

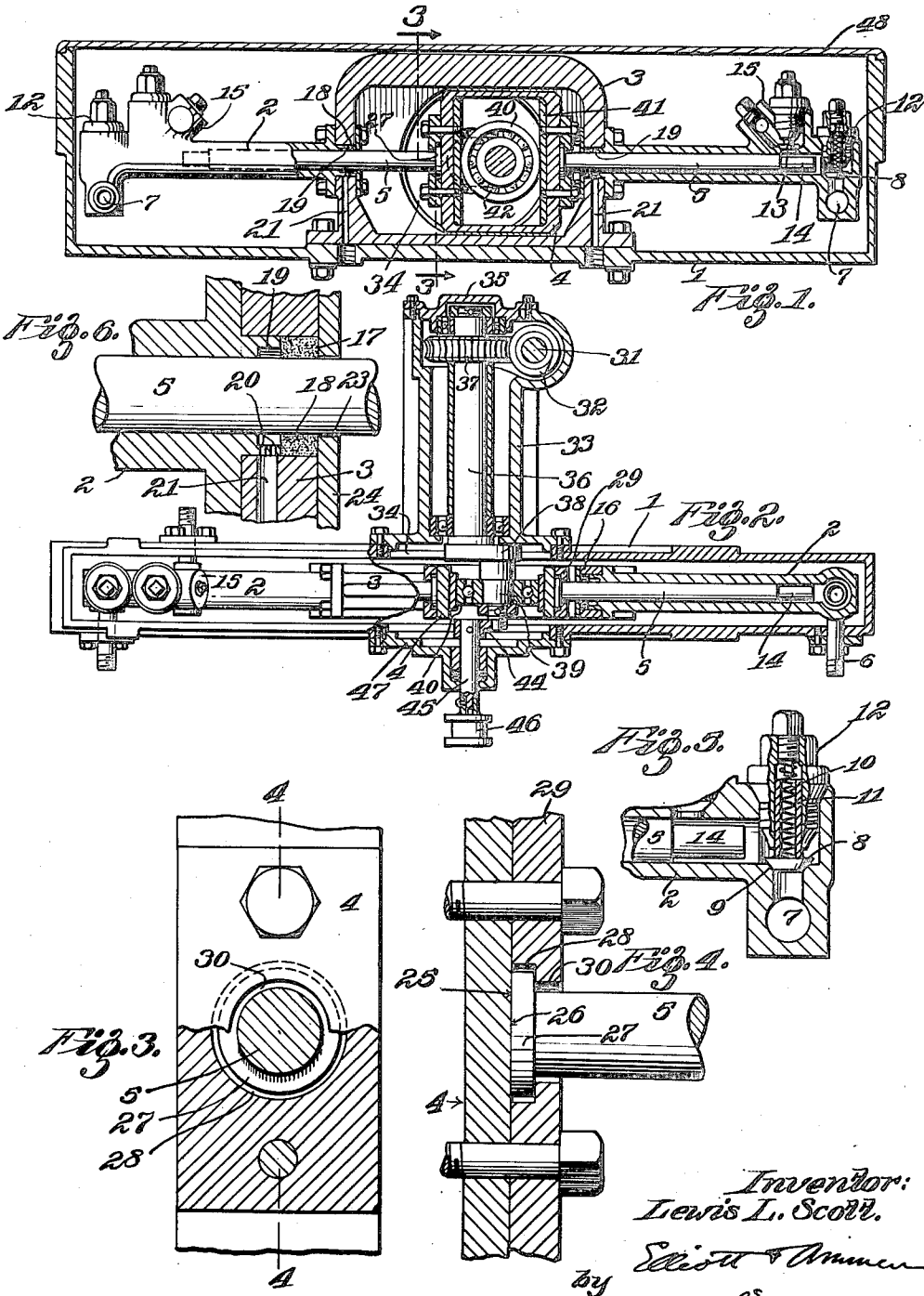
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PUMP.

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UNITED STATES PATENT OFFICE.

LEWIS L. SCOTT, OF ST. LOUIS, MISSOURI.

PUMP.

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To all whom it may concern:

Be it known that I, LEWIS L. SCOTT, a citizen of the United States, residing in the city of St. Louis and State of Missouri, have
5 invented new and useful Improvements in Pumps, of which the following is a specification.

This invention relates to pumps and the general object of the invention is to produce
10 an efficient pump having small clearances and having a general construction which will obviate the necessity for accuracy in alignment of the plunger and its operating parts. Some features of the invention are
15 applicable to machines of other types. A further object of the invention is to improve the details of construction of such a machine or pump.

Further objects of the invention will appear hereinafter.

The invention consists in the novel features and in the general combination of parts to be particularly described hereinafter, all of which contribute to produce a
25 simple and efficient pump. A preferred embodiment of my invention will be particularly described in the following specification, while the broad scope of my invention will be pointed out in the appended claims.

In the drawing,

Figure 1 is a vertical section showing certain parts in elevation and illustrating the general arrangement of the pump;

Figure 2 is a horizontal section and partial
35 plan;

Figure 3 is a detail partial elevation and partial section of certain parts as viewed on the lines 3—3 of Figure 1;

Figure 4 is a vertical section taken about
40 on the line 4—4 of Figure 3;

Figure 5 is a vertical section upon an enlarged scale showing details of the inlet valve; and

Figure 6 is a section upon an enlarged
45 scale and particularly illustrating details of packing, constituting a feature of the invention.

In the drawing, 1 represents a casing which may be in the form of a narrow tank.
50 In this tank the pump is mounted; in the present instance this pump is of duplex type, but many of the features of the invention are applicable to pumps of other types, and in fact, machines of any type operating upon
55 a fluid under pressure.

Within this casing I provide two op-

positely disposed pump cylinders or barrels 2 which are aligned with each other; the inner ends of these cylinders may be attached to a bracket 3 which may operate as a guide
60 for a cross-head 4. Any suitable means may be provided for reciprocating this cross-head. In each pump cylinder or barrel I provide a reciprocating plunger 5; each cylinder is provided with a pair of valves, that
65 is to say, an inlet valve and an outlet or exhaust valve. These valves are preferably mounted so that one of the valves is located at the end of the cylinder and the other valve is mounted on the side wall of the cylinder. In the present instance the water, or
70 other fluid to be pumped is admitted at a water connection 6 which communicates with a water chamber 7 below an inlet valve 8 which seats upon a seat 9 on one side of the
75 axis of the cylinder; the valve 8 is pressed toward this seat by a coil spring 10 carried in a tubular stem 11 carried in a bonnet 12, which bonnet is mounted on the side of the cylinder opposite to the seat 9.
80

On the side wall of the cylinder and adjacent to the inlet valve, I provide an outlet valve 13 which may be similar in construction to the inlet valve, but the seat for this valve is located in the side wall of the
85 cylinder. In ordinary practice the end of the plunger 5 in the extreme position on the out-stroke of the plunger, could not come past the valve 13 because if it did, it would choke the outlet from the pump; this would
90 occasion a considerable amount of clearance consisting in the space in the end of the cylinder between the two valves. Such a large clearance is not advisable in such a pump as it tends to cause the pump to become "air-bound." In order to overcome this
95 objection and reduce the clearance, at the same time leaving the exhaust valve 13 clear in the extreme stroke of the plunger, I provide the end of the plunger with a reduced
100 tip 14. This tip is of reduced diameter with respect to the diameter of the plunger 5 so that there is an annular space formed around it within the pump cylinder. This tip reduces the clearance by the volume of
105 the reduced tip. It will be evident that by employing such a reduced tip, the internal clearance in such a pump can be very substantially reduced. On the out-stroke of the pump plunger 5 the valve 13 raises off its
110 seat and permits the fluid or water to find exit through an inclined boss 15. It will be

noted that on the out-stroke this tip 14 extends past the valve which is located on the side wall of the cylinder in the present instance, the outlet valve. The interior of the casing 1 is filled with a lubricating oil. In order to prevent the water which is operated upon by the pump, from moving past the plunger 5 into the interior of the casing 1 so as to mix with the oil, I provide an improved stuffing box 16; the left hand stuffing box is illustrated in detail in Figure 6. The parts at the stuffing box are constructed so that a packing chamber 17 is formed in a fixed member, for example, the bracket 3, and in this packing chamber a washer or packing ring 18 is placed. This packing ring is preferably of soft or compressible material. Adjacent to this packing ring 18 an annular chamber 19 is formed in one of the fixed members, for example, the cylinder 2, and on its underside this annular chamber is provided with perforations 20 which communicate with a drain duct or passage 21 which leads to an opening 22 through the bottom of the casing 1. Now, when the plunger is reciprocating, any water which moves along the side of the plunger will collect in this chamber 19 and run off through the duct 21. This mode of operation is facilitated by the fact that the washer 18 will be saturated with oil which finds its way through a crevice 23 existing between the plunger and a cap plate 24 which closes the inner end of the stuffing box.

The inner end of each plunger 5 terminates short of the cross-head 4 so as to have its extreme end abutting against the side of the cross-head; it does not penetrate the cross-head but is merely connected to the adjacent side of the cross-head 4 by means which is constructed in such a way as to permit a limited amount of lateral movement of the cross head with respect to the plunger. By this means I avoid any necessity for producing an accurate alignment between the cross-head guide and the cylinders. This connecting means is preferably in the form of a slip connection, which, if desired, may be constructed as illustrated in Figure 4. In this detail the end face 25 of the plunger abuts against the adjacent side face 26 of the cross-head. Furthermore, the end of the plunger is enlarged by means of an integral collar 27 and this collar is received in a counter-bore 28 formed on the inner face of a plate 29 which is attached to the side of the cross-head. This counter-bore 28 is larger than the collar and evidently will permit a limited lateral movement of the cross-head with respect to the plunger. Of course, the opening 30 through the plate which carries the counter-bore 28 is considerably larger than the plunger 5 so that this opening in no way restricts the lateral play

or movement. With this arrangement it will be evident that the end face of the plunger receives the thrust of the cross-head on a working stroke. These faces are well lubricated by means of the oil contained in the casing, and hence the cross-head will be perfectly free to move laterally any limited amount which may be necessary to accommodate any imperfection of alignment between the cross-head guide and the cylinders.

This pump is preferably driven by an electric motor which necessitates a considerable gearing down. For this purpose the electric motor may drive a worm shaft 31 carrying a worm 32 in a suitable casing 33, the interior of which is in communication with the interior of the casing 1. The casing 33 is simply bolted onto the side of the casing 1 at an opening 34 through the side wall (see Fig. 2). The outer end of the casing 33 is provided with means for making an oil-tight closure so as to enable the two communicating casings to contain a quantity of lubricating oil in which the moving parts run. For this purpose the outer end of the casing 33 is formed with a removable cap 35 carrying a bearing for a shaft 36 carrying a worm wheel 37 driven by the worm 32; this shaft 36 carries a crank 38 and a crank-pin 39, the latter being located within the casing 1 and substantially in alignment with the cylinders 2. This crank-pin 39 carries a loose or floating collar 40 which is engaged on opposite sides by the cross-head 4, which is constructed in such a way as to allow freedom of vertical or lateral movement of the floating collar 40 as the crank-pin rotates. For this purpose the cross-head 4 is preferably of rectangular form and its vertical bars are provided with wearing strips 41 against which the floating collar bears. This floating collar may form the outside collar for a ball bearing comprising balls 42 carried between the outer collar and an inner collar 43 which co-operates with the outer collar to form a ball race.

If it is desired to drive another piece of machinery from the shaft 36, this may be readily accomplished by providing the outer end of the crank pin 39 with a crank 44 attached to a small stub-shaft 45 carrying a belt pulley 46. This stub-shaft 45 may be carried in a removable oil-tight cover 47. The casing 1 may be provided with a suitable oil-tight cover 48.

The mode of operation of the pump will now be briefly described.

The worm 32 drives the worm wheel 37 and its shaft 36, thereby rotating the crank 38 and crank-pin 39. As the crank-pin rotates it reciprocates the cross-head 4 through the agency of the floating collar 40. As the cross-head moves toward the right it forces the right hand plunger 5 toward the right, thereby placing the water in the correspond-

ing cylinder 2 under compression, closing the inlet valve 8 and forcing the water out through the outlet valve 13 and the delivery connection 15 through the side of the casing.

5 The abutting faces 25 and 26 of the plunger and cross-head are thoroughly lubricated which permits free lateral movement of the cross-head with respect to the plunger. This movement is permitted by reason of the
10 large counter-bore 28 and bore 30. On the return stroke the plate 29 pulls upon the collar 27 and withdraws the plunger 5 so that the stroke of the cross-head operates to fill the pump cylinder or barrel 2 with
15 water. As indicated in Figure 1, the reduced tip 14 on the end of the plunger materially reduces the clearance volume within the pump which is most advantageous. If any water tends to find its way along the
20 plunger it will be trapped in the annular chamber 19 and will run off through the drain duct 21. In this way, the drain duct prevents the water within the pump from leaking out into the oil bath.

25 The fact that the cross-head 4 is running in oil enables me to use a slip connection such as that described, for connecting each plunger to the cross-head. If the abutting faces of the cross-head and plungers were
30 not thoroughly lubricated the freedom of movements of the parts might be somewhat impaired.

It is understood that the embodiment of the invention described herein is only one
35 of the many embodiments my invention may take, and I do not wish to be limited in the practice of my invention nor in my claims, to the particular embodiment set forth.

What I claim is:—

40 1. In a reciprocating pump, the combination of a cylinder, a cross-head mounted to move toward and from the end of the cylinder, a plunger mounted in the cylinder having its outer end face abutting against and
45 freely movable upon the adjacent side of the cross-head, and means secured to the cross-head for holding the end of the plunger against the same and permitting lateral play between the plunger and the cross-head.

50 2. In a reciprocating pump, the combination of a pair of oppositely disposed cylinders alined with each other, a cross-head disposed between the cylinders, a plunger mounted to reciprocate in each cylinder and
55 terminating short of the cross-head so as to have its extreme end face abutting against and freely movable upon the adjacent face of the cross-head, means for fastening the end of each plunger to the face of the cross-head, constructed to permit a limited lateral
60 movement of the cross-head with respect to each plunger, means for guiding the cross-head in the direction in which the axes of

the cylinders extend, and means for reciprocating the cross-head.

3. In a pump, the combination of a cross-head casing, a cross-head mounted to reciprocate in the casing, means for reciprocating the cross-head, a bracket, a cylinder supported thereby, a plunger mounted to reciprocate in the cylinder, extending past the bracket, and terminating short of the cross-head so as to have its extreme end face abutting against the side face of the cross-head, to receive the thrust of the cross-head, means
70 for connecting the end of the plunger to the cross-head, permitting a limited lateral movement of the cross-head with respect to the plunger, while the plunger is reciprocating, and means for forming an oil-tight
75 closure for said casing, enabling the same to contain oil for lubricating the cross-head and the abutting faces of the cross-head and the plunger.

4. In a motor-driven pump, the combination of a casing, a worm shaft adapted to be driven by a motor, and carrying a worm within said casing, a worm wheel and shaft within said casing, a cross-head casing the interior whereof communicates with the interior of said first named casing, a crank-pin carried by said shaft within the cross-head casing, a cross-head mounted to reciprocate within the cross-head casing, a ball bearing between the crank-pin and the cross-head
85 for reciprocating the same, a cylinder located at each side of the cross-head casing, a plunger mounted to reciprocate in each cylinder, extending into the cross-head casing, with its end face abutting against the face
90 of the cross-head, a slip connection for connecting the end of each plunger to the adjacent side of the cross-head, permitting lateral play during the reciprocations of the plungers, and means for forming an oil-tight closure for said casings enabling the same to contain a lubricating oil for lubricating the ball bearing and said connections.

5. In a reciprocating pump, the combination of a pair of oppositely disposed cylinders alined with each other, a cross-head disposed between the cylinders, a plunger mounted to reciprocate in each cylinder and having a collar on its end adjacent the cross-head and having its end face abutting
110 against the adjacent face of the cross-head, a counterbored plate mounted on the end of each plunger receiving the collar and secured to the adjacent face of the cross-head, said plates permitting a limited lateral play
115 of the cross-head with respect to the ends of the plungers, and means for reciprocating the cross-head.

In testimony whereof, I have hereunto set my hand.

LEWIS L. SCOTT.