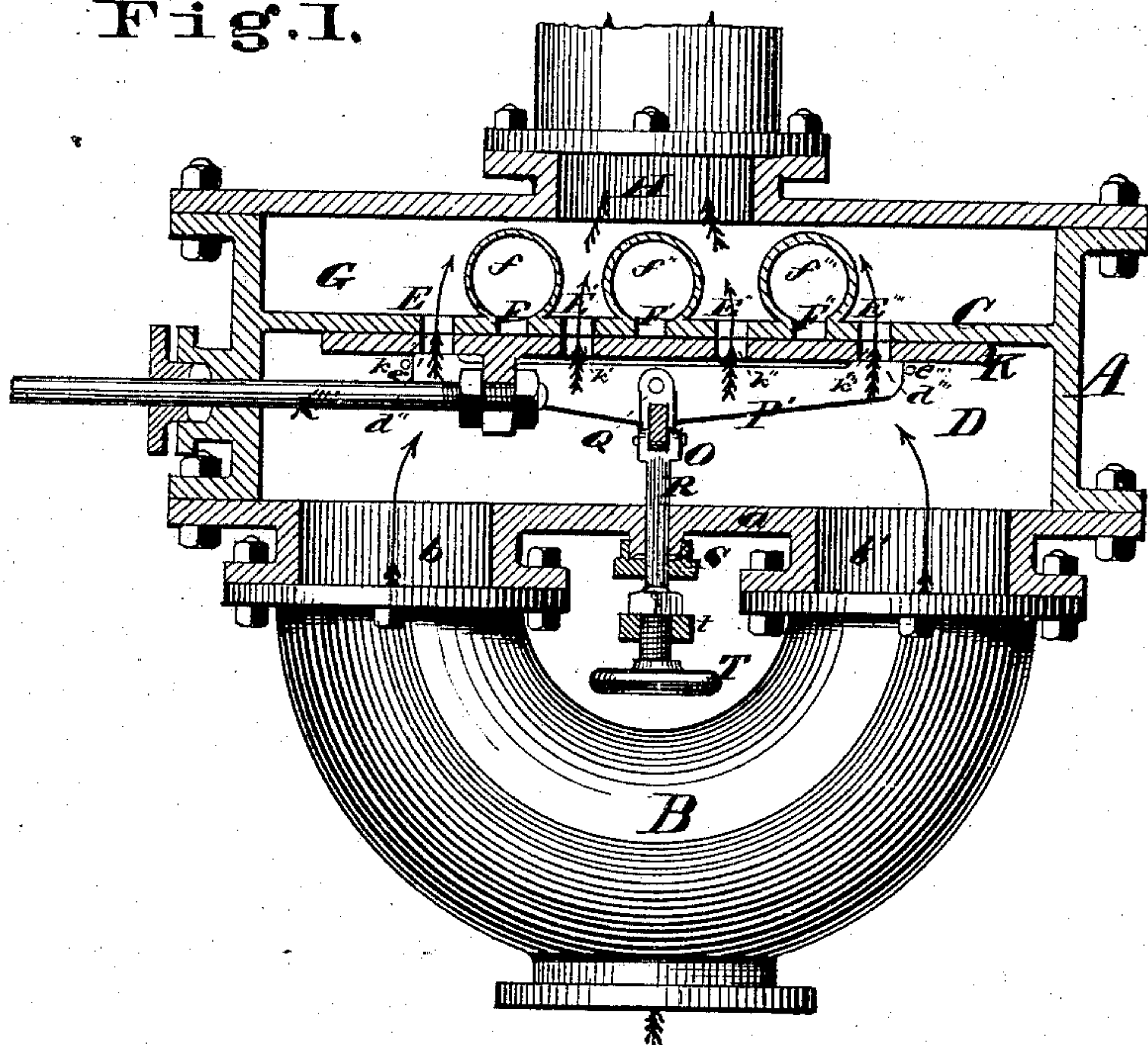
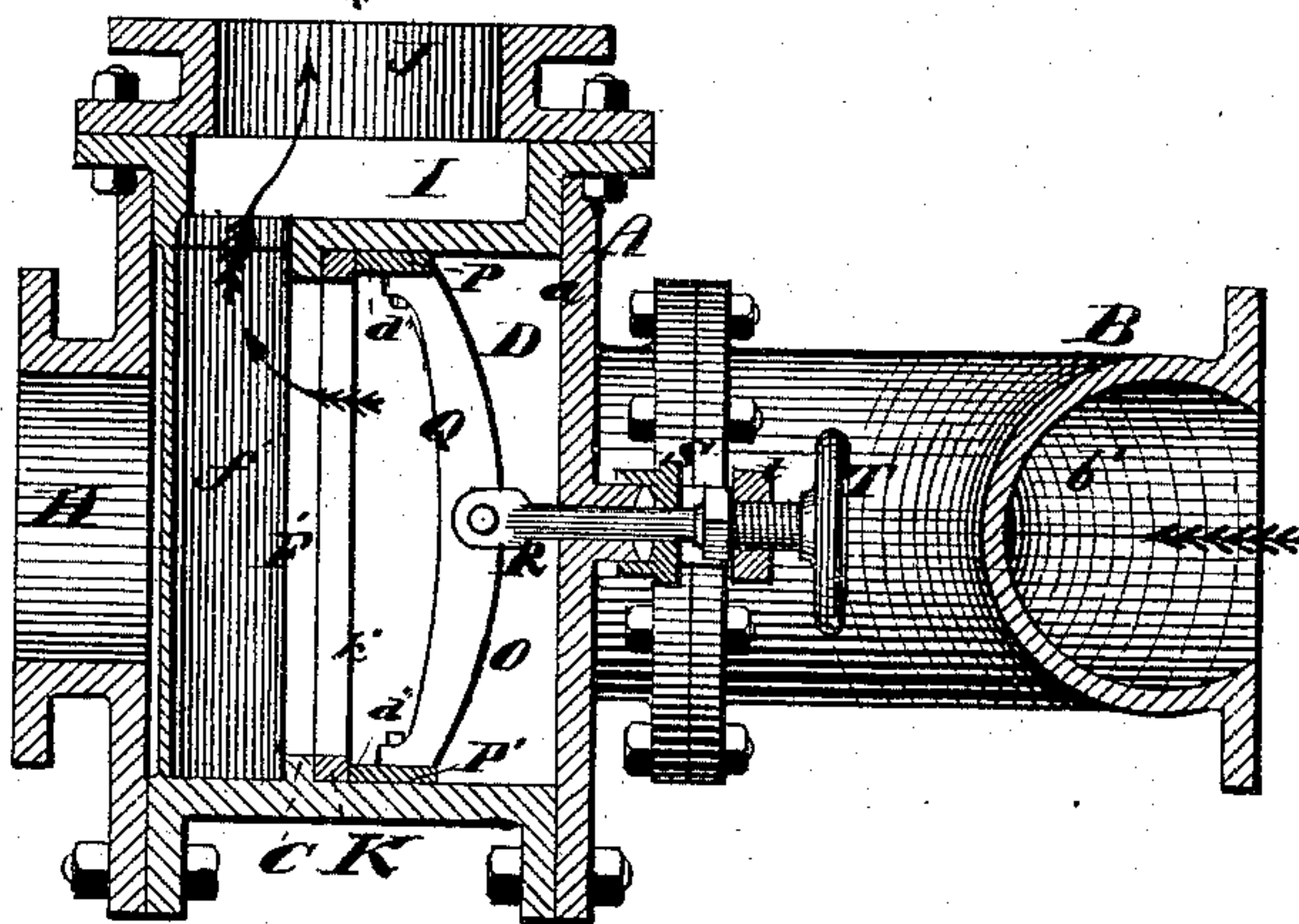


**T. L. JONES.**  
**Combined High and Low Pressure Engines.**  
 No. 157,404. Patented Dec. 1, 1874.

**Fig. 1.**



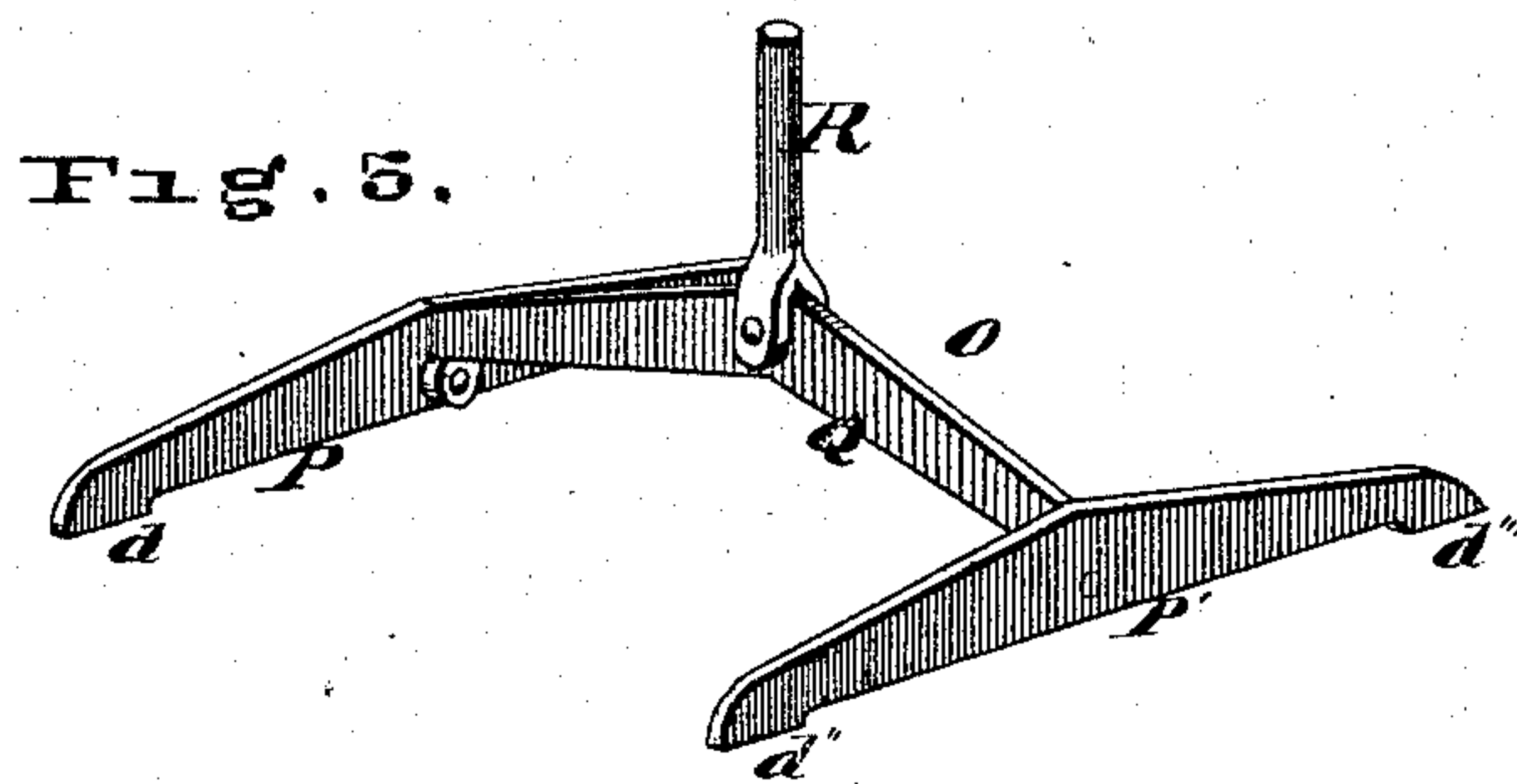
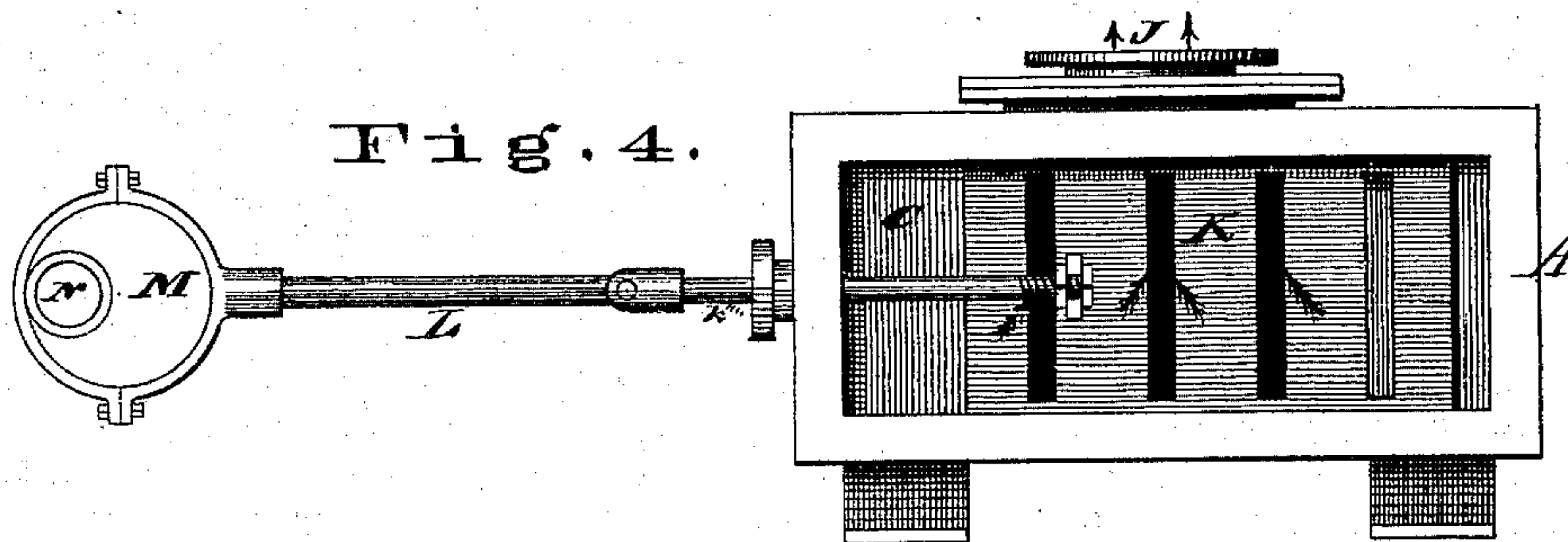
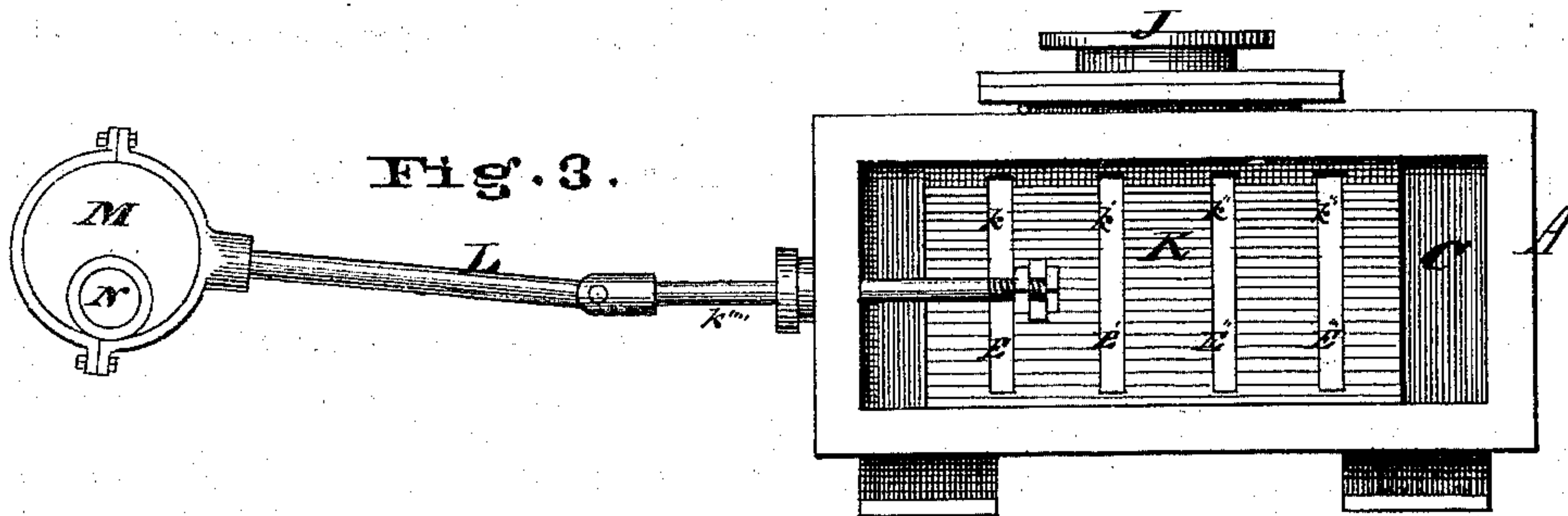
**Fig. 2.**



WITNESSES  
*Sam'l. S. Boyd*  
*C. M. Whitney*

INVENTOR.  
*Thos. L. Jones.*  
 By *Chas. D. Moody.*  
*att'y.*

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# UNITED STATES PATENT OFFICE.

THOMAS L. JONES, OF NATCHEZ, MISSISSIPPI, ASSIGNOR OF TWO-THIRDS HIS RIGHT TO ANTHONY PAULY AND THOMAS P. LEATHERS, OF NEW ORLEANS, LOUISIANA.

## IMPROVEMENT IN COMBINED HIGH AND LOW PRESSURE ENGINES.

Specification forming part of Letters Patent No. **157,404**, dated December 1, 1874; application filed May 6, 1874.

*To all whom it may concern:*

Be it known that I, THOMAS L. JONES, a resident of Natchez, Adams county, State of Mississippi, have made new and useful Improvements in Combined High and Low Pressure Engines, of which the following is a full, clear, and exact description, reference being hereby had to the annexed drawing, making part of this specification, in which—

Figure 1 is a horizontal section on the line  $x x'$  of Fig. 2. The connecting-pipe through which the exhaust steam is taken to the device is shown. Fig. 2, a transverse vertical section on the line  $y y'$  of Fig. 1, also showing the connecting-pipe; Fig. 3, a side view of the invention, the side plate thereof, and also the device for holding the valve in place, being removed. The valve is arranged as in Fig. 1. Fig. 4, a view similar to that of Fig. 3, the valve, however, being arranged as in Fig. 2. In this and in the preceding view the connection with the main shaft and the eccentric thereon are shown. Fig. 5 is a perspective of the device for holding the valve in position.

Like letters of like kind indicate like parts.

I have heretofore made improvements in steam-engines by which the benefits of a high and of a low pressure engine can be obtained conjointly from a single construction. The particular devices referred to, however, (and shown in patents granted me April 14, 1868, and September 14, 1869, and numbered, respectively, 76,776 and 94,891, and in patent granted myself, Anthony Pauly, and T. P. Leathers, March 17, 1874, and numbered 148,565,) are adaptable to engines making but few revolutions per minute, such as the puppet-valve engines in use on the steamers on the Mississippi River.

To provide a construction by means whereof results similar to those obtained in the above-mentioned devices can be secured in engines making from fifty to seventy revolutions per minute, such as in use in sea-going propellers, is the object of the present invention. It consists mainly in the peculiar means hereinafter described, whereby the exhaust steam, at each stroke of the piston as it leaves the cylinder, is at first partly—viz., all saving

one atmosphere—suddenly exhausted into the open air, and afterward—viz., the remaining one atmosphere—diverted into a condenser.

In the accompanying drawing, A, Figs. 1, 2, 3, 4, represents a valve-chest, which, with reference to the engine-cylinder, may be arranged in any suitable position. The chest A is connected with the exhaust-port of the cylinder by means of an exhaust-pipe, B, which opens into the chest A at one or (as preferred) two openings,  $b b'$ .

The ordinary engine-cylinder and its piston are not shown, as their construction and operation are well understood, and because the invention is used in connection with the exhaust steam only as it is liberated from the engine by its own ordinary valve.

The chest A, so far as its outer walls are concerned, is preferably of the form shown. I do not, however, in this respect, wish to be limited to any particular shape.

C represents a partition or valve-seat, extending through the chest and dividing the same. The space D above the seat C is what I term a "diverting-chamber." In the valve-seat is arranged a series, E E' E'' E'', of what I term "atmospheric ports," and also a series, F F' F'', of what I term "condenser-ports." The atmospheric and condenser ports are arranged alternately, as shown in Fig. 1, the atmospheric ports being at the ends. I do not desire to be limited to the number shown. It is, however, essential to have several openings, and of the shape shown—viz., quite narrow in the direction of the movement of the valve and quite wide in the opposite direction. The atmospheric ports open into a common chamber, G, which is provided with an escape-pipe, H, leading to the open air immediately, or through a suitable heater, to heat feed-water for the boilers. The condenser-ports respectively lead into as many passages  $f f' f''$ , which, in turn, lead into a common chamber, I, which is provided with a pipe, J, leading to a suitable condenser. K represents a valve arranged to slide upon the valve-seat C. It is provided with openings  $k k' k'' k'''$ , similar in shape and size to the ports E and F, but so spaced apart as to cause them, in the move-



ment of the valve, either to coincide with the atmospheric ports and close the condenser-ports, or to coincide with the condenser-ports and close the atmospheric ports. The valve through the eccentric rod L, Figs. 3 and 4, is operated by a round eccentric, M, or a suitable cut-off cam, Figs. 3 and 4, which is fastened to the main shaft N. The valve K is properly adjusted to and held against the valve-seat C by means of a peculiar device, O. (Shown in Figs. 1, 2, and 5.) This device consists of two similar arms, P P', which are connected by a cross-piece, Q, that is journaled in the arms midway in their length, and to which, in turn, at its center, by a jointed connection, is attached an upright stem, R, which extends out through the wall *a* of the valve-chest A, and through a suitable stuffing-box, S. Opposite and against the outer end of the stem R, and working in a suitable bearing, *t*, is a set-screw, T. At the ends, respectively, of the arms P P', and toward the valve K, are projections *d d' d'' d'''*, constituting four friction-points, which bear upon the valve. The arms P P' in length are about that of the distance from the extreme port at one end of the valve-seat to the extreme port at the opposite end. The valve K is, preferably, connected with its stem *k'''* on the inner side of the stem R.

In operation the steam, at each movement of the piston, being liberated from the engine by the ordinary valve into the ordinary exhaust-pipe, passes therefrom, through the pipe B, into the chamber D, circulating freely against the valve K. As the engine begins to exhaust, (the eccentric M and valve K being suitably adjusted,) the valve K moves so as to open the atmospheric ports, as shown in Fig. 3, and all but one atmosphere of steam passes off into the open air merely on the turning-point of the crank.

It is essential that such liberation of all but one atmosphere of steam be effected as speedily as possible, and that the principal portion of the stroke of the piston be in connection with the condenser. This is accomplished by using several ports, and arranging them all as described, and by the arrangement of the eccentric or cam.

Thus constructed and arranged, the entire series of atmospheric ports open simultaneously and suddenly, affording a free passage for the steam, and as suddenly closed. The condenser-ports then open, as shown in Fig. 4, and the remaining one atmosphere of steam is diverted into the condenser.

The eccentric is set so that but a slight part of its throw will open and close the atmospheric ports, the remainder thereof being in connection with the condenser-ports. Owing, also, to the arrangement of the condenser-ports, the openings in the valve necessarily coincide for a longer period with them. This is desirable to secure a perfect vacuum. Should, however, it be desired to throw more

of the exhaust into the open air, the eccentric can be moved back or forward on the main shaft accordingly.

It will be observed that, as the exhaust steam of the engine is passing off through the atmospheric ports, there is pressure of but one atmosphere upon the valve K, and that is upon its upper side, and over the condenser-ports. But when the valve changes, and its openings are put in connection with the condenser, a vacuum is formed in the diverting-chamber D, in common with the condenser and the engine-cylinder, and, consequently, against the under side of the valve, and opposite the atmospheric ports, a pressure of one atmosphere is exerted. The valve, therefore, must be held in place by some agency which, at the same time, will not interfere with the free circulation of the steam throughout the diverting-chamber. For this purpose I use the device O.

By means of the set-screw T the device, at the four points *d d'*, &c., is set up against the valve, and caused to support it. The four points *d d'*, &c., are caused to press evenly upon the valve in consequence of the universal joint formed by means of the joints at the ends of the cross-piece Q and at the end of the stem R.

Should the device work loose, it can be readily adjusted by turning the set-screw T.

The arms P P' of the device O are kept from being dislodged under the sliding motion of the valve by four studs, *e e' e'' e'''*, Fig. 1, set similarly in the walls of the chest, and so as to hold the arms P P' in place.

In Fig. 1 the arrows indicate the course of the steam to the open air, and in Fig. 2 to the condenser.

I am aware that manifold openings in the valve and valve-seat of the steam-chest of an engine have heretofore been used, and therefore I do not claim such, broadly; but

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

1. The combination of the chest A, chambers D, G, and *fff*, pipes J and H, valve K, and its seat C, the said valve and seat being provided, respectively, with the openings *k k' k'' k'''* and the ports E E', &c., F F', &c., relatively adjusted and arranged and operating to throw the exhaust steam, at each stroke of the piston, partly into the open air, and partly into the condenser, substantially as shown and described.

2. The combination of the chest A, seat C, valve K, device O, and set-screw T, substantially as described and shown.

In witness whereof I have hereunto set my hand.

THOS. L. JONES.

Witnesses:

H. Y. CHILD,  
L. D. ALDRICH.