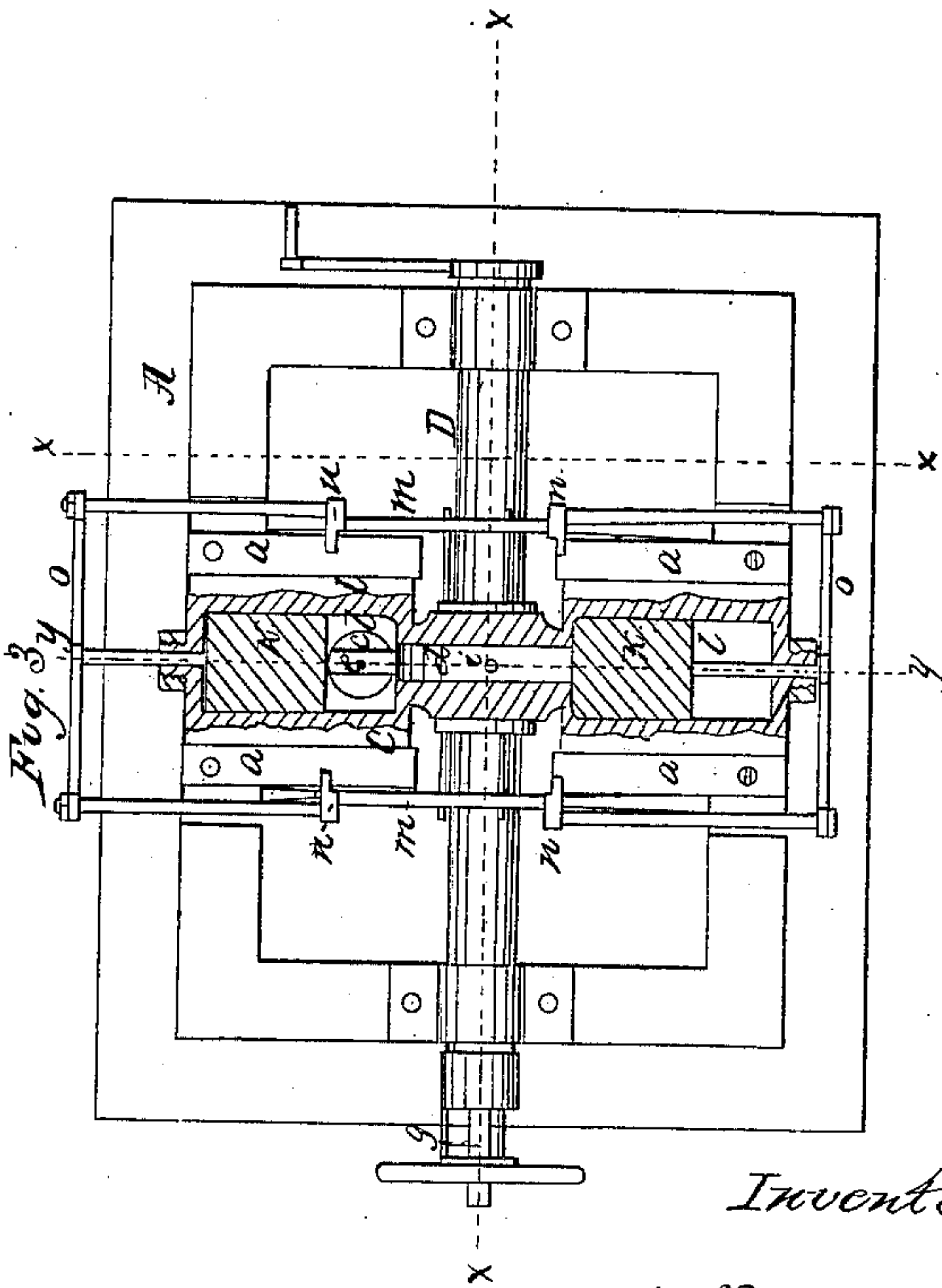
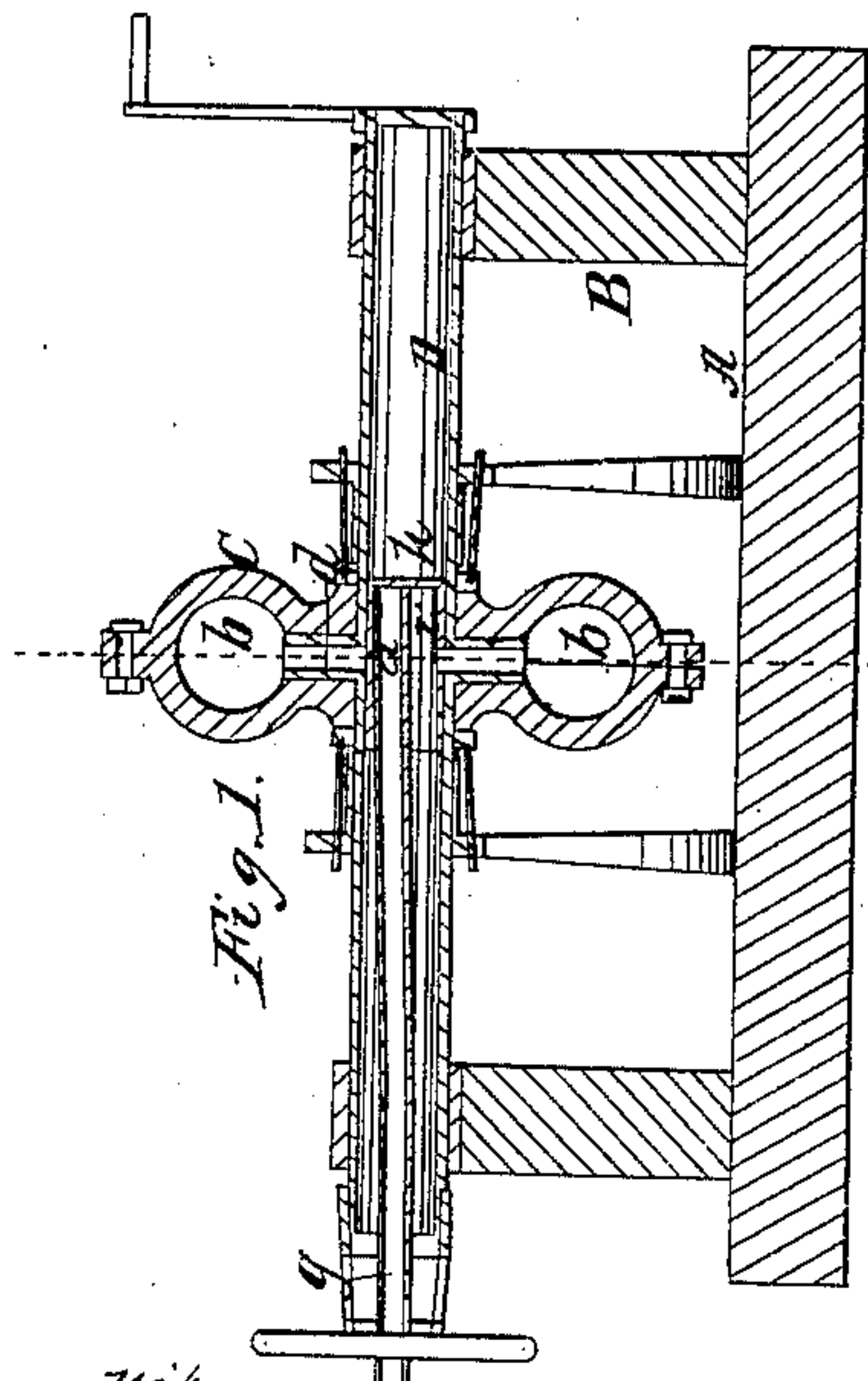
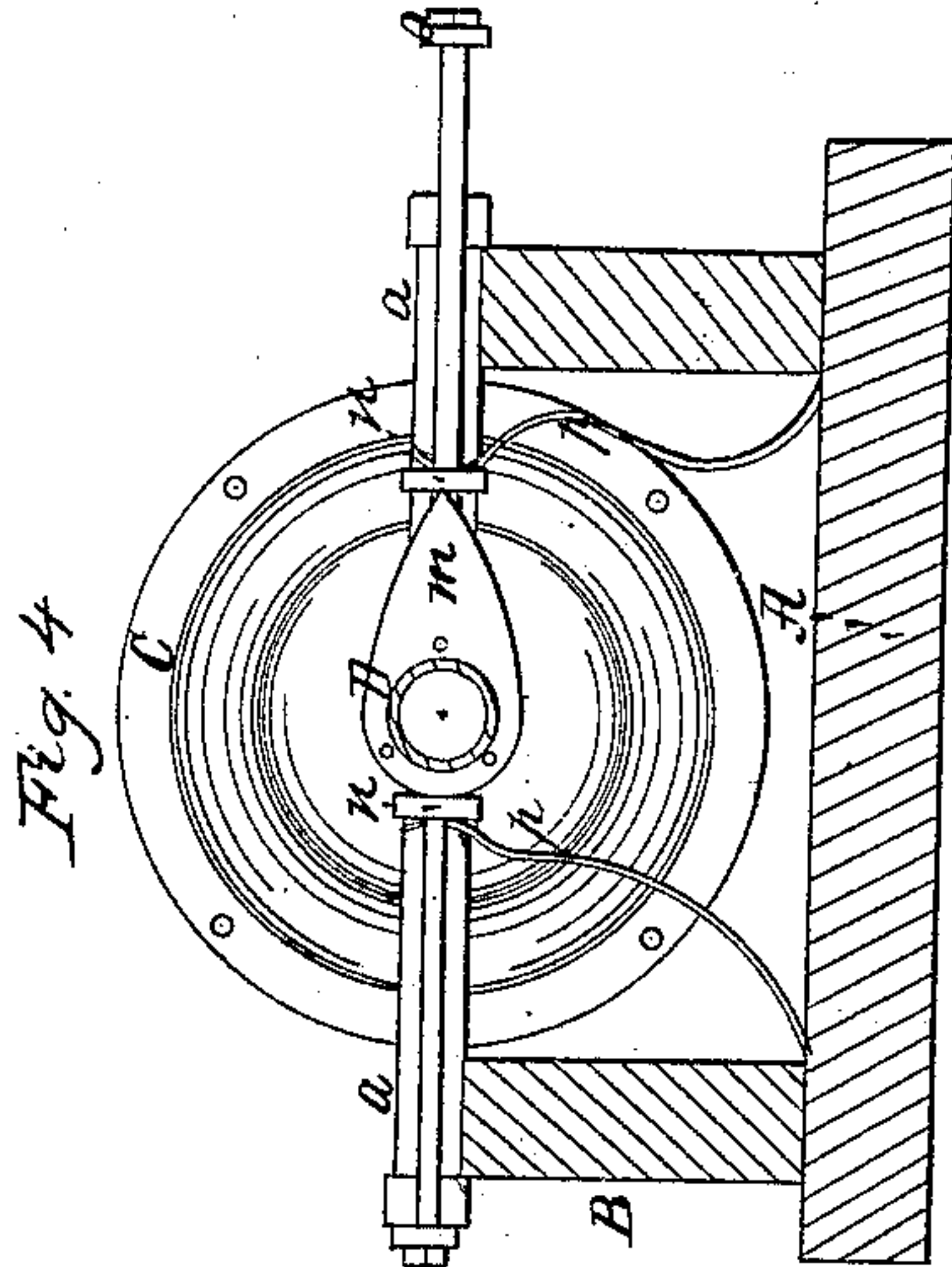
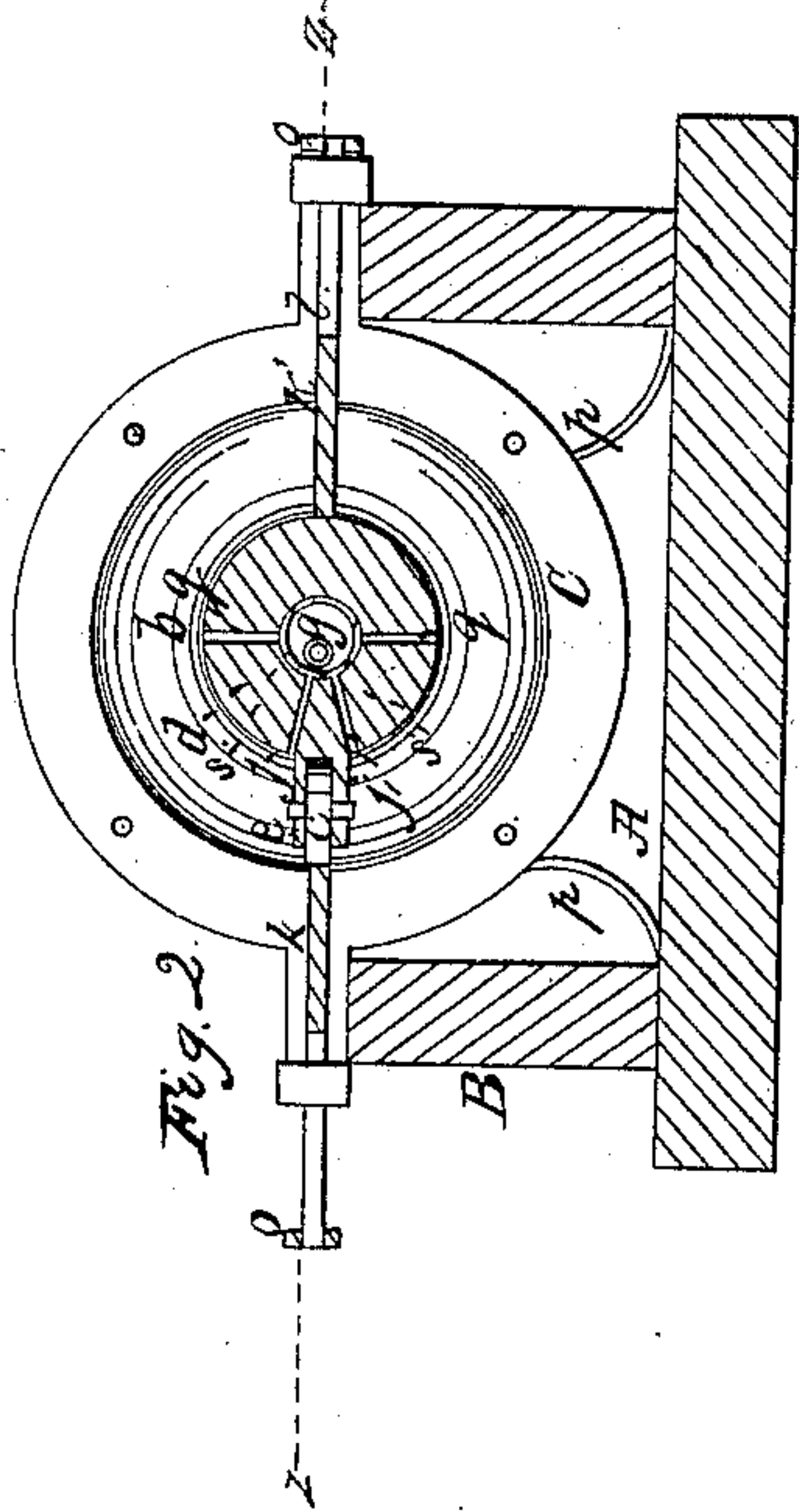


*J. Torrance,*  
*Rotary Steam Engine.*  
*No 51,122.*      *Patented Nov. 21, 1865.*



Witnesses:  
*Thos. Lusk*  
*W. C. Quinn*

Inventor:  
*J. Torrance*  
*By *William H. Allen* Att'y*



# UNITED STATES PATENT OFFICE.

JAMES TORRENCE, OF IRWIN STATION, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOHN GEORGE, JR., OF SAME PLACE.

## IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. 51,122, dated November 21, 1865.

*To all whom it may concern:*

Be it known that I, JAMES TORRENCE, of Irwin Station, in the county of Westmoreland and State of Pennsylvania, have invented a new and Improved Rotary Engine; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a longitudinal vertical section of this invention, the line  $x x$ , Fig. 3, indicating the plane of section. Fig. 2 is a transverse vertical section of the same, taken in the plane indicated by the lines  $y y$ , Figs. 1 and 3. Fig. 3 is a horizontal section of the same, the line  $z z$ , Fig. 2, indicating the plane of section. Fig. 4 is a transverse section, the plane of section being indicated by the line  $x' x'$ , Fig. 3.

Similar letters of reference indicate like parts.

This invention relates to a rotary engine the cylinder of which is provided with an annular channel in which the piston travels. Said channel may be round, square, oval, or of any desired form or shape, but if it is round, the piston, which fits nicely in it all round, is made to turn on a central axis, so that the same wears even all round and leakage of steam is prevented. The piston is secured to a head which is firmly keyed to the main shaft, and steam is admitted through a pipe secured to a rotary valve which is situated in the main shaft, one end of which is bored out for that purpose. The steam-pipe, being much smaller in diameter than the bore of the hollow part of the shaft, allows the spent steam to exhaust freely through the same end of the hollow shaft through which the steam-pipe enters. By turning the valve with a hand-wheel attached to the steam-pipe the engine is reversed.

A represents a bed-plate from which rises the frame or bed B, which supports the cylinder C and forms the bearings for the main shaft D. The cylinder is provided with wings or brackets  $a$ , by means of which it can be firmly bolted down to the bed, and it is made in two halves, each of which is provided with a flange, so that the same can be conveniently bolted together. The interior of the cylinder C forms an annu-

lar channel,  $b$ , in which the piston  $c$  is fitted, and said channel may be made circular or square or elliptical or in any other suitable shape, though I prefer to make the same circular. The piston is secured to a piston-wheel,  $d$ , which is firmly keyed to the main shaft D, and if the channel  $b$  is circular said piston is arranged so that it can revolve freely on its axis  $e$ , which has its bearings in lugs  $f$ , projecting from the circumference of the piston-wheel.

The steam is admitted to the cylinder C through a pipe,  $g$ , which passes in through the main shaft, one end of which is made hollow and forms a socket,  $h$ , into which the steam-valve  $i$  is fitted. This valve is made cylindrical, having its inner closed and made to fit nicely the socket  $h$ .

The steam-pipe  $g$  is firmly connected to the valve, and the steam admitted through said pipe passes into the cylinder through a hole,  $i$ , in the valve and through either one of the ports  $j j'$ , bored through the piston-wheel on opposite sides of the piston. In the position in which the valve is shown in Fig. 2 the steam-port  $j$  registers with the hole  $i$  in the valve, and steam being admitted through said port causes the piston-wheel and the main shaft to revolve in the direction of the arrow marked near it in Fig. 2.

In order to enable the steam to produce the desired effect, two abutments,  $k k'$ , are provided, which move in suitable guide-grooves,  $l$ , in the shell of the cylinder. These abutments are operated by the action of cams  $m'$ , which are keyed to the main shaft, and which act on suitable heads,  $n$ , secured to the inner ends of rods which are fastened in the ends of cross-bars  $o$ , that are attached to the outer end of the shanks of the abutments. Suitable springs,  $p$ , press on the heads  $n$ , and keep the same in contact with working-surfaces of the cams, and said cams are so shaped and situated that each of the abutments is forced back just before the piston arrives, and as soon as the piston has passed they drop back to their original position.

The steam exhausts through ports  $q q'$  in the piston-wheel and holes  $r r'$  in the valve. These holes are so situated that when the hole  $i$  in the steam-pipe and valve corresponds with the steam-ports  $j$  the hole  $r'$  corresponds with



the exhaust-port  $q'$ , as shown in Fig. 2, and if the valve is turned to such a position that its hole  $i$  corresponds with the steam-port  $j'$  the hole  $r$  in the valve will correspond to the exhaust-port  $q$ .

Additional exhaust-ports may be obtained by making holes  $s$   $s'$  into the valve in such positions that when the hole  $i$  corresponds with the port  $j$  the hole  $s'$  will correspond with the port  $j'$ , and while steam is admitted through the port  $j$  on one side of the piston, the space on the opposite side of said piston communicates freely with the open atmosphere through the exhaust-ports  $j$  and  $q'$ . By turning the valve so that the hole  $i$  corresponds with the steam-port  $j'$  the motion of the piston-wheel is reversed and the steam exhausts through ports  $j' q$  and holes  $s r$ . By this arrangement the combined area of the exhaust-ports can be made equal to four (or more) times the area of the steam-ports, and perfect freedom of the exhaust can easily be obtained.

This engine is easily constructed. It requires comparatively little packing. The piston is not liable to wear uneven. The cylinder can

be easily cast and turned out in two halves and bolted together, as previously described, and by slight changes it can be used as a rotary pump.

I claim as new and desire to secure by Letters Patent—

1. Connecting the piston of a rotary engine to the piston-wheel by means of a pivot, and allowing the same to rotate freely around its own axis, substantially as and for the purpose described.

2. The steam-valve  $i$ , fitted into a socket in the main shaft and combined with the steam-pipe  $g$  and ports  $j j' q q'$ , substantially as and for the purpose specified.

3. The arrangement of the revolving valve  $i'$ , situated in the interior of the main shaft  $D$ , piston  $e$ , cylinder  $C$ , cams  $m$ , and abutments  $k k'$ , all constructed and operating substantially as and for the purpose set forth.

JAMES TORRENCE.

Witnesses:

JOHN McWILLIAMS,

JAMES I. MURCHARD.