Aug. 26, 1952 W. J. CONERY 2,608,157

HORIZONTAL JET TYPE PUMP FOR SHALLOW OR DEEP WELLS

Filed Sept. 7, 1948 2 SHEETS—SHEET 1

FIG. 1

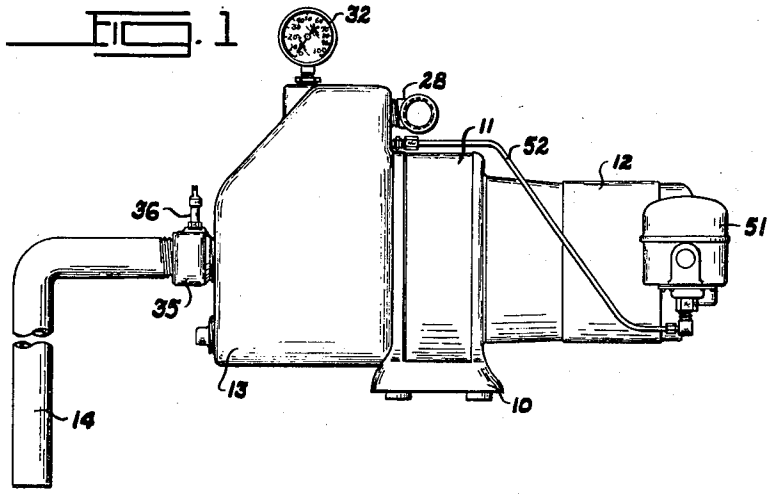
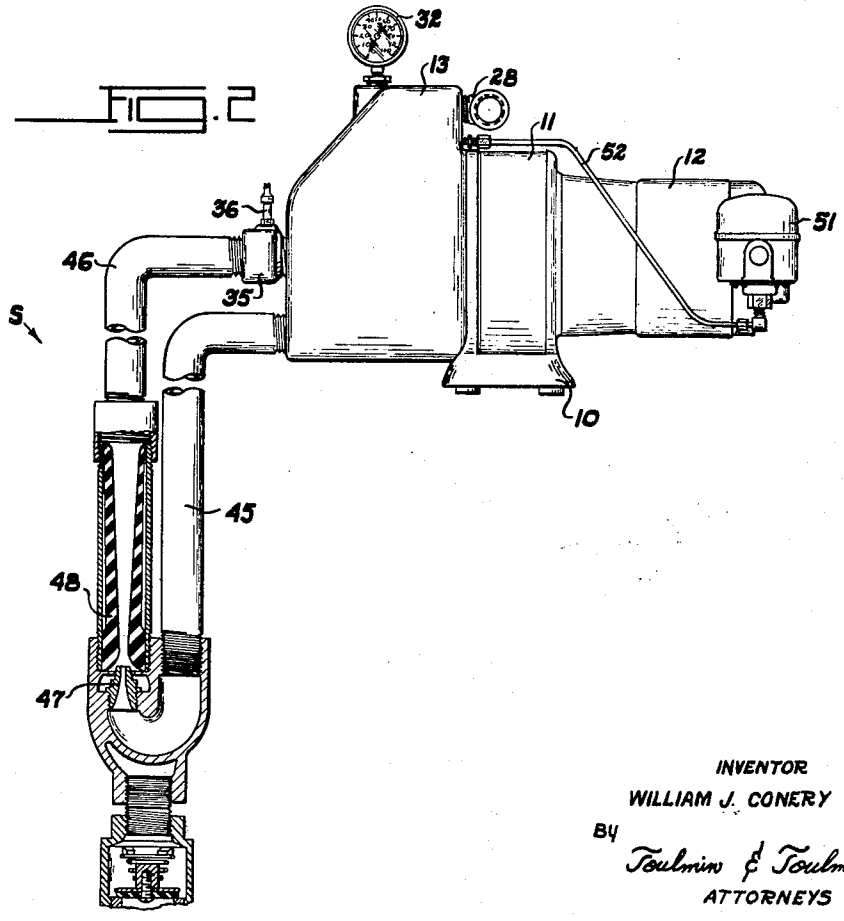


FIG. 2



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FIG. 3

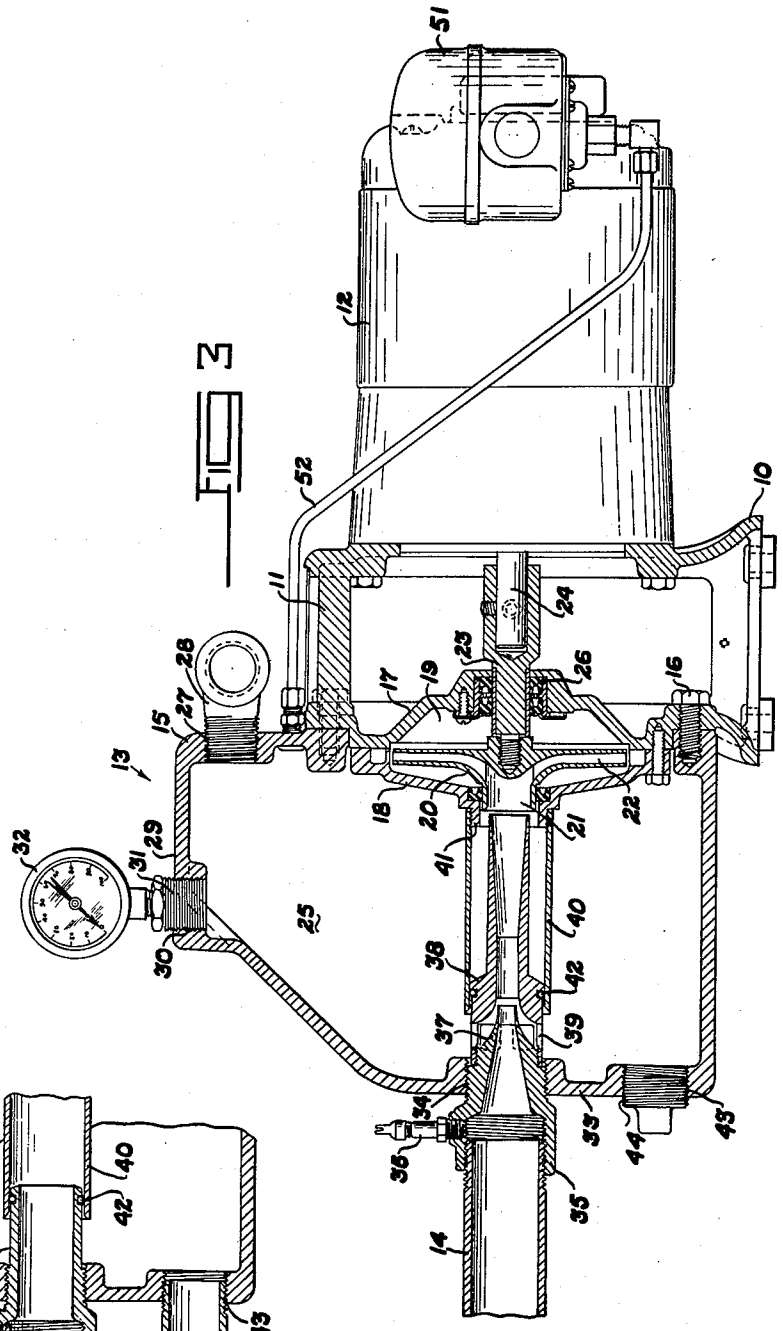
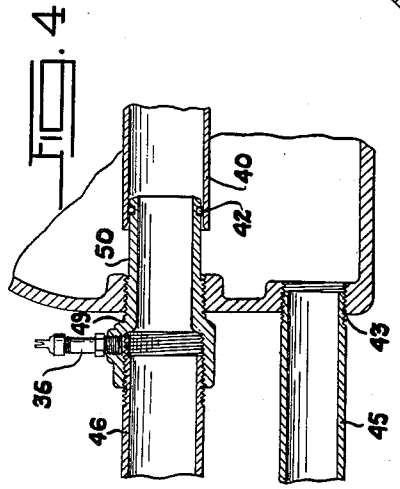


FIG. 4



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HORIZONTAL JET TYPE PUMP FOR SHALLOW OR DEEP WELLS

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3 Claims. (Cl. 103—5)

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The present invention relates to jet type pumps and is concerned primarily with a pump that is adapted for use with either shallow or deep wells by a very simple change in the connections to the pump.

At the present time pumps of the jet type are being produced by pump manufacturers, and some such pumps are adapted for use with either shallow or deep wells. However, in the pumps now available the structure of the pump involving the air separation chamber and passages associated therewith call for a casting that includes webs, partitions, channels, and other structural parts which make the manufacture of such a casting a highly difficult and involved process.

Accordingly, the present invention has in view as its foremost objective the provision of a pump of the type indicated in which the construction of the pump casing has been held down to the epitome of simplicity.

More in detail, the invention has as an object the provision of a pump of the type noted, which includes a chamber which functions as a combined air separation and priming chamber regardless of whether the pump is used with deep or shallow wells, and a special type of jet pump mounted therein, and communicating with a centrifugal impeller pump when used with shallow wells, but which has a conduit extending thereacross to communicate between the return side of a jet pump and the centrifugal impeller when used with deep wells. This chamber is defined by a casing and includes no partitions, webs, or other structural elements which would be difficult to cast.

Still another object of the invention is the provision of a pump of the type noted which includes essentially the chamber aforesaid, a centrifugal impeller pump being mounted in the wall of said chamber with the opposite wall being formed with an opening designed to receive a fitting.

A motor is operatively connected to drive the centrifugal impeller pump. The chamber is also formed with an opening in a wall adjacent the bottom thereof, and this opening is closed by a plug when the pump is used with a shallow well.

In such case the jet pump, comprising the nozzle and venturi, is assembled to extend across the fitting to communicate with the centrifugal impeller pump, and provision is made for the jet pump to communicate with the chamber at a space immediately around the jet nozzle.

When the pump is used with a deep well the jet pump assembly is removed and replaced by a

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conduit that extends from the fitting to the centrifugal impeller pump. The return side of the jet pump that is located in the well is connected to the fitting, while the supply side of the jet system is connected at the opening from which the plug is removed.

Various other more detailed objects and advantages of the invention such as arise in carrying out the above noted ideas in a practical embodiment will in part become apparent and in part be hereinafter stated as the description of the invention proceeds.

The invention therefore comprises a jet type pump for deep or shallow wells which consists essentially of a chamber defined by a casing having spaced walls. A centrifugal impeller pump is operatively mounted in one wall and the opposite wall carries a fitting substantially in alignment with the axis of the centrifugal impeller pump.

When used for shallow well pumps a jet pump extends from this fitting to a point where it communicates with the centrifugal impeller pump, the jet pump also communicating with the chamber.

When used for deep well pumps the jet pump is removed and replaced by a conduit which extends from the fitting to the centrifugal impeller pump. This fitting, as well as another opening in the chamber which is closed for shallow well use, are connected to the pressure and supply sides of a jet system including a jet pump located in the well.

For a full and more complete understanding of the invention reference may be had to the following description and accompanying drawings wherein:

Figure 1 is a view in side elevation showing the pump of this invention when adapted for shallow well use;

Figure 2 is another side view somewhat similar to Figure 1 but showing the pump as adapted for deep well use. In this view certain parts of the jet system are broken away and shown in section;

Figure 3 is an enlarged detailed view partly in elevation and partly in section and developing the interior of the pump proper in section; and

Figure 4 is a sectional view showing the connections to the chamber when the pump is adapted for deep well use.

Referring now more particularly to Figure 1, the pump of this invention is therein illustrated and shown as comprising a base 10 which is adapted to rest on any suitable support.

This base 10 carries a main body casting which

is designated at 11. The casting 11 carries at one side an electric motor 12 and at the other side a pump casing 13.

A suction pipe 14 is shown as connected to the casing 13 and this pipe is adapted to extend to what is known as a shallow well, that is, one the depth of which does not exceed 25 feet.

Referring now more particularly to Figure 3, the casing 13 is shown as having an end wall 15 that is anchored to the casting 11 by the screw bolts shown at 16. This wall 15 is also formed with a large central opening in which is anchored a centrifugal impeller pump casing 17.

As shown in Figure 3 this latter element may be formed as a part of the casting 11. A complemental impeller casing element is designated 18, and the two together define a pumping chamber 19.

Mounted for rotation in the latter is a centrifugal impeller 20 having an axial inlet passage at 21 which communicates with the outwardly extending passages 22. This centrifugal impeller 20 is carried by a stub shaft 23 that is in turn connected to a drive shaft 24 of the motor 12.

The casing 13 defines a chamber 25 which communicates with the pump chamber 19 through passages formed in the casing element 18.

At this point it is well to note that a seal is provided at 26 for preventing fluid from escaping from the pumping chamber 19 along the connecting shaft 23.

The wall 15 is also formed with a threaded opening at 27 in which is screwed a fitting 28 which may extend to a pressure tank or other place where water is to be stored.

The casing 13 also has a top wall 29 formed with a threaded opening 30 which is normally closed by a fitting 31 which may carry a pressure gage shown at 32. Obviously, this fitting 31 may be removed as occasion demands to permit water to be supplied to the chamber 25 as for priming purposes.

The casing 13 also includes another side wall 33 which is opposite to the wall 15 and this wall is formed with a threaded opening at 34 that is substantially in alignment with the axis of the impeller 20. Screwed into this opening 34 is a fitting 35.

It will be noted that the supply pipe conduit 14 which extends upwardly from the well is connected to this fitting 35, and the latter may also carry an air valve as shown at 36 for a purpose later to be described. When the well is adapted for shallow well use this fitting 35 carries the nozzle of a jet pump as represented at 37. This nozzle extends into the funnel shaped entrance of a venturi as represented at 38. Moreover, there are spaces 39 provided around the nozzle 37 so as to establish communication between the chamber 25 and the jet pump made up of the nozzle 37 and venturi 38.

The venturi 38 is mounted within a tubular member 40 which has one end anchored to a tubular projection 41 that is exteriorly threaded and extends outwardly from the pump casing element 18. At the end remote from this connection there is a ring 42 of O cross section which establishes a seal between the venturi and the tubular member 40.

The wall 33 is also formed with a threaded opening at 43 which is closed by a plug 44 when the pump is employed for shallow well purposes.

Shallow well operation

In shallow well operation the pump is first primed, that is, the chamber 25 is filled with water. This may be accomplished by removing the plug 31 and passing the water in through the opening 30, after which the plug 31 will be replaced. The motor 12 is now started into operation to drive the centrifugal impeller 20.

Water will be drawn in from the chamber 25 through the spaces 39, and as it passes around the nozzle 37 air will be drawn from the suction pipe 14. This air, together with water, will be passed through the centrifugal impeller pump and delivered back to the chamber 25. In the chamber 25 the air separates from the water and is passed outwardly through the fitting 28 to the pressure tank.

To retain the priming water in the chamber 25 above the level of the nozzle 37 during the priming operation, and to retain a prime in the pump, a check valve is placed in the suction line 14 near the pump or a foot valve is used at the bottom end of the suction line 14, or both may be used.

This drawing of air from the suction pipe 14 will continue until substantially all of the air will have been evacuated therefrom, whereupon the pump begins to draw water. This water will be drawn from the suction pipe 14 by the action of the jet pump 37—38 and delivered through the centrifugal impeller pump to the chamber 25. As much water as is needed to operate the jet pump 37—38 will be recirculated back in the manner described. However, the additional water which is drawn from the well will be passed out through the fitting 28 to the pressure tank or the place where it is to be used or stored.

It will be noted that the water and air is recirculated by the centrifugal impeller pump from the chamber 25 through the reverse jet pump 37—38 to the pump chamber 19 and back to the chamber 25. This recirculation results in a pressure boost, making it possible to obtain pressures sufficiently high and satisfactory for the pressure system operation which is essential for shallow well operation.

Deep well installation

Referring now for the moment to Figure 2, which will be considered along with Figure 4, it will be noted that when the pump is designed for deep well use the base 10, casting 11, motor 12, and casing 13, remain the same. However, instead of the suction pipe 14 a jet system, which is identified in its entirety by the reference character S, is connected to the casing 13. This jet system S includes a jet supply line 45 and a pressure or return line 46.

The jet pump itself is disposed at a proper location within the well and includes a nozzle 47 which cooperates with a venturi 48 in a well known manner.

Referring now to Figure 4, it will be noted that the plug 44 has been removed from the opening 43 and the jet supply pipe 45 connected to the casing 13 at this point. Moreover, the fitting 35 has been replaced by another fitting 49, to which the jet return or pressure line 46 is connected.

It is further noted that when the fitting 35 is removed the nozzle 37 and venturi 38 will come out with it. The fitting 49 includes a tubular extension 50 which extends into the tubular member 40, with the telescopic connection being sealed by the ring of O cross section shown at 42.

Deep well operation

When the installation above described is used with deep wells, the motor 12 is started into operation to drive the centrifugal impeller 20.

Attention is first called to the fact that for deep well use the fitting 28 will carry a pressure control valve (not illustrated) which will prevent the passage of fluid through the fitting until a certain predetermined pressure has been exceeded.

Thus, as the centrifugal impeller pump operates it builds up pressure on the fluid in the chamber 25 and water is forced down through the jet supply pipe 45 to the nozzle 47. As the jet emerges from the latter and is delivered to the venturi 48 it entrains water from the well and this combined water passes upwardly through the jet return pipe 46, from which it passes through the fitting 49, tubular extension 50, and tubular member 40 back to the inlet 21 of the centrifugal impeller pump.

This combined water is then delivered from the centrifugal impeller pump back to the chamber 25. As much water as is needed to operate the jet system will be returned through the jet supply pipe 45 to the jet system. However, the excess water will pass through the fitting 28 when sufficient pressure has been built up thereon to overcome the pressure control valve. From this fitting 28 the water goes to the pressure tank. It will be noted that any air which is separated from the water in the chamber 25 will go with the water to the pressure tank.

It is to be remembered that the water supply or pressure tanks which are commonly employed with pumps of this type must include a certain amount of air under pressure in order to discharge the water as it is being used. Thus, it is important that there be an adequate supply of air as well as the water.

Thus, in both installations of the pump the air valve shown at 36 is included for the purpose of admitting such air as is needed. This air valve is usually connected to a suitable well known float-controlled air volume control mounted in the pressure tank for automatically maintaining proper air volume in the tank.

It is further noted that a pressure responsive device 51 is associated with the electric motor 12 for automatically bringing it into operation when pressure within the chamber 25 falls below a predetermined limit and for stopping the operation when it exceeds a certain limit. This pressure responsive control 51 is connected to the chamber by the conduit shown at 52.

While preferred specific embodiments of the invention are hereinbefore set forth, it is to be clearly understood that the invention is not to be limited to the exact constructions and devices illustrated and described because various modifications of these details may be provided in putting the invention into practice within the purview of the appended claims.

I claim:

1. In a convertible deep and shallow well pump the combination of a distribution casing having a pair of spaced opposed walls, a pressure pump operatively mounted in one of the walls and having a suction inlet and a pressure outlet, said outlet communicating with the interior of said casing, an opening in said one wall and a discharge pipe secured to said casing at said opening, a pair of openings in the other of said walls, one of said pair of openings being in line with the suction inlet of the pump, a removable plug in the other

of said pair of openings, a tubular member contained within the casing in line with said suction inlet and secured at one end to said pump, the other end of the tubular member extending toward the opening which is in line with the suction inlet of the pump, but stopping short of the last-mentioned opening, a jet pump comprising nozzle and diffuser elements arranged end to end with a portion of the diffuser surrounding the tip of the nozzle element and spaced therefrom by an annular opening, said nozzle passing through said opening which is in line with the suction inlet of the pump and removably secured in the opening, said diffuser extending into said tubular member to a position immediately adjacent said suction inlet, said annular opening constituting a passageway between the distribution chamber and the interior of the diffuser, a detachable sealing connection between the exterior surface of said diffuser and the interior of said tubular member to prevent direct communication between the distribution chamber and said suction inlet except through said annular opening and the diffuser, said jet pump as a unit being adapted to be withdrawn from said tubular member and distribution chamber through the opening which is in line with the suction inlet of the pump when converting from shallow to deep well operation.

2. In a convertible deep and shallow well pump the combination of a distribution casing having a pair of spaced opposed walls, a pressure pump operatively mounted in one of the walls and having a suction inlet and a pressure outlet, said outlet communicating with the interior of said casing, an opening in said one wall and a discharge pipe secured to said casing at said opening, a pair of openings in the other of said walls, one of said pair of openings being in line with the suction inlet of the pump, a removable plug in the other of said pair of openings, a tubular member contained within the casing in line with said suction inlet and secured at one end to said pump, the other end of the tubular member extending toward the opening which is in line with the suction inlet of the pump, but stopping short of the last-mentioned opening, a jet pump comprising nozzle and diffuser elements arranged end to end with a portion of the diffuser surrounding the tip of the nozzle element and spaced therefrom by an annular opening, said nozzle passing through said opening which is in line with the suction inlet of the pump and removably secured in the opening, said diffuser extending into said tubular member to a position immediately adjacent said suction inlet, said annular opening constituting a passageway between the distribution chamber and the interior of the diffuser, said diffuser having a shoulder at its end nearer the nozzle which fits snugly but slidably within the tubular member, a sealing ring interposed between said shoulder and the tubular member to prevent direct communication between the distribution chamber and the suction inlet except through the diffuser, whereby the diffuser is adapted to slide along the interior of the tubular member without breaking the seal and the end of the tubular member remote from the pressure pump is completely filled by said diffuser and the sealing ring, said jet pump being adapted to be withdrawn as a unit from the distribution chamber through said opening which is in line with the suction inlet of the pump when converting from shallow well to deep well operation, said sealing connection being re-

established when re-conversion is made from deep to shallow well operation and the jet pump is reinserted through the last-mentioned opening to cause the diffuser to re-enter said tubular member.

3. In a convertible deep and shallow well pump the combination of a distribution casing having a pair of spaced opposed walls, a pressure pump operatively mounted in one of the walls and having a suction inlet and a pressure outlet, said outlet communicating with the interior of said casing, an opening in said one wall and a discharge pipe secured to said casing at said opening, a pair of openings in the other of said walls, one of said pair of openings being in line with the suction inlet of the pump, a removable plug in the other of said pair of openings, a tubular member contained within the casing in line with said suction inlet and secured at one end to said pump, the other end of the tubular member extending toward the opening which is in line with the suction inlet of the pump, but stopping short of the last-mentioned opening, a jet pump comprising nozzle and diffuser elements arranged end to end with a portion of the diffuser surrounding the tip of the nozzle element and spaced therefrom by an annular opening, said nozzle passing through said opening which is in line with the suction inlet of the pump and removably secured in the opening, said diffuser extending into said tubular member to a position immediately adjacent said suction inlet, said annular opening constituting a passageway between the distribution chamber and the interior of the diffuser, said diffuser having a shoulder at its end nearer the nozzle which fits snugly but slidably within the tubular member, said shoulder being peripherally grooved, a sealing ring of O section positioned in the groove and adapted to bear against the interior surface of said tubular member to prevent direct communication between the distribution chamber and the suction inlet except through said annular opening and the diffuser whereby the diffuser is adapted to slide along the interior of the tubular member without breaking the seal and the end of the tubular member remote from the pressure pump is completely filled by said diffuser and the sealing ring, said jet pump being adapted to be withdrawn as a unit from the distribution chamber through said opening which is in line with the suction inlet of the pump when converting from shallow well to deep well operation and said tubular member being adapted to slide along the shoulder of the diffuser when being removed from the distribution chamber together with the pressure pump.

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