve said bowl to effect
50 such discharge therefrom of purified and unpurified water.

2. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and
55 an outlet for unpurified water and an outlet for purified water, a receptacle within the said shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to deliver purified water into the shell and provided with orifices to deliver unpurified water into the said receptacle within the shell, means whereby the water supplied to the intake shall revolve said bowl to effect such
60 discharge therefrom of purified and unpurified

water, and means within the shell to prevent swirling of the purified water delivered by the bowl.

3. In a centrifugal water purifier, the combination of a shell containing air under
70 pressure and provided with an intake and an outlet for unpurified water and an outlet for purified water, a receptacle within the said shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to deliver purified water into the shell and provided with orifices to deliver unpurified water into the said receptacle within the shell, and means whereby the water supplied to
80 the intake shall revolve said bowl to effect such discharge therefrom of purified and unpurified water; said bowl being provided internally with ribs substantially parallel with the axis of rotation of the shell.

4. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an outlet for unpurified water and an outlet for purified water, a receptacle within the said
90 shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to deliver purified water into the shell and provided with orifices to deliver unpurified water into the
95 said receptacle within the shell, and means whereby the water supplied to the intake shall revolve said bowl to effect such discharge therefrom of purified or unpurified water; the inner surface of the shell sloping
100 upward and inward and downward and inward from said orifices.

5. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an
105 outlet for unpurified water and an outlet for purified water, a receptacle within the said shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to deliver purified water into the shell and provided with orifices to deliver unpurified water into the said receptacle within the shell, and means whereby the water supplied to the intake shall revolve said bowl to effect such
110 discharge therefrom of purified or unpurified water, the inner surface of the shell sloping upward and inward and downward and inward from said orifices, and ribs projecting inwardly from said sloping surfaces
120 at opposite sides of the said orifices.

6. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an outlet for unpurified water and an outlet for
125 purified water, a receptacle within the said shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to deliver purified water into the shell and provided with

orifices to deliver unpurified water into the said receptacle within the shell, means whereby the water supplied to the intake shall revolve said bowl to effect such discharge therefrom of purified and unpurified water, and a float-controlled valve controlling the discharge of water through the outlet communicating with the said receptacle within the shell.

7. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an outlet for unpurified water and an outlet for purified water, a receptacle within the said shell with which the outlet for unpurified water communicates, a suitably journaled bowl within the shell adapted to deliver purified water into the shell and provided with orifices to deliver unpurified water into the said receptacle within the shell, and a turbine within and bearing a fixed relation to the bowl and adapted to be rotated through the impact of the water thereon supplied through the intake.

8. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an outlet for unpurified water and an outlet for purified water, a receptacle within said shell with which the outlet for unpurified water communicates, an inverted bowl within the shell above the said receptacle and provided with orifices in its wall, a cross bar secured to the lower end of the shell, a suitably-journaled tubular stem secured to the cross-bar and communicating with the said intake, and a combined penstock and turbine within and bearing a rigid relation to the bowl and provided with a tubular stem communicating and bearing a fixed relation to the first-named stem.

9. In a centrifugal water purifier, the combination of a shell containing air under pressure and provided with an intake and an outlet for unpurified water and an outlet for purified water, a receptacle within said shell with which the outlet for unpurified water communicates, an inverted bowl within the shell above the said receptacle and provided with orifices in its wall, a cross-bar secured to the lower end of the shell, a suitably journaled tubular stem secured to the cross-bar and communicating with the said intake, a combined penstock and turbine within and bearing a rigid relation to the bowl and provided with a tubular stem communicating and bearing a fixed relation to the first-named stem, and an adjustable bearing engaging the upper end of the bowl.

10. In a centrifugal water purifier, an in-

verted rotary bowl provided near its lower end with a series of orifices, the inner surface of the wall of the bowl flaring downward and outward to the horizontal plane of said orifices and from the latter sloping downwardly and inwardly; and ribs projecting inwardly from the wall between the orifices and forming upright channels in communication near their lower ends with the orifices.

11. In a centrifugal water purifier, an inverted rotary bowl provided near its lower end with a series of orifices, the inner surface of the wall of the bowl flaring downward and outward to the horizontal plane of said orifices and from the latter sloping downwardly and inwardly; and ribs projecting inwardly from the wall between the orifices and forming upright channels in communication near their lower ends with the orifices, a cross-bar secured to the lower edge of the bowl and in conjunction with the latter forming discharge openings inward of said orifices, a tubular stem rigid with and depending from said cross-bar, and a turbine arranged within and rigid with the bowl above the said orifices.

12. In a centrifugal water purifier, an inverted rotary bowl provided near its lower end with a series of orifices, the inner surface of the wall of the bowl flaring downward and outward to the horizontal plane of said orifices and from the latter sloping downwardly and inwardly; and ribs projecting inwardly from the wall between the orifices and forming upright channels in communication near their lower ends with the orifices, a cross-bar secured to the lower edge of the bowl and in conjunction with the latter forming discharge openings inward of said orifices, a tubular stem rigid with and depending from said cross-bar, and a turbine arranged within and rigid with the bowl above the said orifices, a shell inclosing the bowl, means to supply air under pressure to said shell and water under pressure to said turbine through the said stem, a circular water receptacle within the shell and below the bowl outward of the said openings thereof to receive water which may pass through the latter and to permit water which may pass through the former to pass to the bottom of the shell, an outlet for the water on the bottom of the shell, and a valve-controlled discharge pipe for the water collected in the said receptacle.

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Witnesses:

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