

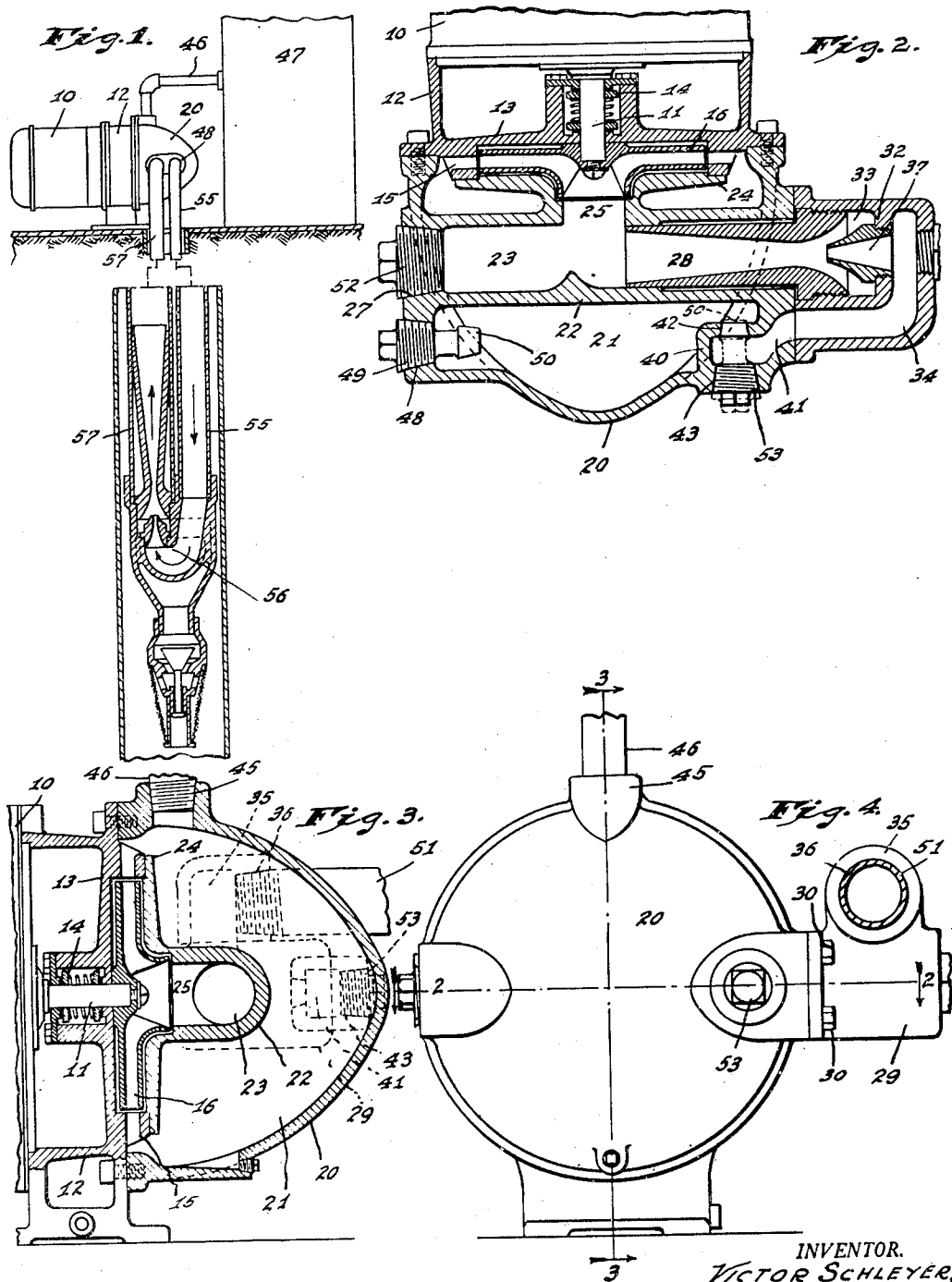
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PUMP

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## PUMP

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This invention relates to jet pumps and especially to jet pumps suitable for use in withdrawing water from wells and discharging it against a discharge head. Such jet pumps are commonly used in one or the other of two different ways, either as shallow-well pumps or as deep-well pumps. In both types of installations, the driving motor and the pump itself, usually a centrifugal pump, are located above the level of the water to be pumped; but in the shallow-well installation the jet is also located above water level, while in the deep-well installation the jet is submerged.

It is the object of my invention to produce a jet pump which can be simply and economically manufactured, which can readily be installed, and which can easily be converted for use either as a shallow-well or as a deep-well pump.

A pump embodying my invention comprises a pump-unit proper, which is conveniently of the centrifugal type. The pump unit is enclosed or partially enclosed by a shell or housing having a branched inlet passage and a discharge chamber provided with two discharge openings adapted for connection to piping. One branch of the inlet passage is also adapted for connection to piping while the other contains an ejector the throat of which communicates with an auxiliary chamber having an inlet opening adapted for connection to piping. The nozzle of the ejector receives liquid from an interior passage which communicates the discharge chamber in the pump housing through an opening that can be closed from without the housing. By properly selecting the openings to which piping is connected, by closing the other openings with pipe plugs, and by either opening or closing the opening in the passage to the ejector-nozzle, the pump may be adapted for use either in shallow-well or deep-well installations.

The accompanying drawing illustrates my invention:

Fig. 1 is an elevation of a deep-well installation showing the jet assembly in vertical section; Fig. 2 is a horizontal axial section through the pump on the line 2—2 of Fig. 4; Fig. 3 is a vertical axial section through the pump on the line 3—3 of Fig. 4; and Fig. 4 is an end elevation of the pump.

The apparatus illustrated in the drawing comprises an electric motor having a housing 10 in which a motor shaft 11 is rotatably supported. To one end of the motor housing 10 I secure an adapter 12 having an outer end wall 13 provided with a central opening through which the motor

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shaft 11 extends. Interiorly, the adapter 12 is provided with a seal 14 for preventing the passage into the adapter of the fluid being pumped, while exteriorly it is provided with an annular diffuser 15. Located within the diffuser 15 and secured to the end of the shaft 11 is a centrifugal pump-impeller 16 of any desired type.

Secured to the adapter 12 is a housing 20 the interior of which constitutes a discharge or pressure chamber 21 receiving the liquid discharged from the pump-impeller 16. A hollow post 22 extends diametrically across the housing 20 and has extending through it a passage 23. At one side of the post 22 and integral therewith I provide a circular disk 24 which fits against the diffuser 15 to complete an enclosure for the impeller 16. The passage 23 constitutes an inlet passage communicating through a lateral opening with the eye of the impeller 16.

At one end, the passage 23 opens exteriorly through an opening 27 which is screw-threaded or otherwise adapted for connection to piping. The opposite end of the passage 23 receives the venturi 28 of an ejector, such venturi conveniently being mounted in an ejector housing 29 secured to one side of the main housing 20 as by screws 30 (Fig. 4). The interior of the ejector housing 29 is divided by a partition 32 into an inlet chamber 33 and a passage 34. The inlet chamber 33, which communicates with the throat of the venturi 28, has a lateral extension 35 (Fig. 3), provided with an opening 36 which is screw-threaded or otherwise adapted for connection to piping. The nozzle 37 of the ejector is mounted in the partition 32 in line with the venturi 28 and in position to receive liquid from the passage 34.

The housing 20 is provided interiorly with a partition 40 which separates the discharge chamber 21 from a passage 41 communicating with the passage 34 in the ejector housing. The partition 40 and the wall of the housing 20 are provided with aligned openings 42 and 43, the latter screw-threaded and the former adapted for reception of a removable closure to be hereinafter described.

The discharge chamber 21 has two outlet openings one of which, indicated at 45, is conveniently located at the top of the housing to communicate with a pipe 46 through which water discharged from the pump is conveyed, as to a pressure tank 47. The other outlet opening, indicated at 48, is screw-threaded for the reception of a screw-threaded plug 49. The opening 48 and the opening 43 are of the same size so

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that the plug 49 can be inserted in either, and the plug has an inward extension 50 positioned and shaped to close the opening 42 when, as indicated in dotted lines in Fig. 2, the plug is in the opening 43.

When the pump is to be used in a shallow-well installation, a suction pipe 51 is screwed into the inlet opening 35 in the ejector housing 29, the plug 49 is screwed into the opening 48, and conventional pipe plugs 52 and 53 are screwed into the openings 27 and 43. As the motor operates to rotate the impeller 16, the liquid discharged from the impeller enters the pressure chamber 21, a part of such liquid leaving the pressure chamber through the discharge pipe 46 and another part flowing through the opening 42 and passages 41 and 34 to the ejector nozzle 37. The suction created at the throat of the venturi 28 by the jet of liquid discharged from the nozzle 37 draws additional liquid through the suction pipe 51, chamber-extension 35, and chamber 33 and into the venturi 28. The liquid discharged from the venturi passes through the opening 25 into the eye of the impeller.

To convert the pump for use in a deep-well installation, the plug 49 is transferred from the opening 48 to the opening 43, where its inward extension 50 closes the opening 42 and prevents liquid in the chamber 21 from escaping into the passage 41 for re-circulation through the ejector and pump. The inlet opening 36 is closed with a pipe plug of appropriate size. A pipe 55 for conveying liquid to the deep-well jet-assembly 56 is connected to the opening 48 and the return pipe 57 from the jet-assembly is connected to the opening 27.

In operation as a deep-well pump, a portion of the water discharged from the impeller 16 escapes through the pipe 46 as before; but as the opening 42 is closed by the plug-extension 50, the remainder of the liquid is forced outwardly through the opening 48 and pipe 55 to the jet-assembly 56, where it mingles at the throat of the ejector with water from the well and returns to the pump through the pipe 57. As the pipe 57 communicates with the inlet passage 23 through the opening 27, the water elevated through such pipe passes by way of the opening 25 into the eye of the impeller.

When the suction head under which the pump is to operate is low enough to make even a shallow-well jet unnecessary, a suction pipe leading from the well may communicate with the opening 27. In such an arrangement the plug 49 is placed in the opening 43 to prevent recirculation of water through the ejector 37-28, while the openings 48 and 36 are closed with conventional pipe plugs.

As will be readily apparent, my pump can readily be converted to serve either as a conventional shallow-well pump, a shallow-well jet pump, or a deep-well jet pump. Adaptation of the pump for any of such uses involves nothing more than the proper positioning of the plug 49, the connection of piping to properly selected openings, and then the closing of the other openings with pipe plugs. The openings 27 and 36 are conveniently of the same size so that when the opening 27 is connected to the pipe 57 leading from a deep-well jet assembly 56 or to a suction pipe from a shallow well, the plug 52 may be used to close the opening 36.

I claim as my invention:

1. In a device of the type described, a pump having a branched inlet passage, a discharge

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chamber for receiving liquid discharged from said pump, said chamber being provided with first and second outlet openings, an ejector located in one branch of said inlet passage and having a nozzle, a removable closure for the other branch of said inlet passage, a pressure passage for conveying liquid under pressure from the discharge chamber to the ejector nozzle, valve means for controlling liquid-flow to said nozzle through said pressure passage, a suction chamber communicating with the throat of said ejector and having an inlet opening adapted for the alternative reception of a suction pipe or a closure, said first discharge-chamber outlet opening being adapted for connection to a discharge pipe, and a removable closure for the second discharge-chamber outlet opening.

2. The invention set forth in claim 1 with the addition that said pressure passage has opposed walls having inner and outer aligned openings through the inner one of which the pressure passage communicates with said discharge chamber, the outer of said aligned openings being adapted to receive the closure for the second discharge-chamber opening, such closure having an integral extension constituting said valve means and extending across the passage to close the inner aligned opening when the closure is received in the outer aligned opening.

3. In combination with a centrifugal pump, a main housing the interior of which constitutes a discharge chamber receiving liquid discharged from said pump, said chamber having two screw-threaded outlet openings, a conduit extending across said housing and having an intermediate opening communicating with the inlet of the pump, one end of said conduit being screw-threaded, an auxiliary housing secured to the main housing over the other end of said conduit, an ejector discharging into said conduit and including a nozzle mounted in said auxiliary housing, said auxiliary housing having a suction chamber communicating with the throat of the ejector and provided with a screw-threaded inlet opening, said housing having a pressure passage providing communication between the discharge chamber and the ejector nozzle, and a valve for controlling liquid-flow to said nozzle through said pressure passage.

4. The invention set forth in claim 3 with the addition that said pressure passage has opposed walls one of which is a portion of the wall of the main housing and the other of which is an interior partition separating the discharge chamber from the pressure passage, said partition and housing wall being provided respectively with aligned inner and outer openings, a screw-threaded pipe plug receivable in one of the outlet openings of the discharge chamber, the outer of said aligned openings being screw-threaded to receive said plug, said valve constituting an inward extension on said pipe plug adapted to extend across the pressure passage into cooperation with the inner aligned opening when the plug is received in the outer aligned opening.

5. The invention set forth in claim 1 with the addition that the removable closure for the other branch of said inlet passage is alternatively receivable in the inlet opening of said suction chamber.

6. In a shallow-well pumping apparatus, a pump, a casing provided with a pressure chamber for receiving liquid discharged from the pump, with an inlet passage for conducting liquid to the pump, and with a pressure passage communi-

cating with said pressure chamber, said inlet passage having first and second branches within the casing, an ejector in the first branch of said inlet passage, said ejector having a nozzle to which liquid is supplied through said pressure passage, and a valve for controlling flow through said pressure passage while said ejector is in place to render said ejector inoperative when liquid is supplied to the pump through the second branch of the inlet passage.

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