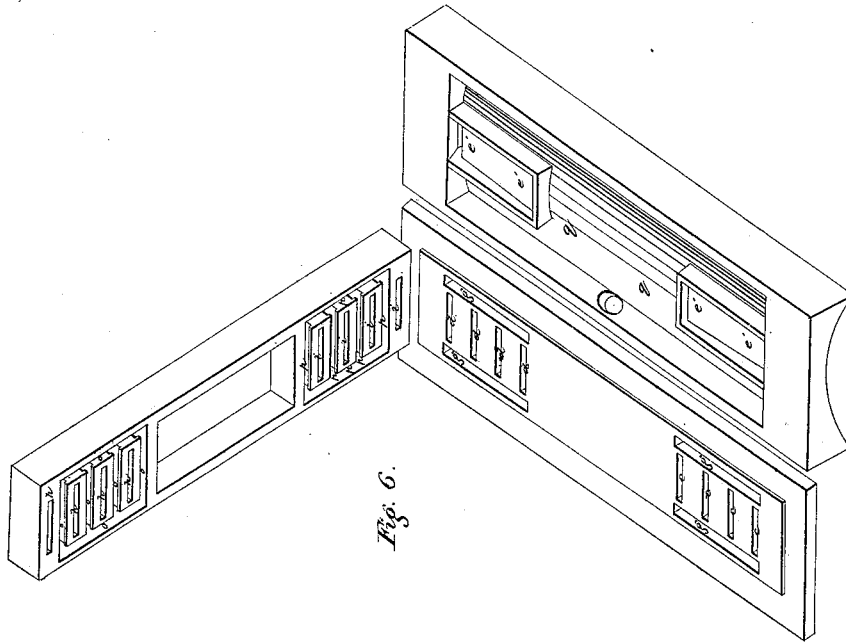


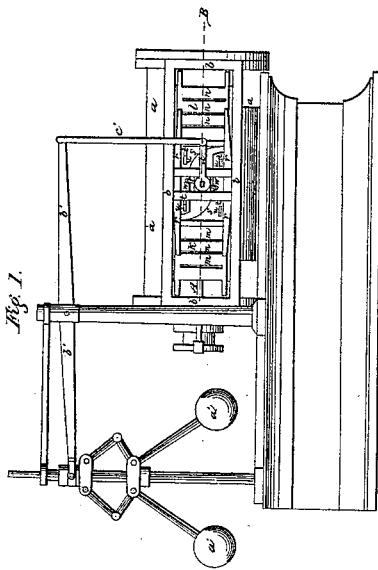
*W. W. Hubbard,  
Steam Slide Valve.*

*N<sup>o</sup> 7,037.*

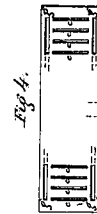
*Patented Jan. 22, 1850.*



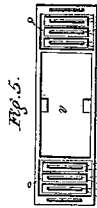
*Fig. 6.*



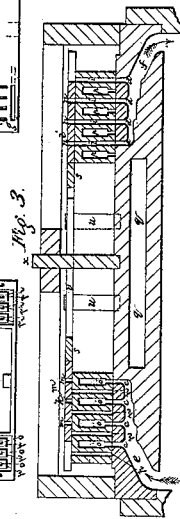
*Fig. 1.*



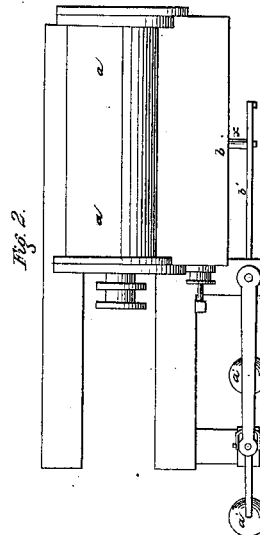
*Fig. 4.*



*Fig. 5.*



*Fig. 3.*



*Fig. 2.*

# UNITED STATES PATENT OFFICE.

WM. W. HUBBARD, OF BOSTON, MASSACHUSETTS.

## GRID-IRON SLIDE-VALVE.

Specification of Letters Patent No. 7,037, dated January 22, 1850.

*To all whom it may concern:*

Be it known that I, WILLIAM W. HUBBARD, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Valves of Steam-Engines, and that the following description, taken in connection with the accompanying drawings, hereinafter referred to, forms a full and exact specification of the same, wherein I have set forth the nature and principles of my said improvements by which my invention may be distinguished from others of a like class, together with such parts as I claim and desire to have secured to me by Letters Patent.

The figures of the accompanying plates of drawings represent my improvements.

Plate 1, Figure 1 is a side elevation of a cylinder of a horizontal steam engine and its appurtenances or appendages, with the front of the steam chest removed. Fig. 2, is a plan of the same. Fig. 3 is an enlarged detailed sectional view, taken in the plane of the line A, B Fig. 1, and Figs. 4 and 5 are detached plans respectively, of the valve seat and under side of the sliding valve. Plate 2, Fig. 6, is a perspective view of the sliding valve, valve seat, and exhaust chamber, so separated or spread apart, as to show the details of construction of each clearly.

By recent improvements, which have been made in steam engines, the steam is introduced and discharged through several rectangular openings, formed in the valve seat, and sliding valve, at proper intervals apart, the capacity of all of which should be sufficient to receive and discharge the greatest amount of steam required to drive the engine, at its utmost power and speed. By these arrangements, the traverse of the sliding valve is materially diminished, as are also thereby the friction and wear and tear of the valve seat. In these improved arrangements, the expansion valves are moved with the sliding valve, being pressed against said sliding valve, by springs or otherwise, which permit their movement to vary the cut off. There has also been combined with said expansion valves, a regulator or governor, and as the motion or traverse of the valves is short, as above specified, the least spreading of the balls of the governor will affect the "cut off" and thereby regulate the working of the engine to a nicety.

In connection with these improvements

which have been recently devised by others, I have invented and combined an improved arrangement of the exhaust openings, or communications or passages, for conducting the exhaust steam to the exhaust chamber, which arrangement is peculiarly adapted to the valves having the several openings for inducting and educting the steam as specified, and considerably enhances their utility and effectiveness.

A, A, A, in the several drawings, is the cylinder and *b, b, b*, represents the exterior casing of the steam chest, into which the steam may be introduced on the side or top as desired.

The valve seat, a plan of which is shown in Fig. 4 has four or more rectangular openings, *c, c, c, c,—d, d, d, d*, cut through at proper intervals apart, at each end of the same, as shown in said Fig. 4 and in Fig. 3, so as to communicate with the passages *e—f* to the cylinder at each end of said cylinder. The sliding valve, a plan of the underside of which, is shown in Fig. 5 has four or more corresponding rectangular openings, cut through it at each end, at exactly the same distances apart as those through the valve seat, as shown at *h, h, h, h,—l, l, l, l*, Figs. 3 and 5. The expansion valve is made in two parts *k* and *l*, each part having rectangular openings *m, m, m,—n, n, n*, and when these openings are over or in opposition with those in the valve seat, and sliding valve above referred to the steam passes into the cylinder at one or the other as the case may be, but when they are not so in opposition the supply is cut off. In Fig. 3 the parts are represented as in position to permit the supply of steam through the passage *f*, but to interrupt it through that denoted at *e*, and it will readily be seen that a very slight traverse of the valves is sufficient for the perfect operation of the engine.

In the underside of the sliding valve, between and around the rectangular openings above referred to, are mortised out, but not through the valve, (so as to communicate freely with each other) the rectangular areas *o, o, o, o, o, o, p, p, p, p, p, p*, into which the steam from the cylinder is exhausted alternately when they are in opposition with the openings *c, c, c, &c., d, d, d, &c.*, cut through the valve seat. The mortised spaces *o, o, o, &c., p, p, p, &c.*, communicate with the exhaust chamber *q q*

about the cylinder (shown in Fig. 3 and by dotted lines in Fig. 4) through the medium of the rectangular mortises or slots *g, g, g, g*, cut in the valve seat, and opening into said chamber, as shown by dotted lines in Fig. 4.

This arrangement is clearly represented in the perspective view, Plate 2 Fig. 6 in which the exhaust mortises *o, o, o, &c., p, p, p, &c.*, in the sliding valve between and around the inducting and educting passages *h, h, h, &c., i, i, i, &c.*, through said valve are colored blue for the sake of distinction, as are also the elongated slots or openings *g, g, g, g*, in the valve seat with which these mortises or spaces *o, o, o, &c., p p p &c.*, communicate freely, and through which, the exhaust steam passes into the exhaust chamber *q q*, on either side of the passages or rectangular pipes, *e' e'—e' e'* which pipes convey the steam to and from the cylinder.

The expansion valve, as before suggested is made in two parts *k* and *l* which are pressed against the sliding valve, so as to move with it by means of the long springs *r r—r r* Fig. 1. Their adjacent sides bear against the edges of the two metallic right angular movable stops *s s*, which are guided in their movements by the slots *t t*, and guiding rods shown at *u u*, Figs. 1 and 3. The guiding rods are fastened to the face of the valve seat, and project through an opening, cut out of the center of the sliding valve, as shown at *v v* Figs. 3 and 5. These stops are moved to and from each other by means of the projections *w w*, from the short shaft *x*, which fit into notches formed in the inner sides of each of said stops, as shown in Fig. 1, said shaft being turned by the spreading of the balls of the governor *a' a'* with

which it is connected through the medium of the lever *b' b'*, connecting rod *c'*, and crank *d'*, as will be readily understood by inspection of Fig. 1.

By the separation of the balls of the governor it will be seen that the two parts of the expansion valve will be moved apart, and the apertures through the sliding valve diminished, and when they fall together or toward each other the stops *s s* will be similarly moved, and the outer ends of the parts of the expansion valve abutting against the ends of the steam chest, will move them together again, and increase the area of the openings in the sliding valves. By this arrangement of the valves it will be observed that the slightest variation of the governor will instantly, and effectually regulate the "cut off" of the engine, thereby making the engine most sensitive in its self-adjustment.

Having thus described my improvements, I shall state my claims as follows:—

What I claim as my invention, and desire to have secured to me by Letters Patent is—

The peculiar arrangement of the exhaust mortises or spaces *o, o, o, &c., p, p, p, &c.*, in the sliding valve between and around the inducting and educting passages *h, h, &c., i, i, &c.*, through said valve, in combination with the elongated side slots or passages *g, g, &c.*, through the valve seat, leading to the exhaust chamber *q q*, the whole arrangement and operation being substantially as herein above set forth.

WM. W. HUBBARD.

Witnesses:

EZRA LINCOLN, Jr.,  
BENJ. C. PIPER.