

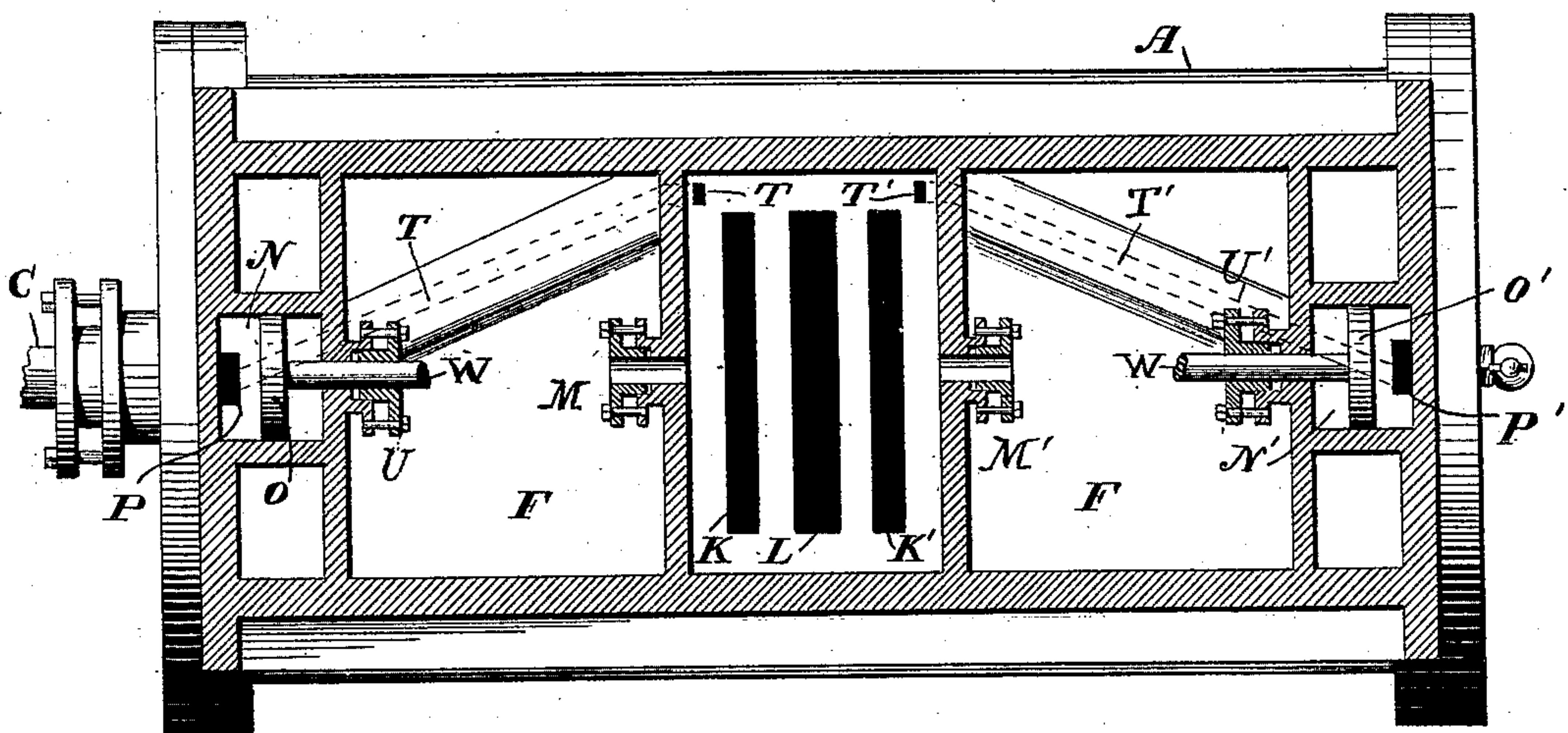
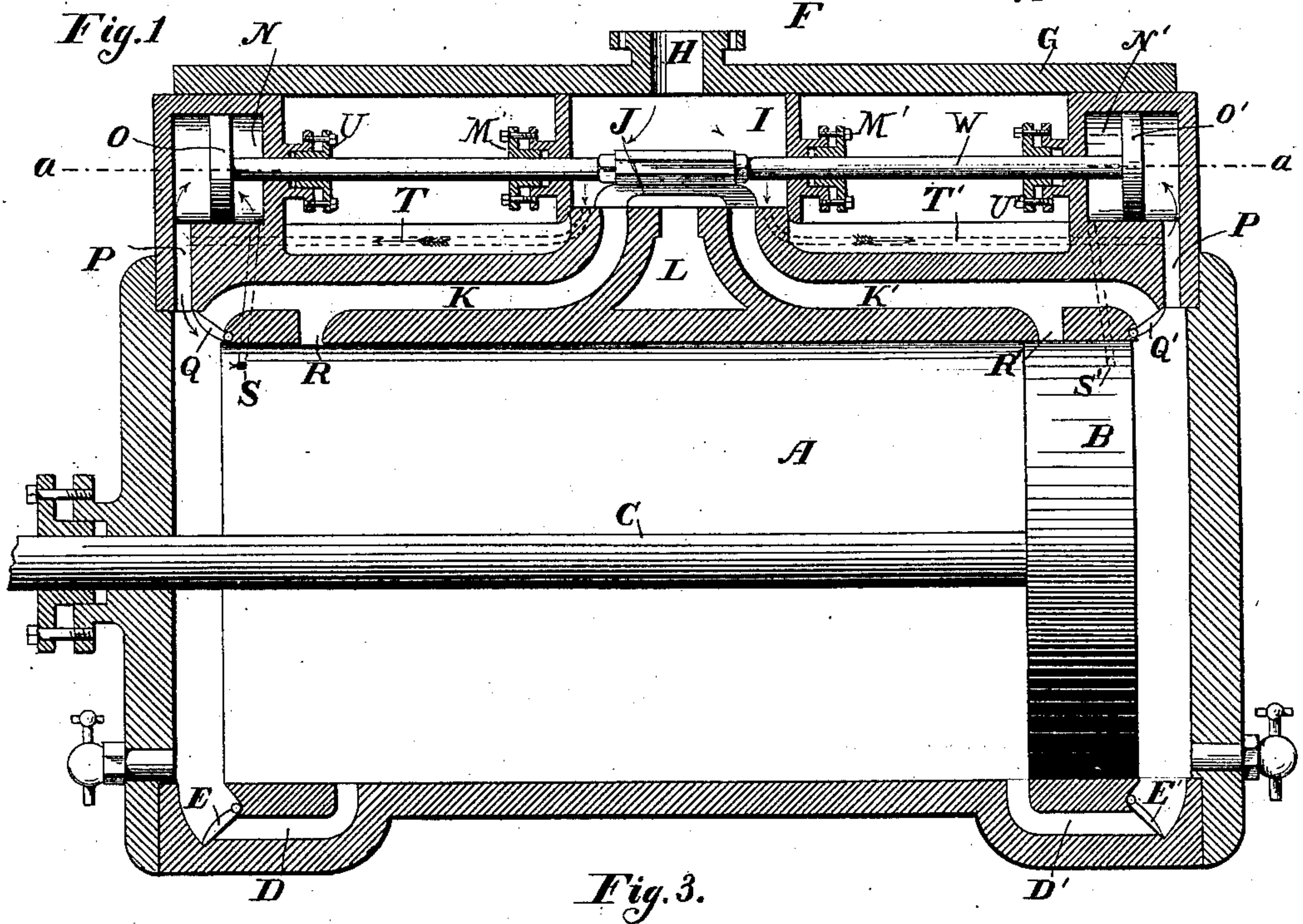
(No Model.)

2 Sheets—Sheet 1.

R. B. ANGUS.
STEAM ACTUATED VALVE.

No. 275,746.

Patented Apr. 10, 1883.



WITNESSES:

A. H. Leubon
John D. Leubon

Robert B. Angus,
INVENTOR
By his Attorney
W. C. Strawbridge,
J. Bonsall Taylor.

(No Model.)

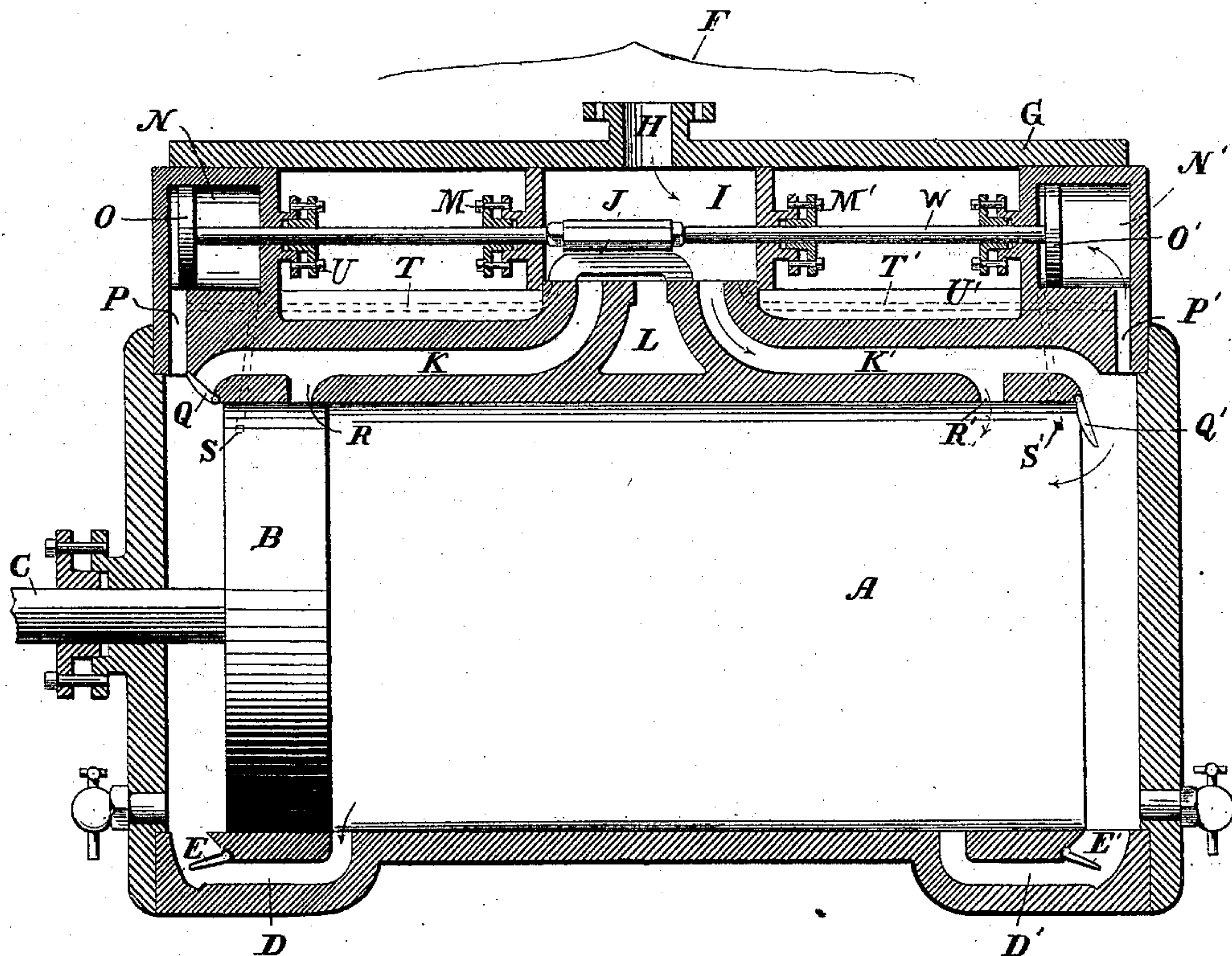
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Fig. 2.



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A. H. Leubner
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Robert B. Angus,

INVENTOR

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UNITED STATES PATENT OFFICE.

ROBERT B. ANGUS, OF POTTSVILLE, ASSIGNOR OF ONE-HALF TO CALVIN W. BROWER, OF TREMONT, PENNSYLVANIA.

STEAM-ACTUATED VALVE.

SPECIFICATION forming part of Letters Patent No. 275,746, dated April 10, 1883.

Application filed December 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, ROBERT B. ANGUS, of Pottsville, Schuylkill county, Pennsylvania, have invented certain Improvements in Steam-Actuated Valves, of which the following is a specification.

My invention relates to what are known as "cut-off valves," and its object is the production of an automatic device in which the parts are few in number, simple in construction, and not liable to get out of order, in which, moreover, the slide or cut-off valve is rendered automatically operative by the action of the steam itself, independent of mechanical movements, and in which provision is made for the cushioning of the piston as well as for the complete control of the induction and eduction of the steam, a distribution of the latter being made whereby the balance is, as nearly as is practicable, preserved.

To the above ends my invention consists in the apparatus hereinafter described and claimed.

In the accompanying drawings, Figure 1 represents in central vertical longitudinal sectional elevation a main cylinder and steam-chest conveniently embodying my improvements, all the parts being represented in the positions which they are assumed in this description to occupy at the moment when the steam is first introduced and prior to the movement of the main piston from the position which it is represented as occupying in said Fig. 1 to that which it occupies in Fig. 2. Fig. 2 is a similar view of the same parts represented in the position which they occupy at the moment when the main piston has completed its travel from the right to the left hand of its cylinder. Fig. 3 is a top plan sectional view of the apparatus described in Fig. 1, section being supposed in a horizontal plane projected on the line *a a* of said Fig. 1, and all the parts being in the position which they occupy in said figure. The valve-rod is represented as broken away and the slide-valve removed, so as to exhibit the induction and exhaust ports and the mouths of the small passage-ways *T T'*.

Similar letters of reference indicate corresponding parts in the figures.

In the drawings, A represents a main cylinder, and B a main piston fitted therein. C is a piston-rod, applied in any usual manner.

The main cylinder proper may be of any preferred construction; but it is provided at a point on its periphery, preferably at its lower portion, with what I term "cylinder-ports" D D', being passage-ways of the character represented, in which are placed oppositely-opening catch-valves E E'.

F is the steam-chest proper, formed preferably in the manner represented in the drawings, and provided with a cover-plate, G, in which is centrally situated the steam-inlet H, opening into a closed valve-chamber, I, within which is fitted a slide-valve, J, of the construction represented, and adapted to control the right and left hand induction-ports, K K', the eduction or exhaust port L, and the mouths of the small passage-ways *T T'*. This slide-valve is controlled by a valve-rod, W, which passes through stuffing-boxes M M', formed in both sides of the valve-chamber, longitudinally outward in both directions, and through other stuffing-boxes, U U', into two minor cylinders, N N', in which latter its opposite extremities respectively connect with two minor pistons, O O', fitted to play within said minor cylinders. From this construction it will be understood that a movement of either minor piston occasions a movement of the valve-rod, slide-valve, and opposite minor piston, and also occasions the opening of one induction-port for the induction of steam to the main cylinder and the opening of the other induction-port to give the lead to the exhaust.

PP' are outer passages, communicating from near the outer heads of the minor cylinders with the main cylinder at points in its periphery near its heads, and exterior to two catch-valves, Q Q', which are applied to the terminal openings of the induction-ports K K' into the main cylinder.

It is proper here to state that the induction-ports are also provided with inner mouths, R R', opening into the cylinder at points in advance of the terminal openings which are controlled by the catch-valves Q Q'.

S S' are inner passages, communicating from near the inner heads of the minor cylinders

with the main cylinder at points on its inner circumference between the inner mouths, R R', of the induction-ports and the terminal openings thereof, which are controlled by the catch-valves Q Q'.

Opening into the valve-chamber are two small passage-ways, T T', which terminate in the outer passages, P P'.

Having now described a preferred construction of an apparatus conveniently embodying my improvements, the operation of the parts composing it is as follows: Assume the main piston in the position represented in Fig. 1. It will be observed that it closes the discharging-outlet of the right-hand inner passage, S', and the inner mouth, R', of the right-hand induction-port. In this position of parts the minor pistons are central within their cylinders, and the slide-valve is in position to shut off the induction of steam through both the induction-ports K K'. In this position, also, steam, entering through the inlet H into the valve-chamber, finds its escape through both of the small passages T T' into both of the outer passages, P P', and thence, in the case of the right-hand small passage, T', permeates the interspace between the outer head of the minor cylinder N' and the right-hand side of the minor piston O', and the interspace between the right-hand head of the main cylinder and the main piston, retaining closed the catch-valves Q' and E'; and in the case of the left-hand small passage-way, T, not only permeates the interspace between the outer or left-hand side of the minor piston O and the outer head of the minor cylinder N, but, passing to the main cylinder, pervades the same, and with the steam, entering through the port K, passes through the left-hand outer passage, S, into the interspace on the inner or right-hand side of said minor piston O, so as to produce an equilibrium of pressure upon opposite sides of the minor piston O, which it cannot do with the right-hand minor piston by reason of the fact already stated that the main piston closes the inner passage, S'. Any excess of steam, as stated, pervades the main cylinder, and, the left-hand induction-port, K, being closed and the lead not given to the exhaust in the then position of the slide-valve, can pass through the main cylinder-port D', lift the catch-valve E', and re-enforce, so to speak, the steam already on the right-hand side of the main piston and the minor piston O'. The distribution of steam being as above set forth, it is obvious that the pressure on the right-hand side of the right-hand minor piston, O', not being equilibrated by a pressure on the left-hand side of said minor piston, by reason, as explained, of the fact that the main piston closes the right-hand inner passage, S', will move the right-hand minor piston, O', to the left hand of its cylinder, and in so doing will move the slide-valve so as to open the right-hand induction-port, K', connect the exhaust-port L with the left-hand induction-port, K, and, further, move the left-hand minor piston, O, (which it

will be remembered is centered in an equilibrium of steam-pressure,) from the position represented in Fig. 1 to that represented in Fig. 2. The instant the slide-valve is moved from off the right-hand induction-port, K', the full induction of steam to the right-hand side of the main piston takes place, the catch-valve Q' opening under the pressure. The instant, also, that the main piston passes the inner mouth, R', induction takes place through said mouth, and steam is also, by the retreat of the main piston, permitted to pass through the inner passage, S', into the interspace between the minor piston O' and the left-hand head of its minor cylinder N', so as to equilibrate said minor piston for the return-stroke. The position of the minor pistons and slide-valve represented in Fig. 2 is unvaried until the moment when the main piston has passed and closed the left-hand inner mouth, R, of the left-hand cylinder-port and the left-hand inner passage, S. The instant, however, that this takes place the catch-valves Q and E are closed by the pressure, and the main piston is not only cushioned against the left-hand main cylinder-head, but the steam is forced to escape through the left-hand outer passage, P, into the left-hand minor cylinder, O, to the outer side of its minor piston, with the result that said piston, the slide-valve, and the right-hand minor piston are moved to the right-hand side, or in a position the opposite of that represented in said Fig. 2. The exhaust from between the minor pistons and the inner heads of their respective minor cylinders takes place through the inner passages, S S', respectively, at the same time that the exhaust takes place from the corresponding end of the main cylinder, any vapor remaining between the inner heads of the minor cylinders and the minor pistons is compressed. The return of the main piston is due to a precisely identical operation, considered with respect to the left-hand side of the main cylinder and steam-chest, to that operation already described with respect to the right-hand side. A redescription of the movement of all the parts in the opposite throw of the cylinder would therefore be redundant.

Having now described the operation of an apparatus conveniently embodying my invention, I desire to state that many details of mechanical construction, as respects both the steam-chest proper and the main cylinder, may of course be adopted without departure from my invention strictly as such. Thus, for instance, other valves than the catch-valves represented may be substituted in their stead, other forms of sliding or cut-off valve operating to the same result be substituted in the stead of the sliding valve represented, and other minor and immaterial variations both in structural and relative relationship of parts be made, without departing from the actual invention.

It will be obvious that I have provided an efficient means whereby the slide or cut-off valve is rendered automatically operative by

the action of the steam itself, and is made entirely independent in said operation of any mechanical devices designed to occasion actuation.

5 The invention is of course applicable to air-engines.

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

1. In a steam-chest, a steam-valve controlling the induction and eduction ports of the cylinder to which said steam-chest is applied, in combination with minor pistons playing in minor cylinders, the ports of which communicating with the main cylinder are not controlled by valves, whereby the slide-valve is wholly actuated by steam-pressure exerted upon or with respect to said minor cylinders, substantially as set forth.

2. In combination with a main cylinder provided with a main piston and formed with valve-controlled cylinder-ports, two minor cylinders communicating each from both of their ends with the main cylinder by means of passages not controlled by valves, and a slide-valve actuated by minor pistons operating in said minor cylinders and controlling the induction and exhaust ports of the main cylinder, substantially as set forth.

3. In combination with a main cylinder, a valve-chamber provided with induction-ports leading to said main cylinder, and with small passage-ways not controlled by valves communicating with both the minor cylinders and with the main cylinder, substantially as described.

4. As a means of communication between the main and the minor cylinders, the inner passages, S S', which are not controlled by valves, but are adapted to be alternately closed by the main piston, substantially as and for the purposes set forth.

5. In combination with a valve-chamber, a valve playing therein, two small passage-ways which are not controlled or covered by said valve, two minor cylinders, and a main cylinder, with which three cylinders said small passage-ways communicate, substantially as set forth.

In testimony whereof I have hereunto signed my name this 17th day of October, A. D. 1832.

ROBERT B. ANGUS.

Witnesses:

WM. ENT,
JOHN P. POWERS.