March 29, 1932. C. G. BOONE 1,851,801

DEEP WELL PUMP

Filed March 18, 1931

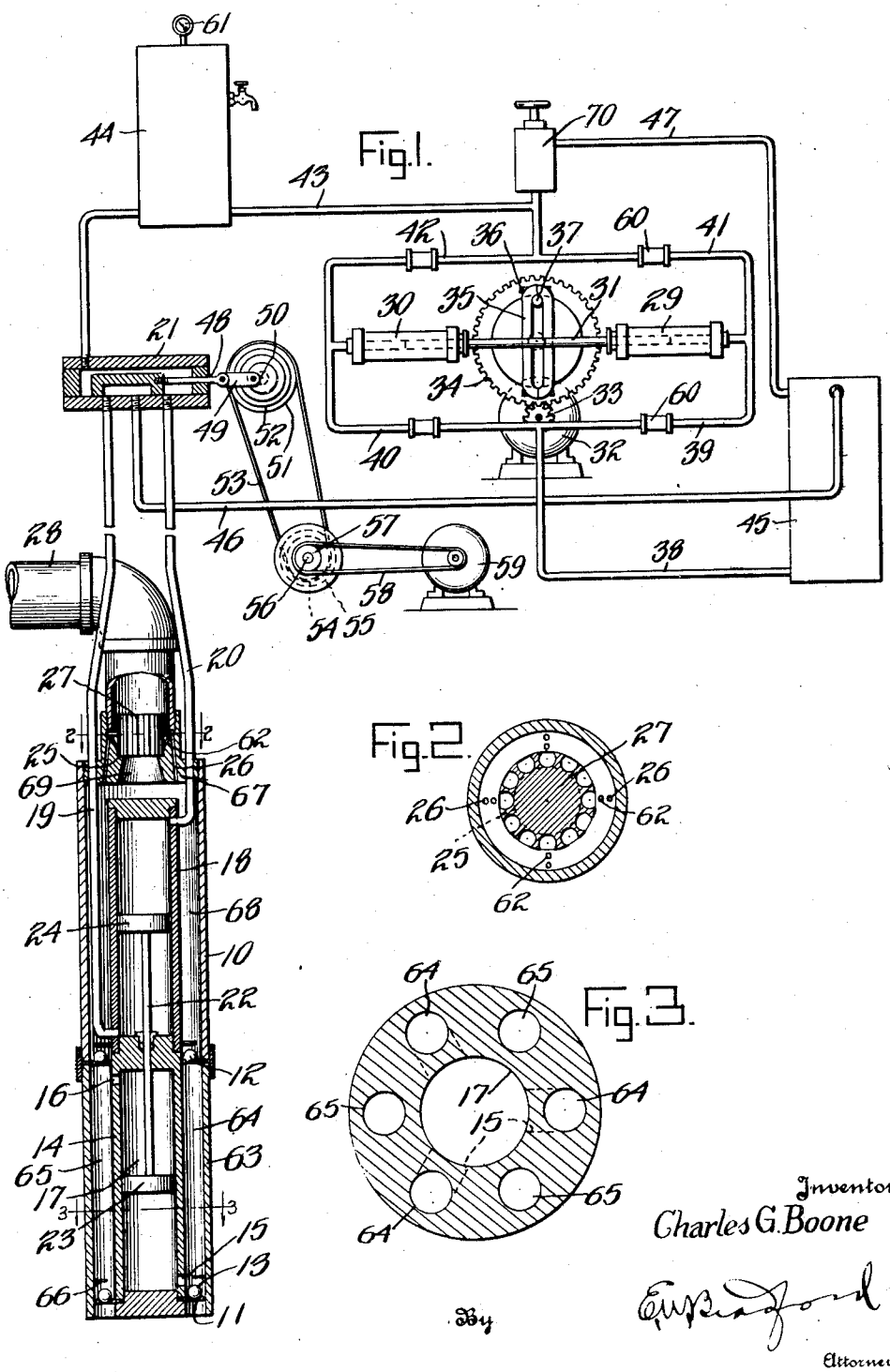

Fig. 1.

Fig. 2.

Fig. 3.

Inventor

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By

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Patented Mar. 29, 1932 1,851,801

UNITED STATES PATENT OFFICE

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DEEP WELL PUMP

Application filed March 18, 1931. Serial No. 523,540.

This invention relates to pumps of the type adapted for use in deep wells in which the pumping mechanism is operated by pressure fluid supplied in any suitable way. In deep wells such as oil wells in which the oil is pumped from great depths sometimes in excess of five or six thousand feet it is not practical to use pumps with long reciprocable pump rods or other reciprocating mechanism operated from the surface. My invention provides a pumping cylinder and operating cylinder near the bottom of the well and mechanism is provided for supplying pressure fluid to the operating cylinder. Means are provided also for eliminating disadvantages due to dirt which is mixed with the oil. The invention further provides means for controlling the speed of operation of the pump.

Other objects and advantages will become apparent as the description proceeds.

Referring to the accompanying drawings, which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a somewhat diagrammatic view of the invention showing the pumping and operating cylinders and control valve in section,

Figure 2, a section on line 2—2 of Figure 1, and

Figure 3, a section on line 3—3 of Figure 1.

The pump consists of cylinder 63 having axial bores 64 and 65 alternately placed and extending throughout its length. The lower ends of these bores are closed by ball check valves 13 which rest on valve seats 11, pins 66 being provided to prevent the balls from being carried too far off their seats. Within the cylinder is a pumping chamber 17 having a piston 23 movable therein. Radial ports 15 and 16 extend from the bores 64 and 65 respectively to the chamber 17 below and above the piston 23 respectively. The upper ends of the bores are closed by ball check valves 12. A cylinder 10 is suitably secured to the upper end of the cylinder 63 as by screw-threading the two together. The upper end of the cylinder 10 is closed by a head 67. A motor cylinder 18 is positioned within the cylinder 10 and secured as by screw threading to a portion of the end of the cylinder 63. An annular chamber 68 is provided between the walls of the cylinder 18 and the cylinder 10. A piston 24 is operable within the cylinder 18 and is operably connected by means of a piston rod 22 with the piston 23. Pipes 19 and 20 provide means for supplying operating fluid to the cylinder 18, these fluid lines being connected to a valve 21. The head 67 is provided with an outlet opening 69 which is closed by a valve 27. The valve 27 is provided with axial channels in its periphery through which the fluid from the pump is discharged. Axial bores 26 extend through the head 67 and oblique bores 62 extend downwardly to direct fluid against the valve seat 25. An outlet pipe 28 is secured in the head 67 for delivering the pumped medium to any suitable storage tank. The purpose of the bores 26 and 62 is to deliver oil against the valve seat to wash off or loosen any grit or sediment which may have settled about it, the loosened grit being delivered out through the discharge pipe 28. From the description it will be seen that the cylinder 18 acts as a motor and the cylinder 63 as a pump, the piston 23 being actuated by the piston 24 through the piston rod 22.

Pressure fluid is supplied to the motor cylinder by a compressor about to be described. This comprises a pair of pumping cylinders 29 and 30 here shown as in axial alinement and having a common piston 31. The piston is driven by an electric motor 32 operating through a pinion 33 which meshes with a large gear 34. A bar 35 is suitably attached to the piston 31, this bar is preferably formed of a pair of members secured together by bolts 36 and providing an elongated transverse slot. A pin 37 secured on the gear 34 engages in the slot of the bar for operating the piston. An intake pipe 38 branches into pipes 39 and 40 which branches are connected to the respective cylinders 29 and 30. Discharge lines 41 and 42 lead to a common discharge pipe 43 which delivers compressed fluid to a tank 44. The suction line 38 is preferably connected to a reservoir 45. An

exhaust line 46 passes from the control valve 21 to the reservoir. A pressure relief valve 70 connects the discharge side of the compressors through a line 47 with the reservoir. The control valve 21 is operated by means of a piston rod 48 connected through suitable link 49 with a crank arm on the outer end of a shaft 50. This shaft is provided with a number of pulleys 51, 52, etc. of different sizes. A belt 53 connects these pulleys with any one of corresponding pulleys 54, 55, etc. on a shaft 56. Belt 57 on the shaft is driven by a belt 58 from a suitable motor 59. The different sized pulleys just mentioned provide means for varying the speed with which the valve 21 is operated to vary the speed of operation of the pump. The pulleys may be made in suitable sizes in order to give the desired operating speed. Check valves 60 may be placed wherever necessary in the lines 39 to 42. The system may be set to operate under any desired pressure by adjusting the relief valve 70 as desired and the pressure under which the system is operating may be indicated by a pressure gauge 61.

It will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention and therefore I do not limit myself to what is shown in the drawings and described in the specification, but only as indicated by the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. A deep well pump comprising a pumping cylinder, an operating cylinder, piston rod with pistons thereon operating in said pumping and operating cylinders, a fluid line for supplying operating fluid to said operating cylinder, a source of fluid under pressure, a valve controlling passage of fluid from said source to said operating cylinder, a motor for controlling said valve, and means for varying the relative speed of the said motor and the said valve, substantially as set forth.

2. A deep well pump comprising a pumping cylinder, an operating cylinder, a piston mounted in each cylinder, a common piston rod connecting said pistons for operating said pistons in unison, a fluid line for supplying operating fluid to said operating cylinder, a source of fluid under pressure, a valve controlling passage of fluid from said source to said operating cylinder, a motor for controlling said valve, and means for varying the relative speed of the said motor and the said valve, said means comprising a plurality of pulleys of different sizes connected by an operating belt, substantially as set forth.

3. A pumping system comprising a compressor, a receiver, a pumping cylinder, a motor cylinder, a piston mounted in each cylinder, a piston rod connecting said pistons, pressure fluid lines connecting said receiver and said motor cylinder, a valve controlling flow of pressure fluid from said receiver to said motor cylinder, and a motor for operating said valve, means for changing the relative speed of said motor and said valve to vary the speed of operation of the pump, substantially as set forth.

4. In a pumping system of the kind described, a pumping and a motor unit having a common operating piston rod with pistons thereon operating in the pumping and the motor cylinders, a casing surrounding the motor cylinder and providing a space through which fluid is passed from the pumping cylinder, a head closing the upper end of the said casing, said head having a check valve positioned therein for catching sediment contained in the liquid which is pumped to prevent the sediment from interfering with operation of the main check valves in the pump, substantially as set forth.

5. In a pumping system of the kind described, a pumping and a motor unit having a common operating piston rod with pistons thereon operating in the pumping and the motor cylinders, a casing surrounding the motor cylinder and providing a space through which fluid is passed from the pumping cylinder, a head closing the upper end of said casing, said head having a check valve positioned therein for catching sediment to prevent interfering with operation of the main check valves in the pump, said head having a plurality of axial bores for delivering the pumped fluid against said check valve to dislodge any sediment which may have become deposited thereon, substantially as set forth.

In witness whereof, I have hereunto set my hand at Tulsa, Oklahoma, this 10th day of March, A. D. nineteen hundred and thirty-one.

CHARLES G. BOONE.