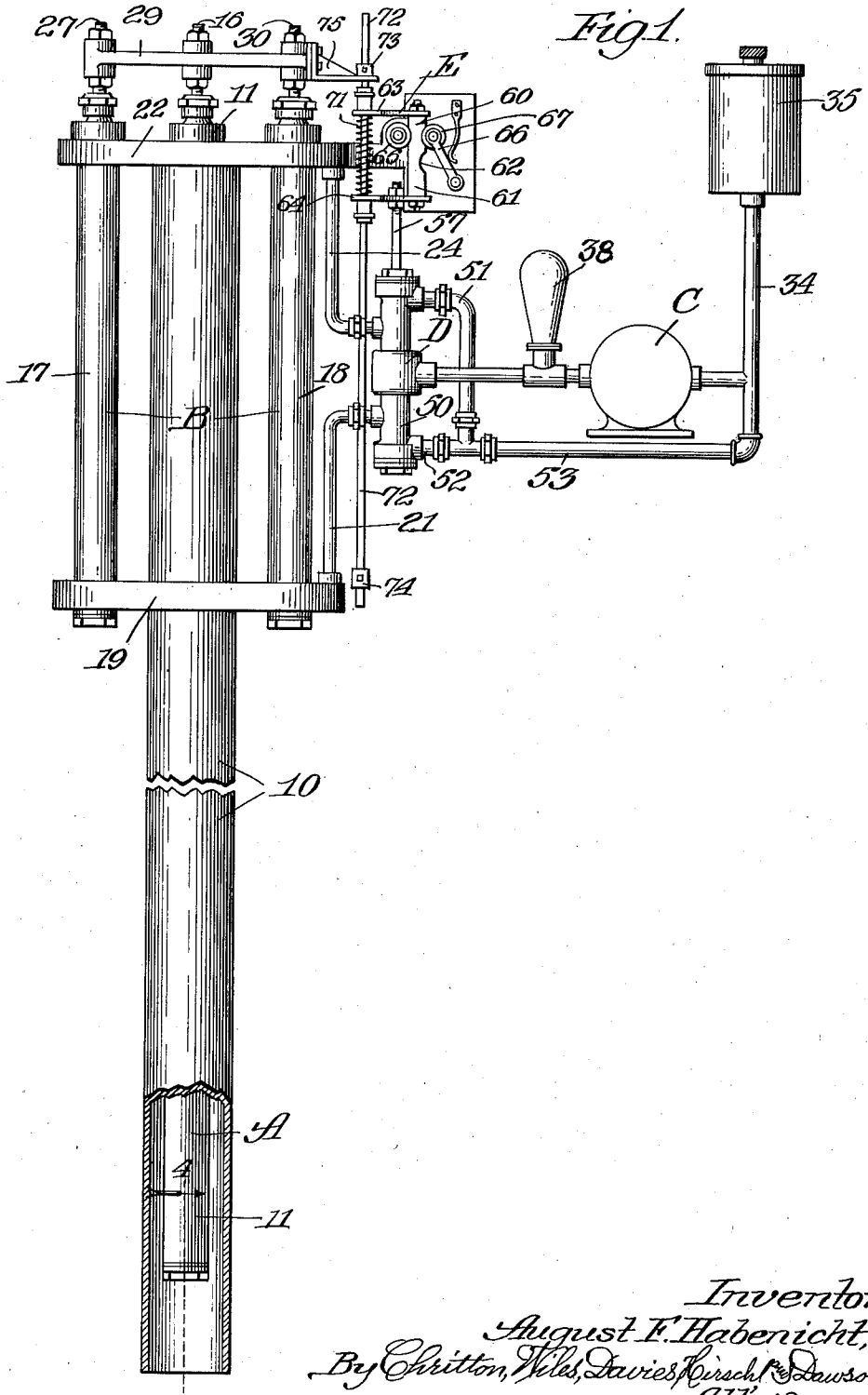
Feb. 18, 1941. A. F. HABENICHT 2,232,449

HYDRAULIC PUMP

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Fig. 1.



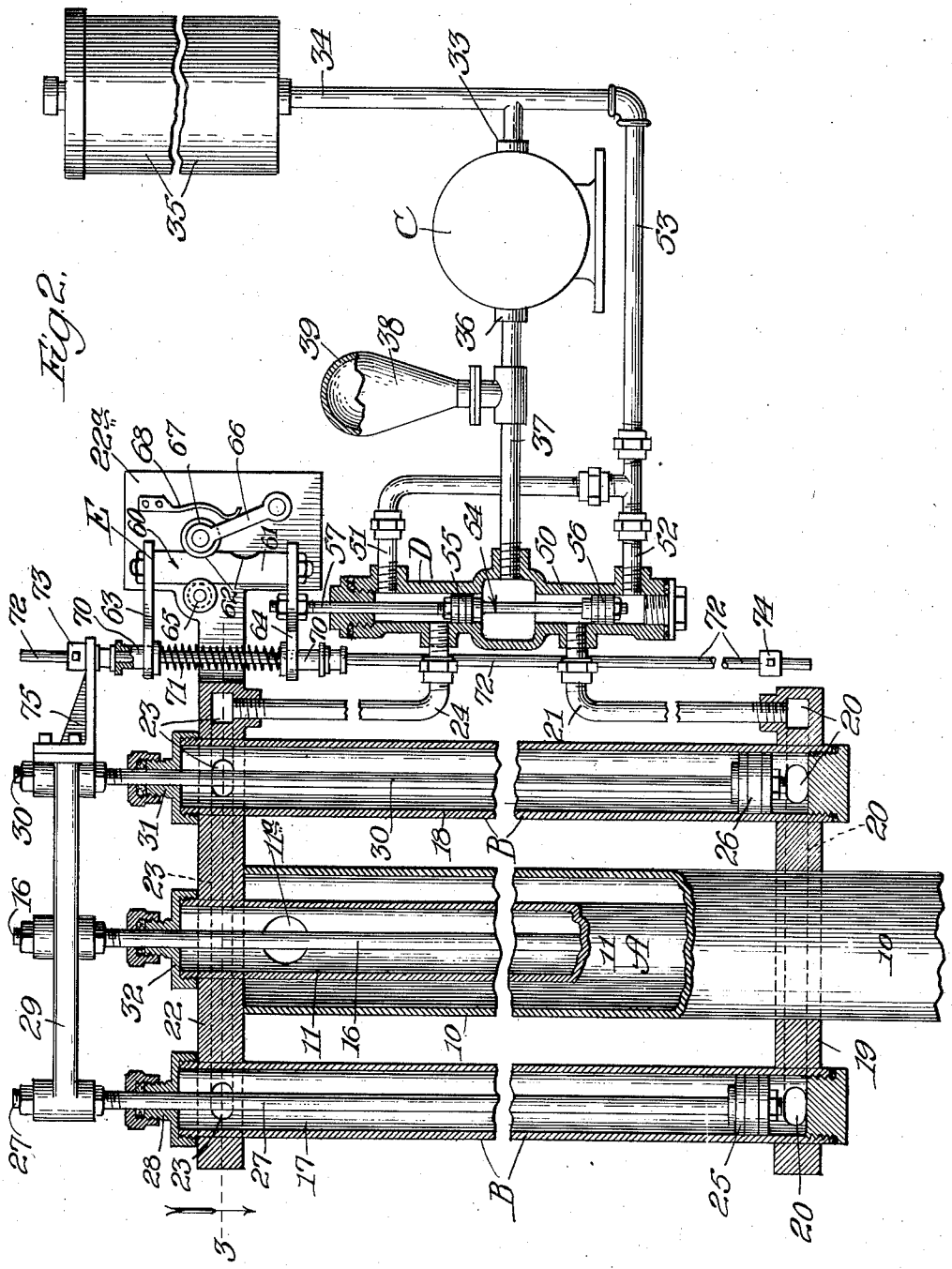
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Fig. 2.



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Fig 3.

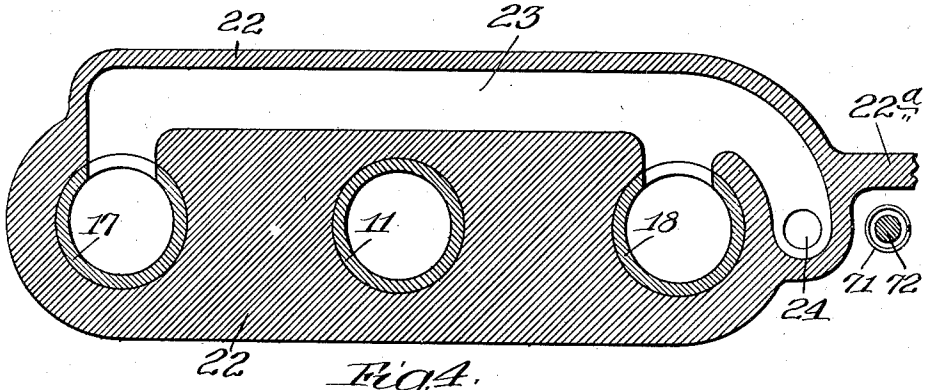
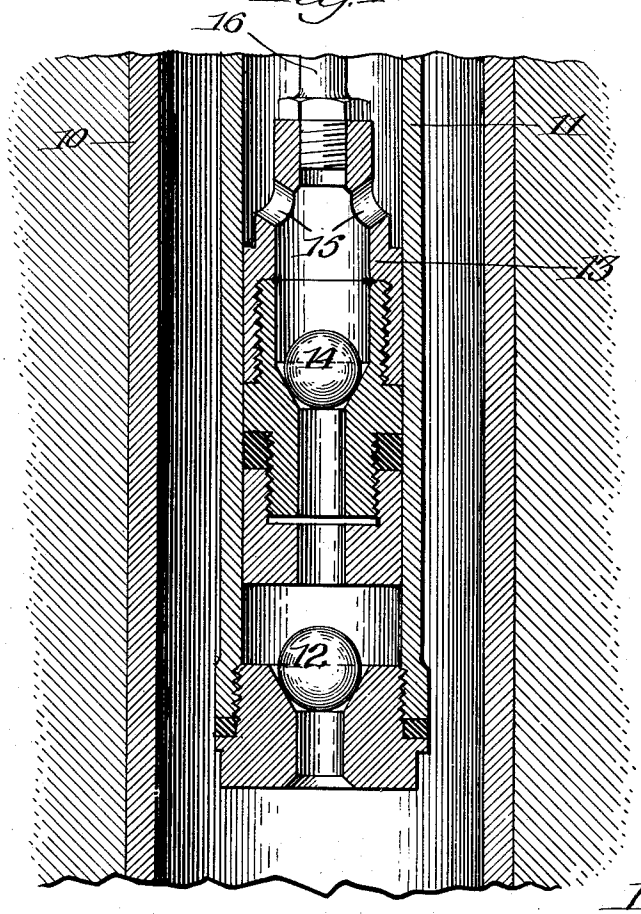


Fig 4.



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Patented Feb. 18, 1941

2,232,449

UNITED STATES PATENT OFFICE

2,232,449

HYDRAULIC PUMP

August F. Habenicht, Tinley Park, Ill.

Application April 30, 1937, Serial No. 140,061

1 Claim. (Cl. 121—164)

This invention relates to a pump and more particularly to a valve-controlled hydraulic pump.

An object of the invention is to provide a hydraulic pump in which liquid under pressure is forced alternately into the two ends of cylinders to effect an oscillating movement of the pump rod.

Another object is to provide cylinders and pump means in such an arrangement as to actuate the pump rod without side strain and at constant pressure throughout its stroke in either direction.

Another object is to provide a quick acting valve mechanism which operates automatically to change the course of the liquid to the opposite end of the cylinder when the piston approaches an end of its stroke. A specific object is to provide valve-control mechanism in which spring means is provided for quickly moving the valve from one position to another. Other specific objects will appear as the specification proceeds.

An embodiment of the invention is illustrated by the accompanying drawings, in which—

Figure 1 is a view in side elevation of the improved pump, the well pipe being shown broken and partly in section; Fig. 2, a broken enlarged view in side elevation of the pump operating mechanism, the parts being shown in position for beginning upward stroke of the pistons; Fig. 3, a sectional view of the upper portion of the cylinders, the view being taken as indicated at line 3 of Fig. 2; and Fig. 4, a detail sectional view of the valve device at the lower end of the pump rod.

As illustrated, A designates lifting mechanism including a pump rod and pipe; B, a pair of cylinders having pistons attached to the pump rod; C, a pump for delivering liquid under pressure; D, a valve for directing liquid to one or the other end of the cylinders; and E, automatic valve control mechanism.

My improved pump may be used for raising any kind of liquid and in various situations.

The illustrations given show the pump as adapted to draw water or oil upwardly from a lower portion of the well pipe 10. A pump pipe 11 extends downwardly within the well pipe and has an inlet valve 12 at its bottom, this valve being adapted to pass liquid only into pipe 11. Upwards of valve 12 is a bucket 13 which slidably engages the inside walls of pipe 11 and is equipped with a valve 14 which will pass liquid only upwardly into the interior of bucket 13. At its upper portion bucket 13 is provided with holes 15 to allow the liquid to pass out into pipe 11. The lower end of pump rod 16 is attached to bucket 13, and upon up and down movement of this rod liquid is raised in pipe 11 and caused to pass out through outlet opening 11a. This much of the mechanism is well known, and any equivalent means may be substituted therefor. If desired, the bucket 13 may be of the double-acting cylinder type.

In the embodiment shown two cylinders 17 and 18 are employed, though any number of cylinders may be used as are desired. However, the cylinders should be so located about the pump rod that this rod will be the center of the forces exerted by the pistons of all of the cylinders. In such an arrangement the pump rod will be given a straight pull and side strain on the rod will be eliminated. As here shown, cylinder 17 is on one side of the pump rod and cylinder 18 on the other. These cylinders are secured at their bottom ends by a cross piece 19 which may extend about well pipe 10 and contain openings through which the cylinders are received. This cross piece contains an interior passage 20 which communicates with the interior of both cylinders and communicates also with the conduit 21 which leads to the valve D.

A top cross piece 22 secures and supports the cylinders at their top ends. This piece contains openings through which the cylinders and pipe 11 are received, and contains also a passage 23 which communicates with each of cylinders 17 and 18 and also with a conduit 24 leading to the valve D.

Cylinders 17 and 18 are equipped with pistons 25 and 26, respectively. Piston rod 27 of piston 25 extends through the closure 28 of cylinder 17 and is connected with the one end of the cross member 29, and piston rod 30 of piston 26 extends through the closure 31 of cylinder 18 and is connected with the other end of cross member 29. The pump rod 16 extends through closure 32 of pipe 11 and is connected to the center of cross member 29.

The pressure pump C may be a common rotary pump or may be of any suitable type adapted to deliver liquid under pressure. This pump may be located at quite some distance from the well or place where the pumping is to be done, and in fact just one pump C may be utilized to supply pressure for pumping several different wells. This feature provides an important advantage when there are several wells to be pumped within a relatively small area.

The inlet 33 of pump C is connected by pipe 34 with a reservoir 35 which contains oil or any

suitable liquid for use in the pump; and the outlet 36 is connected by pipe 37, of any desired length, to the valve D. A housing 38 is attached to pipe 37 and has its interior chamber 39 in communication with the interior of this pipe. The purpose of this housing is to provide an air cushion for the liquid discharged from pump C.

The valve D comprises a housing 50 of the general shape shown in Figs. 1 and 2 of the drawings. Pipe 37, through which liquid under pressure is delivered by the pump C, connects with the middle portion of housing 50. Conduit 24 leading from the top of the cylinders connects with housing 50 upward of its middle portion, and conduit 21 leading from the lower end of the cylinders connects with housing 50 downward of its middle portion. Pipes 51 and 52 connect respectively with the upper and lower ends of housing 50 and lead to pipe 53 connected with the inlet 33 of pump C.

Within housing 50 is a piston member 54 which is equipped with spaced rings or washers 55 and 56 adapted to slide up and down in contact with the walls of housing 50. The stem 57 of the piston member extends through the upper closure of the housing and has its upper end connected with the valve-control mechanism later to be described.

When the piston member 54 is in lower position, as shown in Fig. 2, a passage is open between pipe 37 and conduit 21, and another passage is open between conduit 24 and pipe 51. When this member is moved upwardly, pipe 37 is opened to conduit 24 and conduit 21 is opened to pipe 52.

The valve control mechanism E comprises a holding member 60 having an upright bar 61 equipped with spaced arcuate notches 62 on one side. At the top and bottom of bar 61 are the laterally extending arms 63 and 64 having openings in their ends. Member 60 is secured to the top of valve stem 57 and is adapted to move vertically to change the valve position.

A frame member 22^a, which may be merely an extension of the cross piece 22, has mounted thereon a roller 65 which engages one side of bar 61. The other side of bar 61 containing notches 62 is engaged by an arm 66 pivotally mounted on frame member 22^a and having a roller 67 at its end which roller is adapted to fit into the arcuate notches 62. This arm is pressed by spring 68 into engagement with the notched side of bar 61. Arm 66 is so positioned as to engage the upper of notches 62 when the piston member 54 is in lower position as shown in Fig. 2. When the piston member is moved to its upper position, roller 67 of lever 66 engages the lower of notches 62.

Each of arms 63 and 64 on holding member 60 receives a spool-like sleeve 70 which is vertically slidable and contains a central opening. A compression spring 71 extends between adjacent ends of sleeves 70, and the control rod 72 extends through each of sleeves 70 and through spring 71. Rod 72 should be at least as long as the longest stroke desired. At its upper portion this rod is equipped with a lug 73 adjustably secured to the rod, and at its lower portion rod 72 is equipped with a second lug 74 also adjustably secured to the rod and adapted to be fixed at some desired point along its length.

For actuating rod 72, an arm 75 is secured to cross piece 29 and is adapted to support the rod; this arm may be fixedly attached to rod 72 if so desired. By this arrangement, when the pistons 25 and 26 move up and down, the rod 72 will move longitudinally with the same stroke characteristics.

Operation

Assuming that the pump is started with the parts in the position shown in Fig. 2, operation of rotary pump C causes liquid (oil, water, or other liquid) to be drawn from reservoir 35 and forced through the central portion of valve housing 50, through conduit 21, and into the lower ends of cylinders 17 and 18, the liquid being distributed evenly to each of these cylinders through the interconnecting passage 20 in cross piece 19. Pressure on the underside of pistons 25 and 26 causes these pistons to move upwardly within the cylinders, raising the pump rod 16, to draw water upwardly within pipe 11.

A constant force urges the pistons straight upwardly until they approach the end of their stroke. Since the rod 72 moves in unison with the piston rods, this rod will move upwardly, sliding within sleeves 70 and spring 71. However, after this rod has moved upwardly so that lug 74 impinges against the lower sleeve 70, this sleeve will be caused to move upwardly within arm 64, so as to compress spring 71. Then when lower sleeve 70 has reached the end of its travel within arm 64, member 60 will itself be caused to move upwardly with rod 72. When this occurs, the roller 67 at the end of spring pressed arm 66 will be caused to disengage the upper of notches 62. Once the engagement with this upper notch is broken, spring 71, now under compression, operates to move member 60 quickly upwardly until the lower of notches 62 is engaged by spring pressed arm 66.

This quick movement of the valve member through the action of spring 71 operates to throw the valve into its other position in which liquid under pressure from pipe 37 is directed through conduit 24 to the upper end of the cylinders, the liquid being evenly distributed to each of the cylinders by the passage 23 in cross piece 22. Now liquid under pressure is being delivered to the upper side of pistons 25 and 26 and these pistons are caused to move downwardly. The liquid beneath the pistons is allowed to pass through conduit 21 and pipes 52 and 53 to the inlet of the pump C. As the pistons approach the end of their downward stroke, the upper lug 73 on rod 72 impinges the uppermost of sleeves 70 and moves this sleeve downwardly within arm 63 to compress spring 71. When this sleeve can move no farther within arm 63, holding member 60 is moved downwardly to disengage arm 66 from the lowermost of notches 62, after which spring 71 quickly expands to move member 60 and stem 57 downwardly to again change the position of the valve. This cycle is then repeated. Upon upward stroke of the pistons the liquid above the piston is allowed to return through conduit 24 and pipes 51 and 53 to the intake of the rotary pump C.

It will be observed that the improved pump may be made to operate at any desired length of stroke, the length of the stroke being limited only by the length of the cylinders. To shorten the length of stroke it is necessary only to move the adjustable lug 74 upwardly on rod 72, so that this lug will impinge sleeve 70 to reverse the direction of flow before the piston has been raised so high.

The provision of the air chamber 39 contributes greatly to the smoothness with which the improved pump operates. Though the valve is

changed quickly at the end of each stroke, an instant of time is required for the pistons and pump rod to change the direction of their motion, and during this time the flow of liquid from the pressure pump C will be interrupted. Air chamber 39 provides a cushion which takes up a small quantity of liquid during this interruption and allows the operation to continue without excess pressure being built up and without jerk or halt in the operation of the pump mechanism.

It is understood that many changes may be made in the specific construction described without departing from the spirit of the invention. The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom.

I claim:

In a valve controlled hydraulic motor of the character set forth, valve control mechanism including a member attached to the stem of the valve and having spaced arms, aligned sleeves extending through said arms, a compression spring between said arms and having its ends engaging said sleeves, the inner ends of said sleeves having projections engaging said arms, a rod extending through said sleeves and spring and equipped with spaced lugs for engaging the remote ends of said sleeves to compress said spring as said rod is moved longitudinally into extreme position, a bar connecting said arms together and containing notches, and a spring pressed holding member for cooperation with said notches.

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