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W. H. CROW

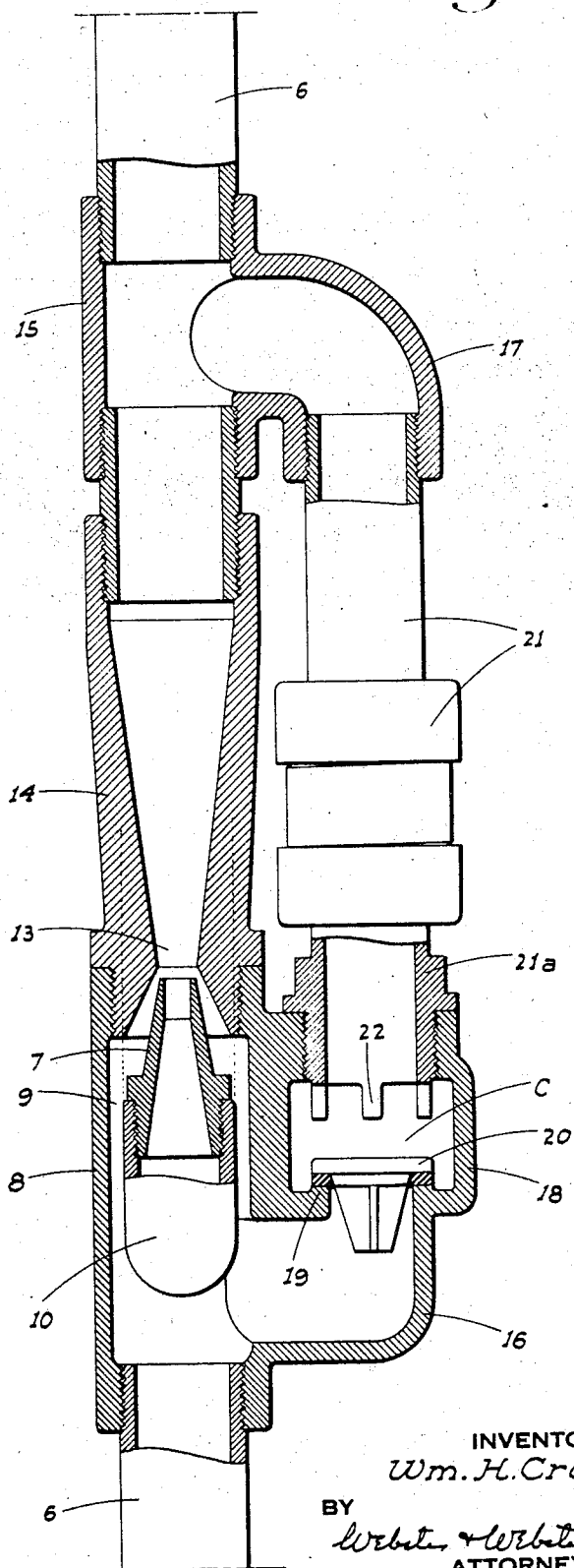
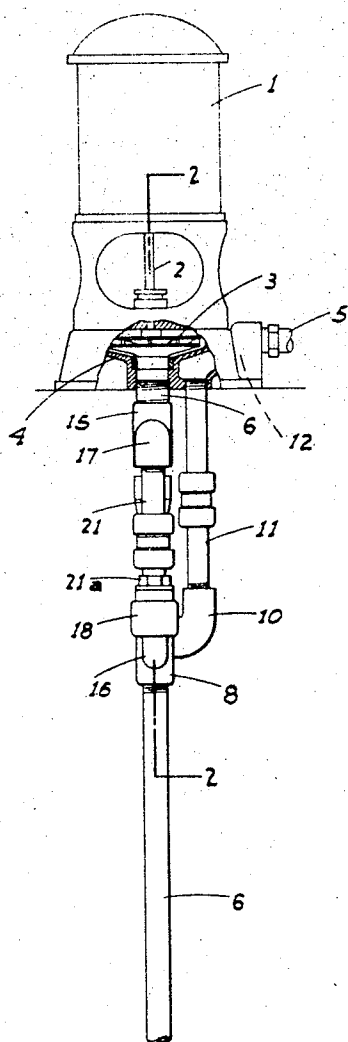
2,245,256

PUMPING SYSTEM

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Fig. 2

Fig. 1



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PUMPING SYSTEM

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This invention relates in general to an improved pumping system, and in particular the invention is directed to an improved pumping system for shallow well pumps which are actuated by means of relatively low power motors.

In shallow well low power pumps, it is a common practice to embody an ejector in the suction pump in order to boost or increase the pressure to an amount substantially in excess of that pressure which such a pump could ordinarily develop in the pressure tank or on a pressure line; the ejector being supplied with water under pressure from a take-off point on the pressure side of the pump. In this way, it is possible to increase tank pressure or line pressure without a proportionate increase in the motor power. However, the use of an ejector on a pump limits the volumetric pumping capacity thereof, which has been found to be an undesirable feature.

It is therefore the principal object of the present invention to provide in such a shallow well, low power pumping system an assembly including such an ejector in part arranged to create a relatively high water pressure in the supply tank or the like when the pump is operating against a pressure on the discharge side thereof, and to pump a substantially larger volume of water than otherwise possible when the pump is open on the discharge side.

A further object of the invention is to provide in a low power pumping assembly which includes an ejector in the suction pipe, means arranged to automatically by-pass the upward flow of water in the suction pipe about the ejector whereby to increase the volumetric pumping capacity of the pump when the discharge side of the latter is open, and the suction in said suction pipe below the ejector is greater than the pressure on the discharge side of said pump. Such a situation would occur, for example, when the water delivery system beyond the pump is opened for irrigation or similar purpose and thus creates no back pressure.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawing similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a somewhat diagrammatic eleva-

tion of a vertical centrifugal pump of low power shallow well type, embodying the invention.

Figure 2 is a vertical sectional elevation taken on line 2—2 of Fig. 1.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 indicates the motor enclosing housing of a vertical centrifugal pump, such housing enclosing a relatively low power electric drive motor (not shown) whose drive shaft 2 depends therefrom and is mounted at its lower end in connection with a centrifugal impeller 3 enclosed in suitable housing 4; a discharge pipe 5 leading from one side of housing 4.

A common suction pipe 6 is connected with housing 4 at the bottom and depends therefrom into the well. The ejector assembly in the present embodiment of the invention is interposed in suction pipe 6 immediately below the impeller housing 4. Such ejector assembly comprises an upwardly discharging ejector jet 7 disposed in a fitting 8 whose lower end is threaded onto the adjacent end of the suction pipe 6. The jet 7 is of substantially less diameter than the internal diameter of housing 8 whereby to form a water flow passage 9 about said jet; the jet being supported by elbow 10 which extends through the side of housing 8. The elbow is connected by a suitable pipe and fitting assembly, indicated generally at 11, with the discharge side of the pump as indicated generally at 12.

The jet 7 discharges into a venturi 13 formed in a fitting generally known as an ejector diffuser 14 which is mounted in connection with and projects upwardly from fitting 8; the upper end of such ejector diffuser being connected with the lower end of the upper section of the suction pipe by pipe means including a fitting 15.

Fittings 8 and 15 are provided with laterally extending elbows 16 and 17 respectively, such elbows opening toward each other. Immediately above the upper end of elbow portion 16, fitting 8 is formed with a housing 18 providing an enclosed chamber C which includes an upwardly facing valve seat 19; elbow 16 opening into chamber C through said valve seat. An upwardly opening check valve 20 of suitable type is disposed in chamber C for cooperation with valve seat 19. The upper end of housing 18 above chamber C is initially open; such open end of said chamber being arranged in communication with the lower end of elbow 17 by means of a pipe and fitting assembly indicated generally at 21, and which includes a portion 21a threaded into the upper end of housing 18. Circumferen-

tially spaced rigid fingers 22 depend from the lower end of fitting portion 21a, and are of a length to limit upward movement of check valve 20 to an extent to prevent its accidental escape from an operative position.

The volumetric capacity of the by-pass assembly described in the above paragraph is substantially equal to that of suction pipe 6, and of course much greater than the capacity of venturi 13.

Operation

In use, when the above described pumping system is operating against a pressure on the discharge side of the pump, the check valve 20 remains closed. When so operating, the ejector portion of the assembly functions in the same manner as is now common in ejector type pumps.

However, when the pumping system is open on the discharge side of the pump, as for irrigating or the like, and the pump is not working against a pressure on said discharge side, the suction in suction pipe 6 below the ejector is greater than the pressure on the discharge side of the pump and valve 20 immediately and automatically opens. When this occurs, the volumetric pumping capacity of the pump increases substantially, due to the fact that the water is then by-passing the restriction of the venturi and flowing through chamber C and about the open check valve.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

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

1. The combination in pumping apparatus including a driven pump, a vertical suction pipe connected with the pump, an ejector assembly interposed in said suction pipe intermediate its ends, and means for supplying pressure fluid to the ejector; of a separate vertical conduit connected between spaced points on the suction pipe and by-passing the ejector assembly, means included in said conduit forming an enlarged

chamber therein, a valve seat between said chamber and one portion of the conduit, and a check valve disposed in said chamber in cooperative relation to said seat.

2. In pumping apparatus which includes a driven pump, a suction pipe assembly adapted to depend into a well, an ejector unit in said suction pipe assembly intermediate its ends, and means for supplying pressure fluid to the ejector; said assembly including vertically spaced fittings, the ejector being disposed therebetween, elbows projecting laterally from the same side of said fittings and facing each other, a separate by-pass pipe connecting said elbows, and a check valve unit formed in one of said elbows and having a valve opening in the direction of the pump.

3. In pumping apparatus which includes a driven pump, a suction pipe assembly adapted to depend into a well, an ejector unit in said suction pipe assembly intermediate its ends, and means for supplying pressure fluid to the ejector; said assembly including vertically spaced fittings, the ejector being disposed therebetween, elbows projecting laterally from the same side of said fittings and facing each other, the lower fitting being provided with a housing forming an enlarged chamber immediately above the corresponding elbow, there being a valve seat in the bottom of said chamber and through which said corresponding elbow opens, a check valve cooperating with said seat and opening upwardly, and a separate by-pass pipe connected between said chamber and the upper elbow.

4. In a pumping system which includes a driven pump and a suction pipe assembly connected therewith; said assembly comprising upper and lower pipe sections initially spaced apart at their adjacent ends, spaced fittings secured on said adjacent ends of the pipe sections, an ejector diffuser connected between said fittings, a jet mounted in the lower fitting and facing upwardly into the ejector diffuser, separate passage means between the jet and the discharge side of the pump for supplying pressure fluid to said jet, elbows projecting laterally from the fittings on the same side and facing each other, a by-pass pipe connecting said elbows, and a check valve unit formed in one of said elbows and having a valve opening in the direction of the pump.

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