Nov. 29, 1949 J. W. GURLEY 2,489,636

EJECTOR ASSEMBLY

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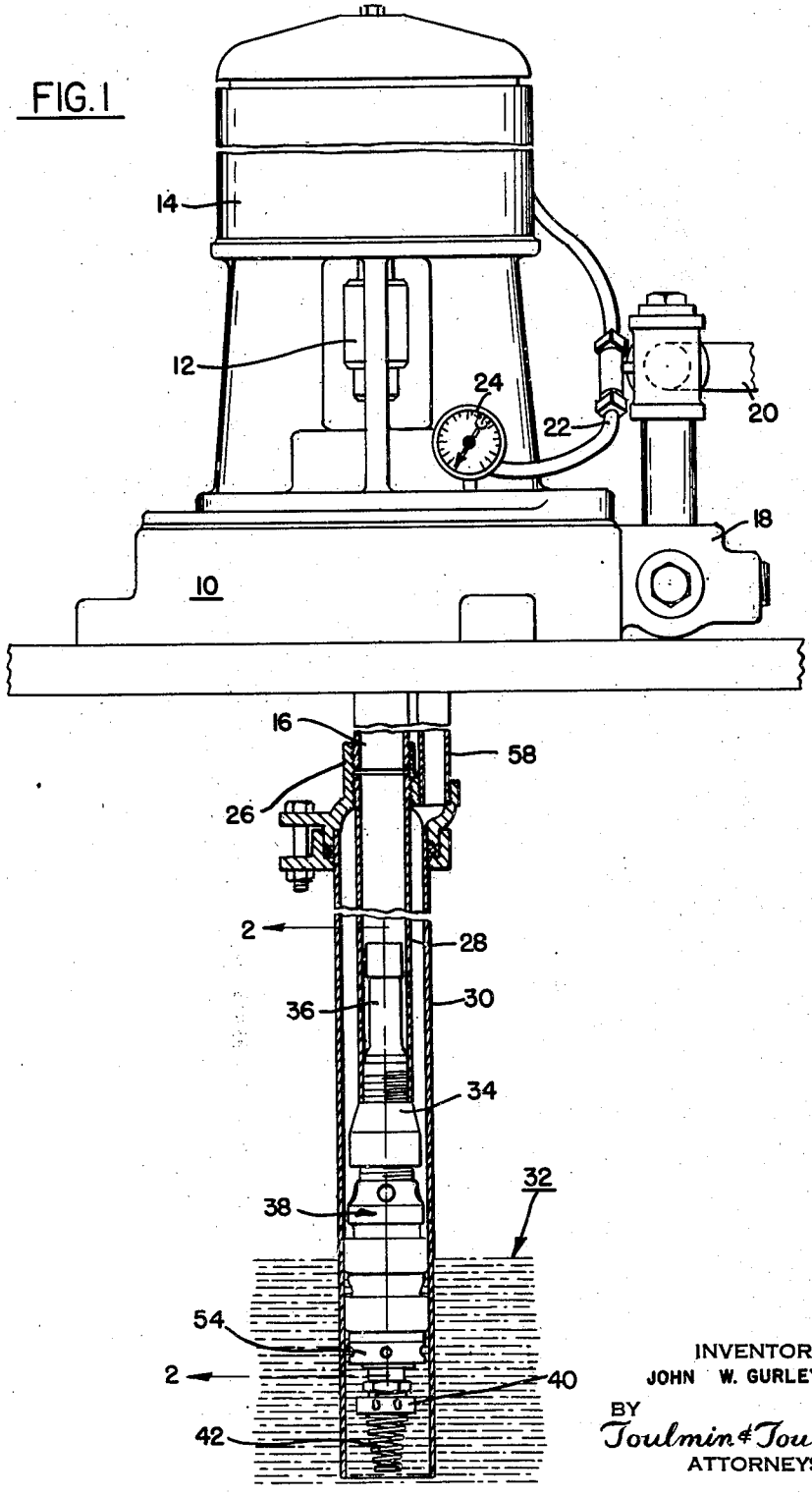
FIG. 1



INVENTOR
JOHN W. GURLEY
BY
Toulmin & Toulmin
ATTORNEYS

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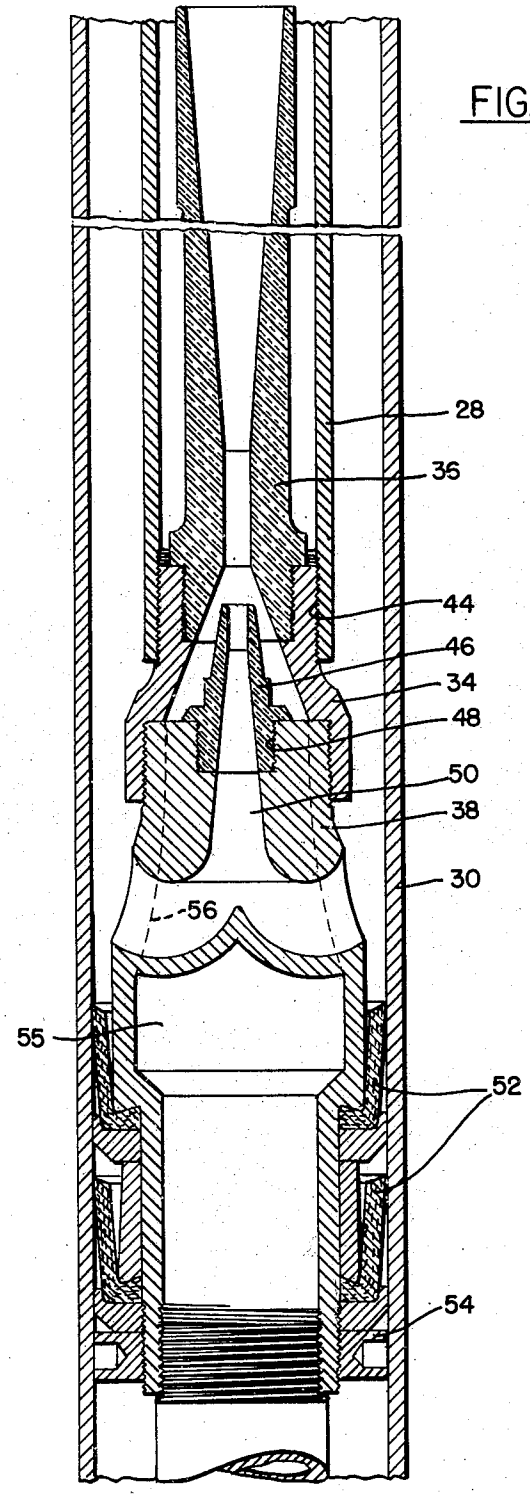
FIG. 2



INVENTOR
JOHN W. GURLEY

BY
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ATTORNEYS

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FIG. 4

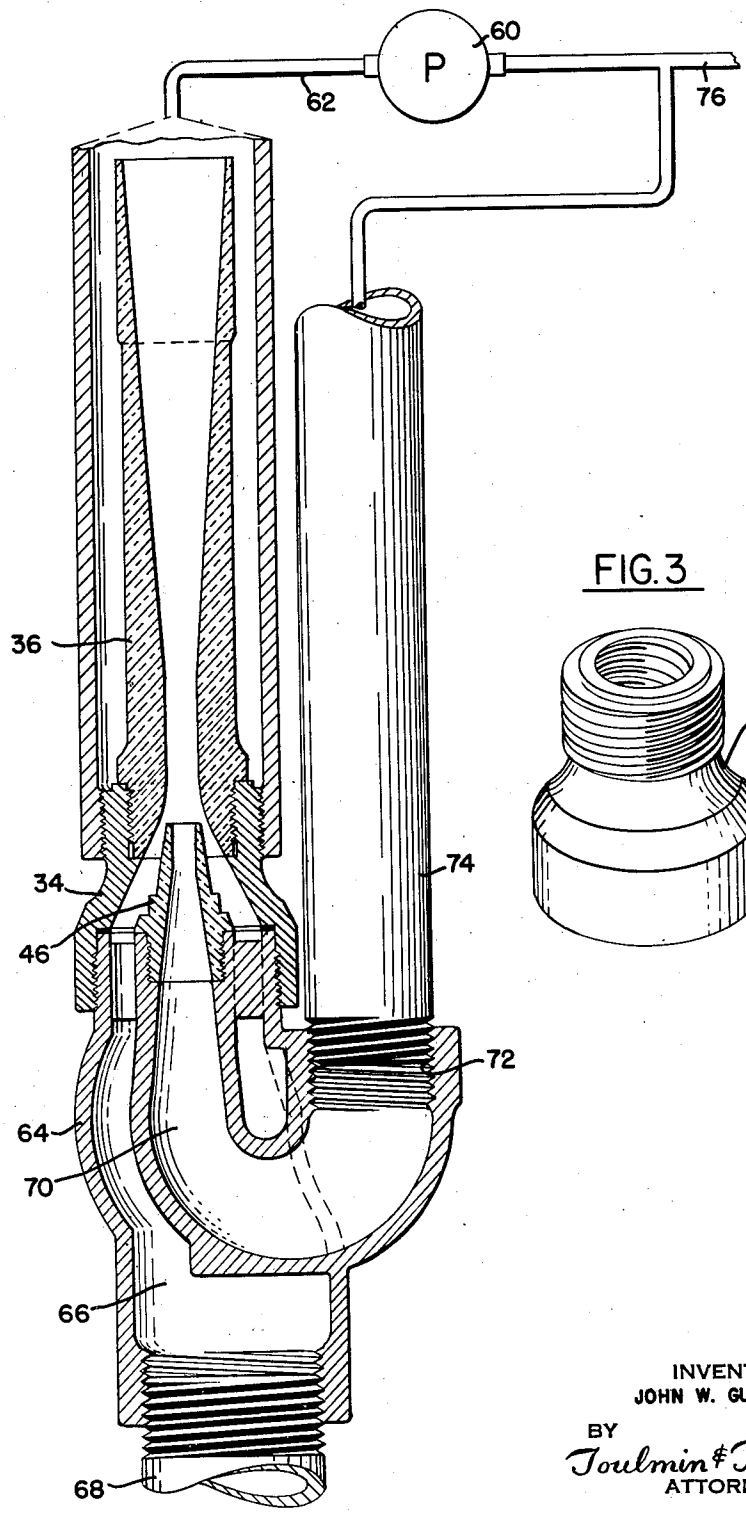

FIG. 3

INVENTOR
JOHN W. GURLEY

BY
Toulmin & Toulmin
ATTORNEYS

Patented Nov. 29, 1949

2,489,636

UNITED STATES PATENT OFFICE

2,489,636

EJECTOR ASSEMBLY

John W. Gurley, Dayton, Ohio, assignor to The Duro Company, Dayton, Ohio, a corporation of Ohio

Application October 24, 1946, Serial No. 705,459

8 Claims. (Cl. 103—260)

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This invention relates to ejectors and mountings therefor, and especially to ejectors for fluid pumps such as shallow and deep well water pumps.

The operation of the usual type water pump is generally enhanced by the use of an ejector whereby the pump is self-priming, creates a greater suction, and is enabled to pump liquids from much greater depths. An ejector of this type comprises an axially aligned jet or nozzle and Venturi tube or diffuser, the jet discharging into the throat of the venturi, and the suction conduit also being connected with the Venturi throat. The other end of the venturi is connected to the inlet of the pump and the discharge side of the pump is connected jointly with the nozzle and with a discharge line.

Heretofore, it has been customary to form in one piece the receiver for both the jet and the Venturi tube, or to utilize the Venturi tube as one of the structural members of the pumping assembly. In most instances, it was necessary to locate the nozzle within the member which received the Venturi tube so that removal of the nozzle was difficult except with special tools such as socket wrenches. Furthermore, the Venturi tube was in danger of being harmed due to the stresses thereon when it was used as a structural member.

A particular object of the present invention is to provide an improved mounting means for the Venturi tube in an ejector type pumping system wherein all stresses are removed from the said tube.

A still further object is to provide an improved type mounting for a Venturi tube in an ejector type pumping system which permits the forming of the Venturi tube from low strength material such as plastic, porcelain or glass.

A still further object of the present invention is to provide an improved mounting for a Venturi tube which enables the Venturi tube to be removed from the system and which also permits easy access to the jet or nozzle of the system.

Another object is the provision of an adapter piece which surrounds the jet or nozzle in an ejector type pumping system and which supports the Venturi tube and by means of which the manufacture of the jet supporting member is greatly simplified.

It is a still further object to provide a means according to any of the foregoing objects which is universally useful in both deep and shallow well pumping systems.

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These and other objects and advantages will become more apparent upon reference to the following description and the accompanying drawings in which:

Figure 1 is a view showing a pumping system constructed according to this invention;

Figure 2 is an enlarged vertical section of the arrangement shown in Figure 1 and which is indicated by the line 2—2 on Figure 1;

Figure 3 is a perspective view of the adapter of this invention which mounts the Venturi tube; and

Figure 4 is a view similar to Figure 2 by showing a double tube.

Referring to the drawings, Figure 1 shows a pumping system consisting of a pump 10 which is connected by a shaft and coupling indicated at 12 to be driven by a motor such as the electric motor 14. The pump 10 may be of any suitable type such as a centrifugal type pump and it will suffice for the purpose of this disclosure to refer to it as a pressure pump. The pump 10 has an inlet conduit 16 connected therewith and discharges through an outlet fitting 18 to which is connected the discharge conduit 20.

The discharge conduit 20 may have connected therewith, as by the conduit means 22 a suitable pressure indicating gauge 24 and a pressure switch, not shown, which controls the operation of the motor 14.

The inlet conduit 16 of the pump 10 is connected with a fitting 26 which supports an inner conduit 28 and a concentric outer conduit 30 which depend toward the liquid level in a well generally indicated at 32. The conduit 30 extends into the liquid within the well while the conduit 28 ends short of the bottom of the conduit 30 and has connected therewith a fitting or adapter 34. The adapter 34 supports a Venturi tube 36 within the conduit 28 and also supports a fitting generally indicated at 38 through which liquid is drawn from the well via a foot valve 40 and strainer 42.

Referring to Figure 2, the Venturi tube and the parts associated therewith are more clearly seen. In this figure it will be noted that the Venturi tube 36 is supported solely by being threaded into a recess in the upper end of the adapter member 34, the outer part of the upper end of the said adapter member being threaded as at 44 to receive the end of the conduit 28.

Beneath the end of the conduit 28 the adapter member 34 is enlarged and is internally threaded to receive the threaded upper end of the fitting 38. In the upper end of the fitting 38 is a thread-

ed recess which threadedly receives the jet or nozzle 46 as at 48.

The nozzle 46 is hollow and communicates with a passage 50 in the fitting 38 that divides into a pair of laterally extending passages which communicate directly with the interior of the outer conduit 30. The fitting 38 extends downwardly from the aforementioned lateral passages and carries a pair of cup-shaped leather packing members 52 which are clamped in position by a nut 54 so that leakage of fluid between the conduit 30 and the member 38 is prevented.

The lower end of the member 38 is hollow, as indicated by the passage 55, and communicates directly with the liquid in the well through the foot valve and strainer. The passage 55 at its upper end divides into two passages, one of which is indicated by the dotted lines at 56 in Figure 2, and which communicate with the conical chamber formed by the member 34 in the lower end of the Venturi tube 36.

Referring again to Figure 1, it will be noticed that the member 26 is adapted for receiving the end of a conduit 58 which is connected, by a means not shown, with the discharge side of the pump 10 to receive pressure fluid therefrom. The pressure fluid passing through the conduit 58 from the pump flows downwardly within the conduit 30 and is directed upwardly through the jet 46 into the throat of the venturi or diffuser 36. This creates a suction in the chamber at the base of the venturi and draws the water from the well upwardly through the passage 55 into the Venturi tube, and thence through the conduit 28 into the inlet side of the pump 10.

It will be noted that the weight of the member 38, the foot valve and strainer, and other parts connected therewith are carried by the adapter member 34 and inner conduit 28, and that there are no stresses on the Venturi tube or the nozzle 46. Thus, any material which will reasonably withstand the eroding action of the liquid flowing through the pump and particles of foreign material carried thereby is suitable for use in the nozzle and in the Venturi tube. Among such substances are various plastic materials such as Bakelite, polystyrene, the ureas, etc., as well as glass, porcelain and other ceramics, and some metals and alloys which do not possess sufficient strength to be employed as structural members.

It will be apparent that the arrangement of this invention substantially simplifies the manufacture of the Venturi tube and nozzle because it enables them to be molded by high speed production methods rather than machined out from solid metals.

It will also be noted that the ejector assembly, comprising the jet and Venturi tube, is readily disassembled, and that no special wrenches are required for removing the jet portion. Rather, the adapter member 34 is removed and thereafter an automatic wrench can be employed for removing the jet 46. It should also be noted that the adapter member 34 completes the channel connecting the suction conduit leading to the well with the inlet end of the Venturi tube. By so utilizing the adapter member, the forming of the member 38, which is usually cast, is greatly simplified.

In Figure 4 there is shown a similar arrangement wherein the pump 60 is connected by a single suction conduit 62 with the adapter member 34 of this invention. As before, the adapter

member 34 mounts the Venturi tube 36 and encloses the jet or nozzle 46 which is carried in the upper end of a fitting 64. The fitting 64 includes a passage 66 leading from the chamber formed by the adapter member 34 to a suction conduit 68 which extends into the liquid to be pumped. The member 64 also includes a passage 70 communicating with the inside of the jet 46 and terminating in a threaded port 72 which receives a conduit 74 that leads to the discharge side of the pump 60. Another conduit 76 leading from the discharge side of the pump carries the pumped fluid therefrom.

It will be noted that both of the arrangements in Figures 2 and 4 have the features of this invention in that the Venturi tube does not form a structural member in the sense that it is required to support a load and, therefore, may be manufactured from any suitable material irrespective of its structural strength. Both of the arrangements shown also include the feature of fully exposing the jet or nozzle when the adapter member 34 is removed thereby to simplify inspection or replacement of the jet or nozzle. Furthermore, both of the arrangements in Figures 2 and 4 have the upper portion of their suction conduits between the well and Venturi tube completed by the adapter member 34 so that the fitting which carries the nozzle is of a substantially simpler form thereby reducing the complexity of the coring thereof when the said fitting is cast.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. In a jet pump; a nozzle; a member having the nozzle supported in the end thereof and having a suction passage opening around the periphery of said nozzle and a pressure passage opening into the interior of said nozzle; a diffuser in alignment with said nozzle; an adapter supporting said diffuser and carried by said member; a first conduit around said diffuser and connected directly with said adapter; and a second conduit surrounding said first conduit, said member and said adapter and in sealing engagement with said member, the suction passage in said member opening below the sealing engagement between said member and second conduit, and the pressure passage therein opening above the said sealing engagement.

2. In a jet pump; an axially aligned nozzle and diffuser tube; a fitting; means detachably supporting said nozzle in the end of said fitting; an adapter member secured to the end of said fitting and surrounding said nozzle; means in the other end of said adapter member for detachably receiving said diffuser tube; and sealing means carried by said member for sealing the same within a conduit.

3. In a jet pump; an axially aligned nozzle and diffuser tube; a fitting; means detachably supporting said nozzle in the end of said fitting; an adapter member secured to the end of said fitting and surrounding said nozzle; means in the other end of said adapter member for detachably receiving said diffuser tube; other means at the said other end of said adapter member for detachably receiving the conduit into which said diffuser tube discharges; and gasket means on the body of said fitting for sealing the same within a conduit.

4. In a jet pump; concentric conduit means

extending into a liquid supply, the inner of said conduit means being shorter than the outer of said conduits; a fitting sealed in the outer conduits and below the end of the inner conduit; a nozzle mounted in the upper end of said fitting; passage means connecting the lower end of the outer conduit with the periphery of said nozzle; other passage means connecting the interior of said nozzle with the space between said conduits; an adapter screw-threadedly connected with said fitting and with said inner conduit for directly supporting said fitting thereon; and a diffuser tube mounted in said adapter and extending into said inner conduit.

5. In a jet pump; concentric conduit means extending into a liquid supply, the inner of said conduit means being shorter than the outer of said conduit means; a fitting sealed in the outer of said conduits and below the end of the inner conduit; a nozzle mounted in the upper end of said fitting; passage means connecting the lower end of the outer conduit with the periphery of said nozzle; other passage means connecting the interior of said nozzle with the space between said conduits; an adapter screw-threadedly connected with said fitting and with said inner conduit for directly supporting said fitting thereon; and a diffuser tube mounted in said adapter and extending into said inner conduit, said adapter completing the suction passage from around the periphery of said nozzle into the receiving end of said diffuser.

6. In a jet pump; concentric conduits adapted for extending into a liquid supply, the inner of said conduits being shorter than the outer of said conduits; a fitting mounted in the outer conduit and below the end of the inner conduit; a nozzle mounted in the upper end of said fitting; said fitting having passage means connecting the lower end of the outer conduit with the periphery of said nozzle and also connecting the interior of said nozzle with the space between said conduits; an adapter screw-threadedly connected with said fitting and with said inner conduit for directly supporting said fitting thereon;

and a diffuser tube mounted in said adapter and extending into said inner conduit.

7. In a jet pump; concentric conduits adapted for extending into a liquid supply, the inner of said conduits being shorter than the outer of said conduits; a fitting mounted in the outer conduit and below the end of the inner conduit; a nozzle mounted in the upper end of said fitting; said fitting having passage means connecting the lower end of the outer conduit with the periphery of said nozzle and also connecting the interior of said nozzle with the space between said conduits; an adapter screw-threadedly connected with said fitting and with said inner conduit for directly supporting said fitting thereon; a diffuser tube mounted in said adapter and extending into said inner conduit; and sealing means between said fitting and the outer of said conduits.

8. In an ejector assembly for pumps; a nozzle; a member detachably supporting said nozzle and having a suction passage therein opening at the periphery of said nozzle and a pressure passage therein opening into the center of said nozzle; a diffuser tube in axial alignment with the discharge end of said nozzle; a suction conduit surrounding said diffuser tube; and means of supporting said diffuser tube and said suction conduit comprising an adapter screw-threaded to said conduit and to said member and detachably supporting said diffuser tube, said adapter having a passage therein to join the suction passage in said member with the passage in said diffuser.

JOHN W. GURLEY.

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