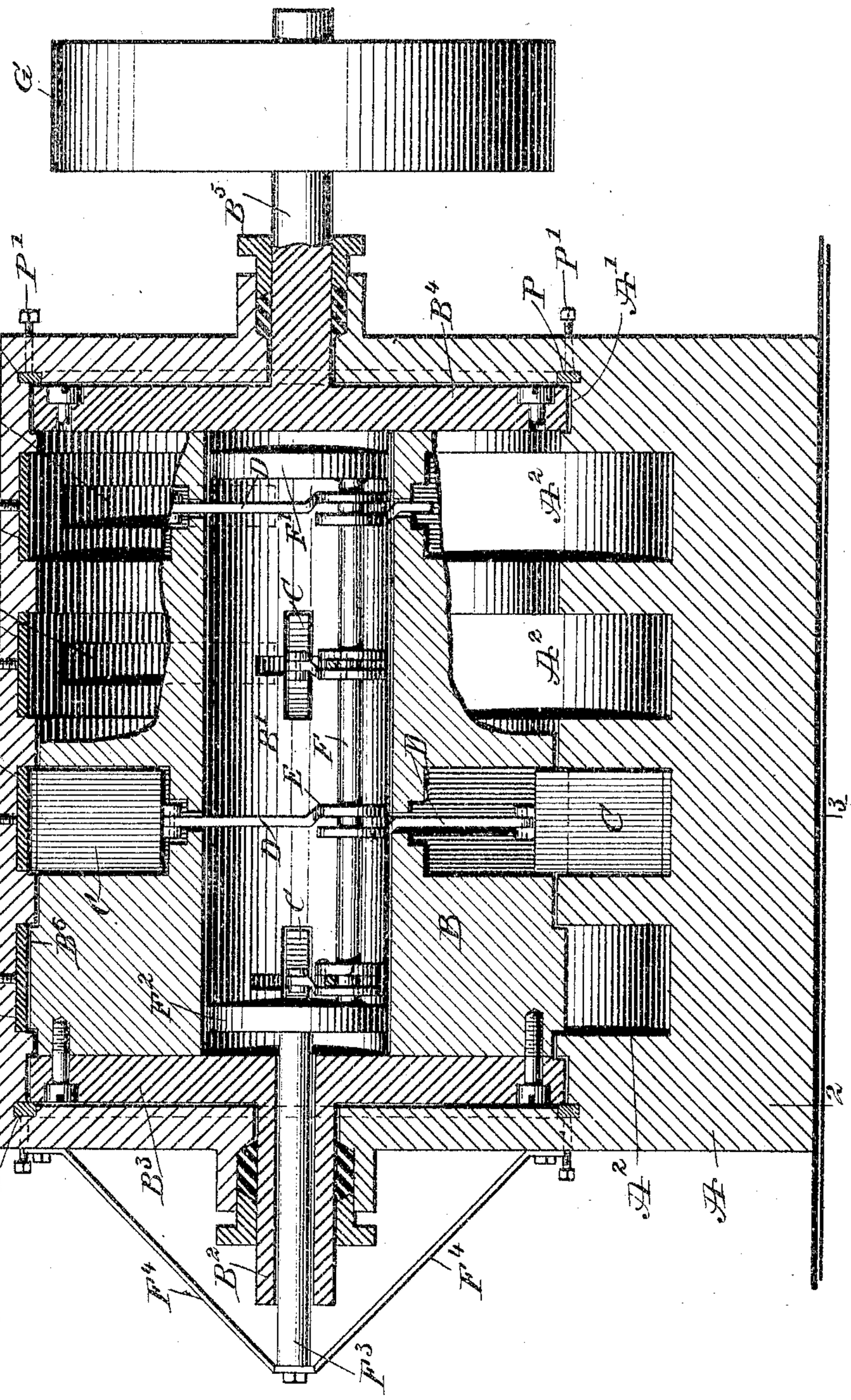
No. 776,431. PATENTED NOV. 29, 1904.

I. SEVERANCE.

ROTARY ENGINE.

APPLICATION FILED DEC. 17, 1903.

NO MODEL. 2 SHEETS—SHEET 1.



WITNESSES:

John A. Bergstrom

Rud. J. Hoos Jr.

INVENTOR

Ira Severance

BY Munn & Co.

ATTORNEYS

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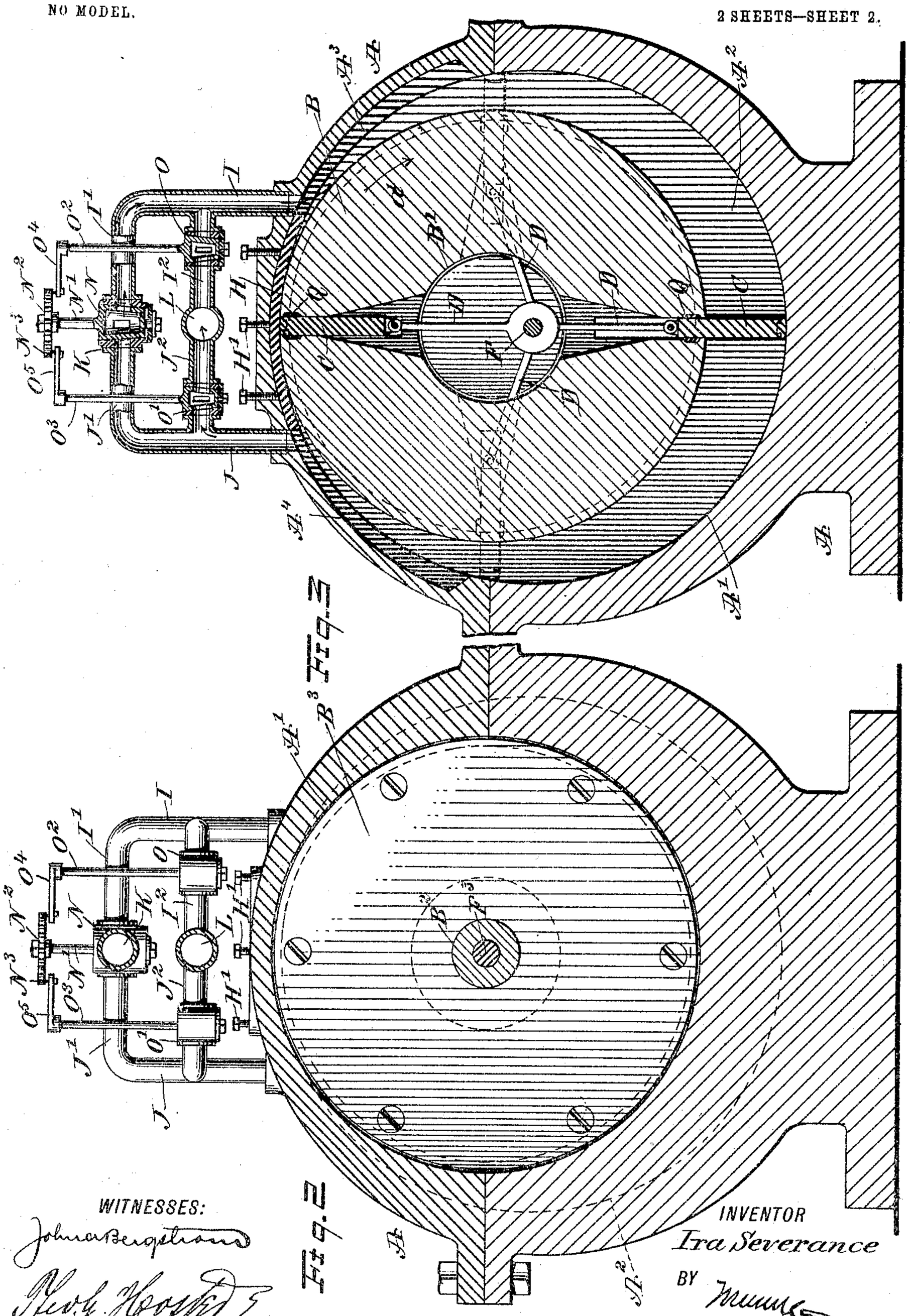

FIG. 2.

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No. 776,431. Patented November 29, 1904.

UNITED STATES PATENT OFFICE.

IRA SEVERANCE, OF MINNEAPOLIS, MINNESOTA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 776,431, dated November 29, 1904.

Application filed December 17, 1903. Serial No. 185,512. (No model.)

To all whom it may concern:

Be it known that I, IRA SEVERANCE, a citizen of the United States, and a resident of Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved rotary engine which is simple and durable in construction, very effective in operation, and arranged to allow convenient reversing to insure a positive working of the valves in unison with the rotary motion of the piston and to provide a continuous action of the motive agent under initial pressure on the piston-heads without the usual cut-off for each revolution of the piston.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a longitudinal sectional elevation of the improvement. Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 1, and Fig. 3 is a similar view of the same on the line 3 3 of Fig. 1.

The cylinder A is preferably made in two parts bolted or otherwise fastened together, and the cylinder is formed with a bore A′ for the piston B to rotate in and with one or more annular working chambers A^2, into and out of which slide the piston-heads C, mounted to slide radially in suitable bearings formed in the piston B. As shown in the drawings, four such working chambers A^2 are provided and spaced from each other, and in each working chamber two piston-heads C are caused to operate, the piston-heads being disposed diametrically; but I do not limit myself to the number of working chambers in a single cylinder nor to the number and arrangement of the piston-heads C in each working chamber, as the same may be varied without deviating from the spirit of my invention.

The piston-heads C for each working chamber A^2 are pivotally connected by a pitman D with a shaft F, held stationary within a longitudinal central recess B′, formed in the piston B, so that when the piston rotates the piston-heads C are caused to slide radially in the piston B in and out of the corresponding working chamber A^2.

The stationary shaft F is secured at its ends on spider-wheels F′ and F^2, fitting loosely in the recess B′, and the spider-wheel F^2 is provided with a central post F^3, extending through a hub B^2, formed on an end plate B^3, bolted or otherwise fastened to one end of the piston B. The outer end of the post F^3 is attached to braces F^4, secured to the cylinder A, so as to hold the post F^3 and the spider-wheel F^2, and consequently the shaft F and spider-wheel F′, stationary for the purpose above mentioned.

The piston B is provided at its right-hand end with an end plate B^4, carrying the main shaft B^5, journaled in suitable bearings carried on the cylinder A. A pulley G is secured on this shaft B^5 for transmitting the rotary motion of the engine to other machinery. The piston B is also provided with annular ridges B^6, projecting slightly into the working chambers A^2, as will be readily understood by reference to the left-hand side of Fig. 1, and the top of each ridge B^6 abuts against the under side of a packing-plate H, held adjustably in the corresponding working chamber by set-screws H′, as will be readily understood by reference to Figs. 1 and 3.

By the arrangement described the piston B at the ridges B^6 and the packings H forms an abutment, and adjacent to the side edges of each packing H are formed channels A^3 and A^4, opening into the working chamber A^2 at opposite sides of the piston, and into the upper ends of the said channels A^3 and A^4 lead pipes I and J, connected by branch pipes I′ and J′ with a steam-supply pipe K, connected with a boiler or other supply and provided with a valve K′ for regulating the amount of steam passing through the pipe K to the pipe I or J, as hereinafter more fully described. The pipes I and J are also connected by branch pipes I^2 and J^2 with a general exhaust-pipe L for carrying off the exhaust-steam.

In order to direct the motive agent into

either of the channels A^3 or A^4, according to the direction in which the piston B is to rotate, I provide at the junction of the branch pipes I′ and J′ with the supply-pipe K a valve N, adapted to connect the supply-pipe K with either of the branch pipes I′ or J′. Each of the valves N is provided on its valve-stem N′ with a sprocket-wheel N^2, and the several sprocket-wheels N^2 are engaged by a sprocket-chain N^3, passing around a sprocket-wheel N^4 held on a shaft N^5, journaled in suitable bearings and carrying a hand-wheel N^6 under the control of the operator. When the latter turns the hand-wheel N^6, a rotary motion is given to the shaft N^5 and the sprocket-wheel N^4 to cause a traveling of the sprocket-chain N^3, so that the several sprocket-wheels N^2 are turned simultaneously and with the same the stems N′ and valves N for the latter to connect the supply-pipe K with either of the branch pipes I′ or J′, according to the direction in which the hand-wheel N^6 is turned. When the valves N are in the position indicated in the drawings, then the supply-pipe K is connected with the branch pipes I′, so that the motive agent passes into the pipes I and by way of the channels A^3 into the working chamber A^2 of the cylinder A. During the time the valves N are in this position the supply-pipe K is cut off to the branch pipes J′.

In the branch pipes I^2 and J^2 are arranged valves O and O′ for connecting or disconnecting the pipes I and J with or from the exhaust-pipe L—that is, the valve O closes the pipe L to the pipe I at the time the valve N connects the supply-pipe K with the branch pipe I′; but during this time the pipe J is connected by the valve O′ and branch pipe J^2 with the exhaust-pipe L.

In order to reverse the valves O and O′ simultaneously with the valves N, the stems O^2 and O^3 of the valves O and O′ are provided with crank-arms O^4 and O^5, connected with the sprocket-wheels N^2, so that when the latter are turned the stems O^2 and O^3 and the valves O and O′ are correspondingly turned—that is, in unison with the valves N. The motive agent passing into the working chamber A^2 by way of the pipe I and channel A^3 acts on the corresponding piston-head C, so as to impart a rotary motion to the piston B to rotate the latter in the direction of the arrow *a′*. The channels A^3 and A^4 are of such a length that when one piston-head C in a working chamber A^2 has passed the lower end of the channel A^3 then the other piston-head C is about to open the channel A^4 at the lower end to allow the steam in the rear of this piston-head C to escape from the working chamber A^2 by way of the channel A^4 and the pipes J, J^2, and L.

By the arrangement described it will be seen that the motive agent, such as steam, will act on a piston-head C during the major portion of one revolution of the piston under initial boiler-pressure to insure a powerful action of the engine. Thus from the foregoing it will be seen that a continuous action of the motive agent under initial boiler-pressure on the piston-heads is had without requiring the usual cut-off valves for each revolution of the piston.

It will further be seen that by connecting the piston-heads C with the stationary shaft F a positive sliding motion is given to the piston-heads in unison with the rotation of the piston B, so that the outer ends of the said piston-heads are always in firm contact with the inner peripheral surfaces of the working chambers A^2 for the steam to act on the piston-heads in the manner above described.

When it is desired to reverse the engine, it is only necessary for the operator to turn the hand-wheel N^6 to reverse the several valves N, O, and O′, so that the motive agent now passes from the supply-pipe K by way of the branch pipes J′, pipes J, and channel A^4 into the working chamber A^2 at the opposite side of the piston B, so that the motive agent in acting on the piston-heads C turns the piston B in the inverse direction of the arrow *a′*. The exhaust motive agent in the rear of the piston-heads C passes out of the working chambers A^2 by way of the channel A^3, pipes I, branch pipes I^2, and exhaust-pipe L. If desired, the valved branch pipes I^2 J^2 may be directly connected with the channels A^3 A^4 instead of by way of the pipes I and J.

In order to render the engine steam-tight, suitable packings are employed wherever necessary—for instance, packing-rings P are used between the cylinder-heads and the end plates B^3 and B^4 of the piston, and the said packing-rings are adjustable by suitable set-screws P′, as indicated in Fig. 1. Packings Q are also placed in the bearings for the piston-heads C in the piston B (see Fig. 3) to prevent leakage of steam past the piston-heads into the central recess B′, the latter being preferably filled with a suitable lubricant to insure an easy running of the engine. Packings are also provided for at the outer ends of the piston-heads C, so as to prevent leakage of steam from one side of the piston-head to the other in the working chamber A^2.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A rotary engine comprising a cylinder having on its inner surface a plurality of eccentric grooves forming working chambers, each groove or chamber being provided with inlet and exhaust channels, connected with the supply and exhaust of the motive agent, a piston of a diameter to fit the bore of the cylinder and mounted to turn therein, said piston having a central longitudinal recess, and radial openings, a plurality of piston-heads sliding in the radial openings of the piston

and in and out of each of the said grooves or chambers, stationary means within the said piston-recess, and devices for connecting the said stationary means with the said piston-heads, to impart a positive motion to the piston-heads on the rotation of the piston, as set forth.

2. A rotary engine comprising a cylinder having an eccentric working chamber provided with inlet and exhaust channels, connected with the supply and exhaust of the motive agent, a piston mounted to turn in the cylinder and having a central recess, piston-heads sliding in the piston and in and out of the said working chamber, stationary means within the said piston-recess, consisting of a shaft, spider-wheels carrying the shaft, a post on one of the spider-wheels and extending to the outside of the piston and cylinder and braces for attaching the post to the cylinder, and devices for connecting the said stationary means with the said piston-heads, to impart a positive motion to the piston-heads on the rotation of the piston, as set forth.

3. A rotary engine comprising a cylinder having on its inner surface a plurality of eccentric grooves forming working chambers, each groove or chamber being provided with an inlet and an exhaust, a piston of a diameter to fit the bore of the cylinder and mounted to turn in the same, said piston being in contact at one point with the said grooves or working chambers to form an abutment between the inlet and exhaust of each of said grooves or chambers, piston-heads slidable in the said piston and in and out of each of the said working chambers, a shaft held stationary in a central recess in the piston, and pitmen connecting the piston-heads with the said shaft, as set forth.

4. A rotary engine comprising a cylinder having on its inner surface a plurality of eccentric grooves forming working chambers, each groove or chamber being provided with an inlet and an exhaust, a piston of a diameter to fit the bore of the cylinder and mounted to turn in the same, said piston forming an abutment between the inlet and the exhaust of each groove or chamber, the piston having a central longitudinal recess and radial openings, a plurality of diametrical piston-heads mounted to slide radially in the radial openings of the said piston and in and out of each of the said grooves or chambers, a shaft held eccentrically in the said piston-recess, spider-wheels carrying the said shaft, a post on one of the spider-wheels and extending loosely through the piston to the outside of the cylinder, means for holding the post in a fixed position, and pitmen connecting the said piston-heads with the said shaft, as set forth.

5. A rotary engine comprising a cylinder having a plurality of working chambers, each provided with inlet and exhaust channels, a piston mounted to turn in the cylinder and provided with annular ridges projecting into the working chambers, inlet and exhaust pipes connected with the said channels and provided with reversing-valves under the control of the operator, diametrical piston-heads mounted to slide radially in the said piston and in and out of each of the said working chambers, stationary means within a central recess in the piston, and a connection between the stationary means and each piston-head, to cause the latter to slide on rotation of the piston, as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

IRA SEVERANCE.

Witnesses:
CHARLES L. SAWYER,
J. L. NOTT.