(No Model.) 2 Sheets—Sheet 1.

R & E. LANZONE.

ROTARY ENGINE.

No. 572,707. Patented Dec. 8, 1896.

FIG: 1.

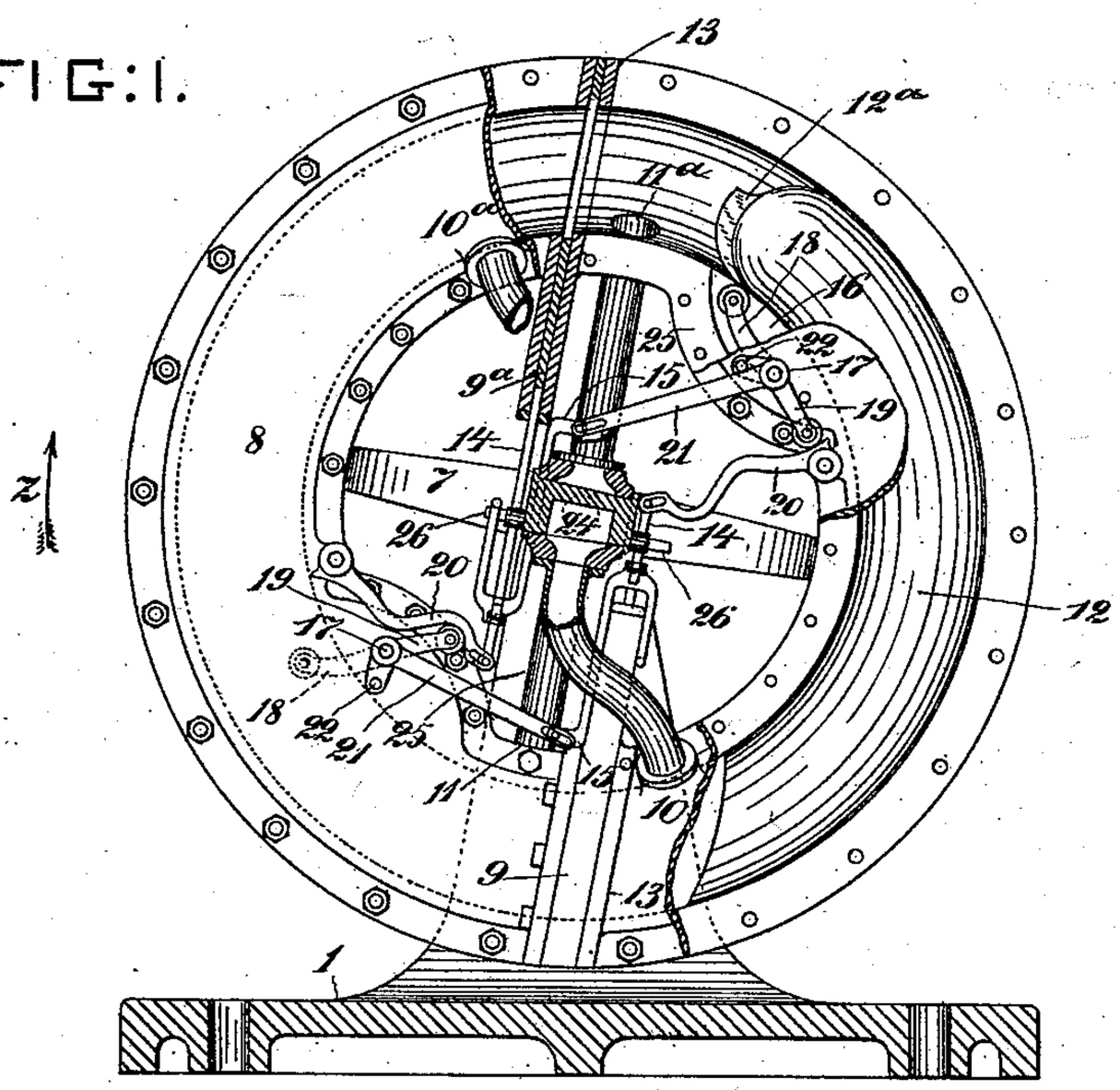
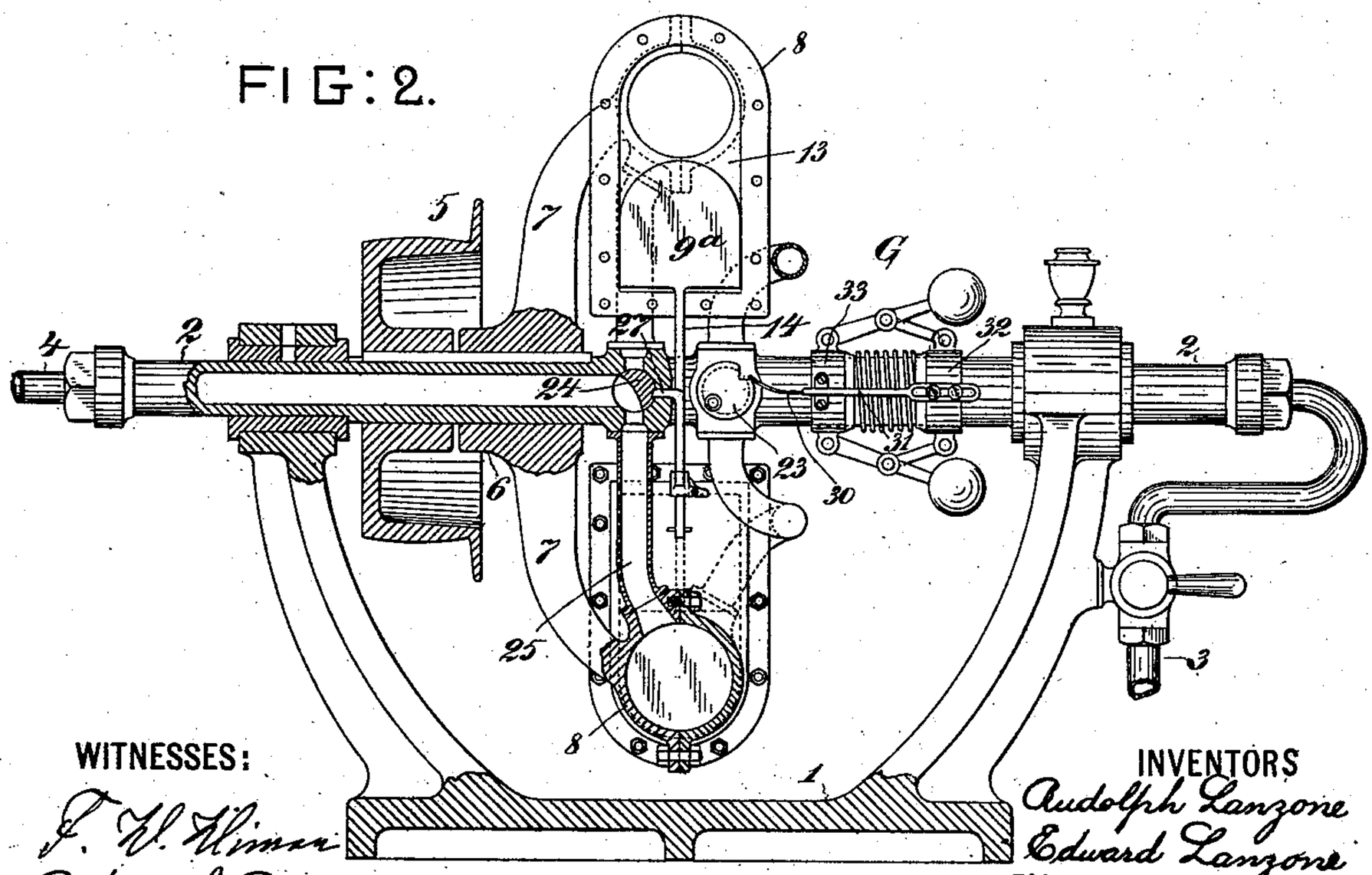


FIG: 2.



WITNESSES:

L. W. Hinman

Peter A. Ross

INVENTORS

Rudolph Lanzone

Edward Lanzone

BY

Henry Connett

ATTORNEY

(No Model.) 2 Sheets—Sheet 2.

R. & E. LANZONE.

ROTARY ENGINE.

No. 572,707. Patented Dec. 8, 1896.

FIG: 3.

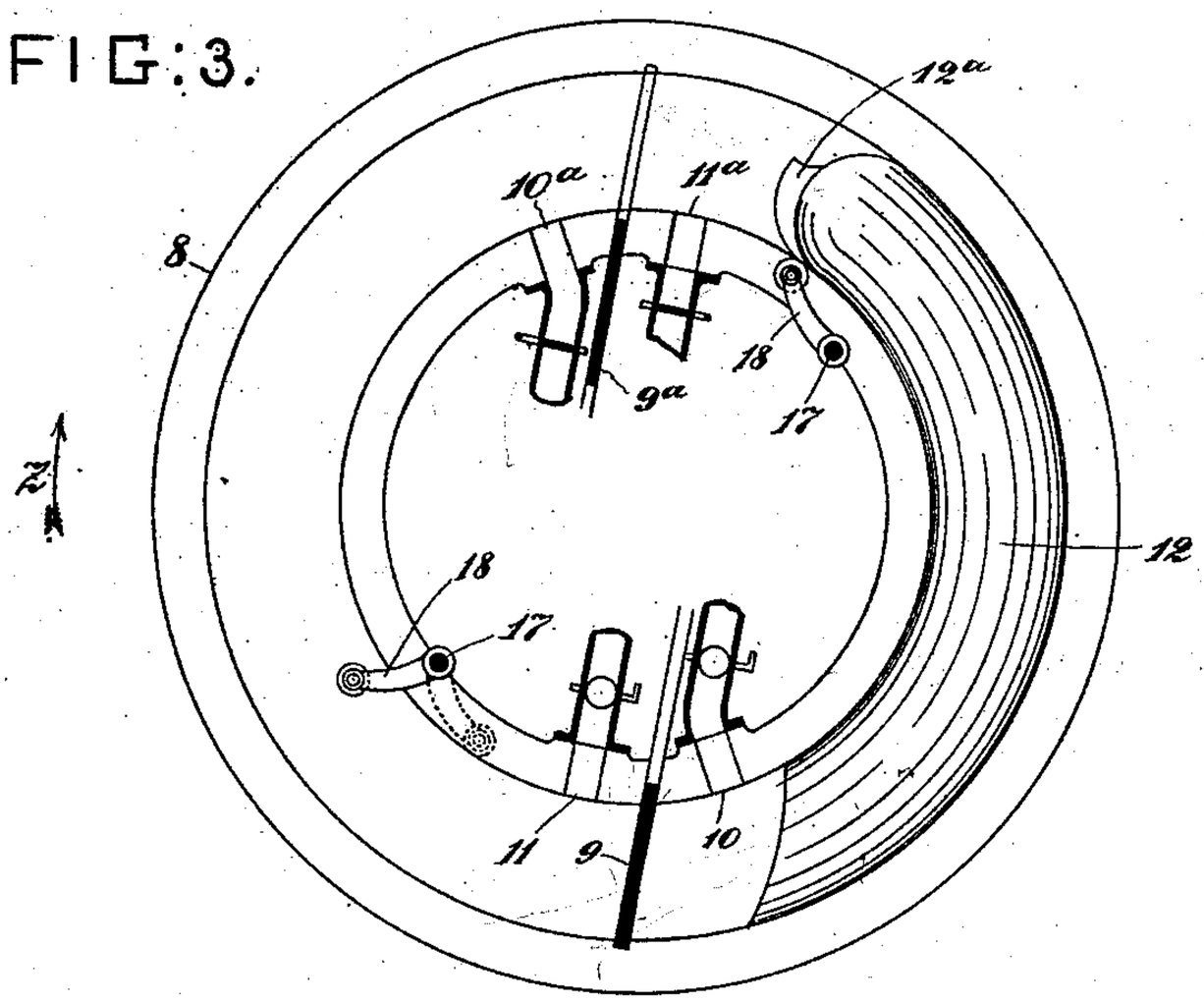


FIG: 4.

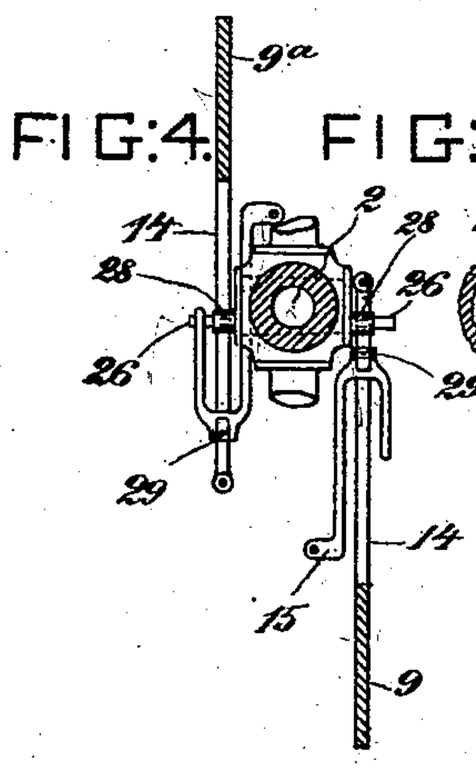


FIG: 5.

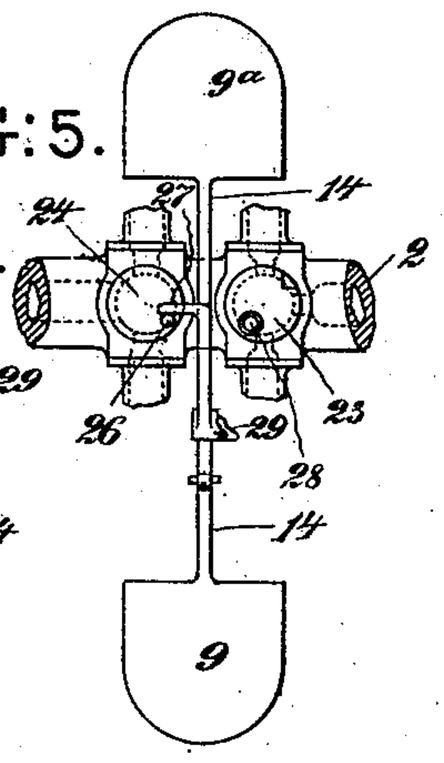
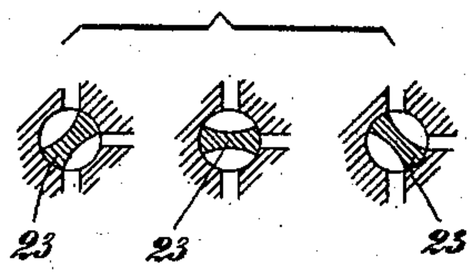


FIG: 6.



WITNESSES:

J. A. Ulman.

Peter A. Ross.

INVENTORS.

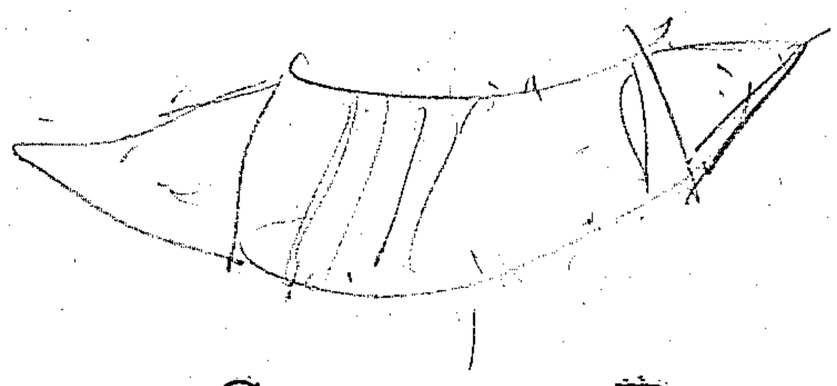
Rudolph Lanzone

Edward Lanzone

BY

Henry Connett

ATTORNEY



UNITED STATES PATENT OFFICE.

RUDOLPH LANZONE AND EDWARD LANZONE, OF SOUTH RIVER, NEW JERSEY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 572,707, dated December 8, 1896.

Application filed April 14, 1896. Serial No. 587,494. (No model.)

To all whom it may concern:

Be it known that we, RUDOLPH LANZONE and EDWARD LANZONE, subjects of the King of Italy, and residents of South River, Middlesex county, New Jersey, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

Our invention relates to rotary engines adapted to utilize fluids under tension, such as steam, compressed air, &c.

Our engine comprises, as its essential characteristic features, a rotatable hollow annulus or annular cylinder having a cut-off slide or slides to close the annular passage therethrough at proper points in the revolution, inlets and outlets for the fluid under tension, suitable means for closing and opening said inlets and outlets at proper intervals, and a relatively heavy gravity-abutment in the annular passage in the rotating annulus, said abutment being free and fitting snugly in said passage, whereby when fluid under tension is admitted behind one of the cut-off slides and between said slide and said gravity-abutment the annulus or annular cylinder will be rotated by the reactionary pressure of the fluid on said abutment, which remains stationary, or substantially so, by reason of its inertia.

In the accompanying drawings we have illustrated an embodiment of our invention, together with automatic mechanism for operating the cut-off slides and the valves which control the inlet and exhaust ports and with a governor for controlling the admission of steam, whereby the benefits of expansion are attained.

In the drawings, Figure 1 is a sectional end elevation, and Fig. 2 is a sectional side elevation, of the engine. Fig. 3 is a diagrammatical view to illustrate in simple form the principle upon which the engine operates. Figs. 4 and 5 are detached fragmentary views illustrating the mechanisms for operating the valves which control the steam inlets and exhaust ports. Fig. 6 shows the three positions of the valve for admitting steam to the engine in three separate views.

In the construction shown in the drawings, 1 is a bed-plate in which is rotatively mounted a hollow shaft 2, adapted to receive steam at one end through a supply-pipe 3 and to exhaust at the other end through an exhaust-pipe 4. On this shaft is keyed a pulley 5 for driving machinery through the medium of a belt.

Fixed on the shaft 2, through the medium of a boss 6 and arms 7, is a hollow annulus 8, which we will call, for convenience, the "cylinder" of the engine. As herein shown, the annular bore in this cylinder is circular in cross-section, and the cylinder is made up of sections and bolted together for convenience of construction, but these features are not essential to the invention.

Mounted in the cylinder and arranged radially, or nearly so, are two cut-off slides 9 and 9^a. These slides are diametrically opposite to each other, and automatic mechanism will be provided for operating them. That shown in the drawings will be hereinafter described. It will be sufficient to say here that after one slide shall have been closed the other will be instantly opened. These slides perform the function of cylinder-heads, and the cylinder is provided with steam-inlets 10 and 10^a, just back of the respective slides, and steam-outlets 11 and 11^a (to the exhaust) just in front of the respective slides. The valves for controlling the inlets and outlets for the steam and the mechanism shown for automatically operating said valves will be hereinafter described. Any mechanism that will effect the object may, however, be employed.

In the bore of the cylinder is the gravity-abutment 12, hereinbefore mentioned. This is a simple heavy body having a circular cross-section of a size to fit substantially steam-tight in the cylinder and curved longitudinally to fit the circle of the bore. This abutment should be as heavy as possible relatively to the engine.

Fig. 3 is a diagrammatic view of the engine, designed merely to show the operation. The slide 9 is closed and slide 9^a open. The steam-inlet 10 is open and inlet 10^a closed. The exhaust-outlet 11 is open and exhaust-outlet 11^a is closed. The steam entering at the inlet 10 acts on the slide 9 and reacts on the end of the abutment 12 adjacent as on a piston,

causing the cylinder 8 to rotate in the direction indicated by the arrow *z*. The steam in front of slide 10 exhausts at outlet 11. When the open cut-off slide 9^a shall have passed the lower end of the abutment 12, it instantly closes and the slide 9 opens. As soon as the slide 9^a closes the ports 10^a and 11^a open, the ports 10 and 11 being closed at the same time. The operation is then repeated. The abutment is represented in Figs. 1 and 3 in its most advantageous position, its weight being wholly supported by the pressure of steam on its lower end.

We will now describe the mechanisms illustrated herein for automatically operating the cut-off slides and the valves, premising that we do not limit ourselves to these, as other mechanisms may be used as well.

Each cut-off slide 9 or 9^a is inclosed in a guiding-casing 13 and has a stem 14, which plays through a suitable stuffing-box in the casing, and on said stem is fixed a laterally-projecting lug or toe 15, as clearly shown in Figs. 1 and 4. In the cylinder 8 is formed a pocket 16, in which is mounted a rock-shaft 17, provided with an arm 18, bearing at its end a stud or roller adapted to engage, as the cylinder rotates, a cam 12^a on the rear or upper end of the abutment 12, whereby at each rotation of the cylinder the roller on the arm 18 engages said cam and rocks said shaft 17. On the outer or projecting end of the shaft 17 is fixed an arm 19, which also carries a stud or roller adapted to bear on a lever 20, fulcrumed on the cylinder, and by the rocking of said shaft 17 to impart a quick swinging movement to said lever 20. The free end of the lever 20 is coupled to the outer end of the stem 14 of the slide 9 and acts to close said slide when the shaft is rocked by the cam on the abutment 12.

On the rock-shaft 17 is loosely or frictionally hung an arm 21, which is coupled to the lateral lug or toe 15, carried by the stem of the slide 9^a, so that the swinging of said arm 21 serves to open the slide 9^a; but as the slide 9 must be fully closed before the slide 9^a begins to open we cause the first part or half of the movement of the rock-shaft 17, acting through the arm 19, to actuate the lever 20, the last part or half of said movement being ineffective, as the lever 20 is curved so as to permit the stud on the arm 19 to play over it. When, however, the arm 19 shall have reached the end of its effective stroke, a stud 22 (see Fig. 1) on a short arm on the rock-shaft engages the loose arm 21 and causes it to act to open the slide 9^a.

There are two oppositely-arranged sets of the devices last described, as seen in Fig. 1, and when the slides are operated by one set of these devices the said slides act to return the other set to their first position.

It will be noted that as the cam 12^a is on the rear or upper end of the abutment 12 it is immaterial what position the latter may occupy. The slide which is passing it will not be closed until it shall have passed the lower end of the abutment, and hence no collision between a slide and the abutment can occur, even though the abutment shifts its position.

The valve mechanisms will now be described.

In the shaft 2 are two plug-valves 23 and 24, between which the bore or hollow in the shaft 2 is stopped. The valve 23, at the right in Fig. 2, is the steam-inlet valve and the valve 24, at the left, is the exhaust-valve.

The plug of the exhaust-valve 24 is cut away at one side, so that by rocking it either the port 11 or 11^a may be put in connection with the exhaust-passage in the shaft 2, as seen in Fig. 2, through the connecting-pipes 25. On each end of the valve-plug is a crank-stud 26, and these are adapted to be engaged each by a projecting stud 27, carried by the stem of one of the cut-off slides, so as to rock or partially rotate the plug. Thus when the slide 9 is closing, the stud 27, carried by it, engages a crank-stud 26 on the plug of the exhaust-valve, rocks said plug and opens the exhaust to the port 11. The closing of the other slide, 9^a, opens the port 11^a to the exhaust.

The plug of the steam-inlet valve 23 is cut away, as seen in Fig. 6, so as to admit steam to either port 10 or 10^a, or to cut it off entirely, as indicated in the intermediate view, Fig. 6. The plug of this valve also has a crank-stud 28 at each end, adapted to be engaged by studs 29, carried by the stems of the respective slides 9 and 9^a. The stud 29 on the opening slide engages a stud 28 on the valve, rocks the plug thereof, so as to admit steam, and then passes the stud on the plug, leaving the latter to be rotated back to the cut-off position (intermediate view, Fig. 6) by a spring 30, (seen in Fig. 2,) which engages a V-shaped notch in the projecting end of the valve-plug. The studs 29 are hinged in a well-known way, so that when the slide moves in the opposite direction in closing the stud 29 will yield and wipe by the stud on the valve-plug without operating the latter. The opening slide is made to operate the valve to admit steam, as the other slide must be fully closed before steam is admitted.

We have shown in Fig. 2 a ball-governor G, carried by the shaft 2 and provided with a sheath 31, which is secured to the sliding ring 32 of the governor and arranged so as to snugly embrace the spring 30, which latter is fixed at one end to the fixed ring or collar 33 or any fixed collar on the shaft. When the balls of the governor fly out, the sheath 31 is pushed forward, so as to embrace and sheathe more of the spring 30, thus shortening its free operative portion and stiffening the spring, so that it acts more quickly to close the valve and cut off the steam. Thus the steam is worked expansively and the cut-off controlled by the governor.

We have shown the movable cut-off heads 9 and 9^a as radially-arranged slides, and we

prefer this arrangement, but any arrangement by which such heads are made to perform their duties will serve. There may be one or more of these heads or cut-off slides. To lessen the waste-space between the head (9 in Fig. 3) and the lower end of the abutment 12, the latter may be cut beveled, as shown, so as to allow the head to close and yet reduce the waste-space to a minimum.

We may say that where only one cut-off slide or head is employed two cylinders or engines will be mounted on a common shaft. Otherwise at least two such slides must be used. There is no advantage gained, however, in using more than two slides, as the abutment 12 should never fill more than half the annular bore of the cylinder.

Having thus described our invention, we claim—

1. A rotary engine comprising a rotating, annular cylinder, provided with one or more movable cut-off heads, and with inlets and outlets for a fluid under tension, automatic mechanism for operating said heads and for controlling the admission and exhaust of said fluid, and an abutment mounted in the bore of said cylinder, said abutment being free and sustained in its position only by gravity, as set forth.

2. A rotary engine comprising a rotatively-mounted shaft, having in it a passage for the supply of steam or other fluid to the engine and an exhaust-passage, an annular cylinder fixed on said shaft and provided with ports to admit the fluid and ports for the exhaust, arranged in pairs, cut-off slides, one between each pair of ports in the cylinder, an abutment 12, in the bore of the cylinder and provided with a cam 12^a for operating the slides and valves, the said valves, in the main shaft, and mechanism, carried by the cylinder, for operating said slides and valves through the medium of the said cam, substantially as set forth.

3. In a rotary engine, the combination with the rotatively-mounted cylinder, having inlet-ports for a fluid under tension, an abutment mounted in the bore thereof, a hollow shaft on which said cylinder is mounted, and a valve 23 in said shaft, the plug of which is adapted to admit steam and to cut it off, of the spring 30, its tip engaging the plug, a governor G, carried by the shaft and having a movable ring 32, and a sheath 31, carried by said ring and embracing said spring, whereby the movement of said ring under the influence of the governor-balls serves to cause the sheath to inclose more or less of the spring and vary its stiffness, substantially as and for the purposes set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

RUDOLPH LANZONE.
EDWARD LANZONE.

Witnesses:
HENRY CONNETT,
PETER A. ROSS.