

G. D. LOUD.
PUMPING UNIT.
APPLICATION FILED FEB. 5, 1912.

1,087,671.

Patented Feb. 17, 1914.

3 SHEETS—SHEET 1.

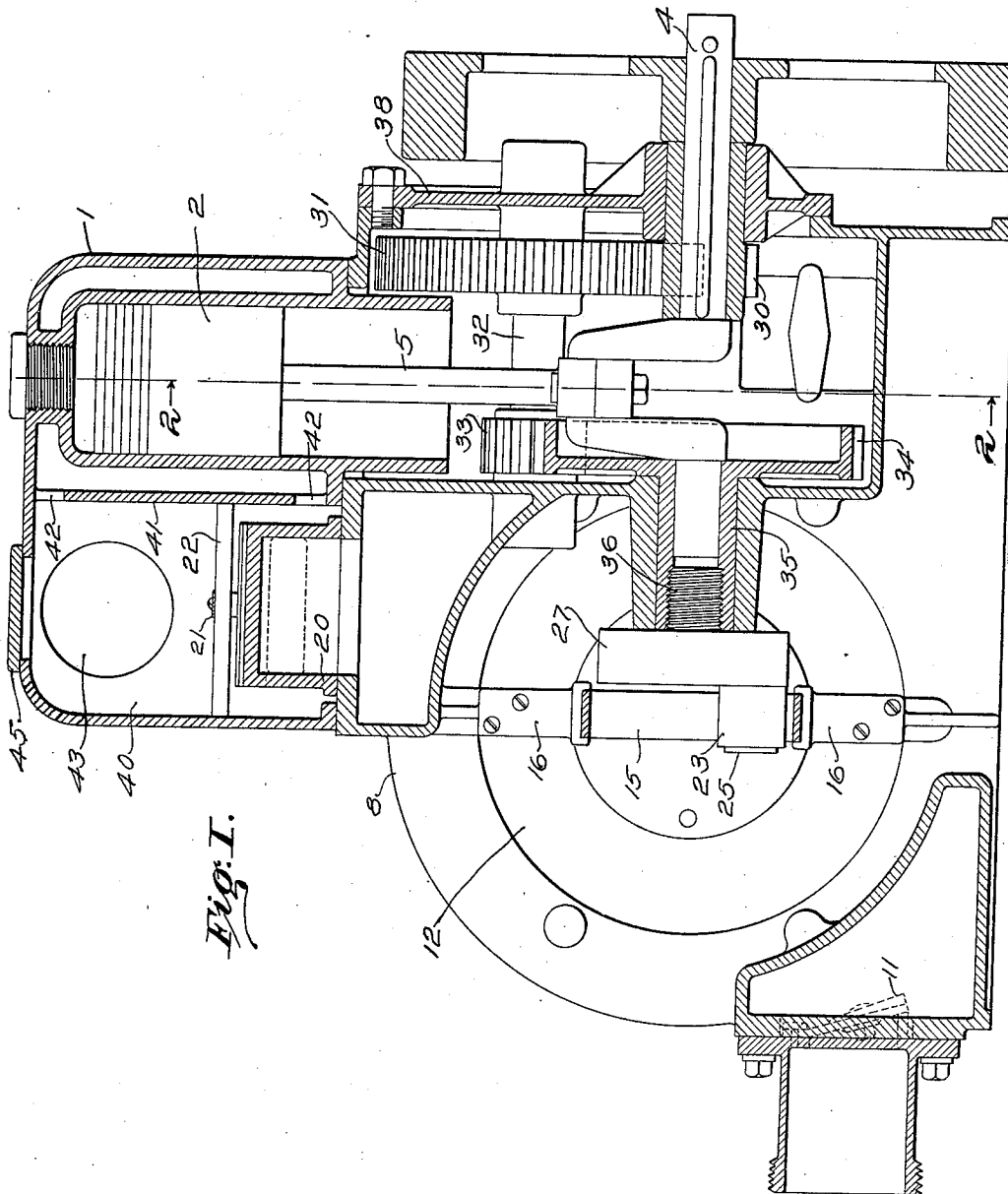


Fig. 1.

Witnesses:
Roswell F. Hatch
Burton W. Cary

Inventor:
George D. Loud
by Phillips, Vass & Fisher
Attys

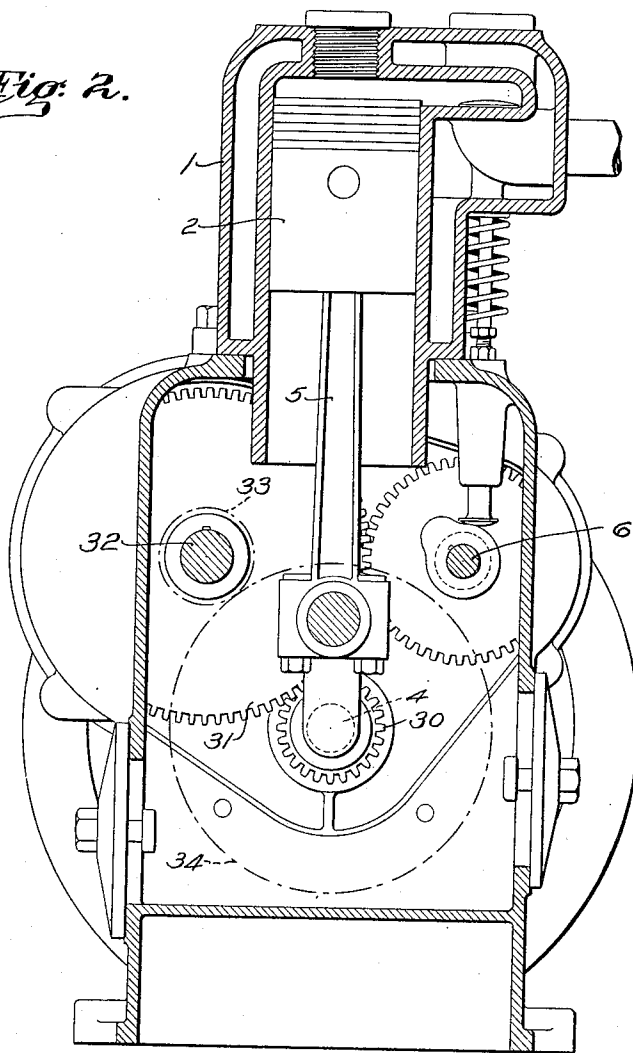
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3 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
Roswell F. Hatch.
Burton W. Cary

Inventor:
George D. Loud
4 Philip, Van Emmerick
Att'y

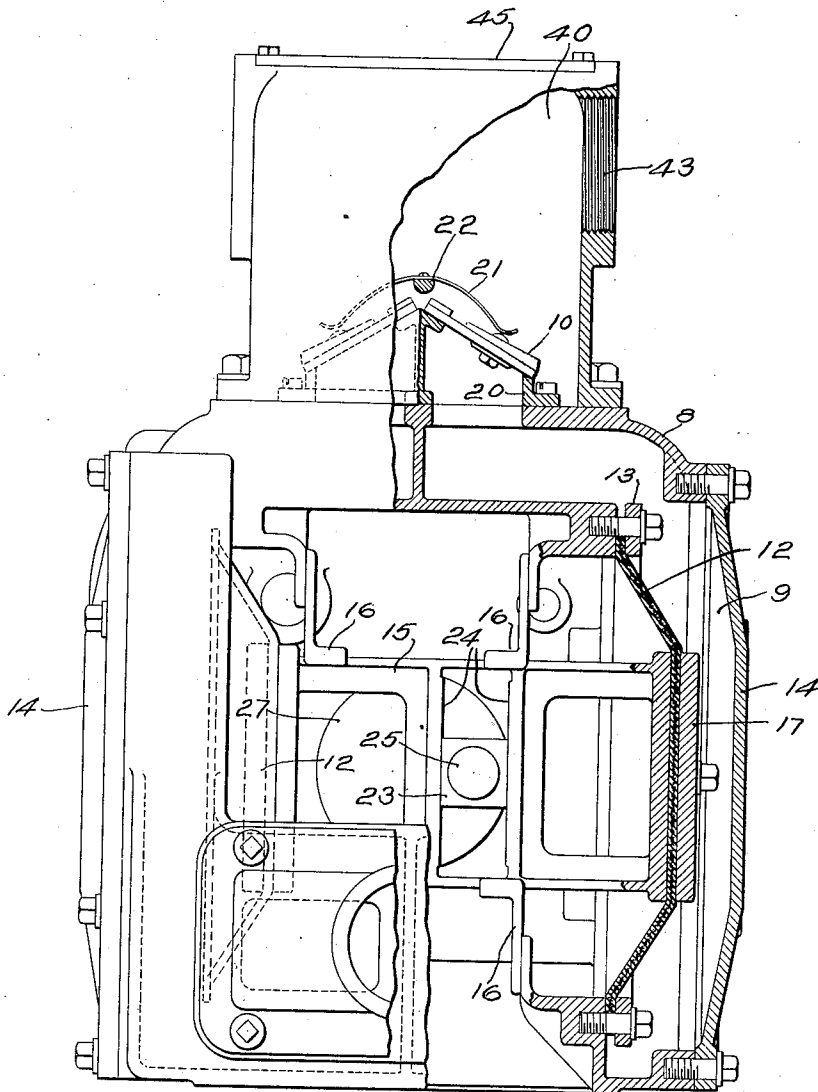
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3 SHEETS—SHEET 3.

Fig. 3.



Witnesses:

Samuel F. Hatch.

Burton W. Cary.

Inventor:

George D. Loud
by Phillips, Van Emmerick
Attys.

UNITED STATES PATENT OFFICE.

GEORGE D. LOUD, OF BOSTON, MASSACHUSETTS.

PUMPING UNIT.

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Patented Feb. 17, 1914.

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To all whom it may concern:

Be it known that I, GEORGE D. LOUD, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Pumping Units; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to pumping units, and more particularly to a pumping unit which consists of a motor and a pump actuated thereby.

There are many classes of work where relatively small quantities of water are to be pumped, that make it inadvisable to install a large power pump. In this class of work the pumping is generally performed by hand, which is necessarily a slow and expensive operation, making it extremely desirable to have a small pumping unit which is power operated and complete in itself, and which is readily portable and may be moved from place to place with no greater inconvenience than the ordinary hand pump.

The object of the present invention is to provide as a single integral unit a suitable pump and motor therefor which has a compact arrangement and is entirely self-contained, and which will operate without attention for a considerable period.

With this object in view, the several features of the invention consist in certain novel features of construction, combinations and arrangements of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art from the following description.

In the accompanying drawings illustrating the preferred form of the invention, Figure 1 is a longitudinal section in elevation of the internal combustion motor and pump and illustrates the several features of the invention in their preferred form; Fig. 2 is a vertical section taken upon the line 2-2 of Fig. 1, looking in the direction of the arrows; and Fig. 3 is a left-hand end elevation partly in section of the diaphragm pump.

The pump shown in the illustrated embodiment of the invention is extensively used by contractors where it is desired to pump varying quantities of water which

have collected during the construction work. As no very large amount of water is pumped at any one time, and as the location of the construction work is constantly changing, it is not economical to provide a large power pump for this work. Accordingly, the results are secured by one or more hand pumps, which have the advantage that they are portable and may be readily removed from one place to another, but are disadvantageous in that they are necessarily of a limited capacity and require the constant services of one or more workmen.

In the present invention, a compact, simple pumping unit is provided which has a small number of moving parts entirely inclosed and not liable to derangement, and a capacity under normal working conditions which is in excess of double that of the hand pump. This pumping unit carries its own fuel supply, and after being set up will operate without further attention. To this end, a plurality of pumps are arranged transversely of the motor drive shaft and are operated by a single actuating member connected to the motor shaft.

In the simplest and most efficient form of the invention which has yet been devised, a pair of oppositely disposed diaphragms are rigidly connected by a cross-head which reciprocates transversely of the motor drive shaft and which is actuated thereby through a train of reducing gears.

The motor may consist of an internal combustion engine provided with the usual water jacketed cylinder indicated at 1, and having a piston 2 connected to a crank shaft 4 by means of a connecting rod 5, or any other suitable type of motor. The motor is of the 4-cycle type in which an explosion occurs for each two revolutions of the crank shaft and the valves are of the common type of puppet valve actuated by cams secured to a rotary valve shaft 6. The pump virtually consists of two single acting diaphragm pumps inclosed in an integral casing indicated at 8. Each pump has a closed chamber 9 which is provided with a delivery valve 10 and a suction valve 11 located at the top and bottom of the chamber respectively. These valves are of the type known as flap valves, and are hinged upon their edges and arranged to be normally closed by gravity and automatically opened by the variation of pressure in the chambers. The

inner wall of each chamber is closed by a flexible diaphragm 12 which is rigidly secured at its edge by a clamping ring 13 provided with a series of clamping screws. Each diaphragm, as will be noted clearly from an inspection of Fig. 3, is made of a single integral sheet of rubber having a layer of fabric molded therein. This construction affords the required flexibility for the diaphragm and at the same time enables it to withstand repeated flexing without cracking or breaking. In order to render the chambers readily accessible when desired, a cover plate 14 is detachably secured to the side of the casing opposite each chamber. Both diaphragms are operated in unison by a single actuating member consisting of a cross-head 15 slidingly supported in guideways formed upon a series of L-shaped members 16 which are rigidly secured to a fixed portion of the casing.

The cross-head is clamped at its opposite ends to the diaphragms by clamping plates 17. With this arrangement, as the cross-head is reciprocated, the diaphragms are flexed in opposite directions to vary the volume of the pump chambers, which variation causes alternate periods of vacuum and pressure in the chambers and opens the suction and delivery valve respectively. In this type of pump, owing to the large area of the diaphragm, the volume of the pump chamber may be widely varied, giving the pump a relatively large capacity without necessitating a wide range of movement of the diaphragm, or long stroke of the pump, as it may be termed. It will also be noted that with this construction there are no bearings or stuffing boxes located in the pump chambers to allow leakage of water there-through, or to become clogged by dirt or grit entrained in the water. In order that these pumps shall operate efficiently and have the greatest possible draft, it is necessary that the chambers shall be so arranged that there is no possibility of an air lock forming at any point. To this end, it will be noted that the passages leading from the suction and delivery valves to each pump chamber are of ample size and are free from abrupt curves and turns to allow air pockets to form therein. The delivery valve is mounted at the extreme top of each chamber and is supported upon an inclined seat, indicated at 20 in Fig. 3. As all portions of the valve opening are located above the pump chamber and passage, there is no possible chance of forming a water seal to pocket air in the chamber or passages. Inasmuch as a pump of this type operated by power necessitates a rapid opening and closing of the valve, it is found desirable to provide some auxiliary means for aiding the closure of the valve by gravity. To this end a plurality of springs 21 are supported above the valves 10 by a

bridge member 22, and are arranged to bear thereon.

The cross-head 15 is arranged to reciprocate transversely of the engine crank shaft, as shown clearly in Figs. 1 and 3, and this movement is imparted by a slide block 23 arranged to move between vertical guides 24 formed upon the cross-head 15. The slide block 23 is journaled upon a crank pin 25 which projects laterally from a disk 27 supported axially of the crank shaft 4. As it is desirable to operate the diaphragms at a lesser speed than the motor, the disk 27 is actuated from the crank shaft through suitable reducing mechanism, which in the present invention consists of a train of intermeshing gears. The crank shaft 4 has a small pinion 30 splined thereto which meshes with a large intermediate gear 31 secured to a counter shaft 32. The intermediate gear drives the cam shaft 6 through a second gear secured to the cam shaft, as shown clearly in Fig. 2 of the drawings. The opposite end of the counter shaft 32 is provided with a small gear 33 secured thereto which meshes with a large spur gear 34 loosely journaled upon the end of the crank shaft 4. The gear 34 is provided with a laterally extending hub 35 which is cylindrical in form and is loosely journaled in the crank case and forms a bearing for one end of the crank shaft 4. The end of the sleeve 35 is threaded internally to receive a threaded stud 36 which is mounted concentrically with the disk 27. With this construction and arrangement, the disk 27 is supported axially of the crank shaft 4 but is rotated at a considerably reduced speed through the train of reducing gears above described. This construction enables a compact arrangement to be obtained which occupies a minimum of space, and the crank case and pump casing may be formed as a single integral part to retain the various parts of the mechanism rigidly in operative relation. In order to lubricate the piston and reducing gears the crank case is maintained partially full of lubricating oil, the height of the oil being determined by any suitable means. The side of the crank case which is removed from the pump is provided with a detachable cover plate 38 which enables the parts to be readily assembled and also affords access to the interior of the crank case when desired. In order to avoid carrying water for cooling purposes, it is found very desirable to divert a portion of the water which is lifted by the pump through the engine jacket. With this arrangement a constant circulation of water is secured through the jacket as long as the pump is operating and the cylinder is prevented from heating to a high temperature even with long continued operation. To this end, a common delivery chamber is pro-

vided for both pumps which is located above the pumps and in close proximity to the power cylinder of the motor.

The delivery chamber is indicated at 40 and is separated from the water jacket of the cylinder by a partition 41 provided with a pair of restricted openings 42 located at the top and bottom of the chamber. These openings serve to allow a free circulation of water from the chamber through the water jacket, and are of sufficient size to prevent clogging by the dirt and grit which is entrained in the water. As the water comes into contact with the walls of the cylinder, it is heated, causing a continuous circulation and preventing the collection of sediment in the water jacket. The delivery chamber is provided with one or more openings, indicated at 43, which are arranged to be connected to a delivery pipe, and with a removable cover plate 45 which allows a ready access to the delivery valves for any purpose whatsoever. Even after the pump stops raising water the delivery valves will retain the water in the delivery chamber which will circulate continuously through the water jacket to keep the engine cool.

While it is preferred to employ the specific construction and arrangement of parts shown and described, it will be understood that this construction and arrangement is not essential except so far as specified in the claims, and may be changed or modified without departing from the broader features of the invention, which invention in its broader aspects is not limited to a diaphragm type of pump.

What is claimed is:—

1. A pumping unit, having in combination, a motor provided with a reciprocating piston and crank shaft, a hydraulic pump, a gear sleeved upon one end of the crank shaft at one side of the crank and operatively connected with the pump, speed reducing gears connecting the crank shaft, at the opposite side of the crank, with the first mentioned gear, and a crank case for the motor completely inclosing all of the gears, thus effecting lubrication of the gears with the motor lubricant contained in the crank case.

2. A pumping unit, having, in combination, a motor provided with a reciprocating piston and crank shaft, a hydraulic pump having an actuating member movable transversely of the crank shaft, connections between the shaft and actuating member for driving the pump at a reduced rate of speed, comprising a driving pinion secured to the shaft and a gear provided with a sleeve surrounding the shaft at opposite sides of the

crank and in close proximity thereto, a countershaft, reducing gears supported upon the countershaft, a crank case inclosing the gears and forming bearings for opposite ends of the crank shaft, and a crank secured to the sleeved gear and operatively connected with the actuating member.

3. A pumping unit, having, in combination, an internal combustion motor provided with a water jacketed cylinder, a drive shaft for the motor, a pump operated by the drive shaft and having a delivery chamber in its upper portion provided with passages in the top and bottom communicating with the water jacket of the cylinder to allow a portion of the water which is pumped to circulate through the water jacket of the motor, substantially as described.

4. A pumping unit, having, in combination, an internal combustion motor provided with a water jacketed power cylinder, a pump arranged below and transversely of the power cylinder, connections between the pump and motor, a delivery chamber for the pump, and connections between the delivery chamber and water jacket to provide for the circulation of water through the jacket to and from the delivery chamber, substantially as described.

5. A pumping unit, having, in combination, a motor provided with a reciprocating piston and crank shaft, a hydraulic pump having an actuating member movable transversely of the crank shaft, connections between the shaft and actuating member for driving the pump at a reduced speed comprising a driving pinion secured to the shaft at one side of the crank, a gear sleeved upon the shaft upon the opposite side of the crank, a countershaft, reducing gears supported upon the countershaft, a crank case inclosing the gears and forming bearings for opposite ends of the crank shaft, and a crank operatively connecting the sleeved gear and actuating member.

6. A pumping unit, having in combination, an internal combustion motor having a water jacketed power cylinder, a hydraulic pump, a delivery chamber for the pump, driving connections between the pump and motor, and connections between the delivery chamber and water jacket for permitting a portion of the output of the pump to be diverted through the water jacket of the motor and returned to the delivery chamber, substantially as described.

GEORGE D. LOUD.

Witnesses:

BURTON W. CARY,
GEORGE E. STEBBINS.