

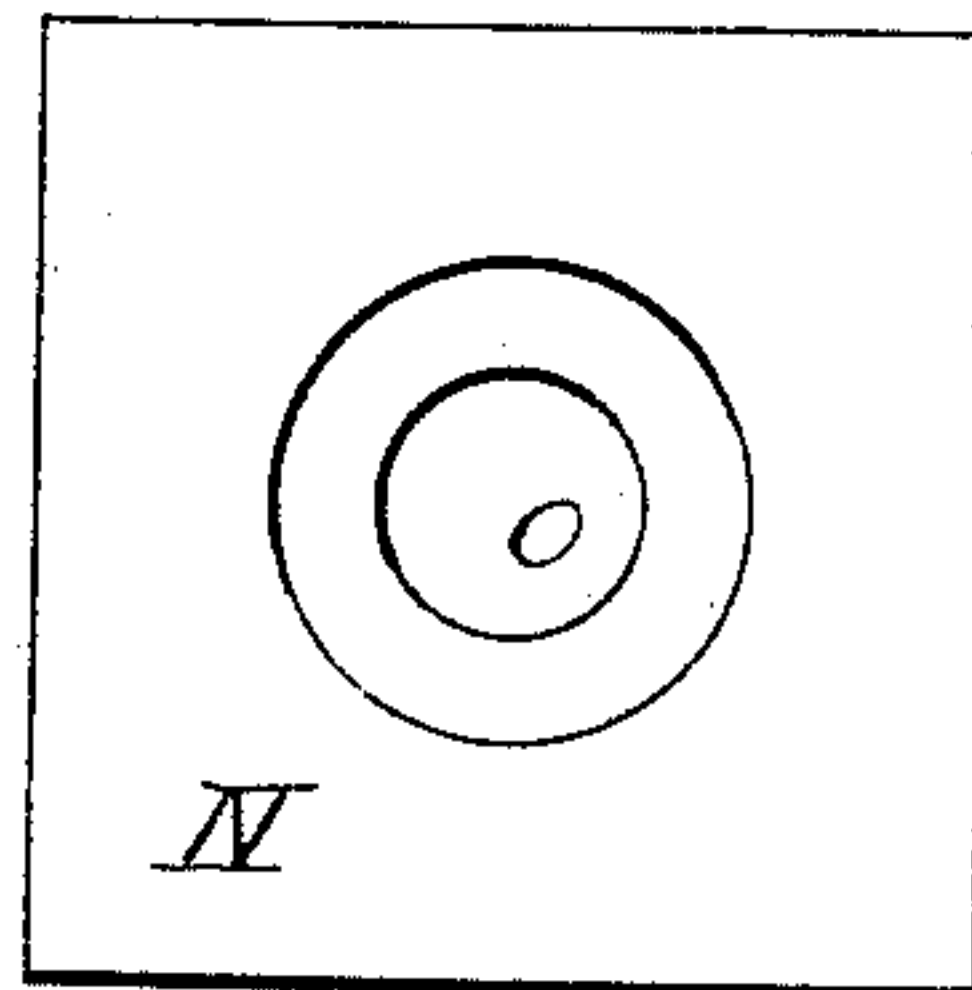
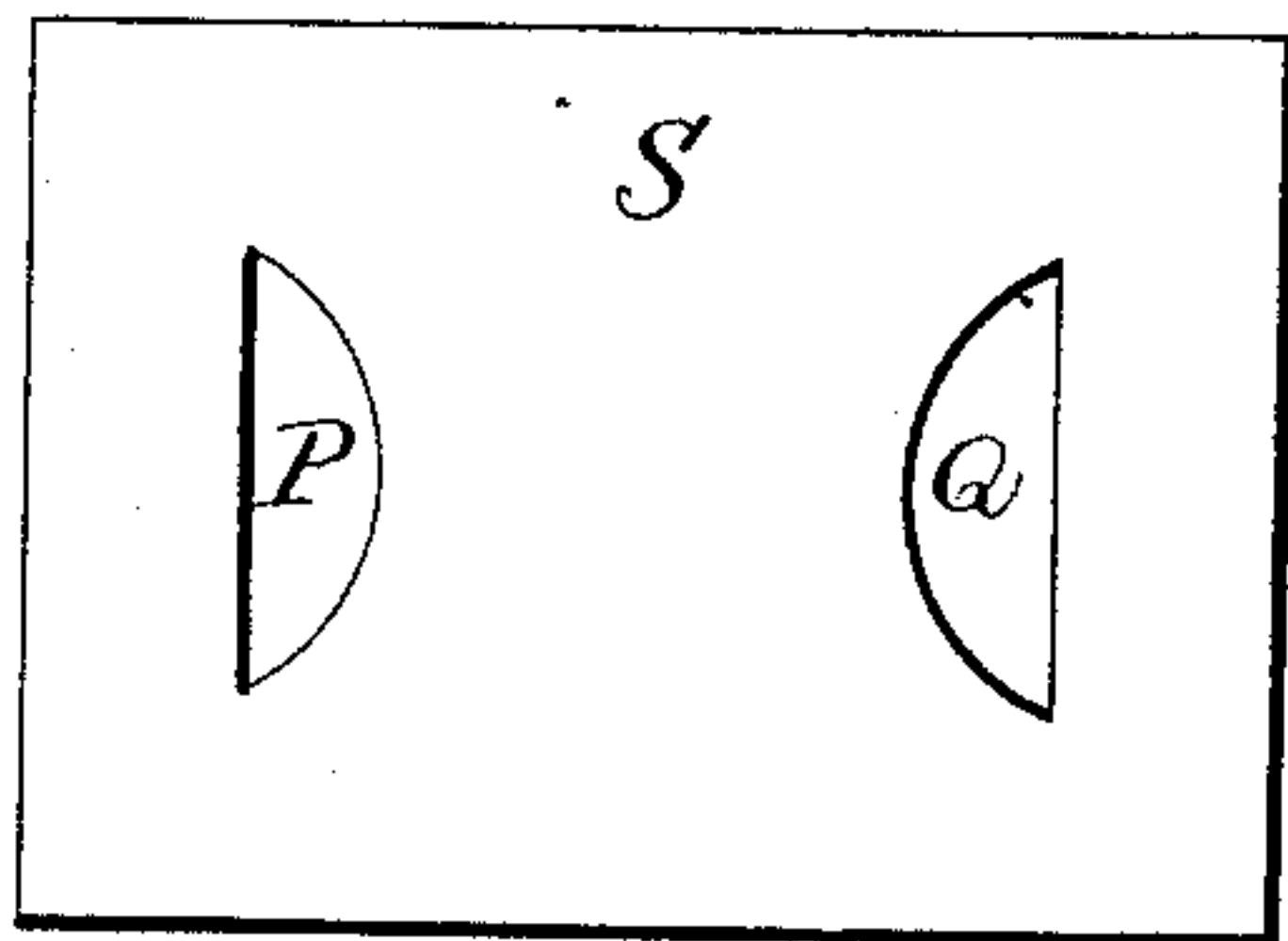
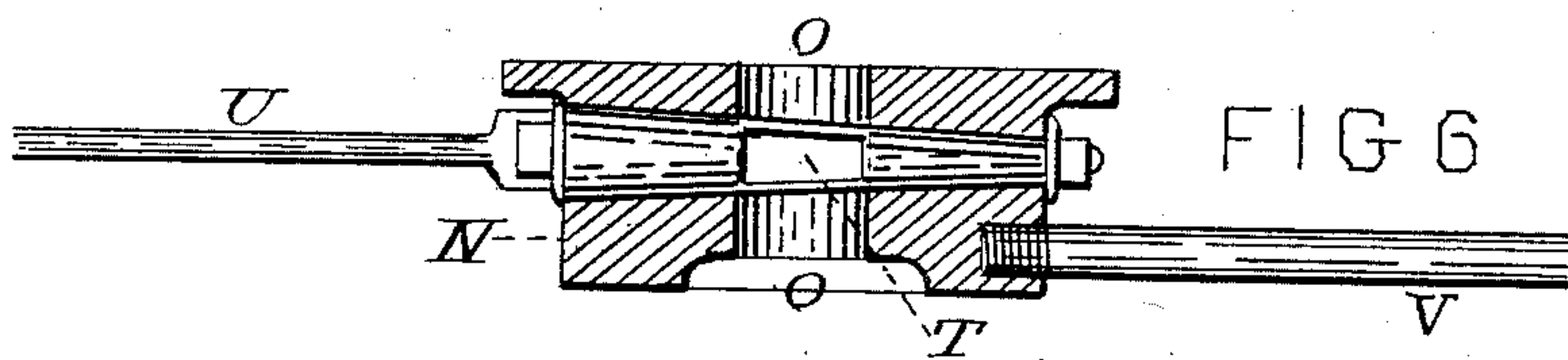
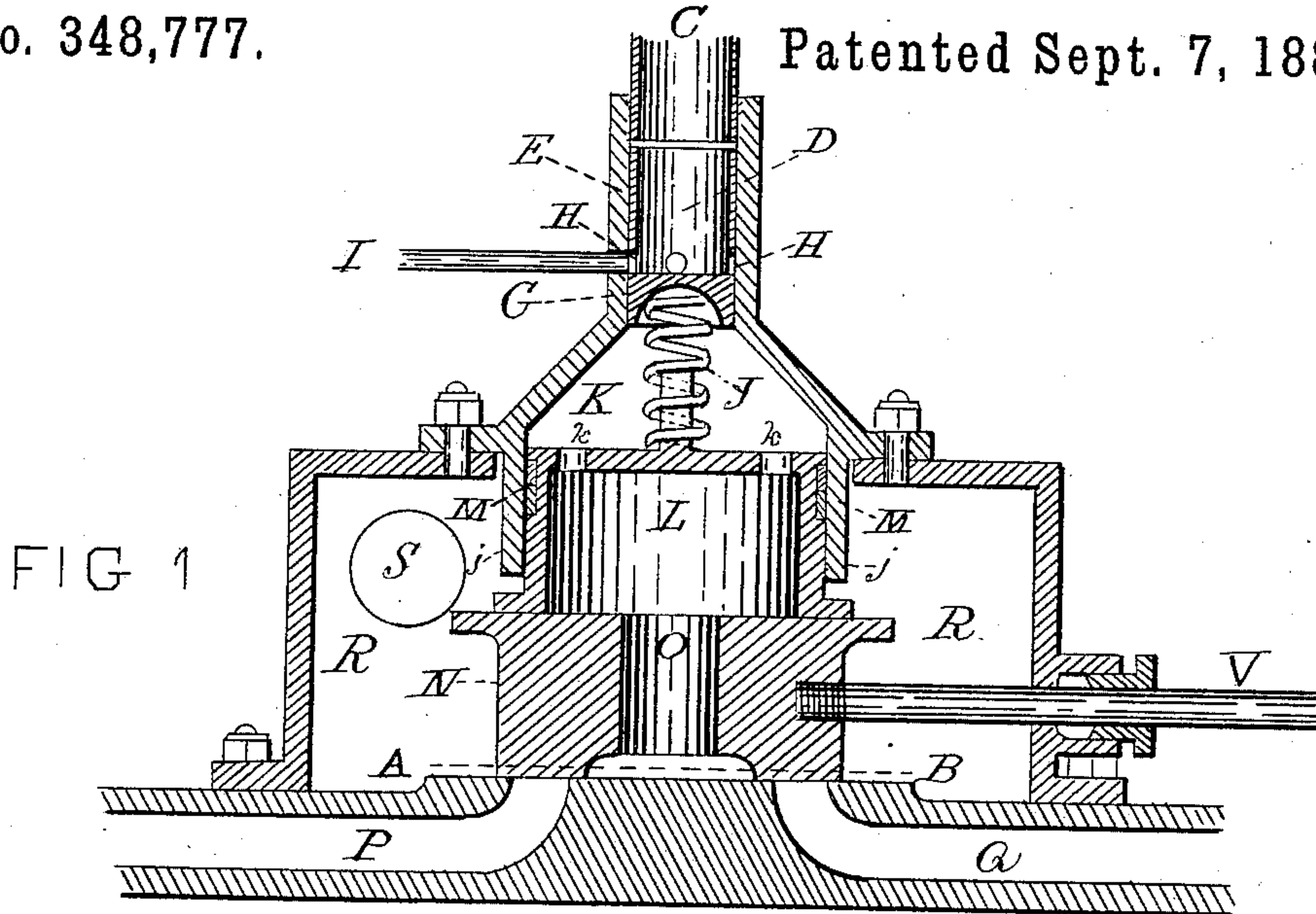
(No Model.)

2 Sheets—Sheet 1.

Z. T. RENO.
SLIDE VALVE.

No. 348,777.

Patented Sept. 7, 1886.



WITNESSES.

Frederic Book
Edward Blanchard

INVENTOR.

Bochary. Taylor. Reno

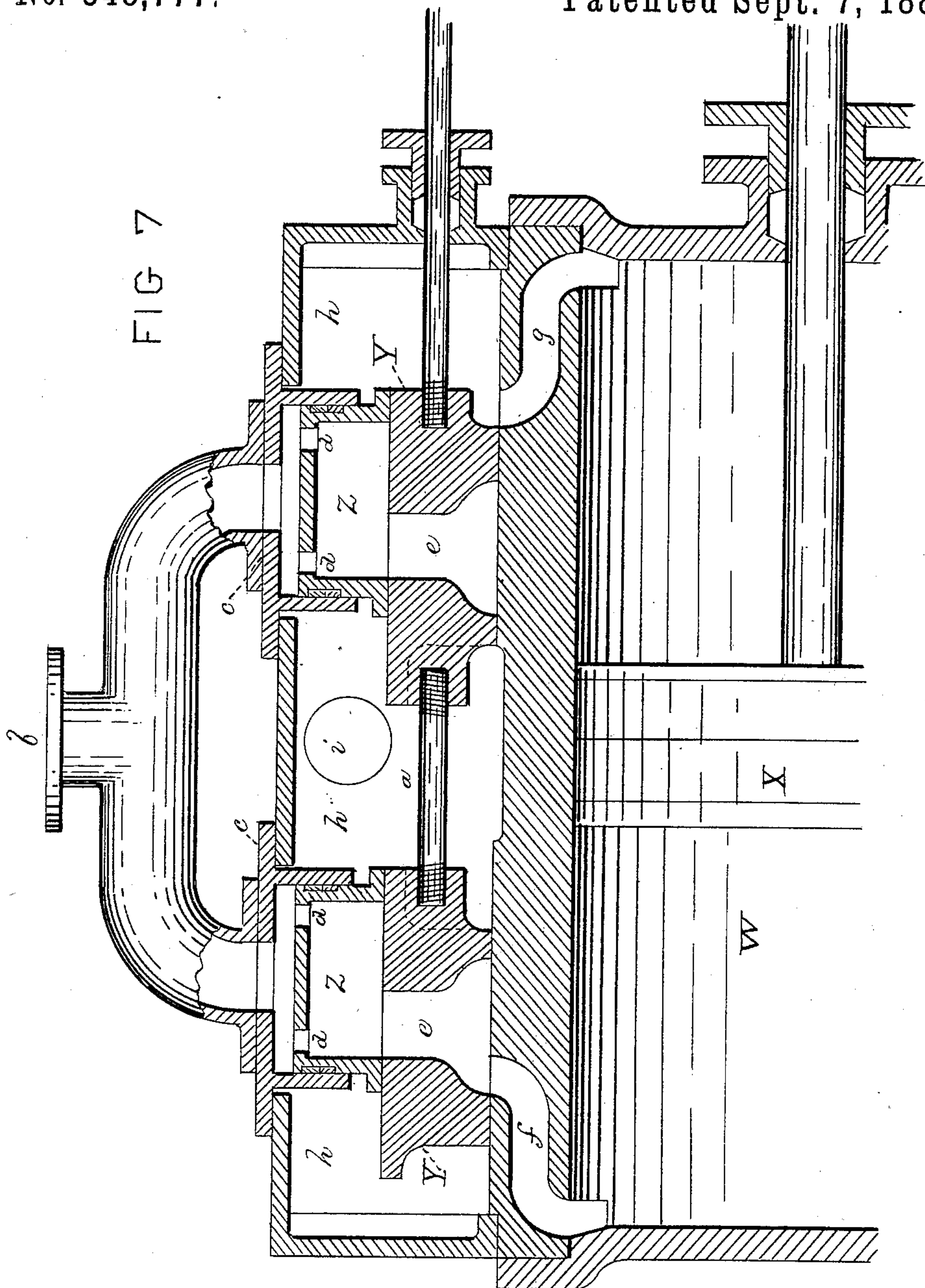
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UNITED STATES PATENT OFFICE.

ZACHARY TAYLOR RENO, OF NEW ORLEANS, LOUISIANA.

SLIDE-VALVE.

SPECIFICATION forming part of Letters Patent No. 348,777, dated September 7, 1886.

Application filed December 21, 1885. Serial No. 186,363. (No model.)

To all whom it may concern:

Be it known that I, ZACHARY TAYLOR RENO, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Improvement in Slide-Valves for Steam-Engines, of which the following is a specification.

My invention relates to improvements in slide-valves and the manner of admitting steam to them, so that the water of condensation may largely free itself previous to passing through the slide-valve in the cylinder; also, to provide a balanced or nearly balanced slide-valve having a central steam-opening through it and having steam-pressure top and bottom of the valve which works over the steam-ports and allows the steam to exhaust into the steam-chest, into which high steam does not enter; also, to provide a valve and steam-ports in valve-seat of engine-cylinder that will permit a rapid discharge of exhaust-steam, which is especially desirable in locomotives and high-speed steam-engines. These objects are obtained by the mechanism shown in the accompanying drawings, in which like letters refer to like parts.

Figure 1 represents a longitudinal section through the slide-valve, the steam-chest, and steam-ports of a steam-engine cylinder. Fig. 2 is a face view of valve-seat of engine-cylinder. Fig. 3 is the face view of the bottom of the slide-valve. Fig. 4 is a horizontal section of slide through line A B, Fig. 1, and shows, also, the valve-seat under the valve with the relative position of valve and steam-ports in valve-seat at the end of extreme throw of valve. Fig. 5 is a similar view as Fig. 4, but shows the valve just beginning to admit steam and the relative size of exhaust-opening. Fig. 6 shows a longitudinal section of valve with a regulating-cock through it. Fig. 7 is a longitudinal section of part of a steam-engine cylinder and piston and arrangement of double slide-valves.

Steam enters steam-pipe C, Fig. 1. At D is a short pipe turned and fitted so it will slide in a bored hole of steam-chest cover E. The sliding pipe D is solid at bottom G, and forms a piston. When steam is lightly turned on pipe C, the condensed water in the pipe is

driven out through holes H and drip-pipe I. As the pressure increases, the piston D descends, overcoming the resistance of the spiral spring J until the holes H in pipe D open into the chamber K, when the entrance to pipe I is cut off and steam enters chamber K, presses on piston L, which works in cylinder J, formed by lower part of steam-chest cover E, and a steam-joint is made by packing-rings M. The lower face of piston L presses an upper face of the valve N. The steam passes through holes K in piston L, thence through hole O in valve N. The lower part of hole O is enlarged to just the extent that is necessary to make its area slightly less than the area of the inside of the piston L, so that the valve N may be nearly balanced, but held down by the greater pressure on top.

At P Q are the ports through which pass alternately high and exhaust steam. The steam exhausts into the steam-chest R and passes out through hole S.

At Fig. 4 the relative positions of valve N and openings P and Q in valve-seat S are shown when wide open. The steam is entering opening Q and exhausting out of opening P.

At Fig. 5 the relative positions of valve N and valve-seat S are shown when steam commences to enter and steam begins to exhaust. It will be seen that by the shapes of the openings in valve N and the openings P and Q in valve-seat that at all parts of the stroke the exhaust is larger than the steam-opening, even if the valve be set without any lead on the exhaust. This is obtained by the combined curved and straight lines on same opening in valve-seat S, and the circular or curved shaped opening O in valve N.

I do not confine myself to using the herein-described valve N in combination with the described steam-openings in valve and valve-seat, as the valve N can be used equally as well with parallelogram or other shaped openings in valve and valve-seat; but I prefer the herein-described shapes. Nor do I confine myself to using the described balance-valve N in combination with the described mechanism for removing condensed water from steam-pipe, as the valve N can be worked advan-

tageously without such mechanism as well as with it, as shown at Fig. 7, in which the valve N of Figs. 1, 3, 4, 5 becomes valve Y.

Fig. 6 shows a cock, T, through hole O in valve N.

U is a socket-wrench handle fastened to cock T, and passes through a stuffing-box in end of steam-chest, with a handle outside to regulate at will the flow of steam immediately at the steam-openings P and Q.

V is the valve-stem.

This cock T in valve N will not be used generally; but I desire to show and describe the arrangement if I should ever desire to use it.

Fig. 7 shows part of a steam-engine cylinder, W, and piston X, and arranged for double valves Y Y and double valve-pistons Z Z. The valves Y Y are connected together in any suitable way, as at *a*. The steam-pipe *b* branches to each steam-chest cover *c*. The steam passes in through holes *d* and holes *e* in valves Y.

The drawings at Fig. 7 show the steam-port *b* receiving full opening of steam. The port *g* is full open, through which the exhaust-steam is passing out into the steam-chest *h*,

and thence escapes through hole *i* into escape-pipe.

What I claim, and desire to secure by Letters Patent, is—

1. A solid valve provided with a direct continuous steam-passage through it from top to bottom face, in combination with a piston and cylinder over the valve, the piston resting on top face of valve, substantially as described.

2. A solid slide-valve having a direct continuous central steam-passage through it, in combination with steam-ports in valve-seat provided with straight and curved edges to each port for the purpose of obtaining a free and rapid exhaust, substantially as described.

3. The herein-described slide-valve N, in combination with the piston L, the cylinder *j*, the spring J, and the piston D, provided with the holes H to allow the water of condensation to pass out of steam-pipe through drip-pipe I, substantially as described.

ZACHARY TAYLOR RENO.

Witnesses:

FREDERIC COOK,

EDWARD J. BLANCHARD.