

No. 706,485.

Patented Aug. 5, 1902.

G. E. WOODARD.
ROTARY ENGINE.

(Application filed Oct. 24, 1901.)

(No Model.)

3 Sheets—Sheet 1.

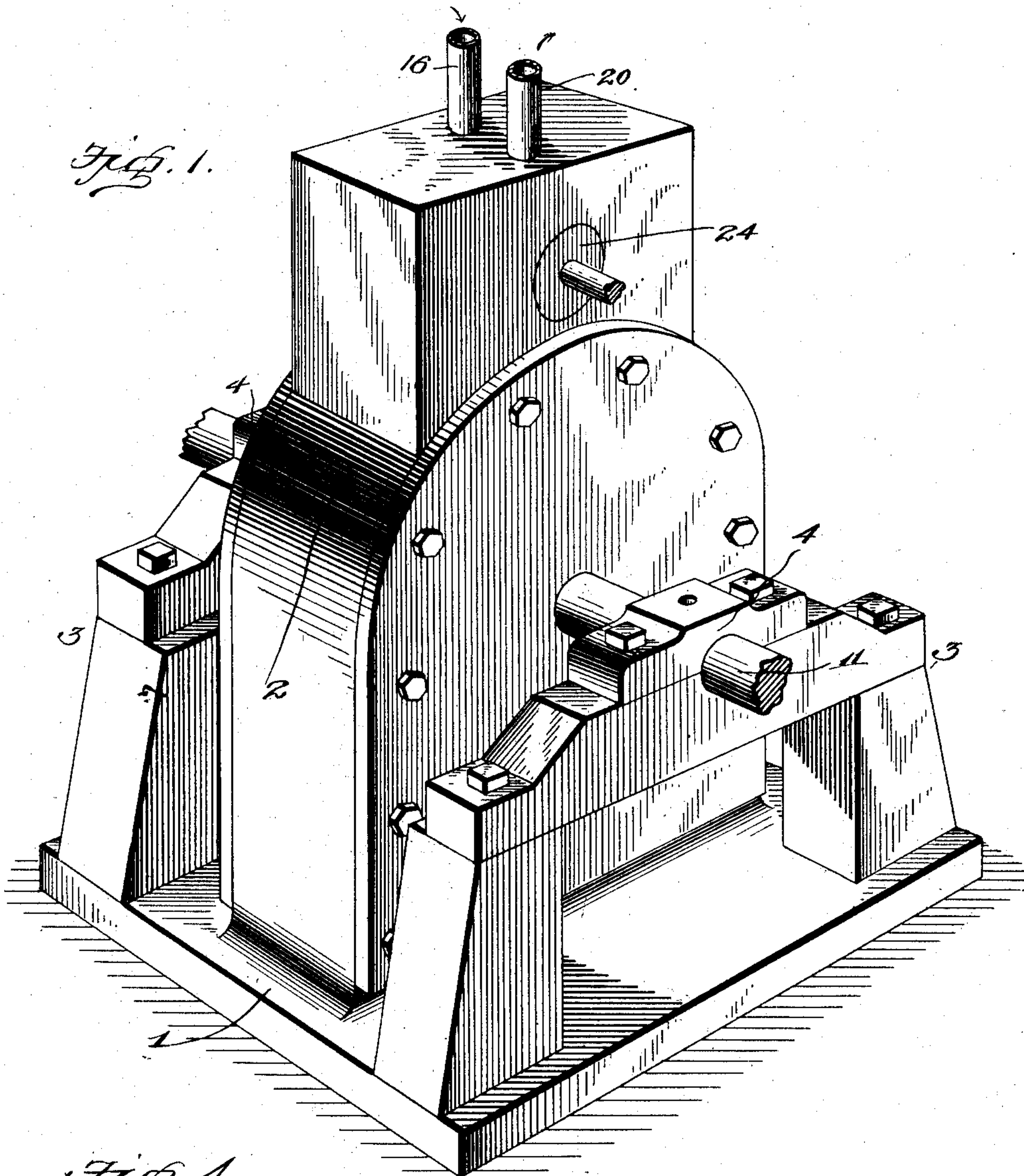
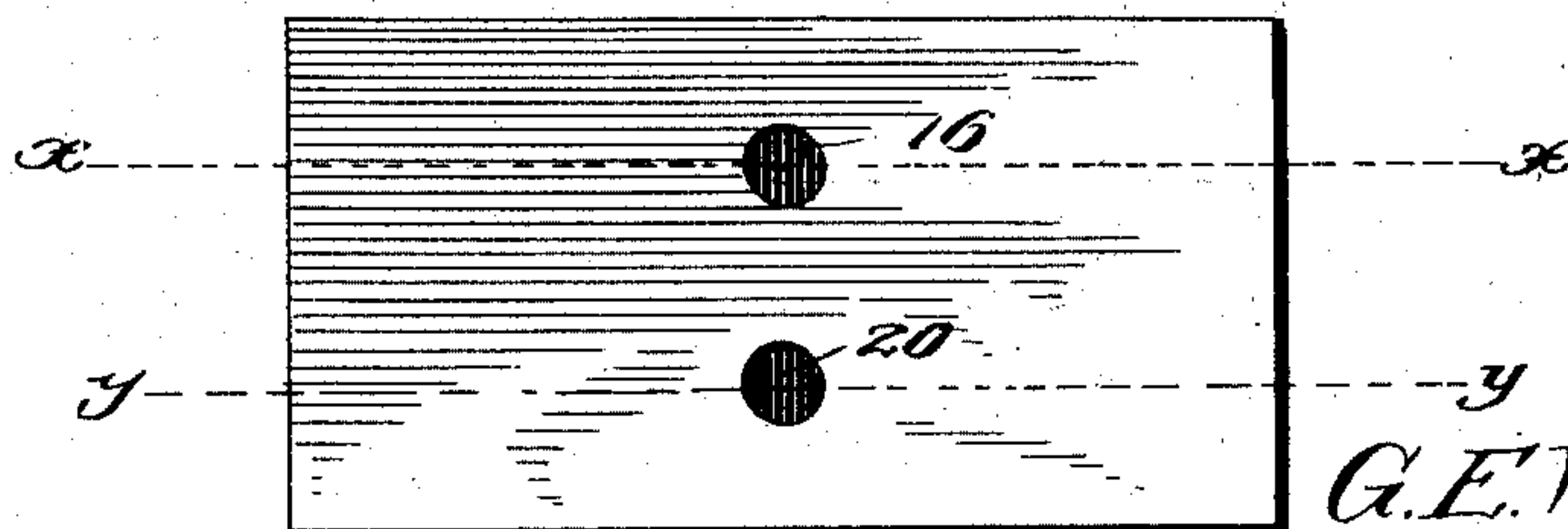


Fig. 4.



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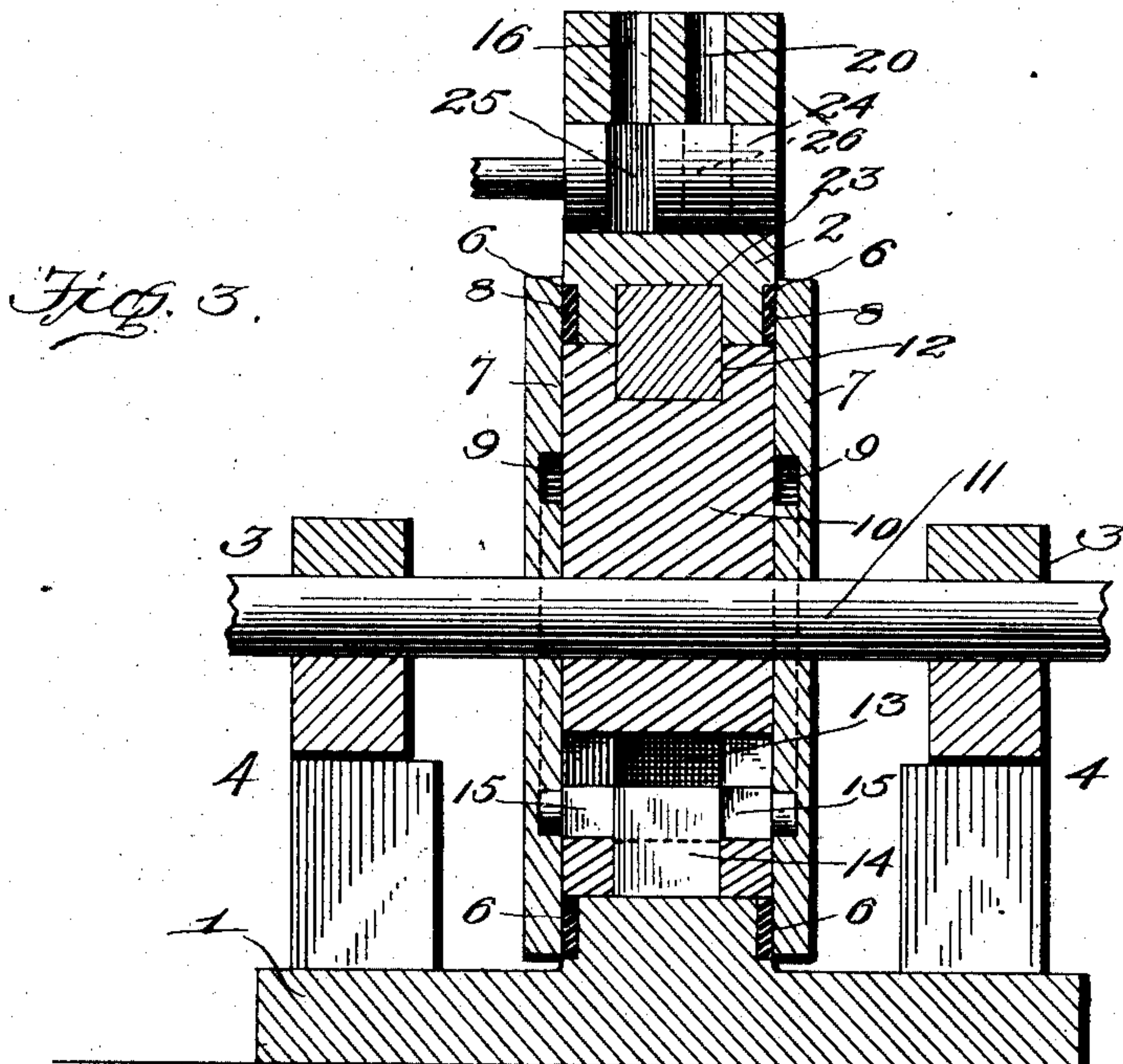
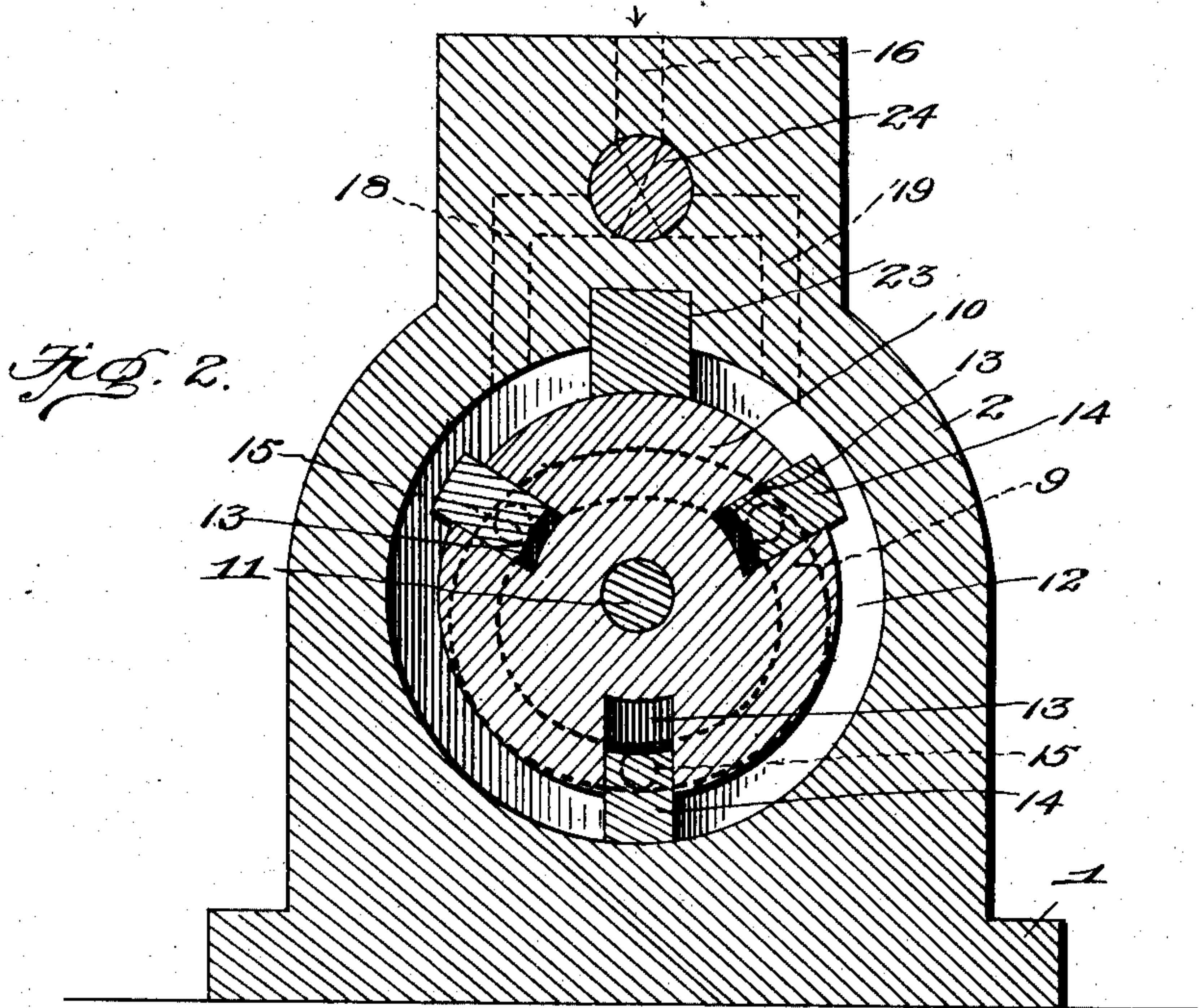
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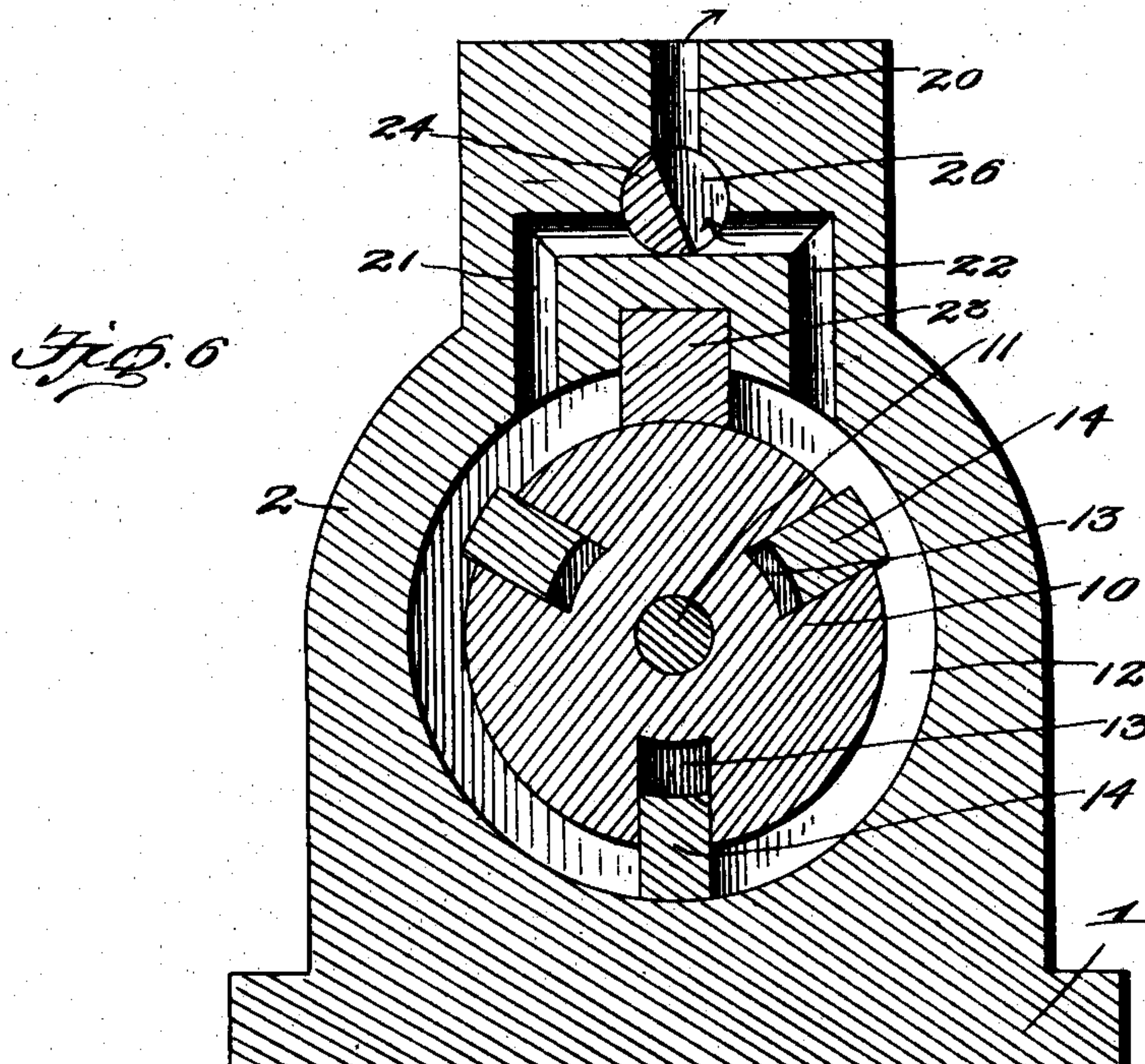
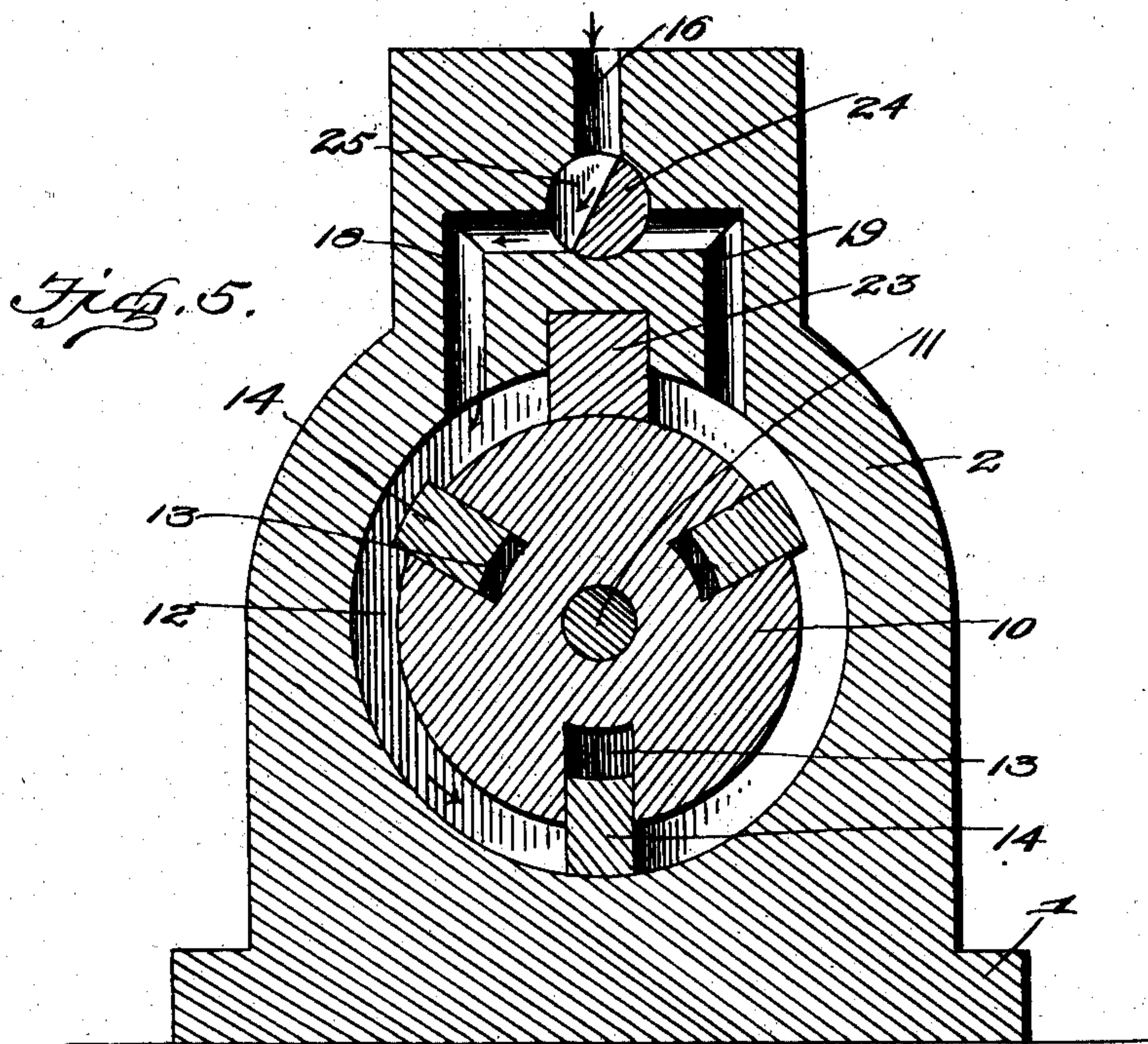
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

GEORGE E. WOODARD, OF BRADFORD, PENNSYLVANIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 706,485, dated August 5, 1902.

Application filed October 24, 1901. Serial No. 79,845. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. WOODARD, a citizen of the United States, residing at Bradford, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Reversible Rotary Steam-Engines; and I do 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.

The invention relates to reversible rotary steam-engines of the "concentric-impact" type.

The object of the invention is to provide an engine of this character which shall be simple of construction, durable in use, comparatively inexpensive of production, and efficient in action.

With this and other objects in view the invention consists of certain novel features of construction, combination, and arrangement of parts, which will be hereinafter more fully described, and particularly pointed out in the appended claim.

In the accompanying drawings, Figure 1 is a perspective view of my improved rotary engine. Fig. 2 is a vertical sectional view. Fig. 3 is a similar view at right angles to Fig. 2. Fig. 4 is a top plan view of the valve-casing. Fig. 5 is a longitudinal sectional view on line *x x*, and Fig. 6 is a longitudinal sectional view on line *y y*.

Referring to the drawings, 1 denotes the base of the engine; 2, the cylinder; 3, the pillow-blocks, and 4 the shaft-bearings. The cylinder is provided at its ends with packing-recesses 6 and has secured to said ends the heads 7, between which and the base-walls of the recesses are placed packing-strips 8. The heads 7 are provided on their inner faces with cam-grooves 9.

10 denotes a piston mounted to rotate within the cylinder and fixed to a shaft 11, journaled in the bearings 4. This piston is provided with an annular groove 12, intersected by radial slots 13, which open through the ends of the piston. Placed within these slots are wings 14, provided with trunnions 15 at their ends, which project through the ends of the slots and engage the cam-grooves of the cylinder-heads, whereby the wings are reciprocated within their recesses at proper intervals during the rotation of the piston within the cylinder.

The valve-casing is provided with a steam-inlet 16 and with two ducts 18 and 19, leading therefrom into the interior of the cylinder at opposite points of a vertical line drawn through said cylinder. The valve-casing is also provided with exhaust-ports 20 and also with exhaust-ducts 21 and 22, which lead into the cylinder at opposite points of a vertical line drawn therethrough.

23 denotes an abutment arranged on opposite sides of the ducts 19 and 22 and 18 and 21. 24 denotes a valve-plug provided in its periphery with recesses 25 and 26, the former being designed to control the admission of steam into the cylinder at either side of the abutment, so as to reverse the direction of rotation of the piston, and the latter being designed to control the exhaust through the ducts 21 and 22, it being understood that when the piston is rotating in the direction shown by the arrow in Fig. 2 the steam is being supplied through the duct 18 and the exhaust is taking place through the duct 22 and when rotating in the opposite direction the steam is supplied through the duct 19 and is exhausting through the duct 21.

In operation, steam being supplied to rotate the piston, as said piston rotates the trunnions or studs projecting from the ends of the wings into the cam-grooves in the cylinder-head will reciprocate said wings, so that as the wings reach the abutment they will be withdrawn into their slots, so as to permit of their passing the abutment, and after passing the abutment they will be projected radially into contact with the inner wall of the cylinder, so as to offer resistance to the steam, and thus drive the piston. By shifting the valve so as to supply steam to the opposite duct the piston will be driven in a reverse direction.

From the foregoing description, taken in connection with the accompanying drawings, the construction, mode of operation, and advantages of my invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and details of construction may be made with-

in the scope of the invention without departing from the spirit or sacrificing any of the advantages thereof.

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

In a rotary steam-engine, the combination with a cylinder provided with grooves in its ends, of heads secured to said cylinder, packing-strips located in said grooves and forming a steam-tight joint between the cylinder and the heads, cam-grooves located in the inner sides of the heads of the cylinder, an abutment-head located within said cylinder, a valve-casing provided with a steam-inlet having two ducts leading therefrom into the cylinder at opposite points of a vertical line drawn through said cylinder, said casing being also provided with exhaust-ports and with exhaust-ducts which lead into the cylinder at opposite points of a vertical line drawn therethrough, a valve-plug provided with two recesses in its periphery, one being

designed to control the admission of steam into the cylinder at either side of the abutment-head, so as to reverse the direction of rotation of the piston, and the other designed to control the exhaust through the exhaust-ducts, a rotary piston having an annular groove intersected by slots open at their ends, wings located in said slots and having studs or trunnions projecting through the open ends of the slots and through the grooves in the heads of the cylinder, whereby as they approach the abutment-head, the wings will be drawn into said slots to permit of said wings freely passing under the abutment-head, substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE E. WOODARD.

Witnesses:

MARY WOODWARD,
L. F. EGBERT.