

(No Model.)

W. H. SMITH.  
ROTARY STEAM VALVE.

No. 352,895.

Patented Nov. 16, 1886.

Fig. 1

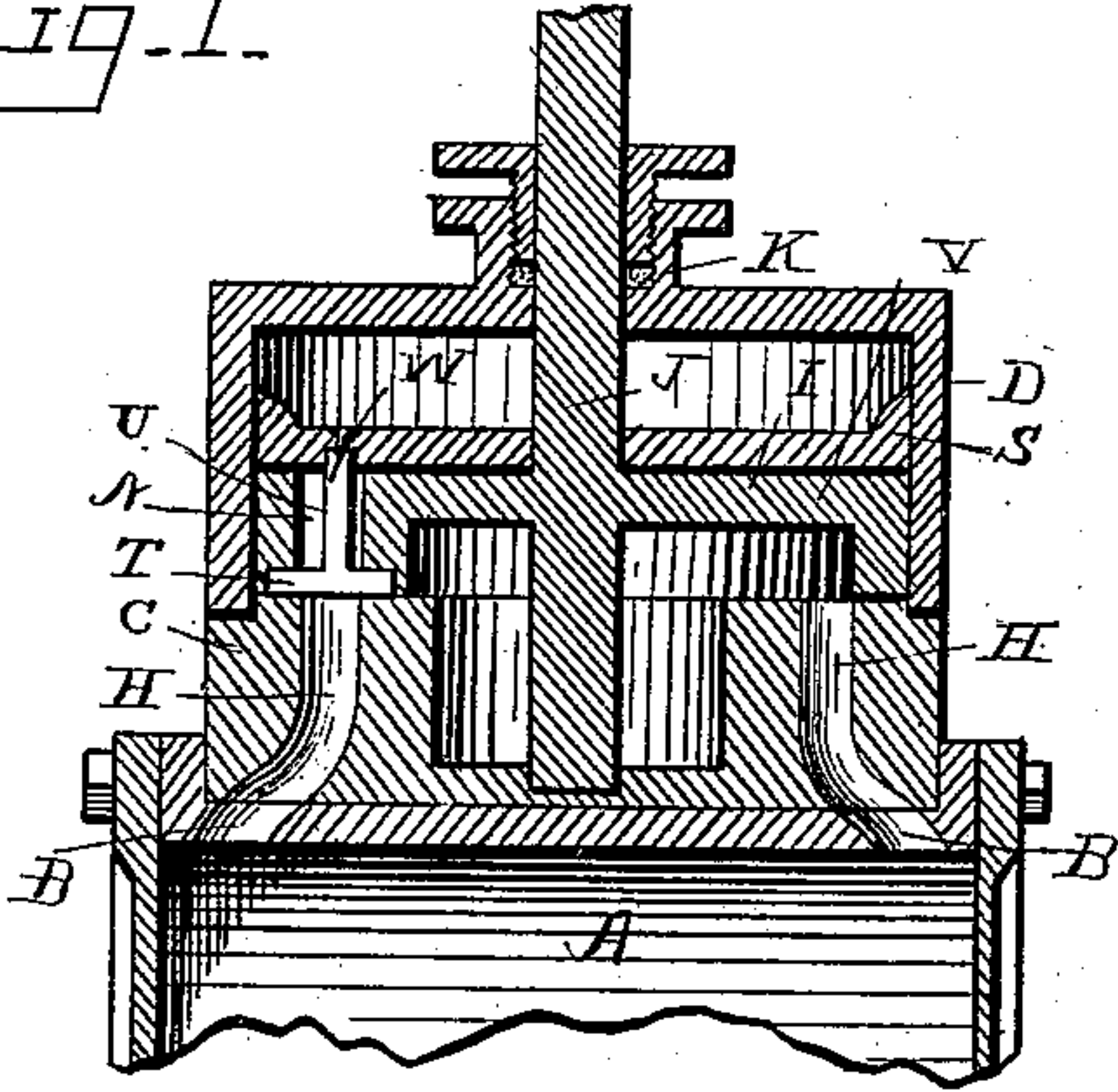


Fig. 2

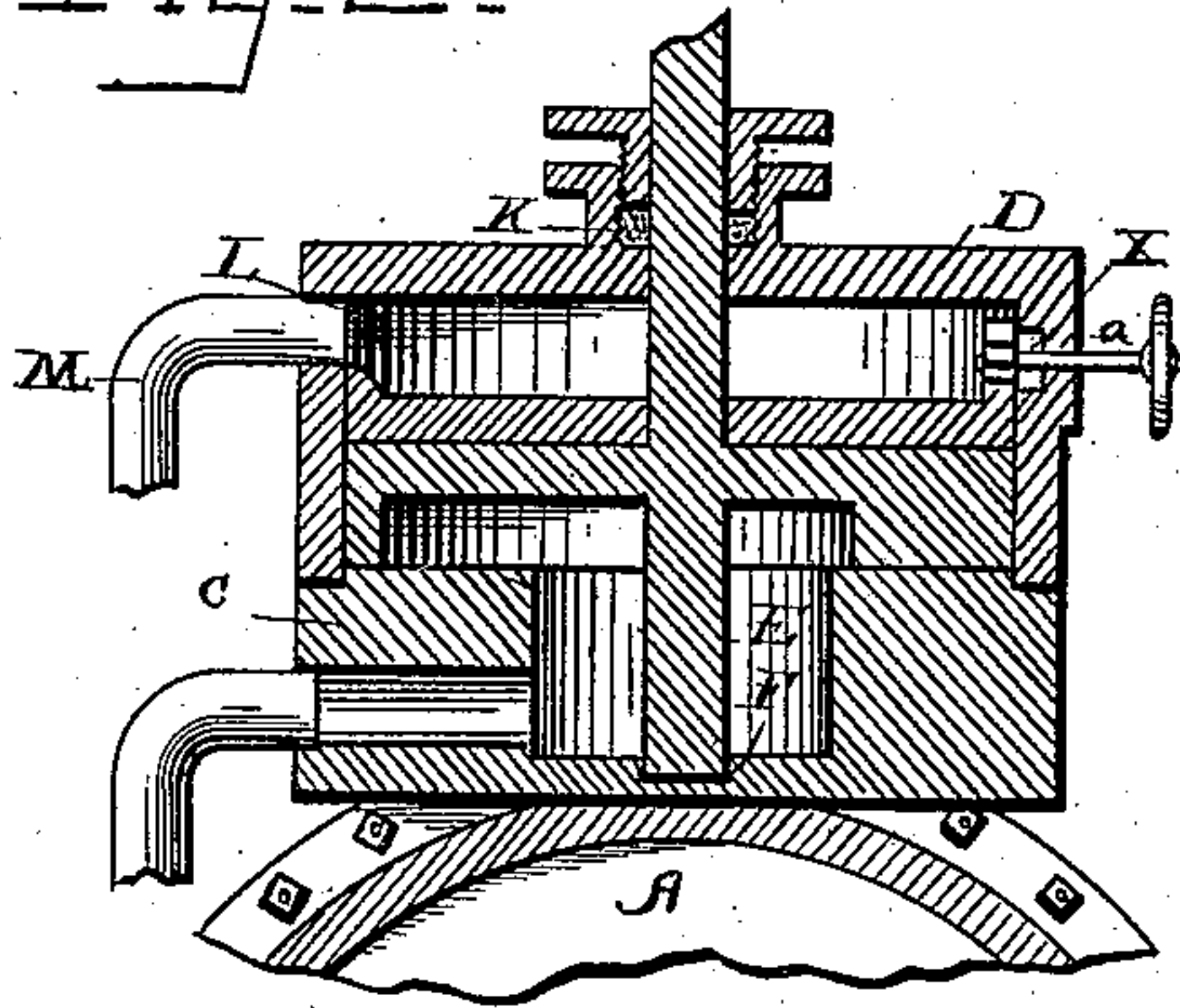


Fig. 3

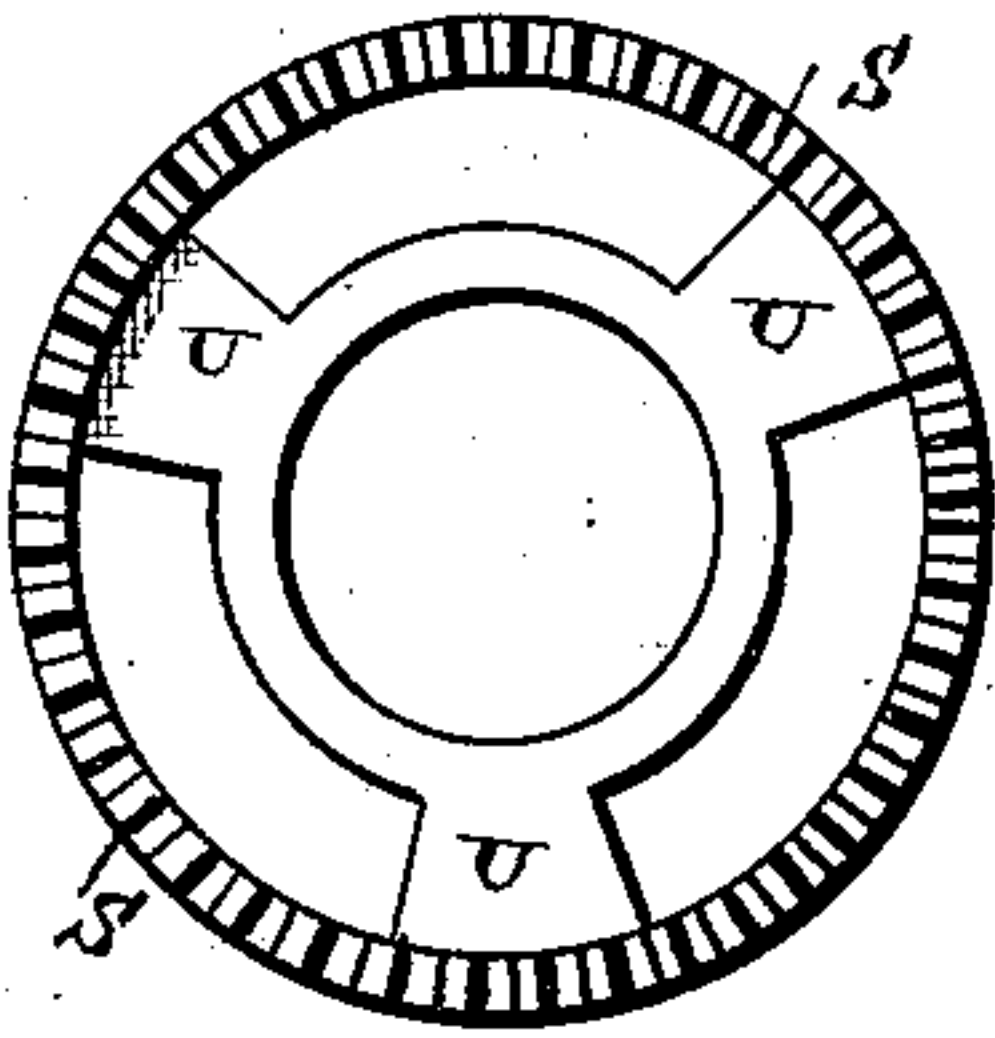


Fig. 4

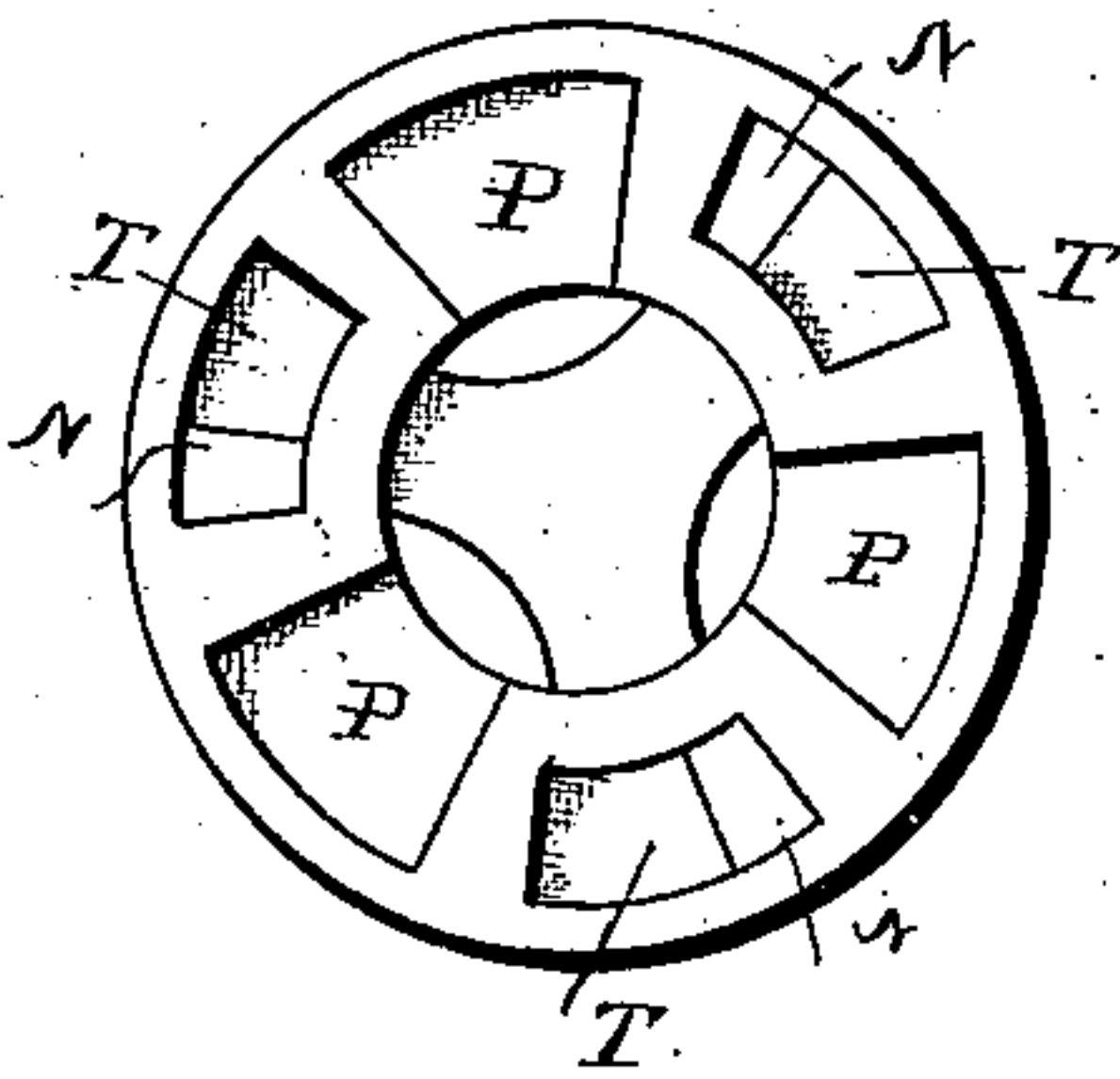


Fig. 5

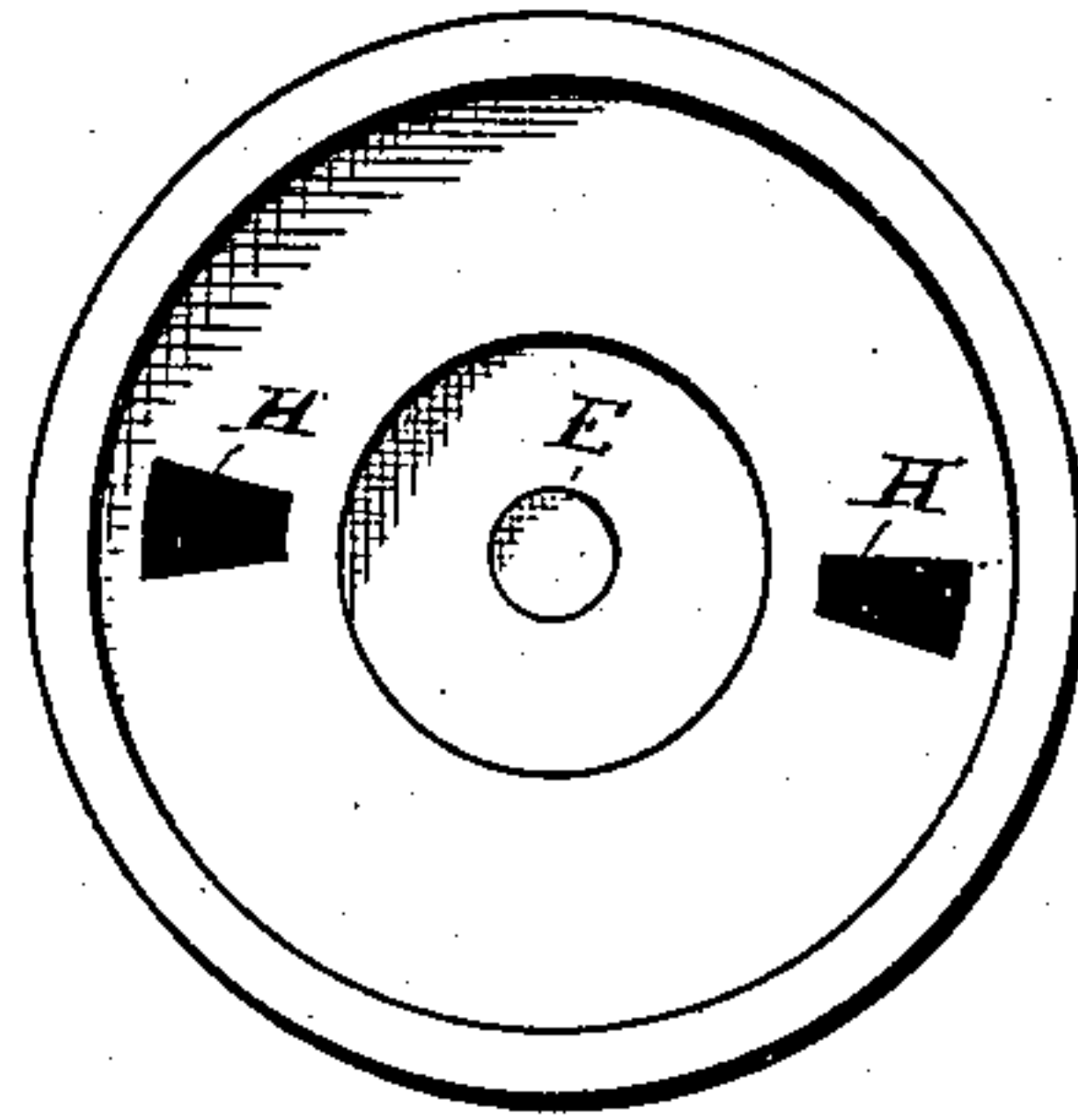
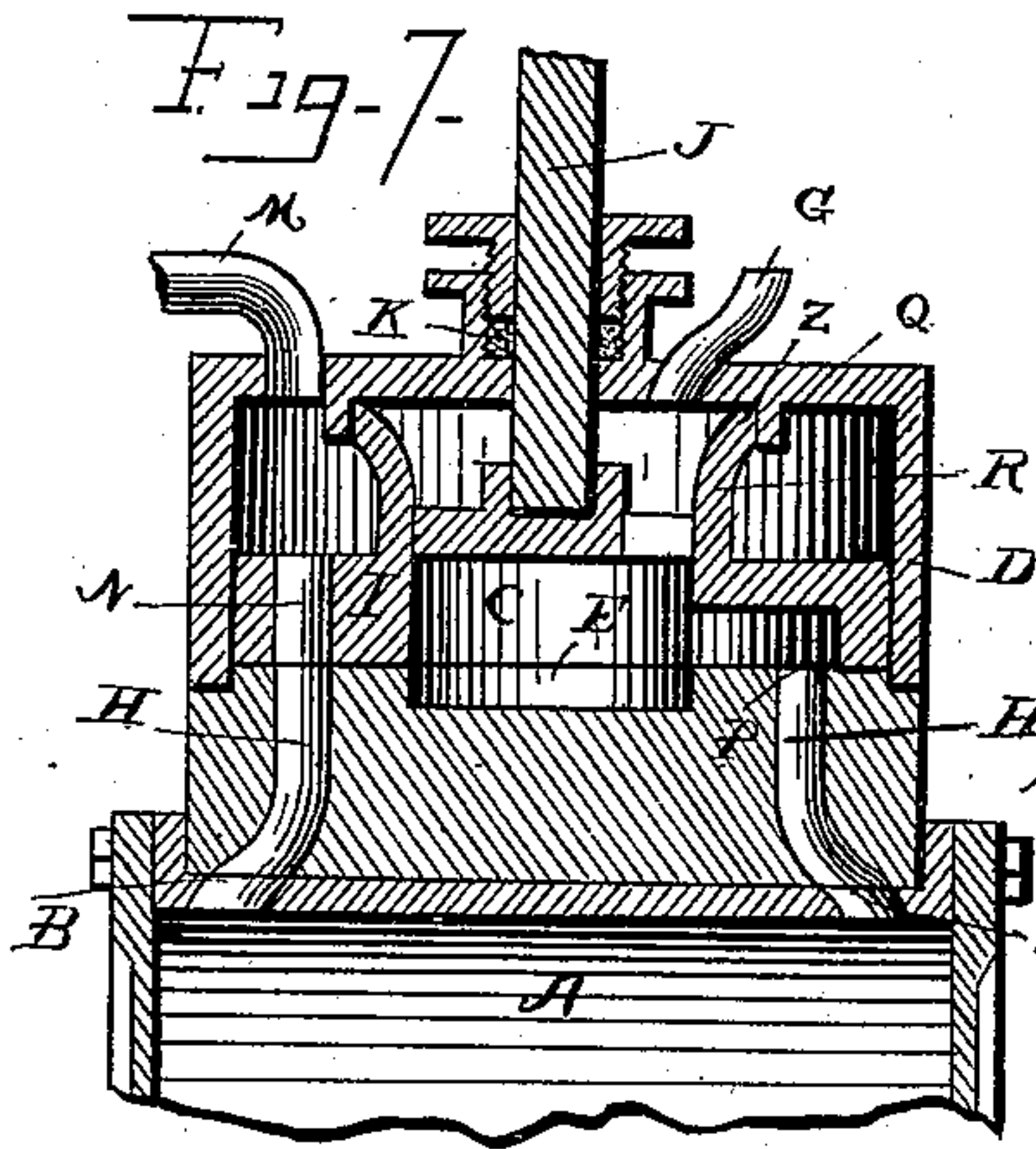


Fig. 6



Fig. 7



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# UNITED STATES PATENT OFFICE.

WILLIAM H. SMITH, OF LA CROSSE, WISCONSIN, ASSIGNOR OF ONE-HALF  
TO CHARLES H. SCHOFF, OF MARSHALLTOWN, IOWA.

## ROTARY STEAM-VALVE.

SPECIFICATION forming part of Letters Patent No. 352,895, dated November 16, 1886.

Application filed September 25, 1885. Serial No. 178,203. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. SMITH, a citizen of the United States of America, and a resident of the city of La Crosse, in the county of La Crosse and State of Wisconsin, have invented certain new and useful Improvements in Rotating Steam-Valves for Steam-Engines for working steam expansively and for reversing engines run by such rotating valves; and I do hereby declare that the following is a full, clear, and exact description of my invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Figure 1 is a longitudinal vertical sectional view of a steam-engine provided with my improved rotating reversible valve. Fig. 2 is a cross-section of the same. Fig. 3 is a view of the sectional circular plane lying on the top of the valve, with cut-off blocks attached underneath. Fig. 4 is a bottom view of my rotating reversible valve with three openings; Fig. 5, a plan view of valve-seat. Fig. 6 is a section of cut-off block, and Fig. 7 is a vertical section of valve.

Similar letters of reference indicate corresponding parts in all the figures.

My invention has relation to rotating valves for steam-engines for working steam expansively and reversing engines run by such valves; and it consists in the improved construction and combination of parts of a valve rotating upon an axis at right angles with the axis of the cylinder, as hereinafter described and claimed, in such a manner as to permit a free exhaust during the entire length of the stroke and as to be capable of taking steam with equal facility, being run in either direction, thus permitting a reverse of the engine.

In the accompanying drawings, the letter A indicates the cylinder of a steam-engine, which has the usual steam-channels, B B, opening at both ends of the cylinder and opening into the valve-seat, Fig. 5, at the points or openings H H, which are placed longitudinally on the cylinder.

The valve-seat, Fig. 5, is a circular plane, and is provided with a cylindrical valve-chest, D. The valve-seat has a central exhaust-recess, E, and this recess has a laterally-extend-

ing exhaust-channel, G, opening through the side of the valve-seat and provided with a suitable exhaust-pipe. The steam-channels B B from the ends of the cylinder form steam ports or openings H H, diametrically opposite each other and at the points of the valve-seat nearest to the ends of the cylinder. The valve-seat and valve-chest and the connection of the valve-seat with the cylinder are old and not claimed in this application.

The valve, Fig. 4, is circular, having its surface both top and bottom flat and bears with its under surface upon the valve-seat, and is turned by a stem or shaft, J, passing through its center, and turning with its lower end in the central bearing in the valve-seat, and with its upper portion passing through a stuffing-box, K, centrally located in the top of the valve-chest, which valve-chest is provided with a live-steam port, L, opening from a live-steam pipe, M. All of these appliances are old.

Near the edge of the circular valve and equidistant from each other are three (any other uneven number may be used) segmental slots or perforations, N, passing through the body of the valve and sufficiently wide to properly register with the openings in the valve-seat for the admission of steam into the cylinder through the valve-seat, and extending equally distant in length on either side of a diameter of the valve Y Y, cutting the segmental exhaust-recess P into equal parts, thus permitting the valve to rotate and take steam alike in either direction. These slots or perforations are long enough to permit the cylinder to take steam during the entire stroke. The length of these slots or perforations to cover an entire stroke and their location are new and a part of my invention.

The valve has a central exhaust-recess, O, excavated in its under surface, with sections extending into the steam-balance, to permit the exhaust-steam to freely enter the central cavity of the steam-balance, opening into a number of segmental recesses, P, equal to the number of slots or perforations N which are used in the valve, which segmental recesses are diametrically opposite such slots or perforations. These segmental recesses are excavations in the under surface of the valve, and furnish exhaust-openings, and are made to register with the openings in the valve-



seat, and are long enough to admit of an entire stroke of the engine. These exhaust-recesses and excavations are old.

There is a cylindrical steam-balance, R, of the diameter of the exhaust-opening, in the center of the valve, attached to the top of the valve (or may be cast with it) in its center, and extending to the top of the valve-chest, having a flange, Q, at its top and a bearing on an annular flange, z, or bearing projecting from the under side of the covering of the valve-chest, and fitting steam-tight. This is old.

There are cut-off blocks or sections T, of the thickness of the valve, fitting steam-tight in the slots N, which form the cut-off of live steam, and are movable from one end of the slot or steam-port to the other. These cut-off blocks have a flange projecting from the under surface, on the curved sides, fitting a corresponding surface at the edge of the slot on the under side of the valve. This flange is for the purpose of more completely covering the port in the valve-seat as the cut-off block passes over it, and also to keep the blocks in place. These cut-off blocks and the manner of constructing and using them are new and a part of my invention. Fig. 6 is an end view of one of these blocks.

There is a circular sectional plane, Fig. 3, of sufficient thickness to give it the required strength, lying on the top of the valve, fitting closely around the cylindrical steam-balance, and ground down on its under side to fit closely to the top of the valve. The sectional radii U lie over the cut-off blocks T, and are wide enough to form a slight projection on each side of said blocks. These blocks are made fast by screws or otherwise to the radii of this sectional circular plane, and are moved by it. On the top of this circular plane and around its periphery is a set of cogs, S, engaging the cog-wheel x. This device is designed to change the location of the cut-off blocks from one end of the steam port or perforation N to the other at will, thereby permitting a reverse motion of the engine. This sectional circular plane and the manner of attaching it to the cut-off blocks and of using and controlling it are new and a part of my invention. The cog-wheel x will be disengaged by pulling it outwardly into the cavity in the valve-chest a', or by any other means. The change in the location of these cut-off blocks may be made by any other device without departing from the spirit of my invention. It follows that the length of the cut-off blocks T will determine the cut-off of live steam, whether one-half, one-third, one-fourth, or at any other point, and may be changed whenever a change in the cut-off is desired.

When steam is let into the valve-chest and a slot or perforation is brought to register with one of the steam-channels of the cylinder in the valve-seat, the steam will enter through the same into the cylinder, and at the same time a segmental exhaust-recess will

be over the opposite port or opening, allowing the exhaust-steam to pass from the cylinder into the central recess in the valve, and out through the exhaust-opening in the valve-seat, and by revolving the valve the piston will make one stroke for each set of slots and recesses in the valve. The exhaust will continue until the piston has completed its stroke, so that the exhaust will be perfect, and the cut-off will be such as to allow the steam to act by expansion. When the cut-off block is changed to the other end of the slot, the valve can rotate and take steam in the opposite direction, thus permitting a reverse of the engine.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination of a circular valve-chest having a valve-seat at its bottom, a circular valve having a series of segmental openings, and a segmental block within each of said openings, each of said blocks being shorter than the said openings and adapted to be moved therein.

2. The combination of a circular valve-chest having a valve-seat at its bottom, a circular valve having a series of segmental recesses upon its under side, said recesses opening into a central exhaust-aperture, and a segmental opening in said valve between each of said recesses, a plate fitting upon said valve having a central aperture and a series of segmental openings, a segmental block secured to each of the radii of said plate and fitting within said segmental openings in said valve, said blocks being shorter than said openings and adapted to be moved therein.

3. The combination of a circular valve-chest having a valve-seat at its bottom, a valve having a series of segmental openings, a plate having a circular aperture and a series of segmental openings, and a block secured to each of the radii of said plate, said blocks being shorter than the openings in said valve, and having a flange projecting from their under sides and adapted to be moved within said openings.

4. The combination of a circular valve-chest having a valve-seat at its bottom, a valve having a series of segmental openings, a plate having a central aperture and a series of segmental openings, a block secured to each of the radii of said plate and adapted to be moved from end to end of said openings in said valve, the periphery of said plate being provided with cog-teeth, and a cog-pinion, said valve-chest being provided with a recess upon one side for the reception of said cog-pinion.

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

WILLIAM H. SMITH.

Witnesses:

WM. H. STOGDILL,  
S. MARTINDALE.