

No. 849,279.

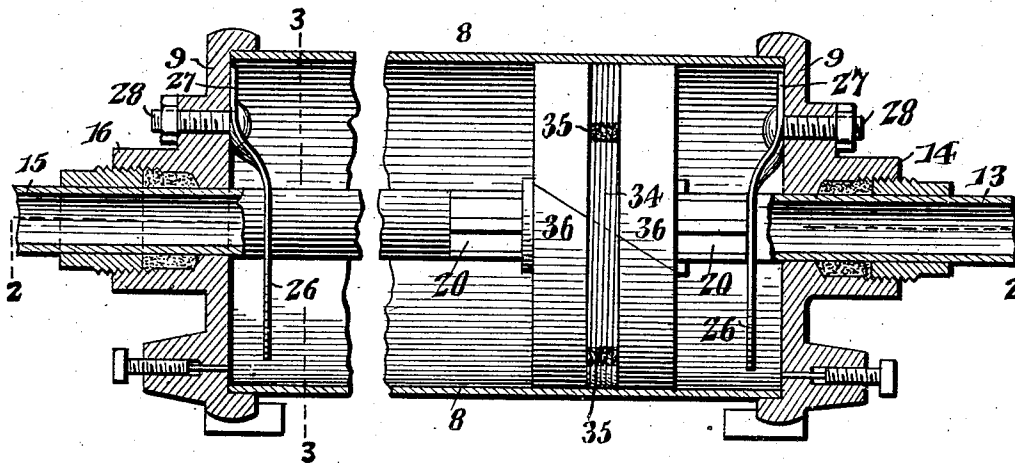
PATENTED APR. 2, 1907.

R. R. SPEARS.  
MOTOR.

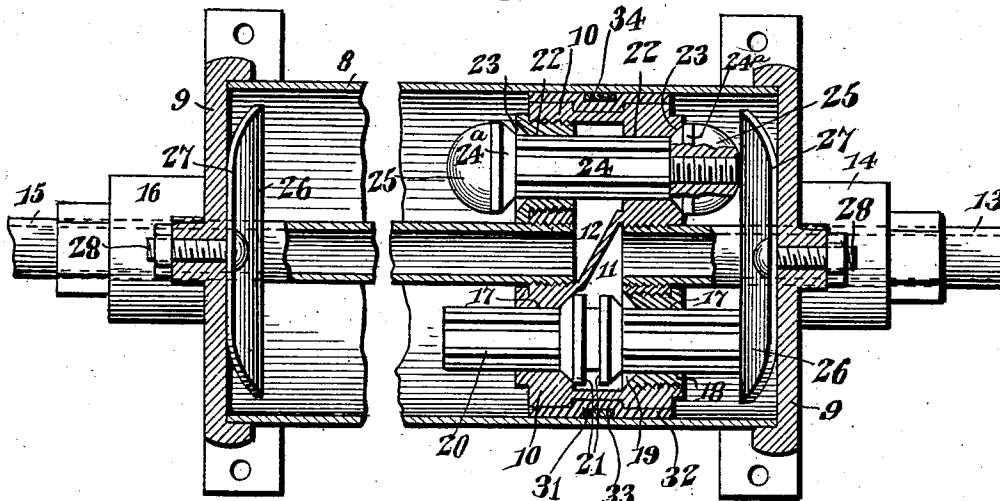
APPLICATION FILED JUNE 14, 1906.

2 SHEETS—SHEET 1.

*Fig. 1.*



*Fig. 2.*



*Ralph R. Spears,* Inventor

Witnesses  
*Jas. E. McEachran*  
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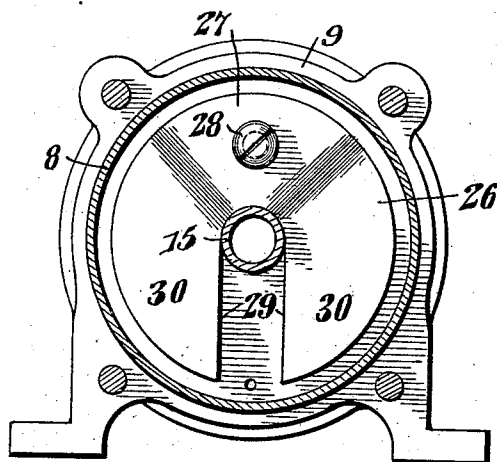
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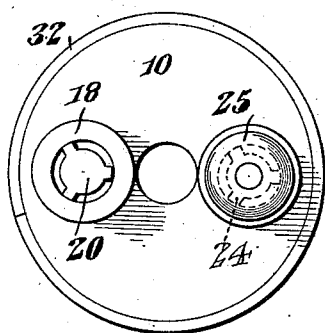
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2 SHEETS—SHEET 2.

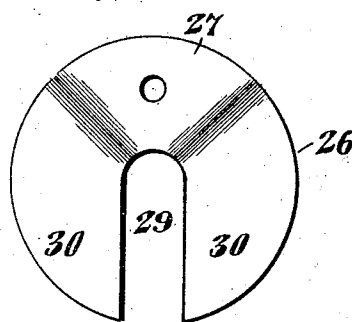
*Fig. 3.*



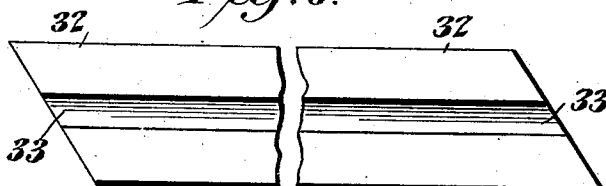
*Fig. 4.*



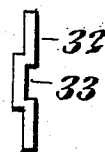
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



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# UNITED STATES PATENT OFFICE.

RALPH R. SPEARS, OF WHEELING, WEST VIRGINIA.

## MOTOR.

No. 849,279.

Specification of Letters Patent.

Patented April 2, 1907.

Application filed June 14, 1906. Serial No. 321,674.

*To all whom it may concern:*

Be it known that I, RALPH R. SPEARS, a citizen of the United States, residing at Wheeling, in the county of Ohio and State of West Virginia, have invented a new and useful Reciprocatory-Piston Motor, of which the following is a specification.

This invention relates more particularly to that class of motors wherein the motive fluid is alternately supplied to and exhausted from the cylinder on opposite sides of the piston and wherein the controlling-valves are carried by the piston and operated upon the approach of the same to the cylinder-heads.

One of the principal objects is to provide an effective motor of the above type having novel yielding means for effecting the operation of the valves, said means being exceedingly simple and not liable to derangement; furthermore, permitting the turning of the piston without becoming inoperative.

The preferred form of construction is illustrated in the accompanying drawings, wherein—

Figure 1 is a sectional view through the motor, the piston being shown in elevation. Fig. 2 is a sectional view on the line 2 2 of Fig. 1. Fig. 3 is a cross-sectional view on the line 3 3 of Fig. 1. Fig. 4 is an end elevation of the piston. Fig. 5 is a view in elevation of one of the springs. Fig. 6 is a detail view of the annular band. Fig. 7 is an end view of the same.

Similar reference-numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated a cylinder is employed comprising the usual tubular member 8, having heads 9 connected thereto. A reciprocatory piston 10 operates in the cylinder and is provided with a supply-chamber 11 and an exhaust-chamber 12. A piston-rod section in the form of a supply-pipe 13 is connected to one side of the piston and communicates with the supply-chamber 11, said piston-rod section or pipe slidably passing through a suitable stuffing-box 14 on one head. Another piston-rod section 15 constitutes an exhaust-pipe and slidably passes through a stuffing-box 16, secured to the opposite head, said piston-rod section or pipe 15 being connected to the opposite side of the piston to that carrying the pipe 13 and communicating with the exhaust-chamber 12, all of which is clearly shown in Fig. 2 of the drawings.

Supply or inlet ports 17 open through the opposite sides of the piston and communicate with the supply-chamber 11, one of said ports passing through a removable plug 18. The inner ends of these ports are surrounded by valve-seats 19. A channeled valve-stem 20 is slidably mounted in the ports 17, which ports are all disposed in alinement, said stem having its ends projecting beyond the opposite sides of the piston, as shown. Oppositely-arranged valves 21 are carried by the intermediate portion of the stem and are located within the chamber 11. The distance between the outer faces of the valves is less than the distance between the valve-seats 19, and it will thus be evident that when one of the valves is seated the opposite port will be opened. Moreover, when the valve-stem is moved the port which is closed by the seated valve will be opened and the opposite port will be closed.

Exhaust-ports 22 open through the opposite sides of the piston and communicate at their inner ends with the exhaust-chamber 12. The exhaust-ports are disposed on the opposite side of the piston-rod to the inlet-ports and have valve-seats 23 surrounding their outer ends. A channeled valve-stem 24 slidably passes through the ports and carries at its ends exhaust-controlling valves 24<sup>a</sup>, that coact with said seats. Inasmuch as the distance between these valves is greater than the distance between the seats, it will be evident that when one of the valves is seated to close its port the other port will be opened, and vice versa. The valves 24<sup>a</sup> are provided with suitable extensions, shown in the present instance in the form of heads 25, the outer ends of which are disposed in substantially the same planes as the outer ends of the valve-stem 20. A single spring is secured to the inner side of each cylinder-head, said springs being preferably in the form of disks 26, having offset portions 27, that rest against the inner faces of the cylinder-heads and are secured by suitable fasteners 28. The disks, as shown in Figs. 3 and 5, are provided with slots 29, that receive the piston-rod sections 13 and 15, and also define wings 30, located on the opposite sides of the piston-rods, said wings being spaced from the cylinder-heads and arranged in the paths of movement of the ends of the valve structures.

The piston-body 10 is of less diameter than the cylinder-wall 8 and is provided in its pe-

riphery with an annular groove 31. A band 32, of leather or other suitable flexible material, surrounds said piston-body and has an intermediate inset portion 33 seated in the groove 31. A retaining-wire 34 is wrapped into a plurality of convolutions around the inset portion and maintains the same in the groove, the wire being held against unwrapping by soldering the convolutions together at suitable intervals, as shown at 35. The marginal portions 36 of the band are free and constitute, in effect, extensible flaps that will freely spread, and thus at all times cooperate with the cylindrical wall 8 of the cylinder. No claim is, however, made to the packing in the present application, as the same constitutes the subject-matter of a co-pending and divisional application.

The operation of the structure need be but briefly described, as it will be apparent to those skilled in the art. The motive-fluid supply is introduced through the pipe or piston-rod section 13 and will thus enter the chamber 11 of the piston. Assuming that one of the valves 19 is closed, it will be evident that this motive-fluid supply will pass through the opposite port and thus enter the cylinder on one side of the piston. The exhaust-valve on this side of the piston is closed, so that the opposite valve is open. The result is that the motive fluid operating against the one side of the piston will force the same toward the opposite end of the cylinder, the exhaust on the opposite side of the piston entering through the open port 22 into the exhaust-chamber 13 and thence through the exhaust-pipe or piston-rod section 15. As the piston approaches the end of its stroke the projecting ends of the valve structures will strike the wing portions of the spring disposed in opposition to their paths of movement and will gradually stop the same. The piston, however, continues its movement until the adjacent inlet-valve is opened, the opposite inlet-valve is closed, the opposite exhaust-valve is opened, and the adjacent exhaust-valve is closed. Immediately the motive fluid will pass through the opposite side of the piston and force the same backwardly.

There are two features to be particularly noted in connection with this structure. In the first place it will be observed that a single spring is employed on each cylinder-head and that this spring can be readily stamped from sheet metal, being held, moreover, by a single device. As a result the structure is greatly simplified, and, more than this, because of the disk shapes of the springs even if the piston rotates portions of said springs will still remain in the paths of movement of the valve mechanisms, and thus the same will still be operated. Another decided advantage resides in the piston structure: Experience has demonstrated that in mech-

anisms of this type the nearer the well-known cup-packing can be approached the less liability there is of leakage; but inasmuch as the valve mechanisms project through the opposite sides of the piston cup-packings cannot be employed. The structure disclosed, however, has practically all of the advantages of cup-packings, for the oppositely-extending margins of the band or ring are free, so that the motive fluid can enter between them and the piston-body, thus forcing them outwardly and insuring a tight joint during the opposite movements of the piston and without regard to the wear of the parts.

From the foregoing it is thought that the construction, operation, and many advantages of [the herein-described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In a motor of the character described, the combination with a cylinder, of a reciprocatory piston and piston-rod mounted in the cylinder, inlet and exhaust valve members movably mounted on the piston on different sides of the piston-rod, and a single yielding abutment element located within the cylinder and having an opening that receives the piston-rod, said element extending around the piston-rod and having portions disposed in the path of movement of both valve members.

2. In a motor of the character described, the combination with a cylinder having a head, of a reciprocatory piston and piston-rod mounted in the cylinder, inlet and exhaust valve members movably mounted on the piston on different sides of the piston-rod, a single yielding abutment element located within the cylinder and having an opening that receives the piston-rod, said element extending around the piston-rod and having portions spaced from the cylinder-head and disposed in the path of movement of both valve members, and means passing through an intermediate portion of the element at one side of the piston and between the portions that are disposed in the path of movement of the valve members for securing said element to the cylinder-head.

3. In a motor of the character described, the combination with a cylinder having a head, of a reciprocatory piston mounted in the cylinder, a piston-rod secured to the piston and passing through the head, inlet and exhaust valve members mounted on the piston, a spring-plate having an intermediate portion secured to the cylinder-head, said

plate having an open portion through which the piston-rod passes, the portions on opposite sides of the opening being offset from the intermediate portion, and said offset portions  
5 being disposed in spaced relation to the head and being located in the path of movement of the valve members.

10 4. In a motor of the character described, the combination with a cylinder having heads, of a reciprocatory piston operating in the head, a piston-rod carried by the piston and extending through both heads, inlet and exhaust valve members carried by the piston on opposite sides of the rod and projecting

beyond the opposite faces of said piston, and 15 spring-disks secured to the inner sides of the heads and having slots in which the piston-rods operate, said slots defining spring-wings arranged on opposite sides of the piston-rod and disposed in the paths of movement of the 20 projecting portions of the valve members.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

RALPH R. SPEARS.

Witnesses:

M. E. MURRIN,  
L. M. CARROLL.

