J. HUTCHINGS.

DIRECT ACTING PUMPING MACHINERY.

APPLICATION FILED JUNE 1, 1909.

965,819. Patented July 26, 1910.

4 SHEETS—SHEET 1.

FIG. 1.

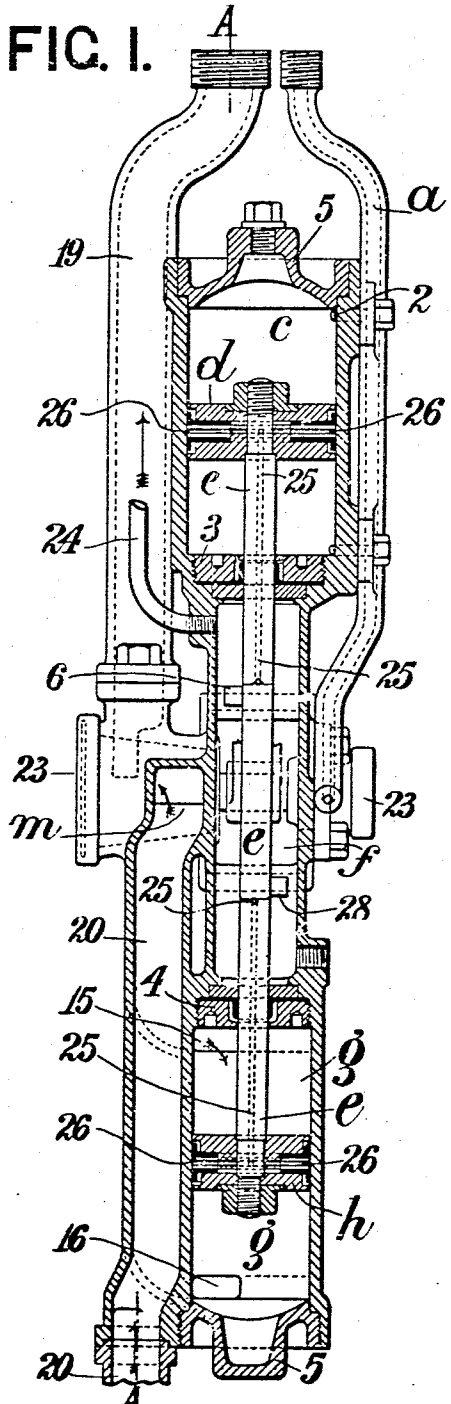
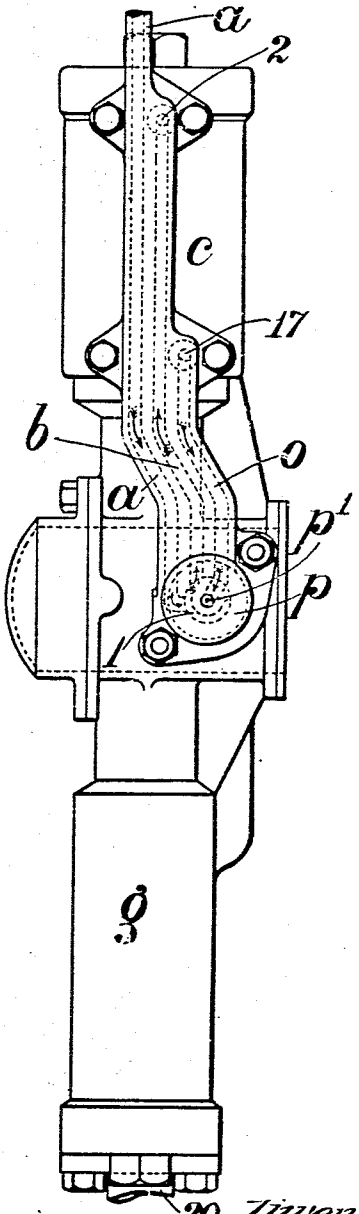


FIG. 2.



Witnesses:

Inventor

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4 SHEETS—SHEET 2.

FIG. 3.

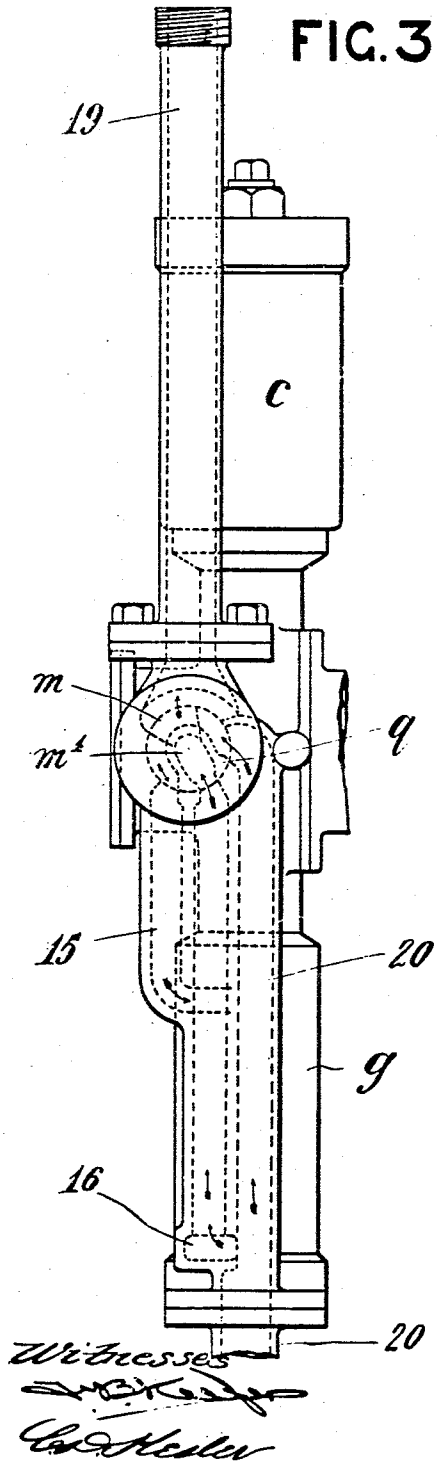
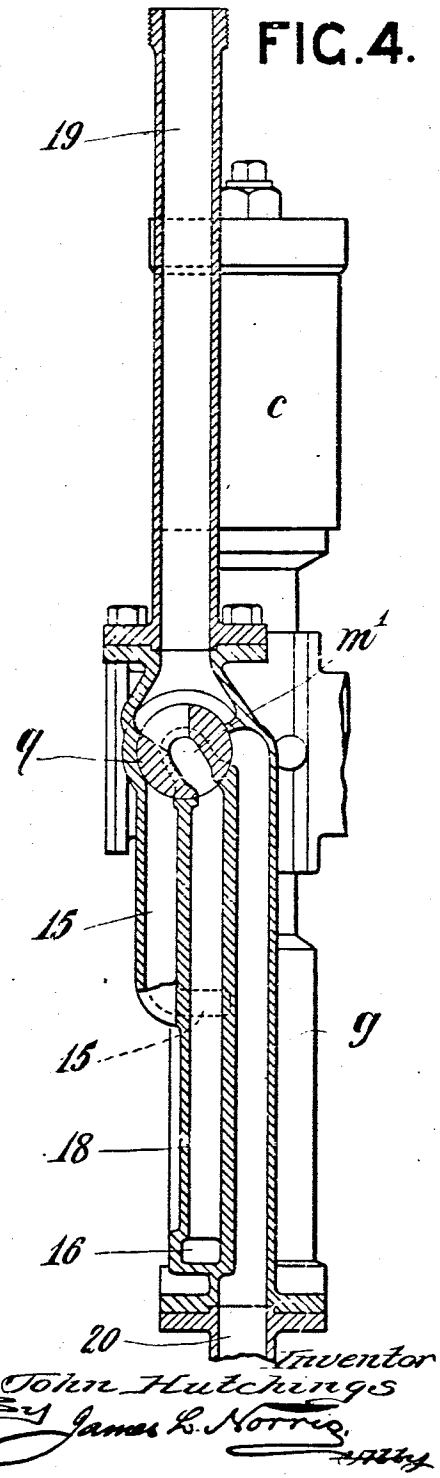


FIG. 4.



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4 SHEETS—SHEET 3.

FIG. 5.

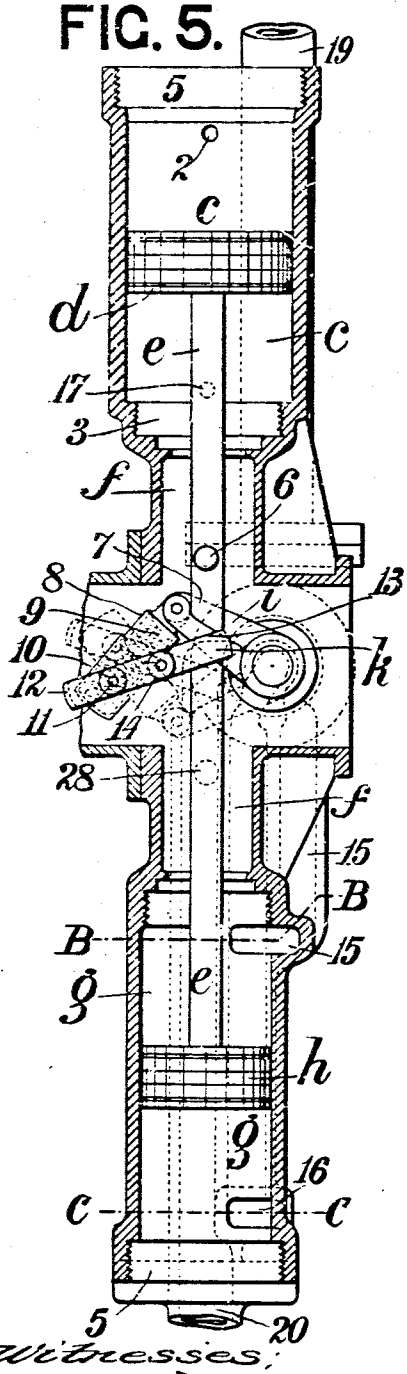


FIG. 6.

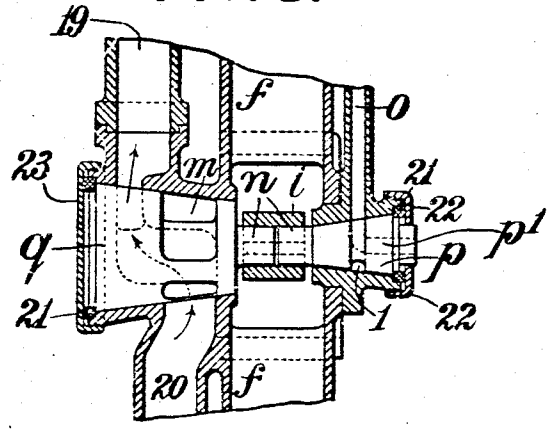


FIG. 7.

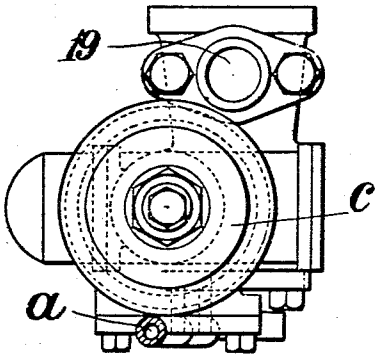
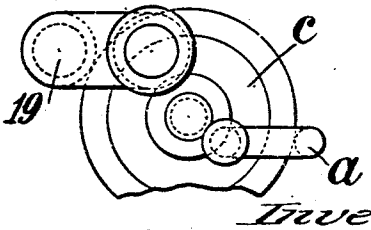


FIG. 8.



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4 SHEETS—SHEET 4.

FIG. 9.

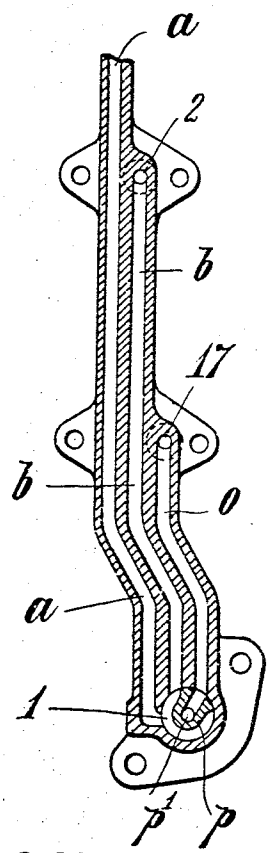


FIG. 10.

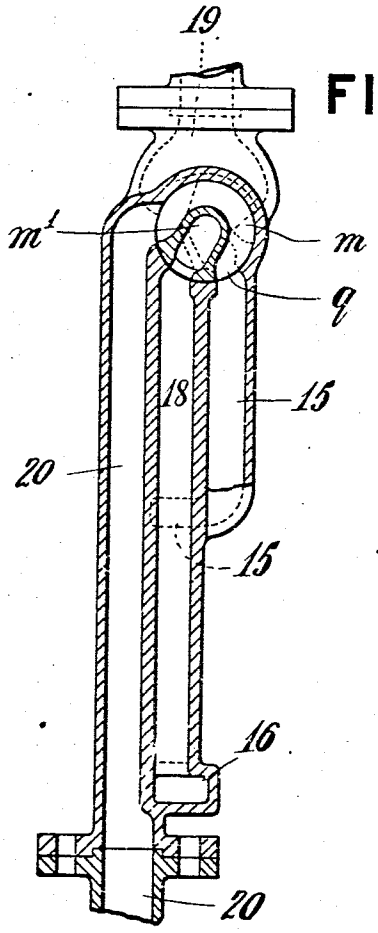


FIG. 11.

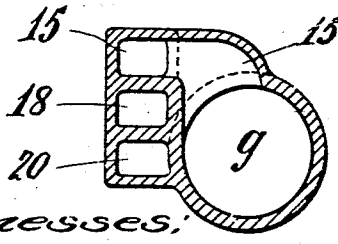
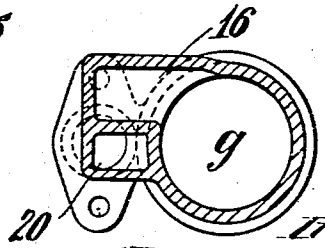


FIG. 12.



Witnesses:

Inventor
John Hutchings

By James L. Norris

Atty

UNITED STATES PATENT OFFICE.

JOHN HUTCHINGS, OF LONDON, ENGLAND.

DIRECT-ACTING PUMPING MACHINERY.

965,819. Specification of Letters Patent. Patented July 26, 1910.

Application filed June 1, 1909. Serial No. 499,329.

To all whom it may concern:

Be it known that I, JOHN HUTCHINGS, a subject of the King of Great Britain, residing at Capel House, 62 New Broad street, in the city of London, England, have invented certain new and useful Improvements in and Relating to Direct-Acting Pumping Machinery, of which the following is a specification.

This invention is designed to improve the construction of pumps for raising and forcing fluids, such as water, petroleum and other similar liquids of a non-corrosive nature, and of the kind known as direct acting pumps, actuated by compressed air, steam or other elastic fluid, or it may be driven by water.

According to the invention an improved construction of valve and valve mechanism which serve to control simultaneously the fluid to be driven and the motive fluid, are employed to direct said fluids into an improved arrangement of channels or passages adapted to serve alternately as admission or exhaust or delivery ways to and from the cylinders for the motive and the driven fluids respectively. A common source of supply of lubricant is provided and the general construction and arrangement of the pump is such that the whole of the reciprocating and other moving parts are totally inclosed.

In the drawings:—Figure 1 shows a front view of the pump partly in section. Fig. 2 shows a side elevation of Fig. 1 taken from the right hand side. Fig. 3 shows a corresponding side elevation taken from the left hand side of Fig. 1. Fig. 4 shows a section taken about the line A, A, Fig. 1. Fig. 5 shows a section taken centrally and at right angles to Fig. 1, in order the better to show the valve actuating parts. Fig. 6 shows another sectional view of the central parts of Fig. 1 taken on line parallel to but in rear of the line of section adopted in that figure. Fig. 7 is an upper side view of the parts seen in Fig. 2. Fig. 8 is an upper side view of the top of Fig. 1. Fig. 9 is a section taken through the middle of the respective passages, *a*, *b*, *o*. Fig. 10 is a similar section taken through the passages 15, 18, 20. Fig. 11 is a cross section of these passages 15, 18, 20, taken on the line B, B, Fig. 5. Fig. 12 is a similar view on the line C, C, Fig. 5.

According to this invention the valve comprises two truncated conical members *p*, *q*, each provided with oppositely disposed spindles *n* to which a lever *i* is keyed, and whereby angular movement is imparted to the valve; said lever being actuated by mechanism to be hereinafter described.

The member *p* of the valve is formed with a part-circumferential port 1 and with an axial port p^1, and the member *q* is formed with a part-circumferential port *m* and with a U-shaped internal port m^1.

21, 21, are packing rings and 22, 23, are screw caps whereby the said portions *p* and *q* are retained in position.

f is a fluid tight chamber wherein is situated valve-operating mechanism and which is filled with lubricant supplied by a pipe 24 from a suitable source (not shown). From said chamber *f* ducts or channels 25, 25, convey the lubricant to spaces 26, 26, (Fig. 1) whence the lubricant exudes on to the piston rings and the cylinder walls, the piston rod *e* passing through said chamber also conveys lubricant during its reciprocation to the glands through which it passes.

d, *h*, are pistons connected to a common piston rod *e* and adapted to reciprocate in cylinders *c*, *g*, respectively. Communicating with said cylinders and co-acting with the ports in said valve members *p* and *q* are a series of passages or channels for the conveyance of motive fluid and of driven fluid respectively.

The fluid employed as the motive agent enters under pressure at the pipe *a* and passes therethrough to the part-circumferential port 1 in the valve *p* and enters the passage *b* whence it is delivered through the opening 2 into the upper cylinder *c*. In this cylinder *c* there reciprocates the piston *d* mounted upon the rod *e* which passes through glands 3, 4, in the cylinders *c* and *g* respectively and through the intermediate lubricant chamber *f*. Caps 5 close the ends of the respective cylinders *c* and *g*. Mounted on said rod *e* and reciprocating in the cylinder *g* is the piston *h* which, during the downward movement of the piston *d*, descends and draws fluid to be forced along the passage 20 and around the part-circumferential port *m* of the valve *q* (Fig. 10) through the passage 15 into the cylinder *g*. At the same time the piston *h* expels fluid from the lower end of said cylinder through the passages 16 and 12 to and through the U-shaped internal port m^1 of valve *q* and thence away by the delivery passage 19.

The pressure of the motive fluid at the upper side of the piston *d* causes said piston to descend, any fluid which may be contained below said piston *d* being exhausted through the opening 17, passage *o* and axial port *p'*. the valve member *p* at this time occupying the position indicated in Figs. 2 and 9.

The valve operating mechanism comprises a stud 6 on the piston rod *e* which during the reciprocation of the latter contacts with the extremity 7 of the lever *i* moving said lever angularly in a downward direction and lowering the cylinder 8, articulated to said extremity 7. The movement of the cylinder 8 compresses a coiled spring 9 contained therein against the end of a secondary member 10 carried by trunnions 11 mounted in bearings in the extremity 12 of the lever *k;* and cylinder 8 sliding telescopically within the secondary member 10. The stud 6 having moved the lever *i* to about a horizontal position said stud comes into contact with the end 13 of the lever *k* and moves said lever *k* angularly about its pivotal axis 14, lowering the end 13 and raising the end 12. Directly the horizontal position of the parts is attained and passed the compressed spring 9 expands and instantaneously imparts angular movement to the valve; the parts then assuming the positions indicated by dotted lines in Fig. 5. This angular movement imparted to the valve reverses the positions of the ports from those shown in Figs. 4, 5, 9 and 10.

The reversal of the portion *p* of the valve causes the lower face of the piston *d* to receive the pressure of the motive fluid which enters through an aperture 17 from the pipe *o* controlled by the part-circumferential port 1 of the valve *p;* motive fluid being supplied to said pipe *o* from the main supply pipe *a*. As the piston *d* rises, the fluid above it which previously served to effect its downward stroke, is exhausted from the upper portion of the cylinder *c* through the opening 2, passage *b* and axial port *p'* from which port the fluid is discharged from the apparatus. Similarly the simultaneous reversal of the portion *q* of the valve diverts the flow of the forced fluid, and the upper face of the piston *h* forces the fluid out from the cylinder *g* through the passage 15 and the U-shaped internal port m^1 of said valve *q* into the delivery pipe 19. At the same time fluid to be forced is drawn through the inlet 16 (which previously served as a delivery port) from the pipe 18 which through the part-circumferential port *m* is in communication with the main intake pipe 20.

The replacement of the valve to the initial position is effected by the stud 28 during the return stroke of the piston rod *e*.

The intake end of the main supply pipe 20 for the fluid to be forced may be fitted with any convenient strainer of bulbous or other form.

Pumping machinery constructed as described will be found admirably adapted for employment, for example, in deep boreholes such as are formed in order to reach deposits of petroleum and other matters capable of being pumped to the surface of the ground. Also for clearing old disused or flooded mines, mine shafts, stopes, drives and the like, or for pumping water from the hulls of vessels, the basements of buildings, or in fact from any situations difficult of access; a great advantage of the invention being the general construction and arrangement whereby the whole of the apparatus is completely self contained and the mechanism is protected against injury or damage of any kind due to external sources. Moreover pumping machinery constructed as described may be employed in any of the situations mentioned without fixing to any support and practically in any position either above the water or submerged.

What I claim is:—

1. Pumping machinery comprising a pair of opposed cylinders a double-acting driving piston and a double-acting driven piston, a piston rod common to both pistons, a chamber intermediate said cylinders, a valve totally inclosed by said chamber and simultaneously controlling the admission and exhaust of the driving fluid and of the driven fluid, spring-controlled telescopic cylinders pivotally mounted in a cradle arranged to oscillate within said chamber and operatively connected to said valve, studs upon said piston rod to oscillate said cradle, and an arrangement of passages constructed upon said cylinders and chamber and co-acting with said valve to direct fluid toward and from said driving and driven pistons respectively.

2. Pumping machinery comprising a pair of opposed cylinders a double-acting driving piston and a double-acting driven piston, a piston rod common to both said pistons, a chamber intermediate said cylinders, a valve totally inclosed by said chamber and provided with ports for the simultaneous control of the driving fluid and of the driven fluid, spring-controlled telescopic cylinders operatively connected to said valve and pivotally mounted in a cradle arranged to oscillate within said chamber, studs upon said piston rod to oscillate said cradle, and an arrangement of passages constructed upon said cylinders and chamber and co-acting with said ports to direct said fluid toward and from said driving and driven pistons respectively.

3. Pumping machinery comprising a pair of opposed cylinders a double-acting driving piston and a double-acting driven piston, a piston rod common to both pistons, a chamber for lubricant intermediate said cylin-

ders, a valve totally inclosed within said chamber and provided with ports for the simultaneous control of the driving fluid and of the driven fluid, means whereby lubricant may be conveyed to said pistons and their respective cylinder walls, spring-controlled telescopic cylinders pivotally mounted in a cradle arranged to oscillate within said chamber, a lever operatively connecting said valve to said spring-controlled telescopic cylinders, studs upon said piston rod to oscillate said cradle, and an arrangement of passages constructed upon said cylinders and chamber and co-acting with said ports and adapted to serve alternately as exhaust and delivery ways for said driving and driven fluids respectively.

4. In pumping machinery of the type specified, an oscillating valve comprising two opposed truncated conical members, ports in one of said truncated conical members for the passage of the driving fluid, ports in the second of said truncated conical members for the admission and exhaust respectively of the driven fluid, passages co-acting with said ports in the one truncated conical member. passages co-acting with said ports in the second truncated conical member, an operating lever common to both said truncated conical members, spring-controlled telescopic cylinders connected to said operating lever, a chamber, a cradle pivotally supporting said telescopic cylinders and mounted to oscillate in said chamber, and means to oscillate said cradle.

5. In pumping machinery of the type specified, an oscillating valve comprising two opposed truncated conical members, ports in one of said truncated conical members for the passage of the driving fluid, ports in the second of said truncated conical members for the admission and exhaust respectively of the driven fluid, passages co-acting with said ports in the one truncated conical member, passages co-acting with said ports in the second truncated conical member, an operating lever common to both said truncated conical members, spring-controlled telescopic cylinders connected to said operating lever, a chamber, a cradle pivotally supporting said telescopic cylinders and mounted to oscillate in said chamber, a piston rod in said chamber, and studs upon the piston rod for oscillating said cradle during the reciprocation of said rod.

6. In pumping machinery of the type specified, an oscillating valve comprising two opposed truncated conical members, ports in one of said truncated conical members for the passage of the driving fluid, ports in the second of said truncated conical members for the admission and exhaust respectively of the driven fluid, passages co-acting with said ports in the one truncated conical member, passages co-acting with said ports in the second truncated conical member, an operating lever common to both said truncated conical members, spring-controlled telescopic cylinders connected to said operating lever, a chamber for lubricant, a cradle pivotally supporting said telescopic cylinders and mounted to oscillate in said chamber, a piston rod in said chamber, studs upon said piston rod for oscillating said cradle during the reciprocation of said rod, and means whereby lubricant may be conveyed from said chamber to lubricate the parts of said pumping machinery.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN HUTCHINGS.

Witnesses:
HARRY J. STOGTEN,
JOHN BAILEY.