

No. 680,259.

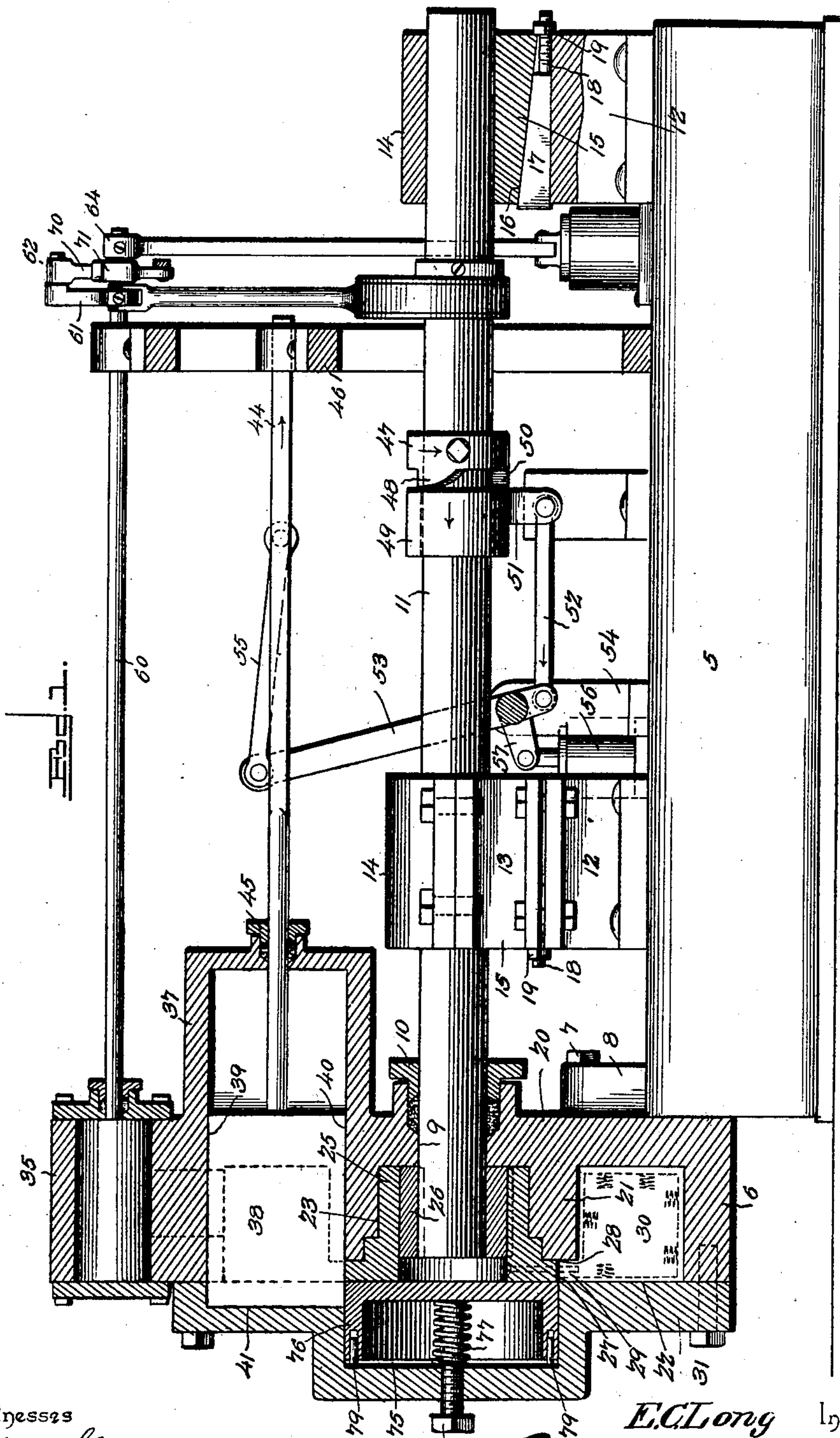
Patented Aug. 13, 1901.

E. C. LONG.  
ROTARY ENGINE.

(Application filed May 2, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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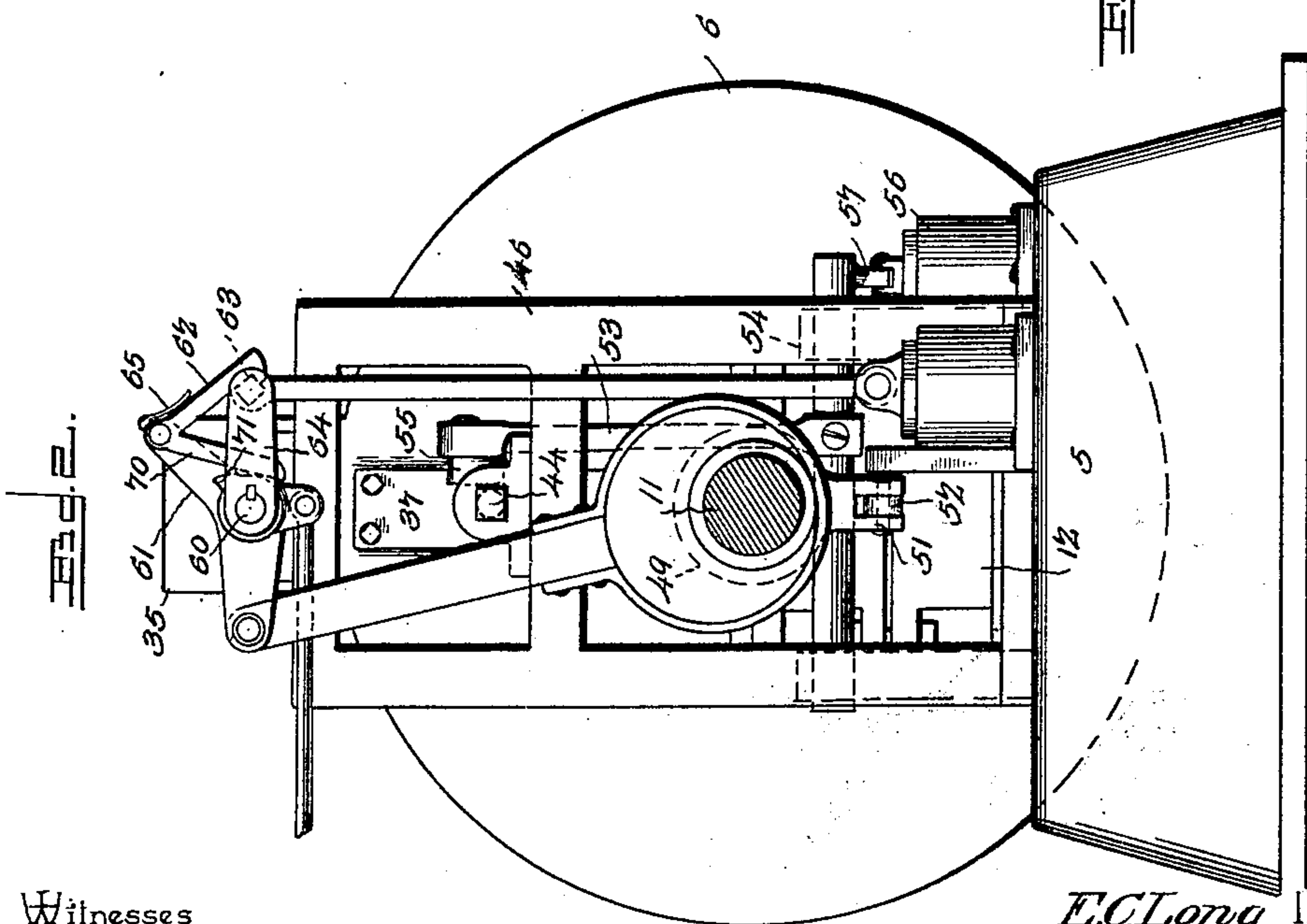
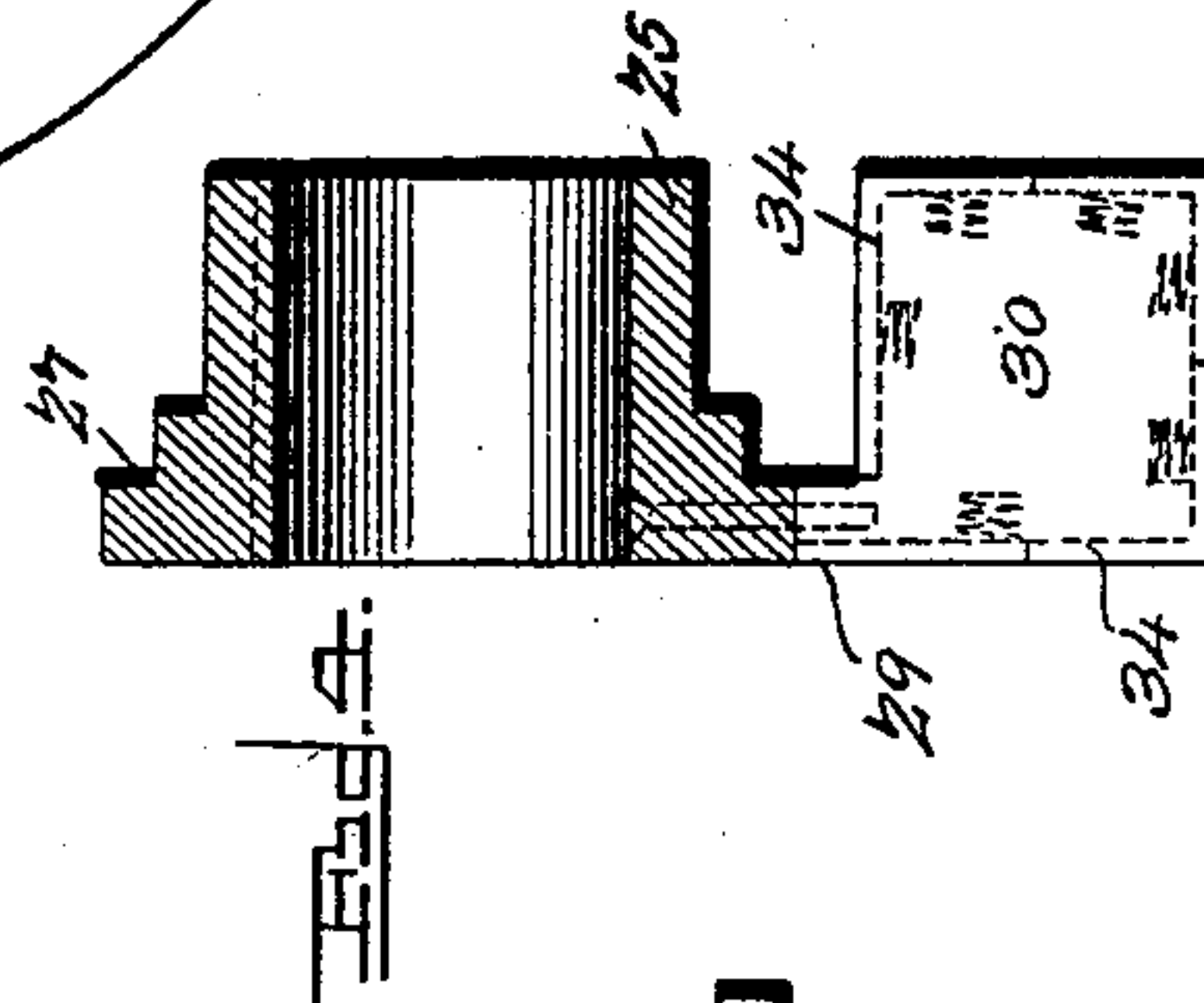
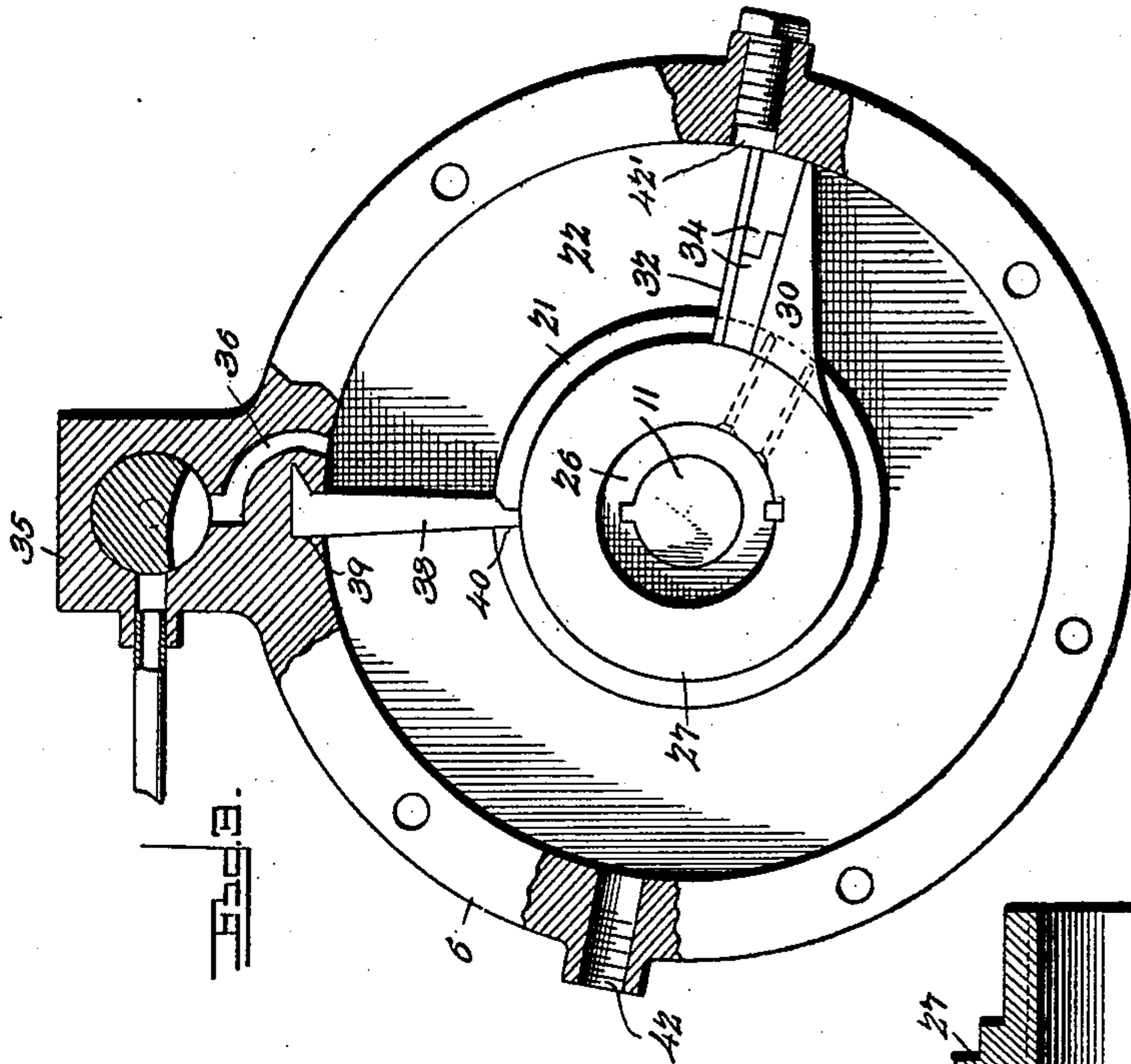
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# UNITED STATES PATENT OFFICE.

ELMER C. LONG, OF MONROE CITY, MISSOURI, ASSIGNOR OF ONE-THIRD TO  
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## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 680,259, dated August 13, 1901.

Application filed May 2, 1900. Serial No. 15,244. (No model.)

*To all whom it may concern:*

Be it known that I, ELMER C. LONG, a citizen of the United States, residing at Monroe City, in the county of Monroe and State of Missouri, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to steam-engines in general, and more particularly to that class known as "rotary" engines, although it will be understood from the following description that the principles involved may be employed in an engine operable by other than steam-pressure, one object of the invention being to provide a construction in which there will be an expansion of steam in an annular chamber in such a manner that the energy of the steam will be exerted against a fixed abutment and a movable piston-head to contribute rotary motion to a shaft carrying the head.

A further object of the invention is to provide such a construction and arrangement of the cylinder and the parts therein, as also of the cut-off mechanism and movable abutment, as will develop the greatest efficiency in the engine.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a central vertical section taken through the cylinder of the engine, the steam-chest, and the abutment-chest and showing parts of the structure in elevation. Fig. 2 is an end view of the complete engine with the pillow-blocks at one end of the shaft removed from the bed-plate. Fig. 3 is a rear end view of the cylinder of the engine with the rear head removed, parts of the cylinder being shown in section. Fig. 4 is a central section of the piston-hub and showing the piston-head in elevation.

Referring now to the drawings, the engine of the present invention is mounted upon a bed-plate 5 and comprises a cylinder 6, which is held to one end of the bed-plate by bolts or screws 7, passed through a lug 8 upon the bed-plate and into the end of the cylinder, or is fastened in place in any other suitable manner. The cylinder 6 has a central bearing opening 9, provided with the usual stuffing-box 10, which receives the engine-shaft

11, said shaft having also bearings in pillow-blocks mounted on the bed-plate 5. One of these pillow-blocks is shown at each end of the bed-plate, and each consists of a base portion 12 and an upper portion 13, which latter is formed in two parts 14 and 15, each having one-half of the bearing formed therein and held in mutual relation to support the shaft by means of the usual lag-screws, these screws affording also means for adjusting the boxes or journals of the shaft.

The upper and lower members 12 and 13 of the pillow-blocks are connected by means of bolts engaging flanges upon the members, and the upper members 12 have wedge-receiving slots 16 therein, which receive wedges 17 in such positions that the wedges bear at one side against the lower members 13 of the pillow-blocks and at their upper sides against the upper sides of the slots 16. The wedges have threaded stems 18, which project from between the block members 12 and 13, and with these stems are engaged nuts 19, which are adapted to be screwed up to impinge the ends of the block-sections and draw the wedges outwardly, thus causing the thickened ends of the wedges to engage the shallow portion of the wedge-slot and give a wedging effect to raise the upper member 12 and thereby with the shaft. Thus the engine-shaft may be adjusted, so as to bring the shaft in axial alinement with the cylinder to prevent binding.

In the present instance the cylinder and the head 20 at the inner end thereof are formed integral, although, as will be understood, they may be formed separate, and concentric with the cylinder and interiorly thereof is formed an annular flange 21, so that the cylinder comprises an outer annular expansion-chamber 22 and an inner chamber 23, which is cylindrical, the flange 21 being somewhat shorter than the length of the cylinder, so that the expansion-chamber communicates with the central chamber, as shown.

The shaft 11 projects into the central cylindrical chamber of the cylinder, and upon this end of the shaft is fixed the hub 25 of the piston, said hub being directly splined to a bushing 26, which is in turn splined to the shaft, as shown. The hub is increased



slightly in diameter at its outer end, as shown at 27, to fit the portion 28 of increased diameter of the central chamber of the cylinder, and extending radially from the hub is the web 29, which carries the piston-head 30 at its outer end. This web 29 is of such dimensions that it fits snugly between the outer end of the flange 21 and the inner face of the cylinder-head 31, which is secured in the usual manner against the adjacent end of the cylinder, while the piston-head is rectangular in outline and fits snugly in the expansion-chamber of the engine. The pressure-receiving face 32 of the piston lies radially of the hub, while the opposite face thereof is curved in the direction of a tangent to the hub, so that it is thicker at the web 29 in the direction of rotation than at its outer end. The side edges of the piston-head are provided with packing-strips 34, which effectively pack the head in the cylinder and prevent leakage of steam past the head.

The steam for the engine is first supplied to a steam-chest 35, from which leads a steam-inlet passage 36 to the cylinder, this passage being governed by a rotary cut-off valve, which is operated in a manner hereinafter set forth. Below the steam-chest is formed the abutment-chest 37, in which is located the slidable abutment 38, said abutment-chest having communication with the cylinder and being so disposed that when the abutment 39 is moved from its chest into the cylinder it will lie transversely of the expansion-chamber of the engine, said abutment being of such size as to snugly fit with its upper and lower edges in longitudinal slots 39 and 40 in the inner face of the cylinder and the outer face of the flange 21, respectively, and the outer cylinder-head has also a recess 41, which receives the outer end of the abutment, so that when the abutment is projected into the expansion-chamber it is held positively against displacement by steam-pressure. It will be noted that the slot 39 is broadened at its upper end and that the sides of said slot are tapered downwardly, and also that the engaging edge of the abutment is similarly formed. The object of this construction is in order that the wear of the abutment against the sides of the slot 39 may be taken up, and the abutment will be by gravity held against the rear faces of the slots with which it is engaged, so that no hammering can ensue when steam-pressure is admitted against the pressure-receiving face of the abutment. It will be understood that without the construction shown if the abutment is the least bit loose then the inflow of pressure will throw the abutment to the limit of its movement with violence, causing a hammering noise. The exhaust-port 42 is positioned at a point about two hundred and seventy degrees from the abutment in the direction of rotation of the piston, so that the steam is exhausted when the piston has completed about three-fourths of a rotation.

In order to operate the abutment to project it into the cylinder during the inflow of steam and to withdraw it after the exhaust, so that the piston-head may pass by it, the abutment is provided with an operating reciprocatory rod 44, which is passed through a stuffing-box 45 at the rear end of the abutment-chest, and the outer end of this rod is slidably mounted in the upright 46. A collar 47 is fixed upon the shaft 11 and has a laterally-extending cam 48, one end of which is beveled and the other end abrupt. A second collar 49 is loosely mounted on the shaft 11 and has a lateral lug 50, having a beveled end and an abrupt end, the lugs of the collars being disposed toward each other in such manner that in the operative rotation of the engine-shaft the beveled portions of the lugs will mutually engage, forcing the loose collar along the shaft until the lugs have passed one beyond the other, after which the loose collar will be returned. The loose collar has a lug 51, to which is pivoted one end of a link 52, the opposite end of the link being pivoted to a lever 53, pivoted to an upright 54 upon the bed-plate, and the upper end of lever 53 is connected with the rod 44 by means of a link 55, so that as the loose collar is reciprocated on the engine-shaft under the influence of the engagement of the cams the abutment will be correspondingly moved. To return the collars, and therewith the abutment, to project the latter into the cylinder with a swift movement, a dash-pot 56 of usual construction is provided, this pot having connection with the crank-arm 57 on the lever 53.

In order to operate the rotary cut-off valve, the common form of Corliss valve-movement is employed. The valve-rod 60 is extended through the upright 46 and at its outer end is mounted the rocker 61, having the hook 62 at its outer end, which is adapted to engage the squared block 63 upon the crank-arm 64, which is fixed to the valve-rod, said hook being held in operative position by a spring 65. A dash-pot is connected with the outer end of the crank-arm, and as the rocker is moved in one direction it engages the hook with the block and raises the end of the crank-arm, after which it releases it, and the dash-pot returns the arm and therewith the valve-rod, this oscillation of the rod acting to correspondingly move the cut-off valve. The latch or hook is disengaged from the block by moving it pivotally therefrom, and to secure this pivotal action the hook is pivotally mounted on the rocker and has an arm 70, which lies against a cam 71 on the valve-rod. This cam is adjustably mounted and is connected with a common form of ballast to rotate it, so that at different points of its rotation it will release the hook from the block at different stages of rotation of the engine. This structure is well known and requires no further explanation.

The removable cylinder-head has a central recess 75, in which is disposed a cylindrical



wear-plate 76, which rests against the outer end of the piston-hub and is held in close contact therewith through the medium of a helical spring 77, disposed within this hollow wear plate or block and resting with its ends against the wear-block and against the bottom of the recess of the cylinder-head. This helical spring encircles a set-screw 78, which latter acts to hold the spring in place and also to limit the outward movement of the plate. Pins 79, engaging perforations in the wear-block and cylinder-head, prevent the block from rotating under the influence of the piston-hub.

In Fig. 3 of the drawings there is shown a second exhaust-opening 42', diametrically opposite to the opening 42, which opening 42' is employed only when two piston-heads are used, and in this event said heads are at diametrically opposite points of the piston-hub. When two heads are used, there is less expansion of each charge of steam in the engine and only the maximum expansion of each charge is employed, so that greater effective energy of the engine is secured.

What is claimed is—

1. A rotary engine comprising a cylinder having a fixed head at one end and a removable head at the opposite end, a central annular flange upon the inner face of the fixed head and extending to a point adjacent to the removable head, and forming an inner cylindrical chamber and an outer annular expansion-chamber having a communicating passage, a shaft passed through the fixed cylinder-head and terminating short of the removable head, which latter has a recess in its inner face, a hub fixed to the shaft and having a radial web lying between the end of the flange and the removable head of the cylinder, said web having a head at its outer end fitting the expansion-chamber, a hollow cylindrical wear-block in the recess of the removable head and having one end closed and disposed against the end of the piston-hub, a set-screw passed through the removable head and into the wear-block for engagement with the closed end thereof to limit its rearward movement, and a helical spring disposed upon the screw and having its ends bearing against

the wear-block and the bottom of the recess to hold the block yieldably in operative position.

2. In a rotary engine, the combination with a base having pillow-blocks thereon, of a shaft mounted in said blocks, a cylinder at one end of the base and into which the shaft is passed, a piston within the cylinder and fixed upon the shaft for rotating it, an abutment-chest communicating with the cylinder, a slidable abutment in the chest for movement into and out of the cylinder, an upright between the pillow-blocks and having bearings, an operating-rod connected with the abutment and disposed slidably in a bearing of the upright, a cam upon the shaft, a collar upon the shaft and adapted for sliding movement by the cam, a rock-lever mounted upon the base and connected at one end with the collar and at the other with the abutment-rod through the medium of links, a dash-pot connected with the rock-lever, a steam-chest, an oscillatory cut-off valve in the steam-chest, a rod for the valve disposed in a bearing of the upright, and eccentric connections between the shaft and valve-rod for operating the latter, the rods and shaft lying in a common vertical plane and the eccentric connections lying beyond the end of the abutment-rod.

3. A rotary engine comprising a cylinder having an annular flange on the inner face of a head thereof and concentric therewith, a central opening in the flanged head, a shaft disposed in said opening and extending part way through the cylinder, a piston having a hub fixed upon the shaft and extending into the inclosure of the flange and against the inner face of which it has a bearing, said piston having a head lying between the flange and the outer wall of the cylinder, and an adjustable wear-block held between the inner end of the shaft and the adjacent head of the cylinder and against the end of the piston.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ELMER C. LONG.

Witnesses:

HARRY H. HOLLANDER,  
GEO. H. CHANALIE.