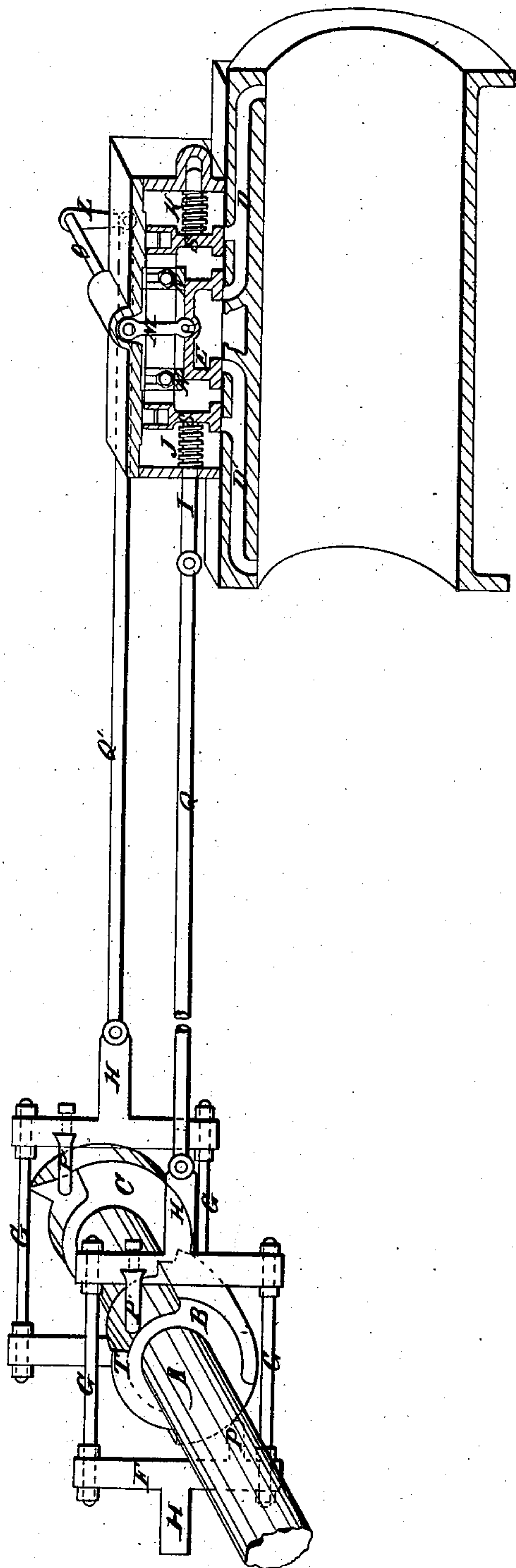


W. M. Henderson,

### Steam Cut-Off.

*N<sup>o</sup> 14,611,*

Patented Apr. 8, 1856.



# UNITED STATES PATENT OFFICE.

WM. M. HENDERSON, OF BALTIMORE, MARYLAND.

## ARRANGEMENT OF SLIDE-VALVES AND MEANS FOR OPERATING THEM.

Specification of Letters Patent No. 14,611, dated April 8, 1856.

*To all whom it may concern:*

Be it known that I, WILLIAM M. HENDERSON, of Baltimore city and State of Maryland, have invented certain new Improvements in the Construction and Operation of Slide-Valve Engines; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing, making a part of this specification, and which is an isometrical view of a steam cylinder with the valves connected with and worked by graduated cam-boxes, of which B is constructed for operating the cut-off steam valve S, the different degrees of cut-off or expansion being graduated across the box in an oblique direction between any two extremes of cut-off desired and adjustable by sliding on the parallel key on the shaft A, the rise for opening the valve being parallel with the shaft, and therefore not being effected by adjustment the steam ports, will always open at the same part of the stroke at all times and in all positions of the box, which in revolving pushes back the nose P, with it the yoke F and opposite nose P', the box at that part being cut away for its reception.

The yoke and valve stem I being connected with the rod Q, the valve S admits steam to the cylinder by the port D. And when the oblique fall passes the nose P, the spring J closed the port at the point of adjustment and cut-off desired. The valve is prevented from going back too far by the part T of the box catching the opposite nose P' on which it slides until the rise comes in contact with it which opens the other port D' in like manner. The closing of which is effected by the spring K in the same manner as before explained. The bar here shown graduates from  $\frac{1}{2}$  to  $\frac{7}{8}$  of the entire stroke. But a further degree of expansion may be gained by widening the yoke by the stretchers G G.

H H are bearings for carrying the yoke.

C is the exhaust controlling bar, similar in construction to B, and adjustable on the shaft to a similar yoke in like manner, the graduated part being arranged to vary the time of exhaust, which is controlled entirely by the valve E, and which is a free and independent valve, worked by separate mechanism, and in no way connected, or effected, by the movements, or operation of the steam cut-off valve S. The yoke F' being connected with the arm L by the rod Q' motion is given in due time to the valve E by the arm M, which is keyed with the arm L on the rockshaft O.

N N are two strips, adjustable by the set bolts there shown, for holding the valve E close to the eduction ports of the cylinder, as also for taking up the wear thereof.

Having thus explained the nature of my invention, I will point out the substantial features of it. The cylinder has 5 ports all in the same plane. The center one is the exhaust port, the two next in proximity are the eduction ports communicating with the same passages as the two outer ones, which are the induction ports. The steam by this arrangement is exhausted by different ports from those by which it entered the cylinder. There are two valves, the one S for operating on the induction ports, and balanced by packing which works against the planed surface of the steam chest cover, and receives its motion from the graduated adjustable cut-off bar B. Inclosed and working within the valve S is the nonpressure valve E which is freed from the pressure of the steam by the packing of the valve S preventing the ingress thereof, this valve has the entire control over the exhaustion, and made variable by the adjusting bar C from which it receives its motion. The two valves are in no way connected or effected by the movements or operations of each other, being worked entirely by separate mechanism.

What I claim as of my invention, and desire to secure by Letters Patent is—

The arrangement of the valves and the means for operating them as herein set forth by which the entire exhaust is controlled by a nonpressure valve, inclosed and working within the balanced cut-off induction slide valve, and worked by separate mechanism in the same plane, the time of cut-off and exhaust being variable at pleasure and in no way connected or effected by the movements or operations of each other.

WILLIAM M. HENDERSON.

Witnesses:

N. ROBINSON,

WM. H. BAYZAND.