July 9, 1957 J. E. ARMSTRONG 2,798,435

PORTABLE PUMPING SYSTEM

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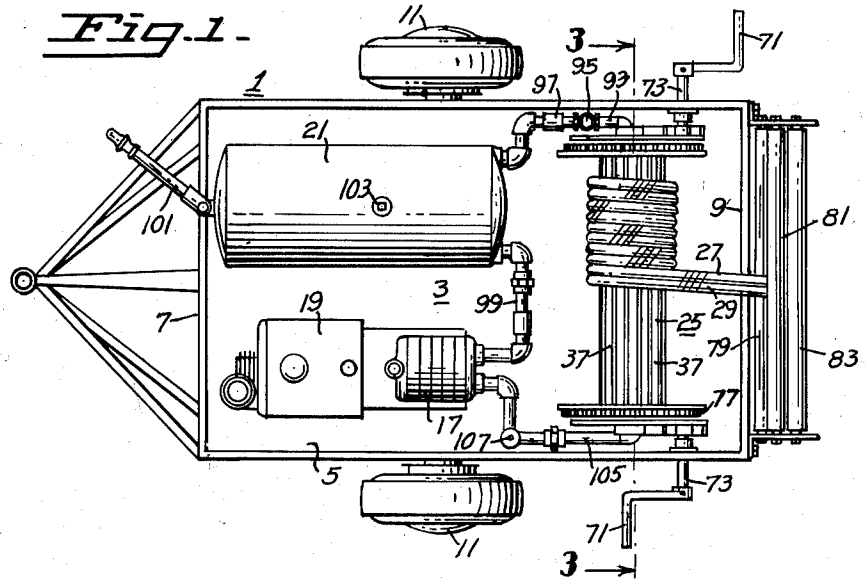
Fig. 1.



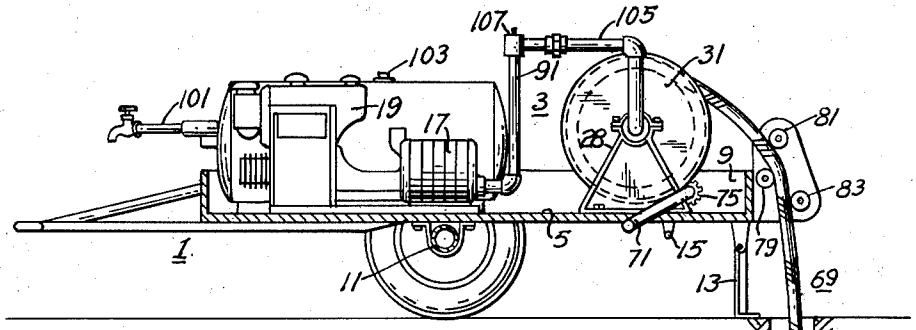


Fig. 2.

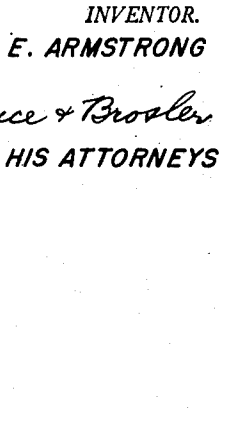


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Fig. 3.

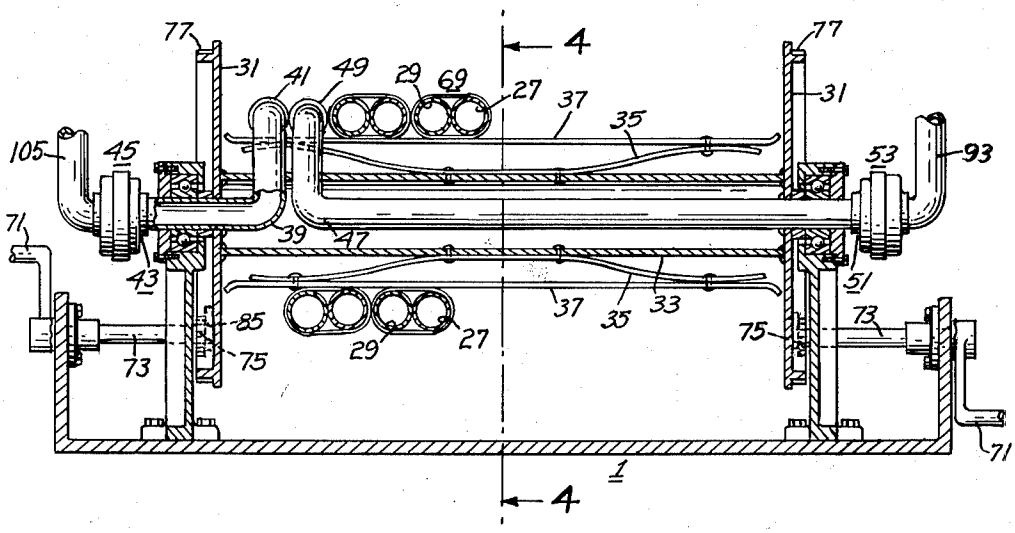
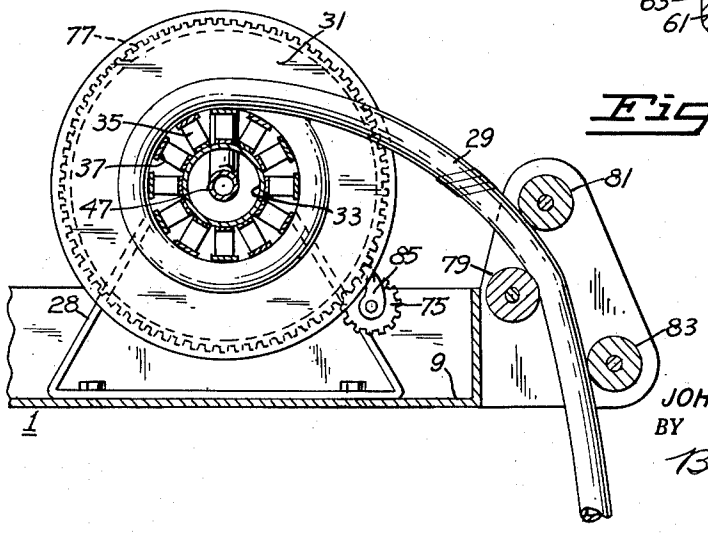


Fig. 4



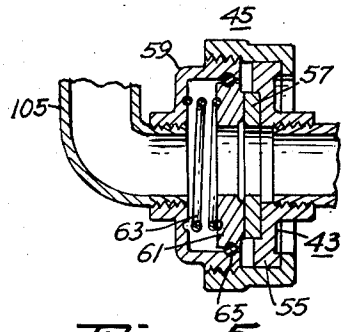


Fig. 5.

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PORTABLE PUMPING SYSTEM

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5 Claims. (Cl. 103—5)

My invention relates to a pumping system, and more particularly to a pumping system which is portable.

The present invention has been developed to handle situations which require the shifting of pumping operations from one location to another.

Thus, for example, in the matter of arm maneuvers, the necessity for obtaining adequate water presents a problem. The ability to promptly make use of existing sources of water, or the digging of new wells at the scene of operations and the ability to promptly pump water therefrom would not only provide fresh water, but in greater quantities than could conveniently be ported from some distant point.

The utility of such equipment might well be extended to other fields of activity such as in the testing of wells, etc.

Among the objects of the present invention are:

(1) To provide a novel and improved pumping system capable of being readily moved from one place to another for operational purposes;

(2) To provide a novel and improved portable pumping system for deep well operation;

(3) To provide a novel and improved portable pumping system of the injector type;

(4) To proved a novel and improved portable pumping system of the injector type, requiring no assembling operations to place the system in operation;

(5) To provide a novel and improved portable pumping system which can be put into operation in a matter of a few minutes;

(6) To provide a novel and improved self-priming deep well pump system which does not require a footvalve;

(7) To provide a novel and improved self-priming deep well pressure system which does not require a footvalve.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same, taken in conjunction with the accompanying drawings wherein—

Figure 1 is a plan view of a portable pumping system in accordance with the present invention;

Figure 2 is a side elevation view of assembly of Figure 1, illustrating the same in operating position;

Figure 3 is a view in section, taken in the plane 3—3 of Figure 1;

Figure 4 is a view in section, taken in the plane 4—4 of Figure 3; and

Figure 5 is a view in section, of a rotary joint employed in the system of the preceding figures.

A conventional type injector system utilizes in conjunction with a conventional type surface pump unit, a pair of pipes extending down into a well and terminating at their lower end in an injector pump assembly. One of the pipes is known as the pressure line, while the other is known as the return line or suction line.

One of the important features of the present invention resides in providing a portable pumping system of the injector type, in which the pressure line and suction line are made flexible, such as through the utilization of flexible hose, and providing means for compactly storing such lines in a manner whereby they may be readily released down a well opening with the injector assembly attached, for pumping operations.

Referring to the drawings for details of my invention in its preferred form, the portable pumping system illustrated utilizes a trailer type vehicle 1 for carrying an assembled pumping system 3, said vehicle including a body 5 having a front end 7 and rear end 9 with a wheel mounting 11 substantially across the midsection thereof. A post or jack 13 hingedly secured to the underside of the body adjacent the rear end thereof, functions to stably support the vehicle body in substantially a horizontal position when the trailer is at rest, and is adapted to be swung to an out-of-the-way position against the underside of the body when not in use, to permit maneuverability of the trailer. A clip 15 or its equivalent attached to the underside of the body is provided to releasably hold the support or jack in such out-of-the-way position.

The system components utilized in the particular pumping system illustrated, involve a pump unit 17, preferably one of the centrifugal type which may be built up of one or more stages, such pump unit being driven by some prime mover 19 such as a gasoline engine, or an electric motor if electrical power is available to drive the same. Adjacent the pump unit and its prime mover, is a storage tank 21, preferably horizontally disposed to maintain a low center of gravity.

Rotatably mounted between a pair of upstanding end plates or brackets 23 adjacent the rear end of the trailer body, is a hose reel 25 possessing features adapting the same in the handling of a pair of hose lines 27, 29, and under the conditions encountered in the use of such pump system.

Such reel involves a pair of end discs 31, affixed, one at each end of a cylinder 33 constituting an element of a drum assembly on which the hose lines are stored.

In the making up of such drum assembly, a plurality of shallow bowed leaf springs 35, disposed parallel to the longitudinal axis of the cylinder and at spaced peripheral points thereabout, are affixed to said cylinder along the intermediate portion of each spring, leaving the ends of each such spring in spaced relationship to the cylinder. Each spring carries a longitudinally disposed slat 37 which is riveted or otherwise affixed to the ends of such spring. Together, such slats, disposed in spaced relationship to each other about the cylinder and resiliently mounted with respect to said cylinder, constitute in effect, a cushion surface for receiving the hose lines.

A hose connection in the form of a section of pipe 39 bent to a right angle is disposed within the cylinder, one end of the pipe protruding through the cylinder wall and between a pair of said slats where it terminates in a fitting 41 to which a hose may be coupled, while the other end extends axially through the reel support bearing and connects to the rotatable portion 43 of a rotary pipe joint 45.

A second hose connection 47, similar to the first, is likewise incorporated into the structure, with the hose coupling end 49 disposed adjacent that of the other, and its other end emerging axially through the opposite reel support bearing where it terminates in the rotatable portion 51 of a rotary pipe joint 53.

Any suitable type of rotary pipe joint may be employed, though for illustrative purposes, I have shown one in which the rotary portion involves a flange 55 threaded to the hose connection and having a recess in the face thereof to receive a rotatable sealing ring 57, while the fixed or stationary portion entails a housing 59 rotatably coupled to the flange 55, and enclosing a pressure ring 61 held in sealing engagement with the sealing ring by a com-

pression spring 63. An O-ring seal 65 closes the space between the pressure ring and housing.

The hose lines 27, 29 are coupled to the hose connections, and when employed for deep well operation, terminate at their remote ends in an injector assembly 67, and thus function respectively as the pressure and suction or return lines of the pump system. Such hose lines, will preferably be unitized as by joining them together at spaced intervals or by extruding the same as a single extrusion with parallel passages, in either case forming a unitary assembly 69 to assure freedom from entanglement and to facilitate the free movement of the lines on and off the reel.

Control of reel operations is provided for manually by a crank handle 71 having its shaft 73 rotatably mounted in a bearing on the trailer body adjacent an end of the reel. Said shaft carries at its remote end, a pinion 75 in mesh with a ring gear 77 affixed to an end disc of the reel. A similar arrangement may be provided at the opposite end of the reel to permit of two operators working together.

Inasmuch as a portable system may function with wells of varying depths, there will be times when water under pressure will be flowing through a portion of the hose lines while on the reel. Under such condition the lines, in their natural tendency to expand, would exert a crushing pressure radially of the drum. The resiliency of the drum structure, created by the spring mounted slats permit of such expansion without transmitting to the reel structure, stresses of a magnitude which might cause damage thereto.

A roller 79 mounted on brackets adjacent the rear edge of the trailer body, will provide for free sliding movement of the hose lines during either the reeling or unreeling operations, while a pair of such rollers 81, 83 mounted in the same brackets but in parallel spaced relationship to the roller 79 will serve to restrain said hose lines from straightening under the action of the water flowing through these lines.

Suitable brake facilities might be provided to hold the hose reel against undesired rotation due to the hanging weight of hose line and injector assembly. Such braking may be realized through the use of a hinged pawl 85 in the vicinity of one of the ring gears and adapted to mesh with said gear.

A pipe connection 91 from the discharge of the pump unit 17 to the fixed housing 59 of the rotary pipe joint to which the pressure line is connected, serves to connect the pump output to the pressure line for supplying the injector assembly with its necessary requirement of pressure and volume of liquid to maintain operation of the system. A pipe connection 93 leading from the fixed housing of the rotary joint to which the suction line is connected, leads to the storage tank 21, and includes a check valve 95 and strainer 97. The tank in turn, is connected to the input of the pump unit by a pipe connection 99 from a low level point in the tank.

A service line discharge 101 is taken off from the storage tank preferably at a point of intermediate elevation above the bottom of the tank whereby, by supporting the pressure tank above the input to the pump unit, that liquid below the service line connection will always be available for priming purposes.

A snifter valve 103 mounted in the tank at its highest point, permits of the intake of atmospheric air to replace any water drawn from the tank. In the absence of such snifter valve, any attempt to withdraw water from the tank will otherwise produce sub-atmospheric pressure and the system would be rendered inoperative.

In utilizing the portable system thus described, the vehicle is pulled up to a source of water, which will be assumed to be an open well, and the hose lines are then unreeled until the injector assembly becomes submerged in the water in the well. When this has been accomplished, pumping operations may be started whereby water from the well will then be pumped into the storage tank.

Injector assemblies normally include a foot valve at the lower or terminal end thereof, but in the present system, a foot valve is not utilized.

In lieu thereof, the connection 91 from the pump unit to the pressure line is made to include gooseneck 105 rising to an elevation above the desired level of water in the storage tank. At the peak thereof, is provided an air vent valve 107 which, upon opening, will admit air into the connection. By admitting air at this point following the halting of a pumping cycle, the siphoning action which might otherwise occur under the existing conditions, is precluded, thus maintaining the liquid in the storage tank both for service, and for priming purposes when it becomes again necessary to start operation of the pumping system. For operations in sub-zero weather, a heater associated with the storage tank is contemplated.

The elimination of the foot valve not only results in removal of its weight from the system, which is of vital importance in this system, but such elimination of the foot valve also offers the added advantage of permitting draining of the hose lines, as this not only eliminates considerable additional dead weight in the reeling in and storage of the hose lines, but at the same time lessens the problems of freezing which might otherwise exist.

The system described above is adaptable for conversion to automatic pressure operation by the installation of a pressure switch and associated starting equipment.

Maximum efficiency of operation in any injector type pumping system may be realized only when an injector assembly of proper design for a particular depth of operation is employed. Accordingly, to accommodate the system for efficient operation within the wide depth range anticipated, a plurality of injector assemblies designed for efficient operation at widely different depths are provided, to be selectively and interchangeably coupled into the system in accordance with the depth from which water is to be pumped.

The depth of operation may readily be determined by either graduating the hose line assembly at suitable intervals such as every ten feet, or by coloring the hose line assembly in accordance with some color code. Thus the first fifty feet of line might be colored yellow, the next one hundred feet, red, the following one hundred fifty feet, blue . . . etc., or both systems of marking might be utilized. In this manner not only can one tell at a glance, the depth from which pumping takes place, but one can by proper selection of injector assembly, be assured of successful and highly efficient operation.

It will be apparent from the foregoing description of my invention in its preferred form, that the same is subject to alteration and modification without departing from the underlying principles involved. Accordingly, while I have disclosed the same in considerable detail, I do not desire to be limited in my protection to such details except as may be necessitated by the appended claims.

I claim:

1. A portable pumping system comprising a vehicle, a hose reel, said hose reel having a pair of hose connections each terminating on the axis of said reel in the rotatable portion of a rotary joint, means supporting said hose reel on said vehicle adjacent an edge thereof, a pair of flexible hose lines, each coupled to one of said hose connections for storage on said reel, said flexible hose lines being joined lengthwise thereof in a unitary assembly, an injector assembly connected to the loose ends of said hose lines, a valve-free strainer at the lower end of said injector assembly, means for rotating said reel, means calibrating said hose line assembly in terms of pumping depths, a pump unit on said vehicle, a discharge pipe connection from the discharge end of said pump unit to the fixed portion of one of said rotary joints, a storage tank disposed on said vehicle, a pipe connection

from a low point in said tank to the input end of said pump unit, an input pipe connection to said storage tank from the fixed portion of said other rotary joint, and a gooseneck included in said discharge line from said pump unit, said gooseneck rising to a higher point than said storage tank and having an air inlet valve at a high point thereof.

2. A portable pumping system comprising a vehicle, a hose reel, said hose reel having a pair of hose connections each terminating on the axis of said reel in the rotatable portion of a rotary joint, means supporting said hose reel on said vehicle, a pair of flexible hose lines, each coupled to one of said hose connections for storage on said reel, said flexible hose lines being joined lengthwise thereof in a unitary assembly, an injector assembly connected to the loose ends of said hose lines, means calibrating said hose line assembly in terms of pumping depths, a pump unit on said vehicle, a discharge pipe connection from the discharge end of said pump unit to the fixed portion of one of said rotary joints, a storage tank disposed on said vehicle, a pipe connection from a low point in said tank to the input end of said pump unit, a service discharge from said tank at an intermediate level therein to assure priming liquid for said pump unit, an input pipe connection to said storage tank from the fixed portion of said other rotary joint, and an air inlet valve in the top of said storage tank to admit air upon withdrawal of water therefrom.

3. A portable pumping system comprising a vehicle, a hose reel, said hose reel having a pair of hose connections each terminating on the axis of said reel in the rotatable portion of a rotary joint, means supporting said hose reel on said vehicle, a pair of flexible hose lines, each coupled to one of said hose connections for storage on said reel, said flexible hose lines being joined lengthwise thereof in a unitary assembly, an injector assembly connected to the loose ends of said hose lines, a pump unit on said vehicle, a discharge pipe connection from the discharge end of said pump unit to the fixed portion of one of said rotary joints, a storage tank disposed on said vehicle, a pipe connection from a low point in said tank to the input end of said pump unit, a service discharge from said tank at an intermediate level therein to assure priming liquid for said pump unit, an input pipe connection to said storage tank from the fixed portion of said other rotary joint, an air inlet valve in the top of said storage tank to admit air upon withdrawal of water therefrom, and a gooseneck included in said discharge line from said pump unit, said gooseneck rising to a higher point than the desired liquid level in said storage tank and having an air inlet valve at a high point thereof.

4. A portable pumping system comprising a vehicle, a hose reel, said hose reel having a pair of hose connections each terminating on the axis of said reel in the rotatable portion of a rotary joint, means supporting said hose reel on said vehicle, a pair of flexible hose lines, each coupled to one of said hose connections for storage on said reel, said flexible hose lines being joined lengthwise thereof in a unitary assembly, an injector assembly connected to the loose ends of said hose lines, a roller mounted adjacent said vehicle edge over which said hose line assembly may ride, means for rotating said reel, means for braking said rotational movement, means calibrating said hose line assembly in terms of pumping depths, a pump unit on said vehicle, a discharge pipe connection from the discharge end of said pump unit to the fixed portion of one of said rotary joints, a storage tank disposed on said vehicle, said storage tank extending to a greater height than said pump unit, a pipe connection from a low point in said tank to the input end of said pump unit, a service discharge from said tank at an intermediate level therein to assure priming liquid for said pump unit, an input pipe connection to said storage tank from the fixed portion of said other rotary joint, an air inlet valve in the top of said storage tank to admit air upon withdrawal of water therefrom, and a gooseneck included in said discharge line from said pump unit, said gooseneck rising to a higher point than the desired liquid level in said storage tank and having an air inlet valve at a high point thereof.

5. A portable pumping system comprising a vehicle, a hose reel, said hose reel having a pair of hose connections each terminating on the axis of said reel in the rotatable portion of a rotary joint, means supporting said hose reel on said vehicle adjacent an edge thereof, a pair of flexible hose lines, each coupled to one of said hose connections for storage on said reel, said flexible hose lines being joined lengthwise thereof in a unitary assembly, an injector assembly connected to the loose ends of said hose lines, a valve-free strainer at the lower end of said injector assembly, a roller mounted adjacent said vehicle edge over which said hose line assembly may ride, means for rotating said reel, means for braking said rotational movement, means calibrating said hose line assembly in terms of pumping depths, a pump unit on said vehicle, a discharge pipe connection from the discharge end of said pump unit to the fixed portion of one of said rotary joints, a storage tank disposed in a horizontal position on said vehicle, said storage tank in its horizontal position extending to a greater height than said pump unit, a pipe connection from a low point in said tank to the input end of said pump unit, a service discharge from said tank at an intermediate level therein to assure priming liquid for said pump unit, an input pipe connection to said storage tank from the fixed portion of said other rotary joint, an air inlet valve in the top of said storage tank to admit air upon withdrawal of water therefrom, and a gooseneck included in said discharge line from said pump unit, said gooseneck rising to a higher point than the desired liquid level in said storage tank and having an air inlet valve at a high point thereof.

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