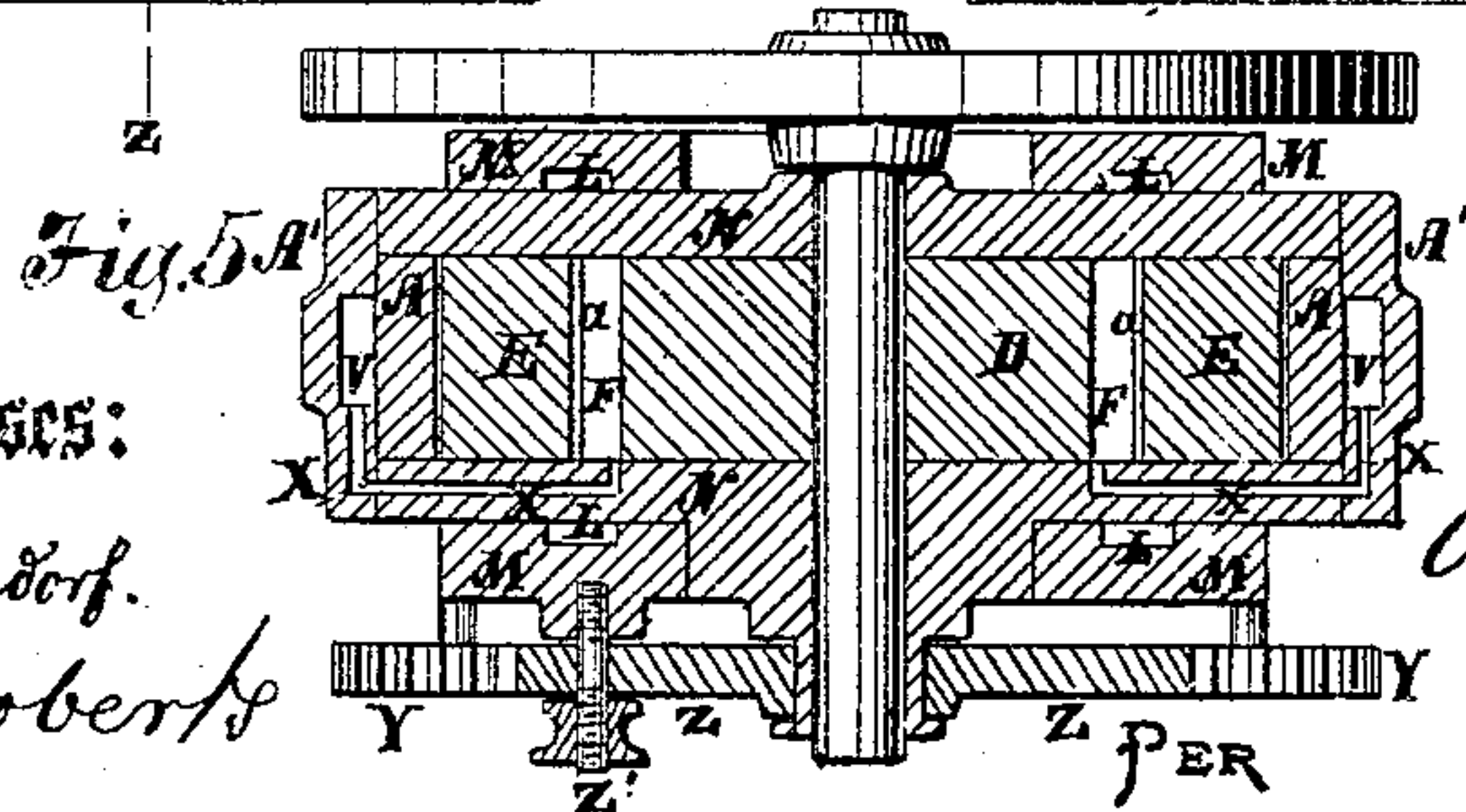
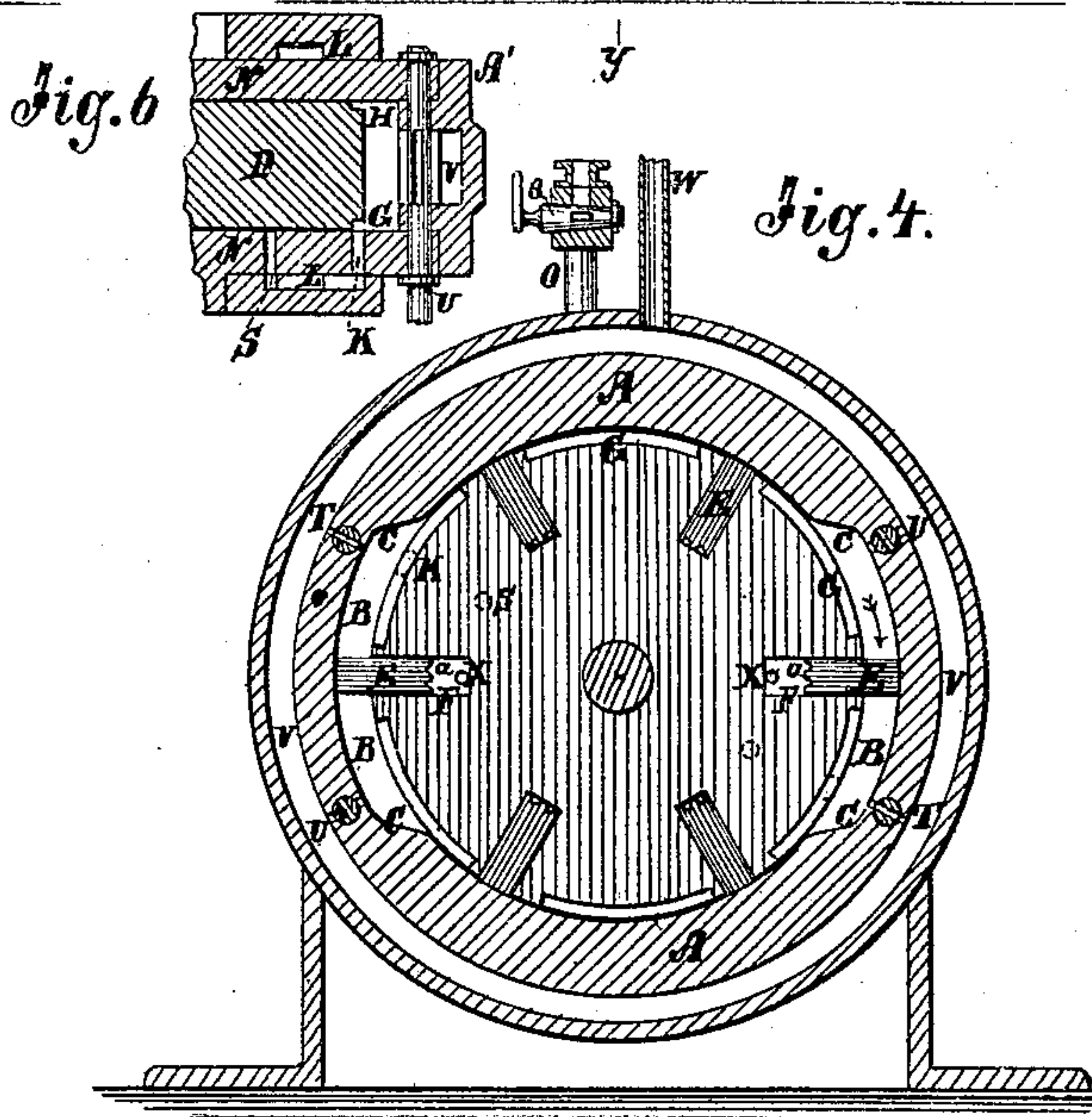
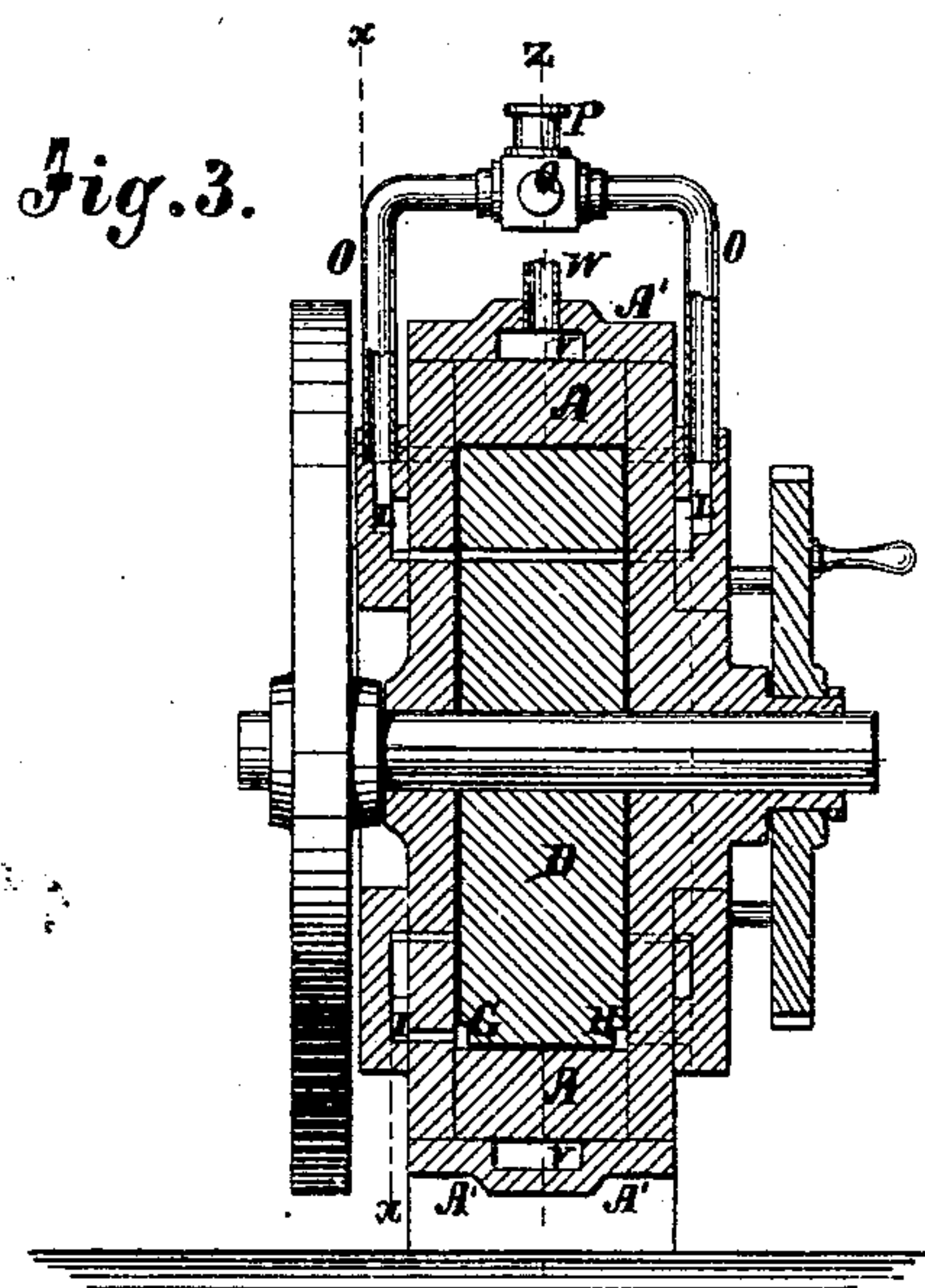
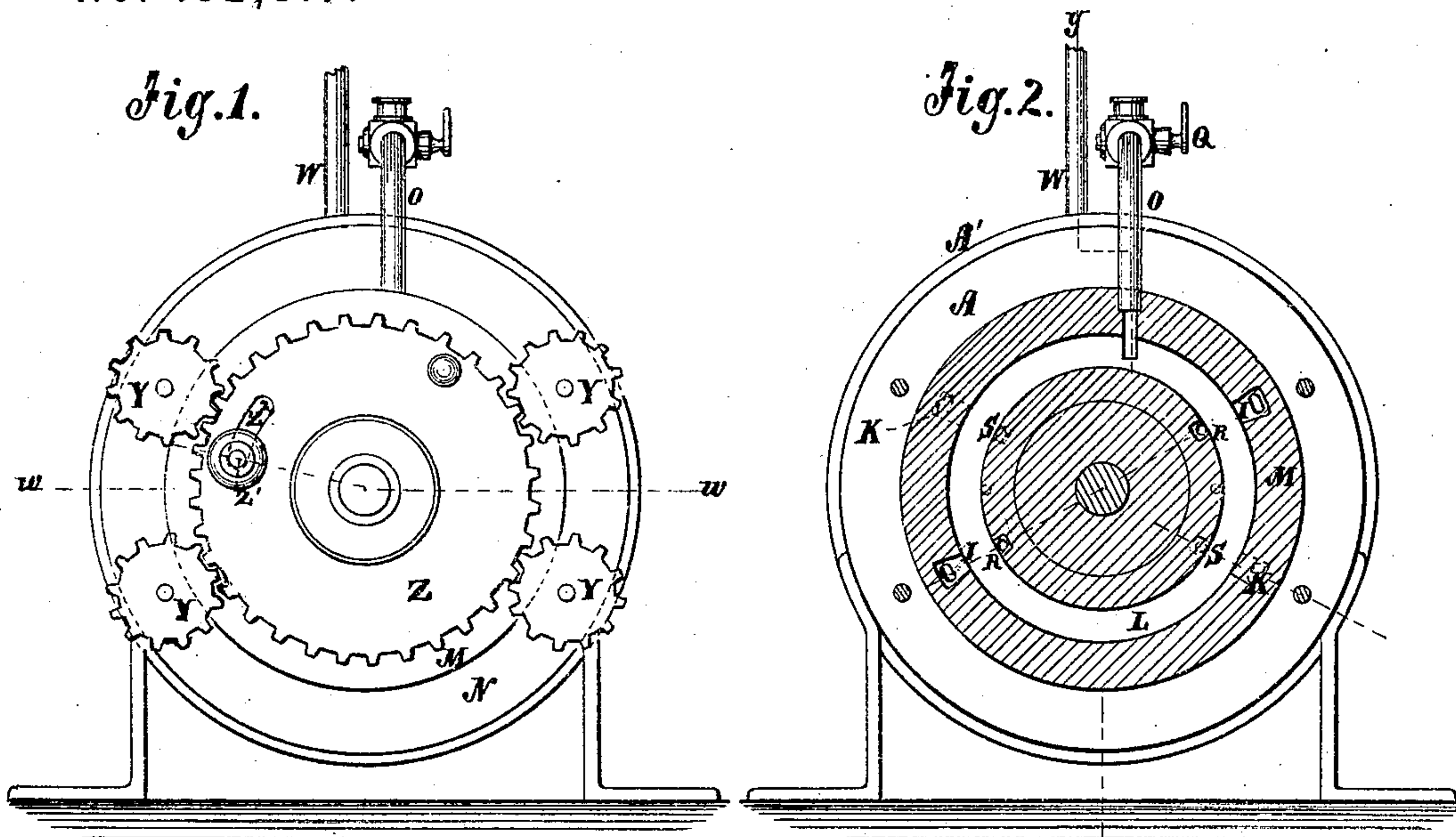


A. PHILP.  
Improvement in Rotary Steam-Engines.  
No. 132,317. Patented Oct. 15, 1872.



Witnesses:  
A Bennekenhoff.  
Alex F. Roberts

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# UNITED STATES PATENT OFFICE.

ANDREW PHILP, OF NEW YORK, N. Y.

## IMPROVEMENT IN ROTARY STEAM-ENGINES.

Specification forming part of Letters Patent No. 132,317, dated October 15, 1872.

*To all whom it may concern:*

Be it known that I, ANDREW PHILP, of the city, county, and State of New York, have invented a new and Improved Rotary Engine, of which the following is a specification:

My invention consists of the construction of the engine and arrangement of ports and steam-ways, as hereinafter described and claimed.

Figure 1 is a side elevation of my improved engine; Fig. 2 is a vertical section on the line *xx* of Fig. 3; Fig. 3 is a vertical section on the line *yy* of Fig. 2; Fig. 4 is a vertical section on the line *zz* of Fig. 3; Fig. 5 is a horizontal section on the line *ww* of Fig. 1; and Fig. 6 is a section of Fig. 2 on the line *aa* of Fig. 2.

Similar letters of reference indicate corresponding parts.

A A' represent the cylinder, which has two long circular recesses, B, in the inner periphery at opposite sides of the axis with inclined abutments C, said recesses being as wide as the length of the cylinder, and as deep as it is designed that the piston-plates that the steam acts upon shall project from the disk D, which fits in the cylinder as close as it can and revolve freely, and carries the said piston-plates E in radial slots F, the said plates being fitted therein so as to slide out and in and yet not allow steam to escape by passing around them in the slots. The said disk is provided with steam-way grooves G on one side and H on the other in the corners between the plates E, by which live steam is admitted to the recesses B, behind the plates E, for propelling the disk. The steam is admitted to these steam-ways by the ports I on one side and K on the other, from the annular steam-chests L in the disks M, attached to the plates N, which inclose the cylinder at the ends, and to which said chests the steam is admitted from the branches O of the steam-pipe P (to either) according to which way the engine is desired to run, by the cock Q, which can be shifted to admit it to either, as required. Steam is also admitted from these steam-chambers through the small ports R on one side and S on the other to the radial slots F behind the plates E, for throwing them out against the walls of recesses B. The ports I and R are shown in full lines, and the ports K and S in dotted lines in Fig. 2, the former indicating those for the front side of the engine, as seen in Fig. 4, and the

latter for those of the rear side. It will be seen that the arrangement of these ports, relatively to the recesses B, is reversed for the different sides of the engine, the object being to run the engine in opposite directions thereby. There is an exhaust-port at each end of the recesses B, with a cock for opening and closing them, as required. Those for exhausting, when the engine runs to the right, are marked T, and those for exhausting when running the other way are marked U. All discharge into the annular space Y, which exhausts through the pipe W. The steam admitted to the radial notches F for forcing the plates E out into recesses B for taking steam therein, exhaust through the small ports X to the rear side of Fig. 4 and to the annular space V, as shown in Fig. 5. These ports X are arranged equidistant between the ends of recesses B, so that they exhaust the said notches, whether the engine runs one way or the other. The inner ends of the plates E have little grooves *a* to admit the steam, although the said ends rest on the bottom of the notches. The ports R and S are arranged in the circle described by these notched ends of the plates, and the inner ends of the slots and the ports I and K are arranged in the circles described by the steam-ways G and H, so that the steam will always enter the notches and recesses when they come to the ports, which are always open and will be cut off when they pass beyond said ports. The ports R and S are so arranged, relatively to the abutments C, that steam will be admitted behind the plates to throw them out just as the rearmost corners of the outer ends begin to descend the inclines C and the ports I K; and steam-ways G H are so arranged, relatively to said recesses, that steam is admitted behind the plates as soon as the said rear corners have arrived at the bottoms of said inclines; and the steam-ways will be made any length short of the exhausts, according to the extent it may be desired to work the steam expansively. The exhausts T will be opened and U closed when the engine is required to run to the right, and U will be opened and T closed when it is required to run the other way.

For shifting the cocks of these valves simultaneously, I have, in this example, represented the spindle of each with a pinion, *y*, geared with a large toothed wheel, Z, mounted in the



axis of the engine, and arranged to shift forward and back far enough to turn the cocks a quarter of a revolution, and to be arrested at the right point in each direction by a stop-stud,  $Z^1$ , passing through a curved slot,  $Z^2$ , in said wheel, said slot being the exact length the wheel is required to turn; but I may have any other suitable contrivance for this purpose; for instance, the two cocks on each side of the vertical plane of the axis may be connected by cranks and a vertical bar, and these two vertical bars may each be connected to a horizontal bar mounted in the axis of the engine to oscillate, and have a handle for shifting it, so that by actuating the said horizontal bar the cocks will be shifted in the same manner as by the turning of the wheel  $Z$ . Although the steam is exhausted from behind the inner ends of the plates before it is from the recesses  $B$ , the said plates will remain out against the walls of  $B$ , steam-tight by the action of the centrifugal force, and the friction of said plates on the walls of the notches  $F$ , caused by the pressure of the steam in  $B$  behind them; but as soon as the steam is exhausted from  $B$  this friction will cease, and it will only be the centrifugal force that will have to be overcome in the forcing of the said

plates back, which will be very light, and, consequently, the wear of the parts will be slight.

The arrangement of the duplicate recesses and ports, so that the power is divided equally upon two opposite sides of the disk, avoids the lateral pressure and the tendency to run and wear out of line common to those engines in which the power is wholly applied on one side is avoided and the friction is considerably lessened. The part  $A'$  of the cylinder is a ring with a groove,  $V$ , in its inner wall and fitted onto  $A$  steam tight; but it is made as much wider than  $A$  as required to overlap the edges of the plates  $N$ . Suitable packing will be employed between the sides of the disk  $D$  and plates  $N$ ; also at the bearings of the shaft of said disk.

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

A rotary engine provided with steam-ways  $G$   $H$  and ports  $I$   $K$  arranged therein, as described.

ANDREW PHILP.

Witnesses:

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