(No Model.) 2 Sheets—Sheet 1.

E. E. THOMAS.

ROTARY STEAM ENGINE.

No. 370,105. Patented Sept. 20, 1887.

Fig. 1.

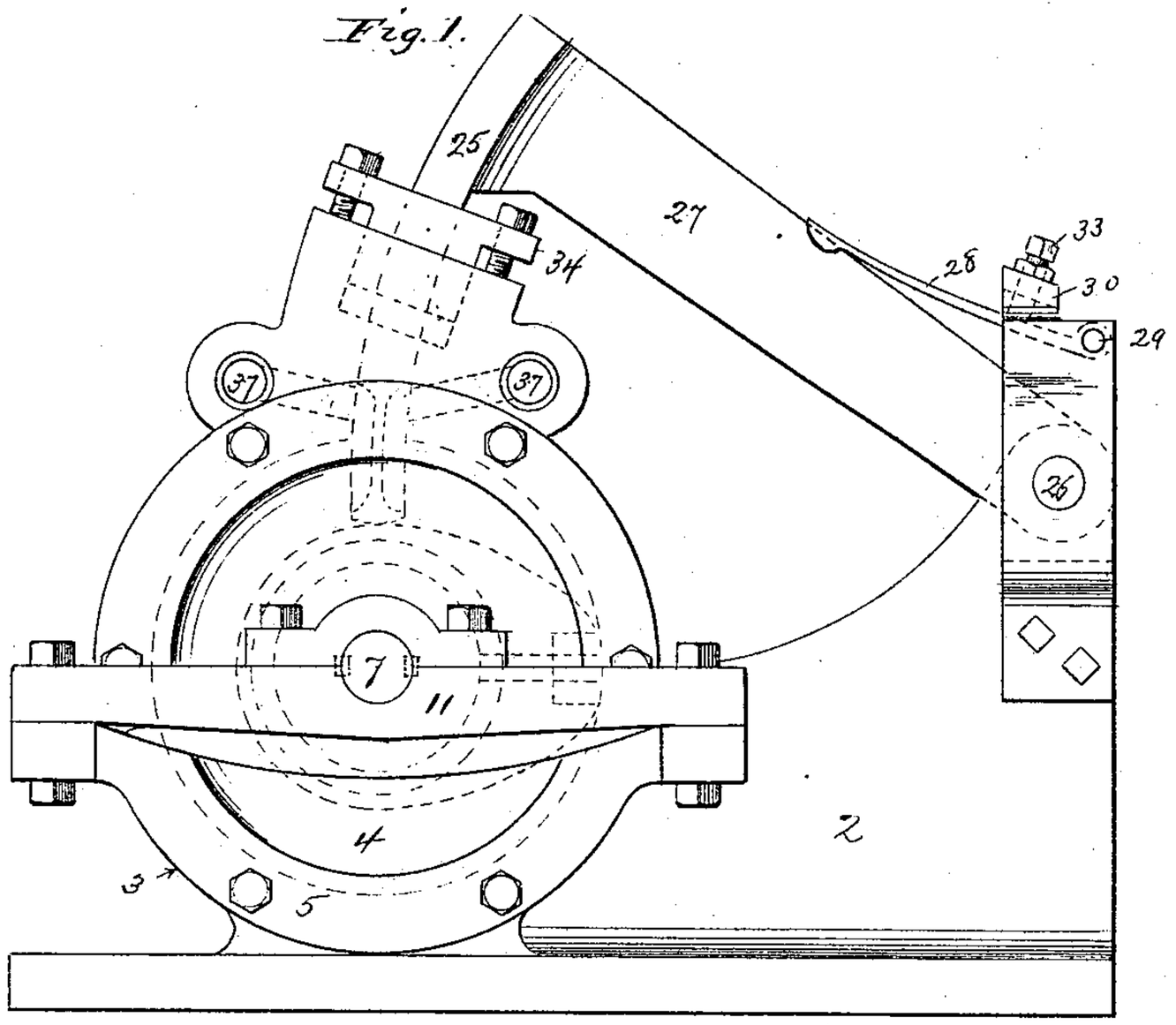
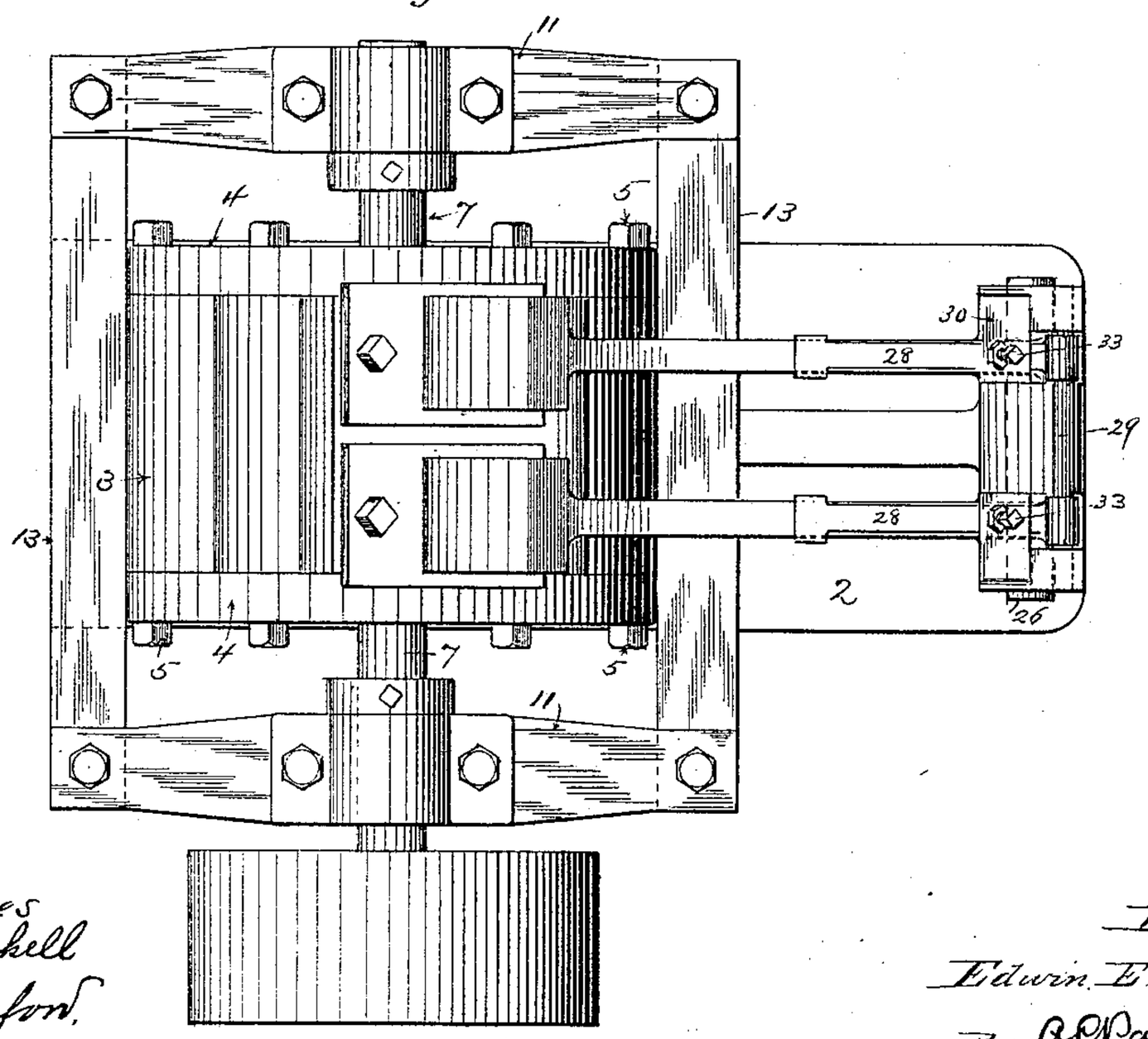


Fig. 2.



Witnesses
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R. H. Sanford.

Inventor
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(No Model.) 2 Sheets—Sheet 2.

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ROTARY STEAM ENGINE.

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Fig 3

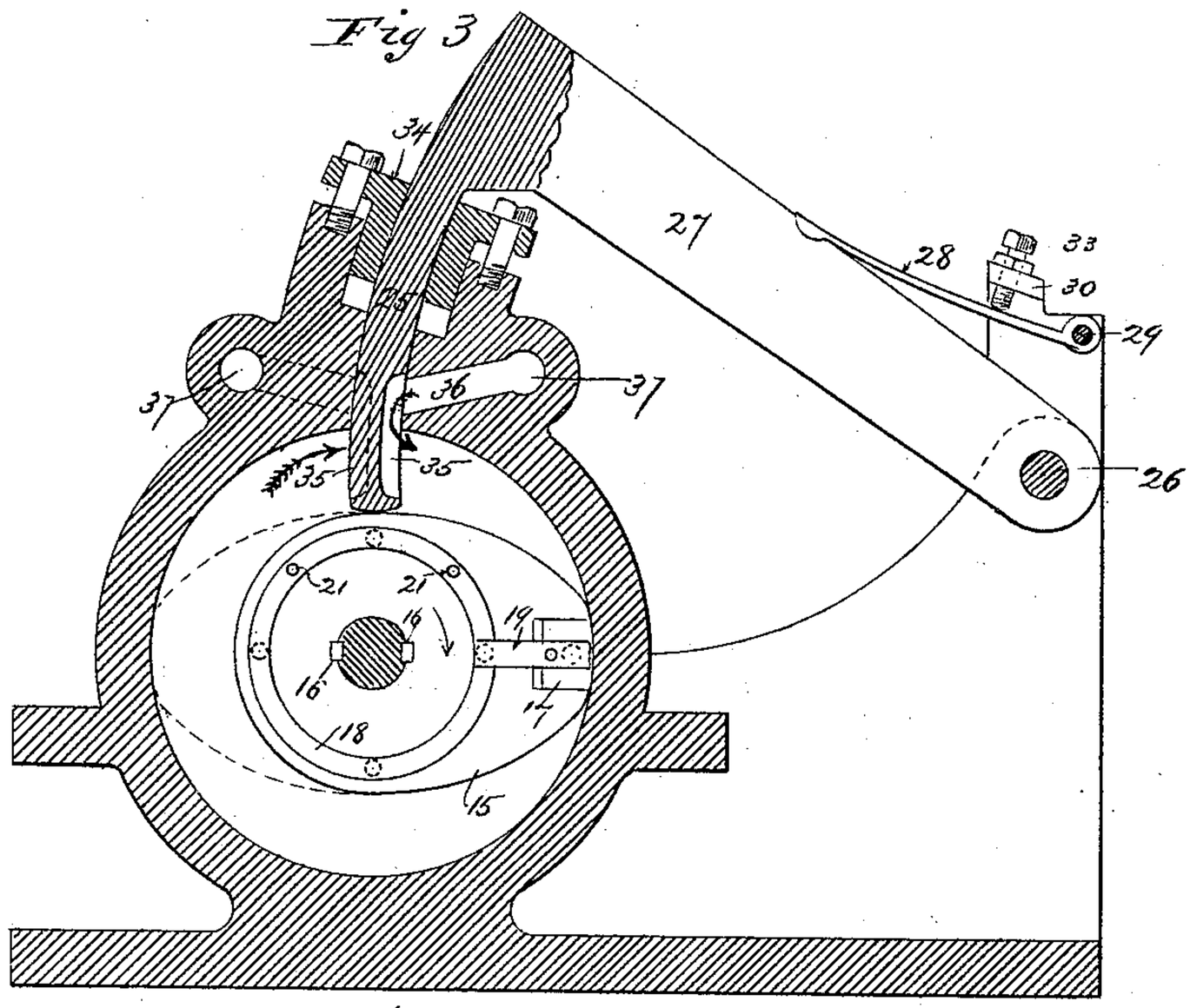


Fig. 4.

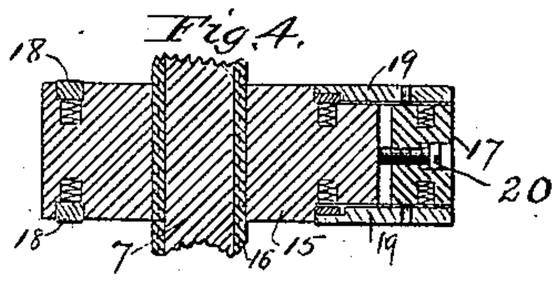


Fig. 5.

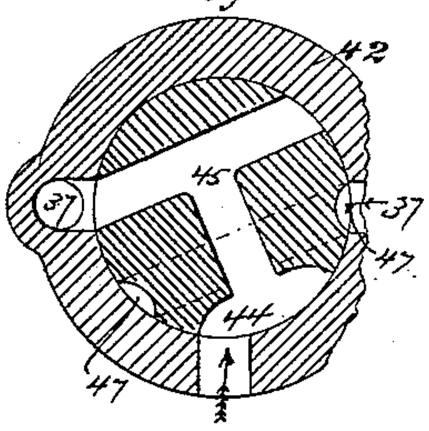


Fig 6

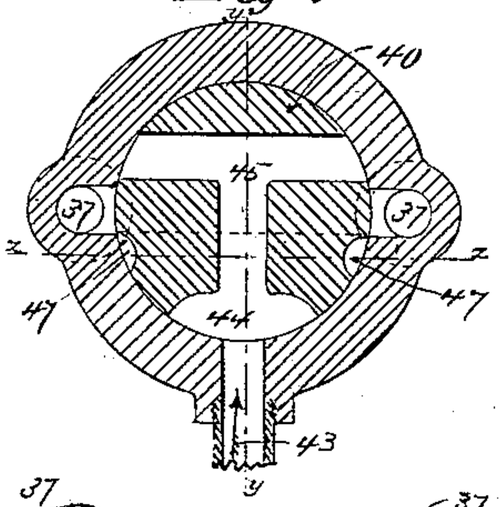


Fig 7

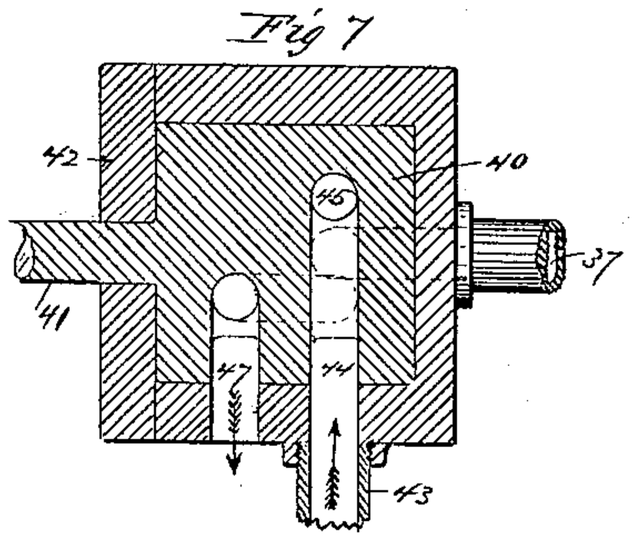


Fig. 8.

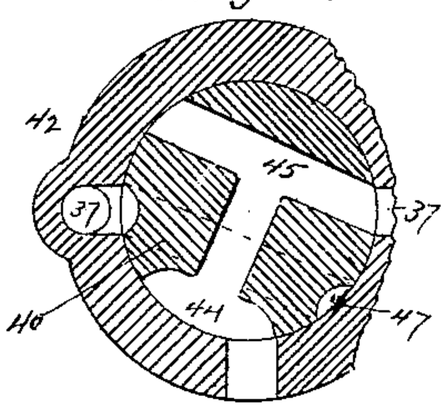


Fig 9

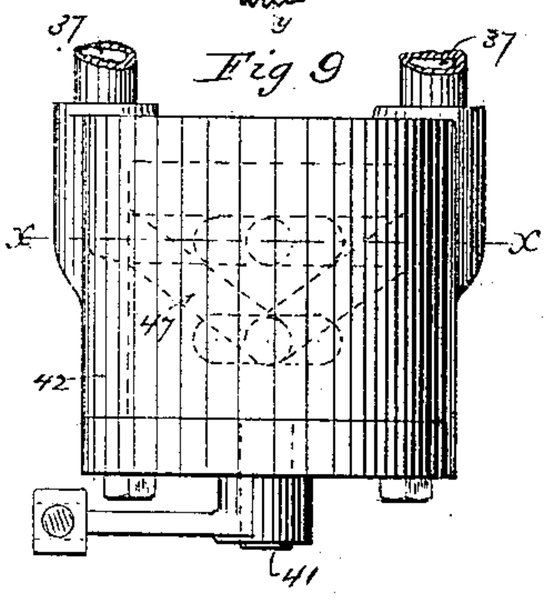
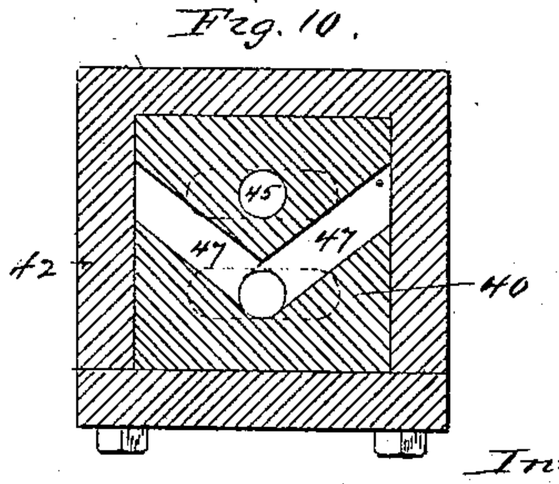


Fig. 10.



Witnesses
A. M. Gaskell
R. H. Sanford

Inventor.
Edwin E Thomas
By R. P. Paul Atty.

UNITED STATES PATENT OFFICE.

EDWIN E. THOMAS, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF ONE-HALF TO JOHN H. PUTNAM, OF SAME PLACE.

ROTARY STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 370,105, dated September 20, 1887.

Application filed February 19, 1887. Serial No. 228,191. (No model.)

To all whom it may concern:

Be it known that I, EDWIN E. THOMAS, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Rotary Steam-Engines, of which the following is a specification.

This invention relates to improvements in the construction of that class of steam-engines that are usually known as "rotary" engines. These engines, as usually constructed, consist of a cylinder through which a shaft passes, having thereon a piston that extends at one side of the shaft to the wall of the cylinder and a sliding abutment between which and the cylinder the steam is admitted. The pressure of the steam in this space moves the piston, and with it the shaft, causing it to rotate in the cylinder. One objection to this construction is that the pressure of the steam against one face of the sliding abutment causes its opposite face to be pressed against the wall of the recess in which it moves, thereby creating considerable friction and requiring considerable power to move the abutment.

One object of my invention is to overcome this objection, which I do by providing an abutment that is rigidly secured to a pivoted arm, which holds it against the pressure of the steam and causes it to have a positive movement in the arc of a circle.

Another object of my invention is to provide a construction that will permit the heads of the cylinder to be readily detached and the pistons to be drawn off from the shaft for the purpose of repacking them.

Another object of my invention is to provide an improved packing for the pistons.

Another object of my invention is to provide the engine with a valve of improved construction.

These objects I attain by means of the construction hereinafter described, and illustrated in the accompanying drawings, which form a part of this specification, in which—

Figure 1 is a side elevation of my improved engine. Fig. 2 is a plan. Fig. 3 is a sectional side elevation, showing the interior of the cylinder and the piston and abutment. Fig. 4 is a detail section of the piston. Fig. 5 is a section of the steam-valve in position to admit steam for the forward motion. Fig. 6 is a section on line X X of Fig. 9. Fig. 7 is a section on line Y Y of Fig. 6. Fig. 8 is a section similar to Fig. 5, showing the valve in position to admit steam for the backward motion. Fig. 9 is a plan view of the valve. Fig. 10 is a section on line Z Z of Fig. 6.

The engine is provided with a suitable bed-frame, 2, which supports the cylinder 3. This cylinder may be of any suitable size, and it is preferably divided into two compartments by a central partition. The cylinder is also provided at each end with a head, 4, that is secured thereto by bolts 5. The piston-shaft 7 passes through the center of the cylinder and is mounted in boxes formed upon the cross-heads 11. These cross-heads are bolted to supports 13, that extend lengthwise of the cylinder, at each side thereof, and are in turn supported by the bed-frame. A separate piston, 15, is provided in each compartment of the cylinder, and these pistons are secured to the shaft so that they extend therefrom at its opposite sides, as shown by dotted lines in Fig. 3. The shaft is provided upon opposite sides with a spline or feather, 16, and the piston with corresponding grooves. These splines prevent the piston from turning on the shaft, but permit it to be moved longitudinally thereon for the purpose of putting it on or taking it off the shaft. The piston projects from one side of the shaft and extends to the wall of the cylinder. The piston is provided at its end with a packing, 17, and on each side with a ring-packing, 18, and with a packing, 19, that extends from the ring-packing to the end of the packing 17. The packing 17 is provided with a screw, 20, which is tapped through it and bears against the piston for the purpose of setting out the said arrangement. The ring-packings 18 are held in place by dowel-pins 21, and are pressed outward against the heads of the cylinder by springs 22, that are seated in recesses under the rings and press against their under surfaces.

The thickness of the piston is substantially equal to the width of the space in the cylinder between its head and the central partition, and the packing-rings 18 and strips 19 are in-

serted to substantially their full thickness into recesses in the piston.

The packing-strip 19 is held at one end by a dowel-pin, 23, to the end of the packing 17, and is also pressed outward by a spring, 24, seated beneath it. The other end of this strip 19 is provided with a shoulder, which laps into a shouldered recess in the ring 18. This construction enables me to remove the piston from the shaft and adjust the packing 17 without breaking the continuity of the packing on the sides of the piston, as the packing 19 moves with the packing 17, while its end moves in the recess in the ring 18.

The movable abutment 25 is secured rigidly to an arm, 27, that is mounted upon a pivot, 26, upon the bed-frame. The abutment is in the form of a segment of a circle that is struck from the center of the pivot 26, and the opening through the wall of the cylinder is formed upon a similar curve, so that the abutment has a swinging movement into and out of the cylinder. The end of the abutment rests upon the piston, and as the piston rotates the abutment moves into and out of the cylinder, being pressed in by a spring, 28, that bears on the arm 27, and being pressed out by the movement of the piston. The spring 28 is secured to a stud, 29, and passes under a lug, 30, that is provided with an adjusting-screw, 33, by which the tension of the spring may be regulated. The abutment passes through a suitable stuffing-box, 34, and is provided upon its opposite faces with the steamways 35. Steam-ports 36 connect with steam-pipes 37 and extend into the passage through which the curved abutment passes. When the abutment is out the extent of its movement, the passage is closed by the inner end of the abutment, which completely fills it. When the end of the abutment is projected into the cylinder, a steam-passage is formed from each of the steam-ports into the cylinder through the grooves in the faces of the abutment.

The operation will be readily understood. Let it be supposed that the parts are in the position shown in Fig. 3 and that steam is entering through the right-hand port into the space between that side of the abutment and the piston. It will then force the piston to move in the direction of the arrow, while the steam on the other side of the piston will exhaust through the other port. To reverse the engine, steam is admitted through the other port and exhausts through the first, the operation being similar in both cases.

It will be seen that with this construction the pressure of the steam upon the abutment cannot affect its free and easy movement. By using a double cylinder and setting the pistons directly opposite each other one piston will always be one-half a revolution ahead of the other, and when one piston is passing the abutment and receiving no steam-pressure the other will be at the half-revolution and will be receiving the full pressure of the steam.

The steam-valve by means of which the engine may be reversed consists of a cylinder, 40, that is mounted upon an axis, 41, in a cylindrical steam-chest, 42. To this chest, at diametrically-opposite sides, the steam-pipes 37 of the engine are connected. The steam-supply pipe 43 is connected with the chest midway between the two pipes 37, but in the same plane therewith. The cylindrical valve 40 may be turned upon its axis by any suitable means applied to the stem 41. The valve has a T-shaped port, 45, extending through it in the plane of the three pipes 43 and 37. The main portion of this port has an enlargement, 44, at its end, as shown in Figs. 5 and 6, and the cross-passage with which the main passage connects is on the other side of the center of the valve from the enlarged end of the main passage, as shown in Fig. 6. When the valve is in the position shown in Fig. 6, the steam-port 45 does not communicate with either of the pipes 37. The main part of the port is then directly in line with the intake-pipe 43.

By moving the valve about a sixteenth of a revolution in either direction the cross-passage of the port 45 communicates with one of the pipes 37, while the pipe 43 still communicates with the enlarged part 44 of the port. Turning the valve an eighth of a revolution in the opposite direction carries the port 45 into communication with the other steam-pipe 37. When the valve is in a position half-way between these two, as indicated in Fig. 6, the steam is cut off from both steam-pipes 37 and from the engine-cylinder. The exhaust-port consists of a V-shaped passage, 47, whose ends extend to the periphery of the cylindrical valve on the opposite side of the center from the cross-passage of the steam-port and have a corresponding relation to the steam-pipes 37, so that when the steam-port communicates with one of the steam-pipes one of the passages of the exhaust-port communicates with the other. Both passages of the exhaust-port communicate with a passage, 49, that leads out through an opening in the wall of the cylindrical steam-chest. This valve, it will be seen, is very simple in construction and easily operated, either to shut off the steam or to direct it into either port of the rotary engine. The engine may therefore be very easily reversed by merely giving a slight turn to the valve, and all complicated devices for accomplishing this result may be dispensed with.

I claim as my invention—

1. The combination, in a rotary engine, with the cylinder provided with the stuffing-box 34, of the arm 27, arranged outside of said cylinder and pivoted to a suitable support, the curved abutment 25, secured to said arm 27 and extending through said stuffing-box into said cylinder and provided upon the opposite faces with the steam-ports 35, the steam-pipes 37, and the steam-ports 36, communicating with said pipes 37 and with said ports 35 and the piston 15, all substantially as described.

2. The combination, in a rotary engine, with the cylinder and piston, of the pivoted arm 27, the curved abutment 25, secured to said arm and having the steam-passages 35 in its opposite faces, the steam-pipes 37, and the steam-ports 36, communicating with said steam-passages 35, all substantially as described.

3. The combination, in a rotary engine, of the cylinder, the removable heads thereon, the removable cross-heads 11, the piston-shaft journaled on said cross-heads and having the splines 16, and the piston 15, secured upon said shaft by said splines and free to slide longitudinally thereon, arranged and operating substantially as described.

4. The combination, in a rotary engine, with the piston 15, of the ring-packing 18 on the side of the piston, the adjustable packing 17 on the end of the piston, and the packing 19, doweled to said packing 17 and movable therewith, arranged substantially as described.

5. The combination, in a rotary engine, with the steam-pipes 37, of the cylindrical steam-chest 42, connected with said pipes, the cylindrical valve arranged in said cylinder and having the T-shaped port 45, and the V-shaped exhaust-port 47, arranged and operating substantially as described.

In testimony whereof I have hereunto set my hand this 16th day of February, 1887.

EDWIN E. THOMAS.

In presence of—

A. M. GASKELL,

A. C. PAUL.