

(No Model.)

2 Sheets—Sheet 1.

W. P. SCATES.
STEAM ENGINE.

No. 452,432.

Patented May 19, 1891.

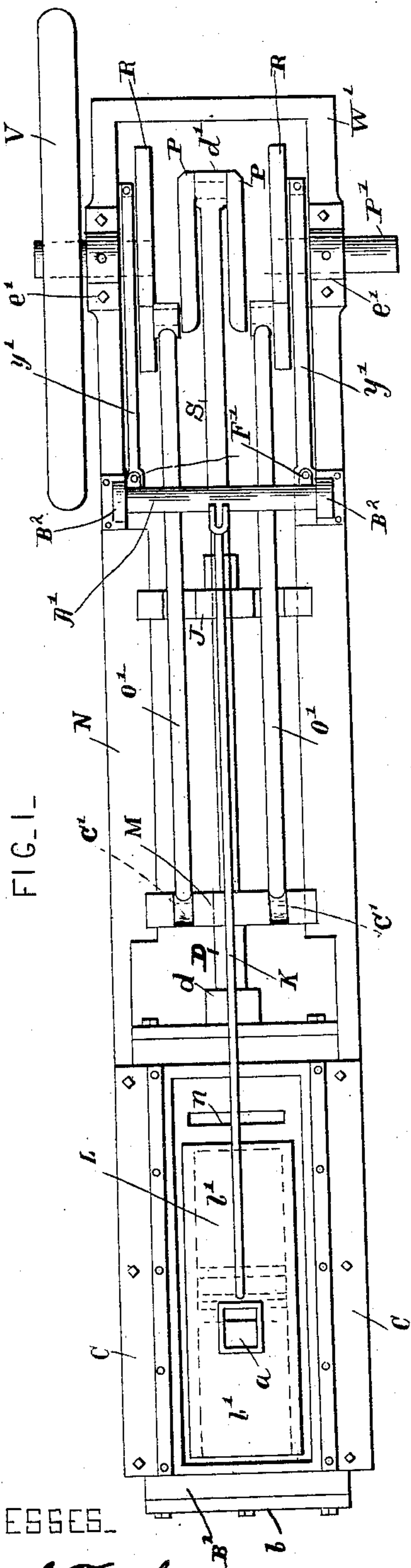


FIG. 1.

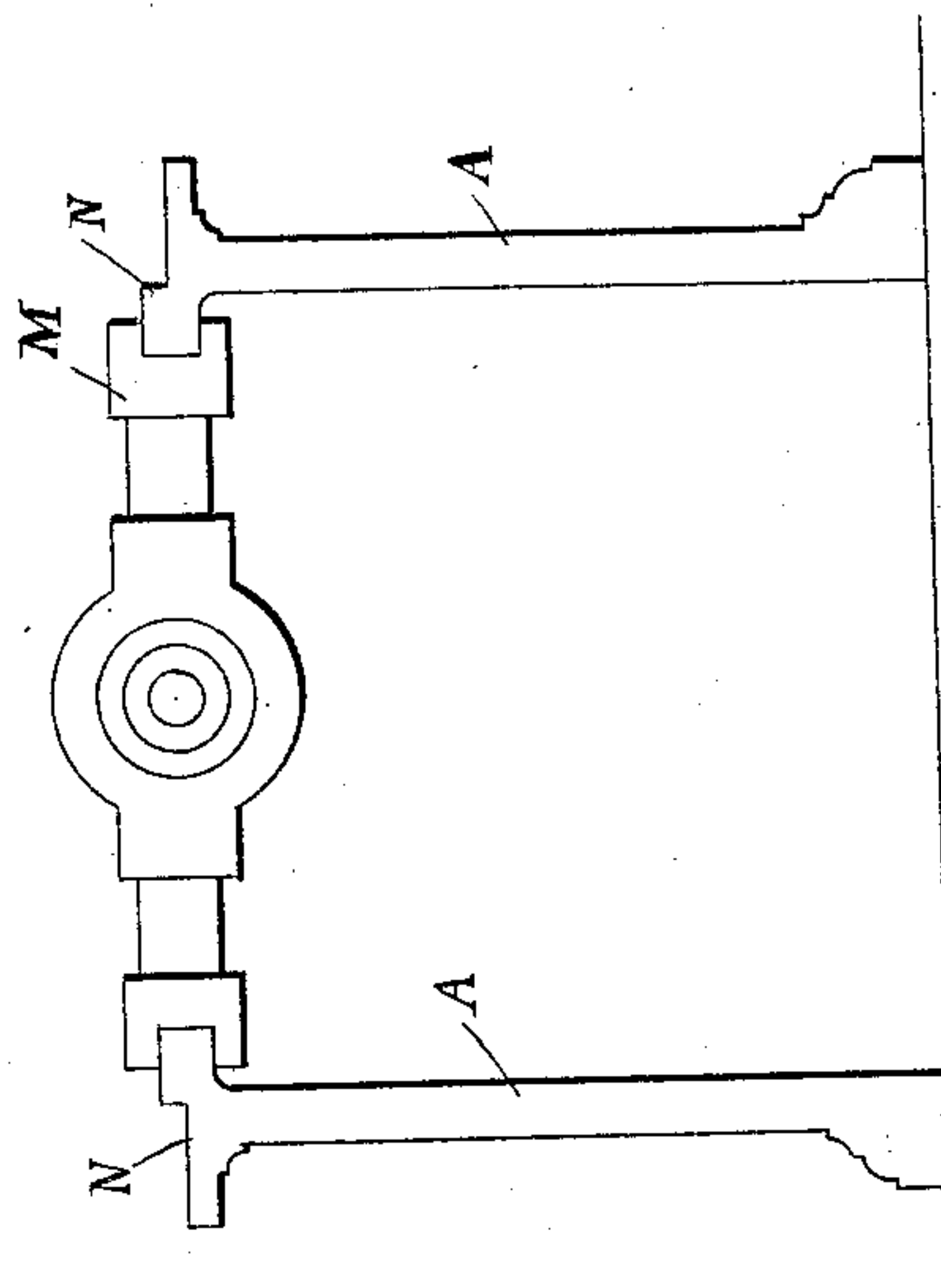


FIG. 3.

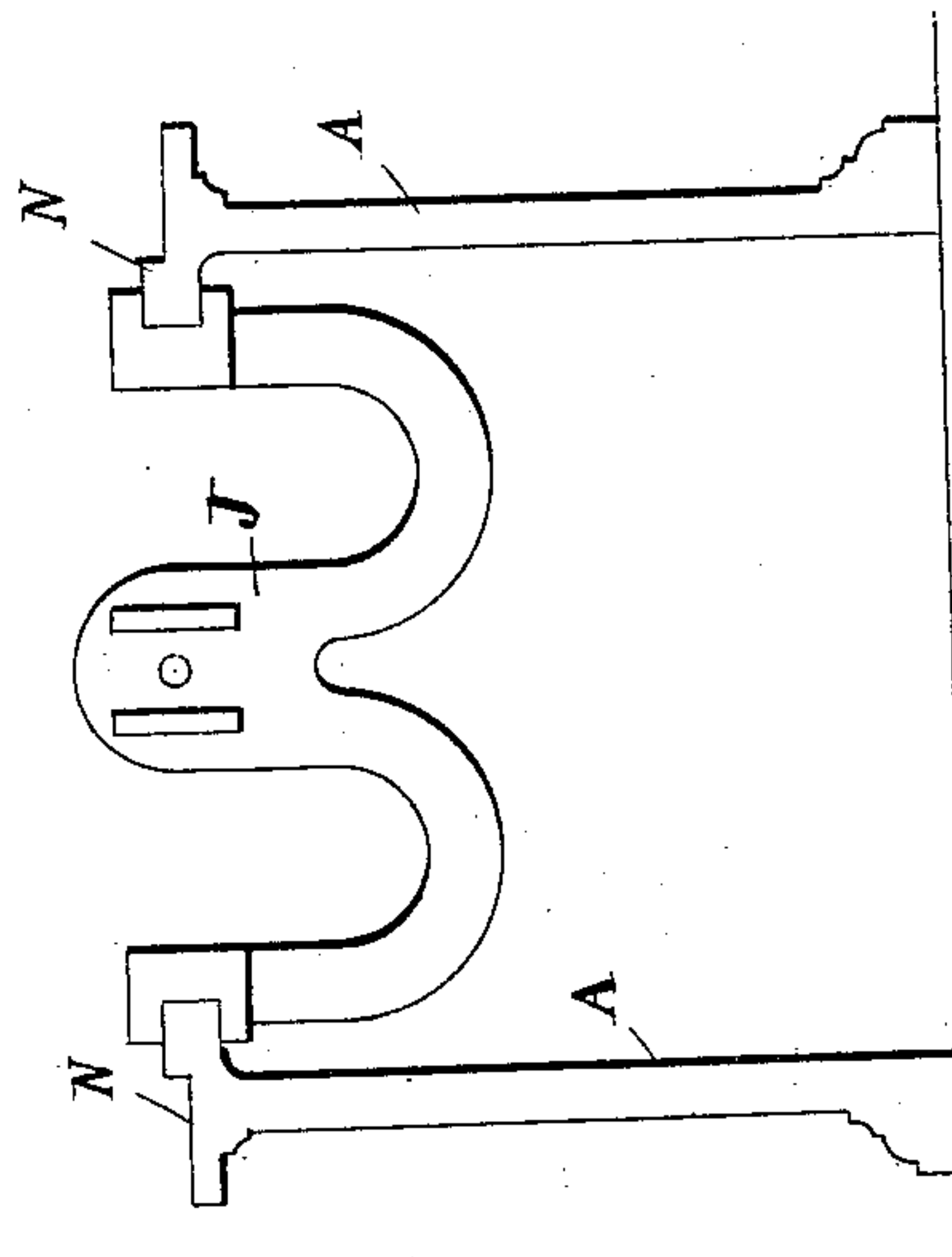


FIG. 2.

WITNESSES.

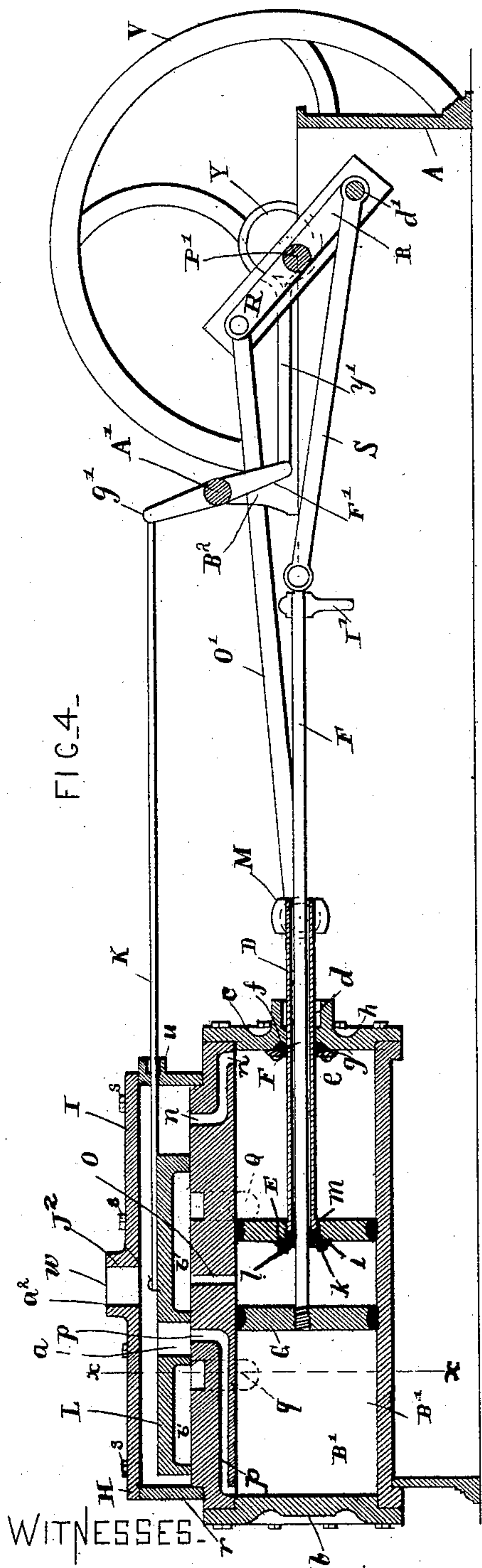
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Wm. Nesbit.

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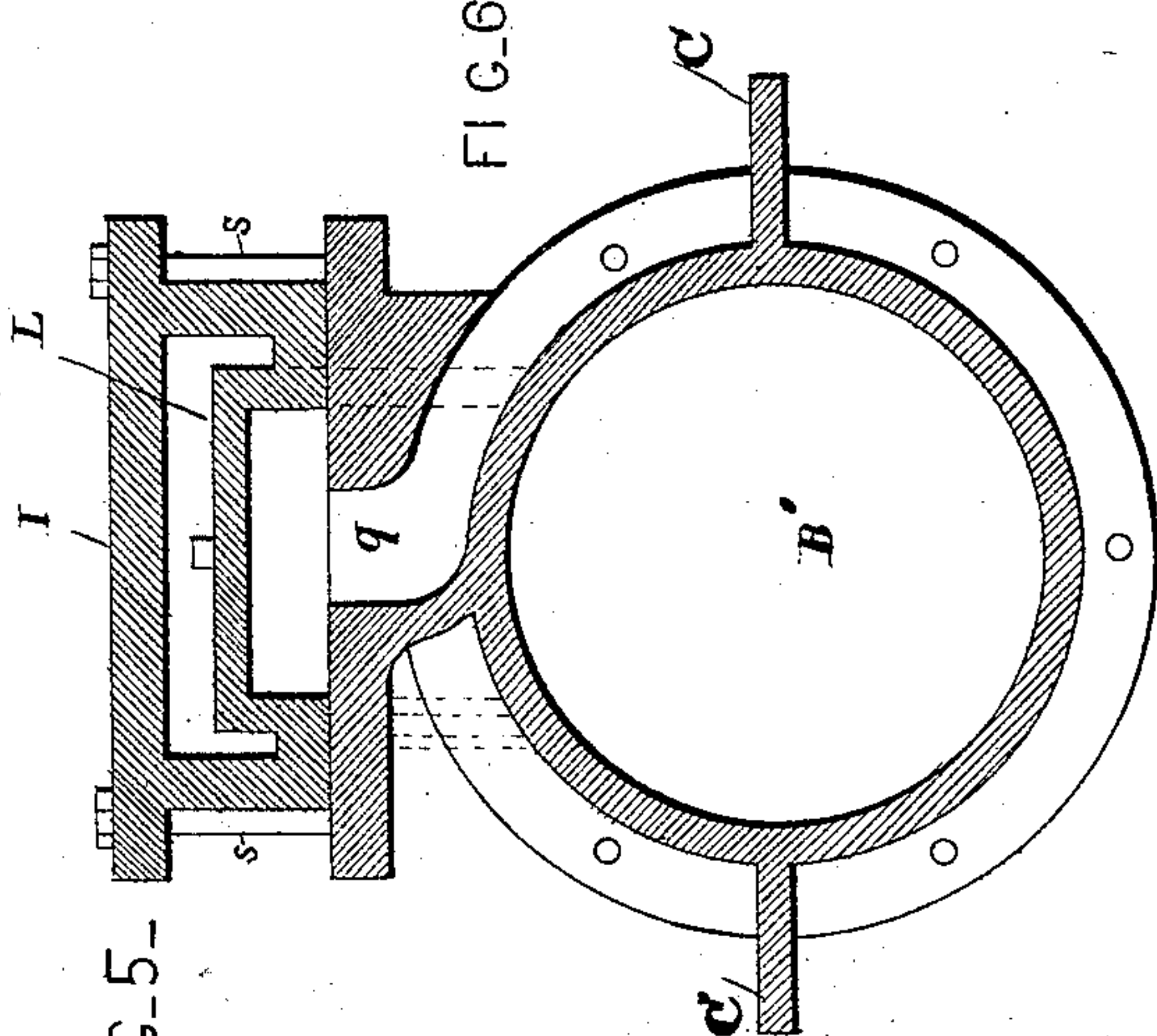
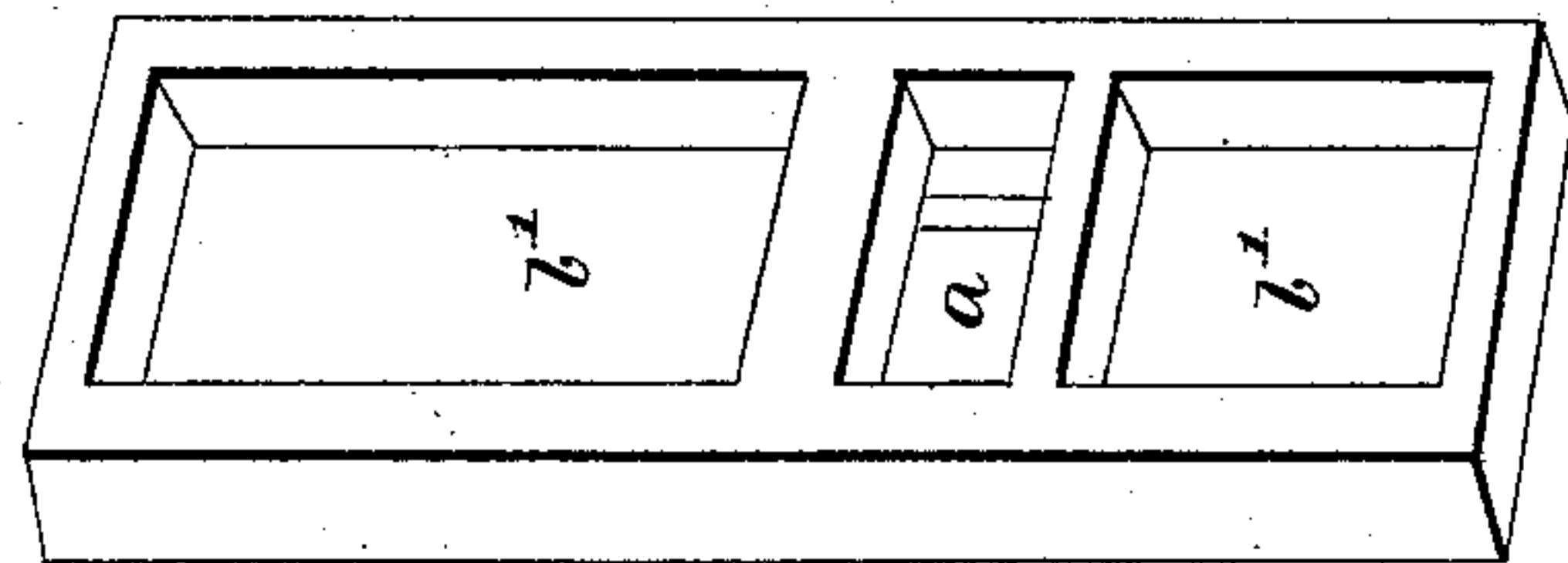
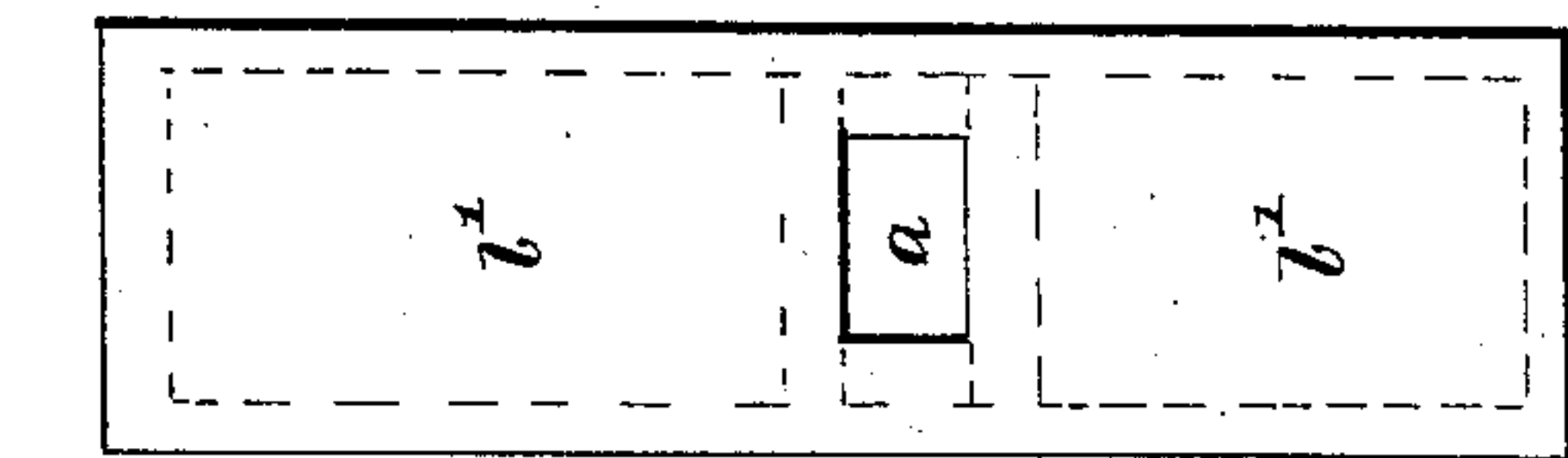
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WITNESSES:
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UNITED STATES PATENT OFFICE.

WILLIAM P. SCATES, OF KNOXVILLE, TENNESSEE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 452,432, dated May 19, 1891.

Application filed June 4, 1889. Serial No. 313,106. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. SCATES, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented certain new and useful Improvements in Steam-Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to new and useful improvements in steam-engines; and it consists in the construction and arrangement of parts which will be fully described hereinafter, and referred to in the claim.

The object of my invention is to produce a steam-engine having two pistons which are constructed and arranged to move in opposite directions and a single valve so constructed as to admit and exhaust steam for properly operating the pistons.

Reference is had to the drawings accompanying this application and forming part of the same, in which—

Figure 1 is a top plan view of my invention. Fig. 2 is an end view of the W-shaped cross-head and section of frame. Fig. 3 is an end view of the other cross-head. Fig. 4 is a longitudinal sectional view of engine and connections. Fig. 5 is a cross-sectional view taken on lines X X, Fig. 4. Fig. 6 is a perspective view of the sliding valve. Fig. 7 is a plan view of the same.

A represents the frame or bed-pieces to which the engine is secured, and cylinder B' has supporting flanges C, which are bolted or otherwise fastened to the said bed-plate.

The cylinder B' is provided with outer and inner heads or caps b and c, the inner head c being provided with a central perforation d, of sufficient size to admit the enlarged piston-rod and permit it to work freely longitudinally. A concave recess e is formed in the inner edge of the perforation d, and in this recess a flexible packing f is placed and held by means of a gasket or ring g. In this manner a steam-tight packing is formed around

the piston D at any pressure used with a minimum amount of friction.

The inner end of the piston-rod D is secured to a piston E, that is provided with a central perforation i, adapted to receive the screw-threaded inner end of the piston-rod D, the perforation i being likewise screw-threaded, by means of which the piston-head E is secured tightly to the end of the rod D. A cup-shaped enlargement is formed in the inner end of the perforation i, in which is placed a packing k, and a gasket or ring l is suitably secured to the piston for holding the packing in place, as shown. By this construction a steam-tight joint is formed around the piston-rod F, which moves longitudinally through the piston-rod D. The piston-head E is provided with elastic packing around its periphery in the usual manner, and it is adapted to move from the steam-port n to the steam-port o. The piston G is formed in like manner, except the inner end of the piston-rod F is screw-threaded and secured to the center of the piston G without a cup-shaped central recess. The free end of the piston-rod F passes through the piston-rod D, which is made hollow.

The steam-ports n, o, and p are small openings formed in cylinder B' under the steam-chest H. The opening for port n is made through the side of the cylinder B' near its inner end, and the steam-port o is formed near the center and steam-port p near the outer end. The purpose of this construction, as shown in Fig. 4, is to permit steam to pass through the port o into cylinder B', between the piston-heads E and G, and by expansion force said piston-heads apart with great force, driving piston-head G the length of its stroke to the inner edge of the port p and driving piston-head E in the opposite direction to the inner edge of the port n. Steam is then let into ports n and p simultaneously between the inner faces of the cylinder-heads c and b and the flat faces of piston-heads E and G, and by its expansive force moves said pistons back to their original positions on either side of the port o near the center of the cylinder B'. As the piston-heads E and G travel outward from the center the exhaust-steam passes out of the ports n and p

and through openings $Q q$, formed between the cylinder B' and the steam-chest H , and as the said piston-heads move toward the center port o the exhaust-steam passes out of the port o and through a side opening Q , formed between the cylinder B' and steam-chest H .

Steam-chest cap-plate I is provided with a central steam-inlet J^2 , which may have a plug or cut-off in the usual form, and the inner end of the steam-chest H is also formed with an opening u to permit the valve-stem K to pass in freely.

The valve M is formed angular and of proper size to work freely inside of the steam-chest. An angular perforation a is formed about two-thirds the length of the valve, and between said perforation and the outer ends or longitudinal extremities two angular cavities B' are formed in the under face of said valve for the purpose of directing the exhaust-steam out of the openings $Q q$.

Curved inlet-ports n and p are formed in the bed-piece of steam-chest H , port n being formed between exhaust-opening Q and the inner end of the cylinder, with its inlet close to the inner face of the cylinder-head c , and port p is formed with its inlet-opening between the central port o and the exhaust-opening q , and, passing under said exhaust, terminates in an outer opening close to the inner face of the cylinder-head b . The central steam-port o is formed in the steam-chest H in a vertical line with the inlet-opening J^2 , as shown in Fig. 4. By this construction, when valve L is at rest and the opening J^2 and a and the central port o are in line or registering, live steam will pass directly through said openings and port into the cylinder B' at about its central point, between the two pistons E and G , forcing them apart by the expansive force of said steam, driving each its full stroke to the ends of cylinder B' . The full expansive force of the steam is thus utilized.

The outer end of the piston-rod D is secured to cross-head M , which works in guides N , and the outer arms of said cross-head are loosely secured to one end of connecting-rods O' by means of wrist-loops C' . The opposite ends of said connecting-rods are in like manner connected to the double crank-arm P , which is jointed to shaft P' by means of plates R , or it may be formed integral with said shaft.

The outer ends of the piston-rod F are centrally secured to a **W**-shaped cross-head J , adapted to work in guideways N , the **U**-

shaped parts on each side of the piston-rod F being formed to permit of the free vertical movement of the connecting-rods O' .

One end of the connecting-rod S is pivoted to the center of the cross-head J , and the opposite end is loosely held to the bend in the crank-arm P , opposite to the bends that are joined to connecting-rods O' by means of wrist-loop d' .

Crank-shaft P is journaled in the frame A and provided with a balance-wheel V .

By this construction, as shown in Fig. 4, when the outer piston-heads E and G are forced apart by steam, the piston D , with connecting-rods O' , exerts a pushing force on crank-arm P , and the piston F , with connecting-rod S , exerts a pulling force on said arm, thereby equalizing the strain on said shaft P' , causing it to run more steadily.

The outer ends of the double crank are secured rigidly to plates R , and between plates R and the inner faces of journal-boxes e' are secured to the outer faces of plates R , the eccentrics Y , the arms y' of which are pivoted to downwardly-projecting arms F' on rock-shaft A' , the outer ends of said shaft being journaled in uprights B^2 , and the center is provided with an upright projection g' , to which is pivoted the outer end of the valve-stem K .

Having thus described my invention, I claim—

In a steam-engine, a cylinder, two pistons within the cylinder, which move in opposite directions, inlet-ports at the center and at each end of the cylinder, the inlet end of one of said end ports extending inward to near the center of the cylinder, an exhaust-port between its inlet end and the end of the cylinder, and an exhaust-port between the other end port and the central port, a valve having a chamber in its under face at each end, one chamber being larger than the other, for the purpose shown, and an opening through the valve between the two chambers, the parts combined to operate in the manner shown and described, whereby a single valve is used.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM ^{his} × P. SCATES.
mark

Witnesses:

W. M. ASHMORE,
C. T. SISK.