

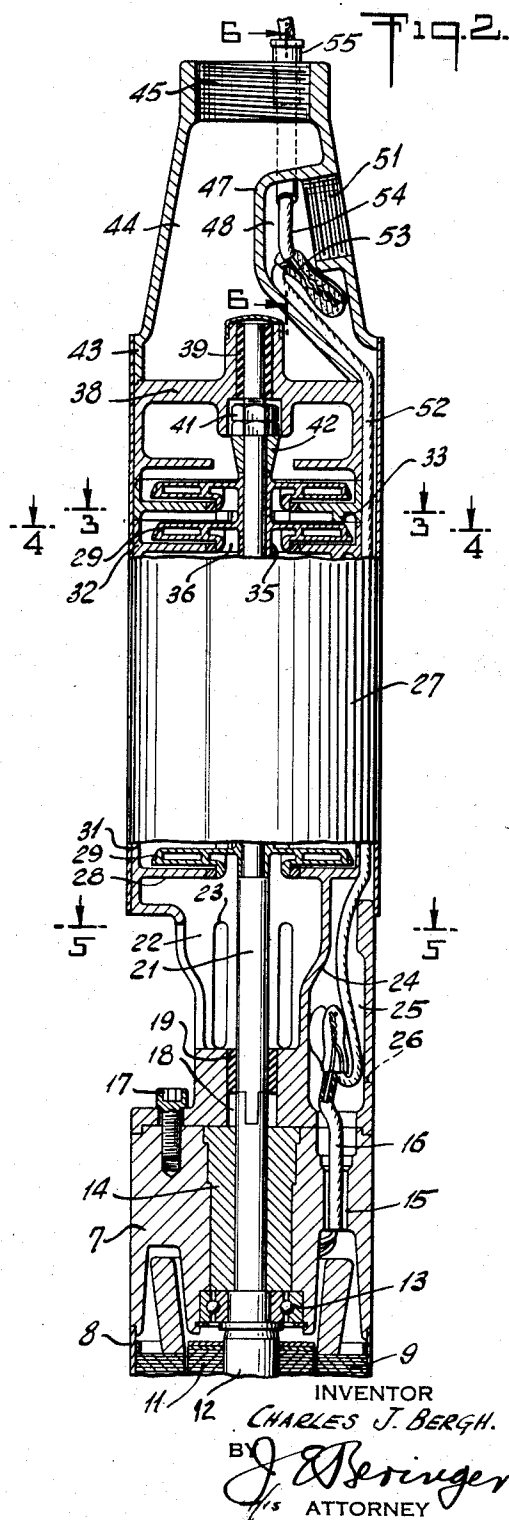
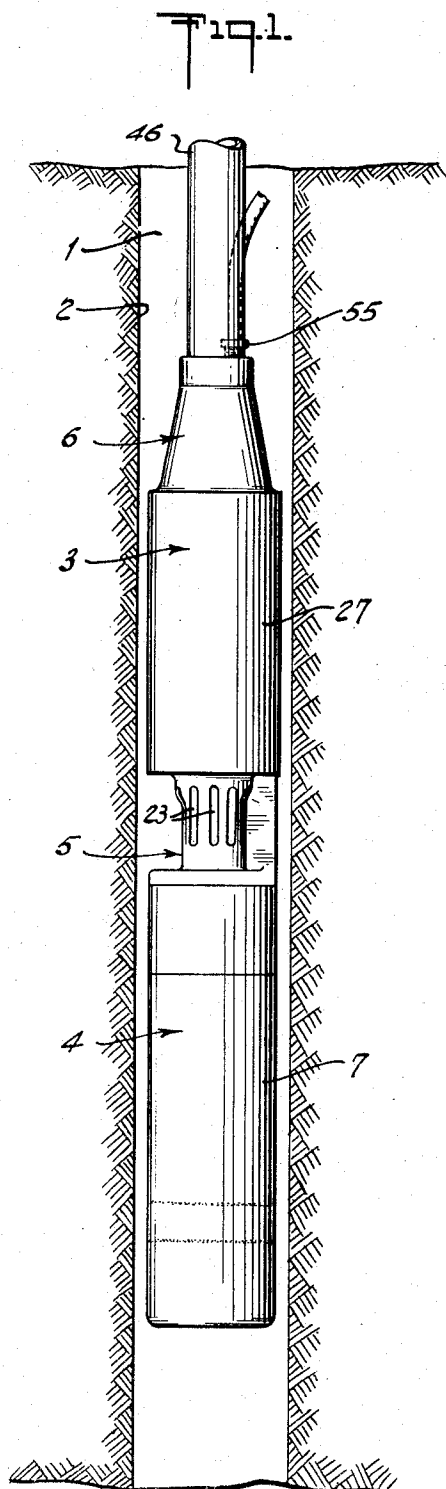
Aug. 11, 1953

C. J. BERGH
SUBMERSIBLE PUMP

2,648,286

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2 Sheets-Sheet 1



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Fig. 3.

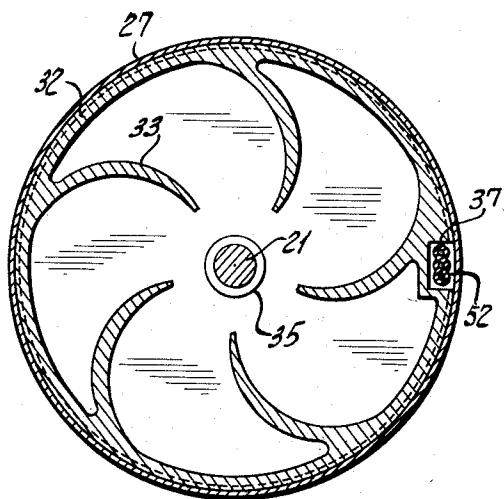


Fig. 4.

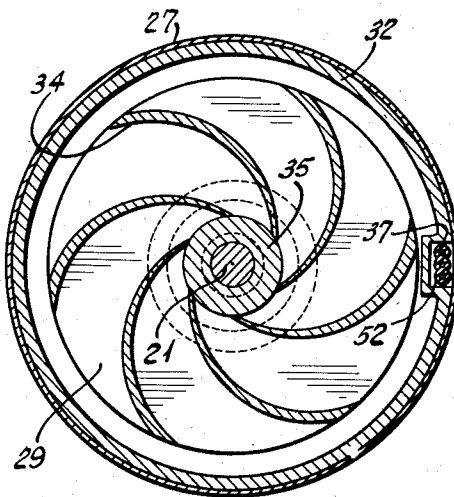


Fig. 5.

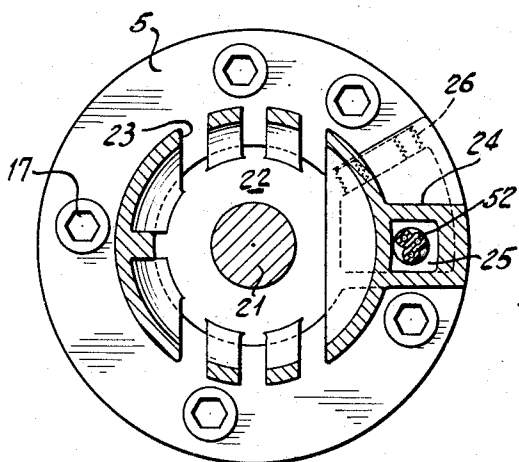
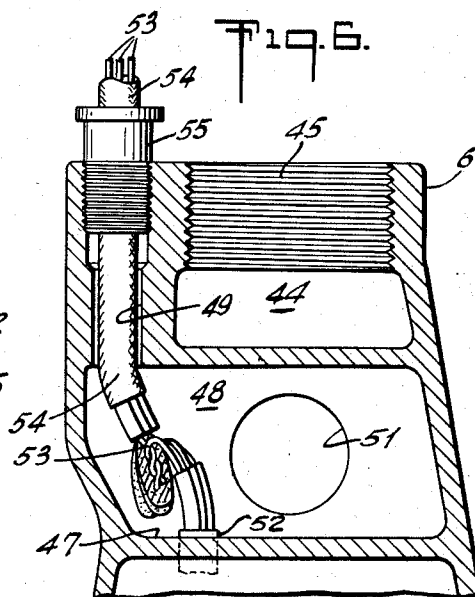


Fig. 6.



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SUBMERSIBLE PUMP

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3 Claims. (Cl. 103-87)

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This invention relates to submersible electric motor operated pumps wherein a motor and a pump are interconnected in unitary relation for submersion in a well, the motor being disposed axially of the pump and beyond or beneath it.

While in general concerned with the provision of an improved pump of the class described, the invention has particular reference to an arrangement for extending wire leads to the electric motor.

One object of the invention is to protect such leads from contact with the fluids in the well and from the abrasive effect of contact with the well casing.

Another object of the invention is to obviate the necessity for reducing the pump impeller diameter to allow room for the motor leads to pass between the pump and the well casing.

A further object of the invention is to provide for simplified connection and disconnection of the electrical leads from the power source and the motor leads.

Other objects and structural details of the invention will appear from the following description when read in connection with the accompanying drawings, wherein:

Fig. 1 is a view of a submersible pump in accordance with the instant invention as installed in a well;

Fig. 2 is a view of the pump, partly in elevation and partly in longitudinal section; and

Figs. 3, 4, 5 and 6 are views in cross section taken along the respective lines indicated in Fig. 2.

Referring to the drawings, a pump in accordance with the instant invention is shown in Fig. 1 in a well 1, lined by a casing 2. The pump comprises a pump unit 3, a motor unit 4, a suction section 5 interposed between and interconnecting the pump and motor units, and a discharge section 6 on the opposite end of the pump unit. As shown in Fig. 2, the motor unit comprises a cast body 7 constituting an extension of a sleeve or casing 8, the sleeve receiving a cylindrical projection on the body and being secured thereto as by soldering. The sleeve 8 mounts electric motor components including a wound stator 9 and a rotor 11, operation of the motor being effective to rotate a shaft 12. The shaft 12 extends through and beyond the body 7, being rotatable in bearings 13 and 14 therein and projecting beyond the upper or outer end of the body. Also opening through the upper or outer end of the body 7 is a passage 15 receiving electric motor leads 16.

The suction section 5 is made as a brass cast-

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ing or the like and is bolted to the body 7 by bolts 17. A bore 18 receives the projecting end of the shaft 12 and further mounts a bearing 19 through which extends the lower end of another shaft 21, there being a keyed connection between the shafts 12 and 21. Above the bearing 19 is a suction chamber 22 in communication with the well through spaced apart vertical slots 23 (see Fig. 5). A vertical wall 24 in section 5 defines a junction box chamber 25 overlying and communicating with the passage 15. A lateral opening 26 in the wall 24 provides access to the chamber 25, such opening being normally closed by a plug (not shown).

The pump unit 3 comprises a cylindrical shell 27 which at its one end receives suction section 5 and is attached thereto as by soldering. That end of section 5 which is received in the shell 27 is formed as an impeller housing, having an impeller flange 28 providing a bearing for an impeller 29 and further having an axial cylindrical extension 31 surrounding the impeller. Resting upon such cylindrical extension is a multiple stage series of impeller housings 32 which are the same as that formed on the end of section 5, with the addition of gathering vanes 33 (see Fig. 3) on the underside thereof. Each mounts an impeller 29, which, as seen in Fig. 4, has centrifugal vanes 34 radiating from a hub 35 mounted on the shaft 21. A central opening 36 defines an inlet for each impeller which discharges radially against the sides of the impeller housing, the discharged fluid being collected by the gathering vanes 33 of the next higher stage impeller housing and directed to the inlet 36 of the next higher stage impeller.

Each impeller housing 32 is formed with a longitudinal slot 37 opening to the periphery of the housing. When the several housings are arranged with the slots 37 aligned with one another there is defined a vertical wire passing channel inside the shell 27 and substantially overlying and communicating with the junction box chamber 25 in section 5.

Supported in the shell 27 above the topmost impeller stage is an upper bearing support 38 of webbed construction for the free flow of fluid therethrough. A bearing 39 in the center of support 38 receives the upper end of the shaft 21. Immediately beneath the bearing 39, the shaft 21 is threaded and has lock nuts 41 thereon which engage the hub 35 of the topmost impeller 29, through a spacer 42. The several impellers 29 rest one upon another so that the thrust exerted by spacer 42 is effective to unite the several im-

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pellers for unitary rotation with the shaft 21. The periphery of support 38 has a longitudinal slot to register with the slots 37 in impeller housings 32.

The discharge section 6 is formed with a cylindrical flange 43 received in the outer end of the shell 27 and presents a chamber 44 communicating through a threaded bore 45 with a discharge conduit, as the pipe 46 of Fig. 1, for carrying fluid out of the well. A wall 47 in the section 6 defines a junction box chamber 48 therein. A longitudinal passage 49 (see Fig. 6) communicates with the chamber and opens through the top of section 6 alongside bore 45. A lateral opening 51 into the chamber is normally closed by a plug (not shown).

The wire passing channel formed by the slots 37 in the impeller housings 32 has a length of electric cable 52 therein. One end of such cable extends into the lower junction box chamber 25 where it is joined to the electrical motor leads 16 which are introduced into the chamber 25 through the passage 15. The other end of cable 52 extends from the wire passing channel, which is considered to include the slot in bearing support 38, into the upper junction box chamber 48. There it is joined to electrical wires 53 projecting from a cable 54, the cable 54 being introduced into the chamber 48 by way of the passage 49 in the outer end of which is a bushing 55. The cable 54 and wires 53 therein lead from a suitable source of electrical power and extend down into the well alongside the discharge conduit 46. A completed connection, through the cable wires 53, cable 52 and wires 16 serves, therefore, to connect the motor to a source of operating power.

In effecting such connections it will be understood that the cable 52 is in effect a part of the pumping unit 3, normally disconnected from both the motor leads 16 and the power source leads 53. In assembling the device, which is of course done above ground, the cable 54 is inserted through passage 49 into the junction chamber 48. There the free ends of the wires 53 and the free ends of the wires in cable 52 are pulled out through the lateral opening 51, joined together as indicated in Fig. 2 and then reinserted in the chamber 48. Similarly in junction box 25 the lower ends of the wires in cable 52 and the motor leads 16 are pulled out through opening 26, joined together and then reinserted in chamber 25. Both openings 26 and 51 are, of course, closed by plugs when the connections have been made.

What is claimed is:

1. A submersible electric motor operated pump, including a cylindrical shell, a suction section and a discharge section in respective opposite ends of said shell and projecting therefrom, junction box chambers in said sections, an electric motor secured to said suction section and presenting a wire passing opening communicating with the junction box chamber in said suction chamber, pump impeller housings slidably fitting said shell stacked one upon another in said shell and retained therein by said sections, and individual slots in the peripheries of

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said housings cooperatively defining a longitudinally extending wire passing channel inside the shell and communicating with said junction box chambers, said slots being formed by a portion of the wall of each housing and being disposed inwardly toward the periphery of the impeller pertaining to the housing.

2. A submersible electric motor operated pump, including a cylindrical shell, a plurality of pump stages slidably fitting the shell stacked one upon another in said shell, each said stages comprising an impeller housing presenting a longitudinally extending peripheral slot, formed by an indentation in the wall of the housing, said slots when aligned defining a wire passing channel, a suction section and a discharge section mounted in respective opposite ends of said shell and clamping the stages therein, said sections extending out the ends of the shell, junction box chambers in said sections communicating with the opposite ends of said wire passing channel, electric leads in said channel having their ends extending into said chambers, and openings into said chambers through the sides of said sections for access to the ends of said electric leads whereby they may be connected to and disconnected from other electric leads from a source of electric power and from an electric motor.

3. A submersible electric motor operated pump, including a cylindrical shell, a suction section telescoping one end of said shell and a discharge section telescoping the other end of said shell, a plurality of pump housings each having a peripheral wall and slidably fitting said shell and stacked therein on top of said suction section, a bearing support member beneath said discharge section and on top of the uppermost of said stages, said sections being secured to said shell and clamping the said stages and member tightly therein, each of said housings having a portion of its said wall formed inwardly to define a notch and said member also having a peripheral notch, said notches being adapted for registration to form a longitudinally extending slot inside said shell, each of said sections having a junction box chamber communicating with an end of said slot for passing wires along said shell, pump impellers in said stages, and a shaft mounting said impellers and having one end journaled in said member and its other end journaled in said suction section.

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