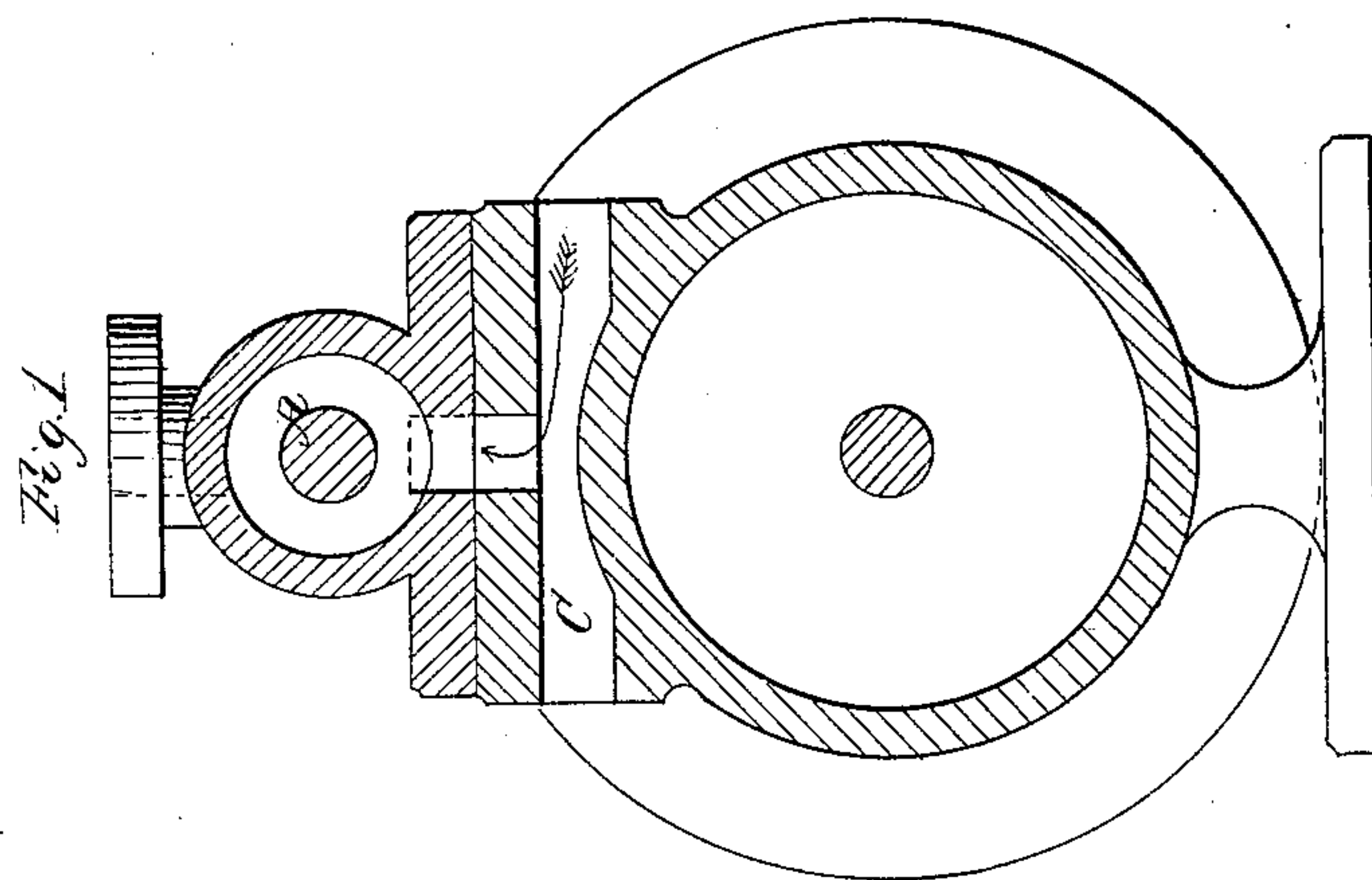
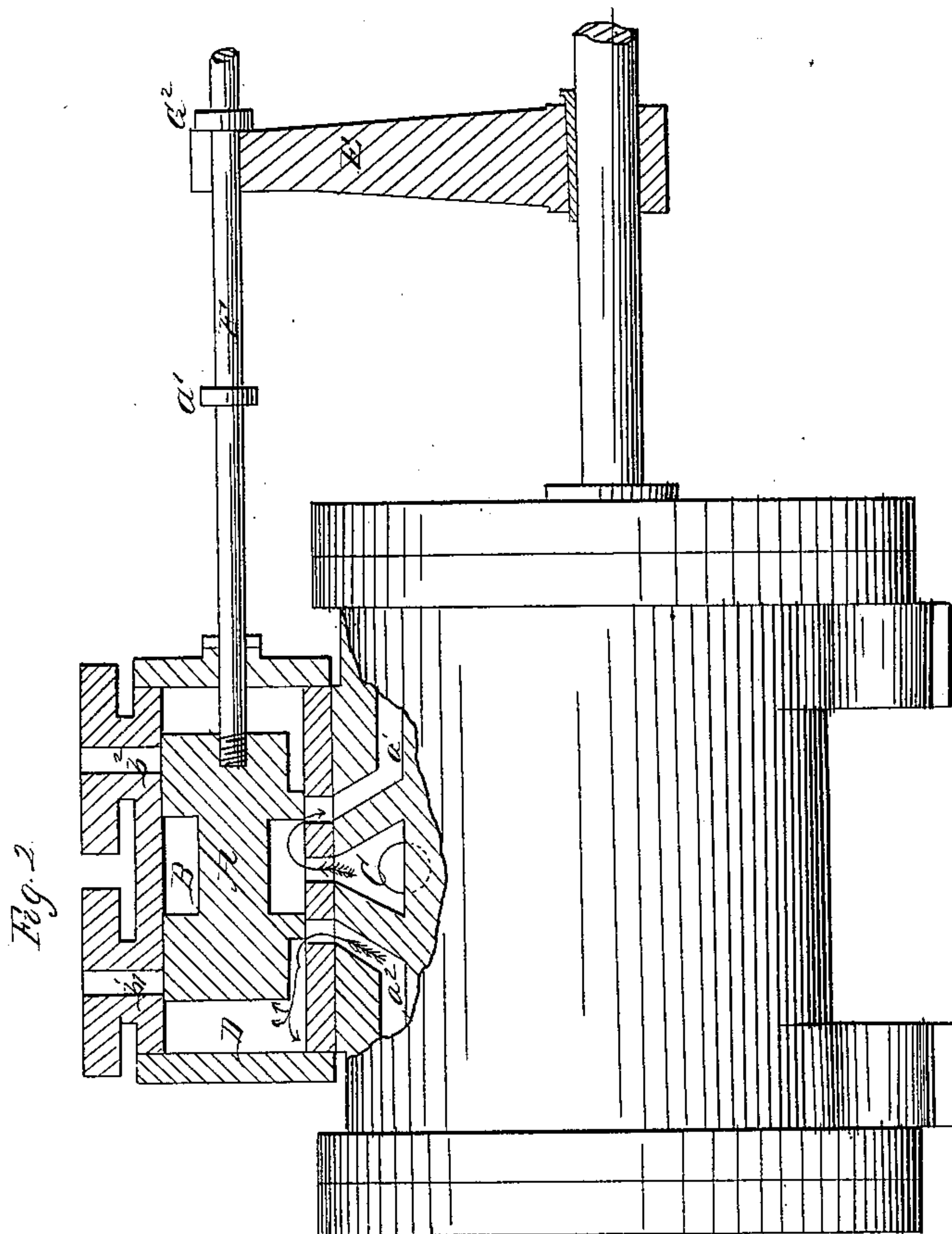


*H. R. Worthington*

*Steam Slide Valve.*

*N<sup>o</sup> 14,749.*

*Patented Apr 22, 1856.*



# UNITED STATES PATENT OFFICE.

HENRY R. WORTHINGTON, OF BROOKLYN, NEW YORK.

## COMPLETING THE THROW OF THE VALVES OF DIRECT-ACTING ENGINES BY THE EXHAUST-STEAM.

Specification of Letters Patent No. 14,749, dated April 22, 1856.

*To all whom it may concern:*

Be it known that I, HENRY R. WORTHINGTON, of the city of Brooklyn, county of Kings, and State of New York, have invented a certain new and useful Improvement in the Manner of Operating the Steam-Valves of Direct-Acting Pumping-Engines, and that the following is a full, clear, and accurate description of a practical way for carrying the same into useful operation, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a transverse section. Fig. 2 a side elevation with the steam-chest, valve and passages in section.

By direct acting pumping engines is meant that variety of reciprocating engines in which the power of the steam works through the intervention of a piston and rod directly upon the pump piston or plunger, without a crank or other device for producing rotatory motion. The necessity for some provision for throwing the steam valve arises from the fact that the motion derived from the main piston will not continue after the steam valve is brought into the position which covers all the ports.

The object of the present improvement is therefore to furnish a power for throwing the steam and exhaust valve wide open that shall be independent of the main motion and able to act when that has ceased. The drawings only show the steam cylinder and valve appendages and the piston rod is supposed to be broken off, as the connection with a pump is not necessary for illustrating the invention. This invention which I denominate the "exhaust throw" consists in compelling the steam used in the steam cylinder of the engine to complete the throw of the steam valve just before it is permitted to escape or exhaust into the atmosphere or condenser.

The steam valve A, constitutes a piston for the small cylinder B, into which it is

accurately fitted, and through which it is intended to traverse. The arrows show in what manner the steam passes into and out of the main cylinder.

Operation: As represented in the drawing the main piston has just completed a stroke from left to right. The steam admitted through the central opening C, is just on the point of passing into the right hand end of the main cylinder, through the opening ( $a'$ ) while the exhaust from the left hand side, already commencing to escape through the port ( $a^2$ ) fills the space D. But from this space or cavity it has no escape until by its elastic force it crowds or forces the piston valve A, toward the right far enough to uncover the opening ( $b'$ ) which communicates with the escape pipe or condenser. By the time this opening is uncovered the steam port ( $a'$ ) of the main cylinder is also open to the central steam passage C. Thus the necessary motion of the steam valve is produced by the effort of the steam to escape from the small cylinder B. It is hardly necessary to observe that a similar operation takes place at the end of the return stroke, whereby the steam is made to pass into the port ( $a^2$ ) and the exhaust to escape through the opening ( $b^2$ ).

The piston valve A is brought into the proper position for allowing the "exhaust throw" to take effect at or near the end of the stroke by the agency of the arm E, upon the tappets  $G'$   $G^2$  and the valve rod F.

Having thus described my invention and shown how the same may be carried into useful operation, what I claim as new and desire to secure by Letters Patent, is—

Completing the throw of steam valves of direct acting engines, by the steam already within the cylinder, on its way to the open air or to a condenser as herein set forth.

HENRY R. WORTHINGTON.

In presence of—

WM. A. PERRY,

DAUPHINE S. HINES.