No. 643,791. Patented Feb. 20, 1900.

H. O. GADBERRY.

ROTARY MOTOR.

(Application filed June 30, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

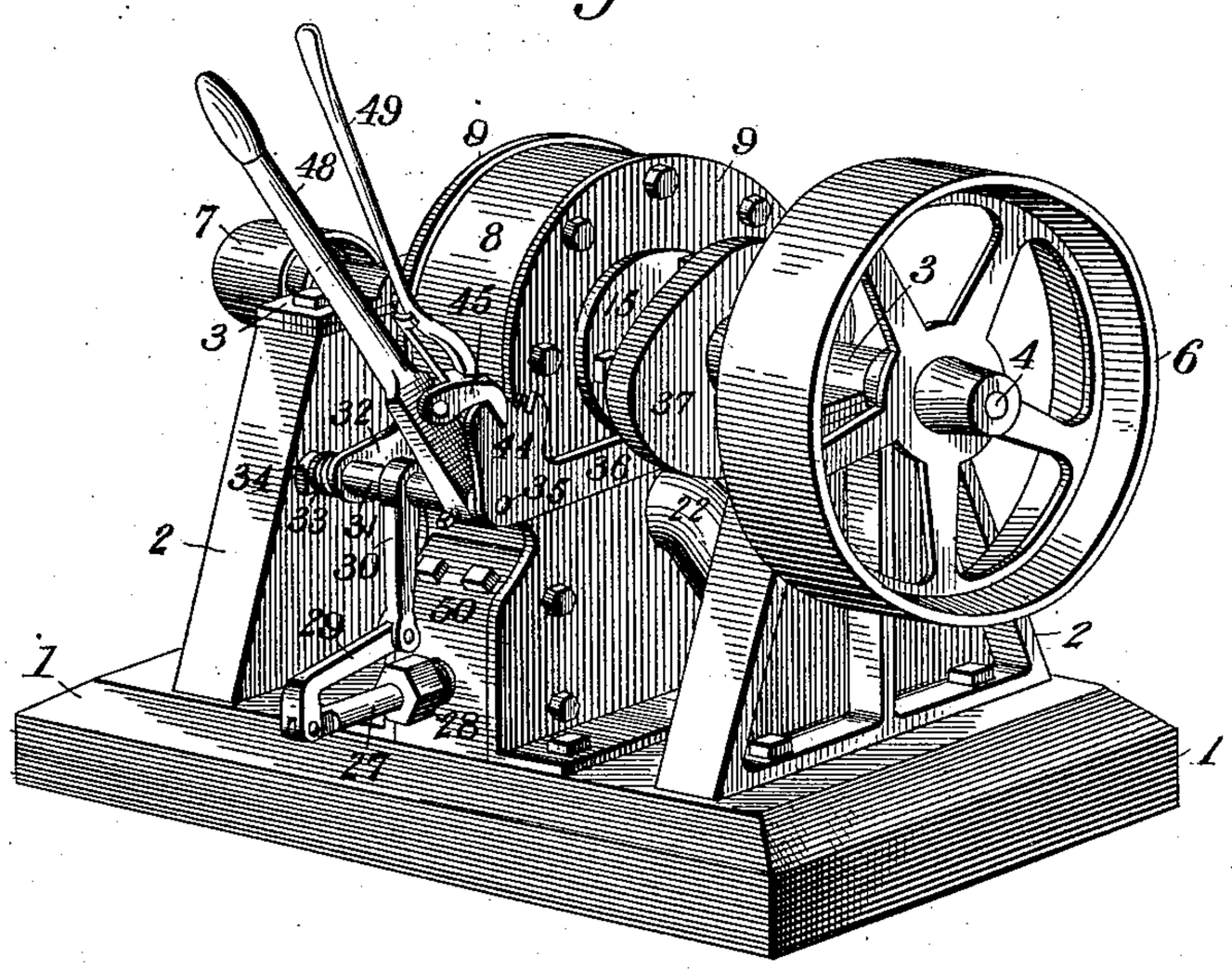

Fig. 2.

Witnesses
Louis E. Langille.
D. P. Valhampton

H. O. Gadberry, Inventor
By
E. G. Siggers.
Attorney

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Fig. 3.

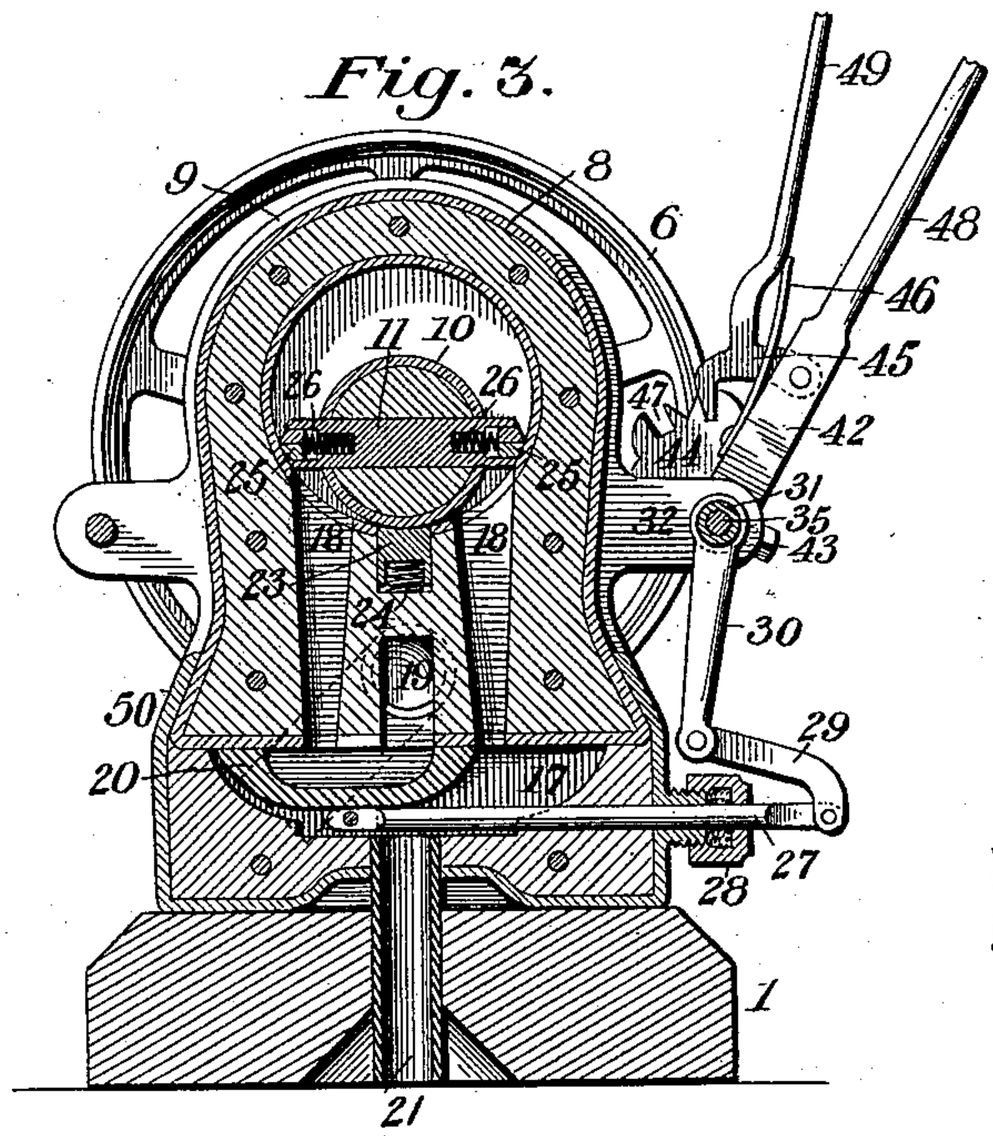


Fig. 6.

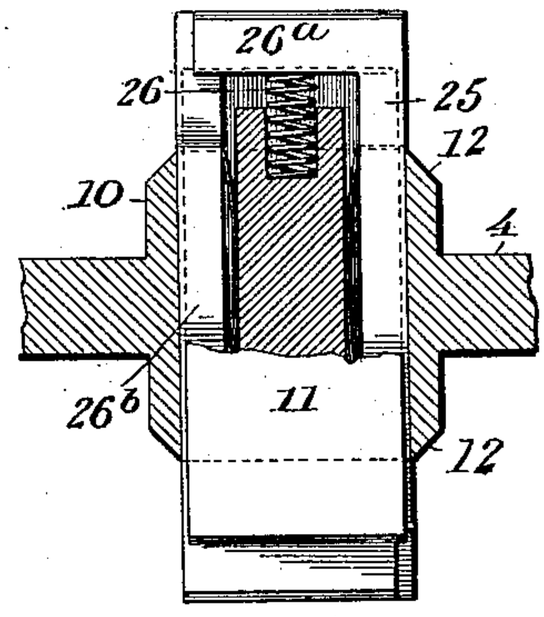


Fig. 5.

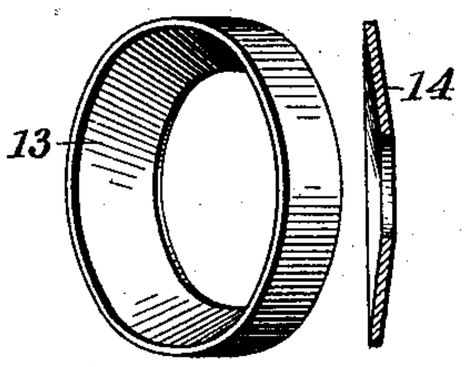


Fig. 4.

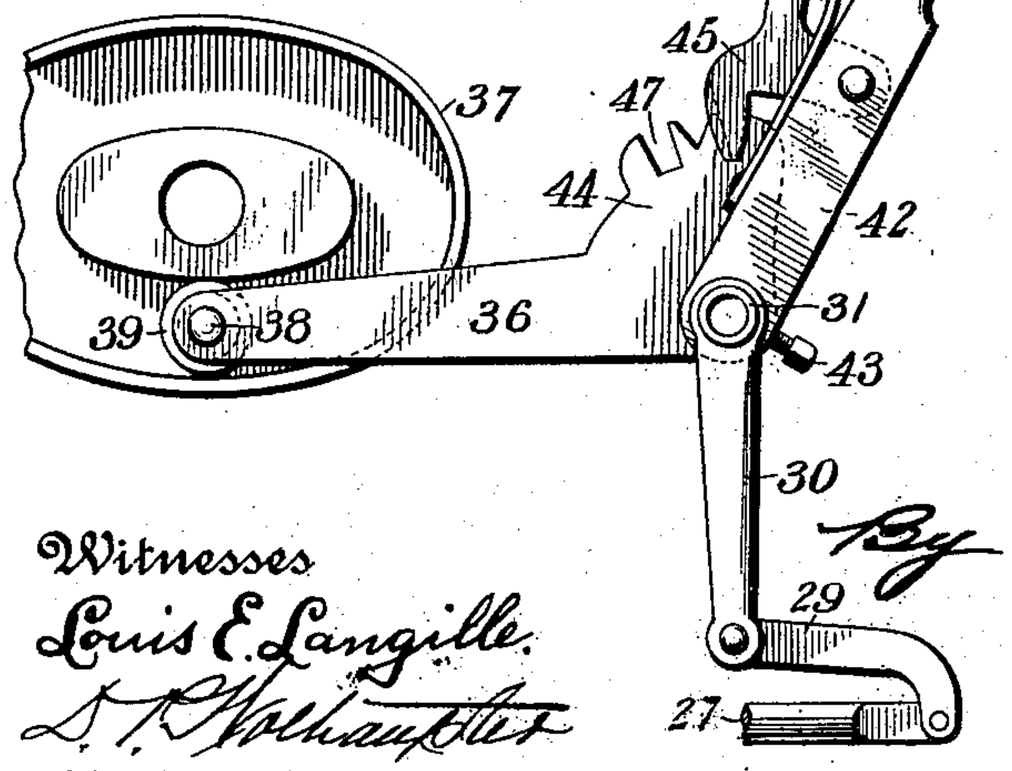
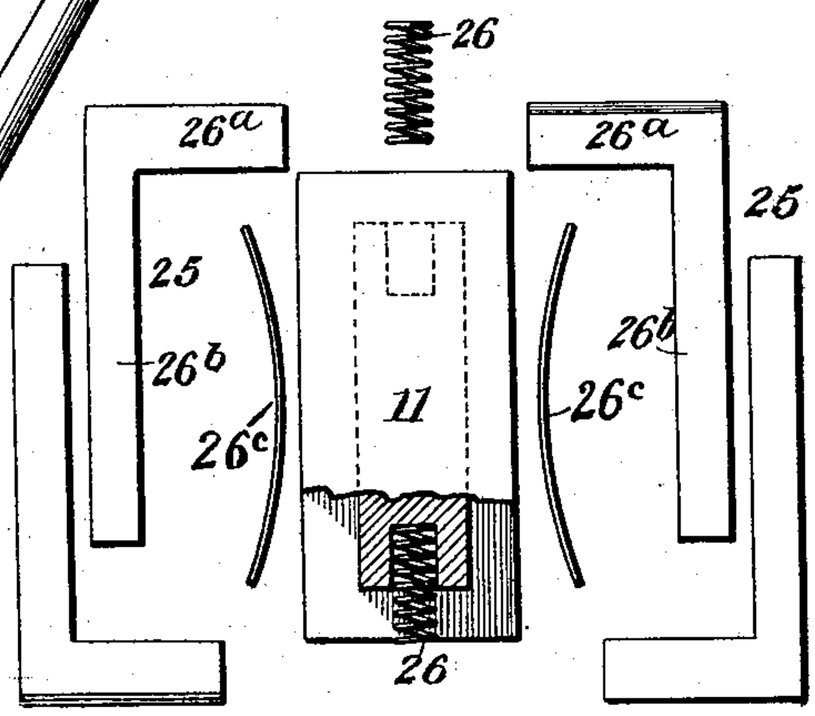


Fig. 7.



Witnesses
Louis E. Langille.
L. P. Wolhaupter

H. O. Gadberry, Inventor
By
C. L. Siggers
Attorney

UNITED STATES PATENT OFFICE.

HARVEY O. GADBERRY, OF CARTHAGE, MISSOURI.

ROTARY MOTOR.

SPECIFICATION forming part of Letters Patent No. 643,791, dated February 20, 1900.

Application filed June 30, 1899. Serial No. 722,367. (No model.)

To all whom it may concern:

Be it known that I, HARVEY O. GADBERRY, a citizen of the United States, residing at Carthage, in the county of Jasper and State of Missouri, have invented a new and useful Rotary Motor, of which the following is a specification.

My invention relates to rotary motors of the eccentric-piston type, and has for its object to provide a simple, compact, efficient, and durable construction and arrangement of parts whereby economy in the use of the motive agent may be attained by utilizing the maximum expansion thereof.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a perspective view of a motor constructed in accordance with my invention. Fig. 2 is a vertical section of the motor, taken in a plane parallel with the axis of the piston. Fig. 3 is a vertical section taken through the cylinder at right angles to the plane of Fig. 2. Fig. 4 is detail view of the valve mechanism detached. Fig. 5 is a similar view of one of the cone bearing-rings. Fig. 6 is an enlarged detail view of the piston-slide. Fig. 7 is a detail sectional view of the piston-slide, showing the parts thereof dismembered.

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

Rising from a base 1 are bearing-standards 2, having bearings 3, in which is mounted a shaft 4, carrying in the construction illustrated a balance-wheel 6 and a driving-pulley 7; but it will be understood that any other means of communicating motion to the machinery to be driven may be utilized in this connection.

The cylinder consists of a body portion or casing 8 and removable heads or end plates 9, which may, as illustrated in the drawings, be flanged at their lower edges and fastened to the base or the support of the engine. The bore of the cylinder is arranged eccentrically with relation to the shaft which passes therethrough, and hence the piston-core 10, which is carried by the shaft, is also disposed eccentrically and is provided with a diametrical guide slot or opening in which is fitted the slide 11, constituting the piston-wings, adapted to operate terminally in contact with the walls of the cylinder. The extremities of the piston-core are chamfered or beveled, as shown at 12, and removably fitted in suitable openings in the cylinder-heads, concentric with the driving-shaft, are bearing-rings 13, having bearing-surfaces which are beveled to correspond with the bearing-surfaces of the piston-core, said bearing-rings being adapted for adjustment to take up lost motion and receive the axial thrust of the core. In the construction illustrated washers or compensating rings 14 are arranged exteriorly of the cylindrical heads for contact with the outer surfaces of said bearing-rings, and are slightly dished or concavo-convex in construction to provide for exerting a continuous inward pressure upon the bearing-rings when the gland-plates 15 are held in operative position therewith by means of the nuts 15ª, threaded upon the gland-bolts 16.

The valve-chamber 17 is preferably arranged in the casing or body portion of the cylinder, with the valve-seat formed by that wall of said chamber which is adjacent to the cylinder, and provided with feed-ports 18 and an intermediate exhaust-port 19, said ports being controlled by a slide-valve 20, which is so constructed and arranged as to adapt it to perform the functions of the throttle-valve. Motive agent, such as steam, is admitted to the valve-chamber by means of a supply-pipe 21, which in the construction illustrated enters said chamber at its lower side, and communicating with the exhaust-port 19 is an exhaust-conveyer 22, the feed-ports controlled by said valve being extended to communicate with the cylinder or piston chamber of the casing and tapping the same at opposite sides of the plane of contact of the piston-core with the wall of the cylinder. At this point of contact I have arranged in the wall of the cylinder a packing-strip 23, yieldingly held in contact with the surface of the core by means of a suitable spring 24, and fitted in suitable channels in the side and end edges of the piston-slide are angular packing-strips 25, held in place by means of the end coil-spring 26

and side bow-springs 26c. These packing-strips respectively consist of an end portion 26a, which is equal in width with the channel in which the strips are fitted, and side arms or portions 26b, of reduced width, are overlapped, the arms of one packing-strip terminating short of the cross-bar or terminal portion of the other strip.

The slide-valve is provided with a stem 27, extending through a stuffing-box 28 in the end of the casing and connected by means of a link 29 with a crank-arm 30 on a rock-shaft 31, which is mounted upon the casing in suitable bearings 32, said rock-shaft being held from axial vibration by tension devices consisting of a spring 33 and a tension-nut 34, and at the same time said tension device is adapted to exert a limited amount of frictional resistance to the rocking motion of said shaft to prevent looseness in operation. The rock-shaft is of tubular construction, and extending axially through the bore thereof is a spindle 35, upon one extremity of which the above-described tension-nut is threaded, while to the other extremity thereof, and hence mounted coaxially with the rock-shaft, is attached a rock-arm 36, which receives an oscillatory motion from a valve-operating cam 37, consisting of an elliptical disk having a cam-groove in which is arranged a pin 38 on the extremity of said rock-arm. In practice I prefer to provide said arm with an antifriction-roller 39. Said cam-disk is adjustably fitted upon the shaft of the engine, and for this purpose is provided with a hub or sleeve 40, having a set-screw 41, and not only is this cam-disk capable of axial adjustment to arrange it in the desired position with relation to the rock-arm, but angular adjustment to vary the position of the major axis thereof with relation to the piston-wings. Also adjustably fitted upon the rock-shaft for angular adjustment is an adjustable clutch member 42, held at the desired adjustment by means of a set-screw 43, and carried by the rock-arm and arranged in a plane parallel with said clutch member 42 is a second clutch member 44, formed as an angular extension of said rock-arm and consisting of a toothed segment. The first-named or rock-shaft clutch member carries a dog 45 for engagement with either of a plurality of notches in said segment or rock-arm clutch member, said dog being yieldingly held in engagement with the segment by means of a spring 46. The segment illustrated in the drawings is provided with terminal notches or seats 47, and when the dog of the other clutch member is in engagement with one of said terminal notches or seats the valve mechanism is set to cause the admission of motive agent through one of the above-described feed-ports into the cylinder, according to the direction in which it is desired that the piston shall rotate, and said segment is also provided with an intermediate or stop notch or seat, and when the dog is in engagement therewith the valve is held in an intermediate position, whereby both of the feed-ports are closed.

In order to facilitate the adjustment of the rock-shaft clutch member to cause the reversal of the motor or the stopping thereof, said clutch member is extended to form a reversing-lever 48, and connected with the dog is a handle 49, which is within reach of the hand of an operator grasping the reversing-lever.

In operation the adjustment of the rock-shaft clutch member to cause the engagement of the dog with one of the terminal notches or seats of the segment allows steam or other motive agent to enter the cylinder through one of the feed-ports, and the rotation of the driving-shaft causes the oscillation of the rock-arm, and hence the communication of a rocking movement to the rock-shaft, which reciprocates the valve and causes the automatic cut-off at the desired points in the stroke thereof. To vary the point at which this cut-off occurs in order to vary the lead of the valve, and thus utilize to a greater or less extent the expansion of the motive agent, the rock-arm-operating cam may be adjusted angularly upon the driving-shaft. Furthermore, in order to vary the relative positions of the rock-shaft and rock-arm when the dog is in engagement with the different notches or seats of the segment the rock-shaft clutch member may be adjusted angularly with relation to the rock-shaft.

From the foregoing description it will be seen that while compactly arranged to adapt the engine to be constructed in any desired size the application of the motive agent to the piston-wings is within the control of the operator, both as to the point of application and the duration thereof, and hence the expenditure of motive agent may be regulated to suit the load to attain the maximum economy in the use thereof. Furthermore, the described construction enables me to provide the cylinder-bore and the valve-seat with linings of soft metal. Furthermore, as illustrated, the portion of the casing below the valve-chamber may be constructed separately from the portion in which the cylinder is formed and may be secured thereto by terminal extensions 50, suitably secured by bolts or otherwise to the main portion of the casing.

A further advantage of the construction described resides in the simplicity of the valve-gear and the specific means disclosed in connection therewith for varying the relative adjustment of the elements thereof and in the tension devices employed for preventing lost motion or excessive vibration of the parts, and particularly of the spindle to which the rock-arm is attached.

It is to be understood that the herein-described construction is not only adapted for use as a rotary steam-engine, but is also ca-

pable of general application as a rotary motor—for instance, as a pump, blower, water-motor, and like machines.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. In a rotary motor, the combination of a cylinder and its shaft, an eccentrically-mounted piston having terminal beveled bearing-surfaces, bevel-faced bearing-rings mounted in the cylinder-heads for axial movement, gland-plates located outside of the cylinder-heads, spring-washers interposed between the gland-plates and said bearing-rings, means for adjusting the gland-plates axially of the cylinder-shaft, and valve mechanism for controlling the admission of motive agent to the cylinder, substantially as specified.

2. In a rotary motor, the combination of a cylinder and its shaft, an eccentrically-mounted piston having terminal beveled bearing-surfaces, bevel-faced bearing-rings mounted in the cylinder-heads for axial movement, gland-plates mounted upon and adjustable toward and from the cylinder-heads, spring-washers in the form of dished disks encircling the cylinder-shaft and interposed between the gland-plates and said bearing-rings, and adapted to be compressed by the gland-plates, and valve mechanism for controlling the admission of motive agent to the cylinder, substantially as specified.

3. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of a rock-shaft operatively connected with said valve, a rock-arm, and means actuated by the cylinder-piston for oscillating the same, and a clutch having its members carried respectively by said rock-shaft and rock-arm for communicating motion from the latter to the former, substantially as specified.

4. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having oscillatory elements respectively connected with said valve and actuated by the cylinder-piston, and clutch mechanism between said elements, substantially as specified.

5. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having a rock-shaft operatively connected with said valve, a rock-arm, clutch mechanism for connecting the rock-shaft with the rock-arm, and a cam carried by the spindle of the cylinder-piston for actuating said rock-arm, substantially as specified.

6. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having a rock-shaft operatively connected with said valve, a rock-arm, clutch mechanism for connecting the rock-shaft with the rock-arm, and a cam mounted for adjustment upon the spindle of the cylinder-piston for actuating said rock-arm, substantially as specified.

7. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having a rock-shaft operatively connected with said valve, a rock-arm, clutch mechanism for connecting the rock-shaft with the rock-arm, a cam mounted for angular adjustment upon the spindle of the cylinder-piston for actuating said rock-arm, and means for securing said cam at the desired adjustment, substantially as specified.

8. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of a rock-shaft operatively connected with said valve, a rock-arm, and means actuated by the cylinder-piston for operating said arm, and clutch mechanism for connecting the rock-shaft with the rock-arm, the same consisting of a toothed segment on one of said members, and a pawl-carrying element on the other of said members, substantially as specified.

9. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of a rock-shaft operatively connected with said valve, a rock-arm, and means actuated by the cylinder-piston for operating said arm, and clutch mechanism for connecting the rock-shaft with the rock-arm, the same consisting of a toothed segment on one of said members, and a pawl-carrying element on the other of said members, said pawl-carrying member being provided with an extension forming a reversing-lever, substantially as specified.

10. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of a rock-shaft operatively connected with said valve, a rock-arm, and means actuated by the cylinder-piston for operating said arm, and clutch mechanism for connecting the rock-shaft with the rock-arm, the same consisting of a toothed segment on one of said members, and a pawl-carrying element on the other of said members, said pawl-carrying member being provided with an extension forming a reversing-lever, and a lever carried by said extension and connected with the pawl, substantially as specified.

11. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having a tubular rock-shaft operatively connected

with said valve, a rock-arm having its spindle mounted in the bore of said rock-shaft, means actuated by the cylinder-piston for operating said rock-arm, and clutch mechanism having its interlocking arms carried respectively by said rock-shaft and rock-arm, substantially as specified.

12. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having a tubular rock-shaft operatively connected with said valve, a rock-arm having its spindle mounted in the bore of said rock-shaft, means actuated by the cylinder-piston for operating said rock-arm, tension devices connected with said spindle for frictionally resisting the rocking motion thereof, and clutch mechanism having its interlocking arms carried respectively by said rock-shaft and rock-arm, substantially as specified.

13. In a rotary motor, the combination with a cylinder and piston, and a reciprocatory valve for controlling ports in communication with the cylinder, of valve mechanism having a tubular rock-shaft operatively connected with said valve, a rock-arm having its spindle mounted in the bore of said rock-shaft, means actuated by the cylinder-piston for operating said rock-arm, tension devices consisting of a tension-nut threaded upon said spindle at the opposite end from the rock-arm, and a tension-spring interposed between said nut and a fixed object, for frictionally resisting the rocking motion of the spindle, and clutch mechanism having its interlocking arms carried respectively by said rock-shaft and rock-arm, substantially as specified.

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

HARVEY O. GADBERRY.

Witnesses:
J. H. DRYDEN,
C. B. STICKNEY.