No. 717,023. Patented Dec. 30, 1902.

J. PUTMAN.

ROTARY ENGINE.

(Application filed June 19, 1902.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 4.

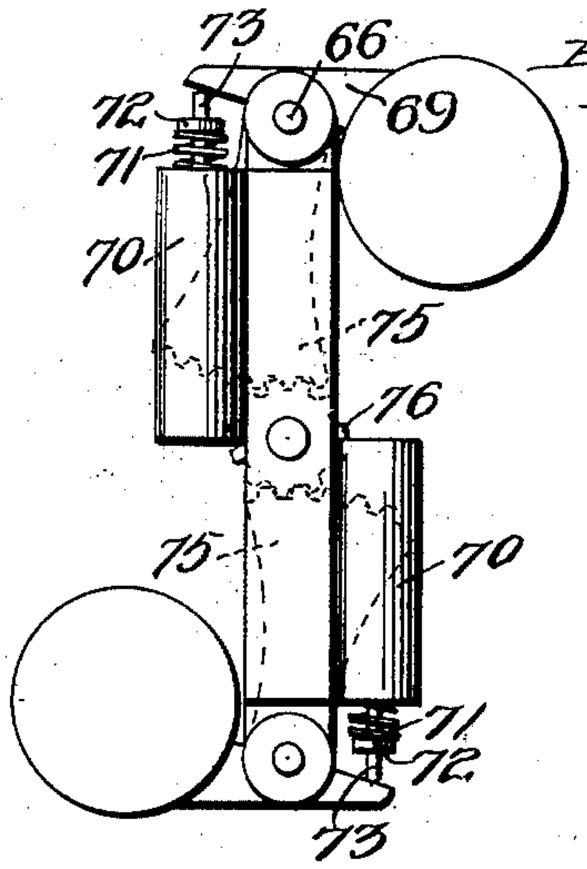

Fig. 1.

Witnesses
E. C. Goldsborough
Jno. E. Parker

John Putman, Inventor.
by C. A. Snow & Co.
Attorneys

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J. PUTMAN.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 9.

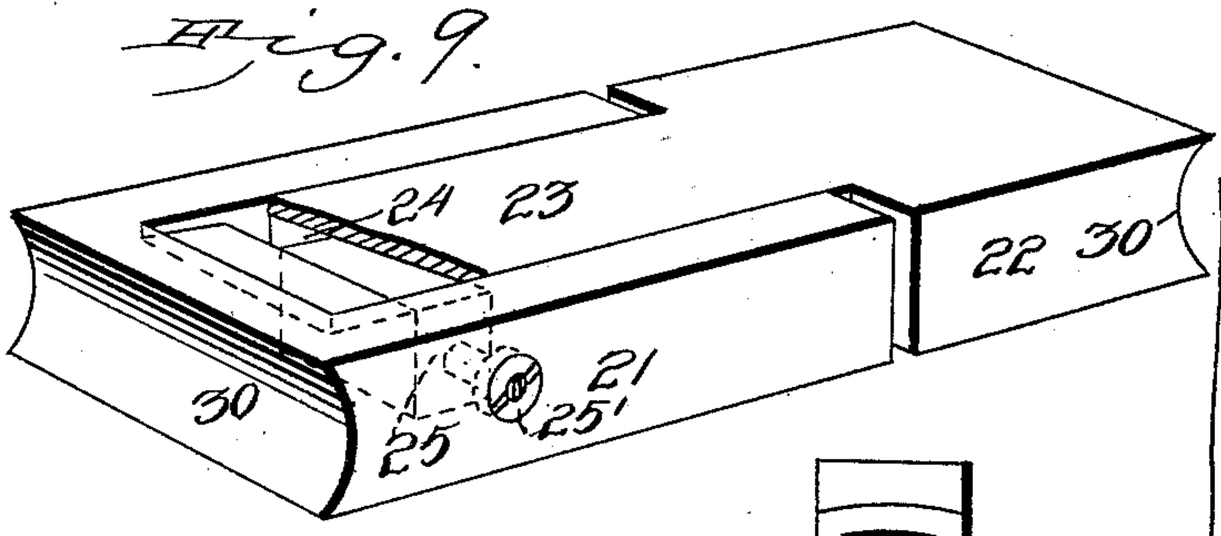


Fig. 8.

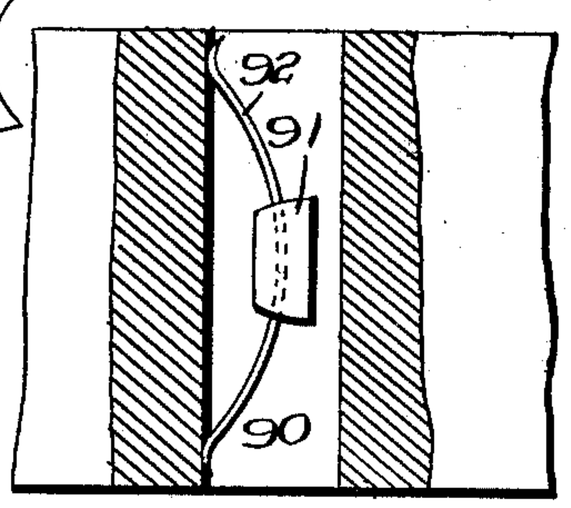


Fig. 2.

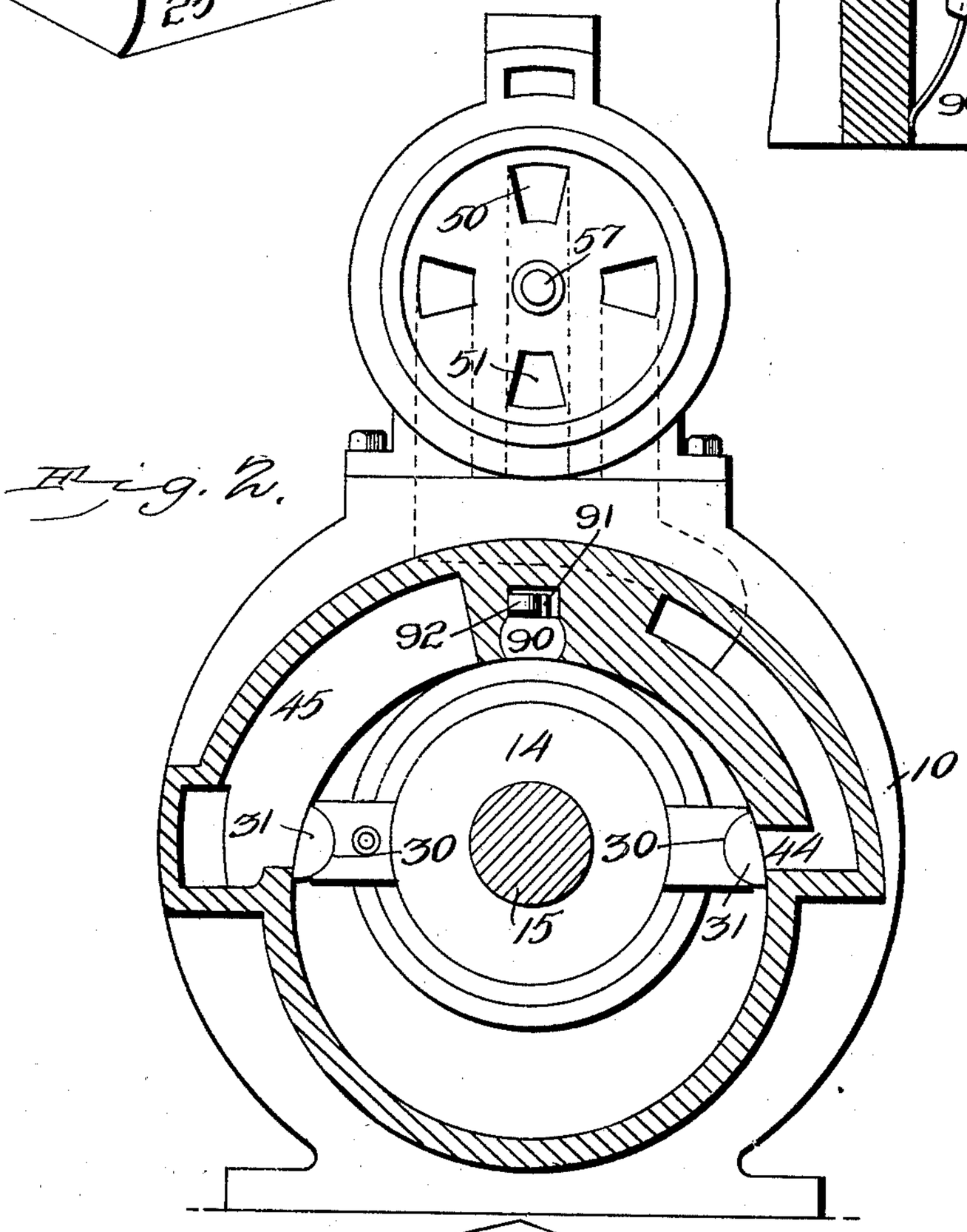
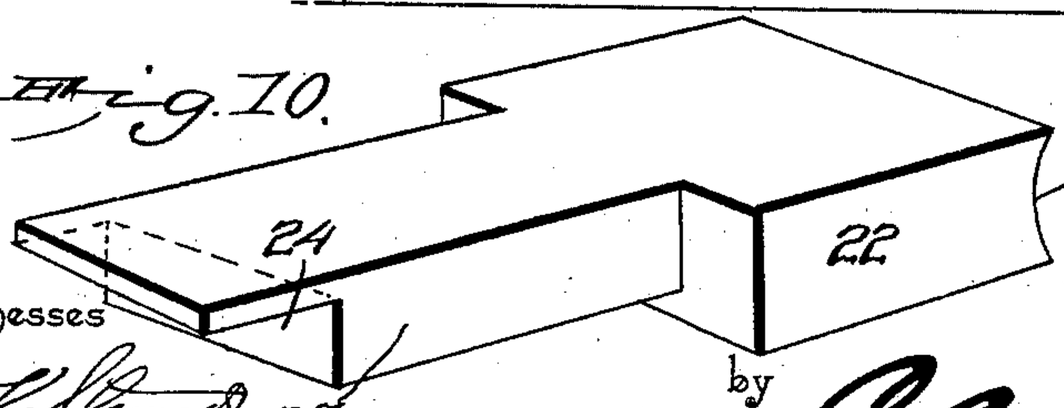


Fig. 10.



Witnesses
E. F. Stewart
Jno. G. Parker

by Cushman & Co.
Attorneys

John Putman,
Inventor.

No. 717,023. Patented Dec. 30, 1902.

J. PUTMAN.

ROTARY ENGINE.

(Application filed June 19, 1902.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 3.

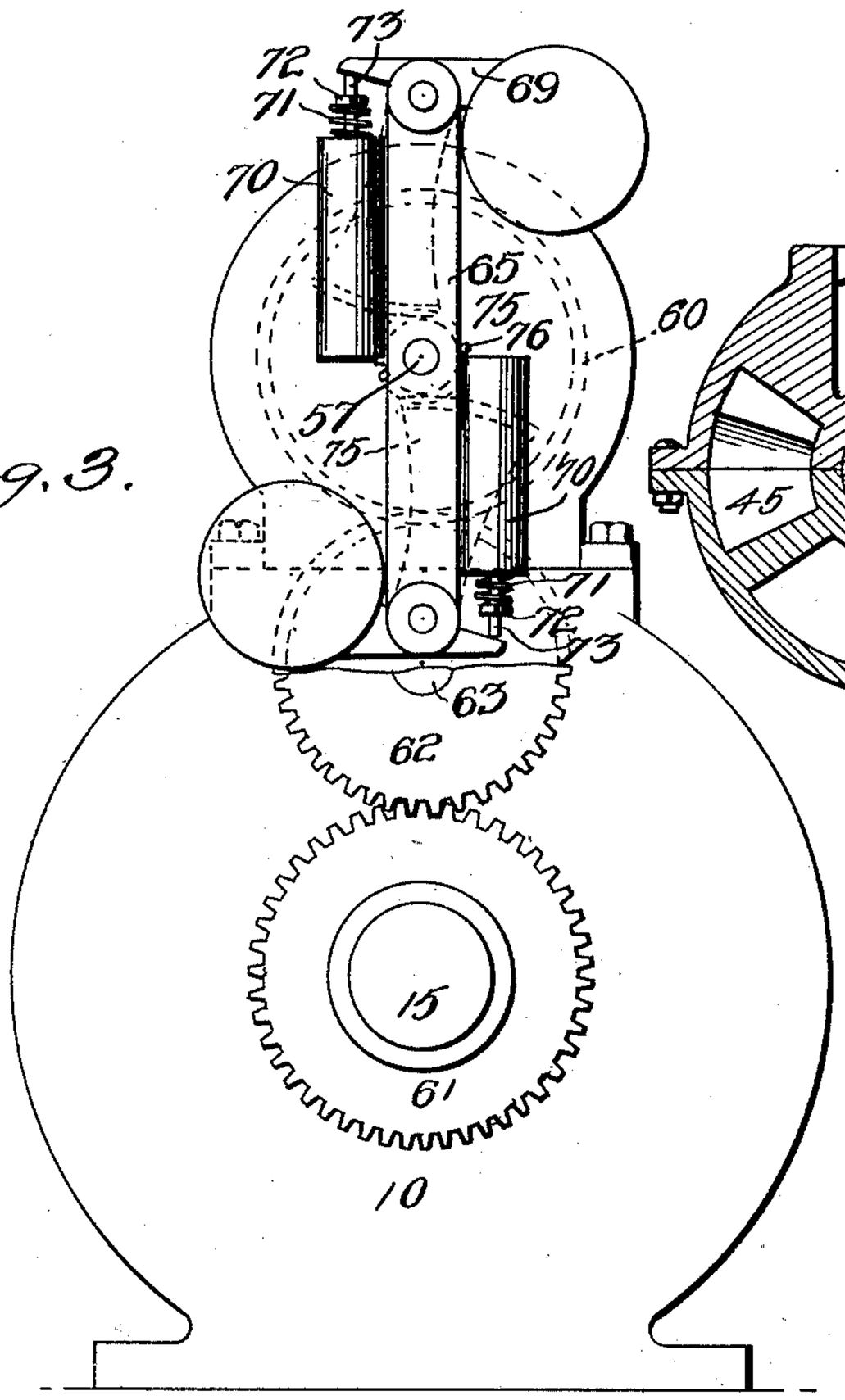


Fig. 4.

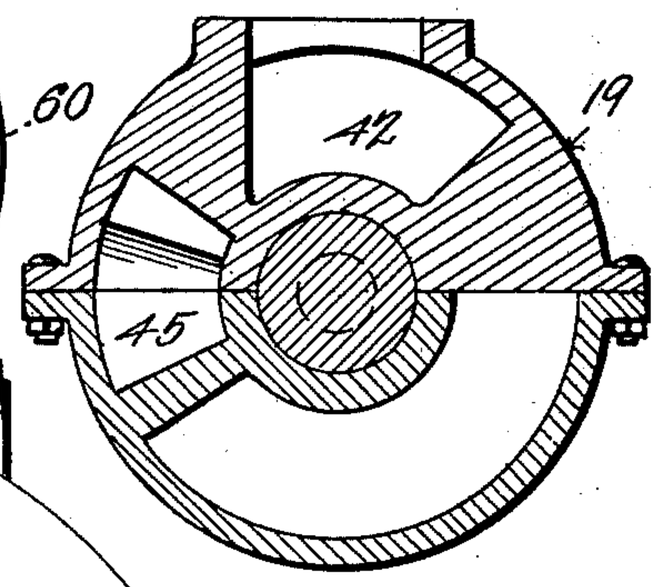


Fig. 5.

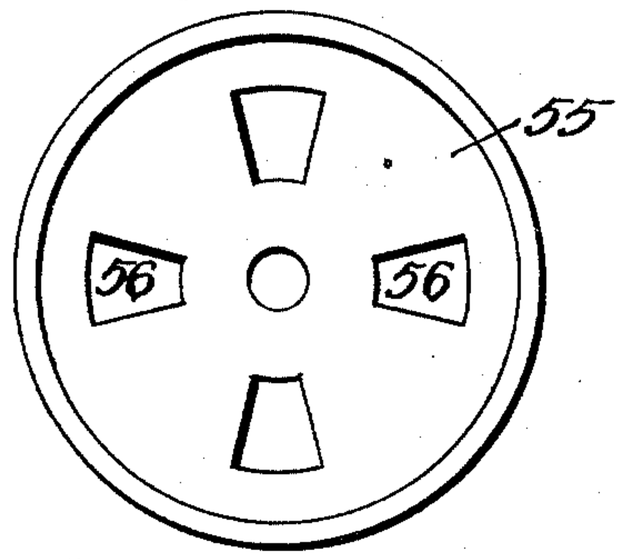


Fig. 6.

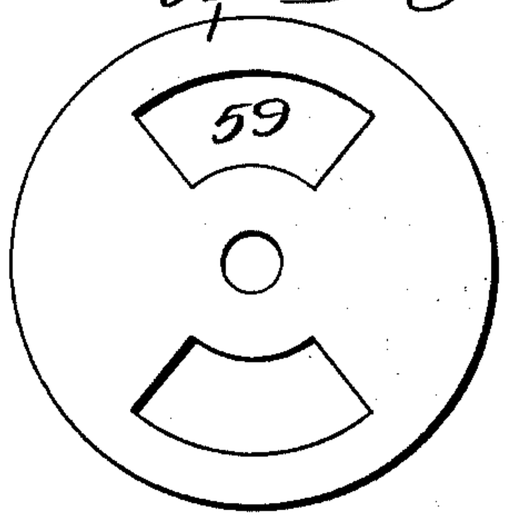
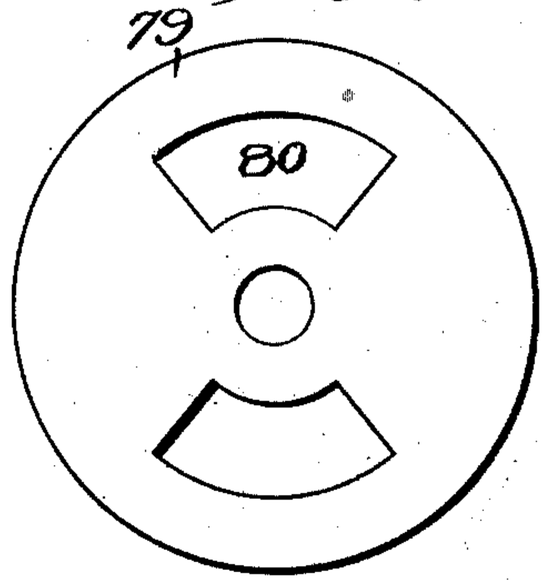


Fig. 7.



Witnesses
E. F. Stewart
Jno. E. Parker

John Putman Inventor.
by C. A. Snow & Co.
Attorneys

UNITED STATES PATENT OFFICE.

JOHN PUTMAN, OF LOVINGTON, ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 717,023, dated December 30, 1902.

Application filed June 19, 1902. Serial No. 112,377. (No model.)

To all whom it may concern:

Be it known that I, JOHN PUTMAN, a citizen of the United States, residing at Lovington, in the county of Moultrie and State of Illinois, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to certain improvements in rotary engines, and has for its object to construct an improved form of engine in which the steam is automatically cut off to a greater or less extent as the speed of the engine increases.

A further object of the invention is to provide an improved form of double-cylinder rotary engine in which the movable piston-abutments are arranged at approximately right angles to each other in the two cylinders in order to better equalize the pressure of steam on the abutments.

A still further object of the invention is to provide an improved form of sliding abutment having movable contact-faces for engaging the inner curved wall of the cylinder and so constructed as to permit of adjustment for wear.

A still further object is to provide an improved form of abutment or packing to separate the two sides of the cylinder from each other.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims.

In the drawings, Figure 1 is a longitudinal sectional elevation of a rotary engine constructed in accordance with the invention. Fig. 2 is a transverse sectional elevation of the same on the line 2 2 of Fig. 1. Fig. 3 is an end elevation of the engine. Fig. 4 is a detail perspective view of the governing device for regulating the quantity of steam admitted to the cylinders at each half-revolution of its pistons. Figs. 5, 6, and 7 are detail views of the valve mechanism. Fig. 8 is a sectional plan view on the line 8 8 of Fig. 1, illustrating the arrangement of the cylinder-abutment or packing-strip. Figs. 9 and 10 are detail perspective views of one of the sliding piston-abutments. Fig. 11 is a sectional elevation of a portion of the engine on the line 11 11 of Fig. 1.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The cylinders 10 and 11 are arranged side by side, each being approximately circular in form and provided at one end with a removable head 12, having a circular recess for the reception of the reduced end portion of the circular piston-body 14. Two piston-bodies are used, one being located in each of the cylinders, and both are secured to or formed integral with a shaft 15, having a reduced central portion or hub 16, slightly separating the piston-bodies from each other, and around this central portion or hub is fitted a two-part casting 19, forming a head for the adjacent ends of the two cylinders and being provided with suitable ports or passages for admitting steam to the cylinders and permitting its escape therefrom after passing through the cylinder.

The two piston-bodies are provided with diametral slots 20, arranged approximately at right angles to each other and adapted for the reception of sliding abutments of the character shown in Figs. 9 and 10. One abutment is arranged at each cylinder, and each of said abutments is in the form of a substantially rectangular plate formed in two sections 21 and 22. The section 21 is provided with a recess in one of its faces for the reception of the reduced end 23 of the section 22, and in the end of said section 23 is formed an inclined slot 24, in which is fitted a sliding wedge-block 25, having a flat face engaging with one wall of the recess in the section 21 of the abutment, while the inclined face engages with the inclined end wall of the slot 24. The sections are so made as to slightly overlap in order to prevent the passage of steam, and the construction is such that the juncture of the two sections of each abutment is always disposed within the slot in the piston-body. In the wedge-block 25 is a threaded opening adapted for the reception of the threaded portion of a screw 25, having one end swiveled in a suitable opening formed in one wall of the recessed section 21 of the abutment, the head of the screw being arranged flush with the outer face of said sec-

tion, so that by the employment of a screw-driver or other suitable tool the wedge may be adjusted in such manner as to lengthen the abutment and compensate for wear. In the outer ends of each abutment are semicircular recesses 30 for the reception of packing-strips 31, adapted for contact with the inner curved wall of the cylinder, the faces of such contact-strips being shaped to conform to the walls of the cylinder and closely following the contour thereof while rocking or oscillating in the semicircular supporting-seats 30 in the ends of the abutments.

In the opposite sides of each piston-body are annular grooves 32 for the reception of similarly-shaped packing-strips 33, adapted for contact with the cylinder-heads, said packing-strips being pressed outwardly into intimate contact with the cylinder-head by springs 34. Each packing-strip is cut away or is formed in two sections to permit the free passage of the sliding abutments, as will be readily understood.

In the two-part central section 19 are two steam-ports 42 and 43, leading, respectively, to the cylinders 10 and 11, the opening of one of such ports being indicated at 44 in Fig. 2, and in said central portion are two exhaust-ports, one of which is indicated at 45 in Fig. 2, both ports leading to a common exhaust.

Secured to the central section 19 is a steam-chest 46, into which steam is admitted through a port 47, the passage of the steam from this port to the ports 44 and 43 being governed by a peculiar form of valve mechanism. The steam-chest is provided with a removable head 48, having a chamber 49, from which extend four ports or passages arranged at angles of ninety degrees from each other, the upper and lower ports in the same vertical plane leading through the port 42 to the cylinder 10, while the remaining ports 51 of the horizontally-alined pair lead through the port 43 to the cylinder 11.

Secured within the steam-chest is a flanged disk 55, having four openings 56, arranged in line with the ports 50 and 51, said disk being rigidly secured in place and provided with a central opening for the passage of a revoluble shaft 57, on which is mounted a disk valve 58 of the character more clearly shown in Fig. 6. The valve 58 is provided with two ports 59 of segmental form, each extending through an arc of about ninety degrees, and the ports being arranged at diametrically opposite points, so that as the valve revolves the pairs of horizontally alining and vertical alining ports of the disk 55 will be alternately placed in communication with the steam-chest, steam passing simultaneously through both ports of the pair to supply steam to the same cylinder. The outer end of the shaft 57 is provided with a gear-wheel 60, driven by a gear-wheel 61 on the main shaft 15 of the engine through an intermediate gear 62, mounted on a stud 63, carried by a standard 64, which also serves as a support for the shaft 57.

To the shaft 57 are secured two diametrically opposed arms 65, which may be formed in a single casting, each arm being provided near its outer end with a pivot-stud 66, and to better support this pivot-stud the arm is formed with a bracket 67, having an opening for the reception of the pin. Each pin 66 carries a weighted lever 69, movable outwardly under the influence of centrifugal force when the shaft 67 is rotated.

Each of the arms 65 carries a tube 70, extending parallel therewith and serving for the reception and support of a compression-spring 71 to counteract the outward movement of the governor-weights. The tension of the springs may be adjusted in any desired extent by nuts 72, adapted to threaded stems 73, extending partially through the coils in which the springs are wound. The outer ends of the springs 73 bear against the under side of the weighted levers 69 and tend to resist the outward movement of the weights, so that by adjusting the nuts 72 the sensitiveness of the governor might be regulated and any desired speed maintained. The weighted arms 69 are rigidly secured to the studs 66, and the outer ends of the latter are extended beyond the brackets 67 and carry segments 75, the inner ends of which are provided with gear-teeth adapted to intermesh with the teeth of a pinion 76, carried by a sleeve 77, mounted upon the shaft 57. The sleeve 77 extends through a suitable stuffing-box 78, formed in the head 49 of the steam-chest, and at its inner end said sleeve is secured to a disk 79 of the character more clearly shown in Fig. 7. The disk valve 79 is of substantially the same construction as the steam-valve 58, being provided with segmental ports 80, arranged at diametrically opposite points and each extending through an arc of somewhat less than ninety degrees. The disk-valve 79 is mounted between the stationary disk 55 and the head 49 of the steam-chest, and this valve, together with the steam-valve 58, is secured to its carrying device by a pin-and-slot connection, as indicated at 81 of Fig. 1, the connection being such as to permit slight movement of the valve in order that it might readily accommodate itself to the valve-seat, while at all times being securely connected to the carrying shaft or sleeve for rotative movement.

The steam-valve 58 is continuously rotated in the same direction by means of the gearing extending between the shaft 15 and the valve-carrying shaft 57 and serves to alternately admit steam to the cylinders 10 and 11, the steam passing through the two vertical alining ports 50 to the cylinder 10 and then through the two horizontally-alining ports 51 to the cylinder 11. The cut-off valve 79 receives a partial rotative movement through the medium of the governor-segments 75, the pinion 76, and the sleeve 77, the direction of

movement being governed by the speed of rotation of the main shaft and serving to regulate the quantity of steam admitted to the engine through the steam-ports 59 of the valve 58. The position of the valves is governed by suitable adjustment of the train of gearing connecting the shafts 15 and 57, and when once the valves are set they will be retained in proper position until the gears are changed.

In order to prevent the passage of steam between the inlet and exhaust sides of the cylinder, I employ a movable abutment or packing-strip of the character more clearly shown in Figs. 2 and 8 and comprising a bar 90, having rounded edges adapted to a similarly-shaped recess in the wall of the cylinder immediately above the piston. The packing-strip 90 may turn freely in its rounded holding-recess and on its upper face has a lug 91, carrying a plate-spring 92, the opposite ends of which bear against the wall of the upper rectangular portion of the recess, as shown more clearly in Fig. 2. The spring serves to partially rotate the packing-strip and maintains one edge thereof in intimate contact with the periphery of the piston-body, the curved face of the strip being presented to the steam side of the cylinder and serving to effectually prevent the steam blowing over to the exhaust-port without first acting on the sliding abutment.

While the construction herein described, and illustrated in the accompanying drawings, is the preferred form of the device, it is obvious that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described the invention, what I claim is—

1. The combination in a rotatory engine, of a plurality of steam-cylinders, pistons therein, a steam-chest having a single steam-inlet, a plurality of ports leading therefrom to the cylinders, a revoluble disk valve for placing the ports of the respective cylinders alternately in communication with the steam-chest, and means for revolving said valve.

2. The combination in a rotatory engine, of a plurality of steam-cylinders, pistons therein, a steam-chest having two pairs of steam-ports, the diametrically opposing ports of each pair being in communication with the respective cylinders, a revoluble disk valve having a pair of ports adapted to alternately place the diametrically opposing pairs of ports in communication with the steam-chest, and means for revolving said valve.

3. The combination in a rotatory engine, of a plurality of steam-cylinders, pistons therein, a steam-chest, steam-passages leading therefrom to the cylinder, a revoluble disk valve having ports for alternately placing the passages of the respective cylinders in communication with the steam-chest, a ported disk valve movable circumferentially to cut off the flow of steam through all of the steam-passages, and a governor controlling the position of the cut-off valve, substantially as specified.

4. The combination with an engine, of a steam-chest, a stationary ported disk therein, a revoluble steam-valve seated against one side of the disk, a shaft carrying said valve, means for revolving the shaft, a ported cut-off valve seated against the opposite side of the disk, a sleeve mounted on the valve-carrying shaft and carrying the cut-off valve, and a governing device for controlling the position of the sleeve and cut-off valve.

5. The combination with an engine, of a steam-chest, a stationary ported disk therein, a steam-valve seated against one side of the disk, a shaft carrying the steam-valve, a ported cut-off valve seated against the opposite side of the stationary disk, a sleeve mounted on the disk-carrying shaft and carrying said cut-off valve, a centrifugal governor carried by the shaft, gear-segments operable by said governor, and a pinion secured to the cut-off sleeve and intermeshing with said segments.

6. The combination with an engine, of a steam-chest, a stationary ported disk therein, a steam-valve seated against one side of the disk, a cut-off valve seated against the opposite side of the disk, concentric shafts on which said valves are loosely mounted, means for continuously revolving the shaft of the steam-valve, and a governor for regulating the position of the cut-off valve.

7. The combination with a steam-engine, of the main shaft, a steam-chest, steam and cut-off valves mounted concentrically within the steam-chest, a carrying-shaft for the steam-valve, a train of gearing connecting said carrying-shaft to the main shaft of the engine, a pair of governor-arms rigidly secured to said carrying-shaft and having brackets disposed near their outer ends, pivot-studs disposed in openings in said brackets and arms, counterweighted levers secured to said studs, spring-carrying cylinders carried by the arms, adjustable springs disposed within the cylinders and bearing against said levers, gear-segments secured to the pivot-studs, a sleeve mounted on the carrying-shaft and supporting the cut-off valve, and a pinion secured to said sleeve and intermeshing with the segments.

8. The combination in a rotatory engine, of the cylinder, a piston-body eccentrically disposed, and a sliding abutment carried by the piston-body, said abutment comprising a pair of interfitting sections, a wedge-block disposed between the sections, and means for adjusting said wedge-block to regulate the length of the abutment.

9. A piston-abutment for a rotatory engine, comprising one section having a recess, a second section having a tongue fitting within said recess and provided with an inclined wall at one end, a wedge-block seated within the recess and bearing against the inclined

wall, and a screw adapted to a threaded opening in said wedge-block for adjusting the length of the abutment, substantially as specified.

10. The combination in a rotatory engine, of a pair of cylinders, a shaft eccentrically mounted in said cylinders, piston-bodies carried by said shaft and provided with an intermediate portion of reduced diameter, a two-part casing fitted around said intermediate portion and extending to a point within the peripheral line of the piston-bodies, packing-rings carried by the opposite side walls of the piston-bodies, abutments mounted in said piston-bodies, a steam-chest supported by the upper portion of the two-part casing, steam-passages leading through said casing from the steam-chest to the respective cylinders, and means for controlling the flow of steam from the steam-chest to the cylinders, substantially as specified.

11. The combination in a rotatory engine, of the two cylinders, piston-bodies disposed therein and having an intermediate portion of reduced diameter, a sectional casing fitting around said intermediate portion and forming the adjacent heads of the two cylinders, a steam-chest carried by the upper portion of said casing, steam-passages formed in said casing and extending between the steam-chest and the respective cylinders, removable outer heads for said cylinders, annular packing-rings carried by both of the piston-bodies and bearing against all of the cylinder-heads, and sliding abutments carried by said piston-bodies.

12. The combination with a cylinder having a curved recess, of an abutment or packing-strip having curved side walls and seated in said recess, a lug carried by said abutment, a revoluble piston and a plate-spring extending between the lug and one wall of the piston and tending to force the abutment into contact with the periphery of the piston, 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.

JOHN PUTMAN.

Witnesses:
L. G. HOSTETLER,
FRED HARMON.