May 15, 1928. 1,669,668

T. MARSHALL

PRESSURE BOOSTING FIRE HYDRANT

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Fig. 1.

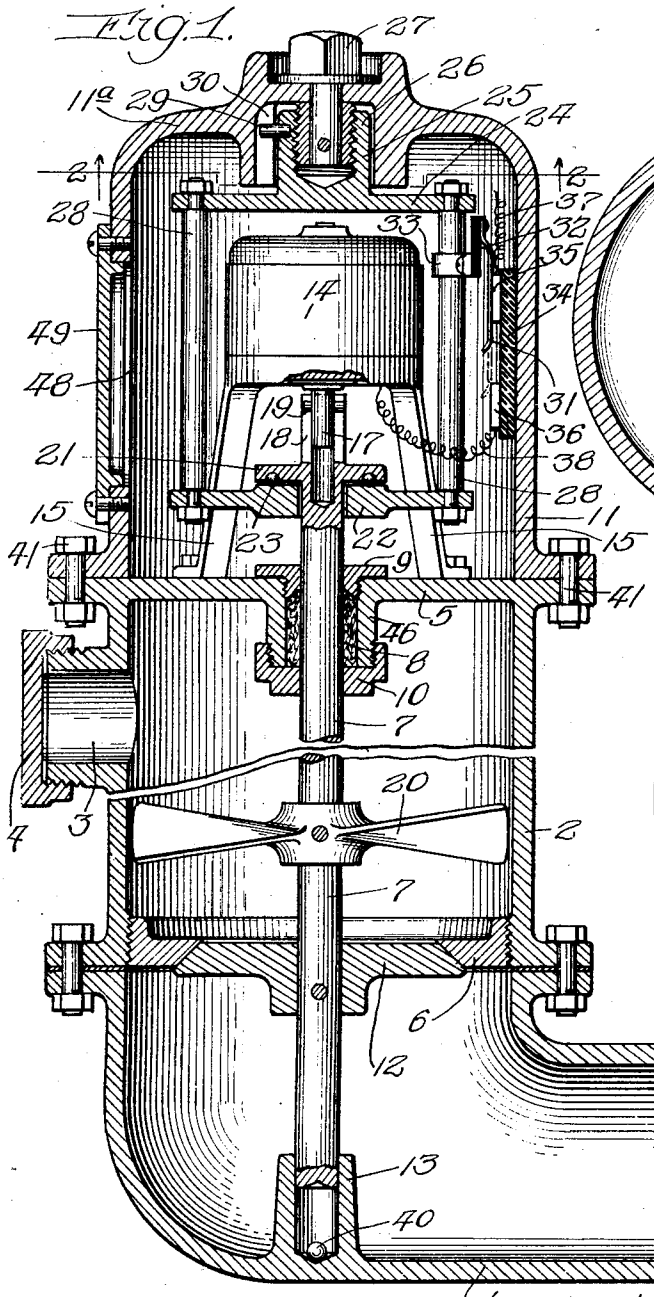


Fig. 2.

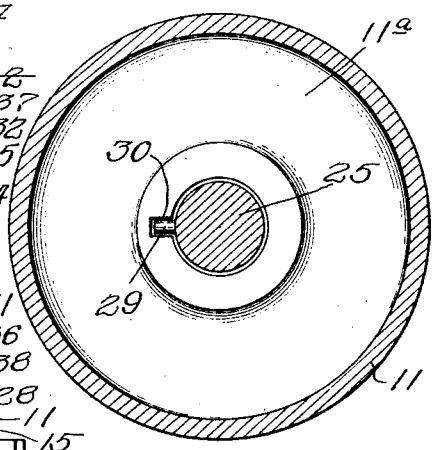
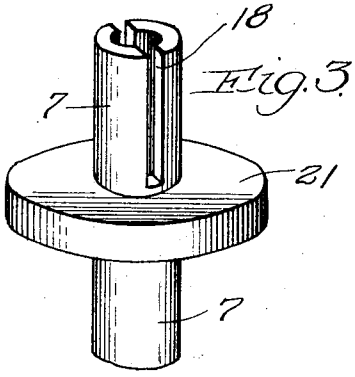


Fig. 3.



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PRESSURE-BOOSTING FIRE HYDRANT.

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My invention relates to fire hydrants and in some of its general objects aims to provide a hydrant equipped with a power-driven pump for boosting the pressure of the water emitted from the hydrant, and also provided with simple means whereby the hydrant can readily be used either for furnishing water at the presure at which this is supplied to the hydrant by the water mains, or at the pump-boosted higher pressure. Furthermore, my invention aims to provide a fire hydrant in which the initial opening of the valve will cause the emission of water at the pressure in the supply main, and in which a further movement of the valve-controlling plug will start the pressure-boosting pump.

More particularly, my invention provides a fire hydrant of this general type in which a valve-controlling stem serves also as a shaft for the impeller of the pump, and in which the means which impart vertical movement to this valve stem also operate a switch for controlling an electric motor connected to this stem.

In small cities and villages, and also in the outlying districts of larger cities, the pressure in the usual water supply mains is inadequate for the speedy quenching of fire, and particularly so with fires in buildings more than a few stories high. Consequently, even small municipalities commonly provide large sized water-supply tanks disposed at considerable heights, and also provide fire engines employing high pressure pumps actuated either by steam from a boiler or by gasoline engines. Both the elevated tanks and the fire engines used for this purpose involve a heavy expense and the tanks usually are unsightly; while any prolonged operation of the fire engines is contingent on the replenishing of the fuel supply, which is not always prompt. Moreover, fire engines require skilled operators which are not always available on short notice in small communities.

My invention aims to overcome all of these objections by equipping each hydrant with a potential fire engine and one which can readily be opeated by any amateur.

Fig. 1 is a central and vertical section through a fire hydrant embodying my invention.

Fig. 2 is a horizontal section, looking upward from the line 2—2 of Fig. 1.

Fig. 3 is an enlarged perspective view of the upper end portion of the valve stem, including the bearing flange on this stem.

In the illustrated embodiment of my invention, the casing of my fire hydrant includes a bottom inlet section 1 adapted to be connected to the water mains in any usual manner, a tubular riser or pumping section 2 which is secured to the top of the inlet section and which is provided with an outlet 3 controlled by an outlet cap 4, and a cap section 11 secured to the top of the riser section. These superposed sections are tightly jointed to each other, and a centrally perforated horizontal partition 5 is provided at the juncture of the riser section with a cap, while an annular valve seat 6 is secured to the lower end of the riser section as an effective partition between this riser section and the bottom inlet section.

The partition 5 is provided at its center with a tubular stuffing box 46 through which a vertical valve stem 7 extends, and this stuffing box 46 is packed with a packing 8 compressed between a nipple 9 threaded into the bore of the stuffing box at its upper end and a cap 10 threaded on the lower end of the stuffing box. Both the nipple and the cap 10 desirably have bores only slightly larger than the outside diameter of the stem 7, so that the suitably compressed packing effectively prevents the passage of water from the bore of the riser or pumping section 2 to the interior of the cap section 11 which forms the power section or motor section of the casing.

The stem 7 extends downwardly into the inlet section 1 and carries a valve closure member 12 which is formed for tightly fitting the bore of the valve seat 6, for which purpose I am showing both this seat bore and the periphery of the valve member as of a similar and upwardly tapering conical form. Extending upwardly from the bottom of the inlet section 1 in axial alinement with the stem 7 is a tubular bearing 13 in which the lower end of this stem is journaled and is also free to move vertically.

Mounted within the cap section 11 is a stationary electric motor 14, which is here shown as supported by legs 15 secured to the partition 5 and which has its vertical shaft 17 in axial alinement with the stem 7, this shaft being operatively splined to the stem so that rotation of the motor shaft will also rotate the valve stem 7 while the splined connection will permit vertical

movement of the stem with respect to the motor and the hydrant casing. For this spline connection purpose I am showing the upper end of the stem 7 as bored out so that the lower end of the motor shaft 17 is journaled in it, and as having a diametric slot 18 entered by a pin 19 which extends through the said shaft. Fastened to the stem 7 within the riser or pumping section 2 of the hydrant casing is a pumping member, such as an impeller 20 which extends radially close to the bore of this casing section and which has twisted vanes adapted to force water upwards when the impeller is rotated in one direction.

To support the stem 7 which carries both the impeller 20 and the valve member 12, I provide this stem at some distance above the partition 5 with a rigid flange 21 which overhangs a bearing bar 22 through which the stem 7 freely extends, and I desirably interpose friction-reducing means, such as a series of balls 23 between this bearing bar 22 and the flange 21. Then I support this bearing bar from the top of the cap section of the hydrant casing by means which will readily permit a raising or lowering of this bar, and hence of the valve closure member 12. For this purpose, I am here showing the bearing bar 22 as rigidly connected by shouldered bolts 28 to a supporting bar 24 which has a central boss 25 threaded upon a bushing 26 pinned to the vertical shank of a control plug 27. This plug has its head supported by the top 11^a of the cap section, the head being preferably of the pentagonal shape fitting the handles commonly used for controlling the supply of water through fire hydrants. Thus arranged, the supporting bar 24, the two bolts 28 and the bearing bar 22 form a rigid frame which can be raised and lowered by rotating the plug 27, provided that this frame is kept from rotating about the axis of the plug, for which latter purpose I am showing a pin 29 projecting radially from the boss 25 into a vertical slot 30 milled into the cap 11^a.

Then I provide means for controlling the actuation of the impeller, desirably in the form of a switch, and I preferably arrange this switch so that it will close the circuit after the said frame (together with the stem 7 and the valve closure member 12) have been lowered for a considerable extent, and so that the switch will open the circuit before the said frame has been raised sufficiently to close the valve. For this purpose, I am illustrating a switching member 31 fastened to one of the rods 28 through an insulator 32 by a clamp 33, and a switch base member including an insulating base 34 fastened to the casing cap 11 and carrying two vertically spaced contact members 35 and 36. One of these contact members is connected by a wire 37 to one side of the circuit, while the other is connected by a wire 38 to one terminal of the motor, and the switching member 31 is so formed that it will engage both contact members only after the frame which supports the valve closure member has been lowered beyond the extent required for the full opening of the valve in proportion to the size of the outlet 3.

With the hydrant thus arranged, the plug 27 (which has its head accessible from the exterior of the casing) normally holds the valve closed and holds the motor-controlling switch open, as shown in Fig. 1. When the plug is rotated to lower the valve stem and the switching member, the valve opens first, and by suitably proportioning the parts I can permit the valve to be opened fully before the switch closes the circuit to the motor. Consequently, the user can readily secure a supply of water at the regular water main pressure by merely rotating the plug to this extent, so that the hydrant then affords the ordinary low-pressure water supply for flushing the street, filling sprinkler wagon tanks, and the like. In case of a fire, the plug is rotated further in the same direction, thereby closing the switch and causing the motor to rotate the impeller, so that the latter boosts the pressure of the water, thereby making my hydrant equally well adapted for supplying water at either low or high pressure. To prevent the plug 26 from being screwed entirely out of the boss 25 on the supporting bar, I provide means for limiting the lowering movement of the said frame, this being here shown as an anti-friction ball 40 in the bottom of the tubular boss 13 which forms a bearing for the lower end of the stem 7.

In the illustrated construction, the cap section 11 has a lateral opening 48 normally closed by a cover 49. By reaching through this opening, the lower nuts on the bolts 28 can be detached, thereby permitting the bearing bar (together with the stem and the parts mounted on the latter) to drop until the lower end of the stem strikes the ball 40. By then detaching the bolts 41 which fasten the top section 11 of the casing to the riser portion 2, the top section can readily be lifted off, so as to afford access to the motor for inspection and lubrication. Thus arranged, the interior of the top section affords a motor chamber which is effectively sealed from the riser section 2, while the riser section forms a pumping chamber through which the water passes either at the water main pressure or at a boosted pressure.

Since a continuous supply of current can readily be secured from the electric light plant in almost every community, my invention provides ready means for supply-

ing water at high pressure whenever so needed. Moreover, by merely providing supplies of hose and hydrant-operating handles at scattered points, a community can readily insure the speedy availability of high pressure water for fire-fighting instead of having this await the summoning of local firemen and the coming of the fire engine from a distant point while the fire is gaining headway.

However, while I have illustrated and described my invention in an embodiment in which the riser section of the casing also forms the housing for the impeller of the pressure boosting pump, in which the stem of the valve is supported by a frame passing around the motor, and in which one part of the motor-controlling switch is carried by this frame, I do not wish to be limited to these or other details of the construction and arrangement thus disclosed. Obviously, many changes might be made without departing either from the spirit of my invention or from the appended claims.

I claim as my invention:

1. In a fire hydrant, a hydrant casing having an outlet and an inlet, a valve member controlling the inlet and including a vertical valve stem within the casing, an impeller on the valve stem, an electric motor operatively connected to the said stem, means operable from the exterior of the casing for lowering and raising the valve stem so as respectively to open and close the valve, and a switch in circuit with the motor and controlled by vertical movements of the stem.

2. A fire hydrant as per claim 1, in which the switch is disposed for closing the motor circuit only after the valve has been opened to a predetermined extent.

3. A fire hydrant as per claim 1, in which the motor is stationary and includes an armature shaft splined to the stem to permit vertical movements of the stem without disturbing the operative connection of the armature shaft to the stem.

4. In a fire hydrant, a casing, a valve for controlling the flow of water through the casing, a power-actuated means within the casing for increasing the pressure of water flowing through the casing, control means governing the power-actuated means, a single actuating member, and means connecting the actuating member with both the valve and the said control means for first opening the valve and thereafter starting the operation of the power actuated means.

5. In a fire hydrant, a casing, a valve controlling the flow of water through the casing, an electric motor-driven pump arranged for increasing the pressure of water flowing through the casing, a switch controlling the electric motor, a single actuating member, and means connecting the actuating member with the valve and the switch, the said connecting means being arranged so as to open the valve first and thereafter to close the switch.

6. In a fire hydrant, a hydrant casing having an inlet at its lower end and an elevated outlet, a water supply pipe leading to the said inlet, a valve in the lower portion of the casing for controlling the flow of water through the inlet; a motor-driven pumping member within the casing above the inlet, a valve-controlling means including an upright and vertically movable stem; a motor within the casing above the outlet for rotating the said stem; pumping means below the motor and operatively connected to the stem and actuated by rotation of the stem; and a switch actuated by vertical movement of the stem and controlling the motor.

7. A fire hydrant as per claim 6, in which the casing has a watertight partition disposed above the outlet and disposed below the motor and the switch for shielding both the motor and the switch from water passing through the casing.

8. In a fire hydrant, a casing having an inlet and an outlet, a valve controlling the inlet and having a rotatable stem, an impeller mounted on the said stem for boosting the pressure of water passing from the the inlet to the outlet, a motor within the casing and connected to the said stem for rotating the latter, a partition between the motor and outlet, and a stuffing box carried by the partition and through which the stem extends.

9. In a fire hydrant, a casing having an inlet and an outlet, a valve controlling the inlet and having a rotatable and vertically movable stem, an impeller mounted on the said stem portion for boosting the pressure of water passing from the inlet and the outlet, a motor within the casing and operatively connected to the said stem for rotating the latter, and means actuable from the exterior of the casing for successively opening the valve and starting the motor.

10. In a fire hydrant, a casing having an inlet and an outlet, a valve controlling the inlet and having a rotatable stem and vertically movable, an impeller mounted on the said stem for boosting the pressure of water passing from the inlet and the outlet, a motor within the casing and operatively connected to the said stem for rotating the latter, and means actuable from the exterior of the casing for first moving the said stem to open the valve and thereafter starting the motor.

11. In a fire hydrant, a casing having an inlet and an outlet, a valve controlling the inlet and having a rotatable stem and vertically movable, an impeller mounted on the said stem portion for boosting the pressure

of water passing from the inlet and the outlet, a motor within the casing and operatively connected to the said stem for rotating the latter, a switch in circuit with the motor and controller by vertical movements of the stem, and means actuable from the exterior of the casing for vertically moving the stem, the valve and switch being relatively so disposed that downward movement of the stem first opens the valve and thereafter closes the switch.

12. A fire hydrant comprising a casing having an inlet and an outlet, means including a vertically movable valve closure member for controlling the passage of water from the inlet to the outlet, a vertically and rotationally movable stem supporting the valve closure member, a control plug journaled in the top of the hydrant casing; a supporting member threadedly connected to the plug and supporting the stem, the stem being rotatable with respect to the supporting member, means preventing rotation of the supporting member with respect to the casing, a water impeller carried by the stem, and power means for rotating the impeller.

13. In a fire hydrant, a casing comprising a bottom inlet section, a riser section mounted on the bottom inlet section and having a lateral outlet, and a cap section surmounting the riser section; a partition between the riser section and the cap section; a valve closure member disposed to seat on the said valve seat; a valve stem carrying the said closure member and extending upwardly through the partition; a pumping member disposed within the riser and connected to the stem so as to be actuated by rotation of the stem; a power means disposed within the cap section and connected to the stem for rotating the latter; control means within the cap section for controlling the operation of the power means; an actuating member mounted on the cap section; and connections between the actuating member, the control means and the stem, whereby movement of the actuating member in one direction first moves the stem to open the valve and thereafter operates the control means to start the rotation of the stem by the pumping member.

14. In a hydrant, a pump chamber, a motor casing surmounting the pump chamber, a motor mounted inside the motor casing, means within the motor casing for controlling the switch, a pumping member within the pump chamber, means operatively connecting the pumping member to the motor, a valve controlling the passage of water through the pump chamber, means for controlling the valve including a frame extending around the motor, an actuating member, and connections between the actuating member and the two control means, the connections being arranged so that a continued movement of the actuating member away from its normal position will first open the valve fully and thereafter start the operation of the motor.

Signed at Chicago, Illinois, October 14th, 1927.

THOMAS MARSHALL.