Aug. 4, 1942. H. L. BANCROFT 2,291,601

PUMP

Filed July 31, 1940

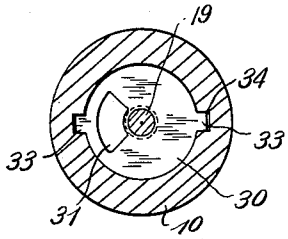

FIG. 4

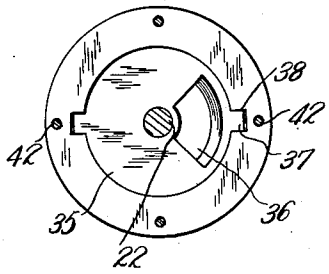

FIG. 3

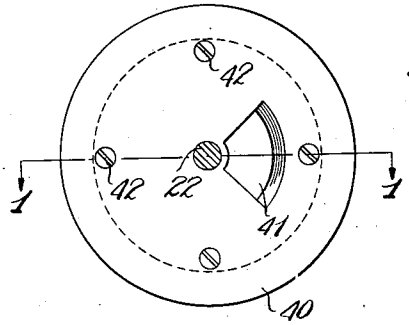

FIG. 2

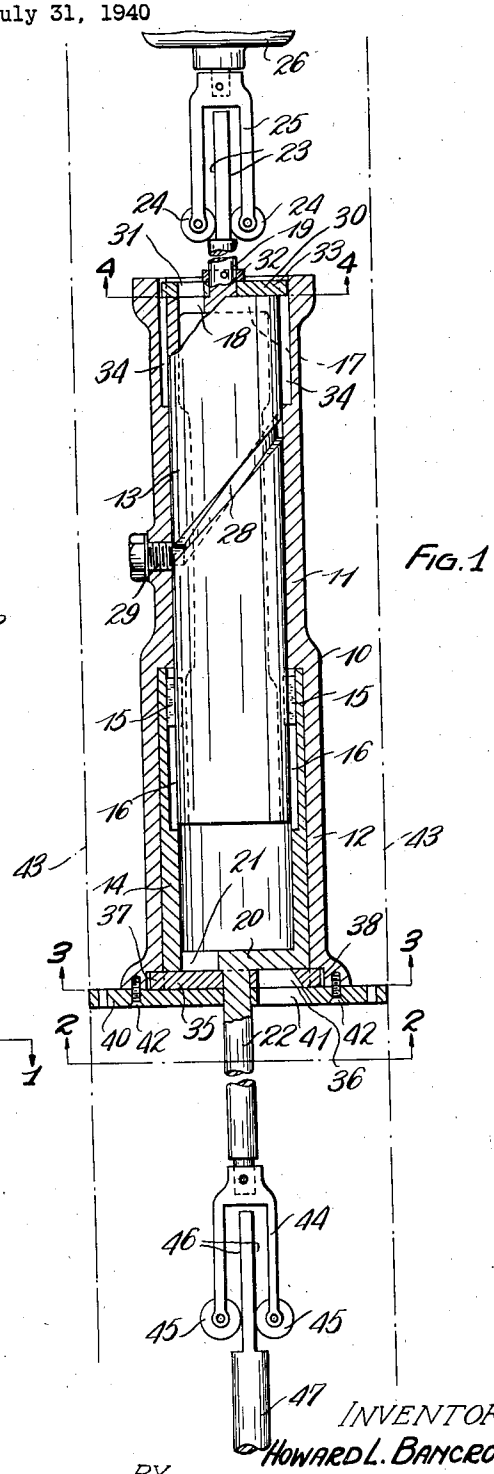

FIG. 1

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PUMP

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7 Claims. (Cl. 103—157)

This invention relates to improvements in pumps, and has reference particularly to deep well pumps, that is pumps for lifting water or other liquid through a considerable height.

One of the objects of the invention is the provision of a pump adapted to the above stated purpose, and of a simple design and few operating parts.

Another object of the invention is the provision of a pump which may be employed as one of a series arranged in tandem.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which

Fig. 1 is an elevational view, partly in central longitudinal section, of a pump embodying the invention.

Fig. 2 is a view principally in end elevation taken substantially on the line 2—2 of Fig. 1.

Figs. 3 and 4 are transverse sectional views on the lines 3—3 and 4—4 respectively of Fig. 1.

The pump of the present invention comprises a cylindrical housing 10 having a small bore portion 11 and a larger bore portion 12. Within the housing there are two telescoping cylinders 13 and 14, both open at their inner ends and so connected together as to permit relative axial movement without relative rotational movement. As illustrated herein the cylinder 13 is provided with a plurality of keys 15 running in keyways 16 of cylinder 14. Cylinder 13 at its outer end has an end wall 17 provided with a port 18, and from the center of wall 17 a shaft 19 extends outwardly, this shaft in the present instance functioning as the shaft through which driving force is transmitted to the pump. Cylinder 14 has an outer end wall 20 provided with a port 21. Wall 20 may also have a central outwardly extending shaft 22.

Shaft 19 may be flattened on two opposite sides, as indicated at 23, for engagement by a pair of rollers 24 carried on a bracket 25 pinned to the shaft of a back geared electric motor 26, by means of which the telescoping cylinders are rotated. While the form of slidable coupling herein disclosed functions satisfactorily, it should be understood that any other coupling capable of transmitting rotation while permitting relative longitudinal movement may be employed. During this rotation cylinder 13 is also reciprocated by means of a cam groove 28 in the outer surface of the cylinder cooperating with the smooth end of a screw 29 that is set into the wall of small bore portion 11 of the cylindrical housing.

A valve disk 30 having a port 31 is mounted for relative rotation upon shaft 19 and is held in engagement with the end wall 17 of cylinder 13 by a collar 32 which is pinned to the shaft. Disk 30 has a pair of diametrically opposed tabs 33 which fit slidably within longitudinal grooves 34 formed in the inner surface of the cylindrical housing 10. Disk 30 is therefore held against rotation as it moves back and forth with the rotating cylinder 13.

A second valve disk 35 provided with a port 36 is rotatably mounted on shaft 22 and is held against rotation by means of tabs 37 which fit into notches 38 formed in the larger bore portion 12 of the housing. A circular plate 40 with a central opening to take shaft 22 engages the outer surface of disk 35, holding that disk against movement longitudinally of the shaft, and has a port 41 continuously registering with port 36. This plate 40 is attached to the housing by screws 42, and may be of a size to engage the bore of a well, indicated by dot and dash lines 43.

Shaft 22 when present carries provision for transmitting driving force from the pump illustrated to another pump, not shown, arranged in tandem with the first pump. To this end shaft 22 may have pinned thereto a bracket 44 carrying rollers 45 which slidably engage a flattened portion 46 of another shaft 47 which comprises part of a second pump arranged below the first one and in tandem therewith.

The pump as shown in Fig. 1 is about to start the compression stroke, that is the cylinder 13, which constitutes the piston, is about to start its movement downward, forcing the liquid within the cylinders out through ports 18 and 31. When the cylinders have rotated 180° the piston will be at the end of its compression stroke, the ports 18 and 31 will be closed, and the opening of ports 21 and 36 will be about to begin, with the beginning of the suction stroke of the pump. Liquid will then be drawn into the space within the telescoping cylinders, which will continue as long as the ports 21 and 36 remain open, or until near the end of the suction stroke. Ports 21 and 36 will then close, ports 18 and 31 will again open and the next compression stroke will begin. The liquid raised by the pump may be conducted away by suitable connections, not herein illustrated.

Obviously the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all of the features of the invention be used conjointly, since they may be employed

advantageously in various combinations and subcombinations.

Having thus described my invention, I claim:

1. In a pump, a cylindrical housing, a pair of hollow telescoping cylindrical members rotatably mounted within said housing open at their inner ends and ported at their outer ends, one of said members being held against longitudinal movement and being slidably keyed to the second member, an outwardly projecting axial shaft operatively connected to one of said cylindrical members for imparting rotation thereto, non-rotatable disk valves associated with the ports in said cylindrical members for opening and closing said ports as the said cylindrical members rotate, and cam means for reciprocating the second member actuated by the rotation of that member.

2. In a pump, a cylindrical housing, a pair of hollow telescoping cylindrical members rotatably mounted within said housing open at their inner ends and ported at their outer ends, one of said members being held against longitudinal movement and being slidably keyed to the second member, an outwardly projecting axial shaft rigidly united to said second member for imparting rotation thereto, disk valves associated with the ports in said cylindrical members, the valve for said first-named cylindrical member being fixed against movement in any direction, the valve for said second member having a central opening through which the shaft projects, means on the shaft to hold the latter valve against the end of the second member, a tongue and groove connection between the last-named valve and said housing to prevent rotation of the valve while permitting movement thereof longitudinally of the pump, and cam means for reciprocating the second member actuated by the rotation of that member.

3. In a pump, a cylindrical housing, first and second hollow telescoping cylindrical members mounted within the housing open at their inner ends and ported at their outer ends, said first cylindrical member being rotatable in the housing and being held against longitudinal movement and said second cylindrical member being slidably keyed to the first member and being rotatably as well as longitudinally movable in said housing, non-rotatable valve means at the outer end of said second cylindrical member movable therewith for controlling a port therethrough, fixed valve means in the housing at the outer end of the first cylindrical member cooperating therewith for controlling a port therethrough, an outwardly projecting axial shaft operatively connected with one of said cylindrical members for imparting rotation thereto, and cam means for reciprocating said second cylindrical member actuated by the rotation of that member.

4. In a pump, a cylindrical housing, a piston therein, a shaft axially connected with said piston and projecting from one end of said housing for rotating the piston, cam means actuated by the rotation of the piston for reciprocating the piston, valve means movable with the piston controlling a port therethrough, rotary valve means at the opposite end of the housing arranged to turn with said piston, and an axial shaft connected with said last named valve means adapted to function as the driving means for a second pump.

5. In a pump, a cylindrical housing, a pair of hollow telescoping cylindrical members rotatably mounted within the said housing open at their inner ends and ported at their outer ends, one of said members being held against longitudinal movement and being slidably keyed to the second member, valve means comprising the ports in the ends of the members, means for imparting rotation to one of said members, cam means for reciprocating the second member actuated by the rotation of that member, and an outwardly projecting axial shaft attached to each of said members, one of said shafts being adapted to receive rotation for operating the pump and the other of said shafts being adapted to transmit rotation for the operation of a second pump.

6. In a pump, a cylindrical housing, a pair of hollow telescoping cylindrical members rotatably mounted within the said housing open at their inner ends and ported at their outer ends, one of said members being held against longitudinal movement and being slidably keyed to the second member, valve means comprising the ported ends of said members, cam means for reciprocating the second member actuated by the rotation of that member, and an outwardly projecting axial shaft attached to each of said members, one of said shafts being adapted to receive rotation for operating the pump and the other of said shafts being adapted to transmit rotation for the operation of a second pump.

7. In a pump, a cylindrical housing, a pair of hollow telescoping cylindrical members rotatably mounted within the said housing open at their inner ends and ported at their outer ends, one of said members being held against longitudinal movement and being slidably keyed to the second member, valve means comprising the ported ends of said members, cam means for reciprocating the second member actuated by the rotation of that member, an outwardly projecting axial shaft attached to each of said members, one of said shafts being adapted to receive rotation for operating the pump and the other of said shafts being adapted to transmit rotation for the operation of a second pump, and an axially slidable driving connection for the shaft attached to said second member.

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