Jan. 26, 1926. 1,570,854

C. H. NORDELL

MEANS FOR SEPARATING, WASHING, AND DISCHARGING COMMINUTED SOLID MATERIAL IMMERSED IN LIQUIDS

Filed Sept. 12, 1922

Fig. 3

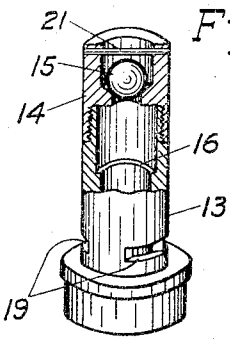


Fig. 2

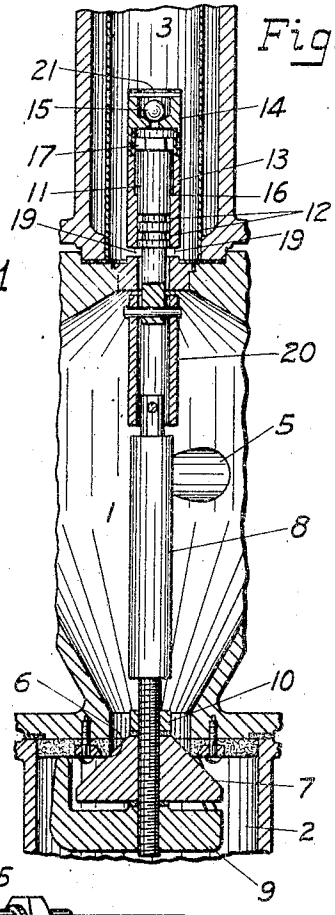


Fig. 1

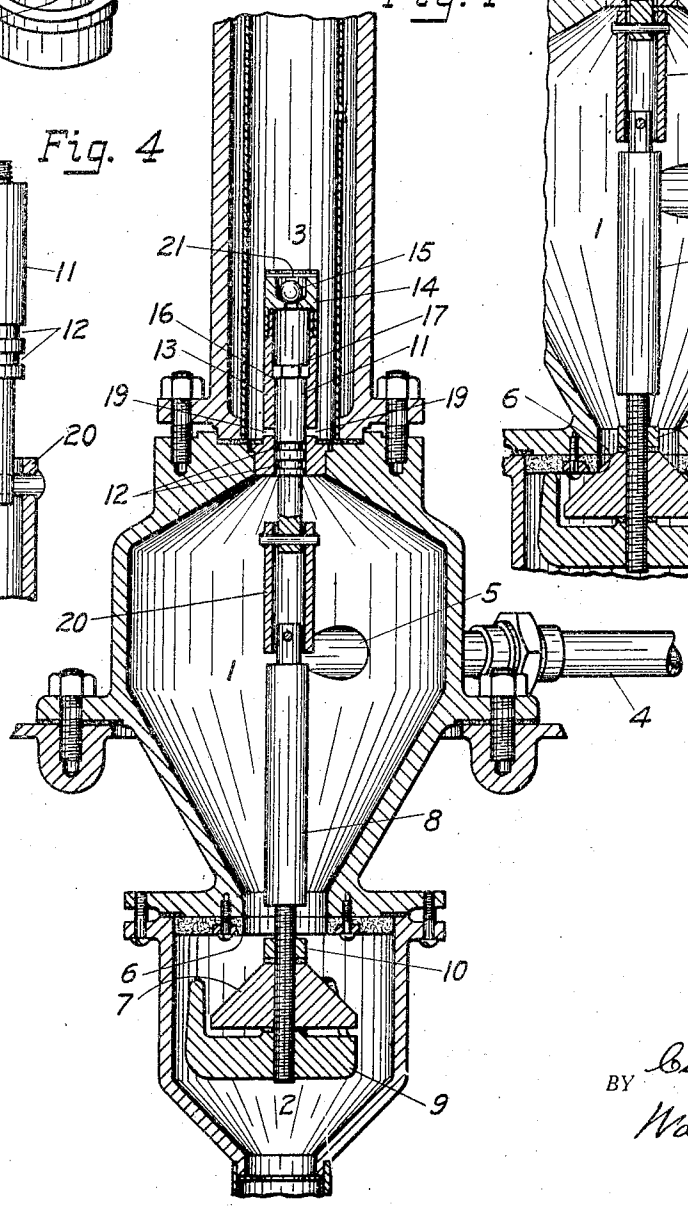
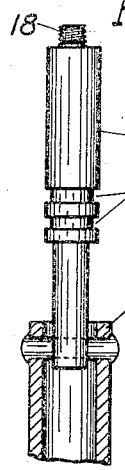


Fig. 4



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UNITED STATES PATENT OFFICE.

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MEANS FOR SEPARATING, WASHING, AND DISCHARGING COMMINUTED SOLID MATERIAL IMMERSED IN LIQUIDS.

Application filed September 12, 1922. Serial No. 587,836.

To all whom it may concern:

Be it known that I, CARL H. NORDELL, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented new and useful Improvements in Means for Separating, Washing, and Discharging Comminuted Solid Material Immersed in Liquids, of which the following is a specification.

My invention relates to a method of and means for separating, washing and discharging comminuted solid material immersed in liquid, the discharge being from a washing chamber located between two other chambers in a closed system and the movement of liquid in said chambers and the means for controlling the opening from each said chamber to its succeeding one depending upon the relative pressures in said chambers.

Heretofore, it has been found difficult to discharge precipitated granular or comminuted solid material from a washing chamber into a lower chamber in a closed system without allowing too much of the liquid in the lower chamber to pass upwardly through the washing chamber and to waste, when the valve was being closed by a decrease in pressure in the upper chamber, at which time a fresh charge of solid material and liquid is being admitted from the outside to the washing chamber.

The three connecting chambers; the opening between the washing chamber and the lower chamber; a heavy check valve, adapted to close said opening; a substantially vertically positioned cylinder with ports, forming the connection between the washing chamber and the upper chamber; a piston adapted to reciprocate in the cylinder and close the ports; and a connection between said check valve and said piston, constitute the essential elements of this invention.

The improvements described in this invention provide means for discharging the precipitated solid material from the washing chamber into a lower chamber while allowing only substantially so much of the liquid from the lower chamber to pass upwardly into the washing chamber as replaces the bulk of solid material and the piston's displacement. Upon closure by the check valve of the opening between the washing chamber and the lower chamber, wash liquid passes to waste through the ports of the cylinder while a fresh charge of comminuted solid material and liquid is being supplied to the washing chamber to take the place of the waste wash liquid. These two steps, (*a*) of solid material dumping from the washing chamber and (*b*) discharging of waste wash liquid from the washing chamber into an upper chamber and receiving fresh solid material into the washing chamber, occur alternately and in constantly repeated cycles, and are effected by relative changes of liquid pressures in the three chambers.

The particular embodiment of my invention selected for illustration is the zeolite washing chamber and the chambers above and beneath it for use on an automatic water softening apparatus, such as that illustrated and described in my co-pending application Serial #561,095 filed May 15th, 1922 and Serial #585,045 filed August 29th, 1922.

Figure 1 shows the three chambers and their connecting elements, the check valve and the union of the connecting rod, in vertical axial section and the piston, ball valve, remainder of the connecting rod and pipe for forwarding fresh charges of zeolites and water in full; the cylinder ports being closed and the check valve open.

Fig. 2, a detail, is the same for so much of the device as is shown, with the cylinder ports open and the check valve closed.

Fig. 3, a detail, is a perspective of the cylinder with parts broken away and in section and

Fig. 4, a detail, is an elevation of the piston with a part of the universal joint in vertical axial section.

Referring now to the drawings, 1 is the washing chamber, 2, the lower chamber and, 3, the upper chamber. Granular or comminuted water softening mineral that has been regenerated passes from a source not shown in the drawings through the pipe, 4, at the opening, 5, into the washing chamber, 1.

The chamber, 1, has preferably a conical bottom and the opening between chambers, 1 and 2, is provided with a preferably resilient valve seat, 6, and a relatively heavy upwardly seating check valve, 7, therefor. The valve, 7, is secured to a valve rod, 8, near its lower end and has a valve stop, 9,

also secured to said rod. Both valve, 7, and stop, 9, are locked in position on the rod, 8, by the nut, 10.

The valve, 7, is raised to seating position (shown in Fig. 2) by means of the upward pressure of water in the chamber, 1, upon a piston, 11, which has labyrinthine packing rings, 12, and is adapted to fit loosely in a cylinder, 13, secured in the opening between the chambers, 1 and 3.

The cylinder, 13, is provided with a head, 14, in which is seated a ball check valve, 15, secured against displacement in any convenient manner, as by the pin, 21, and is also provided with a shoulder, 16, upon which the nut, 17, secured to the threaded stud, 18, rests. The cylinder is provided with ports, 19, through which water flows to the chamber, 3, when the valve, 7, is seated. The piston, 11, is connected to the valve rod, 8, by a universal joint, 20.

The operation of the device is as follows: Suppose the parts to be as shown in Fig. 1 and the pressures in chambers, 1, 2 and 3, substantially equal. Then by external means not shown in the drawing and not a part of this invention, the chamber, 3, is momentarily substantially relieved of pressure; whereupon the pressures are unbalanced on the piston, 11, and it is raised by hydraulic pressure in chamber, 1, carrying with it the heavy check valve, 7, and attendant parts. The piston and the check valve are so positioned relatively, that the valve closes the opening between chambers, 1 and 2, and the piston uncovers the ports, 19, simultaneously.

The parts are now in the position shown in Fig. 2 and the liquid in chamber, 1, flows through the ports, 19, into the lower pressure region in chamber, 3, while at the same time a fresh charge of comminuted solids and liquids enters the chamber, 1, through the pipe, 4, and opening, 5. As the chamber, 3, was only momentarily relieved of pressure, the incoming charge of comminuted material and liquids builds up the pressure in chambers, 1 and 3, which now have free communication through the ports, 19. When this pressure builds up sufficiently, the heavy check valve, 7, and attendant parts fall by gravity, carrying with it the piston, 11, until all these parts are brought to rest by the nut, 17, bearing on the shoulder, 16, of the cylinder, 13.

The parts are now again in the position shown in Fig. 1; the pressures substantially equalize throughout and the comminuted material in chamber, 1, falls into chamber, 2, while water to take its place flows back from chamber, 2, to chamber, 1, against the descending stream of comminuted material thereby washing it.

The ball check, 15, in the cap, 14, permits free discharge of the liquid trapped in the cylinder, 13, between the piston, 11, and the cap, 14, but retards or prevents its return through the cap, 14. When the piston descends, therefore, the water previously discharged from this space must re-enter through the opening between the walls of the cylinder, 13, and the piston, 11. As this opening is restricted, the piston and attendant parts are forced to fall slowly, preventing shock.

I claim as my invention and desire to secure by Letters Patent of the United States:

1. A device for separating, washing and discharging comminuted solid material immersed in liquid, comprising three chambers one above another, the central one of which has a connection leading to each of the others and means operated by liquid under pressure for alternately closing the connection from the central chamber to each of the other chambers while the remaining connection is open.

2. A device for separating, washing and discharging comminuted solid material immersed in liquid, comprising three chambers one above another, the central one of which has a connection leading to each of the others; means for admitting such solids and liquids to the central chamber; a valve seat and check valve therefor adapted to control the flow of solid matter and liquid through the opening between the middle and lower chambers; a cylinder with ports and a piston therefor adapted to control the flow of liquid from the central chamber to the upper chamber; a connection between said valve and piston to insure the ports being open only when the valve is closed, and the valve being closed only when the ports are open; the combined piston and valve adapted to be operated by the differential hydraulic pressures in said chambers.

3. In combination with a device for separating, washing and discharging comminuted solid material immersed in liquid, a check valve, a piston and a connection between said check valve and piston, causing said piston and valve to move in unison.

In testimony whereof I have hereunto set my hand.

CARL H. NORDELL.