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P. T. COFFIELD.

ROTARY WATER PRESSURE MOTOR.

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Fig. 1.

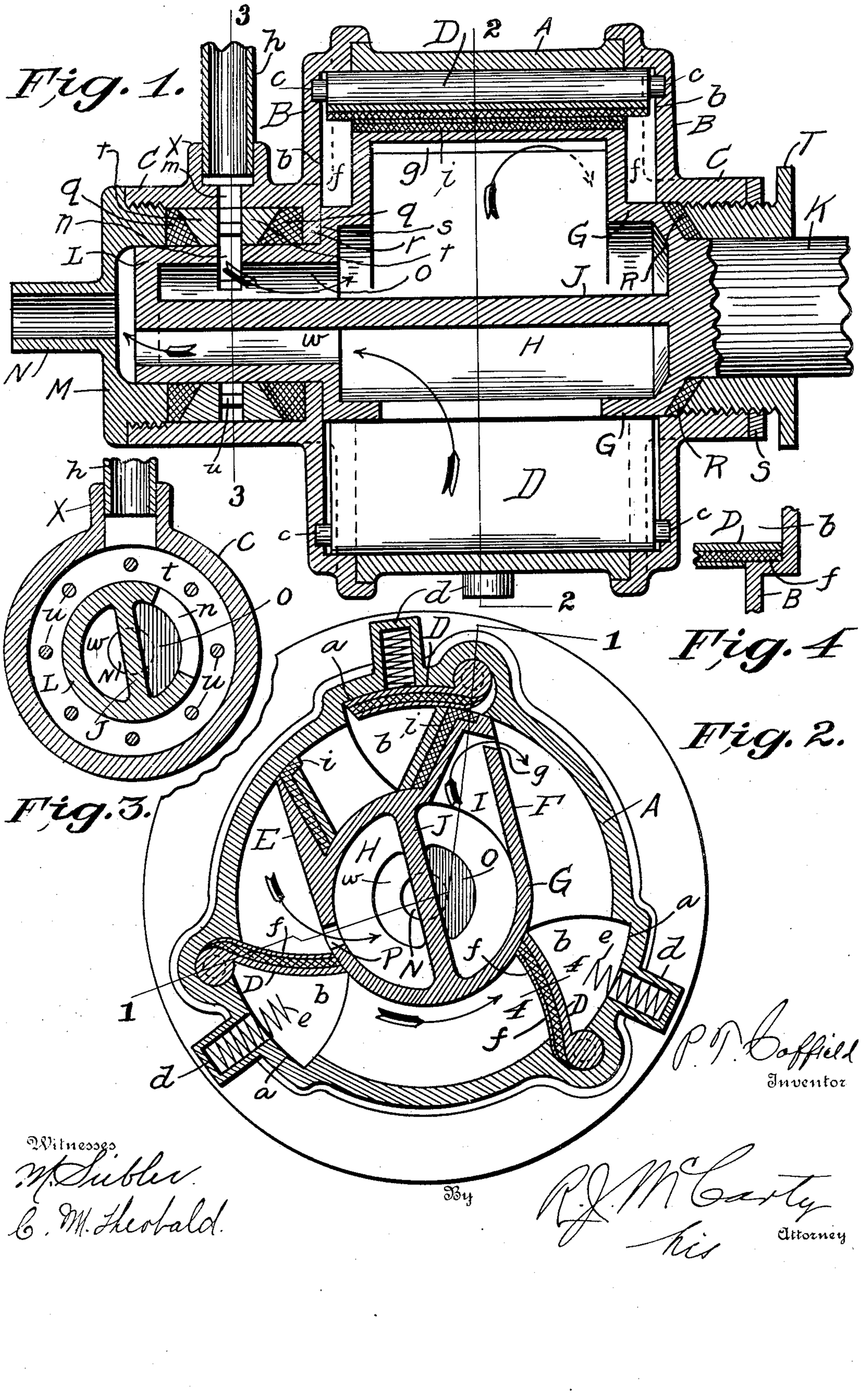

Fig. 4

Fig. 3.

Fig. 2.

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ROTARY WATER-PRESSURE MOTOR.

No. 878,044. Specification of Letters Patent. Patented Feb. 4, 1908.

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To all whom it may concern:

Be it known that I, PETER T. COFFIELD, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Rotary Water-Pressure Motors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in rotary pressure motors adapted to be driven by the water pressure from a hydrant or faucet. In motors of this type, the problem has been to construct a motor so that the energizing fluid cannot pass the rotating piston or the valves at any point of its movement and flow to the exhaust passage without exercising any energy against the piston. A very small amount of "slip" when the water supply is limited, will defeat the operations of the motor.

It is therefore, the object of the invention to so construct the motor that the water will be controlled and prevented from escaping to the exhaust until the full pressure thereof has been exerted to drive the piston.

In many localities the cost of water is considerable and its waste is to be avoided, therefore, a further object of the invention is to provide a motor which will utilize the full force of the water and avoid any waste thereof, and at the same time a motor of such simplicity that it can be built at a comparatively small cost, and combines a minimum weight; occupies a minimum amount of space, and is an economical user of water.

A rotary type of motor designed to use energizing fluid under pressure must have means for trapping the energizing fluid in the rear of the rotating piston, to form an abutment to hold the fluid as it flows into the cylinder to force the piston in its movements. It has been found extremely difficult to provide means for trapping the fluid as above indicated, and at the same time prevent it from passing the piston as said piston passes the points where the means for trapping the fluid are located. It will be understood that should the fluid pass the piston at such points, it will escape freely through the exhaust or outlet and interfere with the operations of the motor. To prevent this escape of the fluid at the points where the piston passes the trapping devices, I have employed the following instrumentalities in a casing having suitable pockets and swinging valves, a double piston or the equivalent of two pistons placed at such distance apart that the first piston, or the one moving in advance of the other, will have passed a driver or swinging valve and its pocket before the second or rearward piston has reached the same, so that the water will be held by the first piston and packing while the second piston is passing. This overcomes the necessity of providing difficult packing at these points and avoids the troubles heretofore experienced. Those who are familiar with the problems peculiar to this type of motor, will recognize the importance of controlling the energizing fluid in such a manner that the inlet to the motor will at no time be open to the exhaust; with these exigencies in view I have provided an inlet port in the rearward or second piston near the wall of the cylinder so that the drivers or swinging valves will be pressed toward the piston by the water pressure immediately after said drivers or valves start from their positions in the pockets where they have been driven by the first or forward piston as it was passing such point.

The exhaust port is located in the cylinder portion of the piston, said cylinder portion being common to both pistons, and said exhaust port being near the base of the first piston and slightly in advance of it. The water enters through an opening in the side of the hollow piston shaft to the inlet port in the second or rearward piston. On each side of the inlet port in said hollow shaft there is placed a packing gland with suitable packing to prevent the water from passing into the exhaust on the one side and from entering the cylinder around the shaft on the other side, so that all the water must pass into the motor through the proper port where its full force can be utilized. The object of locating the inlet port in the side of the hollow shaft instead of the end of said shaft, is to avoid pressure against the end of the shaft, which would be equal to the pressure per square inch exerted on the piston. This end pressure would tend to lessen the efficiency of the motor and cause it to wear out of alinement which are features to be avoided.

Preceding a more detailed description of the invention, reference is made to the accompanying drawings, of which—

Figure 1, is a longitudinal sectional view on the line 1—1 of Fig. 2. Fig. 2, is a cross section on the line 2—2 of Fig. 1. Fig. 3 is a cross section on the line 3—3 of Fig. 1. Fig. 4, is a section on the line 4—4 of Fig. 2.

In a detail description of the invention, similar reference characters indicate corresponding parts.

The cylindrical motor casing A has its inner periphery provided with a series of pockets *a*. The ends of said casing are inclosed by cylinder heads B B having their inner sides provided with a similar number of pockets *b* which register with the pockets *a* in the cylinder or casing. The heads B B have outward tubular extenions C C. As the motor is illustrated, there are three pockets formed as above indicated in the cylindrical casing and heads, and hinged in each of said pockets after the manner of a flap valve, is a driver or swinging valve D. Each of these valves is composed of suitable packing or leather which lies between two plates and each valve is pivoted in the cylinder heads at *c*. Extending outwardly from the pockets *a* is a similar number of spring pockets *d* provided for coil springs which exert an inward pressure upon the drivers or swinging valves D. As before stated, the journals of these valves are mounted in the cylinder heads so that when said valves are in their inner positions, they engage shoulders *f* in the cylinder heads. These shoulders *f* are formed in the pockets *b* in the cylinder heads and they act as valve seats for the valves when said valves move to their inner positions and thus the water is prevented from escaping around the valves and the motor is made perfectly water-tight, while the drivers or swinging valves fit loosely in their pockets.

It will be understood that the three drivers or swinging valves are extended at their ends into the pockets *b* in the cylinder heads, and that said pockets meet the pockets in the cylinder or motor casing and provide seats for the valves as before indicated.

The piston comprises two members E and F, one of which moves in advance of the other and both of which are united to a cylindrical portion G through which the inlet and outlet to and from the motor takes place. The cylindrical portion of the double piston provides two chambers H and I with a division wall J extending longitudinally from the solid shaft portion K of said piston to the end of the hollow shaft portion L. The solid shaft portion K of the piston is the shaft through which the power is transmitted, and the hollow shaft L is the portion through which the inlet and outlet from the motor takes place.

The double piston E and F is placed at the proper distance apart in order that the first or advancing piston E will have passed a swinging valve D and its pocket before the second piston F reaches the same, and the water will be prevented from escaping at any period during which it is exerting a driving pressure upon the second or rearward piston. The second piston F, as well as the first piston is provided with suitable packing *i*. The inlet port *g* in the second piston is near the wall of the cylinder A. The water enters the motor through an inlet pipe *h* connected with the hydrant or faucet (not shown.) The pipe *h* connects with a nozzle *x* on the tubular extension C of one of the cylinder heads. This tubular extension C also has a port *m* which registers with the inlet pipe *h* and with a port *n* in the side of the hollow shaft L of the piston. The port *n* communicates with a chamber *o* in said hollow shaft, and said chamber *o* communicates with the inlet chamber I of the piston. The chamber *o* is inclosed at its outer side by the end wall of the hollow shaft. The water entering the chamber *o* through the port *n* passes directly to the interior of the second or rearward piston member F and through the port *g* to expend its force against said piston. The arrow in Fig. 2 indicates the direction of the piston movement resulting from the inflow of water to the chamber I and thence through the port *g*. The water is trapped by the lower driver or swinging valve D which is in contact with the cylindrical portion of the piston with its ends seated on the seats *f* in the cylinder heads. It will thus be seen that the water enters the axis of the piston and flows directly to a point behind the second piston and is there trapped. When the second piston F passes a swinging valve and its pocket, the spring *e* initially moves the valve inwardly to be engaged by the current of water passing out of the port *g* and the force of said water promptly moves said valve to the limit of its inward movement on the seats *f*. The hollow shaft L of the piston is surrounded by packing *q*, the inner packing abutting against an annular flange or shoulder *r* on the cylinder head. This shoulder or flange *r* lies on the outer side of a corresponding shoulder *s* joining the piston and the hollow shaft portion of the piston, and the shoulder *r* relieves the piston from any end pressure due to the incoming water. A similar seat is provided for the outer packing by the cap nut M which screws into the end of the hollow extension C of the head. This cap nut M has an outlet pipe N joined thereto through which the motor exhausts. Engaging the inner sides of the packing *q* are two metallic glands *t* which are separated by distance pins *u* which maintain said packing on each side of the inlet ports *m* and *n*. The pressure of the incoming water has an effect to maintain these

packing glands tightly against the packing and the packing tightly against their seats, which as before stated, are provided by the flange *r* and the cap nut M. By means of these devices the piston is entirely relieved of any end pressure, the water pressure being exerted equally on the packing glands and packing and not upon the piston. The exhaust water is carried from the motor through the extreme end of the hollow shaft L, entering this portion of the shaft from the outlet chamber H in the piston. The said outlet chamber receives the exhaust from the motor cylinder through an exhaust port P in the cylindrical portion of the piston, and from the chamber H the water enters the passage *w* in the hollow shaft and passes through the end of said shaft to the outlet pipe N, from whence it is conducted to the sink or drain by a rubber hose or other suitable piping (not shown.)

The solid portion K of the piston shaft passes through a stuffing box formed by the cylindrical extension C of the head on that side of the motor, and an internal nut T which screws into said cylindrical extension and between which nut and the cylindrical portion of the piston a packing ring R is placed. The internal nut T engages the packing ring and is locked by a jam nut S.

From Fig. 2 it will be seen that the water is prevented from escaping while exerting its pressure upon the piston. This is due to the arrangement of one piston in advance of the other, the one moving in advance of the other being adapted to pass a valve and pocket before the second or rearward piston reaches the same. The result is, the water is held by the first piston and its packing, while the second piston is passing a pocket and valve and vice versa.

While I have shown the piston as consisting of two distinct members E and F, each of which is provided with suitable packing, I do not desire to limit myself to this particular construction of a double piston, for it can be readily seen that the space between the two members of the piston may be occupied or filled by a moving part of the piston and thus the idea of two separate piston members might be eliminated. It may be stated, however, that if it were possible to construct the piston so that the space between the two piston members might be occupied by an integral part or parts of the piston, it would be necessary to employ the two separate packings to seal the motor cylinder in the manner hereinbefore specified.

The novel construction by which the pressure due to the incoming water is utilized to keep the packing glands pressed firmly against the packing, is also a feature that I wish to claim broadly, as a means of self-adjustment of these parts which render no other means necessary to keep the packing tight, the water pressure driving the glands apart and compressing the packing to the proper degree.

Another important feature of the invention which I desire to emphasize is—a construction and arrangement of swinging valves which have a free and easy movement, and seat substantially like the valve in a pump

I claim:

1. In a rotary pressure motor, a casing having two or more pockets, a driver or swinging valve located in each pocket, a double piston rotatable in said casing and adapted to seal the motor and to prevent slip or waste of fluid while passing any one of said drivers or swinging valves, and means for supplying and exhausting the water to and from the motor.

2. In a rotary pressure motor, a casing having pockets therein, drivers or swinging valves located in said pockets, a double piston rotatable in said casing, the shaft carrying said piston having inlet and exhaust passages therein through which the supply and discharge of fluid to and from the motor takes place.

3. In a rotary pressure motor, a casing having pockets therein, drivers or swinging valves in said pockets, a double piston rotatable in said casing, a central shaft carrying said double piston and provided with inlet and exhaust passages and a double-gland stuffing box.

4. In a rotary pressure motor, a casing having pockets therein, drivers or swinging valves in said pockets, and a double piston coöperating with said valves and pockets to prevent slip or waste of fluid at any point in the rotation of the piston, and means for supplying and exhausting the motive fluid.

5. In a rotary pressure motor, a cylinder having pockets, swinging valves in said pockets, springs exerting inward pressure on said valves, and a double piston in the cylinder adapted to move each valve outwardly in passing the same, and permitting said valve to move inwardly when passed by said piston and thereby prevent slip or waste of fluid when the piston is passing the pockets in the cylinder, and means for supplying and exhausting the motive fluid.

6. In a rotary pressure motor, a casing having pockets therein, a swinging valve in each pocket, a piston rotatable in said casing and having two packed portions one moving in advance of the other to seal the exhaust chamber from the inlet chamber when the piston is passing a pocket, and means for supplying and exhausting the motive fluid.

7. In a rotary pressure motor, a casing having pockets therein, a swinging valve in each pocket, a piston rotatable in said casing and having two packed portions one moving

in advance of the other to seal the exhaust chamber from the inlet chamber when the piston is passing a pocket, the piston having a hollow shaft with inlet and outlet passages therein.

8. In a rotary pressure motor, a casing having a series of pockets, a swinging valve in each pocket, a piston rotatable in said casing, said piston having packing at two different points, one moving in advance of the other to seal the exhaust chamber from the inlet chamber when the piston is passing a pocket, and means for supplying and exhausting the motive fluid.

9. In a rotary pressure motor, a casing having a series of pockets therein, an inclosing head for each end of said casing, said inclosing head having pockets registering with those in the casing, swinging valves located in said pockets, the ends of said valves having seats in the pockets in the heads, a rotatable piston having two separate packings one moving in advance of the other to seal the exhaust chamber from the inlet chamber when the piston is passing a pocket, and means for supplying and exhausting the motive fluid.

10. In a rotary pressure motor, a casing having a series of pockets therein, inclosing heads for said casing having pockets registering with the pockets in the casing, swinging valves in said pockets, the ends of said valves having seats in the pockets in the heads, and a double piston rotatable in said casing and coöperating with the valves and their pockets to seal the exhaust chamber from the inlet chamber when the rearward portion of the piston is passing a pocket, and means for supplying and exhausting the motive fluid.

11. In a rotary pressure motor, a cylinder having pockets therein, a driver or swinging valve in each pocket, a double piston revolving in said casing and adapted to seal the fluid while the piston is passing a pocket, said piston having a hollow shaft divided into two non-communicating chambers, one of said chambers receiving the inlet of fluid through the side of the shaft, and the other chamber discharging the exhaust through the end of the shaft.

12. In a rotary pressure motor, a casing having pockets therein, a swinging valve in each pocket, a piston rotatable in said casing having two packed portions one moving in advance of the other to seal the exhaust chamber from the inlet chamber when the piston is passing a pocket, said piston having an inlet port near the wall of the casing, and its outlet port near the axis of the piston.

13. In a rotary pressure motor, a casing having pockets therein, and inclosing heads with pockets registering with the pockets in the casing, swinging valves located in said pockets, the pockets in the inclosing heads providing seats for the ends of the valves, a double piston revolving in said casing and adapted to seal the motor and prevent slip or waste of fluid while the piston is passing a pocket, and means for supplying and exhausting the motive fluid.

14. In a rotary pressure motor, a cylindrical casing having pockets therein, inclosing heads for said casing having pockets registering with the pockets in the casing, swinging valves in said pockets, a double piston rotatable in said casing, one member of said piston being adapted to pass a valve and pocket before the second member of the piston reaches the same, and means for supplying and exhausting the motive fluid.

15. In a rotary pressure motor, a casing having a series of pockets, inclosing heads having a corresponding series of pockets registering with those in the casing, a swinging valve in each of said pockets adapted to seat in the pockets in the inclosing heads, a revolving piston in said casing having two members extending from a cylindrical body, said cylindrical body having a hollow shaft portion providing an inlet and outlet therethrough to and from the piston, packing surrounding said hollow shaft portion metallic rings engaging said packing, and an inlet port in the hollow shaft between the packing and whereby the fluid passing through said port exerts a pressure upon the metallic rings and the packing to preserve a proper engagement of the packing.

16. In a rotary pressure motor, a casing having pockets therein, inclosing heads for said casing with pockets registering with those in the casing, a swinging valve pivoted in the heads and lying within said pockets, the pockets in the heads providing seats for the ends of the valves, a rotatable piston having one portion moving in advance of the other and sealing the motor against slip or leakage, said piston having a hollow shaft through the side of which the inlet port is provided and through the end of which the exhaust passage is provided, packing surrounding said hollow shaft and abutting against a flange on one of the heads, and a cap nut forming an abutment for the outer packing, packing glands engaging said packing on each side of the inlet port.

In testimony whereof I affix my signature, in presence of two witnesses.

PETER T. COFFIELD.

Witnesses:
JAMES L. COFFIELD,
R. J. MCCARTY.