Oct. 17, 1950 W. J. CONERY 2,525,772

CONVERTIBLE EJECTOR PUMP

Filed June 29, 1945 4 Sheets-Sheet 1

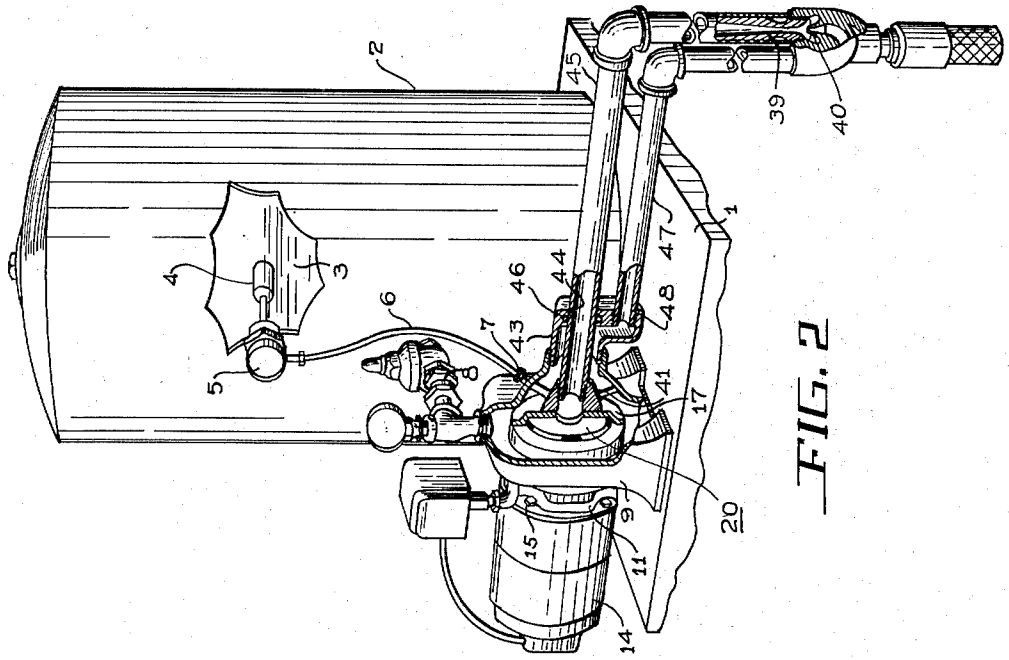


FIG. 2

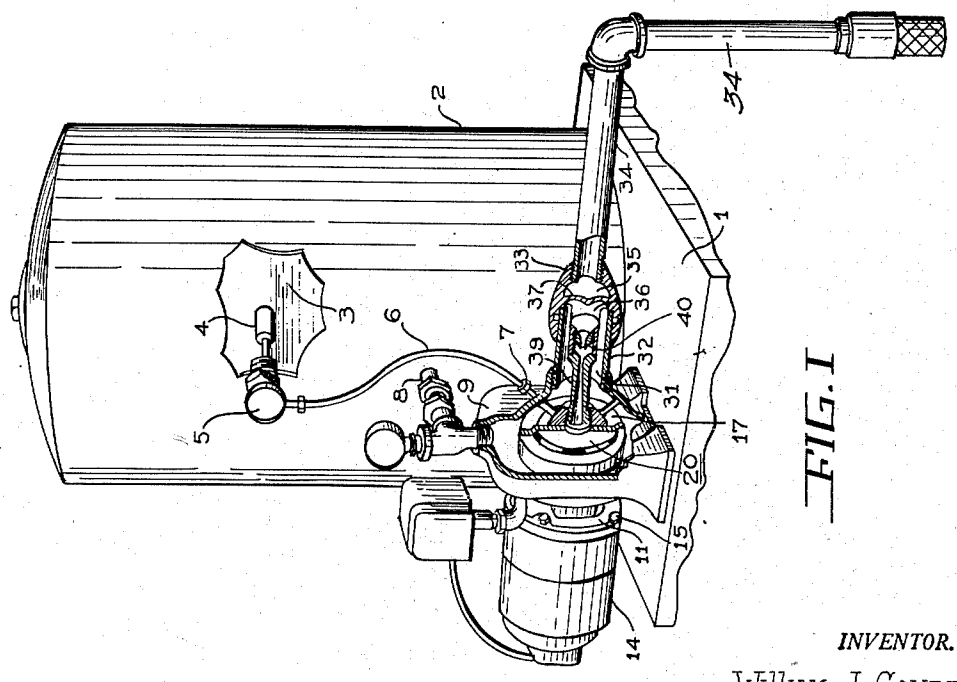


FIG. 1

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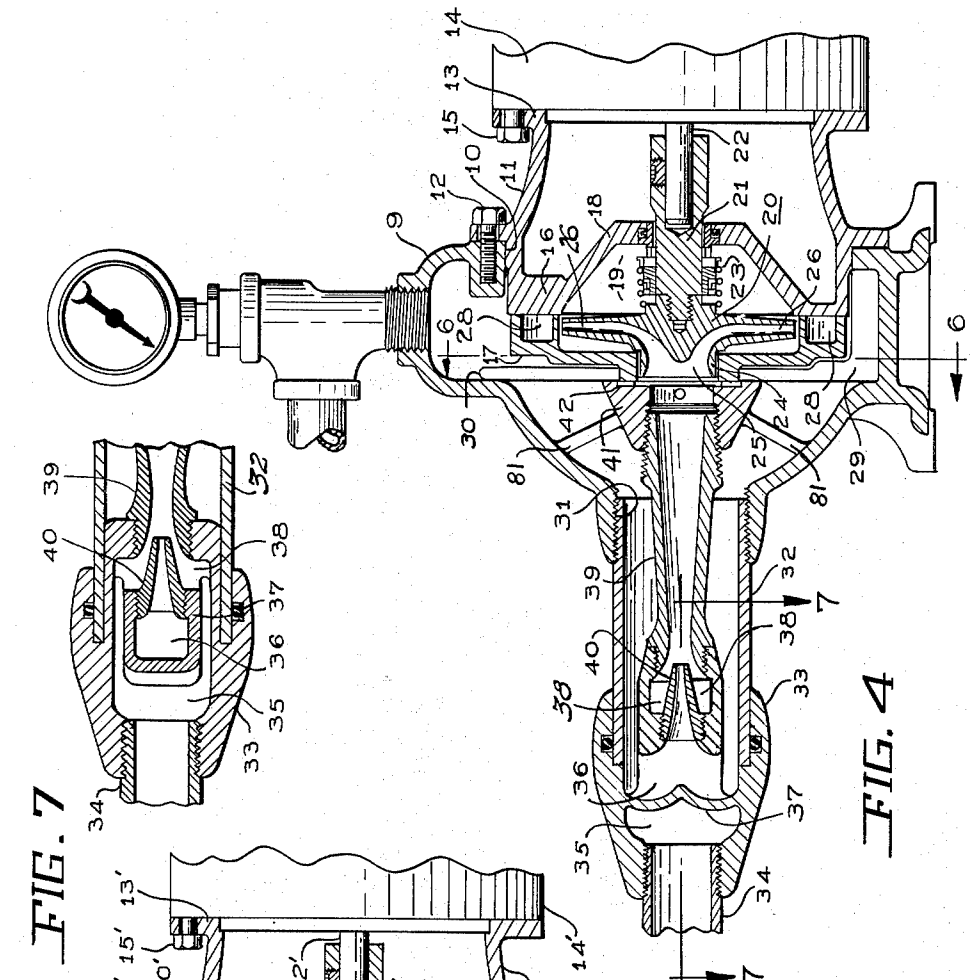


FIG. 4

FIG. 7

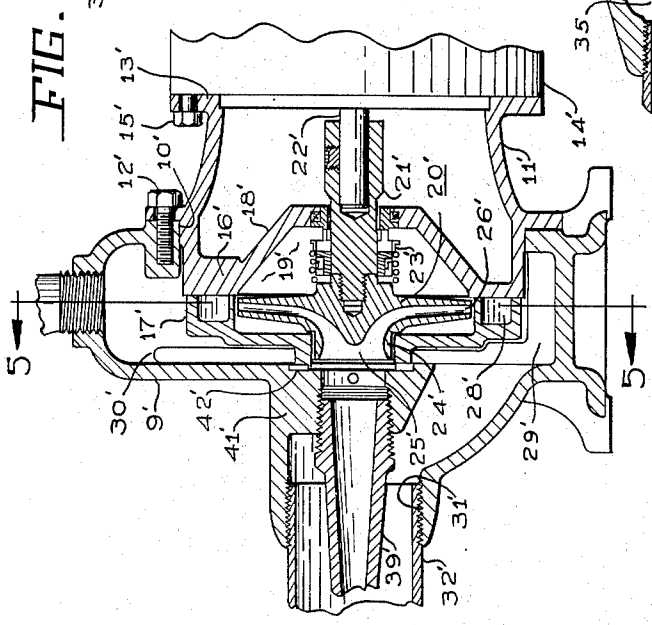


FIG. 3

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FIG. 5

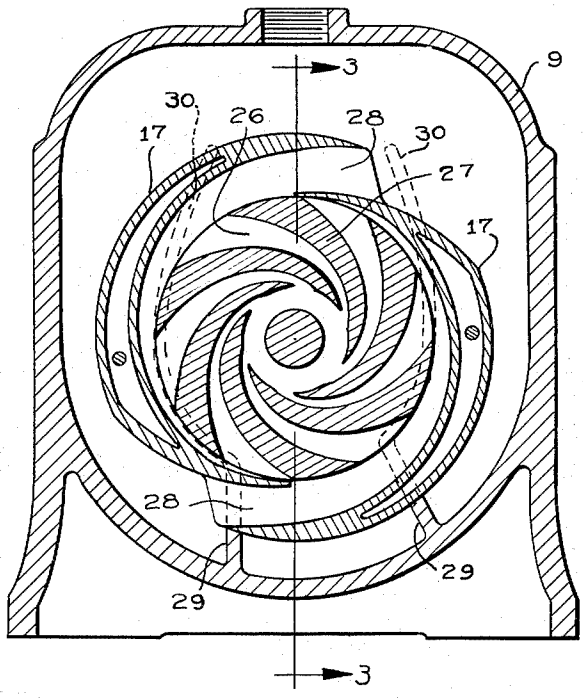
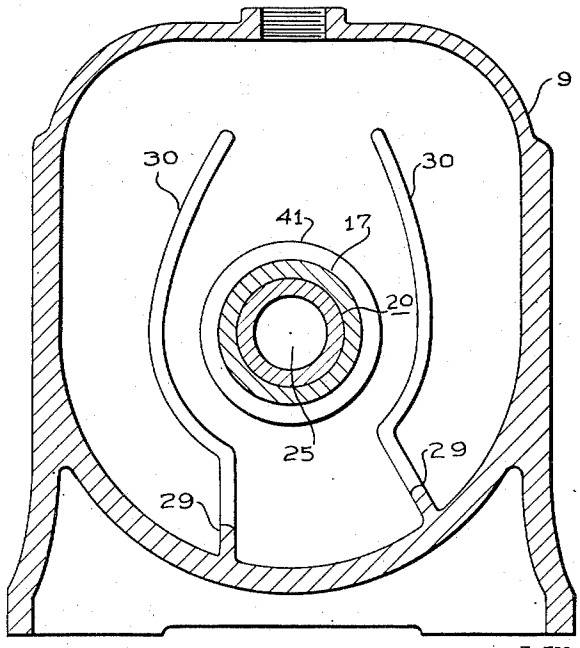


FIG. 6



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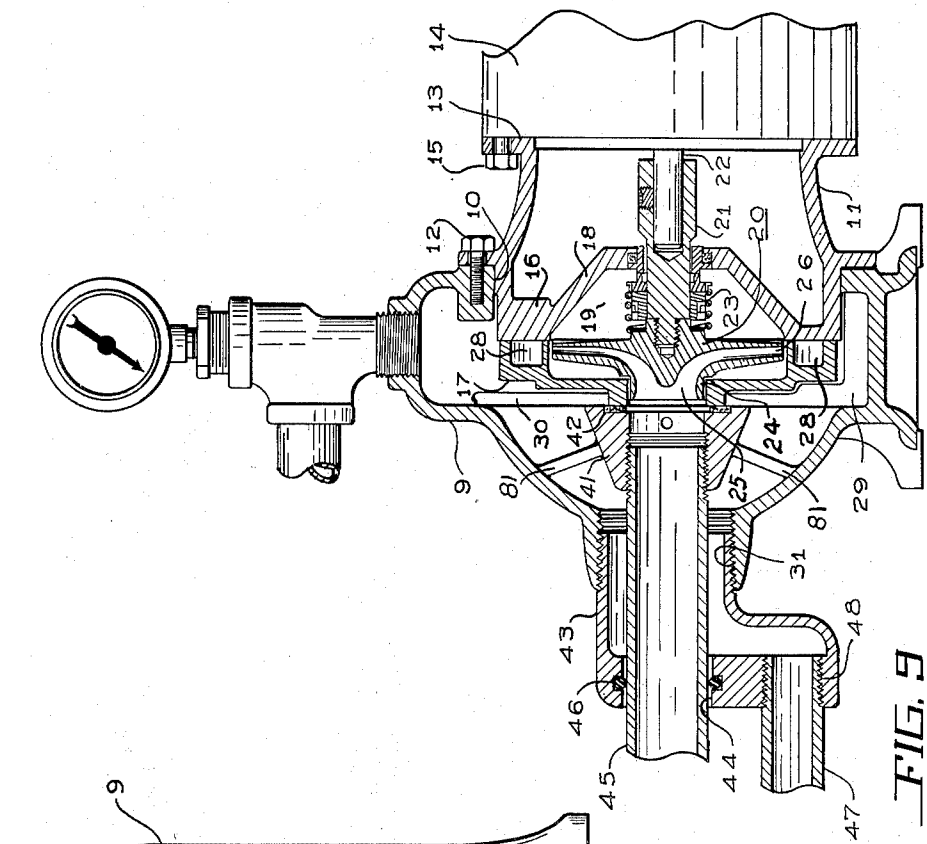


FIG. 9

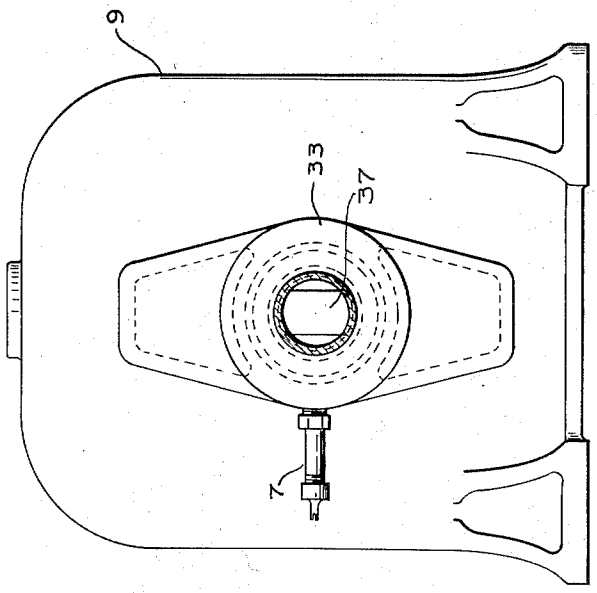


FIG. 8

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2,525,772

UNITED STATES PATENT OFFICE

2,525,772

CONVERTIBLE EJECTOR PUMP

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Application June 29, 1945, Serial No. 602,348

10 Claims. (Cl. 103—5)

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My invention relates to convertible shallow well and deep well pumps and particularly to jet operated centrifugal pumps.

It is an object of this invention to provide a separation chamber which supports on one side a pump rotor and rotor housing together with an electric motor and on the other side a jet mechanism adapted to receive substantially air free fluid from the pump and deliver such fluid into the eye of the rotor of the pump thereby inducing the flow of water either from a shallow well or deep well.

In particular, it is an object of this invention to provide a single opening in the side of the separation chamber casing for the reception of the ejector or for the reception of the piping connected to an ejector located remotely from the casing as in the case of a deep well. Heretofore, multiple side openings in the casing have been employed.

Another object of this invention is to provide a single standard opening so arranged as to receive either the ejector and associated piping for a shallow well or the piping of a deep well arrangement employing an ejector located in the well. By employing a casing with an opening on one side for supporting a bracket which in turn supports the electric motor, the rotor and the pump casing and which supports on the other side the ejector and well piping, it is possible to maintain these essential parts in rigid position and alignment while at the same time providing a ready method of assembly and disassembly, low-cost construction and simple form of mechanism for conversion from a deep to shallow well or from a shallow well to deep well arrangement.

It is a further object to provide a casing around the pump casing substantially equidistant from all parts thereof so as to employ a casing of the minimum practical size while retaining the feature of ready separation of water and air and of maintaining the pump in a self-primed condition.

It is a still further object to provide in this combination tangential passageways from the rotor of the pump through the pump casing into the air and water separation casing and to provide therewith an association of baffles and guides for breaking up continuous rotary movement of the discharge water so there will be a ready separation of the air and water.

Referring to the drawings:

Figure 1 is a perspective view, partially in section, showing the arrangement of this invention for shallow wells;

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Figure 2 is a view showing a similar arrangement for the deep well;

Figure 3 is a section on line 3—3 of Figure 5 looking in the direction of the arrows and represents an alternative shallow well construction to that shown in Figures 1 and 4.

Figure 4 is a similar view showing the arrangement of the ejector when the pump is used with a shallow well;

Figure 5 is a section on the line 5—5 of Figure 3 looking in the direction of the arrows;

Figure 6 is a section on the line 6—6 of Figure 4 looking in the direction of the arrows;

Figure 7 is a section on the line 7—7 of Figure 4 looking in the direction of the arrows;

Figure 8 is a view of the left-hand side of the pump as shown in Figure 4; and

Figure 9 is a vertical section through the pump as arranged for deep well operation.

Referring to the drawings in detail, 1 designates a well platform upon which is mounted the tank 2 containing the pumped water 3. A float 4 regulates a valve 5 for the admission of air through the pipe 6. The pipe 6 is connected into the discharge casing at 7. The tank 2 is supplied with water from the pump through the pipe 8 connected to the top of the air and water separation or distribution casing 9. This casing 9 is provided with an opening 10 in which is mounted a motor supporting bracket 11 that is retained on the casing 9 by the bolts 12. The outer end of this bracket at 13 supports the motor 14. The bolts 15 attach the motor to the bracket. The inner end of the bracket is provided with a shoulder 16 for supporting the pump casing 17. The pump casing 17 forms with the wall 18 of the bracket a pump chamber 19 in which the rotor 20 operates. The rotor 20 is connected by the coupling 21 to the armature shaft 22 of the motor 14. A resiliently pressed seal generally designated 23 is mounted between the rotor and the wall 18 of the bracket. The exact nature of this seal is not important and, therefore, needs no detail description.

The rotor comprises a sleeve 24 forming a central passageway 25 which communicates with the radial passageways 26 in the rotor body 20. These passageways 26 are formed by the ribs or guide vanes 27. The fluid passing through the eye of the rotor and radially and tangentially out of the rotor is delivered into the passageways 28 of the pump casing 17. The fluid thus delivered would continue to rotate within the casing 9 if it were not for the fact that in the bottom of the casing there are transverse baffles 29 associated

with upwardly extending, spaced, arcuate guide ribs 30 which break up the rotation of the water and guide it upwardly thereby separating the air and water so the air can rise to the top of the casing 9, while the water in the bottom of the casing is substantially air free.

This water can then pass outwardly through the port 31 in the side of the casing 9. In the shallow well pump, as shown in Figures 1, 3, 4 and 7, the opening 31 is used as a support for the pipe 32 which in turn supports a coupling 33 that is connected to the well by the piping 34. The pipe 34 communicates with a chamber 35 in the coupling 33. The water from the well passes around the chamber 36 formed by the housing 37 and thence through the passageway 38 into the interior of the ejector or Venturi tube 39.

The nozzle 40 is mounted in the casing 37 and is supplied with the pressure fluid from the casing 9. The flow of this fluid through the nozzle 40 into the ejector 39 induces the flow of the water from the shallow well.

The outer end of the ejector or Venturi tube 39 is detachably mounted on the support 41. This support is closely adjacent the eye of the rotor at 25 and is in sealing engagement with the rotor casing 17. A seal 42 is provided to prevent pressure fluid from the casing 9 entering the eye of the rotor directly. It will be noted in Figures 3 and 4 that there is a modification of the method of mounting the ejector or Venturi tube 39 but the principle of operation remains the same.

Turning to the arrangement for the deep well, as shown in Figures 2 and 9, it can be observed that the opening 31 is provided with a right angle casting which is threaded into it. This casting or coupling means is designated 43. An aperture 44 in this casting receives the pipe 45, one end of which is threaded into the bracket 41 in the casing 9. The Venturi tube of the ejector 39 has been unscrewed from the bracket 41 and the pipe 45 has been substituted therefor.

The pipe 45 is sealed to the casting 43 by the gasket 46. The other end of the pipe 45 is connected to the ejector assembly comprising the Venturi tube 39 of the ejector and the nozzle 40. Fluid is supplied to the nozzle 40 by the pipe 47 which is connected to the lower portion of the casting 43 as at 48 and is arranged to take substantially air free water from the bottom of the casing 9 as it has been discharged by the pump.

The numeral 81 in Figs. 1, 2, 4 and 9 indicates webs which connect 41 to casing 9 respectively.

It will be noted from this arrangement that the major portion of the apparatus is undisturbed when making the conversion from a shallow well to deep well or from a deep well to shallow well. The conversion is effected by removing the pipe 32 and the Venturi or ejector tube 39 and substituting the casing 43 and connecting the pipe 45 in the place of the Venturi tube 39. By having a single opening instead of a dual opening, it is possible to simplify, under some conditions, this conversion.

Turning to Figure 3, which shows an alternative construction of a shallow well pump, the primed numerals indicate corresponding parts to those shown in Figures 1 and 4. It will be appreciated that the form of the invention shown in Figure 3 is as well adapted for conversion to a deep well pump as is that of Figures 1 and 4. Pipe 32' and ejector 39' may be unscrewed from their supports and casing 43 and pipe 45 may be used in their places respectively, thereby converting the construction from a shallow to a deep well pump.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the specification and the appended claims.

I claim:

1. In a pumping apparatus for use with either deep or shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump casing, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means having a jet pump located therein including inner conduit means and outer conduit means, said outer conduit means surrounding at least a portion of said inner conduit means and engaging said air separation casing fitting, said inner conduit means engaging said support fitting, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing.

2. In a pumping apparatus for use with either deep or shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing fitting, said inner pipe means engaging said support fitting, said inner pipe means including a jet pump, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing.

3. In a pumping apparatus for use with either deep or shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing fitting, said inner pipe means engaging said support fitting, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing, said inner pipe means including an ejector and venturi means.

4. In a pumping apparatus for use with shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizon-

tal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separating casing adjacent to said pump inlet, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing fitting, said inner pipe means engaging said support fitting, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing, said outer pipe means having a coupling means and said inner pipe means including a passageway having an ejector and venturi means located between said coupling means and said support means.

5. In a pumping apparatus for use with deep wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing fitting, said inner pipe means engaging said support fitting, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing, said outer pipe means including a casting sealingly engaging said inner pipe means, each of said pipe means having a section which is adapted to extend into a well, and a jet pump located in one of said sections.

6. In a pumping apparatus for use with deep wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing fitting, said inner pipe means engaging said support fitting, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing, said outer pipe means including a casting sealingly engaging said inner pipe means, each of said pipe means having a section which is adapted to extend into a well, and a jet pump located in the section of said inner pipe means.

7. In pumping apparatus for use with either deep or shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump casing, and having an opening in line with said inlet, said air separation casing having an opening of larger size than the opening in said support means, a pair of conduits detachably secured to the openings respectively in said air separation casing and support means, one of said conduits surrounding the other, at least in part, the inner conduit having a jet pump, and the outer conduit being in communication with each of the air separator and jet pump, and sealing means for sealingly engaging said support means and pump casing, whereby to prevent fluid entering between said support means and said pump casing.

8. In a pumping apparatus for use with shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, said support means having a fitting and an opening located adjacent to said pump central inlet passageway, said separation casing having a fitting and an opening, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing fitting, said inner pipe means engaging said support fitting, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing, said outer pipe means having a coupling means, and said inner pipe means including a passageway having an ejector and venturi means located between said coupling means and said support means, and means including a friction device for sealingly supporting one pipe means from the other at a position intermediate the lengths of the pipe means.

9. In a pumping apparatus for use with either deep or shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing, said inner pipe means engaging said support means, said inner pipe means including a jet pump, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between said support means and said pump casing.

10. In a pumping apparatus for use with either deep or shallow wells, in combination, an air separation casing, a pump casing in said air separation casing, an impeller having a substantially horizontal axis mounted in said pump casing, said pump casing having a central inlet passageway, support means mounted in said air separation casing adjacent to said pump inlet, conduit means including inner pipe means and outer pipe means, said outer pipe means surrounding said inner pipe means and engaging said air separation casing, said inner pipe means engaging said support means, said inner pipe means including a jet pump, and sealing means for sealingly engaging said support means and pump casing whereby to prevent fluid entering between

said support means and said pump casing, said conduit means further including a chambered sleeve detachably connecting said inner and outer pipe means to each other.

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