

J. M. LARSON.  
 VALVE OPERATING MECHANISM FOR MOTORS.  
 APPLICATION FILED MAR. 4, 1912.

1,044,197.

Patented Nov. 12, 1912.  
 3 SHEETS-SHEET 1.

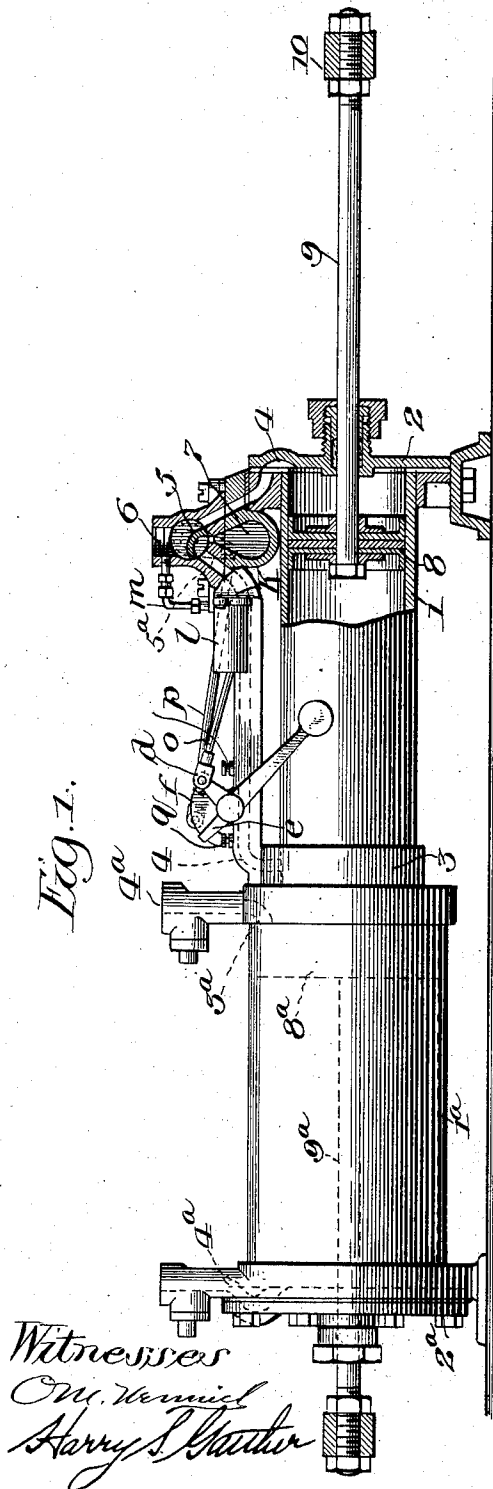


Fig. 1.

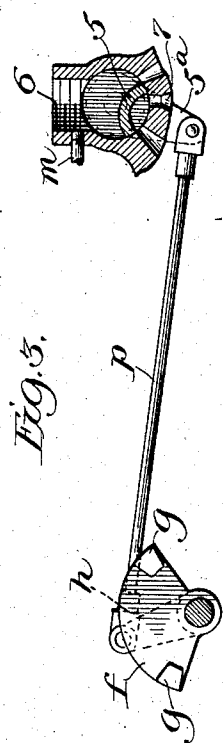


Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 2.

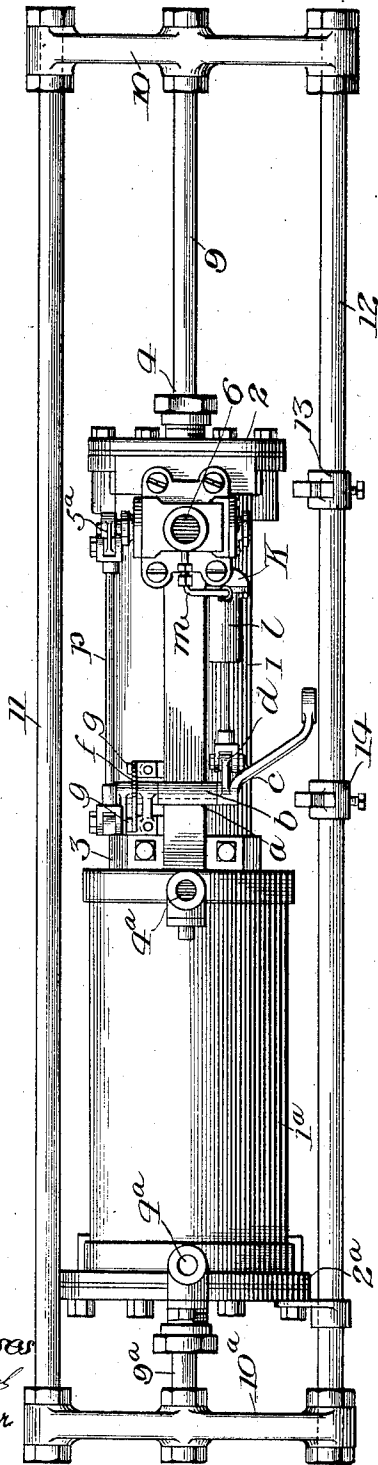
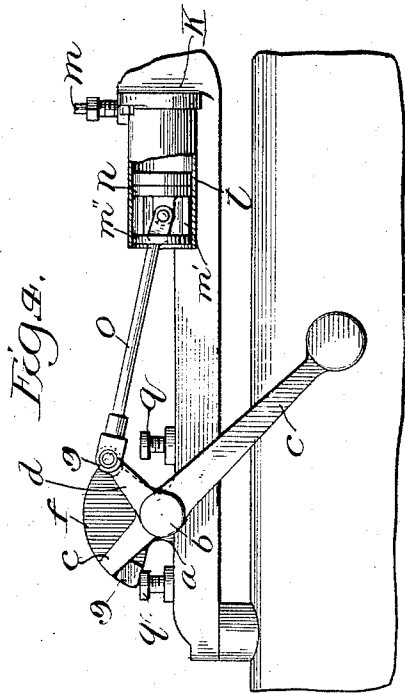


Fig. 1.



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Fig. 5.

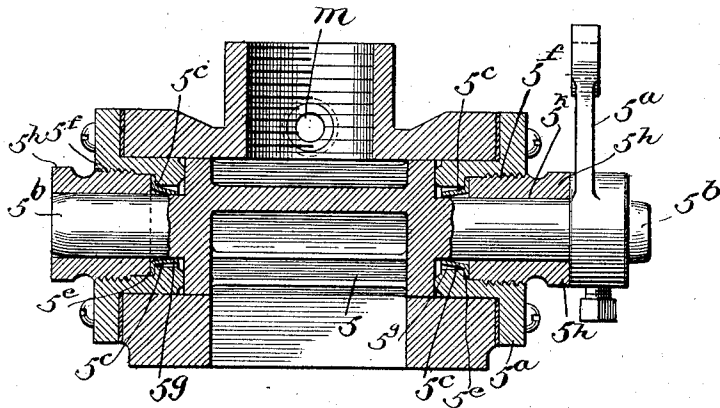
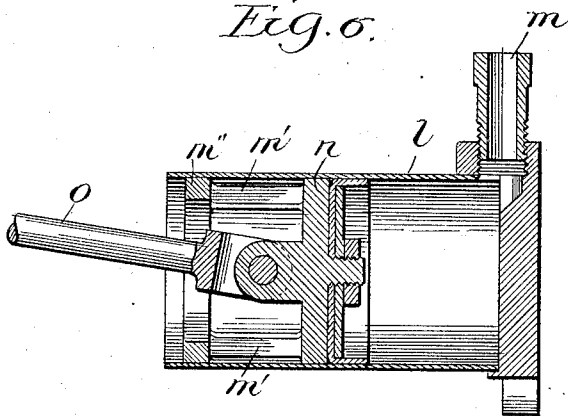


Fig. 6.



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# UNITED STATES PATENT OFFICE.

JOHN M. LARSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO NATIONAL REGULATOR COMPANY, A CORPORATION OF ILLINOIS.

VALVE-OPERATING MECHANISM FOR MOTORS.

1,044,197.

Specification of Letters Patent.

Patented Nov. 12, 1912.

Application filed March 4, 1912. Serial No. 681,364.

To all whom it may concern:

Be it known that I, JOHN M. LARSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valve-Operating Mechanism for Motors, of which the following is a specification.

My present invention relates to improvements in motors and has special reference to the provision of automatic valve controlling mechanism in that class of motors, which, by reason of their slow movement, do not develop sufficient inertia to operate the valves.

Other objects of my invention are to increase ease of operation, to secure a reduction of parts, the simplifying of parts and the location of parts in a position where they are readily accessible for adjustment and repair.

For the accomplishment of the above objects, my invention consists of the new forms and combination of parts as will presently appear.

In the drawings: Figure 1 is a side view of my new motor partially in section. Fig. 2 is a vertical elevation of my new motor. Fig. 3 is a detail of the new valve operating means. Fig. 4 is a detail of the mechanism for automatically operating the valve operating means. Fig. 5 is a cross sectional view of the valve, showing the method of packing same. Fig. 6 is a cross section of the cylinder and piston for automatically operating the valves.

Similar reference designations refer to similar parts throughout the several views.

Referring more particularly to Figs. 1 and 2, the reference numeral 1 designates the piston having the cylinder heads 2 and 3, through each of which is provided passages 4-4, both of which lead to the rotary valve 5, which is adapted to be rotated through the valve arm 5<sup>a</sup> to alternately connect said passages with the inlet passage 6 and the outlet passage 7. In the cylinder 1 is the piston 8 upon the piston rod 9, which projects through one end of the cylinder.

In line with the cylinder 1 is the cylinder 1<sup>a</sup> having the cylinder heads 2<sup>a</sup> and 3<sup>a</sup>, passages 4<sup>a</sup>-4<sup>a</sup>, piston 8<sup>a</sup> and piston rod 9<sup>a</sup> in all respects similar to similar parts of cylinder 1 except that the passages 4<sup>a</sup>-4<sup>a</sup> do not run to a rotary valve but are provided

with suitable valves for the work to be performed.

The piston rods 9 and 9<sup>a</sup> are respectively provided with the cross heads 10 and 10<sup>a</sup>, the ends of which are connected by means of the connecting rods 11 and 12. It is evident that the motion developed in the piston 8 in cylinder 1 will be imparted to piston 8<sup>a</sup> of cylinder 1<sup>a</sup> through the instrumentality of piston rods 9 and 9<sup>a</sup>, cross heads 10 and 10<sup>a</sup> and connecting rods 11 and 12.

For operating the rotary valve 5 which is adapted to alternately connect each end of the cylinder 1 with the supply and exhaust conduits through which the cylinder can be supplied with or drained of the motive fluid, I provide the following mechanism: Upon a convenient portion of the cylinder 1, I provide a boxing or bearing *a* in which is adapted to rotate the shaft *b*. The shaft *b* has projecting radially from one end thereof an offset arm *c* and just inside of the arm *c* it is further provided with another arm *d*. The opposite end of the shaft *b* is provided with a single radially extending arm *e*, journaled to rotate upon the shaft *b*, is the plate *f*, having the lugs *g* extending laterally therefrom into the path of the radial arm *e* and upon the opposite side of the plate *f* is provided a radial or crank arm *h*. Located upon another bracket *h*, which in this case is upon the casing for the rotary valve 5 is positioned a small piston cylinder 1 so that its axis produced will pass through the center or axis of the shaft *b*. The bottom of the piston cylinder 1 is connected by means of a piece of piping of reduced cross section *m* with the supply of fluid pressure 6 which runs the motor. The piston cylinder 1 is provided with the piston *n* which is connected by means of the rod *o* with the radial arm *d* upon the shaft *b*.

It will now be perceived that the action of the piston *n* through the rod *o* will be exerted continually to force the arm *d* outwardly and that by so doing the shaft *b* will be revolved, thereby rotating the arm *e* mounted upon the other end of the shaft *b*, which will in its turn engage one of the lugs *g*, thereby through the plate *f* imparting motion to the radial or crank arm *h*. This arm *h*, as clearly shown in Fig. 3, is connected by means of a rod *p* with the arm 5<sup>a</sup> of the rotary valve 5. In order that too great a motion will not be imparted to the

rotary valve 5 the set screws *g*, as clearly shown in Figs. 1 and 4, are provided upon a suitable portion of the bracket for the boxing or bearing *a*. The arm *e* has some slight play before it engages the lugs *g* so that some momentum can be acquired from the piston stroke before the force thereof starts to operate the valve.

It will be further seen that the piston will actuate the arm *d* so as to rotate the shaft *b* in either direction according as to whether the connection between the rod *o* and arm *d* is caused to assume a position either upon one side or the other of the axial line which passes through the axis of the shaft *b*. In order to shift this connection backward and forward so as to cause the shaft *b* to be rotated alternately in either direction, I provide upon the rod 12 adjustable stops 13 and 14.

By referring to Figs. 1, 2 and 4, especially to Fig. 2, it will be seen that as the piston 8 moves forward or toward the cylinder 1<sup>a</sup> the rod 12 will be carried forward also and with it the adjustable stop 13. This adjustable stop will engage the offset arm *c* carried upon one end of the shaft *b* and rotate the same, thereby forcing the small piston *n* into the cylinder 1 until the connection between the arm *d* and rod *o* has been pressed beyond the axial line of the cylinder when the cylinder will again be pressed outwardly, thereby rotating the shaft *b* through the mechanism heretofore described, shifting the rotary valve 5. When the piston 8 is traveling in the other direction the adjustable stop 14 will engage the arm *c* and force the mechanism in the opposite direction in the same manner, thereby causing a reversal of the action of the valve 5. The force of the motion imparted to the valve can be entirely controlled by the size of the reduced connection *m*.

By referring to Fig. 6, it will be seen that in order to guide the piston *n* in the small cylinder 1 I have extended from the rear face of said cylinder the columns *n'* upon the ends of which is provided the annular band *n''*. The outer face of this annular band *n''* contacts with the inner face of the cylinder 1 and thereby keeps the piston *n* in alinement.

By reference to Fig. 5 will be seen my method of constructing and packing the rotary valve 5. Extending from either end of the valve are the trunnions 5<sup>b</sup> which extend through apertures 5<sup>c</sup> in either side of the valve casing 5<sup>a</sup>. The apertures 5<sup>c</sup> are provided with the annular shoulders 5<sup>e</sup> and the outer portions thereof are threaded at 5<sup>f</sup>. The conical washers 5<sup>g</sup> are placed about the trunnions 5<sup>b</sup> with their outer or larger ends seated upon the shoulders 5<sup>e</sup>. Nuts 5<sup>h</sup> having a central aperture 5<sup>k</sup> to accommodate the trunnions are now screwed into the

apertures 5<sup>c</sup> so as to hold the seated ends of the conical washers 5<sup>g</sup> firmly upon the shoulders 5<sup>e</sup>. In Fig. 5 is also shown a convenient place for attaching the reduced conduit *m* with the source of fluid supply. It will now be seen that if the fluid under pressure tends to escape around the trunnions through the aperture 5<sup>c</sup> the conical washers 5<sup>g</sup> will be compressed about the trunnions and thereby prevent the egress of the fluid.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a motor having a cylinder and a valve to control the flow of fluid into and out of the said cylinder, a channel for the flow of pressure fluid to said valve, means for operating said valve comprising a rotatable shaft, means for causing the action of said piston to partially rotate said shaft, and a relatively smaller auxiliary piston for further rotating said shaft, and a constantly open connection between said auxiliary cylinder and said source of pressure fluid channel.

2. In a motor having a cylinder, a piston, and a valve to control the flow of fluid into and out of said cylinder, a channel for the flow of pressure fluid to said valve, mechanism for operating said valve comprising a relatively smaller auxiliary cylinder, a constantly open connection between said auxiliary cylinder and the said fluid pressure channel, a crank connected with said auxiliary cylinder and journaled to the axial line thereof.

3. In a motor comprising a cylinder, a piston, and a valve for connecting either end of said cylinder alternately with an inlet and outlet port, a channel for the flow of pressure fluid to said valve, mechanism for operating said valve comprising a relatively smaller auxiliary cylinder, a constantly open connection between said auxiliary cylinder and said fluid pressure channel, a piston working in said auxiliary cylinder and connected with a crank arm, a shaft connected with said crank arm, means operated by the main piston for reciprocating said shaft to carry said crank arm against the pressure of said auxiliary cylinder past center, and other means operated by said shaft for shifting said valve.

4. In a motor comprising a cylinder, a piston, and a valve for connecting either end of said cylinder alternately with an inlet and outlet port, a channel for the flow of pressure fluid to said valve, mechanism for operating said valve comprising a relatively smaller auxiliary cylinder, a constantly open connection between said auxiliary cylinder and said fluid pressure channel, a piston carried in said auxiliary cylinder, a transversely pivoted member operated thereby, means operated by the principal piston for

reciprocating said last mentioned member to carry the piston connection past center, and other means operated by said shaft for actuating said valve.

5 5. In a motor comprising a cylinder, a piston, and a valve for connecting either end of said cylinder alternately with an inlet and outlet port, a channel for the flow of pressure fluid to said valve, mechanism  
0 for operating said valve comprising a relatively smaller auxiliary cylinder, a constantly open connection between said auxiliary cylinder and said fluid pressure chan-

nel, a piston carried in said auxiliary cylinder, an arm pivoted to said piston, means 15 for reciprocating said arm to carry said piston connection past center, and other means actuated by said arm for actuating said valve.

In witness whereof, I hereunto set my 20 hand in the presence of two witnesses.

JOHN M. LARSON.

Witnesses:

H. A. HARRIS,

BENJ. T. ROODHOUSE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."