No. 817,472. PATENTED APR. 10, 1906.

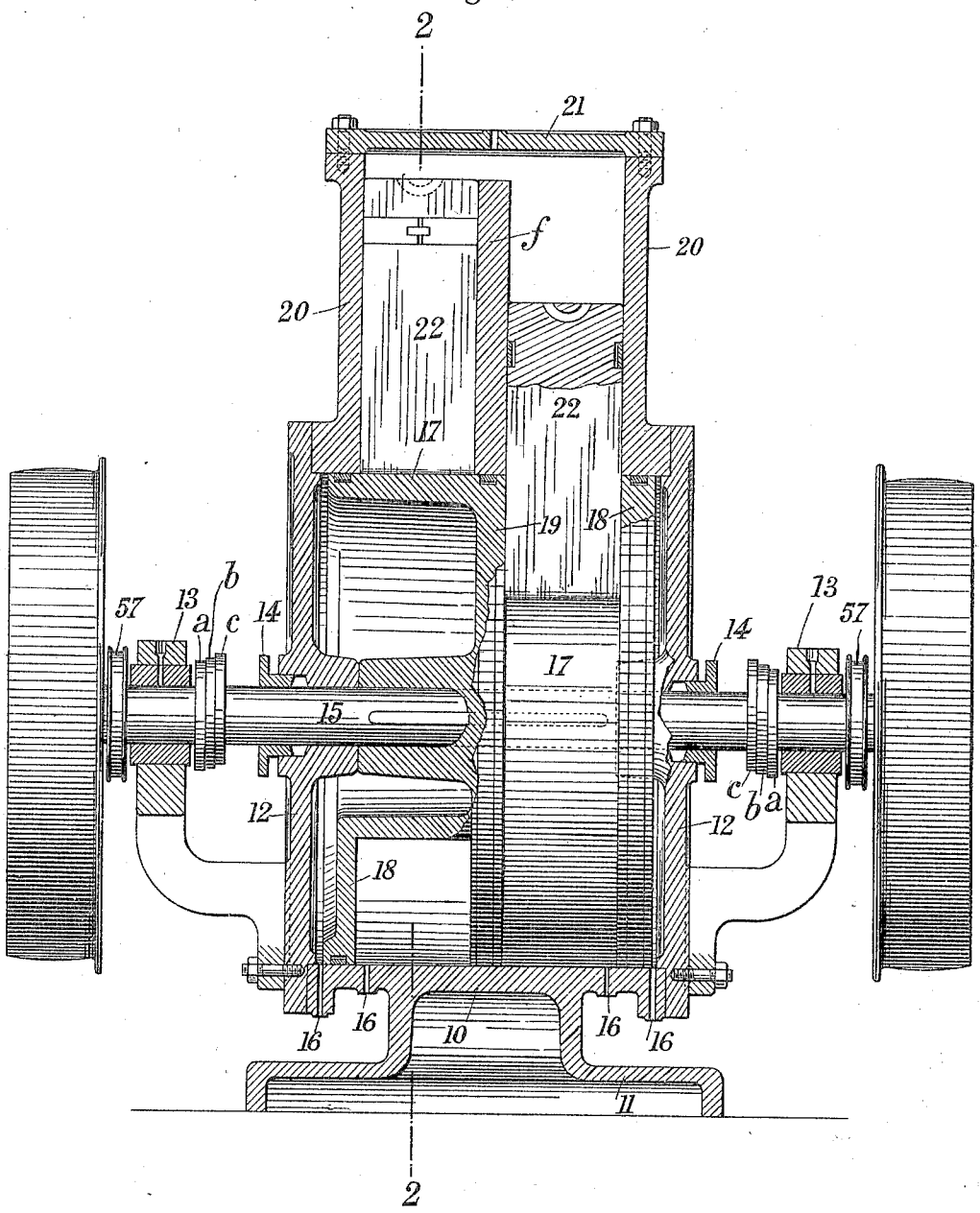
P. DÉCOR.

ROTARY ENGINE.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 1.

Fig. 1



Witnesses=
L. H. Grote.
Geo. T. Marshall

Inventor.
Paul Décor.
by Worth Aycock
Atty.

No. 817,472. PATENTED APR. 10, 1906.

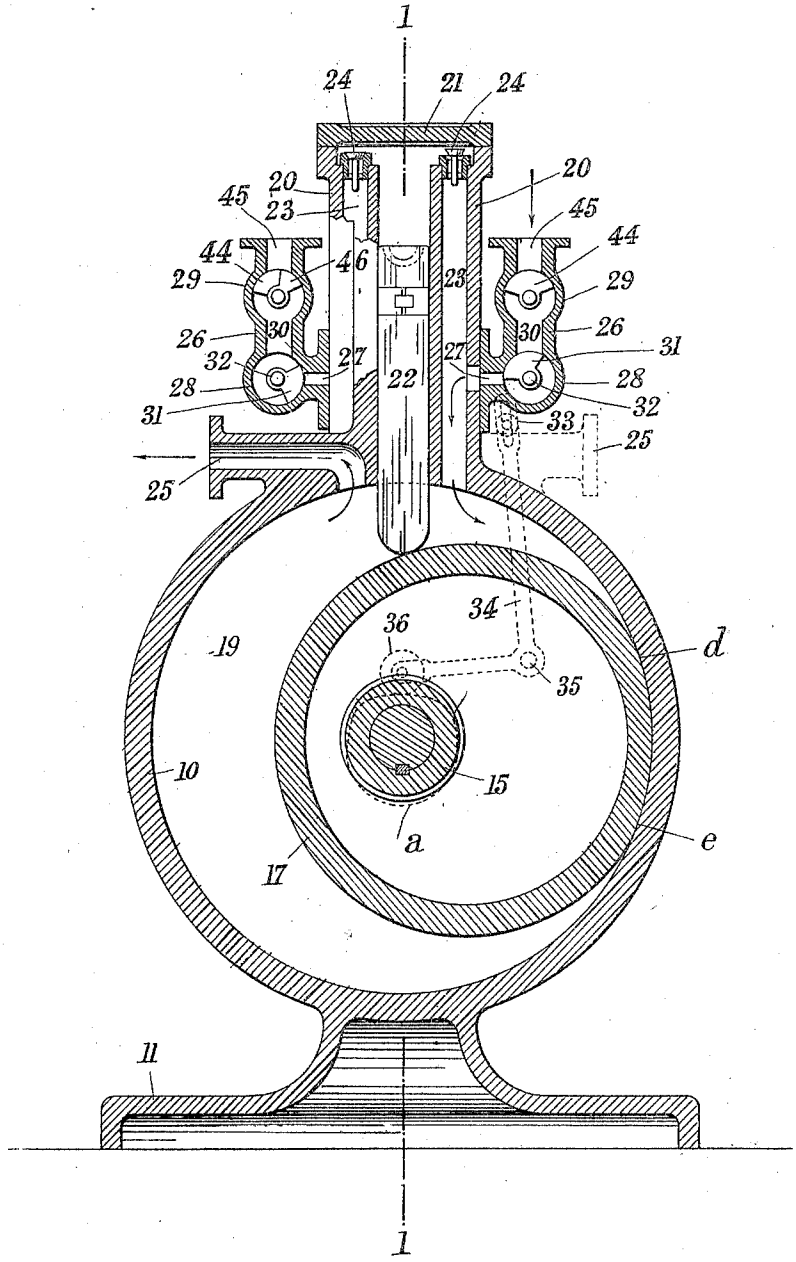
P. DÉCOR.

ROTARY ENGINE.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 2.

Fig. 2



Witnesses=
L. H. Grote.
Geo. T. Marshall

Inventor=
Paul Décor
by Worth Aspinwall
Atty.

No. 817,472. PATENTED APR. 10, 1906.

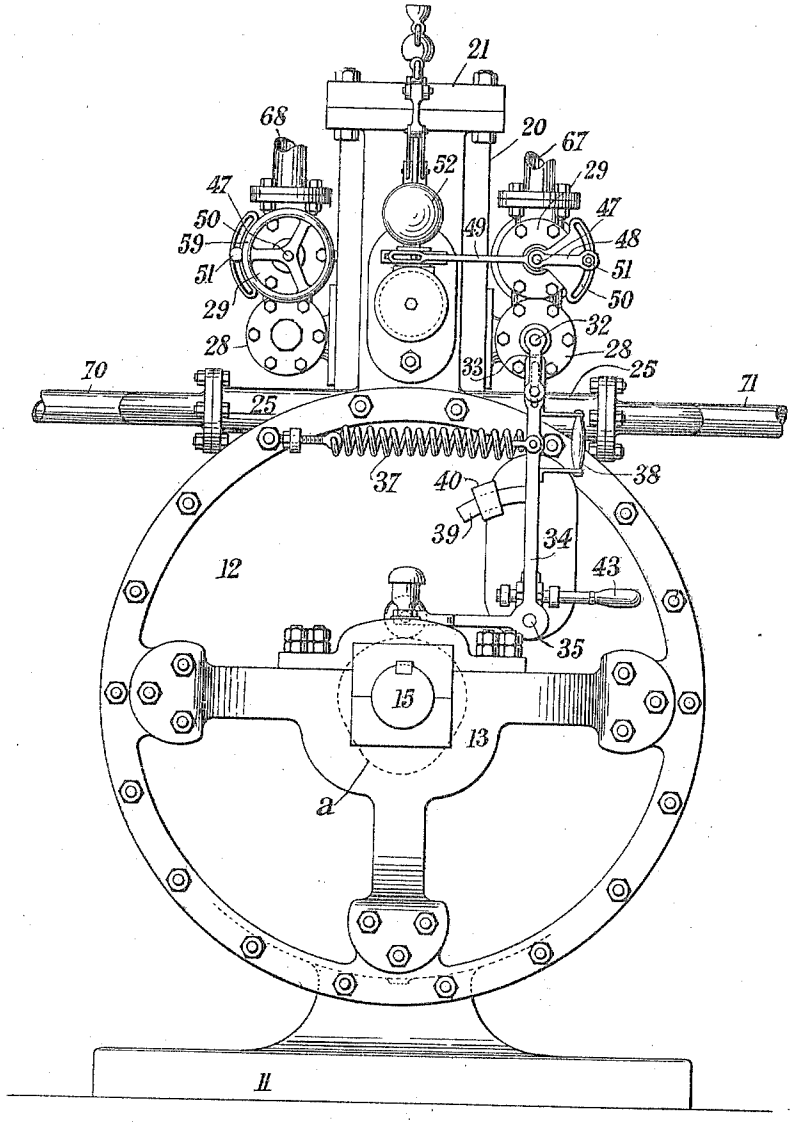
P. DÉCOR.

ROTARY ENGINE.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 3.

Fig. 3



Witnesses:
L. A. Grote.
Geo. H. Marshall.

Inventor:
Paul Décor,
by Wood Asgood & Co.
Atty.

No. 817,472. PATENTED APR. 10, 1906.

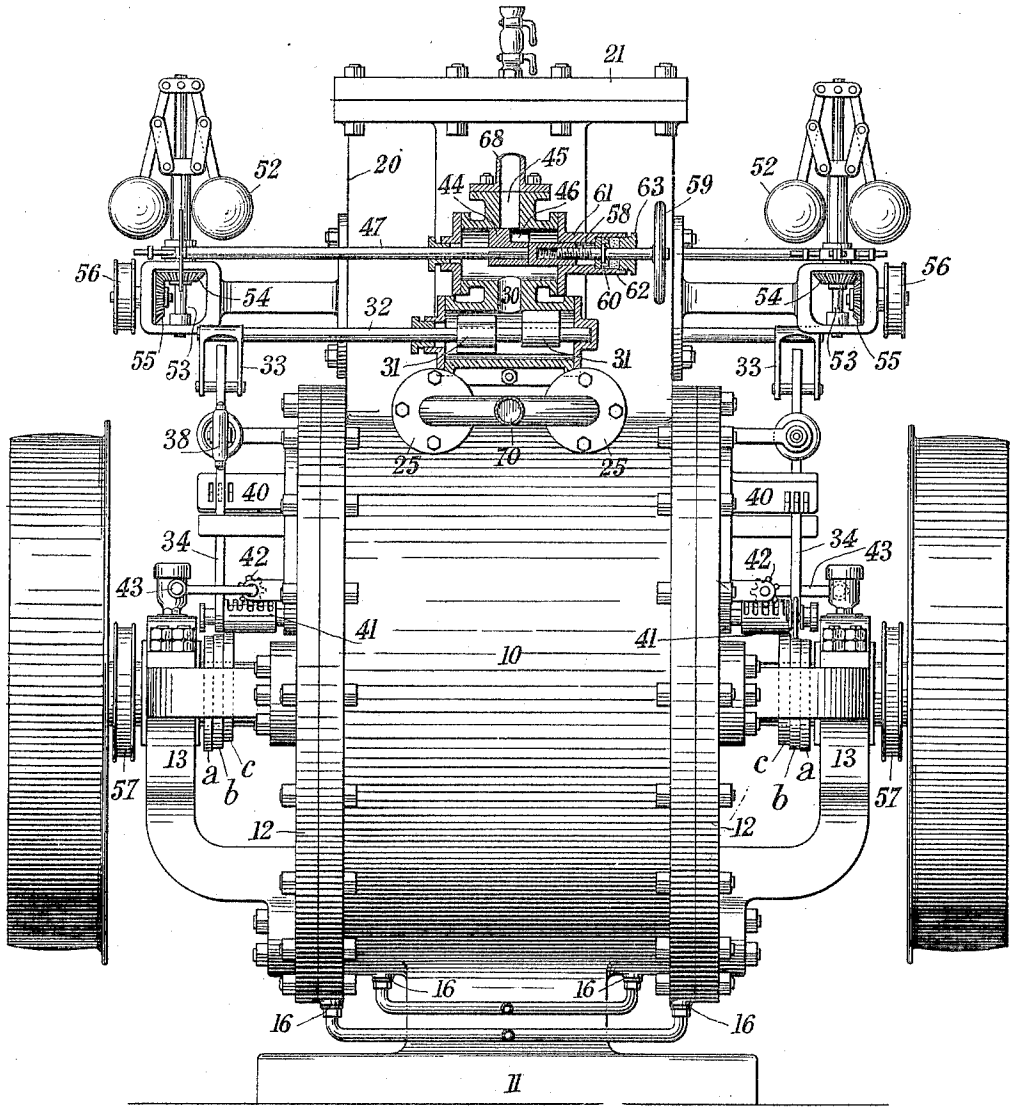
P. DÉCOR.

ROTARY ENGINE.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 4.

Fig. 4



Witnesses=
L. H. Grote.
Geo. H. Marshall

Inventor:
Paul Décor,
by Worth Aspood
Atty.

No. 817,472. PATENTED APR. 10, 1906.

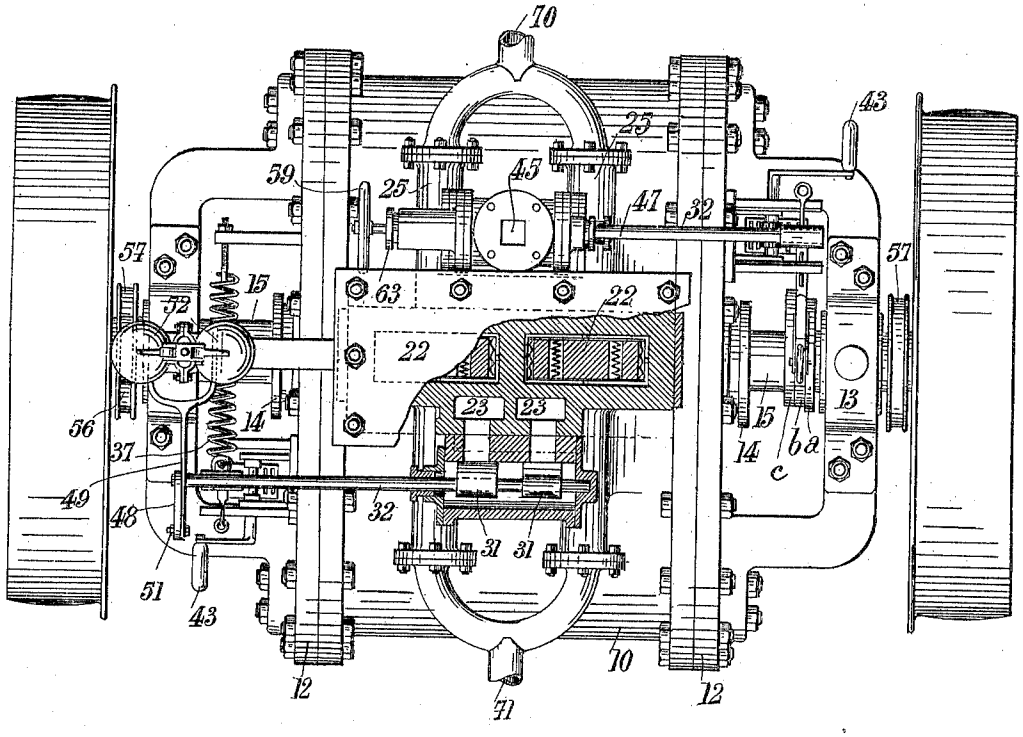
P. DÉCOR.

ROTARY ENGINE.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 5.

Fig. 5.



Witnesses=
L. H. Grote.
Geo. A. Marshall

Inventor
Paul Décor.
By Worth Osgood
Atty.

No. 817,472. PATENTED APR. 10, 1906.

P. DÉCOR.

ROTARY ENGINE.

APPLICATION FILED MAR. 15, 1905.

6 SHEETS—SHEET 6.

Fig. 6

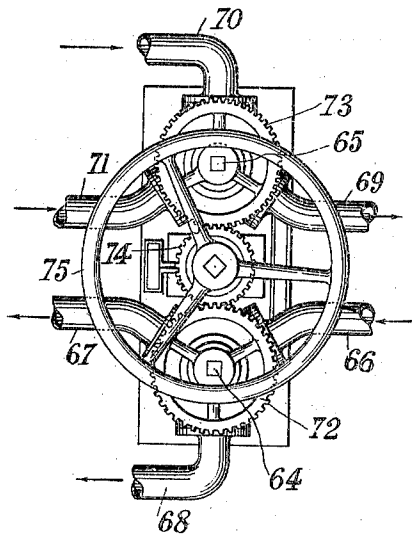
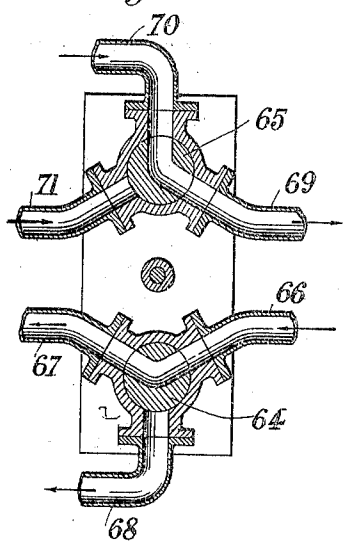


Fig. 7



Witnesses:
L. H. Briote.
Geo. T. Marshall

Inventor:
Paul Décor.
By Worth Osgood
Atty.

UNITED STATES PATENT OFFICE.

PAUL DÉCOR, OF ORAN, ALGERIA.

ROTARY ENGINE.

No. 817,472. Specification of Letters Patent. Patented April 10, 1906.

Application filed March 15, 1905. Serial No. 250,138.

To all whom it may concern:

Be it known that I, PAUL DÉCOR, a citizen of the Republic of France, and a resident of Oran, Algeria, have invented certain new and useful Improvements in or Relating to Rotary Engines and the Like and Means for Regulating the Same, of which the following is a specification.

This invention relates to an engine the speed of which is varied by the governor and the maximum cut-off of which can be varied by hand as required.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of the engine on line 1 1 of Fig. 2. Fig. 2 is a vertical cross-section on line 2 2 of Fig. 1. Fig. 3 is a side elevation. Fig. 4 is a longitudinal elevation with the valve-gear in section. Fig. 5 is a view in plan, partly in section. Fig. 6 is a plan of the reversing-gear, and Fig. 7 is a horizontal section of the mechanism or gear shown in Fig. 6.

The cylinder 10 of the engine is cast together with the frame or bed 11 and is closed at both ends by covers 12, to which are secured brackets 13. These covers are provided in the center with stuffing-boxes for the passage of the driving-shaft 15. The cylinder 10 is provided with suitably-arranged extensions 16, intended to receive drain cocks or pipes.

The piston of the engine, which is double, is constituted by two eccentrics 17, secured together, each consisting of a single part keyed to the shaft 15 and provided at both ends with circular flanges 18, concentric with the shaft and rotating without clearance or play in the cylinder 10. The two eccentrics 17 are divided by a solid partition 19, also concentric with the shaft 15 and rotating without play in the cylinder 10. These eccentrics are keyed at an angle of one hundred and eighty degrees, so that they are always in opposition relatively to each other. To the top of the cylinder 10 is secured or cast integral with it a chamber 20, Figs. 1, 2, closed at the top by a cover 21 and divided into two compartments by a partition *f*, which stops within a certain distance from the cover 21, so that the two compartments are in communication. This partition fits without clearance to the central circular portion 19 of the eccentrics. In each of these two compartments freely moves, but without any side play, an obturator 22, preferably of rectangular shape, resting with its rounded bottom face on the periphery of the corresponding eccentric 17. To the compartments of each obturator 22 correspond two conduits 23, merging at the bottom into the cylinder 10, one on the right and the other on the left hand side of the partition *f*. Each of these conduits 23 is closed at the top by a valve 24. To each eccentric 17 correspond two exhaust-conduits 25. Two of these conduits are arranged on the right and the two others on the left hand side of the corresponding obturator.

To each side of the chamber 20 is secured a valve-chest 26, communicating with the conduits 23 by means of ports 27. This valve-chest forms two superposed cock-casings 28 and 29. In the bottom casing 28, communicating with the casing 29 by means of a passage 30, are arranged without any play two circular obturators, the angular width of which is suitably determined. These obturators 31 are keyed to a spindle 32, to one of the ends of which is secured a lever 33. This lever is pivoted to the end of one of the arms of a bell-crank lever 34, loosely mounted on a fixed spindle 35, and provided at the other end with a roller 36. To the lever 34 is attached a helical spring 37, Fig. 3, which has the tendency of always keeping the roller 36 in contact with one of the cams *a b c*, keyed side by side to the shaft 15 at each side of the cylinder 10.

The lever 34, provided with a handle 38, carries a slide-block 39, curved along a chord of a circle with the same center as the spindle 35 and guided in one of the three holes of a bracket 40, Figs. 3 and 4. This lever 34 is longitudinally adjustable on its spindle 35, and to that end it is secured to a tooth-rack 41, engaging with a pinion 42, the spindle of which is provided with a handle 43. By means of the handle 38 the slide-block 39 can be disengaged from its guide 40. The handle 43 is turned, and the tooth-rack 41, with the lever 34, is moved in one or in the other direction, so as to bring the rollers 36 into contact with one or another of the cams *a b c* and the slide-block into the corresponding hole of the bracket 40, whereby the period of admission of the driving fluid can be modified.

In each casing 29 is arranged a cylindrical obturator in two parts. One part, 44, has a sufficient angular development for never uncovering the rectangular orifice of the conduit 45 for admitting the driving fluid; the other part, 46, is narrower, Fig. 2. These

two parts 44 and 46 of the obturator are secured to each other and to a spindle 47. To one of the ends of the spindle 47 is keyed a lever 48, and on the same end is mounted loose a lever 49, terminating at one of its ends in a quadrant provided with a groove 50, concentric with the spindle 47. The lever 48 can be connected to the quadrant of the lever 49 by a ball or block 51, engaging with the groove 50. The other end of the said lever 49, which is bifurcated, is connected to the movable sleeve of a centrifugal governor 52, Figs. 3 to 5. The vertical spindle 53 of this governor is provided at the bottom with a beveled pinion 54, engaging with a similar pinion 55, to the spindle of which is keyed a pulley 56, connected to another pulley 57, keyed to the driving-shaft 15.

As shown in Fig. 4, the spindle 47 is tapped at the end opposite the governor 52, the pitch of the screw-thread being very high, and receives a screw-threaded rod 58, carrying at the end a hand-wheel 59 and provided with a collar 60, resting against the bottom of the stuffing-box 61. Against this collar 60 rests at the other side a ring 62, held in place by the tightening of the stuffing-box 63, whereby the rod 58 is prevented from moving longitudinally. By turning the hand-wheel 59 the rod 58 is also turned and is screwed or unscrewed in the spindle 47, which moves forward or backward, the sectors 44 and 46 thus being moved.

In order to describe the working of the engine, it will be sufficient to explain that of one eccentric 17 and the corresponding parts, since both the eccentrics work in the same manner, with the only difference that one of them is in advance of half a revolution on the other.

Driving fluid under pressure (steam, compressed air, &c.,) is admitted by the conduit 45, Fig. 2, which is supposed not to be closed by the obturator 44 and 46, passes through the passage 30, which must not be closed by the obturator 31, intended for driving forward, and through the orifices 27 spreads in the cylinder 10, and at the same time raises the corresponding valve 24 and penetrates into the compartments of the two obturators 22, on which it acts and presses them against their respective eccentrics 17. The fluid acts on the eccentric under consideration and causes it to rotate with the shaft 15. It must be pointed out that along a certain length of its circumference (represented by the chord *d e*, Fig. 2) the eccentric 17 has exactly the same curvature as its cylinder 10, for the purpose of insuring a wide surface of contact between these parts.

When the eccentric 17 is in its highest position, it closes by its face *d e* the orifices of the conduits 25 and 23, and the driving fluid can no longer penetrate into the cylinder 10 or escape therefrom. The eccentric 17 continues to rotate, being driven by the other one, which at this moment is in full admission, or, in the event of a single eccentric-engine, by the momentum of a fly-wheel. It uncovers first the orifices of the conduits 25, so as to enable the driving fluid to escape through that of the two conduits which corresponds to the forward driving, and afterward it again uncovers the orifices of the conduit 27, so that the fluid may penetrate to the eccentric 17, while the obturator 22 again descends with it in order to intercept communication between the inlet-opening and the outlet-opening. The same operations as those described are reproduced in the same order during the whole working of the engine.

The roller 36 is in contact with one of the cams *a b c*, which rotate with the shaft 15, and it is periodically raised and lowered and causes to swing the lever 34, which acts on the lever 33 of the obturator 31, in such manner that during the admission the obturator 31 establishes communication between the conduits 30 and 27 for the passage of the driving fluid and closes that communication during the expansion period. It will be understood that, according to the shape of the cam *a*, *b*, or *c* operating the valve-gear, the admission will be regulated so as to give greater or less power, and also to open the ports to a greater or smaller extent so as to vary the speed of the engine. According to circumstances, the roller 36 is therefore brought into contact with the cam *a*, *b*, or *c*, whichever may be suitable, by means already described.

By means of the pulleys 57 the shaft 15 drives the beveled pinions 55 and 54 and transmits rotary movement to the spindles 53 of the two governors 52. Each of these governors regulates the distribution of the fluid on the two eccentrics 17 either for driving forward or for driving backward, and it is sufficient to describe the working of one of them.

When the balls of the governor move apart, the lever 49 swings and carries with it the spindle 47, which is screwed on the rod 58, moving with the two obturators 44 and 46. The larger obturator 44 closes the orifices 45 to a greater extent owing to its advance, while the obturator 46, owing to its rotation, also closes to a greater extent the portion of that orifice which remained free. This reduction of the orifice decreases, therefore, the admission of the driving fluid, and the speed of rotation is consequently reduced. When this speed decreases, the reverse takes place, and the orifice 45 is disengaged. The regulating can also be effected by hand, according to circumstances. To that end the hand-wheel 59 is rotated in suitable direction, and the rod 58 by turning longitudinally moves the spindle 47, in which it is screwed, with the obturators 44 and 46, whereby the

inlet-opening 45 is covered or uncovered to a greater or less extent.

As will be readily understood, there are two distributing and regulating systems. One serves for driving forward and the other for driving backward. With reference to Fig. 2 the distributing system or valve-gear on the right-hand side serves for driving forward and that on the left-hand side for driving backward. For rotating in a given direction it is therefore necessary that the driving fluid should enter only one of the conduits 45 and that the obturators 51 should cover and uncover the ports 27 at a suitable moment—that is to say, with a difference of time corresponding to half a revolution of the eccentrics 17. They must be therefore keyed with a corresponding angular difference.

The reversing-gear is shown in Figs. 6 and 7. It is constituted by two three-way cocks 64 and 65, arranged side by side. The first cock 64 serves to admit driving fluid, and the other, 65, permits its escape. The passage in the cock-plug 64 can be placed in communication either with the conduit 66 for admitting driving fluid and with the conduit 67, connected to the right-hand conduit 45, Fig. 2, for the forward driving of the engine, or with the conduit 66 and the conduit 68, connected to the left-hand conduit 45, Fig. 2, for driving backward. The passage in the cock-plug 65 can be placed into communication either with the conduit 69, opening into the atmosphere, and with the conduit 70, connected to the left-hand exhaust-conduits 25, Fig. 2, for the forward driving of the engine or with the conduit 69 and with the conduit 71, connected to the right-hand exhaust-conduit 25, for the backward driving of the engine. Figs. 3 and 5 represent these communications.

The plugs 64 and 65 are respectively provided with toothed wheels 72 and 73, engaging with the same pinion 74 arranged between them, the spindle of which carries a hand-wheel 75. The plugs 64 and 65 are turned so as to establish communications just described, either for the forward or for the backward driving. The conduits serving for the backward driving are intercepted during the forward driving, and vice versa.

This engine can also be worked with water as driving fluid and be used as a rotary pump.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a rotary engine, the combination with a cylinder divided into two compartments in which are located two eccentric pistons keyed upon the driving-shaft and obturators 22 applied upon the pistons by the pressure of the motor fluid, of a distributing-chamber 20 communicating with the two cylinders, two conduits 23 on each side of the said chamber and discharging on one part into the compartments of the cylinder and on the other part into the upper portion of the said chamber, a distributing valve-chest 26 on each side of the chamber 20 communicating with the conduits 23 through the orifices 27, alternately-moving valves 31 located in the said distributing valve-chest, a series of cams *a*, *b*, *c* keyed upon the driving-shaft to control the said valves 31 by means of appropriate levers, a regulating-valve 44, 46 movable alternately in each distributing-chest 26 and having two parts of unequal size, a screw-shaft bearing each regulating-valve, a centrifugal regulator actuating each of said shafts, and means for compelling the fluid to flow in one or the other of said distributing-chests 26 according to the direction of rotation desired, substantially as described and for the purposes specified.

2. In a rotary engine, the combination with a cylinder divided into two compartments in which are located two eccentric pistons keyed upon the driving-shaft, of two distributing-chests communicating respectively with the said compartments, two discharge-conduits for each compartment arranged in opposition, two three-way cocks 64, 65 operated by gears and communicating respectively with the said chests 26 and the said conduits 25, substantially as described and for the object specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAUL DÉCOR.

Witnesses:
JULIEN CAVERNE,
HANSON C. COXE.