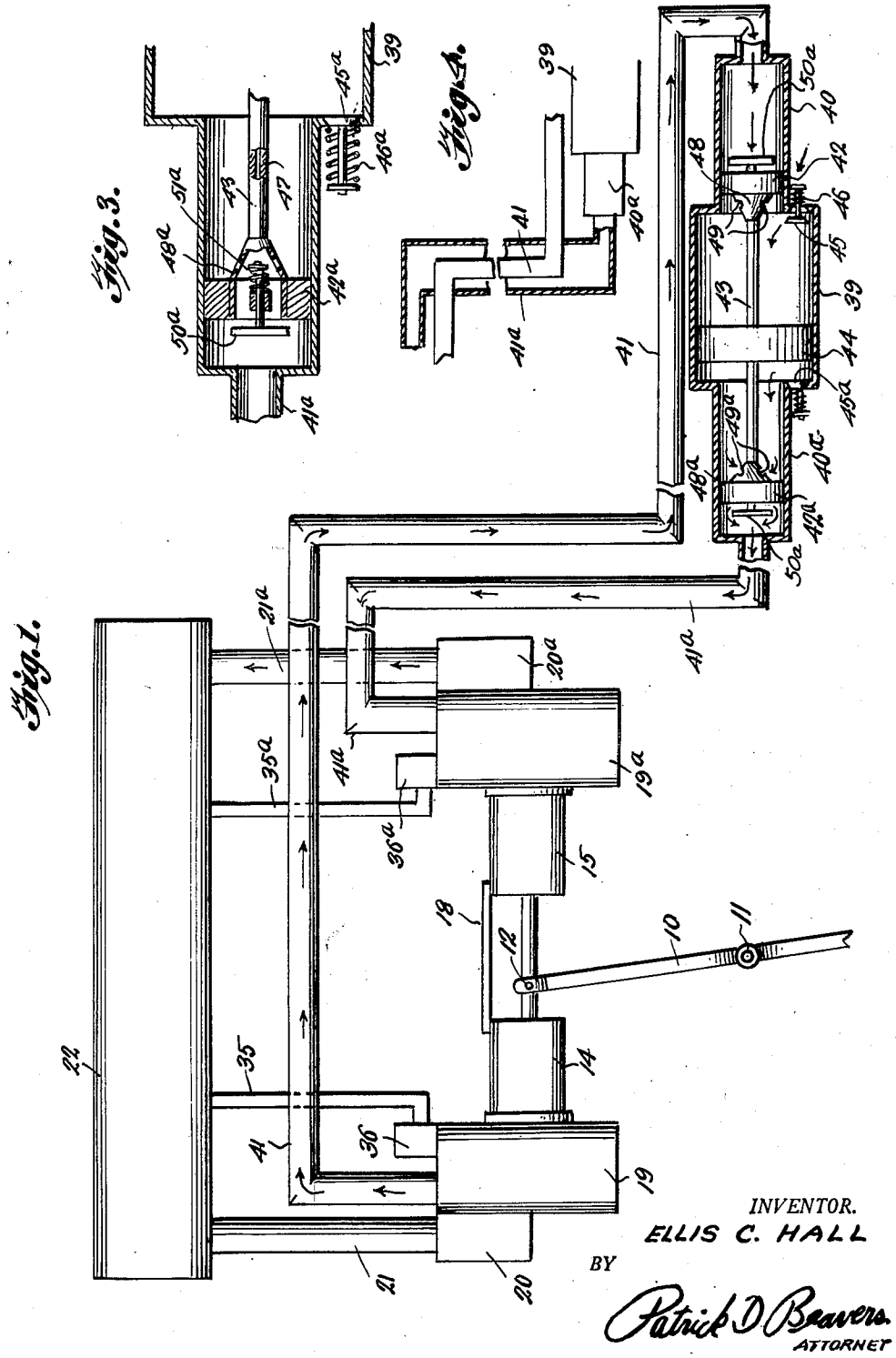
April 20, 1954 E. C. HALL 2,675,760

HYDRAULIC LIQUID PUMP

Filed Sept. 29, 1950 2 Sheets-Sheet 1



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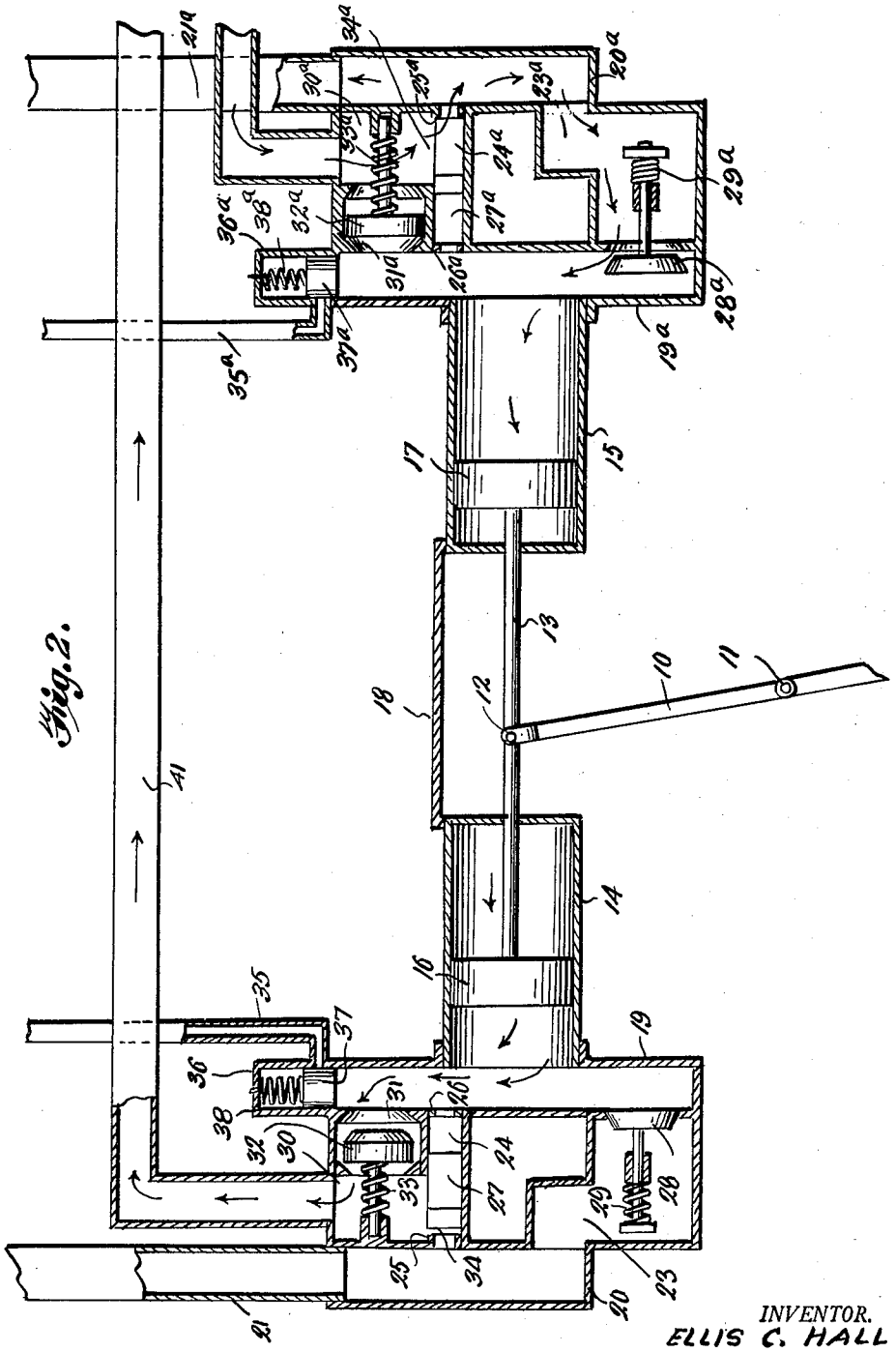


Fig. 2.

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HYDRAULIC LIQUID PUMP

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2 Claims. (Cl. 103—44)

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The present invention relates to an hydraulic liquid pump and it consists in the combinations, constructions and arrangements of parts herein described and claimed.

Generally there is provided an hydraulically operated liquid pump which is particularly adapted to deep well operations and which consists essentially of a motor comprising a pair of pistons mounted in cylinders and adapted to pump fluid through a pair of lines to a pump which, in turn, consists of a pair of cylinders each connected with one end of a comparatively large cylinder and each having therein a piston which pistons are interconnected with a piston rod upon which is mounted a relatively large piston which reciprocates in the comparatively large cylinder. The apparatus is so arranged that pressure alternately applied to the two lines will cause a reciprocation of the pistons in the motor to thus upon each stroke force an excess of fluid taken in by the large cylinder through the line which is inactive at the moment and through certain valve connections in the motor send the excess of fluid to a storage tank.

It is accordingly an object of the invention to provide an apparatus of the character set forth which is relatively simple in construction, easy to operate and yet effective and efficient in use.

A further object of the invention is the provision of an apparatus of the character set forth which is particularly adaptable to the pumping of fluids from deep wells and other places remote from a motor forming a part of the invention.

Another object of the invention is the provision of a novel motor forming a part of the invention.

Another object of the invention is the provision of a novel pump forming a part of the invention.

Other and further objects of the invention will become apparent from a reading of the following specification taken in conjunction with the drawings, in which:

Figure 1 is an elevational view, partly broken away and partly in section, of an embodiment of the invention,

Figure 2 is an enlarged fragmentary sectional view, partly in section, of the motor portion of the apparatus,

Figure 3 is an enlarged sectional view of a portion of the pump portion of the apparatus, and

Figure 4 is a fragmentary reduced elevational view, partly in section, illustrating a modified pipe line construction utilized in the invention.

Referring more particularly to the drawings, there is shown therein a bell crank lever 10 which

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is pivoted at 11 and pivotally connected at one end, as indicated at 12, to a shaft 13. The other end of the bell crank lever 10 is connected to some suitable source of power (not shown) for oscillating the same to provide reciprocal movement for the shaft 13.

The shaft 13 extends into cylinders 14 and 15 and has mounted at either end a piston 16 and 17 which are respectively reciprocal in the cylinders 14 and 15. An aligning arm 18 is shown as interconnecting the outer sides of the cylinders 14 and 15. The cylinder 14 communicates with a casing 19 while the cylinder 15 communicates with a casing 19a. The casing 19 is provided with an extension 20 which is connected by a pipe 21 with a tank 22 and the casing 19a is provided with an extension 20a which is connected by means of a pipe 21a with the storage tank 22. A passageway 23 interconnects the interior of the casing 19 and the extension 20 and a passageway 23a likewise connects the interior of the casing 19a and the extension 20a. A cylindrical passageway 24 interconnects the extension 20 and the interior of the casing 19 and is provided with a seat 25 at that end thereof adjacent the extension 20 and a stop member 26 at its other end, A piston 27 is reciprocable in the passageway 24. A like passageway 24a, seat 25a, stop member 26a and piston 27a are provided in the members 19a and 20a.

The passageway 23 is governed by a normally closed valve 28 which is provided with a spring 29 for maintaining the same in a seated condition. A like valve 28a and spring 29a are provided in the housing 19a for governing the passage 23a.

The housing 19 is provided with a compartment 30 having an opening 31 connecting the same with the interior of the casing 19 which opening 31 is provided with a valve 32 which is maintained normally in a seated position by means of a spring 33. The casing 19a is likewise provided with a compartment 30a having an opening 31a, a valve 32a and a spring 33a.

The compartment 30 communicates with the passageway 24 by means of an opening 34 and the compartment 30a communicates with the passageway 24a by means of an opening 34a. A pipe 35 interconnects the storage tank 22 with a cylindrical extension 36 of the casing 19 and a like pipe 35a interconnects the storage tank 22a with a like cylindrical extension 36a for the casing 19a. A cylindrical pressure relief valve 37 is urged by a spring 38 to normally close the pipe 35 from communication with the interior of the extension

and like elements 37a and 38a are provided in the extension 36a.

A pump structure is best illustrated in Figure 1 and consists of a relatively large cylinder 39 having in communication therewith at either end thereof a relatively smaller cylinder 40 and 40a. A pipe 41 interconnects the outer end of the cylinder 40 with the compartment 30, and a pipe 41a interconnects the cylinder 40a and the compartment 30a. A piston 42 is affixed to a piston rod 43 at one end thereof and is reciprocable in the cylinder 40. At the other end of the piston rod 43 there is affixed a piston 42a which is reciprocal in the cylinder 40a and, centrally affixed to the rod 43, there is a piston 44 which is reciprocal in the cylinder 39.

In the end wall of the cylinder 39 adjacent the piston 42 there is provided a valve 45 which is inwardly opening and which is maintained normally closed by means of a spring 46. In the end wall of the piston 39a adjacent the cylinder 40a a like inwardly opening valve 45a is provided and has a spring 46a for normally maintaining the same in closed position.

The piston rod 43 is provided with a longitudinal passageway 47, as shown in Figure 3, which passageway communicates with an enlarged hollow member 48 which extends through the piston 42 and with an enlarged hollow member 48a which extends through the piston 42a. The member 48 is provided with a plurality of openings 49 which communicate with the interior of the cylinder 39 and the member 48a is provided with a plurality of openings 49a which communicate with the interior 39.

The outer end of the member 48 is provided with a valve 50 which is normally closed and the member 48a is provided with a like valve 50a which is likewise maintained normally closed by means of a spring 51a, it being understood that a like spring is provided for the valve 50.

In operation, it will be apparent that as power is applied to the lever 10 to reciprocate the shaft 13 first in a direction to the left as viewed in Figure 2, that fluid within the casing 19 will be compressed thereby insuring the closing of the valve 28 and at the same time moving the cylinder valve 27 to the left to seat upon the element 25. At the same time, the valve 32 will be opened and fluid will be forced through the pipe 41 and will cause the closing of the valve 50 upon its entrance into the cylinder 40. This action will move the piston 42 to the left as viewed in Figure 1 and consequently will move the piston 44 to the left in the cylinder 39 and the piston 42a to the left in the cylinder 40a. As this action occurs the valve 45 will be opened against the action of the spring 46 thereby drawing fluid into the cylinder 39. This action will also cause the excess fluid from the left side of the piston 44 in the cylinder 39 to pass through the openings 49a and thence into the pipe 41a through the valve 50a. This excess fluid will then enter the casing 19a closing the valve 32a and moving the piston-like valve 27a to the left as viewed in Figure 2 thus allowing fluid to pass through the passageway 24a into the extension 20a and thence through the passageway 23a and through the valve 28a. Some of such fluid will fill into the cylinder 15 as the piston moves to the left. However, the excess fluid which is not needed to fill in behind the piston 17 as it so moves to the left will pass through the pipe 21a to the storage tank 22.

Upon a movement to the right of the shaft 13 upon its next stroke, the reverse of the action above described will take place and the excess fluid will pass through the pipe 21 into the storage tank 22. Thus it will be seen that upon each stroke of the shaft 13 in either direction a certain amount of fluid will be delivered to the tank 22. If, at any time movement of the shaft 13 and its attached pistons 16 and 17 should get out of synchronization with the rod 43 and its attached pistons, any excess of fluid will be delivered to the storage tank 22 through either the pipe 35 or the pipe 35a, the relief valve 37 and/or 37a functioning to allow such passage of excess fluid.

In the form of the invention illustrated in Figure 4, the pipe 41a is shown as being relatively larger than shown in Figure 1, for example, and the pipe 41 is shown as mounted concentrically therein for the greater part of its length to conserve space, it being understood, however, that the pipes 41 and 41a have identical connections with the cylinders 40 and 40a and with the casings 19 and 19a as is shown in Figure 1.

While but certain forms of the invention have been shown and described herein, it will be readily apparent to those skilled in the art that many minor modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. An apparatus of the character described comprising a motor having a pair of cylinders, a piston in each of said cylinders, a shaft interconnecting said pistons, and a pump having a relatively large cylinder, a relatively small cylinder interiorly connected with said large cylinder at each end thereof, a piston in each of said small cylinders and a piston in said large cylinder and a piston rod interconnecting the pistons in said large and small cylinders, a pipe interconnecting one cylinder of the motor with one of the smaller cylinders of the pump, a pipe interconnecting the other cylinder of the motor with the other smaller cylinder of the pump, an inlet valve at each end of the larger cylinder, a storage tank, a pipe connecting each of the cylinders of the motor with said tank, and means for delivering fluid drawn into said pump to said tank, said means including a passageway through the rod in said pump, means forming a perforated compartment connected to said rod and connected adjacent the inner side of each of the smaller pistons in said pump, said smaller pistons each having a centrally disposed opening therethrough, and a spring-closed valve upon the outer side of each of said smaller pistons for controlling the passages in such smaller pistons.

2. An apparatus of the character described comprising a motor having a pair of cylinders, a piston in each of said cylinders, a shaft interconnecting said pistons, and a pump having a relatively large cylinder, a relatively small cylinder interiorly connected with said large cylinder at each end thereof, a piston in each of said small cylinders and a piston in said large cylinder and a piston rod interconnecting the pistons in said large and small cylinders, a pipe interconnecting one cylinder of the motor with one of the smaller cylinders of the pump, a pipe interconnecting the other cylinder of the motor with the other smaller cylinder of the pump, an inlet valve at each end of the larger cylinder, a storage tank, a pipe connecting each of the cylinders of the motor with said tank, means for delivering fluid drawn into said pump to said tank, a pair of relief pipes

interconnecting said motor and said tank, and a pressure-relief valve in each of said relief pipes, said means including a passage through the rod in said pump, a perforated compartment in said rod adjacent the inner side of each of the smaller pistons in said pump, said smaller pistons each having a centrally disposed opening therethrough, and a spring-closed valve upon the outer side of each of said smaller pistons for controlling the passages in such smaller pistons.

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