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LIQUID PUMPING APPARATUS

Filed March 23, 1956

FIG. 2.

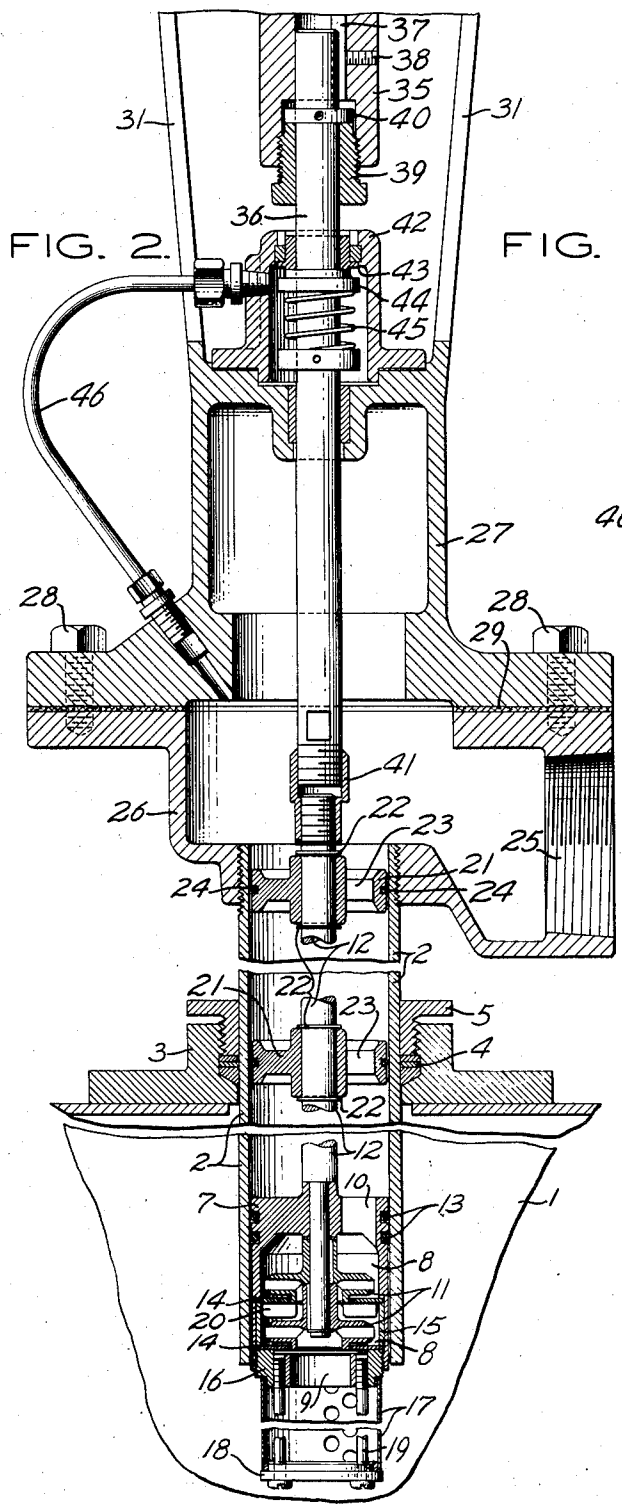
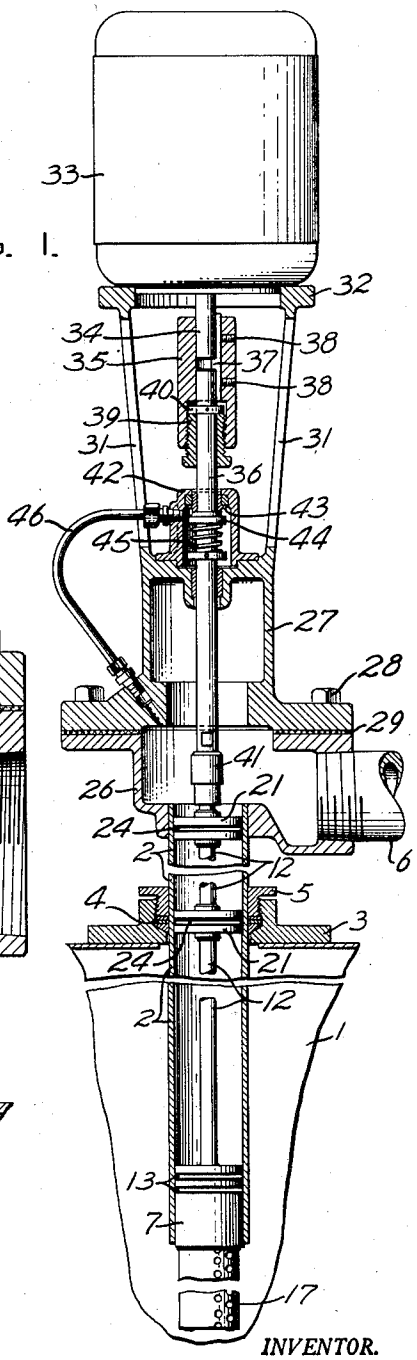


FIG. 1.



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LIQUID PUMPING APPARATUS

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2 Claims. (Cl. 103—87)

This invention relates to improvements in pumping apparatus for liquids and, more particularly, to an improved pumping apparatus which may be mounted in the usual vertical outlet pipe of a storage tank for liquids.

The invention finds one advantageous use in connection with gasoline dispensing apparatus. With the use of larger storage tanks and/or long suction lines, the usual pump in such apparatus has to create a high degree of suction and this often results in undesirable vaporization of the volatile liquid. The apparatus of this invention may serve as a booster pump, being submerged in the liquid in the storage tank and forcing the liquid under pressure to the pump of the gasoline dispenser. Obviously, the invention is not limited to the one use described and may be used as a single pumping means independently of any other pumping means.

The object of the invention is to provide a pumping apparatus which may be mounted within the usual vertical outlet pipe of a liquid storage tank by thrusting it downwardly through such pipe, after the upper end of the latter has been uncovered.

The invention will be disclosed with reference to the accompanying drawings, in which,

Fig. 1 is a sectional elevational view of the complete pumping apparatus shown as mounted in the outlet pipe of liquid storage tank; and

Fig. 2 is a fragmentary sectional elevational view drawn to a larger scale and showing in detail the pump, its driving shaft and the guiding means therefor.

Referring to these drawings, a portion of a storage tank for liquid, such as gasoline for example, is shown at **1**. The liquid outlet pipe for this tank is shown at **2**, mounted vertically in the tank and fixed thereto in any suitable way, as for example, by the stuffing box illustrated. This stuffing box has a body **3**, fixed to the tank and encompassing pipe **2** and receiving packing **4** which is compressed by means of a gland **5** and forced against the outer peripheral wall of pipe **2**. This pipe may be part of the suction line of the pump of a gasoline dispensing apparatus, located above ground remotely from the tank and connected to pipe **2** by other piping, shown in part at **6**, and usually containing a suitable non-return valve (not shown). In such case, the pump of this invention will function as a booster pump, helping the pump in the dispensing apparatus. However, it will be obvious that the pump of this invention may also function alone to supply the dispensing apparatus.

The pumping apparatus of this invention is adapted to be mounted in the pipe **2** by thrusting it into the pipe from the upper end thereof. Such apparatus comprises a cylindrical housing **7** adapted to slidably fit pipe **2** and containing one or more pump chambers **8** (two as herein shown) and inlet and outlet passages **9** and **10** respectively provided in the lower and upper ends of the housing **7**. In the example shown, the pump is of the centrifugal type, having two rotors or impellers **11**, suitably fixed one above the other on a driving shaft **12**, which

is rotatably mounted in the upper end wall of housing **7** but held against axial movement relatively thereto. This shaft extends axially upward through pipe **2** and by means of it, the housing **7** may be thrust piston-like through the pipe from the upper to the lower end thereof. Suitable sealing rings **13**, such for example as O-rings made of "neoprene" or the like, are mounted in grooves formed in the external peripheral wall of the housing **7** and are adapted to engage the internal peripheral wall of pipe **2** and prevent passage of liquid between said walls.

Referring now to the details of the exemplary pump shown, a disk-like partition **14** is arranged beneath each impeller **11** and rotatably receives the downturned annular portion that contains the inlet eye. The upper partition seats against a shoulder in the housing **7**. The lower partition is spaced from the upper partition by a sleeve **15**. The two partitions and the intervening sleeve are clamped in place by an annular nut **16**, threaded into the lower end of housing **7** and providing the above described inlet **9**. This nut may form the upper head of a suitable strainer **17**, the lower head **18** of which is connected by clamping bolts **19** to the upper head. Liquid enters through the strainer **17** into inlet **9**, thence into the inlet eye of the lower impeller, thence being thrown outwardly into the lower chamber **8**, from which it is guided by diffuser vanes **20**, depending from the upper partition **14**, into the inlet eye of the upper impeller, which throws the liquid outwardly into chamber **8** to leave by way of outlet **10** into the pipe **2** at a location above the housing **7**.

For the purpose of supporting the driving shaft **12** from the internal peripheral wall of pipe **2**, one or more guide rings **21** (two as shown) are mounted at axially-spaced locations on the shaft. Each such ring rotatably receives shaft **12** but is held against substantial movement axially of the shaft by suitable means, such as the snap rings **22** which are mounted in grooves in the shaft. Each ring **21** has passages, such as **23**, for liquid to flow through the guide ring. The outer periphery of each guide ring is grooved to receive an O-ring **24**, made of "neoprene" or like material, and frictionally engaging the internal peripheral wall of pipe **2**. These rings **24** hold the guide rings **21** from turning with shaft **12** and enable the rings to yield slightly when necessary to enable the shaft to be centered in pipe **2** despite slight irregularities in its peripheral wall.

The upper end of pipe **2** is closed by a hollow two-part housing except for a lateral outlet **25** to which the described pipe **6** is connected. The lower member **26** of this housing is threaded on the upper end of pipe **2** and is flanged to receive the flange of the upper housing member **27**, the flanges of the two members being suitably secured as by screws **28** and an interposed gasket **29**. The upper member **27** has upward extensions **31** to the upper ends of which are connected a ring **32** which supports an electric motor **33** suitably fixed thereto. The shaft **34** of this motor is connected by a coupling sleeve **35** to a shaft **36**. Both shafts **34** and **36** are connected to sleeve **35** by a key **37**, clamped in place by set screws **38**. The lower end of sleeve **35** has threaded into it a member **39**, the upper end face of which supports a collar **40** fixed on shaft **36**. The members **39** and **40** form a thrust bearing for the pump driving shaft. The latter extends downwardly into the housing **26**, **27** and is connected to shaft **12** by a coupling **41**. Shaft **36** emerges from housing **26**, **27** through a casing **42**, suitably fixed to the top of housing **27** and containing a seal ring **43**, with which is engaged a seal ring **44** carried by shaft **36** and pressed upwardly by a spring **45**. The interior of casing **42** is maintained at the same pressure as the in-

terior of housing **26**, **27** by means of a conduit **46** which interconnects said interiors.

In use, the suction line of the dispensing apparatus is broken at the upper end of pipe **2**. Whatever fitting that connects the pipes **2** and **6** is removed and replaced by the lower housing section **26**, which is screwed onto the upper end of pipe **2**. Then the pipe **6** is connected to the side outlet **25**. The upper housing section **27** has assembled thereon the motor **33** and the several shafts **34**, **36** and **12** are connected, as shown, with the lower end of shaft **12** carrying the piston-like body **7**, which houses the pump. Then, this body **7** is thrust into the upper end of the pipe **2** and forced downwardly therein, followed by the guide rings **21**, until the lower flanged end of section **27** rests upon the upper flanged end of section **26**. These two flanged ends are then fastened together and the assembly is then complete.

It will be clear that the invention affords complete pumping apparatus which may readily be mounted in the usual vertical outlet pipe of a liquid storage tank. The invention provides a pump which may be used as a booster pump to supplement the usual pump of a gasoline dispensing apparatus where the lift is high and/or the suction line is long. When thus used, the high degree of suction that would otherwise be necessary is avoided and the consequent vaporization of the volatile liquid. It will be recognized, however, that the pumping apparatus of this invention may well be used independently of any other pumping means to supply a liquid dispensing apparatus.

What is claimed is:

1. A pump, adapted for mounting in the outlet pipe of a liquid storage tank, and comprising, a pump housing having a cylindrical outer wall to slidably fit like a piston in said pipe and having a pump chamber, and an inlet to and an outlet from said chamber respectively provided in the lower and upper ends of the housing, at least one sealing ring mounted in the outer cylindrical wall of said housing for engaging the internal peripheral wall of said pipe and preventing passage of liquid between said walls from said inlet to said outlet, a pump rotor in said chamber, a drive shaft for the rotor rotatably mounted in said housing and held against axial movement relatively thereto, said shaft adapted to extend axially through said pipe and constituting means by which the housing may be moved piston-like from the upper to the lower end of said pipe, a hollow housing adapted to be secured to the upper end of said pipe to connect with a delivery pipe, said shaft extending upwardly through the last-named housing, and a motor mounted exteriorly of the last-named housing and connected to drive said shaft.

2. The combination, as claimed in claim 1, with at least one guide ring in which said shaft is engaged for rotating and non-axial movement, said guide ring having in its external peripheral wall a ring of flexible material adapted to engage the internal peripheral wall of said pipe.

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