No. 804,162. PATENTED NOV. 7, 1905.

F. M. OBER & B. DUGAR.

ROTARY ENGINE.

APPLICATION FILED FEB. 10, 1905.

5 SHEETS—SHEET 1.

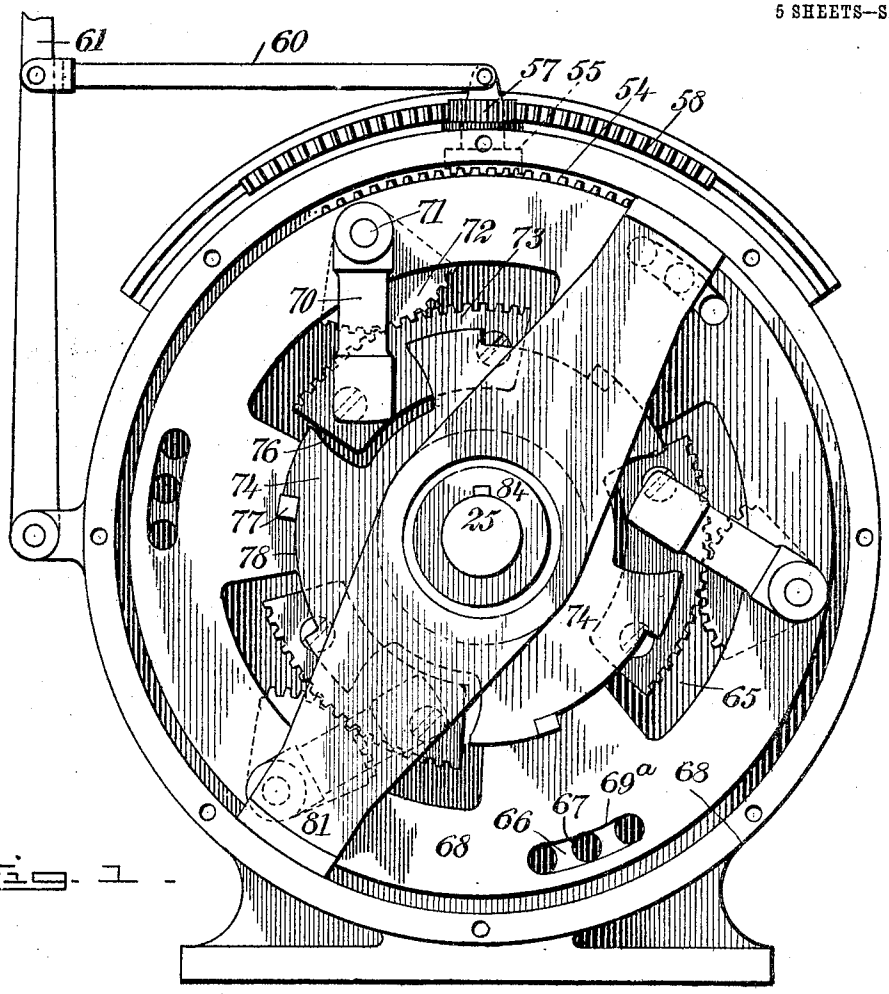


Fig. 1.

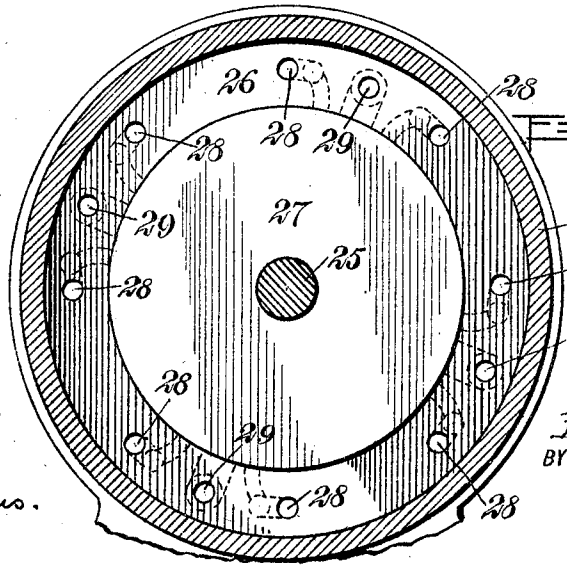


Fig. 5.

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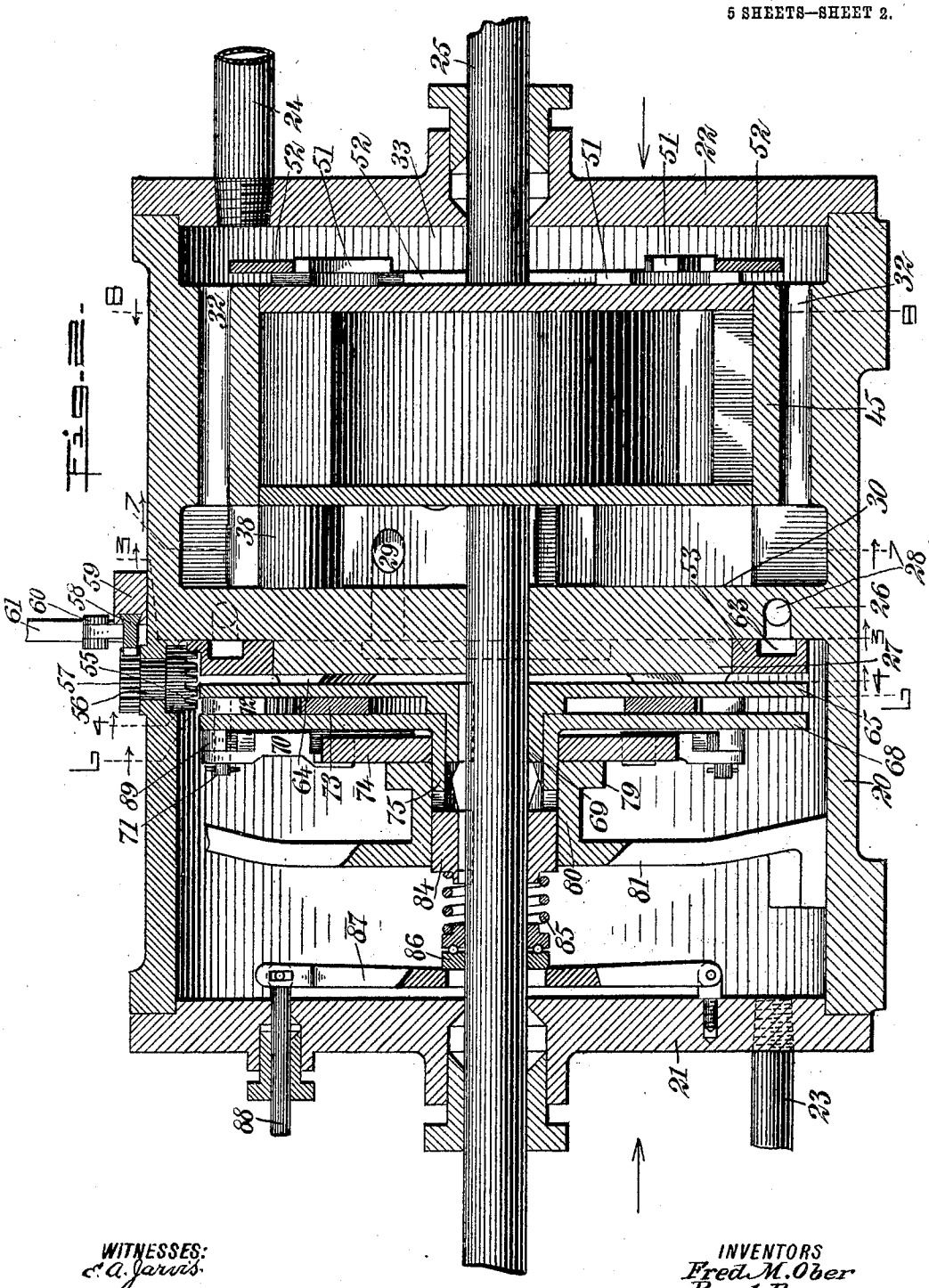
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5 SHEETS—SHEET 2.

Fig. 2.



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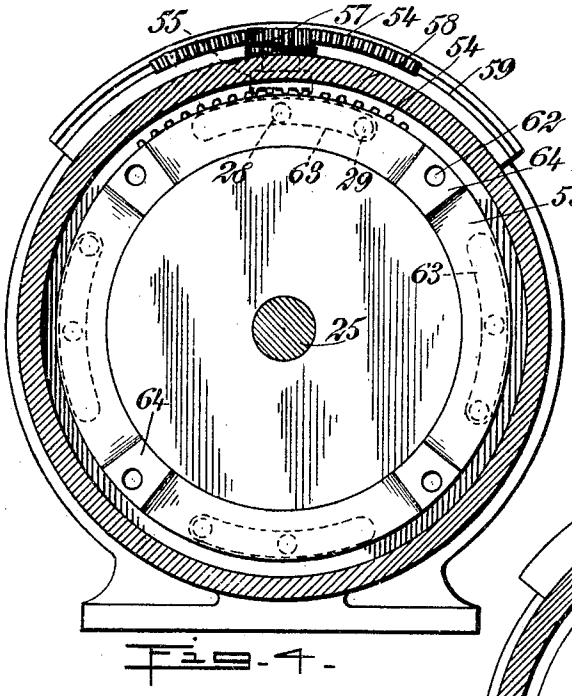


Fig. 4.

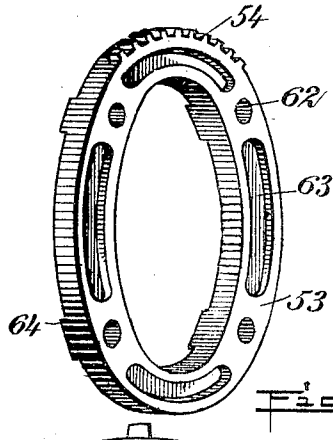


Fig. 5.

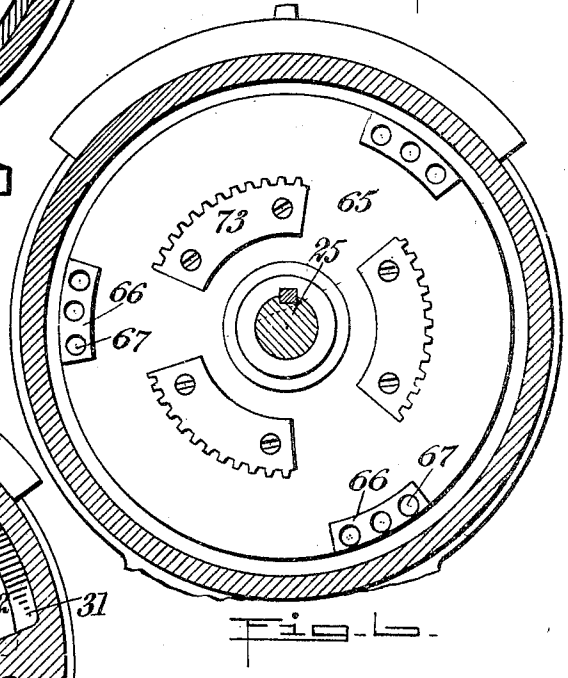


Fig. 6.

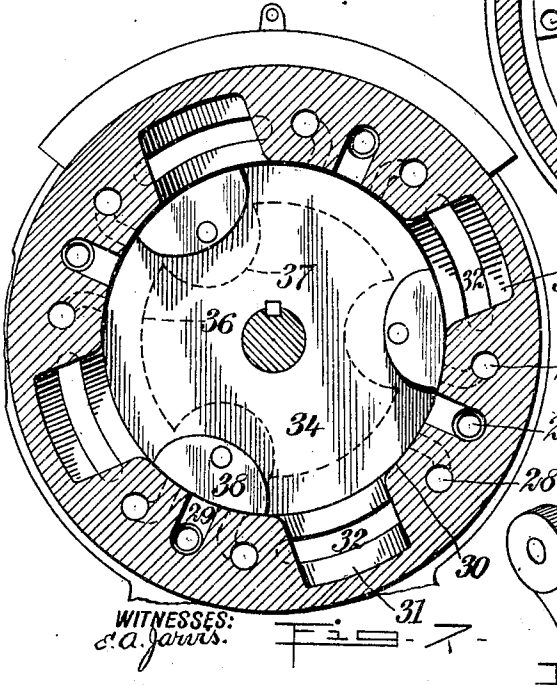


Fig. 7.

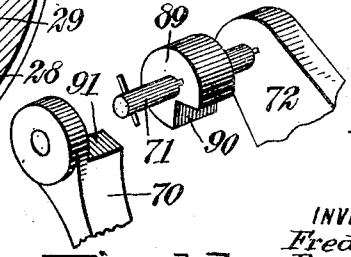


Fig. 16.

Fig. 17.

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6 SHEETS—SHEET 4.

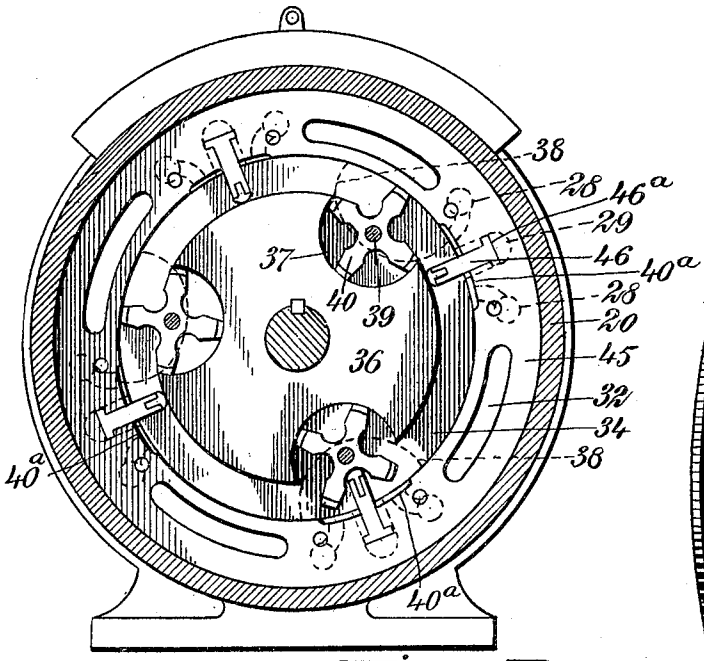


Fig. 8.

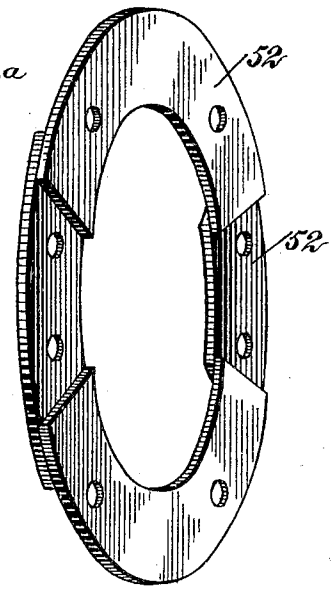


Fig. 10.

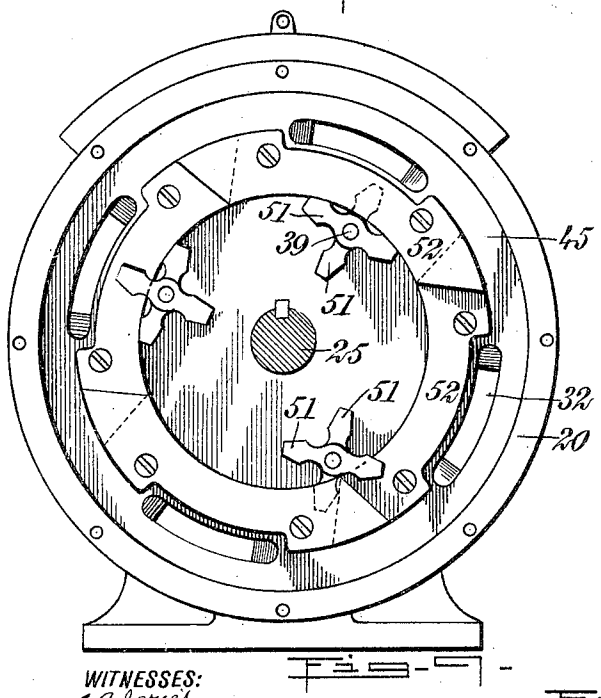


Fig. 9.

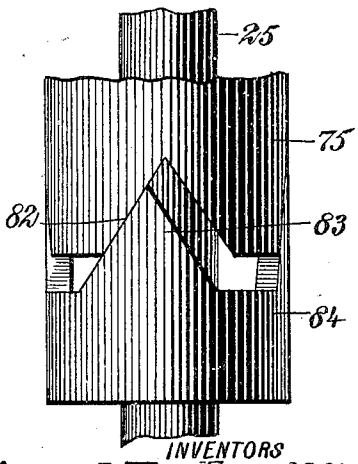


Fig. 11.

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6 SHEETS—SHEET 5.

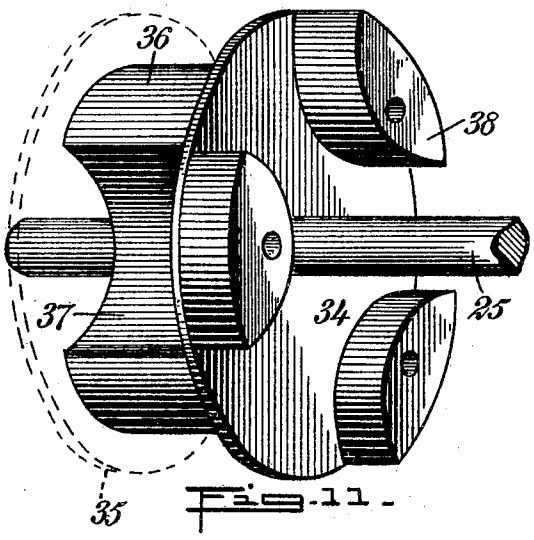


Fig. 11.

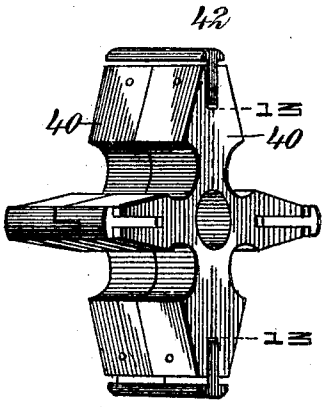


Fig. 12.

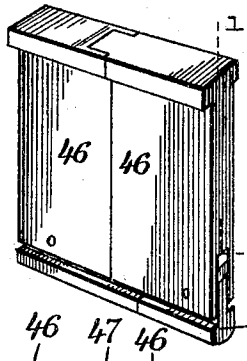


Fig. 14.

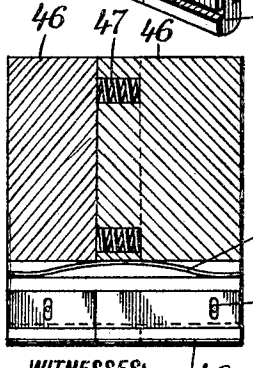


Fig. 15.

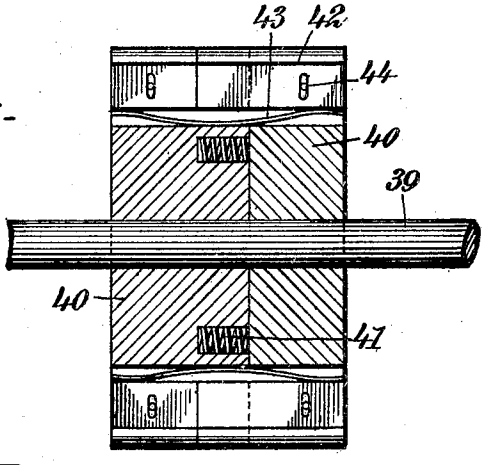


Fig. 13.

WITNESSES:
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UNITED STATES PATENT OFFICE.

FRED MORRIS OBER AND BURT DUGAR, OF MORRISVILLE, VERMONT.

ROTARY ENGINE.

No. 804,162. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed February 10, 1905. Serial No. 245,046.

To all whom it may concern:

Be it known that we, FRED MORRIS OBER and BURT DUGAR, citizens of the United States, and residents of Morrisville, in the county of Lamoille and State of Vermont, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The invention relates to a rotary steam or other elastic-fluid engine in which the rotor is provided with a number of piston-heads revolubly mounted thereon and coacting with abutments supported by the cylinder or stationary part.

The invention resides in certain novel features of construction and arrangement of elements, which will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, which illustrate, as an example, the preferred embodiment of our invention, in which drawings like characters of reference indicate like parts in the several views, and in which—

Figure 1 is an elevational view looking into the steam side of the cylinder. Fig. 2 is a longitudinal section of the engine. Fig. 3 is a sectional elevation on the line 3 3 of Fig. 2 looking in the direction of the arrows marked on the said line. Fig. 4 is a sectional elevation on the line 4 4 of Fig. 2 looking in the direction of the arrows marked on said line. Fig. 5 is a detail perspective of the steam-distributing ring. Fig. 6 is a sectional elevation on the line 6 6 of Fig. 2 looking in the direction of the arrows applied to said line. Fig. 7 is a sectional elevation on the line 7 7 of Fig. 2 looking in the direction of the arrows on said line. Fig. 8 is a sectional elevation on the line 8 8 of Fig. 2, illustrating particularly the rotating piston-heads and abutments. Fig. 9 is an end elevation looking into the exhaust side of the cylinder. Fig. 10 is a detail perspective of the ring for guiding the rotating piston-heads. Fig. 11 is a perspective view of the rotor or rotating member of the engine. Fig. 12 is an enlarged detail of one of the rotating piston-heads. Fig. 13 is a section thereof on the line 13 13 of Fig. 12. Fig. 14 is a detail perspective of one of the abutments. Fig. 15 is a detail section thereof on the line 15 15 of Fig. 14. Figs. 16 and 17 are detail perspective views showing the connection of the governors with their shafts, and Fig. 18 is a detail view showing the cam members for operating the governor-plate.

20 indicates the cylinder of the engine, which is stationary and has a head 21 at the steam side and a head 22 at the exhaust side.

23 indicates the steam-pipe, and 24 indicates the exhaust-pipe.

25 indicates the engine-shaft, which is revolubly mounted in suitable bearings (not shown) and which passes loosely through stuffing-boxes on the heads 21 and 22.

26 indicates a partition which is placed in the cylinder, as shown in Fig. 2, and is provided with a circular enlargement 27 concentric to the shaft 25. This partition 26 is provided, as shown best in Fig. 3, with steam-ports 28, arranged in pairs and between the members of each pair of which are located exhaust-ports 29. These ports pass from the steam side of said partition through the cylinder-walls into the opposite side of the cylinder, so as to distribute the steam to and receive the steam from the rotor, as will hereinafter fully appear. As best shown in Figs. 2 and 7, the cylinder is formed with an inner exhaust-chamber 30, having offset portions 31 communicating by transverse ports 32 with the outer exhaust-chamber 33. The steam-ports 28 pass into the bore of the cylinder at points intermediate said chambers 30 and 33, and the exhaust-ports 29 pass into the bore of the cylinder at the said inner exhaust-chamber 30. (See Figs. 3 and 7.)

Fastened to the engine-shaft 25 is the rotor, which comprises disks 34 and 35, spaced apart by a drum 36, having three peripheral cavities 37. The disk 34 has stops 38 attached to the side adjacent to the partition 26. Said stops carry the spindles 39 of the rotating piston-heads. These piston-heads each comprise cruciform sections 40, relatively movable and pressed apart by springs 41. At the outer ends of the arms of said sections 40 packing-strips 42 are arranged, these strips being pressed outward by springs 43 and having limited sliding movement on the section 40 by means of pins and slots 44. (See Fig. 13.) In this manner the piston-heads are made expansible in all directions, and steam-tight joints are effected. Said cruciform piston-heads are arranged to turn in the respective cavities 37 and coact with a number, preferably four, of abutments which are fastened in the reduced portion 45 of the cylinder lying between the chambers 30 and

33. Said abutments are formed of sections 46, slidably connected and pressed apart by springs 47. The abutments are provided at their outer edges with packing-strips 48, which have pin-and-slot connections 49 with the sections 46 and which are pressed outward by means of springs 50, as shown. The abutments fit loosely in T-slots 46ª, (see Fig. 8,) formed in the part 45 of the cylinder. This allows for endwise movement of the abutments to suit similar movement of the shaft, and also it allows the abutments to be easily removed for repairs, &c. On the inner surface of the part 45 of the cylinder cavities 40ª are formed, which permit leakage of steam past the piston-heads as the same are turning around the abutments, the purpose of which will be hereinafter explained. The steam-ports 28 discharge through the reduced part 45 of the cylinder at opposite sides of the abutments 46, and according to the adjustment of the valve mechanism of the engine one steam-port serves to admit live steam and the other port to carry the exhaust off to the exhaust-ports 29, as will be hereinafter fully set forth. The stops 38, moving around through the chamber 30, will block or choke the several exhaust-ports 29 as the stops pass said ports. This is illustrated in Fig. 7, and this choking of the exhaust-ports occurs at the time that the rotating piston-heads pass the various abutments. (See the full and dotted lines in Fig. 8.) The piston-heads rotating with the rotor successively engage the abutments, as Fig. 8 shows. Referring to Fig. 8, it will be seen that as one of the piston-heads approaches an abutment steam leaks through the cavities 40ª and causes the pressure to be exerted on both sides of and to balance the pressure on one blade of the piston-head, while the pressure exerted on one side of a second blade will cause the piston-head to turn, as indicated in the figure referred to. At this time the exhaust of steam is choked by the stops 38. During the normal operation of the engine, therefore, the piston-heads are turned by the steam. It will also be seen that during the operation of the piston-heads moving between the abutments the pressure on the wings of the piston-heads is such as will not tend to turn the same. In order to hold the piston-heads against idle movement to assist in enabling them to resist the steam-pressure which is exerted thereon and to turn the piston-heads when the engine is running empty, we provide the locking and guiding devices shown in Figs. 2, 9, and 10. These devices comprise crossing fingers 51, attached to the stems 39 of the piston-heads and lying at the exhaust side of the rotor. These crossing fingers 51 are intended to operate with cam-plates 52, fastened to the reduced portion 45 of the cylinder. The cam-plates 52 are arranged to be engaged by the fingers 51, so that when the fingers run along the inner edges of the cam-plates they will lock the piston-heads against rotation; but upon running off of the edge of one cam-plate the fingers will be caused to strike the end of the adjacent cam-plate, as shown at the lower right-hand end of Fig. 9, thus imparting a partial turn to the piston-heads, and the parts are so arranged that this turn occurs at each of the several abutments 46. These means assist in holding the piston-heads against rotation when moving between the abutments and prevent idle movements of the parts. Also when the engine is running empty they serve to turn the piston-heads.

The live steam is admitted between the abutments and the piston-heads by one or the other of the ports 28, according to the direction in which the engine is running, and the exhaust-steam is carried off by the other of the ports 28, by which it is led into the exhaust-ports 29 and various other passages of the exhaust-steam, as will be hereinafter fully explained. The steam-distributing ring 53 fits loosely on the enlargement 27 of the partition 26, and it is formed with gear-teeth 54, which are in mesh with a pinion 55, attached to or formed on a stud-shaft 56, revolubly mounted on the walls of the cylinder 20. Said stud-shaft has a pinion 57 attached thereto, and meshed with this pinion is a rack 58, arranged to slide in a guide 59, attached to the outer side of the cylinder 20. Connected with said rack is a link 60, which extends transversely to a hand-lever 61, and by this means the rack may be reciprocated and the gear 55 turned to impart a turning movement to the steam-distributing ring 53. Said ring 53 is provided with steam-ports 62 and exhaust-ports 63. The steam-ports 62 are adapted to register with the ports 28, and by shifting the distributing-ring the steam may be admitted from the ports 62 to one or the other of the groups of ports 28, thus running the engine forward or reversely, as may be desired. The exhaust-ports 63 serve, as shown by the broken lines in Fig. 4, to connect the exhaust-ports 29 with those of the steam-ports 28, which are not engaged in conducting the live steam. Referring to Fig. 4, it will be seen that the ports 62 of the distributing-ring 53 are supposed to be in communication, respectively, with the steam-ports 28 at the right-hand side of the exhaust-ports 29, and it will also be seen that the exhaust-port 63 connects said exhaust-ports 29, respectively, with the other steam-ports 28. Steam is therefore admitted through the first ports 28 to the rotor, and the exhaust-steam is carried off through the second port 28 into the port 63 and thence across this port into the exhaust-port 29, through which ports the steam passes into the exhaust-chamber 30 and thence across through the transverse ports 32 into the exhaust-chamber 33 and finally out by way of the pipe 24. As best shown in Figs. 4, 5, and 6, the ports 62 of the ring 53 pass through enlarge-

ments 64, formed in said ring, and bearing against these enlargements 64 is a disk or valve-plate 65. This valve-plate 65 is fastened to the shaft 25 and is provided with enlargements 66. The enlargements 66 correspond in number to the number of rotating piston-heads, and in each enlargement a group of steam-openings 67 is formed. As here shown, there are three openings. The valve-plate 65 rotating past the relatively stationary distributing-ring 53 will cause the ports alternately to connect with the ports 62, and steam will be admitted in puffs past the openings 67 into the ports 62. The amount of steam admitted through the openings 67 of the valve-plate 65 is controlled by the governor-plate 68. This plate is mounted loosely on the hub 69 of the valve-plate 65, and it is formed, as shown best in Fig. 1, with slots 69[a], adapted to communicate with the openings 67 in the enlargements 66 of the valve-plate 65. As shown in Fig. 1, the governor-plate is in full open position; but by turning this plate relatively to the plate 65, so that but two or even one of the openings 67 register with the slots 69[a], it follows that the steam-supply will be diminished. Mounted to swing on the governor-plate 68 are a number, preferably three, of centrifugally-operated arms 70, the shafts 71 of which turn freely in the governor-plate and are provided with two segments 72, lying between said plate and the plate 65 and meshed with a rack 73, attached to said plate 65. In this manner the governor-plate 68 is connected to turn with the valve-plate 65; but upon the outward movement of the arm 70, due to centrifugal force, the segments 72 and rack 73 are caused to impart a relative movement to the governor-plate 68, thus varying the registry between the slots 69 and the openings 67. In this manner the steam-supply through the openings 67 is regulated. The enlargements 66 of the plate 65 are of a thickness equal to that of the segments 72 and rack 73, and these enlargements insure a snug connection between the valves and the governor-plates. 74 indicates a governor-reversing disk which is arranged to turn on the hub 75 of the governor-plate and which is provided with slots 76, receiving the extremities of the governor-arms 70. 77 indicates pins fastened on the plate 68 and working in notches 78 in the periphery of the governor-reversing disk 74 to limit the turning movement of said disk relatively to the governor-plate. The reversing-disk 74 is arranged to turn with the governor-plate 68; but it is frictionally engaged with a flange 79, formed on a bearing 80, sustained rigidly within the cylinder 20 by means of a spider 81. Consequently as the rotating parts change the direction of revolution the reversing-disks 74 will lag behind, owing to frictional engagement with the flange 79, and this will bring about a relative movement of the parts 68 and 74, thus changing the position of the governor-arms from one side to the other of the radial line in which the segments 72 lie. In this manner as the direction of revolution of the engine is reversed the governor-arm is reversed to correspond with the reversing movement. To allow thus changing the position of the governor-arm 70, the arrangement shown in Figs. 16 and 17 is provided, the governor-arm being fastened to the shafts 71 of the segments 72 by means of disks 89, keyed to the said shafts and provided with notches 90, in which projections 91 of the governor-arm fit loosely. This allows a certain swinging movement of the governor-arms independent of the segments 72, and this movement is sufficient to permit the arms to change their positions from one to the other side of the radial line in which the shafts 71 of the segments 72 lie.

As shown best in Fig. 18, the hub 75 of the governor-plate 68 is formed with **V**-shaped notches 82 therein, and with these notches operate **V**-shaped projections 83 on a sleeve 84, which is splined on the shaft 25. Said sleeve 84 is pressed into engagement with the hub 75 by means of an expansive spring 85, (see Fig. 2,) and 86 indicates a collar on the shaft which is engaged by a lever 87, fulcrumed within the cylinder. 88 indicates a rod connected with the lever 87 and passing through a stuffing-box on the cylinder-head 21 to facilitate the operation of the lever 87. The rod 88 is intended to be connected with a device for moving and holding it at the desired adjustment. By operating the rod 88 the sleeve 84 is caused to slide toward the hub 75, and by the coaction of the **V**-shaped projections 83 and cavities 82 a turning movement is imparted to the hub, resulting in a turning movement of the governor-plate and a corresponding change in the relation of the slots 69[a] and openings 67. By this arrangement the governor is not only automatically operated, but the amount of steam delivered to the driving parts may be controlled at the will of the operator through the parts 88, 87, 86, 85, and 84, as before explained.

In the organized operation of the invention, assuming the steam to be supplied through the pipe 23, the space at the left-hand side of the partition 26 will be pervaded by the steam-pressure. This pressure will pass through the slots 69[a] and openings 67 into the ports 62, and according to the position of the distributing-ring 53 steam will be admitted to the ports 28 on one or the other side of the exhaust-ports 29, and this steam entering between the rotating piston-heads and the abutments 46 will cause the rotor of the engine to turn in one direction or the other, according to which of the ports 28 is carrying the live steam. The steam will be exhausted through the other ports 28 out back through the partition 26 and will be led by the ports 63 across to the adjacent exhaust-ports 29

and will then pass out to the atmosphere through the chamber 30, ports 32, chamber 33, and exhaust-pipe 24, as before explained. Then the rotating piston-heads each time they approach an abutment will roll around the same, as indicated in Fig. 8. During the movement of the piston-heads in rotating past the abutment the stops 38 choke the exhaust-ports 29 and aided by the cavities 40[a] cause the steam to act on the piston-heads, so as to rotate them, as before explained. As the piston-head returns to its normal position the live steam beginning to act on the piston-head checks its rotating movement and prevents the guide-fingers 51 from violently striking the cam-plates. In order to reverse the engine, it is simply necessary to throw the lever 61, which causes the rack 58 to slide, turning the gear 57, and from this the gear 55, causing said gear to reverse the position of the distributing-ring 53 through the action of the gear on the teeth 54 of said ring. This shifting movement of the distributing-ring will connect the ports 62 with the opposite ports 28 and cause steam to be admitted to the opposite sides of the abutment, thus changing the direction of revolution of the rotor. During the operation of the engine the governor-arm 70 will swing out proportionately to the speed of the engine, and this will bring about a relative movement of the governor-plate 68, opening or closing one or more of the steam-inlet openings 67 of the valve-plate 65, and thus increasing or diminishing the steam-supply. The operator of the engine may at any time effect the same result by moving the rod 88 inward or outward, which will bring about a turning movement of the governor-plate 68. The spring 85 and the parts 84, 83, and 82 serve also to exert a constant strain on the governor-plate, tending to hold it yieldingly in the full-open position, (shown in Fig. 1,) and each time that the plate moves from this position it throws outward the collar 84 and compresses the spring 85.

When the engine comes to rest, the various steam-controlling elements will be in such position as will place one or more of the ports in full open position, provided the distributing-ring is thrown over fully to one or the other end of its movement. This admits of readily starting the engine. On reversing the engine the distributing-ring is thrown from one position to another, and in so moving the ports 63 connect the ports 28 with the exhaust-ports 29, thus completely exhausting the steam from the piston-heads and blocking the admission of steam until the distributing-ring reaches its new position.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. A rotary engine provided with a cylinder, a rotor mounted therein, an abutment carried by the cylinder and coacting with the rotor, and a cruciform piston-head revolubly mounted on the rotor and adapted to be turned by steam-pressure, to enable it to pass the abutment.

2. A rotary engine provided with a cylinder, a rotor mounted therein, a stationary abutment carried by the cylinder and projecting inward into engagement with the rotor, said rotor having a cavity therein, and a cruciform piston-head revolubly mounted on and partly in the cavity of the rotor, said piston-head being adapted to be turned by steam-pressure to permit it to pass the abutment.

3. A rotary engine comprising a cylinder, a rotor mounted to turn therein, a stationary abutment carried by the cylinder and projecting inward into engagement with the rotor, the cylinder having a cavity at each side of the abutment, and a cruciform piston-head revolubly mounted on the rotor, said cavity permitting steam-pressure to act on the piston-head to turn the same as it passes the abutment.

4. A rotary engine comprising a cylinder, a rotor mounted to turn therein, a stationary abutment carried by the cylinder and projecting inward into engagement with the rotor, the cylinder having a cavity at each side of the abutment, a cruciform piston-head revolubly mounted on the rotor, said cavity permitting steam-pressure to act on the piston-head, to turn the same as it passes the abutment, and means for guiding the piston-head in its turning movement.

5. A rotary engine provided with a cylinder, a rotor mounted therein, a stationary abutment carried by the cylinder and projecting inward into engagement with the rotor, said rotor having a cavity therein, a cruciform piston-head revolubly mounted on and partly in the cavity of the rotor, said piston-head being adapted to be turned by steam-pressure to permit it to pass the abutment, and means for guiding the piston-head in its turning movement.

6. A rotary engine provided with a cylinder, a rotor mounted therein, an abutment carried by the cylinder and coacting with the rotor, a cruciform piston-head revolubly mounted on the rotor and adapted to be turned by steam-pressure, to enable it to pass the abutment, and means for guiding the piston-head in its turning movement.

7. A rotary engine comprising a cylinder, a rotor mounted to turn therein, a stationary abutment carried by the cylinder and projecting inward into engagement with the rotor, the cylinder having a cavity at each side of the abutment, a cruciform piston-head revolubly mounted on the rotor, said cavity permitting steam-pressure to act on the piston-head to turn the same as it passes the abutment, a cruciform finger in connection with the piston-head, and a stationary cam-plate coacting with the finger, to guide the turning movement of the piston-head.

8. A rotary engine provided with a cylinder, a rotor mounted therein, a stationary abutment carried by the cylinder and projecting inward into engagement with the rotor, said rotor having a cavity therein, a cruciform piston-head revolubly mounted on and partly in the cavity of the rotor, said piston-head being adapted to be turned by steam-pressure to permit it to pass the abutment, a cruciform finger in connection with the piston-head, and a stationary cam-plate with which the finger coacts to guide the piston-head in its turning movement.

9. A rotary engine comprising a cylinder, a rotor mounted therein, a cruciform piston-head mounted to turn in the rotor, a stationary abutment carried by the cylinder and coacting with the rotor and piston-head, a cruciform finger having connection with the piston-head to move therewith, and a cam coacting with the finger, for the purpose specified.

10. A rotary engine comprising a cylinder, a rotor mounted therein, a cruciform piston-head mounted to turn in the rotor, a stationary abutment carried by the cylinder and coacting with the rotor and piston-head, a cruciform finger having connection with the piston-head to move therewith, and a cam coacting with the finger, for the purpose specified, the said cruciform finger comprising two parts lying in different planes and said cam also comprising two parts lying in different planes, the edges of said parts of the cam being out of registry.

11. A rotary engine comprising a casing or cylinder, a rotor mounted to turn therein, an abutment carried by the cylinder and projecting inward into engagement with the rotor, a rotating piston-head carried by the rotor, a cruciform finger having connection with the piston-head, to move therewith, and a circular cam around which said finger runs, for the purpose specified.

12. A rotary engine comprising a casing or cylinder, a rotor mounted therein, a piston-head revolubly mounted on the rotor, an abutment coacting with the piston-head, a finger corresponding in form to that of the piston-head and having connection with the piston-head, to turn and move therewith, and a cam with which the finger coacts.

13. A rotary engine comprising a cylinder, a rotor mounted therein, an abutment carried by the cylinder and engaging the rotor, said cylinder having steam-ports at each side of and adjacent to the abutment and having a cavity at each side of the abutment, a cruciform piston-head mounted to turn on the rotor, said cavities in the cylinder permitting the steam-pressure to act on the piston-head to turn it in passing the abutment, and a stop arranged to move with the rotor and adapted to choke or blank said ports of the cylinder at the time the piston-head is turning around the abutment.

14. A rotary engine comprising a cylinder, a rotor mounted therein, an abutment carried by the cylinder and engaging the rotor, said cylinder having steam-ports at each side of and adjacent to the abutment and having a cavity at each side of the abutment, a cruciform piston-head mounted to turn on the rotor, said cavities in the cylinder permitting the steam-pressure to act on the piston-head to turn it in passing the abutment, a stop arranged to move with the rotor and adapted to choke or blank said ports of the cylinder at the time the piston-head is turning around the abutment, and means for positively guiding the piston-head during its operation.

15. A rotary engine comprising a cylinder, a rotor mounted therein, an abutment carried by the cylinder and engaging the rotor, said cylinder having steam-ports at each side of and adjacent to the abutment and having a cavity at each side of the abutment, a cruciform piston-head mounted to turn on the rotor, said cavities in the cylinder permitting the steam-pressure to act on the piston-head to turn it in passing the abutment, a stop arranged to move with the rotor and adapted to choke or blank said ports of the cylinder at the time the piston-head is turning around the abutment, a cruciform finger having connection with the piston-head, to move therewith, and a stationary cam engaged by said finger.

16. A rotary engine comprising a cylinder having a partition therein and having a reduced interior portion at one side of the partition with exhaust-chambers at each side of said reduced interior portion, the cylinder also having a transverse exhaust-port connecting the two exhaust-chambers, steam and exhaust ports formed in said partition, a rotor mounted in the reduced portion of the cylinder, a rotating piston-head carried on the rotor, an abutment carried on the reduced portion of the cylinder and coacting with the piston-head, and means at the side of the partition opposite that on which the rotor lies, for controlling the steam movement through said feed and exhaust ports.

17. A rotary engine comprising a cylinder, a rotor mounted therein, a rotating piston-head carried on the rotor, an abutment mounted on the cylinder and coacting with the piston-head, a finger in connection with the piston-head and having a form corresponding to that of the piston-head, and a relatively stationary cam-plate along which said finger runs, for the purpose specified.

18. In a rotary engine, the combination with a cylinder and a rotor mounted thereon, of a governor-plate controlling the steam-supply to the valve devices, a centrifugal governor for automatically operating the governor-plate, a sleeve having a cam-surface engaging a cam-surface on the governor-plate, a spring pressing said sleeve, and a means for manually pressing said sleeve.

19. In a rotary engine, the combination with a cylinder and a rotor mounted thereon, of a governor-plate controlling the steam-supply to the valve devices, a centrifugal governor-arm mounted on the governor-plate, a means for changing the position of the governor-arm, said means comprising a shifting disk having a notch therein receiving the governor-arm, means for connecting the disk with the governor-plate to allow the disk a turning movement independent of the governor-plate, and a stationary member frictionally engaged with said disk for the purpose specified.

20. A rotary engine comprising a cylinder, a rotor mounted therein, a partition in the cylinder at one side of which the rotor is located, the turbine having steam and exhaust ports leading to and from the rotor, a distributing-ring mounted at the side of the partition opposite the rotor and having equidistant steam-ports passing through it, and also having on the face of the ring adjacent to the partition elongated exhaust-ports placed equidistant between the steam-ports, said steam and exhaust ports of the distributing-ring coacting with the steam and exhaust ports of the turbine, whereby upon shifting the ring steam may be admitted to drive the rotor in either direction, means for shifting the ring, and means for supplying steam to the cylinder at the side of the partition on which the distributing-ring is located.

21. A rotary engine comprising a cylinder, a rotor mounted therein, a partition in the cylinder at one side of which the rotor is located, the turbine having steam and exhaust ports leading to and from the rotor, a distributing-ring mounted at the side of the partition opposite the rotor and having equidistant steam-ports passing through it, and also having on the face of the ring adjacent to the partition elongated exhaust-ports placed equidistant between the steam-ports, said steam and exhaust ports of the distributing-ring coacting with the steam and exhaust ports of the turbine, whereby upon shifting the ring steam may be admitted to drive the rotor in either direction, means for shifting the ring, means for supplying steam to the cylinder at the side of the partition on which the distributing-ring is located, a governor located in the cylinder at the side of the partition on which the distributing-ring is located, and a governor-plate connected with the governor and controlling the steam-supply to the distributing-ring.

22. A rotary engine comprising a cylinder, a rotor mounted therein, a partition in the cylinder at one side of which the rotor is located, the turbine having steam and exhaust ports leading to and from the rotor, a distributing-ring mounted at the side of the partition opposite the rotor and having equidistant steam-ports passing through it, and also having on the face of the ring adjacent to the partition elongated exhaust-ports placed equidistant between the steam-ports, said steam and exhaust ports of the distributing-ring coacting with the steam and exhaust ports of the turbine, whereby upon shifting the ring steam may be admitted to drive the rotor in either direction, means for shifting the ring, and means for supplying steam to the cylinder at the side of the partition on which the distributing-ring is located, and a valve-plate lying in the cylinder against the distributing-ring and having a group of steam-ports for each steam-port of the distributing-ring, the valve-plate moving with the rotor past the distributing-ring to admit steam to said ring.

23. A rotary engine comprising a cylinder, a rotor mounted therein, a partition in the cylinder at one side of which the rotor is located, the turbine having steam and exhaust ports leading to and from the rotor, a distributing-ring mounted at the side of the partition opposite the rotor and having equidistant steam-ports passing through it, and also having on the face of the ring adjacent to the partition elongated exhaust-ports placed equidistant between the steam-ports, said steam and exhaust ports of the distributing-ring coacting with the steam and exhaust ports of the turbine, whereby upon shifting the ring steam may be admitted to drive the rotor in either direction, means for shifting the ring, means for supplying steam to the cylinder at the side of the partition on which the distributing-ring is located, a valve-plate lying in the cylinder against the distributing-ring and having a group of steam-ports for each steam-port of the distributing-ring, the valve-plate moving with the rotor past the distributing-ring to admit steam to said ring, a governor-plate controlling the steam-supply to the valve-plate, and a governor for operating the governor-plate.

24. A rotary engine comprising a cylinder, a rotor mounted therein, a partition in the cylinder at one side of which the rotor is located, the turbine having steam and exhaust ports leading to and from the rotor, a distributing-ring mounted at the side of the partition opposite the rotor and having equidistant steam-ports passing through it, and also having on the face of the ring adjacent to the partition elongated exhaust-ports placed equidistant between the steam-ports, said steam and exhaust ports of the distributing-ring coacting with the steam and exhaust ports of the turbine, whereby upon shifting the ring steam may be admitted to drive the rotor in either direction, means for shifting the ring, means for supplying steam to the cylinder at the side of the partition on which the distributing-ring is located, a valve-plate lying in the cylinder against the distributing-ring and having a group of steam-ports for each steam-port of the distributing-ring, the valve-plate moving with the rotor past the distributing-ring to

admit steam to said ring, a governor-plate controlling the steam-supply to the valve-plate, and a governor for operating the governor-plate, said governor being located within the cylinder.

25. In a rotary engine, the combination with a cylinder having a partition dividing it into two parts, said partition having steam and exhaust ports therein, a rotor located in the cylinder at one side of the partition, a distributing-ring located in the cylinder at the opposite side of the partition and having steam and exhaust ports coacting with the steam and exhaust ports of the partition, a valve-plate connected to turn with the rotor and lying against the distributing-ring, the valve-plate having a group of steam-ports for each steam-port of the distributing-ring, a governor-plate controlling steam movement to the valve-plate, a centrifugal governor member mounted on the governor-plate and connected between said member and the valve-plate, whereby the governor causes relative movement of the governor and valve plates, for the purpose specified.

26. A rotary engine having a cylinder with a partition therein dividing it into two compartments, a rotor mounted in one compartment of the cylinder, the partition having steam and exhaust ports therein, a distributing-ring located against the partition in the other compartment and having steam and exhaust ports coacting with the steam and exhaust ports of the partition, a valve-plate having ports adapted to register with the steam-ports of the distributing-ring, a governor-plate controlling the steam-supply to the valve-plate, and a centrifugally-actuated means for the relative movement of the governor and valve plates whereby to govern the action of the engine.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FRED MORRIS OBER.
BURT DUGAR.

Witnesses:
NOEL B. BLAIR,
THOMAS B. ELLIS.