H. S. HELE-SHAW & F. L. MARTINEAU.

PUMP AND MOTOR.

APPLICATION FILED APR. 7, 1911.

1,077,979. Patented Nov. 11, 1913.

4 SHEETS—SHEET 1.

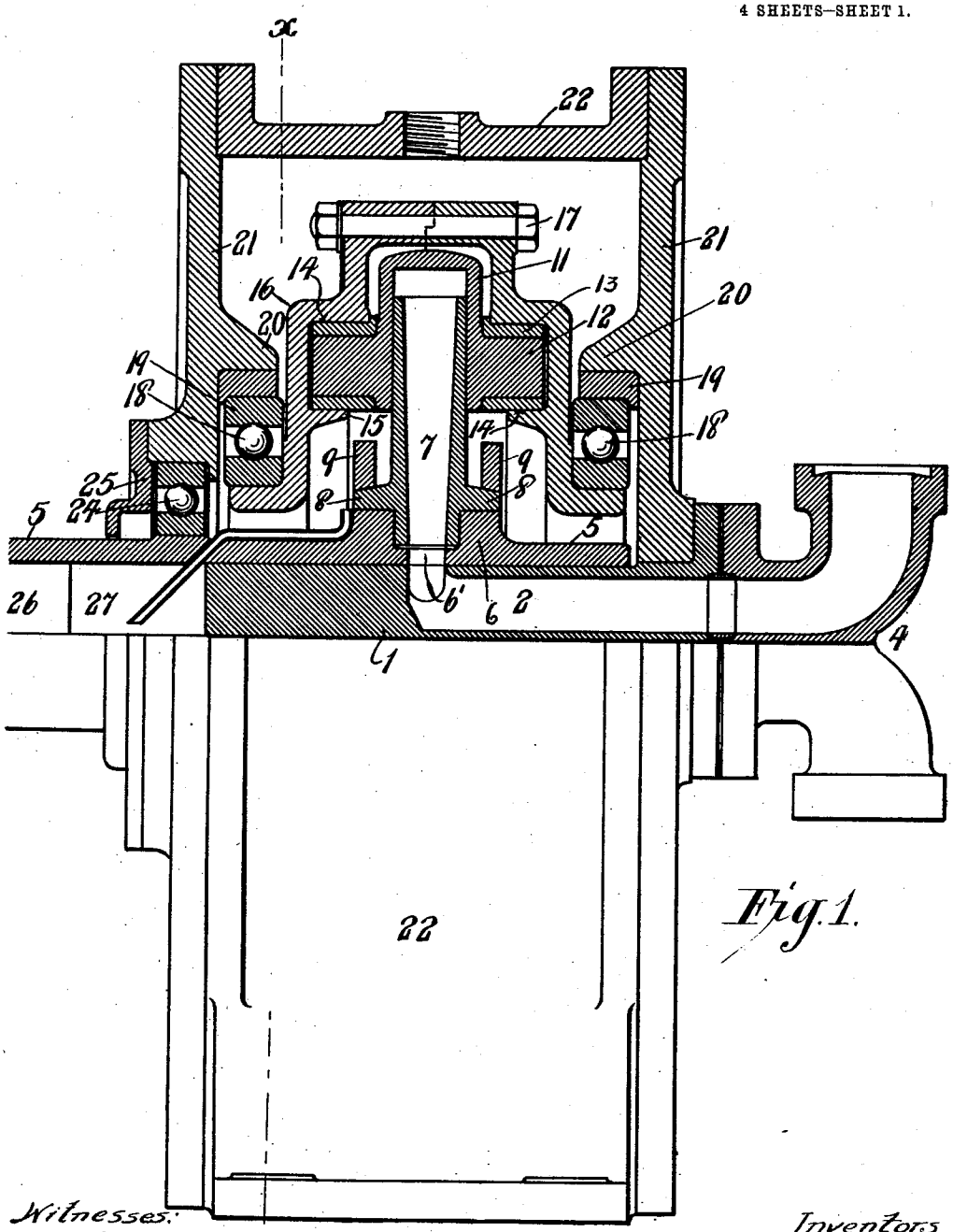


Fig. 1.

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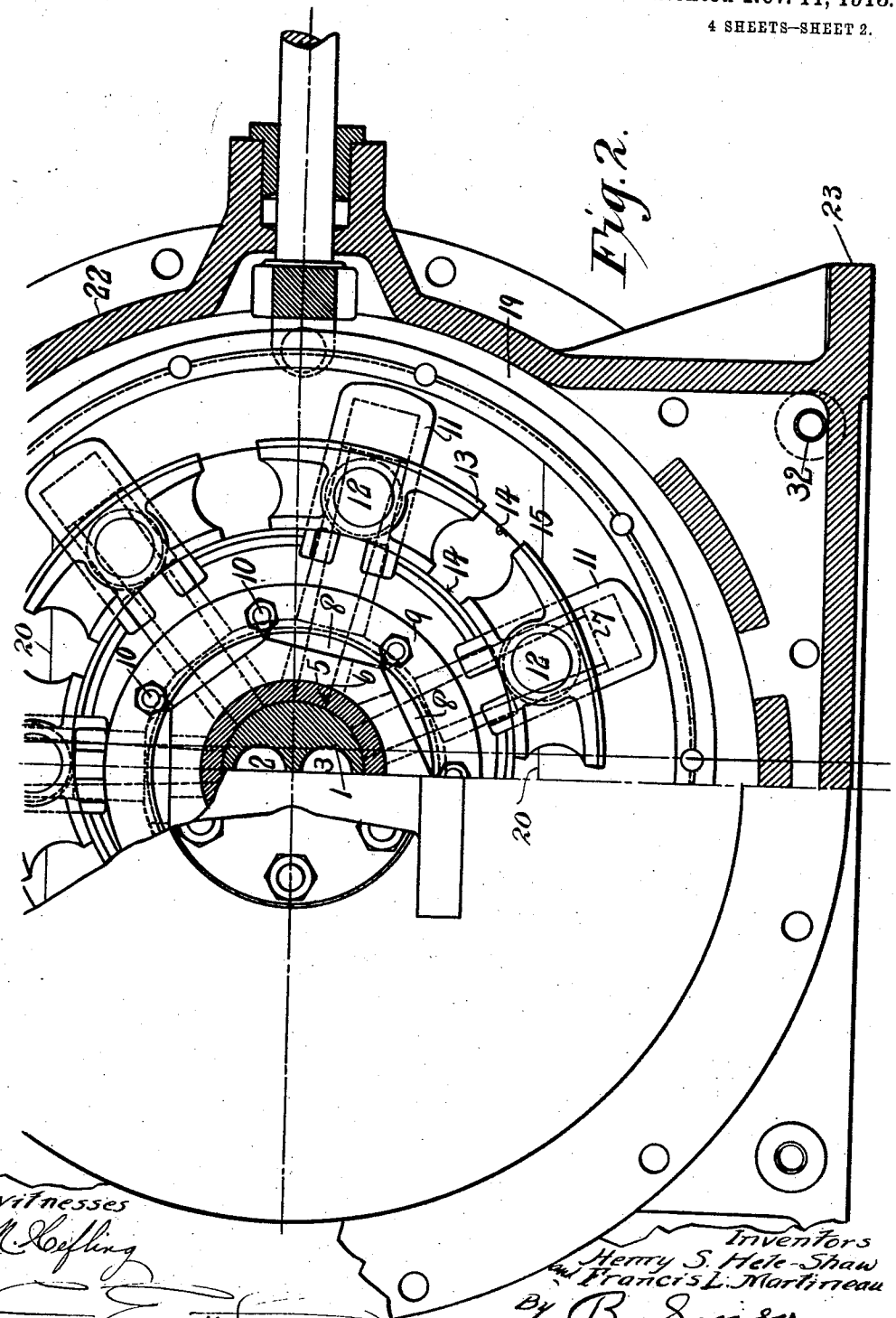
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4 SHEETS—SHEET 2.

Fig. 2.



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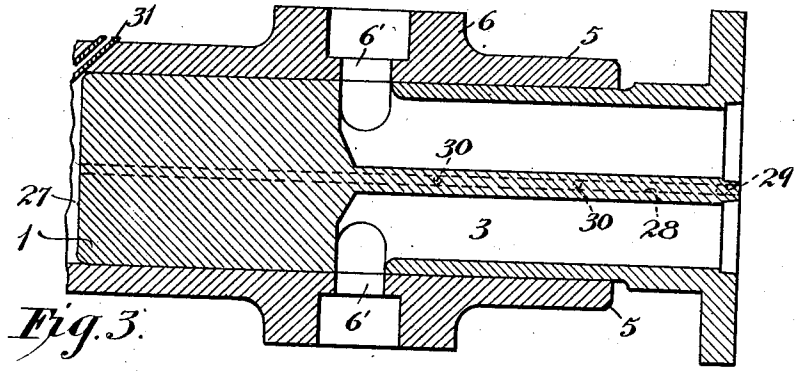


Fig. 3.

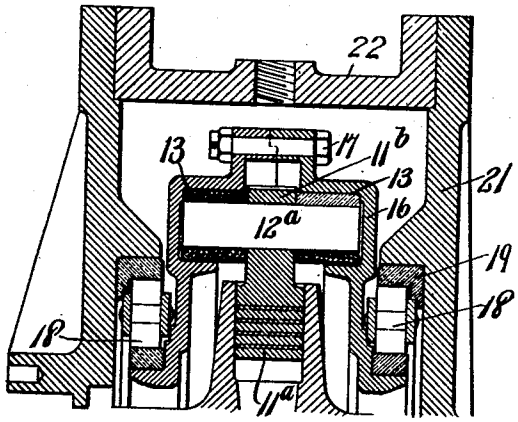


Fig. 5.

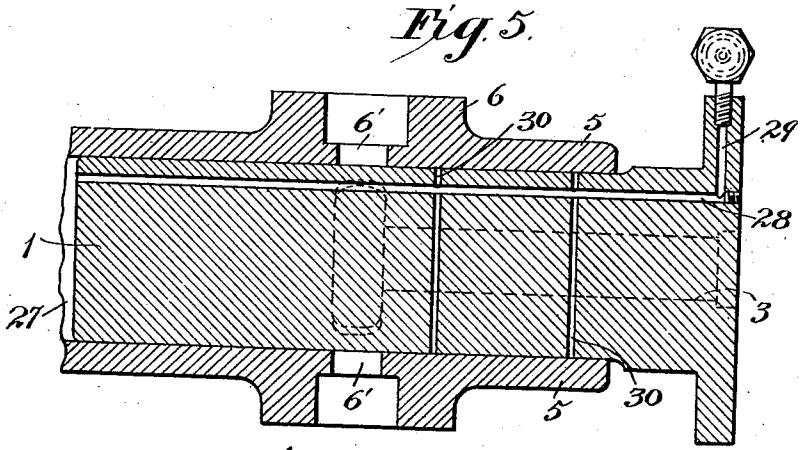


Fig. 4.

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4 SHEETS—SHEET 4.

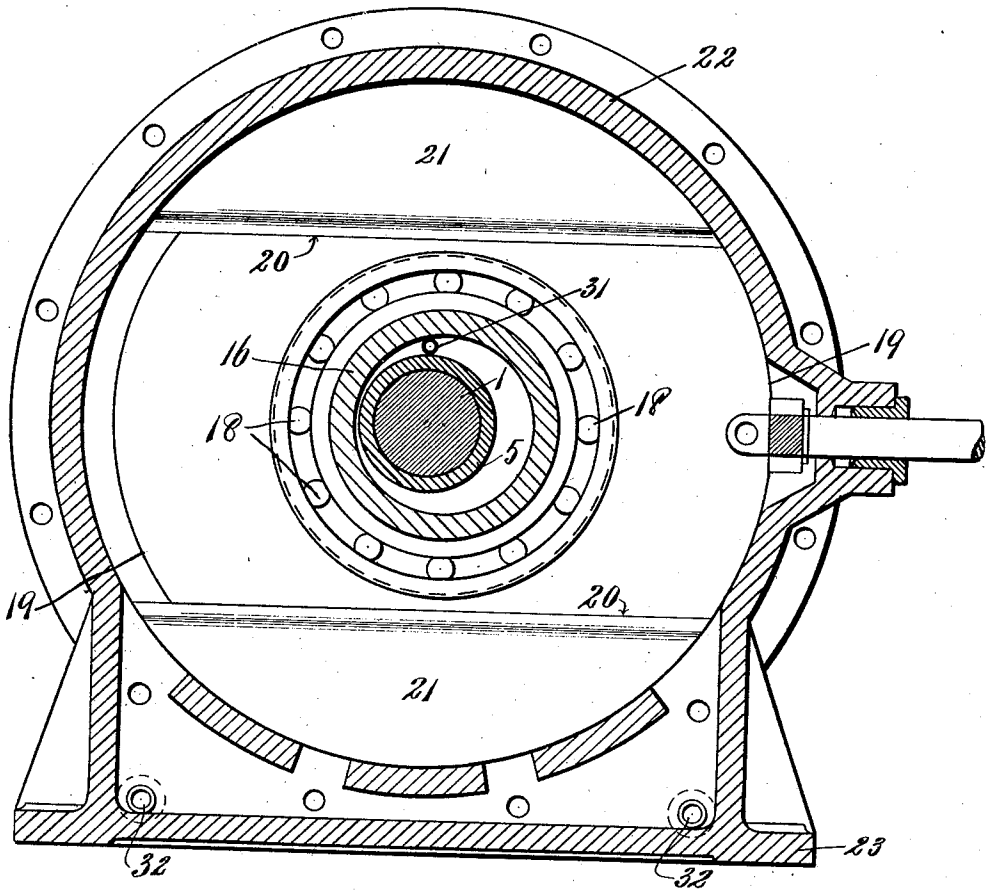


Fig. 6.

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UNITED STATES PATENT OFFICE.

HENRY SELBY HELE-SHAW AND FRANCIS LEIGH MARTINEAU, OF LONDON, ENGLAND.

PUMP AND MOTOR.

1,077,979. Specification of Letters Patent. Patented Nov. 11, 1913.

Application filed April 7, 1911. Serial No. 619,609.

To all whom it may concern:

Be it known that we, HENRY SELBY HELE-SHAW and FRANCIS LEIGH MARTINEAU, both of London, in the county of London, England, have invented certain new and useful Improvements in Pumps and Motors, of which the following is a specification.

This invention relates to improvements in pumps and motors and has reference to that form of apparatus wherein radial pistons cooperate without an eccentric stroke controlling and varying ring.

Our invention consists particularly in certain improvements which render the apparatus more efficient in its operations.

Among the more important features of the invention is the employment of cap pistons in combination with rollers or slippers carried by them and operating in conjunction with the particular construction or stroke varying ring or drum having its slipper or roller paths arranged on either side of the cylinders; said varying ring being of inclosed form whereby the working parts of the apparatus are automatically and effectively lubricated although the outer casing is empty and the loss due to the usual churning of oil in the case is entirely eliminated. The construction of the central valve and its connections of the form shown, is also of importance, said valve having a channel in its diaphragm for establishing a circulation of oil for lubricating between the valve and the cylinder body, and a suitable oil reservoir is provided into which oil leads and from which excess of oil is conducted by centrifugal force to supply the inside of the rotating inclosed stroke varying ring.

In order that the invention may be more readily understood and carried into effect, reference is hereby made to the accompanying drawings wherein—

Figure 1 is an elevational view partly in section of a pump constructed in accordance with our invention. Fig. 2 is a side elevational view thereof partly in section. Fig. 3 is a sectional view of the central valve at right angles to the diaphragm. Fig. 4 is a sectional view through the diaphragm of the central valve illustrating the means for insuring efficient lubrication between the cylinder body and the valve upon which it rotates, and Fig. 5 is a sectional view illustrating a slightly modified method of fitting the piston and its connections. Fig. 6 is a sectional side elevation view taken on the plane X—X′ of Fig. 1.

Referring to these drawings 1 designates the central valve which is constructed from a cylinder of metal, the inlet and outlet passages 2 and 3 being bored out longitudinally and the ports leading to these passages cut in the wall thus formed as will be clearly seen on reference to the drawing. To one end of this valve a double elbow or piece 4 is attached by means of flanges, and pipes may of course be connected to this elbow piece 4 in the ordinary way.

Upon the valve 1 a cylinder body sleeve 5 is rotatably mounted and at the thickened portion 6 of this sleeve faces are cut equal in number to the number of cylinders required. Openings 6′ are provided to coincide with the ports of the valve 1 and recesses are also provided to form sockets to receive the inner open ends of the cylinders 7. These cylinders are each provided with side flanges 8 and when all the cylinders are in position, the ends of these side flanges 8 abut one against the other, and the whole of the cylinders 7 are clamped together by the rings 9 on either side, which rings fit over the flanges 8 and are bolted together as at 10. The open outer ends of the cylinders 7 are closed by the cap or sleeve pistons 11 which slidably fit liquid tight upon them and these cap or sleeve pistons 11 carry preferably integrally with them, the trunnions 12 which serve to carry slippers 13 capable of angular movement upon the said trunnions. The same effect may however be obtained with pistons 11^a working in the cylinders as shown in Fig. 5. In this case the slippers or rollers 13 are carried upon pins or trunnions 12^a which pass through the extensions 11^b of the pistons, the floating ring 16 serving to maintain the whole in position.

The slippers 13—or in some cases it may be preferable to use rollers—run in grooves or paths 14 cut in the inner faces 15 of rings 16 which are bolted together by the bolts 17 and together form the stroke regulating and varying ring or drum, the stroke varying ring or drum being capable of movement so as to cause its axis to take positions on either side of the axis of the stationary valve so as to vary the stroke of the pistons and regulate the direction of the flow of liquid. This ring or drum made up of the two half members 16 is preferably rotatable as shown, and is mounted on ball or roller bearings 18

located on either side, the whole being slidable within limits to regulate the stroke, the bearing being carried by blocks 19 slidable between the slidebars or guides 20 carried by or integral with the walls 21 of the outer casing. The outer casing comprises in addition to these side walls 21 the steel or approximately annular member 22 having integral with it the support base 23. A ball bearing 24 is preferably interposed between the cylinder body sleeve 15 and the wall of the casing, a cap 25 being utilized to hold the bearing in place. The central valve 1, it will be noticed, has a solid end and the cylinder body sleeve is extended and serves to take the drive. The otherwise open end of this sleeve 5 is provided with a plug 26 and thus a reservoir 27 is formed between the end of this plug and the end of the valve 1. A passage 28 is drilled in the diaphragm of the valve 1 and the reservoir can thus be filled through the branch 29 and leakage between the cylinder body sleeve 5 and the valve 1 will also help to keep up the supply to this reservoir. Holes 30 lead from the passages 28 to supply liquid for lubricating purposes between the cylinder body sleeve 5 and the valve 1. Excess of liquid contained in the reservoir 27 is by centrifugal force discharged through the pipe 31 into the floating ring 16 and similarly excess of liquid in the ring 16 escapes through the bearings 18 into the outer casing and may be withdrawn from time to time through an opening or openings such as indicated at 32. The operation of the apparatus will be clear. The cylinder body sleeve 5 carrying the cylinders 7 is rotated and the cap or sleeve pistons 11 coöperate, through their slippers or equivalent devices 13 located in the paths 14, with the stroke varying or regulating eccentric ring 16 and thus reciprocating motion is transmitted to the said pistons and liquid is drawn into and discharged from the apparatus in the manner familiar to those conversant with this type of apparatus.

What we claim as our invention and desire by Letters Patent is:—

1. A pump or motor comprising a central valve provided with ports for the influx and efflux of fluid to and from the cylinders, cylinders rotatable about the said valve, pistons associated with the cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of the cylinders, circular cam paths in either side of said drum and devices carried on either side of said pistons operating without definite attachment in said cam paths substantially as specified.

2. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of the cylinders, devices carried by the pistons cooperating without attachment with said drum and means for supplying lubricant to the interior of said drum wherein said lubricant is maintained by centrifugal force and serves to effect and maintain lubrication substantially as specified.

3. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, an eccentrically situated liquid tight rotatable stroke controlling drum inclosing the pistons and outer ends of said cylinders and adapted to contain lubricating oil, cam paths in either side of said drum, and devices carried by the pistons operating without definite attachment in said cam paths substantially as specified.

4. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of the cylinders and adapted to contain lubricating oil, cam paths in the walls of said drum, devices carried by the pistons operating without definite attachment in said cam paths and means for varying the eccentricity of the drum substantially as specified.

5. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, a stroke controlling liquid tight drum inclosing the pistons and outer ends of said cylinders and adapted to contain lubricating oil, bearings carrying said drum, an empty casing in the side walls of which said bearings are slidably mounted and means for sliding said bearings and consequently said drum to vary the stroke of the pump or motor substantially as specified.

6. A pump or motor comprising a central valve, cylinders rotatable relative to said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of said cylinders with which drum said pistons coöperate without definite attachment, a lubrication reservoir adjacent the central valve and means for conveying the lubricant from the reservoir to the interior of the stroke controlling drum wherein said lubricant is maintained by centrifugal force, substantially as specified.

7. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and the outer ends of said cylinders with which drum the pistons coöperate without definite attachment, a lubrication reservoir adjacent the central valve and adapted to have its supply maintained by leakage, substantially as specified.

8. A pump or motor comprising an empty

casing, bearings carried by said casing, a liquid tight stroke controlling drum carried by said bearings, radial cylinders rotatable in bearings carried by the casing and having pistons coöperating with said drum without definite attachment, pistons reciprocating relative to said cylinders, a central valve about which said cylinders rotate, means for supplying lubricant to the interior of said drum wherein said lubricant is maintained by centrifugal force and excess escapes through and lubricates the adjacent bearings substantially as specified.

9. A pump or motor comprising a central valve, cylinders rotatable relative to said valve, pistons reciprocating relative to said cylinders, a rotatable liquid tight drum controlling the reciprocation of said pistons, said drum inclosing the pistons and the outer ends of said cylinders and containing lubricant maintained therein by centrifugal force substantially as specified.

10. A pump or motor comprising a central valve, cylinders rotatable relative to said valve, pistons reciprocating relative to said cylinders, a rotatable liquid tight drum comprising connected similar members controlling the reciprocation of said pistons, said drum inclosing the pistons and the outer ends of said cylinders and containing lubricant substantially as specified.

11. A pump or motor comprising a central valve, cylinders rotatable relative to said valve, pistons reciprocating relative to said cylinders, a rotatable liquid tight drum controlling the reciprocation of said cylinders, said drum inclosing the pistons and the outer ends of said cylinders and containing lubricant maintained therein by centrifugal force, an empty outer casing and bearings carried by said casing and rotatable supporting said liquid tight stroke controlling drum, substantially as specified.

12. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of the cylinders, devices carried by the pistons coöperating without definite attachment with said drum, means for supplying lubricant to the interior of said drum wherein said lubricant is maintained by centrifugal force, and means for varying the position of said drum to vary the stroke of the pistons substantially as specified.

13. A pump or motor comprising a central valve, cylinders rotatable relative to said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of said cylinders with which drum said pistons coöperate without definite attachment, a lubrication reservoir adjacent the central valve, means for conveying the lubricant from the reservoir to the interior of the stroke controlling drum wherein said lubricant is maintained by centrifugal force, and means for moving the axis of the drum to vary the stroke of the pistons, substantially as specified.

14. A pump or motor comprising a central valve, cylinders rotatable about said valve, pistons operating in said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and the outer ends of said cylinders with which drum the pistons coöperate without definite attachment, a lubrication reservoir adjacent the central valve and adapted to have its supply maintained by leakage, and means for initially charging said reservoir, substantially as specified.

15. A pump or motor comprising a central valve, cylinders rotatable about said valve, cap pistons operating liquid tight upon said cylinders, a rotatable liquid tight stroke controlling drum inclosing the pistons and outer ends of the cylinders, devices carried by the pistons coöperating without definite attachment with said drum, means for supplying lubricant to the interior of said drum wherein said lubricant is maintained by centrifugal force, and means for varying the position of said drum to vary the stroke of the pistons, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

HENRY SELBY HELE-SHAW.
FRANCIS LEIGH MARTINEAU.

Witnesses:
ALFRED AUGUSTUS THORNTON,
H. D. JAMESON.