No. 609,802. Patented Aug. 30, 1898.

V. R. GATES.

ROTARY ENGINE.

(Application filed Apr. 24, 1897.)

(No Model.) 2 Sheets—Sheet 1.

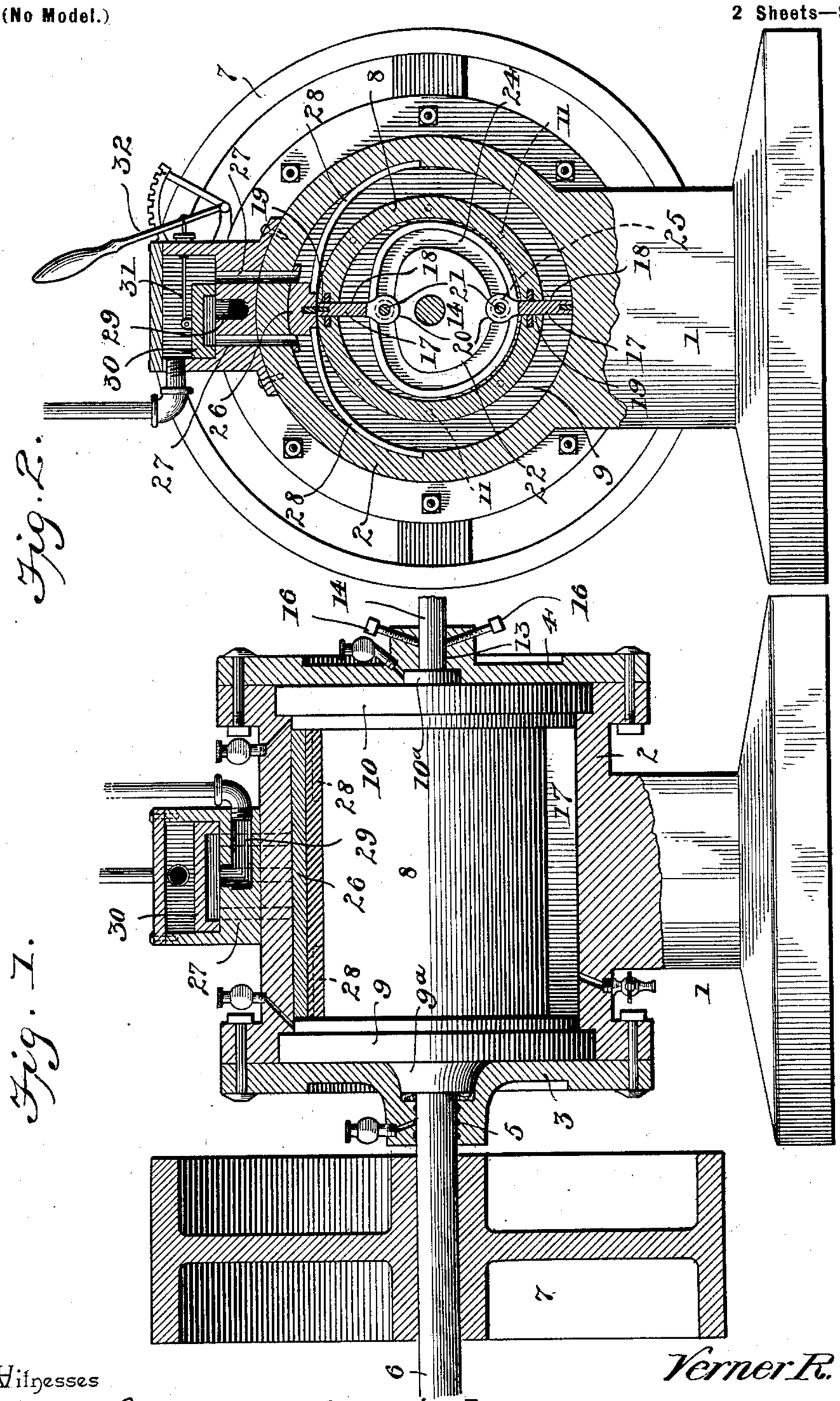

Fig. 2.

Fig. 1.

Witnesses

E. V. Monroe

C. E. Hoyt

Inventor

Verner R. Gates,

By his Attorneys,

C. A. Snow & Co.

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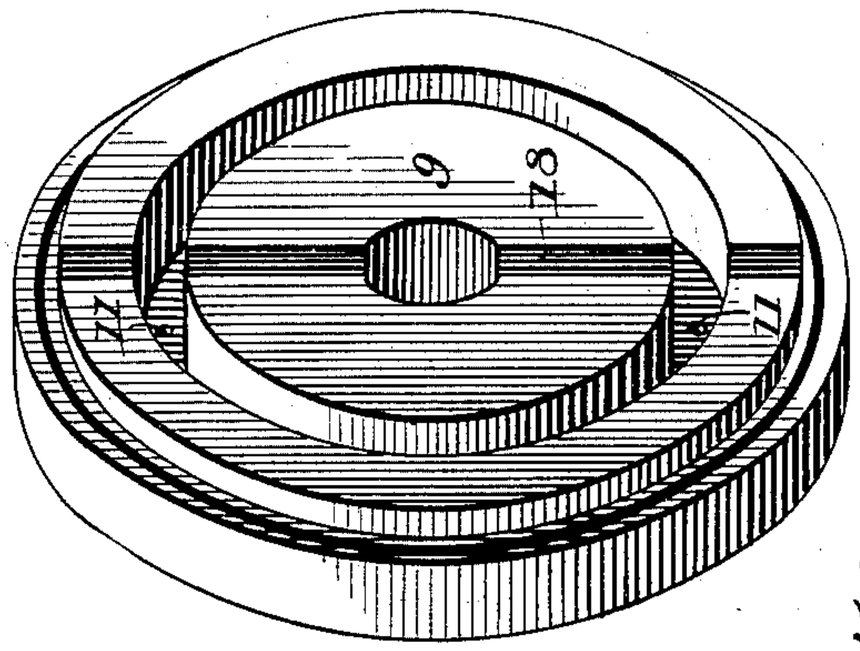

Fig. 4.

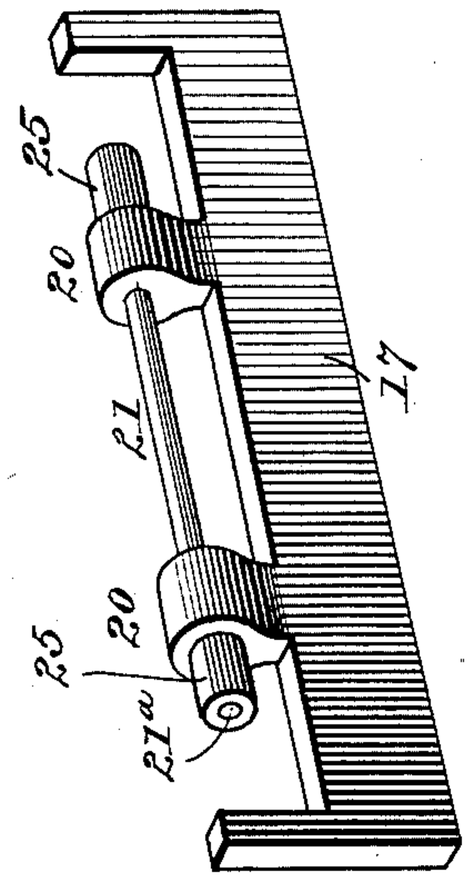

Fig. 5.

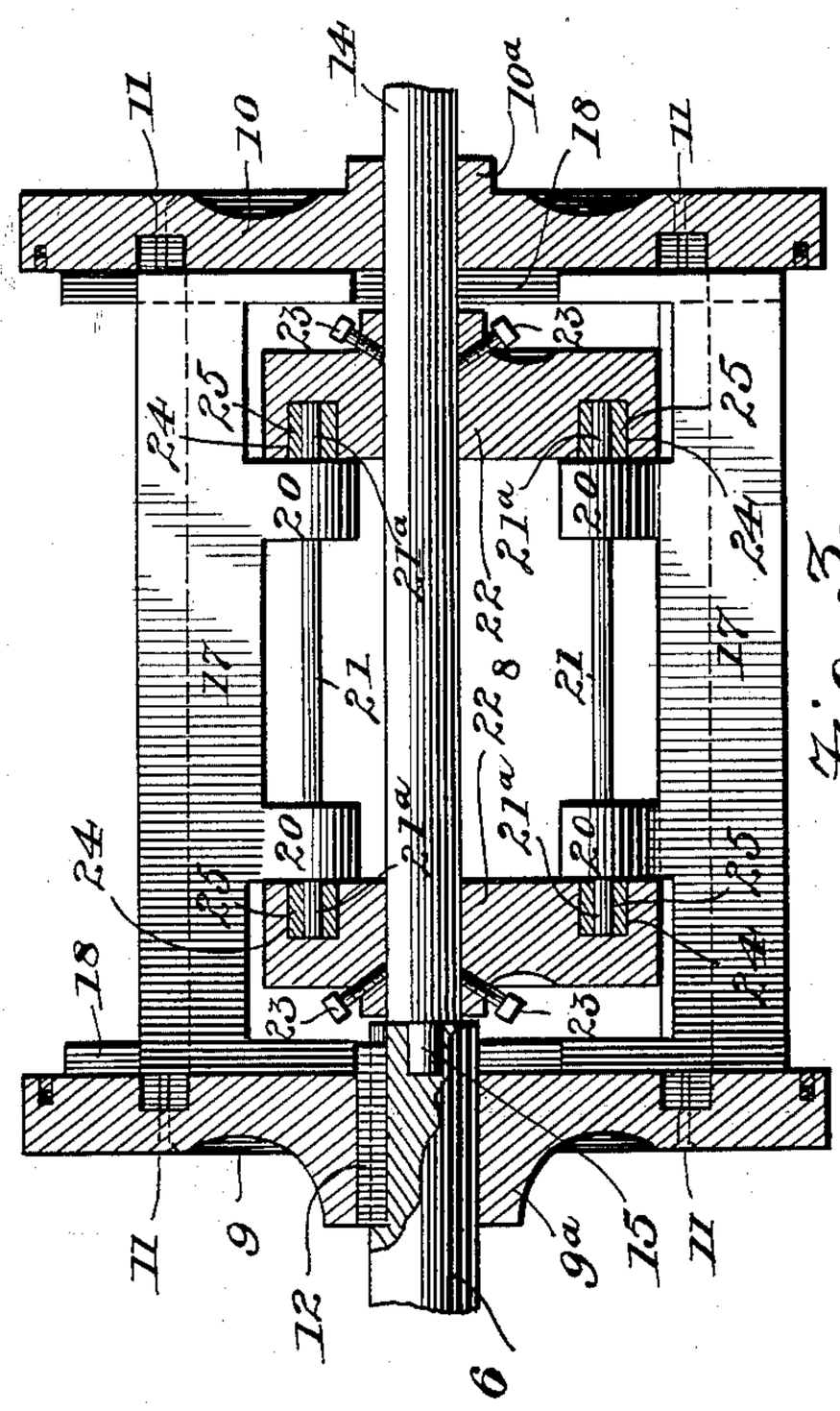

Fig. 3.

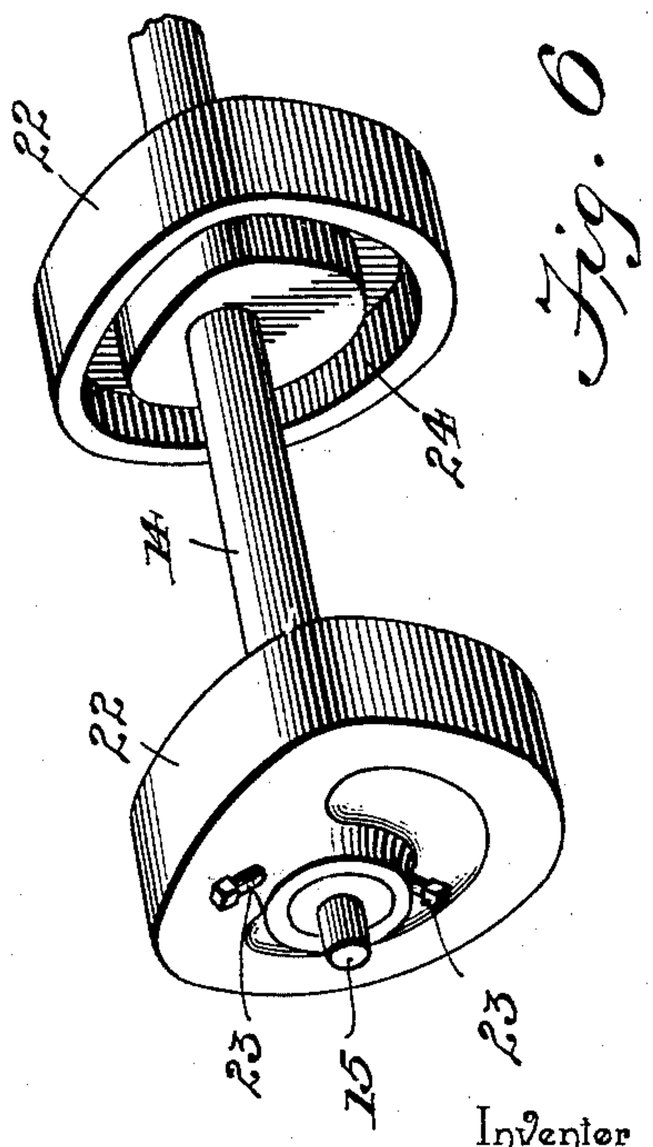

Fig. 6.

Inventor
Verner R. Gates

Witnesses

By his Attorneys,

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

VERNER R. GATES, OF SHERMAN, MICHIGAN, ASSIGNOR OF ONE-HALF TO VINCENT C. WALL, OF SAME PLACE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 609,802, dated August 30, 1898.

Application filed April 24, 1897. Serial No. 633,771. (No model.)

To all whom it may concern:

Be it known that I, VERNER R. GATES, a citizen of the United States, residing at Sherman, in the county of Wexford and State of Michigan, have invented a new and useful Rotary Engine, of which the following is a specification.

My invention relates to rotary engines, and has for its objects to provide an improved engine of the concentric-piston type wherein the movable abutments are positively actuated and to provide such a construction and arrangement of parts that the direct and expansive pressure of the motive agent is applied with the maximum efficiency to the abutments of the piston and whereby one of said abutments is exposed to said direct pressure in any position of the piston to avoid the disadvantage of a dead-center.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical section of an engine constructed in accordance with my invention in the plane of the axis of the piston, the piston being shown in side elevation. Fig. 2 is a vertical section of the same, taken at right angles to the axis of the piston. Fig. 3 is a longitudinal section of the piston in the plane of the movable abutments. Fig. 4 is a detail view in perspective of one of the carrier-heads detached. Fig. 5 is a similar view of one of the movable abutments. Fig. 6 is a similar view of the cams.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates a base which supports a cylinder 2, having heads 3 and 4, the head 3 being provided with a bearing 5, in which is mounted the power-shaft 6, carrying means, such as a pulley 7, to convey motion to machinery to be driven.

Mounted concentrically within the cylinder is a piston comprising a cylindrical drum 8 and terminal carrier or piston heads 9 and 10, said heads being concentrically grooved in their inner faces to receive the extremities of the drum 8, and the latter being secured therein by means, such as bolts 11, extending through the carrier or piston heads and engaging the drum. The piston-head 9 is fixed, as by a key 12, to the contiguous extremity of the power-shaft, and axially alined with the power-shaft and extending through a central opening 13 in the cylinder-head 4 is a cam-shaft 14, preferably reduced at its inner extremity, as shown at 15, to engage a suitable socket in the extremity of the power-shaft. During the operation of the engine this cam-shaft is adapted to remain in a fixed position, and in order that it may be secured in the desired position I employ means such as set-screws 16.

The carrier or piston heads are preferably provided with central enlargements or hubs 9^a and 10^a, which extend into corresponding seats or cavities in the inner surfaces of the cylinder-head, as clearly shown in Fig. 1, the enlargement 10^a thus forming a bearing in the cylinder-head 4 and relieving the cam-shaft of a portion of the strain incident to the rotation of the piston.

Moving abutments or piston-wings 17 are fitted to slide at their extremities in radial guides 18, consisting of grooves formed in the inner surfaces of the carrier or piston heads, said guides intersecting the circular grooves which are formed for the reception of the extremities of the drum, and said drum being provided in the plane of the guides with longitudinal slots 19, through which the moving abutments or wings are adapted to be extended and withdrawn, the radial grooves 18 being of less depth than the annular grooves to avoid extending the slots 19 to the ends of the drum. This provides for a single-piece construction of drum, in that the longitudinal slots of the drum do not extend to the ends thereof, and hence are not open-ended. The inner edges of the moving abutments or wings are provided with extensions, forming lugs 20, connected by a longitudinal bolt 21, which is extended terminally beyond the outer sides of the lugs 20 to form guide-pins, which operate in connection with cams 22, fixed at a suitable interval upon the eccentric shaft 14. In the construction illustrated in the drawings these cams, which are secured to the shaft by means of set-screws 23, are provided

in their inner faces with cam-grooves 24, and into these grooves project the guide-pins 21ª, formed by the extremities of the bolts 21. I also preferably fit each guide-pin with an antifriction roller or sleeve 25.

In operation the rotary motion of the piston due to the pressure upon the exposed moving abutment or piston-wing of the motive agent causes the guide-pins 21ª to travel in the grooves of the cams, and the irregular shape of said grooves causes the alternate extension and retraction of the wings, the retraction being necessary in order to allow the wing to pass a fixed or stationary abutment 26, which is arranged between the feed-ports 27. On each side of the fixed abutment are arranged cam-guides 28, of which the inner edges are shaped to correspond with the paths of the outer edges of the moving abutments or wings as they are retracted or extended. The object of these cam-guides is to prevent contact of the edges of the moving abutments with the fixed abutment and also to provide for exhausting the pressure in rear of one wing at the moment of the exposure of the succeeding wing to pressure.

The feed-port 27 and an intermediate exhaust-port 29 are controlled by a reversing-valve 30, connected by means of its stem 31 with a reversing-lever 32.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. A rotary engine having a cylinder, a concentric piston comprising a cylindrical open-ended single-piece drum, and terminal removable heads closing the ends of the drum and provided with concentric grooves in which the extremities of the drum are fitted, and also provided with radial grooves of less depth than the concentric grooves, and the drum being provided with longitudinal slots registering with said radial grooves of the drum-heads and terminating at the bottoms of said radial grooves, and hence short of the extremities of the drum, abutments or wings fitted to slide in said registering radial grooves and slots, and fixed cams arranged within the drum, and operatively connected with said abutments or wings, and having a cam-shaft extending through one of the drum-heads and the contiguous head of the cylinder and secured in a fixed position to the latter, substantially as specified.

2. A rotary engine having a cylinder, a concentric piston comprising a cylindrical open-ended drum, terminal heads fitted upon and closing the ends of the drum and provided with radial guides registering with longitudinal slots in the drum, and abutments or wings fitted to slide in said guides and slots and provided contiguous to their extremities with longitudinally-extending guide-pins, duplicate oppositely-positioned cams arranged within the drum and provided with grooves in which said guide-pins respectively operate, and a common cam-shaft supporting said cams and extending through one head of the piston, the piston-shaft being attached to the other head, substantially as specified.

3. A rotary engine having a cylinder in one head of which is mounted a power-shaft, a piston having a hollow drum closed at its extremities by terminal heads, and provided with radially-movable abutments or wings, one of the piston-heads being secured to the inner extremity of the power-shaft, a cam-shaft extending through the opposite head of the cylinder and into the piston and stepped at its extremity in a socket in the end of the power-shaft, means for securing said cam-shaft at the desired revoluble adjustment, and cams carried by the cam-shaft and operatively connected with the abutments or wings, 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.

VERNER R. GATES.

Witnesses:

LEROY P. CHAMPENOIS,

H. F. CAMPBELL.