

No. 725,028.

PATENTED APR. 14, 1903.

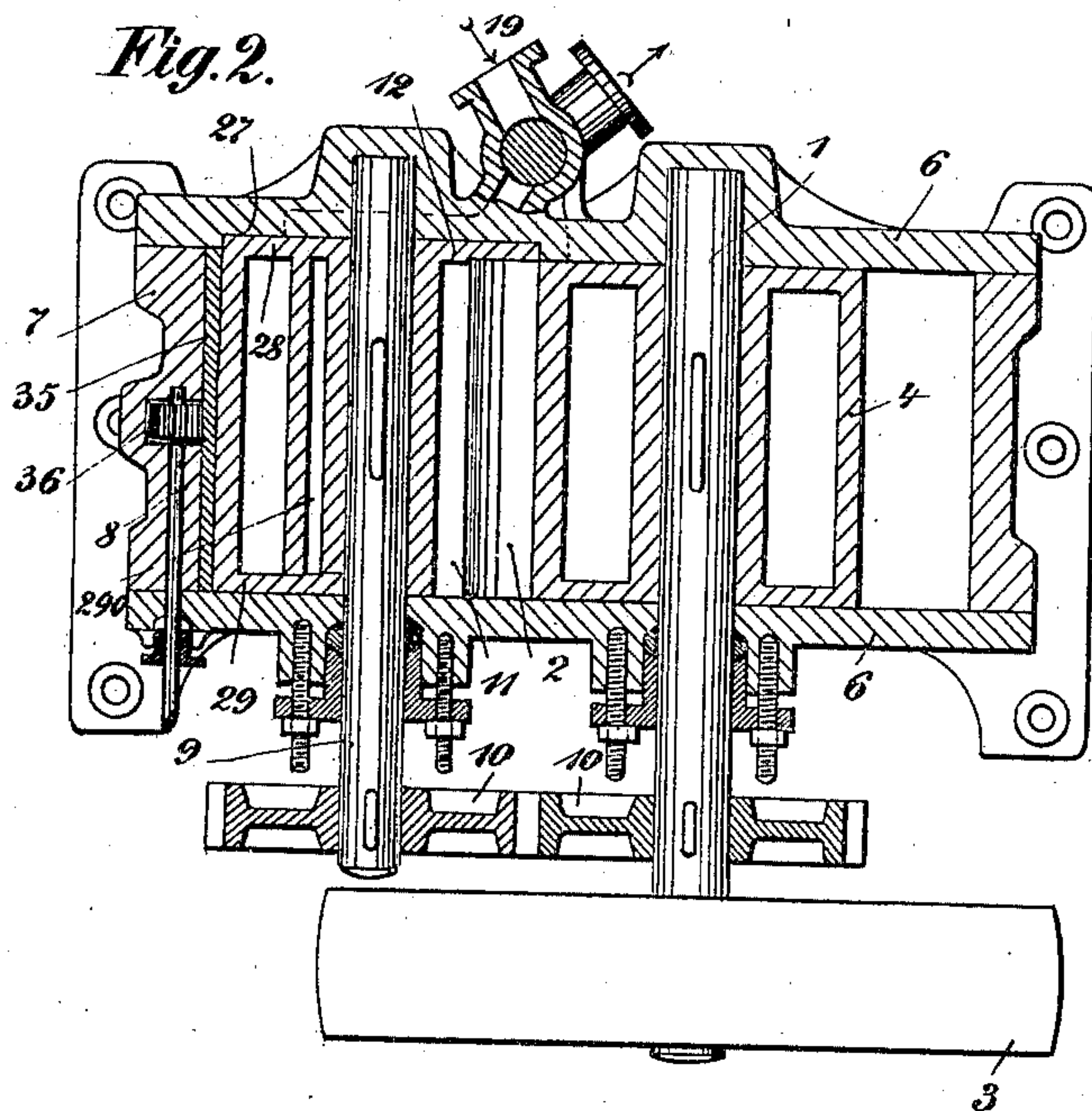
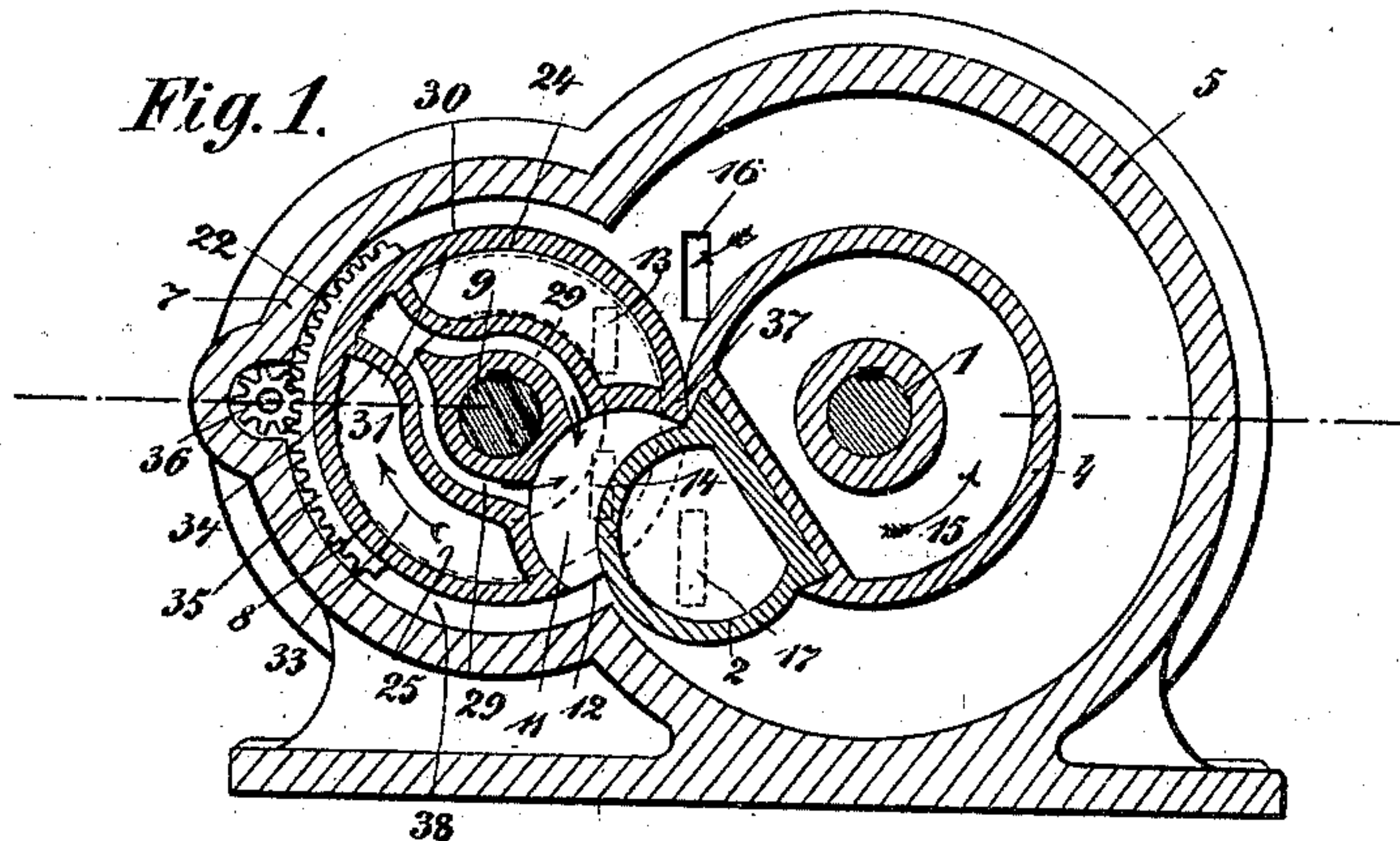
J. H. L. & J. D. A. BÖTTCHER.

ROTARY ENGINE.

APPLICATION FILED NOV. 5, 1900.

NO MODEL.

2 SHEETS—SHEET 1.



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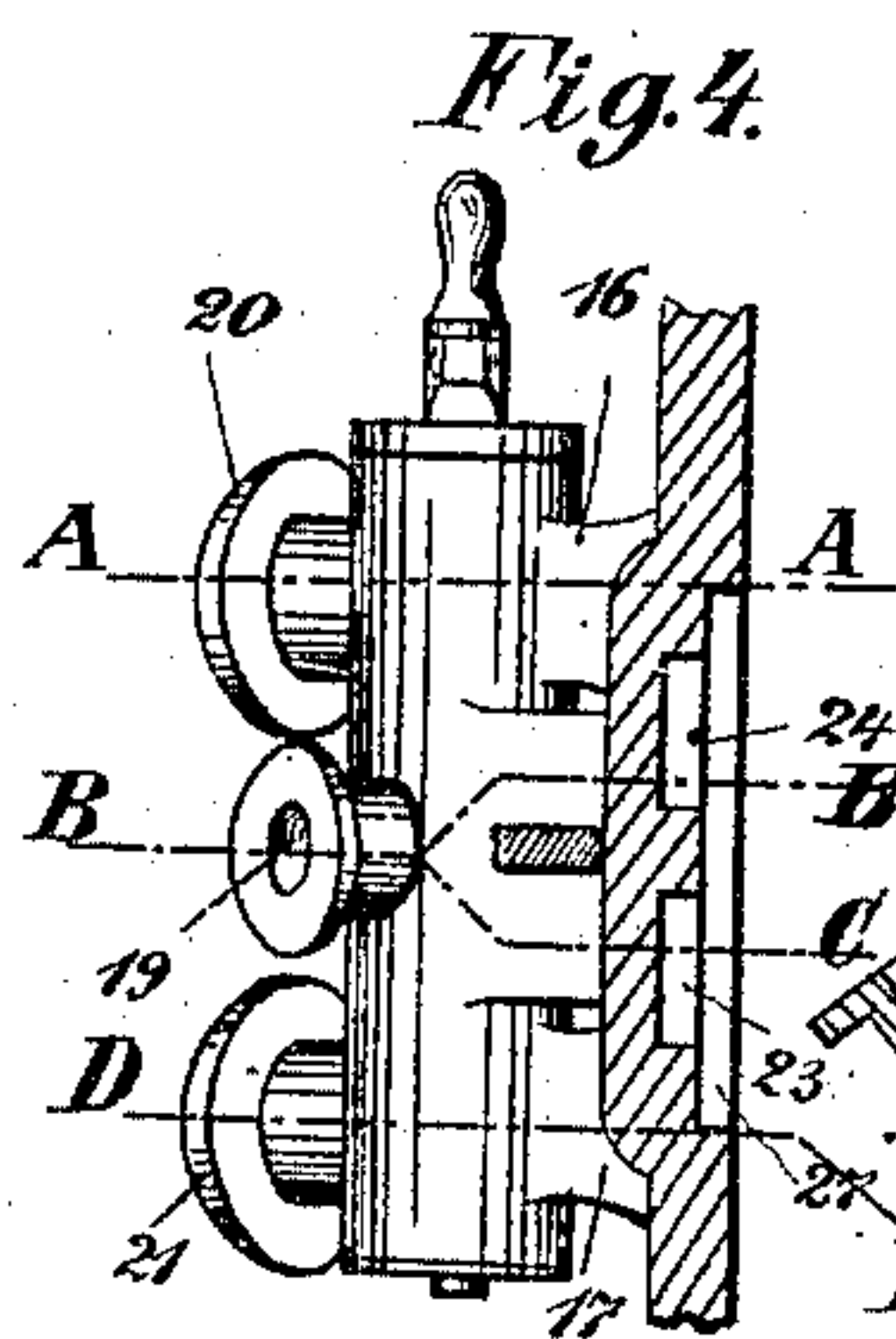
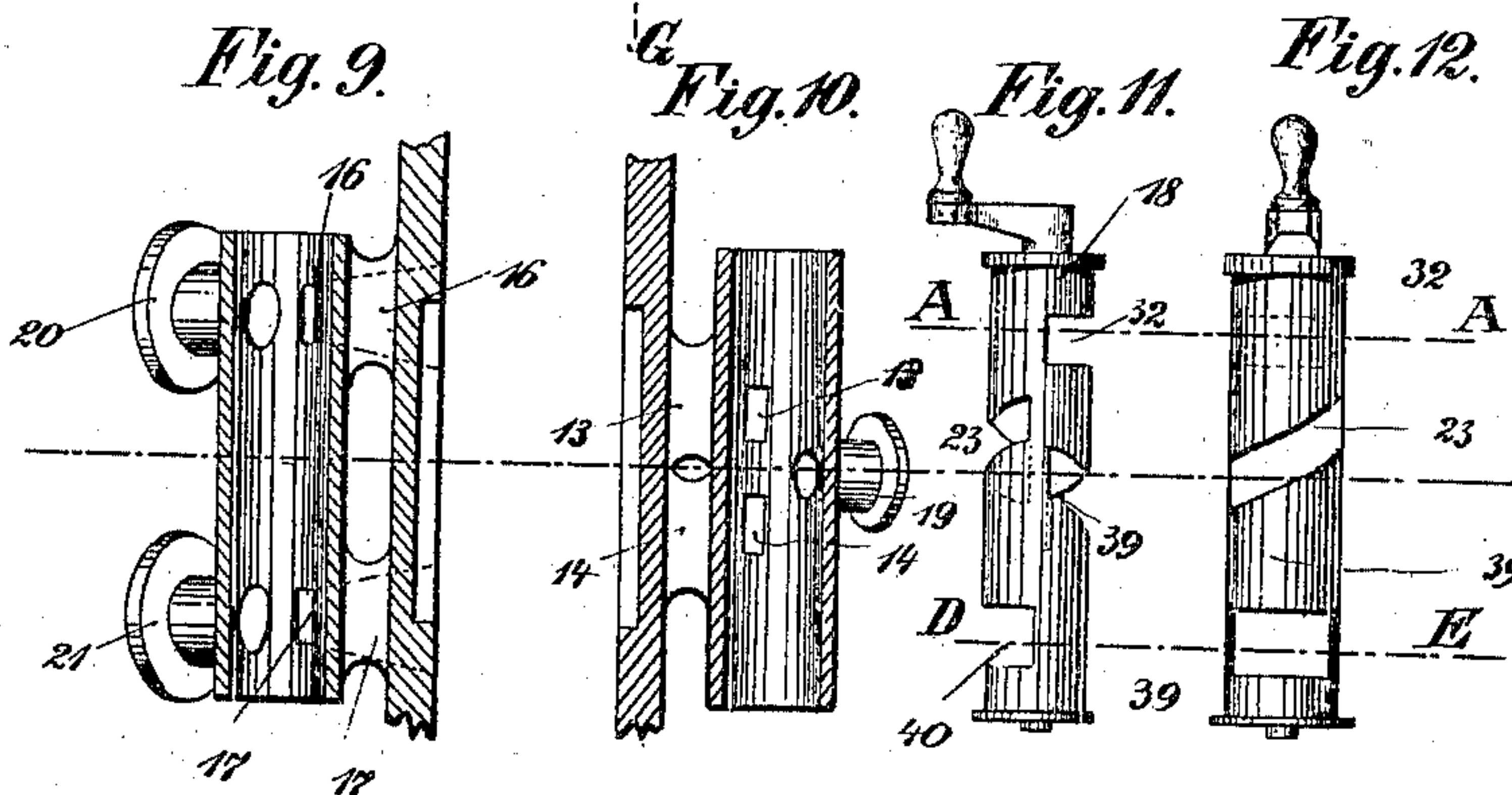
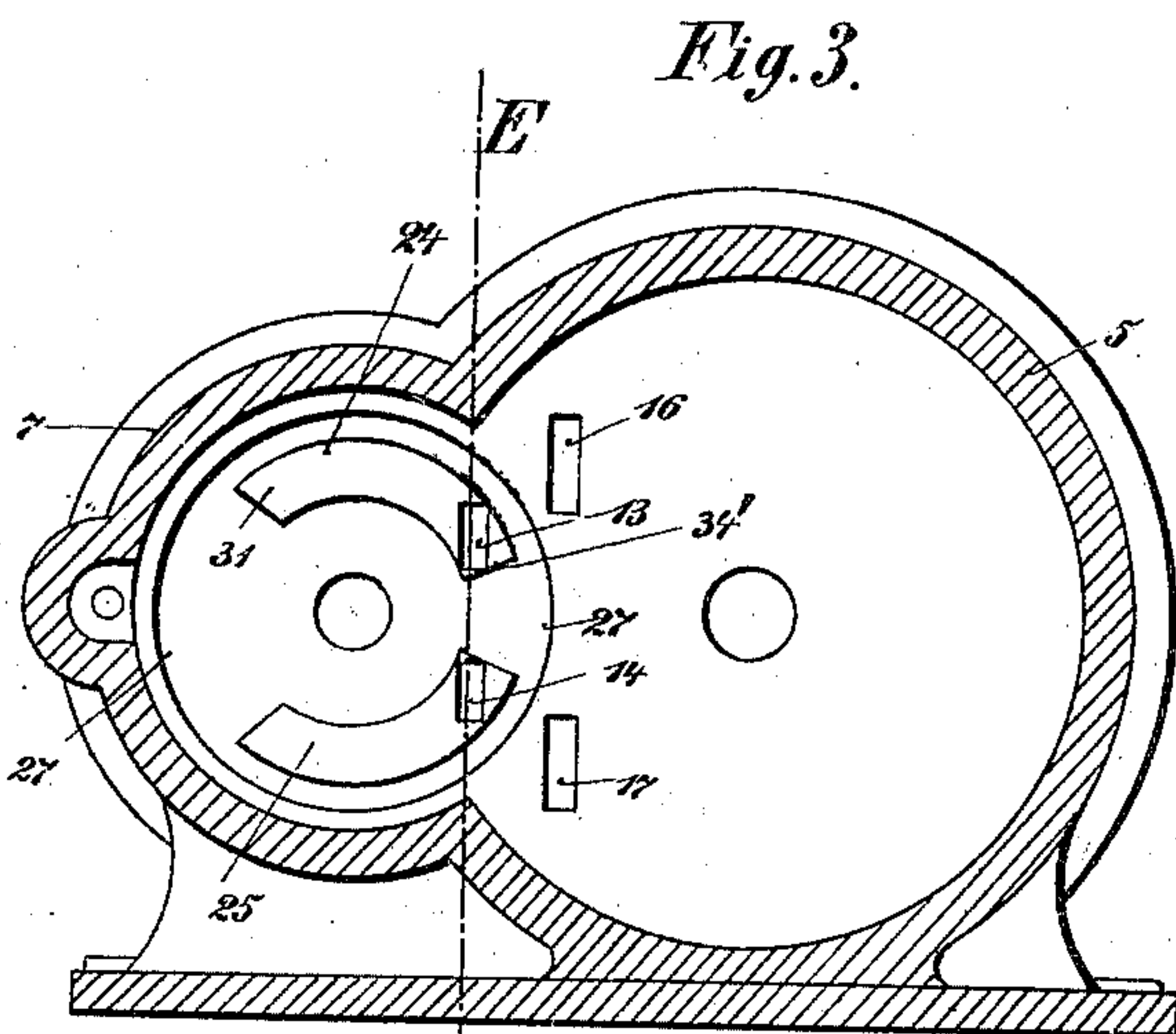
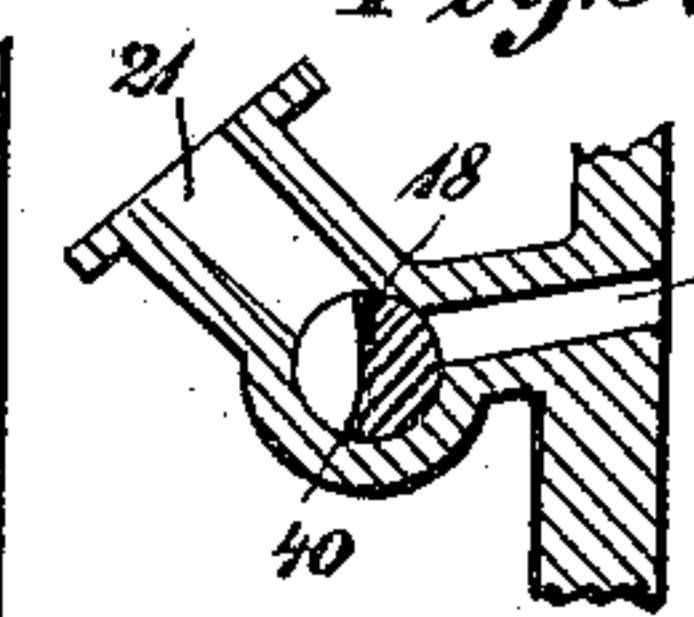
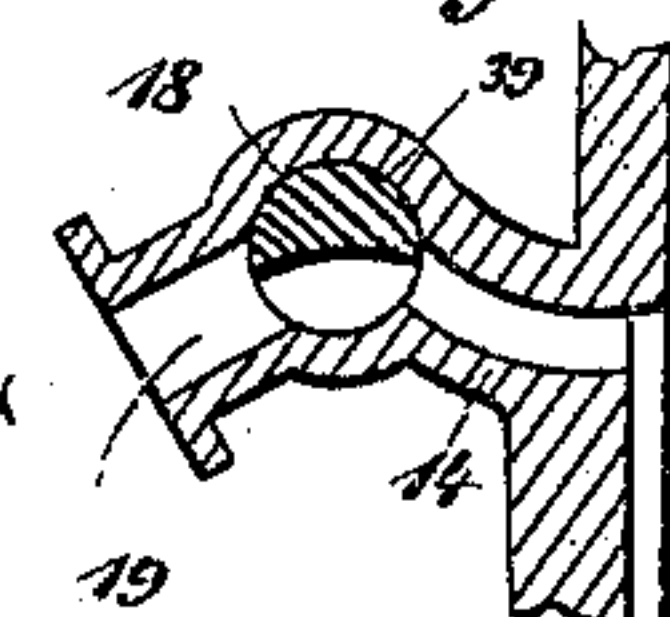
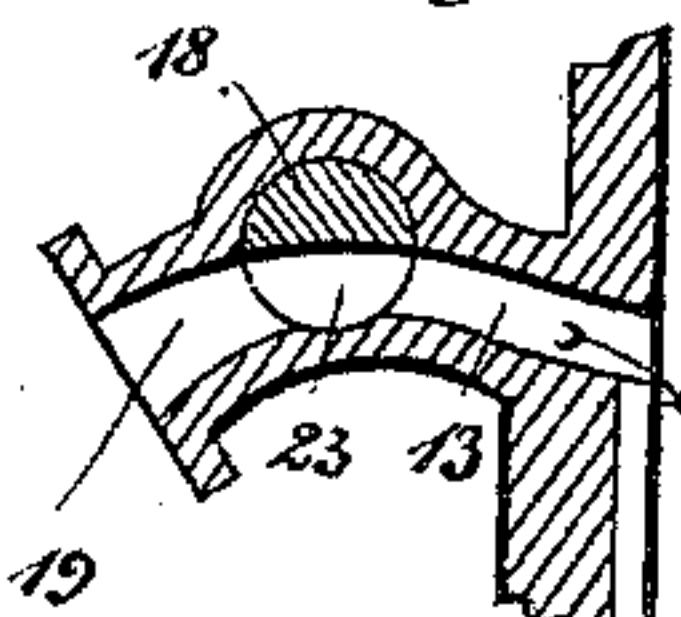
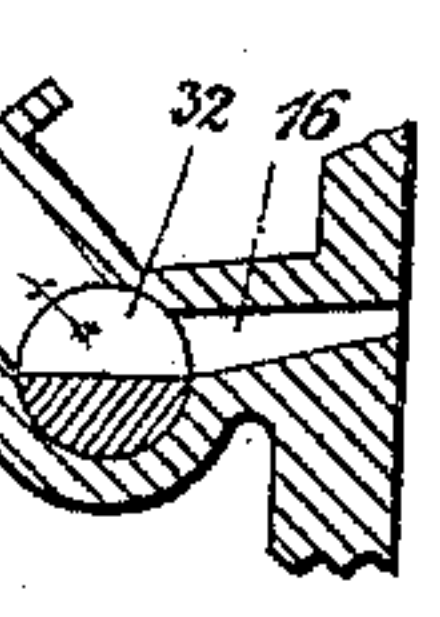


Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

JACOB HEINRICH LUDWIG BÖTTCHER AND JOHANN DETLEF ADOLF
BÖTTCHER, OF HAMBURG, GERMANY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 725,028, dated April 14, 1903.

Application filed November 5, 1900. Serial No. 35,504. (No model.)

To all whom it may concern:

Be it known that we, JACOB HEINRICH LUDWIG BÖTTCHER and JOHANN DETLEF ADOLF BÖTTCHER, subjects of the Emperor of Germany, residing at 40 Teilfeld, Hamburg, in the Empire of Germany, have invented certain new and useful Improvements in or Relating to Rotary Engines, of which the following is a full, clear, and exact description.

The present invention relates to a rotary engine the characteristic feature of which is that the admission of steam or motive fluid to the cylinder in which the piston revolves with the driving-shaft is effected and regulated by a rotary valve.

Figure 1 of the accompanying drawings is a central cross-section through an engine constructed according to this invention; Fig. 2, a central horizontal section through the same; Fig. 3, a central cross-section through the casing of the machine, with the piston and slide-valve removed to render the inlets and outlets of the steam clearly visible. Fig. 4 is a view of the reversing-gear of the motor on line E G, Fig. 3, according to the setting of which the motor will run in either direction. Figs. 5 to 8 are cross-sections of the same on lines A A, B B, B C, D E, respectively. These figures represent the position of the reversing-valve corresponding to the direction of movement of the motor as assumed in Fig. 1. Figs. 9 and 10 represent the casing of the reversing-valve represented in outside view in Fig. 4, Fig. 9 being a vertical section of one half and Fig. 10 that of the other half. Figs. 11 and 12 represent elevations of the rotary-valve spindle, the horizontal sections of which are shown in Figs. 5 to 8, the two views representing positions at right angles to each other.

1 indicates the main driving-shaft in Figs. 1 and 2, the shaft being revolved by means of a wing-piston 2 4 and transmitting its imparted power to a belt-pulley 3 or the like, keyed on the shaft 1. The piston 2 is connected to a cylindrical hollow body 4, keyed on the driving-shaft 1. The piston 2 is preferably somewhat of the shape of a tooth of a toothed wheel. A suitable casing 5 forms the cylinder proper, having ends or sides 6, in which are arranged the bearings of the driv-

ing-shaft 1. With the casing 5 is connected a casing 7 for a cylindrical revolving steam-distribution valve 8, keyed on a shaft 9, driven, say, by means of two toothed wheels 10 from the driving-shaft 1 at a speed equal to that of the latter. The diameter of the steam-distribution valve 8 is exactly equal to that of the drum 4. These two cylindrical bodies therefore roll on each other without any sliding movement. The steam-distribution valve is provided with a longitudinal recess 11, into which the piston passes at every revolution like the tooth of a toothed wheel passes through the interstitial space between two teeth of a wheel geared with it. The said recess 11 is of exactly the same length as the piston 2, the length of the latter being exactly that of the drum 4, which fits closely between the two ends 6. The body of the distribution-valve, however, as seen from the drawings, is somewhat longer than the piston 2, the recess 11 being closed at one end by a segment-shaped part 12, formed integral with the distribution-valve. At the end, therefore, where the recess of the distribution-valve is closed by the segment 12 the distribution-valve presents a full circle. It is necessary to thus provide the distribution-valve on the side of the casing where the reversing device is placed with a full face, since the steam-inlets 13 and 14 are also arranged on this side of the motor-casing, as clearly indicated in Fig. 3.

The steam-inlet passage 13 (see Figs. 6 and 10) is used when the motor is running in the direction indicated by the arrow 15, Fig. 1, while the steam enters through passage 14, (see Figs. 7 and 10,) when the motor is reversed—i. e., running in the direction contrary to that indicated by the arrow 15.

According to the drawings it is assumed that the passage 13 is open and that the motor is running in the direction indicated by the arrow 15. In conformity with this condition the regulating-valve 18 is so turned as to open the steam-port 16 (see Figs. 1, 3, 5, and 9) while closing the steam-port 17, Figs. 1, 3, 8, and 9. The steam enters through an inlet 19, Figs. 2, 4, and 10, and passes out into the air or to the condenser through the exhaust-ports 16 or 17 and the corresponding outlets

20 21. When the motor is running in the direction indicated by the arrow 15, Fig. 1, the steam, entering at 19, passes through a spiral or inclined recess 23 in the reversing-valve body 18, Figs. 11 and 12, through the passage 13, Figs. 6 and 10, and expands in the segmental-shaped recess 24 of the casing 7 of the valve 8. In Fig. 1 this recess 24 is almost wholly indicated by dotted lines, while Fig. 3 represents both this recess 24 and a similar recess 25 on the other side, which is operative during the reverse movement of the motor.

A recess 27 in the casing serves for the reception of that part of the rotary reversing-valve 8 by which it exceeds in length the piston 2 or the drum 4, this relative excess of length of 8 as compared with 4 being clearly represented in Fig. 2. The thickness of the segment-shaped part 12, Figs. 1 and 2, is exactly equal to the depth of the recess 27, and this is also clearly represented in Fig. 2. The distribution-valve 8 (see Fig. 2) is completely closed at the ends by the end walls 28. The end 28, however, is provided with a square orifice 24, (represented only in Fig. 1,) through which the steam passes to the distribution-valve as soon as the said orifice corresponds with a recess 22 (on the assumption that the motor is running in the direction indicated by arrow 15) in the distribution-valve and passing from thence through the two passages 29 to the recess 11, which, extending the entire length of the wing of the piston, therefore acts simultaneously on all parts of the piston. Furthermore, the steam in passing into the recess 22 (also of equal length with the recess 11) and passing from that point through the passages or ports 29 causes the steam to be directed and delivered through and from the distribution-valve in such manner that the impact of the steam on the wing of the piston will be in a direction to force the latter forward. This admission of steam commences, as represented in Fig. 1, at the moment only when the piston 2 has reached the position represented in Fig. 1, for at that moment the forward edge 30 of the orifice 22 is just clear of the edge 31 of recess 24. From this moment the steam becomes effective against the back of the piston, driving it forward in the direction indicated by the arrow 15. In front of the piston there is either atmospheric pressure only or the pressure of the condenser if the machine is provided with one. The steam from the last revolution of the piston passes out through the exhaust-port 16, slot 32 of the reversing-cock 18, Figs. 11 and 12, and outlet 20.

Fig. 5 also helps toward a clear understanding of the passage of the steam. As the piston 2 moves from the position represented in Fig. 1, the distribution-slide 8 revolves at the same angular velocity in the direction indicated by arrow 33, the admission of steam ceasing at the moment the rear edge 34 of the orifice 22, Fig. 1, passes over the edge 34', Fig. 3, of the recess 24. From this moment

the steam is effective through expansion only until the rear edge of the piston 2 passes over the exhaust-port 16, when the steam passes out. At this moment the piston begins to enter the recess 11, the motor producing no driving effect from the moment of the steam-exhaust until the piston again reaches the position represented in Fig. 1, which it will do with the assistance of its fly-wheel or when acting together with a second similar motor. On reaching the position indicated in Fig. 1 the piston is driven forward by an inrush of fresh steam. In order to still more effectively control the steam-supply to the motor than can be done by the recess 24 alone, an expansion-slide 35, Figs. 1 and 2, movable around the rotary valve, can be arranged between the rotary valve 8 and its casing 7, being actuated by hand or by means of a regulator acting on a small toothed wheel 36, engaging with a toothed portion of the slide 35. This expansion-slide is represented in Fig. 1 in a position in which, in cooperation with the edge 37 of the recess 11, Fig. 1, it will cut off the supply of steam from the distribution-valve 8 as soon as the edge 34 passes over edge 34', Fig. 3. If it is required that the admission of steam to the cylinder should be cut off earlier, the expansion-slide 35 is moved in a direction contrary to that indicated by the arrow 33. The edge 37 will thus meet the edge 38 of the expansion-slide earlier, and the fresh steam, although still able to enter the distribution-valve 8 from the recess 24 and through the orifice 22, cannot reach the back of the piston, and the steam thus shut out can only be effective expansively. The recess 11 and passages 29 should be made as small as possible. The operation of the motor is exactly the same when the movement is reversed. The valve-spindle 18 is turned through an angle of one hundred and eighty degrees, thereby closing the ports 13 and 16 and opening ports 14 and 17. The steam will now enter the recess 25, Fig. 3, passing through the orifice 22 into the distribution-valve 8 during the time orifice 22 is passing over the recess 25. The expansion-slide will work in exactly the same manner as described above by setting it correspondingly. The fresh steam passes down through the slot 39 in the spindle 18, while the exhaust-steam passes through the slot 40, Figs. 11 and 12, into the air or to the condenser.

What we claim, and desire to secure by Letters Patent, is—

1. A rotary engine comprising a casing, a rotary drum, provided with a wing-piston, mounted on a shaft journaled in said casing, a rotary cylindrical distribution-valve as 8 also mounted in said casing a recess in said valve to receive the wing-piston and forming a portion of the passage-way for the motive fluid, gearing for rotating the valve and drum at the same angular velocity, and a motive-fluid supply and reversing valve as 18 having spiral recess substantially as described.

2. In a rotary engine, the combination with
a rotating piston having a wing, of a rotary
distributing-valve having a recess to receive
said wing and diametrically opposite pas-
sages 29, a casing for said valve having seg-
5 mental recesses, steam-passages connecting
with said recesses, steam-ports 16 and 17, a
regulating-valve controlling said ports and
having spiral recess, a segmental expansion-
10 slide between the distributing-valve and its

casing, and means for actuating said slide,
substantially as specified.

In witness whereof we subscribe our signa-
tures in presence of two witnesses.

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JOHANN DETLEF ADOLF BÖTTCHER.

Witnesses:

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