No. 766,912. PATENTED AUG. 9, 1904.

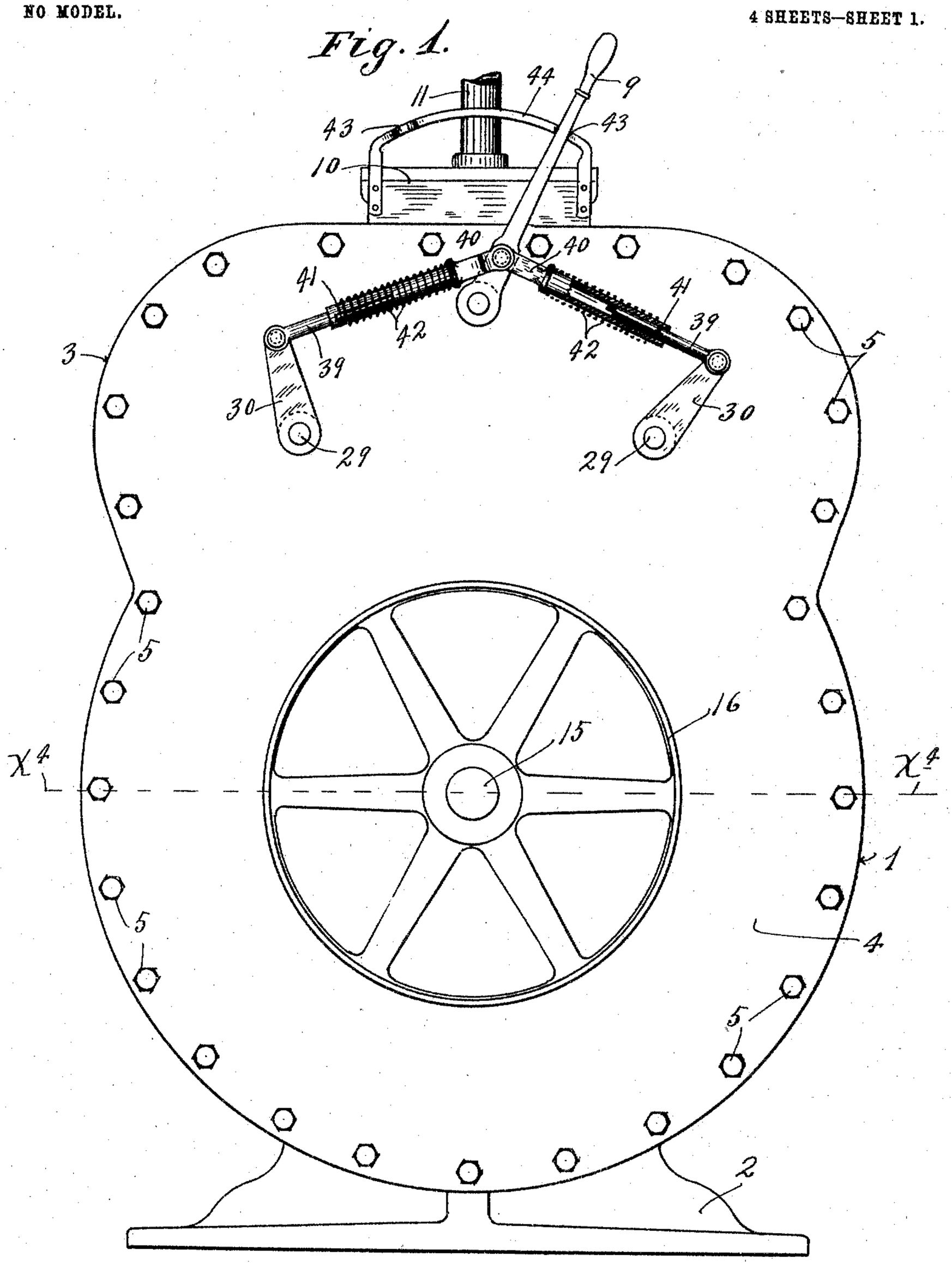
L. E. STETLER.

ROTARY ENGINE.

APPLICATION FILED FEB. 1, 1904.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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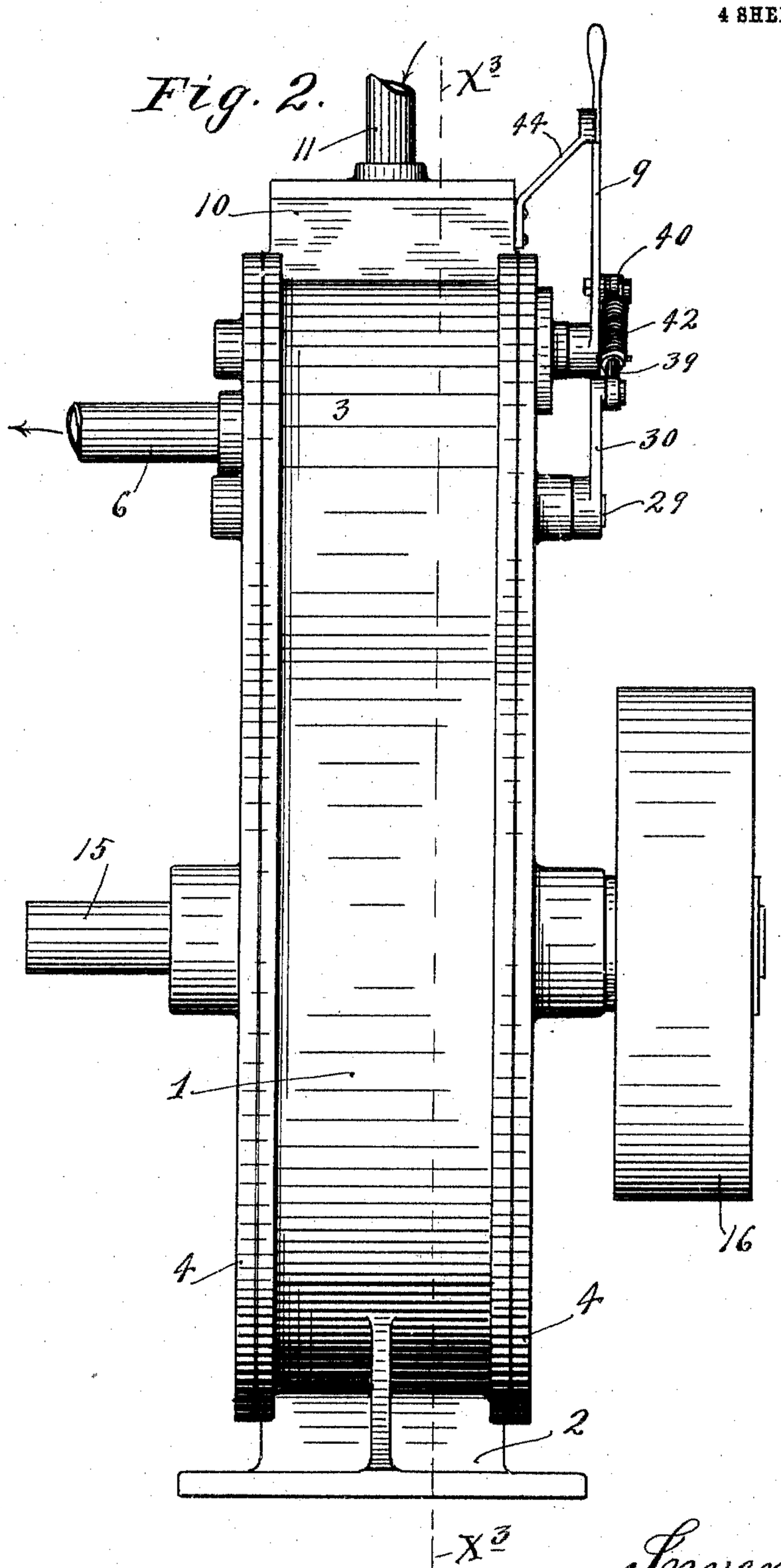
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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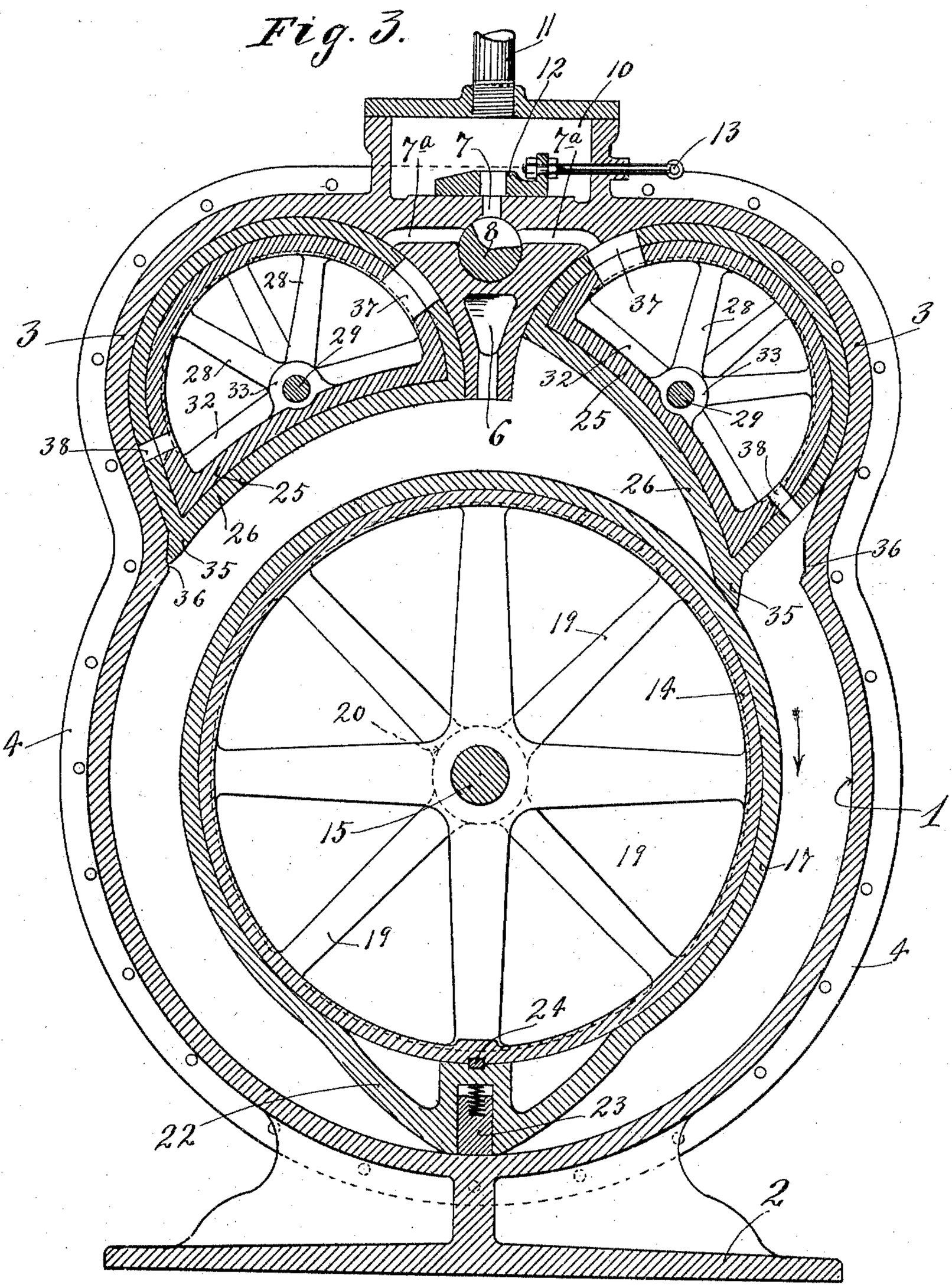
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4.

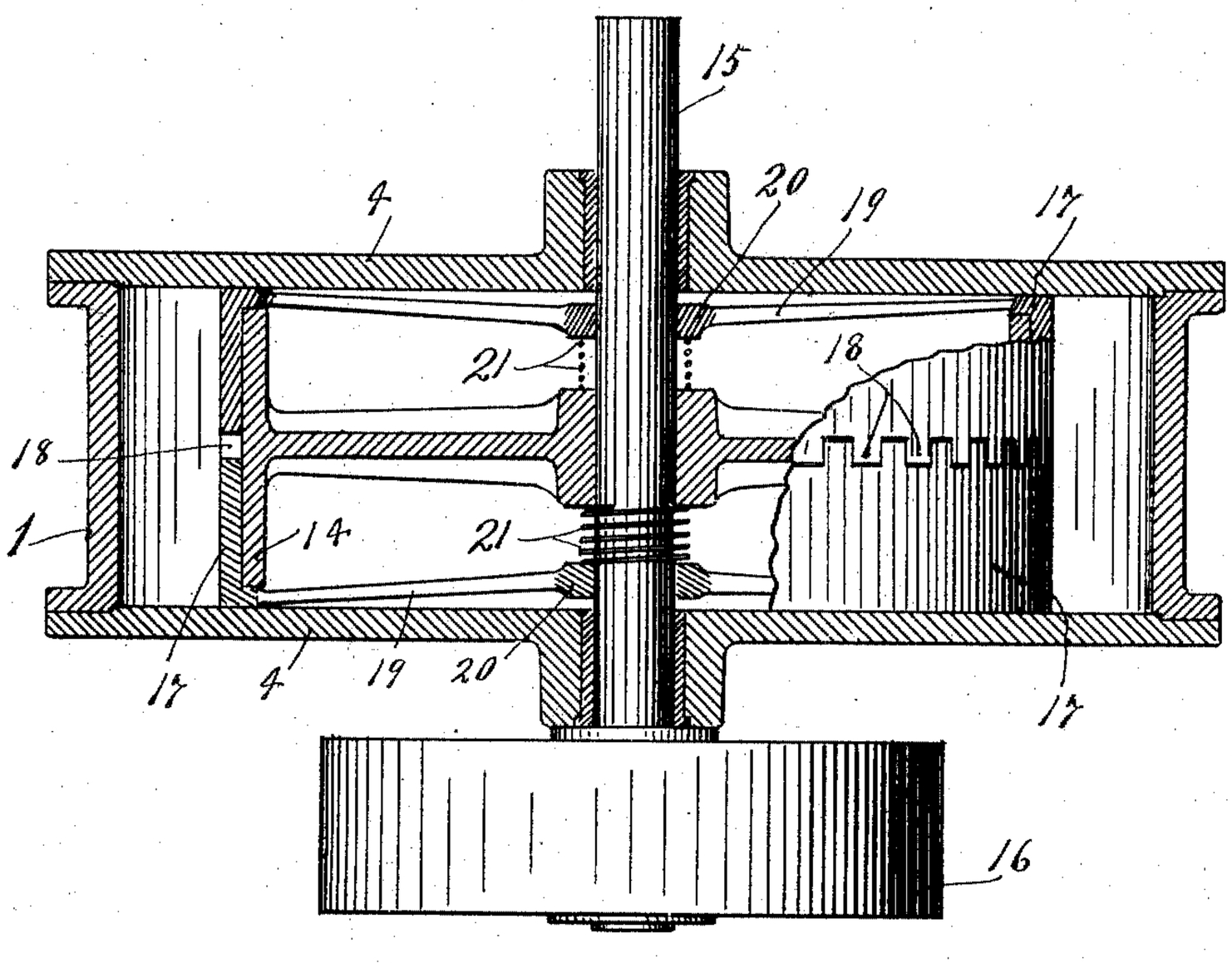
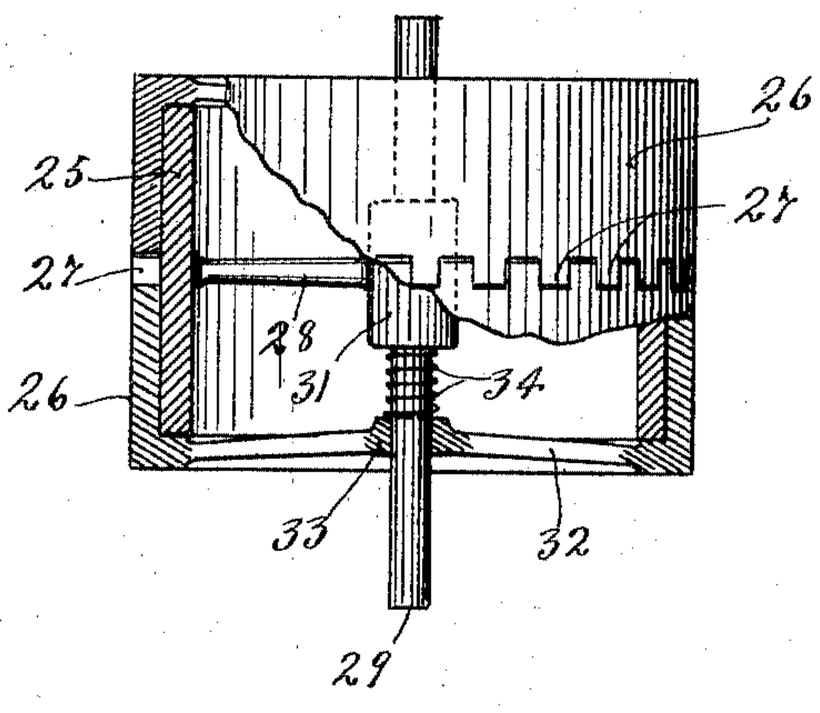


Fig. 5.



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No. 766,912. Patented August 9, 1904.

UNITED STATES PATENT OFFICE.

LEWIS E. STETLER, OF MINNEAPOLIS, MINNESOTA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 766,912, dated August 9, 1904.

Application filed February 1, 1904. Serial No. 191,408. (No model.)

To all whom it may concern:

Be it known that I, LEWIS E. STETLER, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Rotary Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to rotary engines, and has for its object to improve the same in the several particulars hereinafter noted; and to such ends the invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

As is well known, one of the greatest difficulties encountered in the construction of rotary engines has been to provide durable steam-tight joints between the stationary and movable parts of such engines. My invention is directed chiefly to simple, efficient, and durable means for affording steam or air tight joints between these parts of the engine; and it consists in providing the rotating member or piston with incasing sections which form tight joints with the cylinder-heads and with other coöperating parts and which sections have interlapping projections. In the best form of the engine oscillating segmental abutments are provided, and these are equipped with incasing sections quite similar to those provided for the rotary piston.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view in front elevation, showing my improved rotary engine. Fig. 2 is a view in side elevation, showing the said engine. Fig. 3 is a vertical section taken approximately on the line $x^3 x^3$ of Fig. 2. Fig. 4 is a horizontal section taken on the line $x^4 x^4$ of Fig. 1, some parts being left in full; and Fig. 5 is a detail view, partly in plan and partly in horizontal section, showing one of the oscillating abutments removed from working position.

The cylinder-casting 1 is, as shown, cast integral with the base 2 and with segmental abutment-seats 3, and the ends of the said cylinder and abutment-seats are normally closed by detachable heads or plates 4, connected thereto with steam-tight joints, as shown, by means of machine-screws 5. Between the abutment-seats 3 the cylinder-casting is formed with an exhaust-port 6 and with an admission-port 7, which admission-port has branches 7^a, leading one into each abutment-seat. At the junction of the port-branches 7^a with the port 7 is an oscillating reversing-valve 8, the stem of which projects at one end and is provided with a hand-lever 9. The admission-port 7 opens from the steam-chest 10 on the upper portion of the cylinder-casting. A steam-admission pipe 11 leads from a suitable source of supply (not shown) and opens into the steam-chest 10. A distribution-valve 12, having a centrally-located port, coöperates with the admission-port 7 and is mounted to slide on a suitable seat formed at the bottom of the steam-chest. Said distribution-valve 12 has a stem 13, which works outward through one side of the steam-chest and is adapted to be operated with a properly-timed action by any suitable form of valve-gear. (Not shown.) When it is not desired to cut off steam and to cause the engine to run under the expansion of steam, this valve may be dispensed with or it may be left standing as shown in Fig. 3.

Mounted to rotate within the cylinder 1, with its axis concentric to the axis of said cylinder, is a rotary piston 14, made up, as shown, of an annular ring rigidly connected to an engine driving-shaft 15 by radial arms. The said shaft 15 is mounted in suitable bearings formed on the heads or plates 4 and is provided at one of its outer ends with a pulley 16, over which a belt (not shown) may be run to transmit power from the engine. The rim of this rotary piston is incased or covered by two annular peripheral packings or incasing sections 17, which closely fit the same and have interlapping rectangular teeth or lug-like projections 18. These peripheral incasing packings are preferably connected by integrally-cast radial arms 19 with hubs 20, that loosely encircle the shaft 15. Coiled springs 21 on the shaft 15 are compressed be-

tween the hubs 20 and the hub of the piston 14 and yieldingly press the outer edges or bearing-surfaces of the annular incasing packings or sections 17 into close engagement with the inner surfaces of the cylinder heads or plates 4, thus forming steam-tight joints between the said parts and automatically taking up all wear which will occur. The interlapping teeth or projections 18 of the said sections 17 permit the slight separating movement of the said sections 17 necessary to take up wear.

Throughout all but a small portion of their peripheral surfaces the incasing packings 17 are spaced a considerable distance inward from, but extend concentric to, the cylindrical surface of the cylinder 1; but they are provided with outwardly-bulged cam portions 22, that project for contact with the said cylindrical surface and constitute an impelling-surface against which the steam may act to impart a rotary movement to the rotary piston. At its crown or extreme ridge this impelling-surface afforded by cam-like projections 22 is formed with a transverse peripheral seat, in which is mounted a spring-pressed packing-strip 23. This packing-strip 23 extends completely across the said impelling-surface and closely engages at its ends with the cylinder heads or plates 4. As shown, a transversely-extended key 24 holds the incasing sections or packings 17 for rotary movements with the piston 14.

The segmental oscillating abutments 25 are incased by correspondingly-formed packing-sections 26, which sections, like the sections of the piston-incasing packings, are formed with interlapping rectangular teeth or lug-like projections 27. The outer cylindrical surfaces of the incasing packing 26 closely fit the cylindrical surfaces of the abutment-seats 3, and the concave cylindrical surfaces of the said abutment-packings are formed on such lines that when an abutment stands as shown at the left in Fig. 3 said concave surfaces will lie coincident with the cylindrical surface of the cylinder and will, in fact, complete the bearing-surface of the cylinder between those points which are intersected by the cylindrical surface of the abutment-seats. The abutments proper, 25, are, as shown, connected by spokes or radial arms 28 to short shafts 29, loosely mounted in the cylinder-plates 4 and provided at their forwardly-projecting ends with arms 30. The arms 28 converge from a hub 31. (Best shown in Fig. 5.) The abutment-incasing packings 26 have, as shown, radial arms or spokes 32, that unite in hubs 33, loosely fitting the respective shafts 29. Coiled springs 34 on the shafts 29 are compressed between the hub 31 and the hubs 33 and yieldingly press the outer edges of the packings or incasing sections 26 against the adjacent inner surfaces of the cylinder-plates 4. The said springs serve to maintain a close engagement between the said packings 26 and the cylinder-plates and automatically take up the play or slack due to wear between the parts.

At their oppositely-projecting angles or extremities the abutment-incasing packings 26 are formed with piston-engaging flanges 35, which when the abutments are thrown into inoperative positions engage with notches 36, formed in the cylinder at its junction with the abutment-seats.

The oscillating abutments and their incasing packings are formed with peripheral steam-ports 37 and 38, which are located so as to operate as presently described. The abutment-arms 30 are connected to the reversing-levers 9 by divided telescoping links 39 40. The sections 39 and 40 are connected by slot-and-pin couplings 41 and are yieldingly held extended by coiled springs 42. The reversing-lever 9 is adapted to be held in either one of two extreme positions by engagement with one or the other of a pair of notches 43, formed in a lock-segment 44, shown as secured on the side of the steam-chest 10.

When it is desired to rotate the rotary piston in the direction indicated by the arrow marked on Fig. 3, the reversing-lever 9 is moved to and secured to the right, as shown in Fig. 1. This position of the reversing-lever carries the left-hand abutment into an inoperative position, moves the right-hand abutment into an operative position, and sets the reversing-valve 8 in position to direct the steam from the steam-chest into the right-hand side of the annular chamber formed within the cylinder outside of the piston. More specifically stated, with the parts set as shown in Fig. 3 the live steam finds an entrance into the cylinder through the admission-port 7, through the cavity of the valve 8, through the right-hand branch port 17ª, through the abutment-port 37, through the interior of the right-hand abutment, and thence into the cylinder through the abutment-port 38.

The steam admitted as above noted causes the piston to rotate in the direction stated, and when the cam-like impelling-surface 22 of said piston comes into engagement with the concave surface of the abutment-packing it forces the said right-hand abutment temporarily into a position corresponding to that shown at the left in Fig. 3, and by such movement of said abutment the said impelling-surface of the piston is permitted to pass. The above movement of the said abutment is permitted by the right-hand spring 42, which yields to permit the outer section of the right-hand link 39 40 to move telescopically into the inner section, the said spring causing the said abutment to again assume its operative position as soon as the said impelling-surface 22 has passed by the bearing-flange 35 of the said abutment.

As is evident, the engine may be reversed

by throwing the reversing-lever 9 into its extreme position toward the left, so as to reverse the relative positions of the two abutments.

It is evident that under either direction of movement the exhaust-port 6 is open to permit the free exhaust of steam or air in advance of the impelling-surface of the piston. It is also evident that when one of the abutments is moved into an inoperative position it cuts off the supply of steam therethrough to the cylinder, and thus operates as a valve as well as an abutment. The packing-strip 23 and the piston-engaging surfaces of the abutment-flanges 35 are advisably made of such dimensions as to overlap at least two of the joints formed by the interlapping lugs 18 and 27, with which they respectively engage. This reduces the possibility of leaking joints.

The engine above described, while comparatively simple and durable, is efficient for the purposes had in view and is quite cheap to build. It is of course capable of modification within the scope of my invention as herein set forth and claimed.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a rotary engine, a rotary piston having its peripheral surface covered or incased by a pair of annular packings provided with interlapping lug-like projections, substantially as described.

2. In a rotary engine, the combination with a cylinder, coöperating abutments, and valve mechanism, of a rotary piston working in said cylinder, and a pair of annular incasing packings covering the peripheral surface of said piston and having interlapping engagement with each other, and means yieldingly pressing the said annular packings in opposite directions against the cylinder-heads, said packings being bulged radially to form inclined surfaces, substantially as described.

3. In a rotary engine, the combination with a cylinder, oscillating abutments and valve mechanism, of a rotary piston working within said cylinder, and annular incasing packings fitting around said piston, having interlapping peripheral lugs or rectangular teeth and having radially-bulged cam portions fitting against the cylinder-surface and affording impelling-surfaces for said piston, and operating as cams on said oscillating abutments, substantially as described.

4. In a rotary engine, the combination with a cylinder, and a rotary piston working therein, of an oscillating abutment coöperating with said piston, and peripheral incasing packings on said abutments, the sections of which packing have interlapping lugs or angular projections, substantially as described.

5. In a rotary engine, the combination with a cylinder and with reversely-acting segmental oscillating abutments, of a rotary piston working within said cylinder, the incasing packing 17 surrounding said piston, said packings having the interlapping lugs 18 and cam-surfaces 22, springs yieldingly pressing said packings in opposite directions against the cylinder-head, and a spring-pressed packing-strip 23 seated in the said cam projection 22, substantially as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS E. STETLER.

Witnesses:

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F. D. MERCHANT.