

No. 773,365.

PATENTED OCT. 25, 1904.

C. H. ATKINS.
FLUID PRESSURE MOTOR.
APPLICATION FILED MAR. 3, 1904.

NO MODEL.

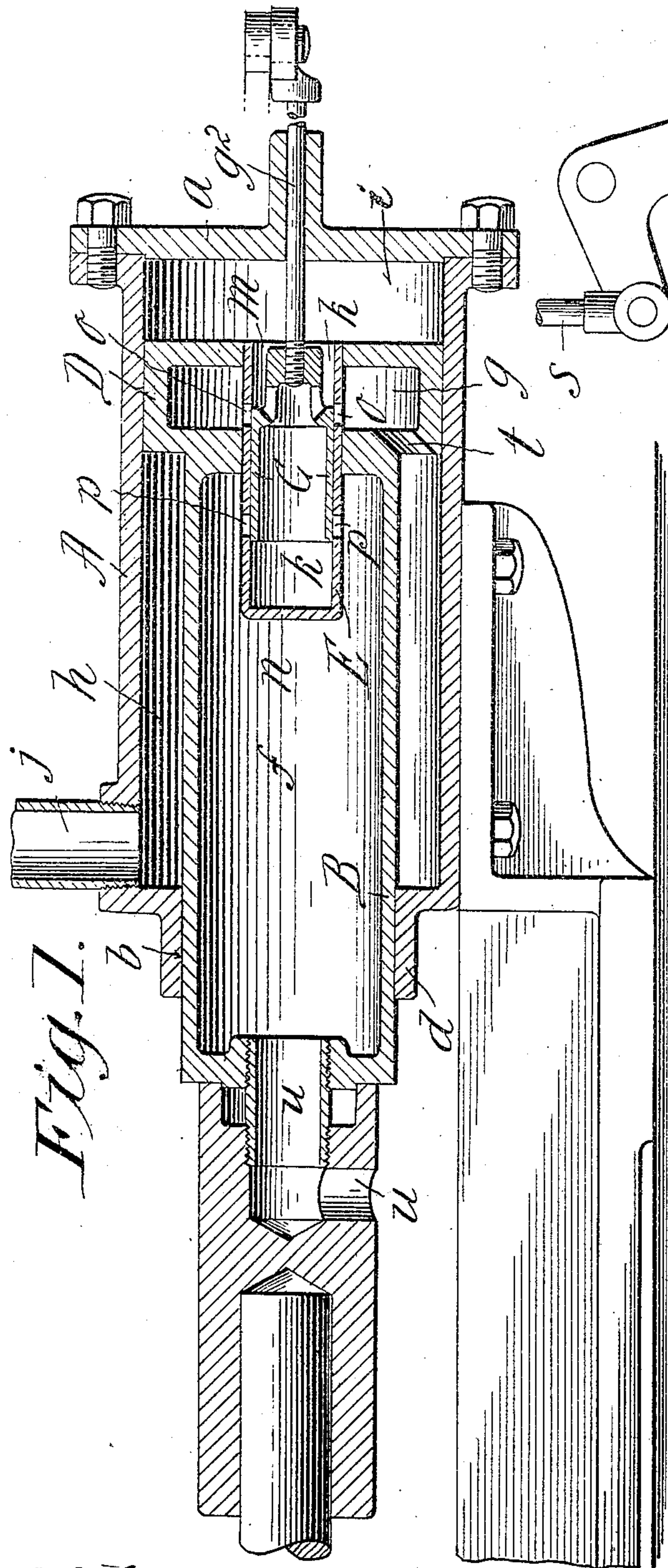


Fig. 1.

Witnesses:
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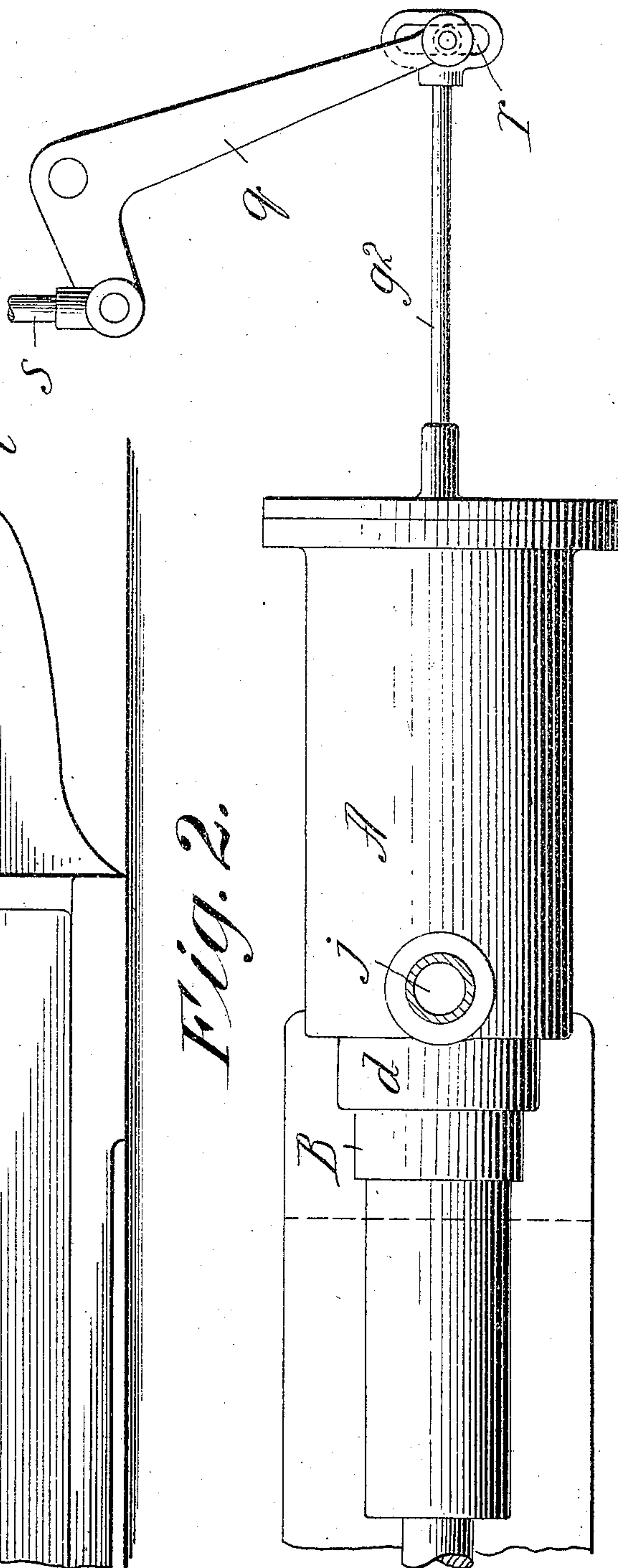


Fig. 2.

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FLUID-PRESSURE MOTOR.

SPECIFICATION forming part of Letters Patent No. 773,365, dated October 25, 1904.

Application filed March 3, 1904. Serial No. 196,341. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HENRY ATKINS, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Fluid-Pressure Motors, of which the following is a full, clear, and exact description.

This invention relates to a fluid-pressure motor, the object being to provide a motor or actuator for imparting motion to any part or device in an easily-controlled and positive manner and by the employment of a comparatively few, simply-formed, cheaply-constructed, and easily-assembled parts.

The situations in which the motor of the present kind may be utilized are numerous and various, as of course the reciprocating plunger comprised in the motor, and which is subject to the fluid-pressure controlled at pleasure by the cut-off valve, by which one is enabled to give at pleasure a more or less powerful access back of the piston-like head of the plunger to result in a more or less extended and a more or less powerful stroke being imparted to the plunger, may actuate or control any immovable part as described. The stroke of the plunger may be employed, for instance, to set a brake on a vehicle or car and when desired to cause a withdrawal of the brake from its set position.

The invention includes a cylinder having one end closed and at its other a contracted circular slide-bearing opening and a plunger slidable in said opening having a piston-like head constituting a slidable partition in the cylinder and creating in one end portion thereof a chamber which is the full cross-sectional area of the cylinder and at the other side of the piston an annular chamber which is of course of cross-sectionally smaller area, the inner boundary thereof being constituted by the periphery of the plunger, the cylinder having a pressure inlet-opening leading into the annular chamber and the apparatus comprising a fluid-way through the piston-like head for establishing communication from the annular chamber at one side of the head to the full-area chamber at the other side and a cut-off valve for opening and closing said

fluid-way; and the invention furthermore and otherwise consists in combinations and arrangements of parts and the constructions of certain of the parts, all substantially as hereinafter fully described, and set forth in the claims.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a central longitudinal sectional view through the fluid-pressure motor. Fig. 2 is a plan view of the same.

In the drawings, A represents a cylinder having at one end the closing-head *a* and having at its other end the somewhat contracted circular opening *b*, surrounded by the endwise-extended annular flange *d*, to afford a suitable length of slide-bearing for the differential plunger B, which is fitted to move for slide movement in and through said opening *b*. The said plunger is hollow, having the chamber *f* therein, and at its end toward the cylinder-head *a* it has the cylindrical flange-like head or piston D, with a chamber *g* therein, which is separate from the plunger-chamber *f*, and said piston-like head D closely fits and slides within the cylinder A and constitutes a movable partition, dividing the annular cylinder-chamber *h* from the full-area cylinder-chamber *i*. The annular cylinder-chamber *h* has its inner wall constituted by the periphery of the plunger B, and the cross-sectional area of this chamber is but fractional of the area of the chamber *i* at the other side of the head D.

j represents a fluid-pressure inlet-opening leading into the annular cylinder-chamber *h*.

Fitted within the head D, centrally thereof, is a casing E, of cylindrical form diametrically considerably less than the diameter of the plunger B, said casing inclosing a chamber *k* for the cylindrical cut-off valve G, the said casing being of a length to extend not only throughout the length of the head D, but to protrude for a suitable distance within the chamber *f* in the hollow plunger, and said casing opens endwise at *m* into the full-area cylinder-chamber *i*, while its opposite end *n* is closed from the plunger-chamber *f*. The said valve-casing E has at different portions in its length the sidewise-opening ports *o* and *p*, the one, *o*, outwardly opening into the plun-

ger-head chamber g , while the one, p , opens into the plunger-chamber f . The said valve G has an axially-extended stem g^2 , with which one arm of a bell-crank lever q has a stud-and-slot engagement, as indicated at r , a thrust-rod or operating-rod s being connected with the other arm of the bell-crank lever for operating it and the cut-off valve.

Through the inner end wall of the hollow plunger-head D is a port t , which forms communication from the annular cylinder-chamber h into the plunger-head chamber g .

At the end of the plunger B which protrudes endwise beyond the bearing-opening b therefor of the cylinder is an outlet relief-passage u for the pressure-fluid.

The cylindrical cut-off valve G is of such a length relatively to the ports o and p , distanced as shown, that when the valve is slid through the bell-crank or other operating mechanism therefor inwardly, so as to uncover the port o or duplicated ports, the end portion of the valve will fully close the port or duplicated ports p .

The pressure fluid, whether compressed air, water, steam, or whatever it may be, entering through the inlet j into the annular cylinder-chamber h will find its way through the port t into plunger-head chamber g , thence through port o , and by way of the endwise-opening valve-chamber k into the full-area cylinder-chamber i , and according to the differences in the areas between the cylinder-chamber i and the annular chamber h there will be a preponderating and greater working force in the chamber i , overpowering and working against the fluid-pressure in the annular chamber h , resulting in the piston-like head being moved in an inward direction—that is, leftward—until the valve-casing E has, with the piston-headed plunger, been carried so that its port o has been moved to the right-hand end of the valve G , whereupon the fluid-pressure access into the full-area cylinder-chamber i will be cut off, at which time the motion of the plunger will stop, and as the plunger by its working movement to the leftward establishes a closing of the port o it brings the port p relatively to the valve, so that a very slight movement given to the valve by the valve-actuating mechanism will open the said port p , whereby all compressed air back of the plunger-head may be relieved through the valve and port p and relief-passage u to enable the pressure fluid in the portion of the cylinder-chamber having the smaller cross-sectional pressure area to work against the plunger-head or piston to carry it to the rightward and to whatever may be regarded as its normal or starting position.

Of course after the valve-stem g^2 has been moved inwardly to any given extent, the plunger at the same time following it, the valve may be given another and still further inward movement for a continuance of the working

stroke, repetitions of the combined inward movements of the valve and plunger being possible within the limits or range of action of the apparatus.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a fluid-pressure motor, in combination, a cylinder having at one end a head, and at the other a contracted opening, and provided with a pressure inlet-opening, a differential plunger slidable through said contracted opening, and having a hollow piston-head, fitting in the cylinder, and provided with a port, establishing communication between the cylinder-chamber and the chamber in the hollow piston-head, a valve-chamber within said piston-head of the plunger, opening endwise to the cylinder-chamber, and having a port opening to the chamber in the piston-head, and a cut-off valve endwise movable in said valve-chamber.

2. In a fluid-pressure motor, in combination, a cylinder having at one end a head and at the other a contracted opening, and provided with a pressure inlet-opening, a hollow plunger slidable through said contracted opening and having a hollow piston-head, fitting in the cylinder, and provided with a port, establishing communication between the cylinder-chamber and the chamber in the plunger-head, and having at its opposite end an outlet or relief passage, a valve-chamber concentrically within the chamber in the hollow piston-head and extending centrally through and within the hollow piston-head, inwardly closed from the plunger-chamber and outwardly open to the end portion of the cylinder partitioned by the hollow piston-head, and having ports opening to the plunger and hollow piston-head chambers, respectively, and a movable cut-off valve in the valve-chamber and so arranged in opening one of said ports as to close the other, and vice versa, substantially as described.

3. In a fluid-pressure motor, in combination, a cylinder closed at one end, having at its other end a contracted circular slide-bearing opening, and having a pressure inlet-opening, a chambered plunger slidably fitted in said opening, having a cylindrical head enlargement, constructed with a chamber and a port therein communicating from the cylinder-chamber with the hollow piston-head, and having a relief outlet-opening endwise beyond the cylinder, a cylindrical valve-casing centrally located at and within the hollow piston-head of the plunger, having ports communicating with the plunger-chamber and with the hollow piston-head, and opening at the end of the head, a cylindrical cut-off valve arranged to alternately open and close said ports, and a valve-stem extended through the closed end of the cylinder.

4. In a fluid-pressure motor, in combination, a cylinder having one end closed and at

its other a contracted circular slide-bearing opening, and a plunger slidable in said opening, having a hollow piston-like head, constituting a slidable partition in the cylinder, and
5 creating in one end portion thereof, a chamber, the full area of the cylinder, and at the other side of the piston an annular chamber, of cross-sectionally smaller area, the inner boundary of which is constituted by the plunger, the cylinder having a fluid-pressure inlet-opening leading into the annular chamber, a port through the hollow piston-head for establishing communication from the annular chamber to the full-area chamber, and a cut-off valve for opening and closing said port.
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5. In a fluid-pressure motor, in combination, a cylinder having one end closed and at its other a contracted slide-bearing opening, a plunger in the cylinder and slidable in said
20 opening, having a hollow piston-like head,

constituting a movable partition in the cylinder, and creating in one end portion thereof, a chamber, the full area of the cylinder, and at the other side of the piston an annular chamber, of cross-sectionally smaller area, the cylinder having a fluid-pressure inlet-opening leading into the annular chamber, a port through the hollow piston-head for establishing communication from the annular chamber to the full-area chamber, a cut-off valve for opening and closing said port, and means for establishing an exhaust-outlet from the full-area cylinder-chamber, for the purposes set forth.
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Signed by me at Springfield, Massachusetts, in presence of two subscribing witnesses.

CHARLES HENRY ATKINS.

Witnesses:

WM. S. BELLOWS,
A. V. LEAHY.