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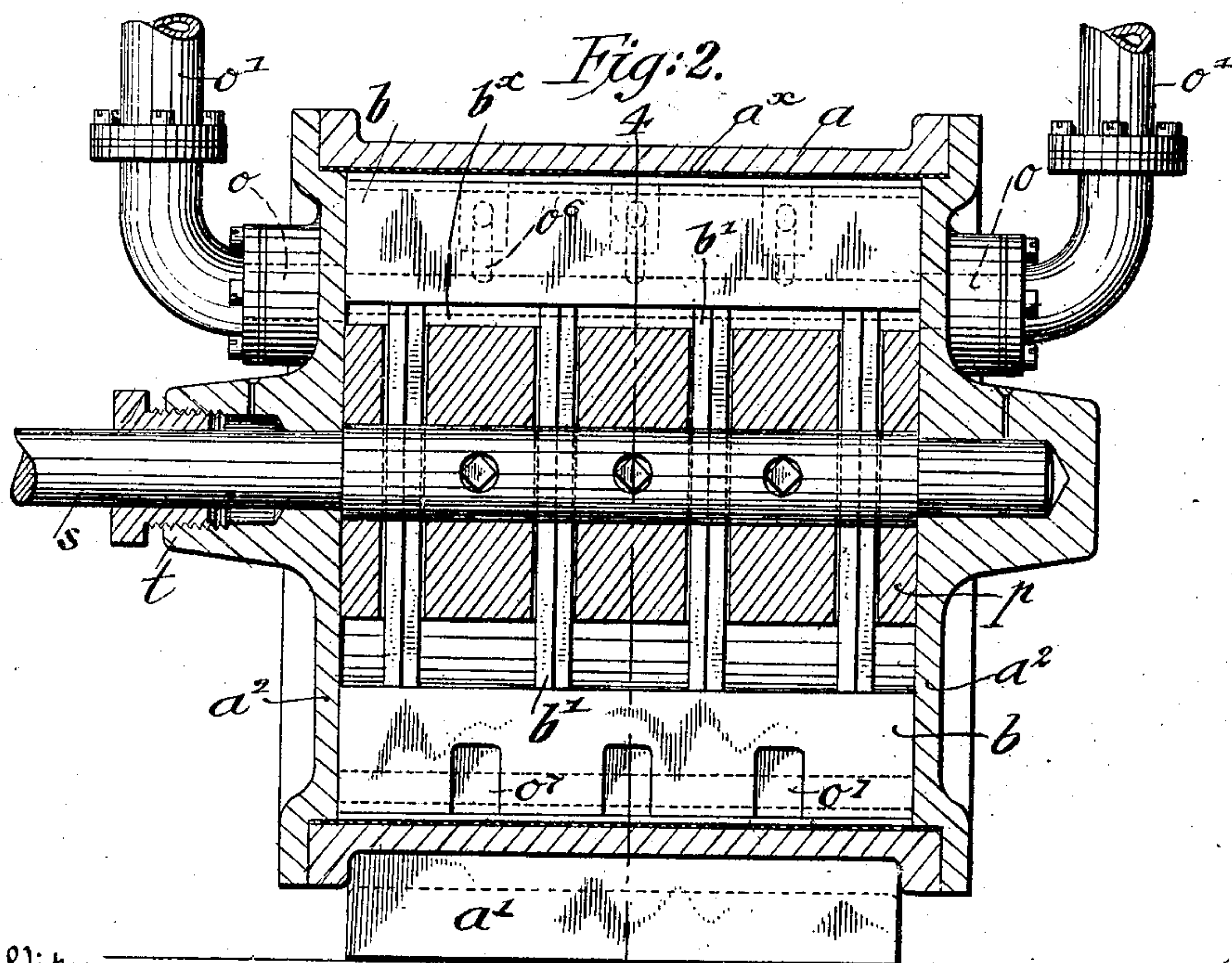
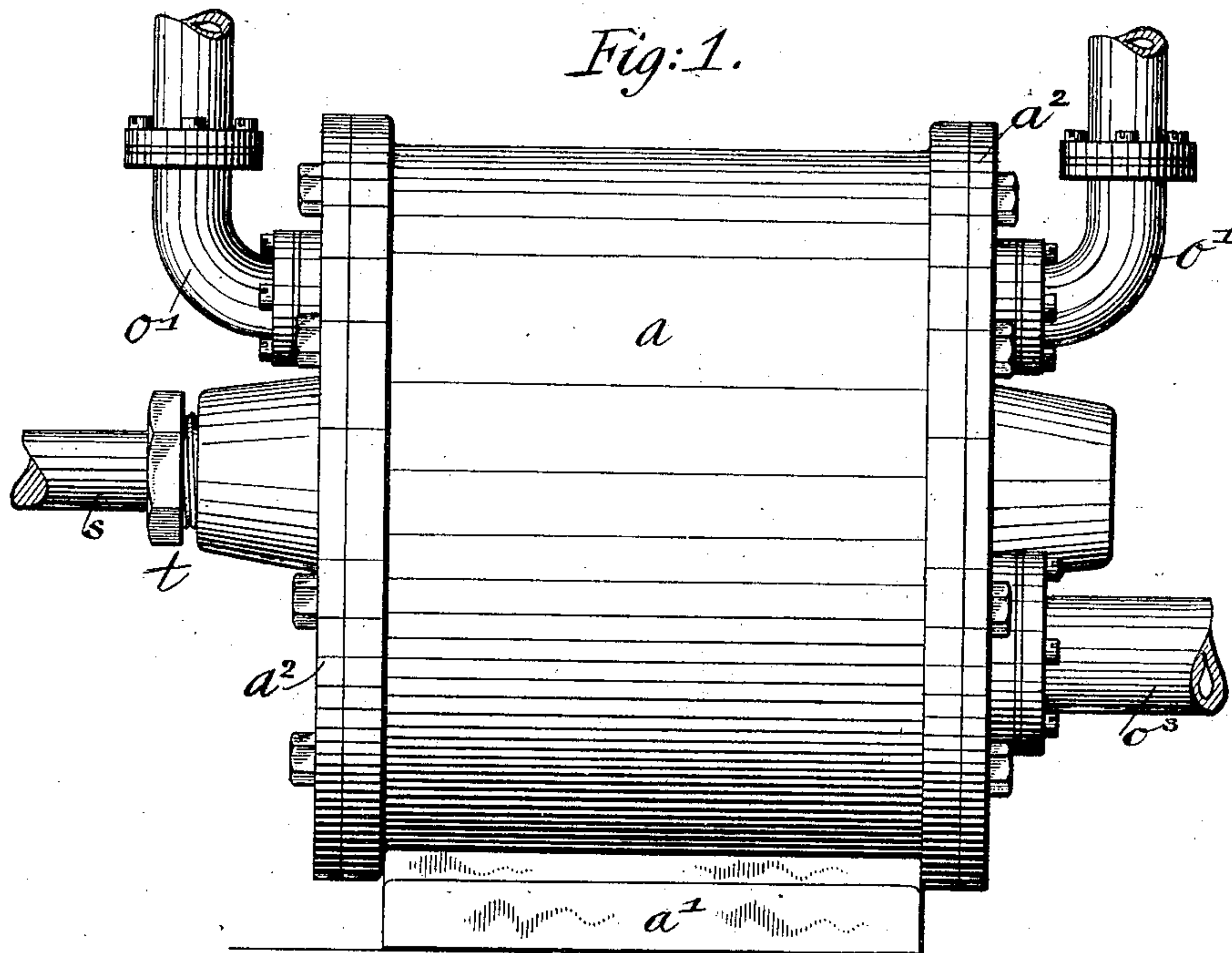
PATENTED JULY 30, 1907.

A. T. BEACH & H. C. RUSS.

ROTARY ENGINE.

APPLICATION FILED NOV. 27, 1906.

2 SHEETS—SHEET 1.



Witnesses  
David Levine  
Henry J. Schrier.

Inventor  
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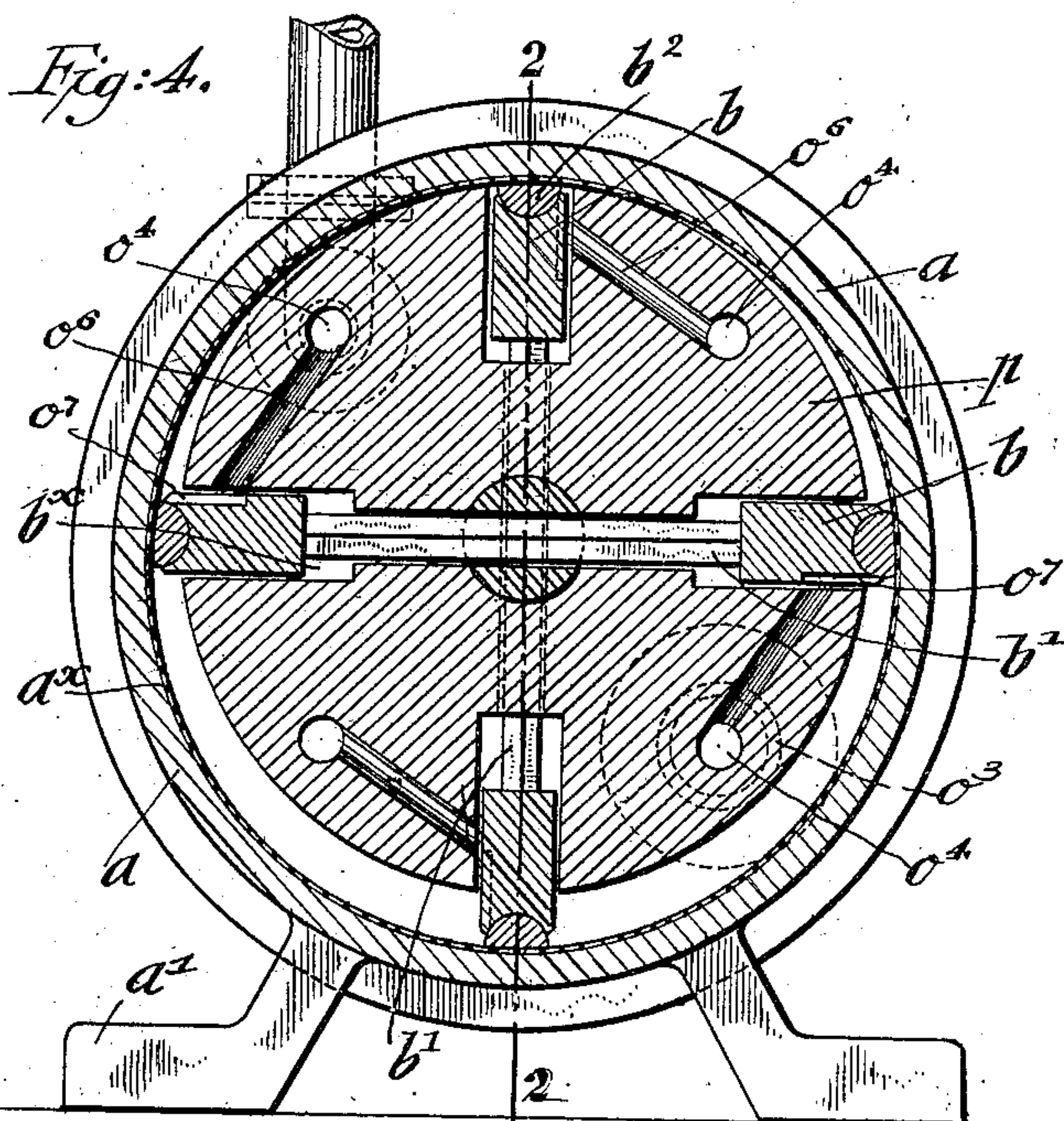
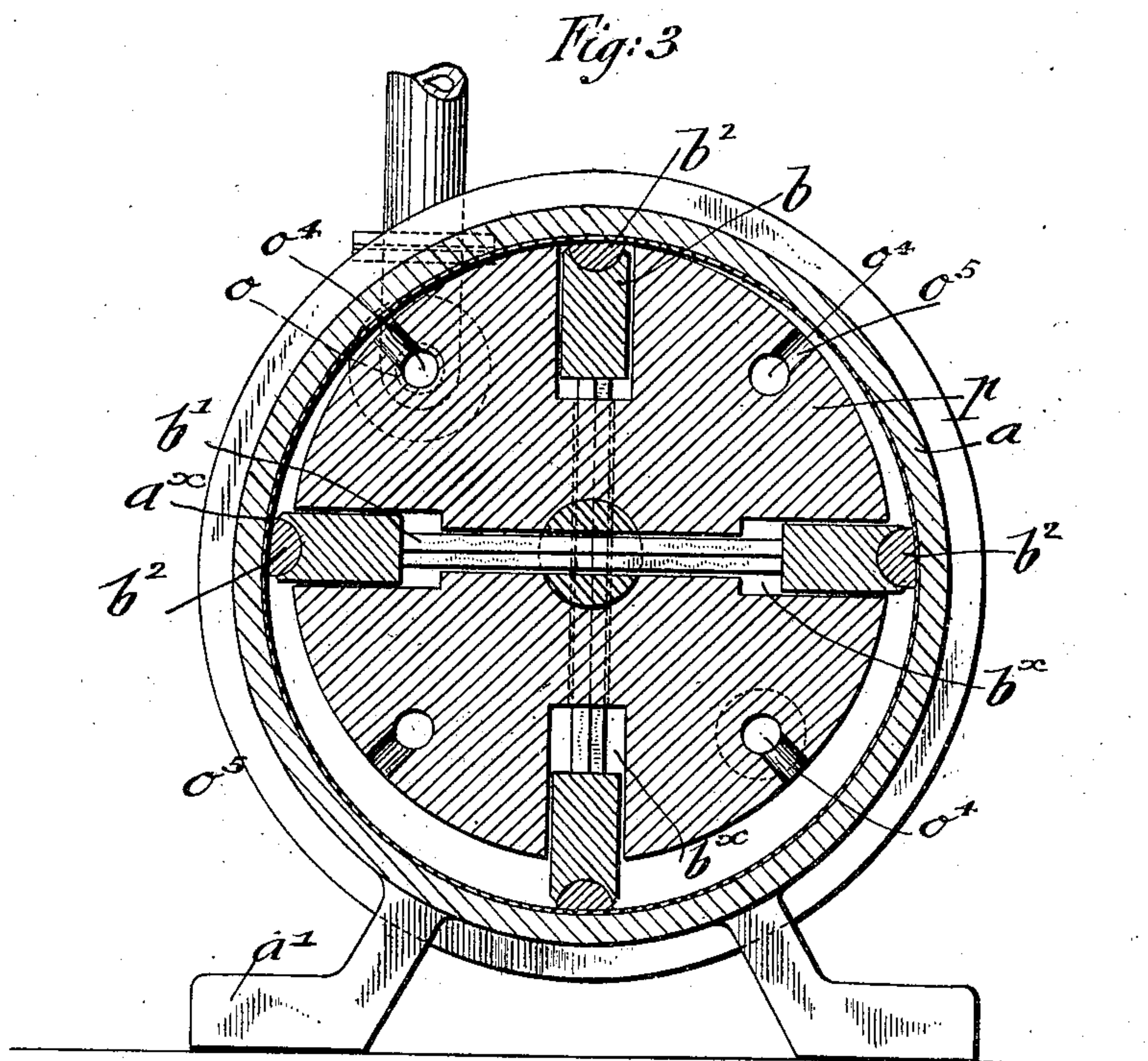
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2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

ARTHUR T. BEACH AND HOWARD C. RUSS, OF NEW YORK, N. Y.

## ROTARY ENGINE.

No. 861,937.

Specification of Letters Patent.

Patented July 30, 1907.

Application filed November 27, 1906. Serial No. 345,364.

*To all whom it may concern:*

Be it known that we, ARTHUR T. BEACH and HOWARD C. RUSS, citizens of the United States, residing, respectively, in New York, in the borough of Brooklyn, and New York, in the borough of Manhattan, State of New York, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

This invention relates to improvements in rotary engines of that type in which an eccentric piston is rotated in contact with the inner surface of a stationary cylinder, the piston being provided with sliding wings so that the steam or other elastic medium is used first by direct contact on the wings and then expansibly; and for this purpose the invention consists of a rotary engine which comprises a cylinder, a piston rotatable eccentrically in said cylinder, wings guided in sockets of said cylinder, the wings being connected in pairs by diametrical shanks of square cross-section, and ports located intermediately of the sliding wings and conducting the live steam into the space between the inner surface of the cylinder, the outer surface of the piston and one of the wings and then to the port, the shanks of the piston being guided in circular openings of the piston and shaft for producing the free passage of the steam from one wing to the other and for balancing the wings; and the invention consists further of certain other features of construction as will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a side-elevation of our improved rotary engine. Fig. 2 is a vertical longitudinal section of the same on line 2, 2, Fig. 4, Fig. 3 is a vertical transverse section showing a modified arrangement of the inlet-parts, and Fig. 4 is a section on line 4, 4, Fig. 2.

Similar letters of reference indicate corresponding parts in the different figures of the drawings.

Referring to the drawings, *a* represents a cylinder which is supported stationary on a suitable base-plate *a*<sup>1</sup> and which is tightly closed by heads *a*<sup>2</sup> in which are arranged the bearings for the shaft *s*, one of the bearings being provided with a suitable stuffing-box *t* for the shaft. The shaft *s* is supported eccentrically to the cylinder *a* and carries a piston *p* which rotates with the shaft eccentrically of the cylinder. The piston is provided with four socket-shaped recesses *b*<sup>x</sup> in which are guided radially sliding wings *b* which are connected at their inner edges by square diametrical rods or shanks *b*<sup>1</sup> that pass through round openings in the piston *p* and shaft *s*. The outer ends of the sliding wings *b* are provided with arc-shaped grooves for receiving semi-circular steel packing-bars *b*<sup>2</sup> which are accurately fitted into arc-shaped recesses of the wings so as to turn in said recesses as the piston is rotated, so that the slightly curved outer faces of the packing-bars always form intimate contact with the interior surface

of the cylinder *a* which is formed by a thin steel casing *a*<sup>x</sup>. The wear on the faces of the packing-bars is compensated by exchanging the worn bars with new bars or by adjusting the wings on the connecting-shanks. The socket-shaped recesses in the piston *p* are somewhat longer than the length of the wings and their packing-bars so as to prevent any concussion between the inner ends of the wings and the inner ends of the recesses during the rotation of the piston in the cylinder.

The heads of the cylinder are provided with steam-ports *o* and supply-pipes *o*<sup>1</sup> for the live steam at the upper part, there being an exhaust-port and an exhaust-pipe *o*<sup>3</sup>, as shown in Figs. 1 and 4. The piston *p* is provided intermediately between the wings with longitudinal channels *o*<sup>4</sup>, the ends of which communicate during the rotation of the piston with the supply ports *o* so as to receive the live steam and are connected by radial channels *o*<sup>5</sup> with the steam-space formed between the inner surface of the cylinder, piston and that wing which is located next to the port which receives live steam. The steam then strikes one side of the wing and forces the wing and the piston with the shaft in the direction in which the live steam is supplied. When the next following channel coincides with the live-steam port steam is again admitted. During this time the wing that was before acted upon by the steam is moved forward, while the next following wing shuts off the steam from the live-steam port and receives a new supply of steam in the space to which steam was before admitted, the steam acting expansibly in the larger space of the next following medium, until the first piston arrives at the exhaust-port, when the steam is exhausted.

When the engine is to be run in one direction live steam is admitted through the supply-pipe at one side of the cylinder, while when the engine is to be rotated in the reverse direction the live steam is supplied to the supply-pipe at the opposite side of the cylinder.

In place of connecting the longitudinal channels by radial ports with the interior steam-spaces, the same may be connected by inclined channels *o*<sup>6</sup> which pass through the piston toward the wings, as shown in Fig. 4. In this case the wings are provided at one side with shallow grooves *o*<sup>7</sup> through which the steam is conducted into the steam-space formed between the inner surface of the cylinder, the piston and the wing which is then in connection with the live-steam channel. In other respects the action of this piston is the same as in that shown in Fig. 3.

The connecting-rods or shanks of each pair of wings pass sidewise of each other through the shaft and form with the round openings in the piston and shaft connecting-channels between the socket-shaped recesses of the wings, so that the steam can freely pass from that wing which is acted upon by the live steam to the wing opposite thereto, by which they are balanced, so that



the steam that passes through the sides of the steam-receiving wing exerts no back-pressure on the steam which is distributed in the space formed around the connecting-shank and in the space formed in the socket-shaped recesses at the opposite side of the piston. By this arrangement the free motion of the wings is produced and thereby the free rotary motion of the piston in the cylinder, the steam acting thereby in the nature of a lubricant for the wings.

- 10 Rotary engines of smaller size can be operated with one pair of wings, a connecting-shank and packing-bars for the wings.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

- 15 1. A rotary engine comprising a cylinder, a piston rotatable eccentrically in the same, two pairs of wings guided in socket-shaped recesses of the piston, said wings being provided with packing-bars and square connecting-shanks moving in round openings at the center of the piston and  
20 shaft, and longitudinal channels for the live steam located intermediately between the wings.

2. A rotary engine comprising a cylinder, a piston rotatable eccentrically in the same, two pairs of wings guided radially in the piston, each wing being provided at its edge with a recess of semicircular cross-section, packing-bars of semicircular cross-section fitting within said recesses of the wings and sliding on the inner surface of the cylinder, and connecting-shanks for said wings, there being channels for the live steam extending longitudinally of said piston intermediately between the wings. 25

3. A rotary engine comprising a cylinder, a piston rotatable eccentrically in the same, a shaft for said piston, two pairs of wings guided in socket-shaped recesses of the piston, there being longitudinal channels in the piston located intermediately between the wings and inclined channels leading from the longitudinal channels toward the wings, and inlet-ports to successively register with said channels. 30 35

In testimony, that we claim the foregoing as our invention, we have signed our names in presence of two subscribing witnesses.

ARTHUR T. BEACH.  
HOWARD C. RUSS.

Witnesses:

PAUL GOEPEL,  
HENRY J. SUHRBIER.