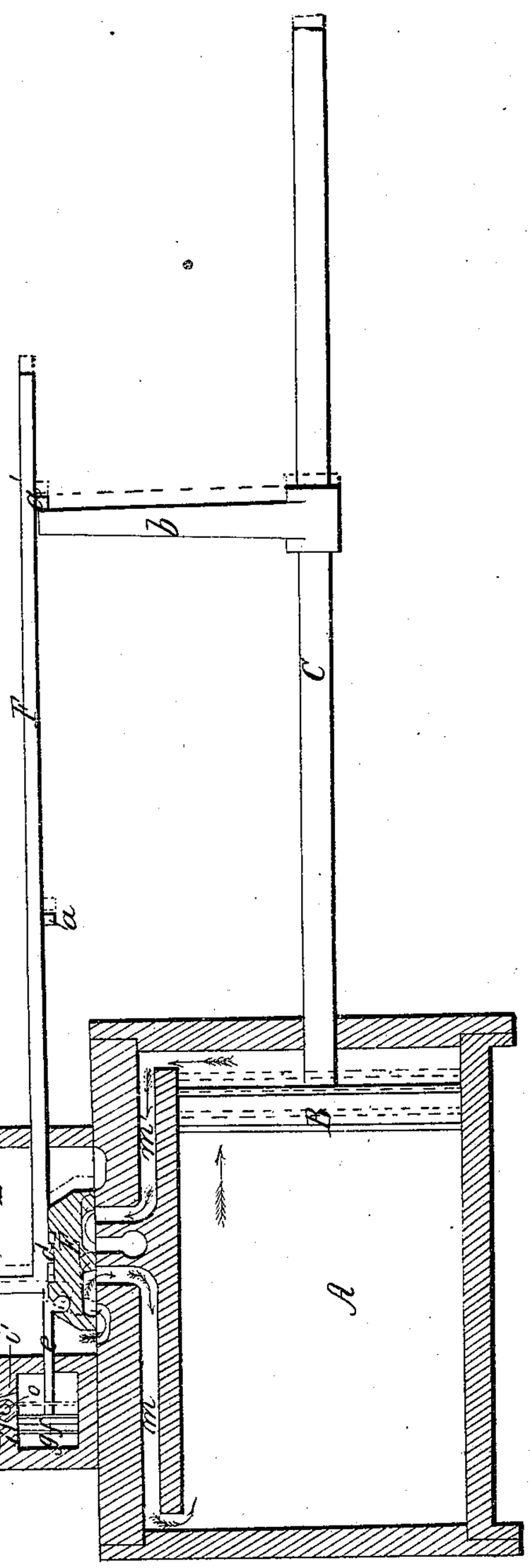
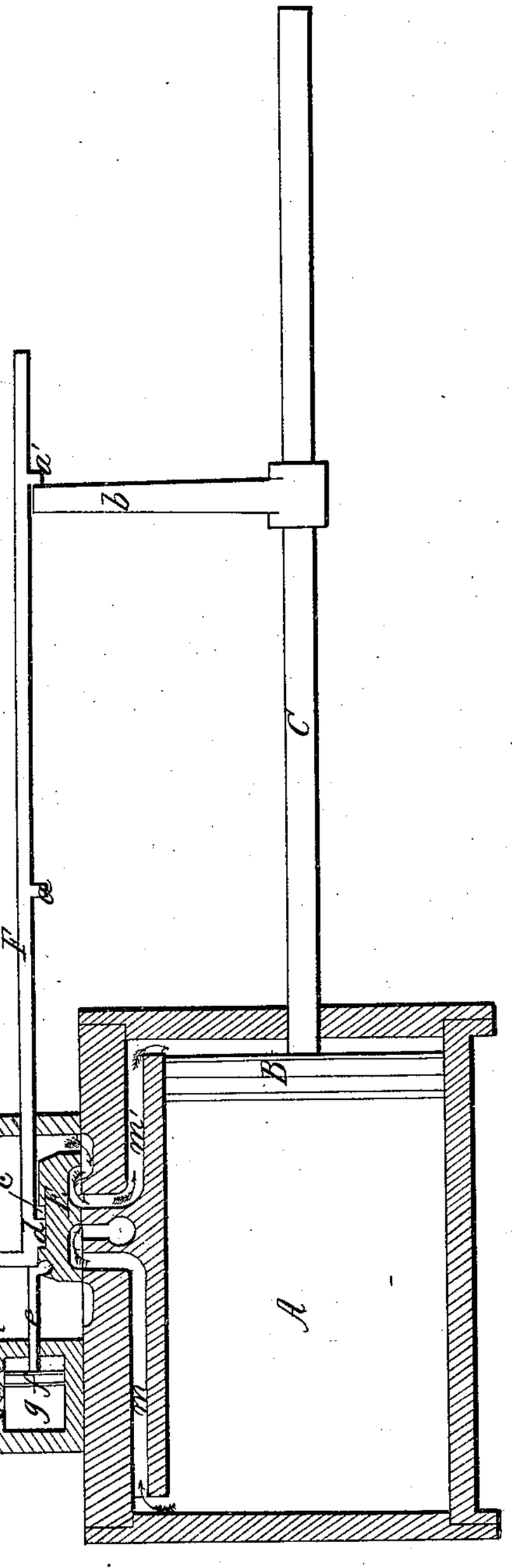
Hubbard & Conant.

Valve Motion.

No. 12,203. Patented Jan. 9, 1855.





UNITED STATES PATENT OFFICE.

GEO. W. HUBBARD, OF BROOKLYN, AND WILLIAM E. CONANT, OF GREENPOINT, NEW YORK.

OPERATING SLIDE-VALVES IN DIRECT-ACTION ENGINES.

Specification forming part of Letters Patent No. 12,203, dated January 9, 1855; Reissued September 18, 1869, No. 2,359.

To all whom it may concern:

Be it known that we, GEORGE W. HUBBARD, of Brooklyn, in the county of Kings and State of New York, and WILLIAM E. CONANT, of Greenpoint, in the county and State aforesaid, have invented a new and Improved Valve-Motion for Direct-Action Engines; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are two longitudinal central sections of a double acting steam engine having our improved valve motion applied, showing the position of the valve and its appendages at different stages of the operation of the engine.

Similar letters of reference indicate corresponding parts in both figures.

In double acting direct action engines, whose power is transmitted directly from the piston rod without producing any rotary motion, and consequently not employing a fly wheel, considerable difficulty is experienced from the difficulty of obtaining some perfect means of operating the slide valve, for when driven by an arm on the piston rod acting on tappets the steam is cut off when the valve has only made one half the necessary movement for reversal and if the resistance is great the piston then stops and as it can move the valve no farther some other means are required to complete the stroke of the valve to open the port for reversal. Most of the means employed for that purpose have from some causes been imperfect.

This invention consists in certain effective means hereinafter described of carrying the valve past the center to open the port to its full width for reversal.

A, is the cylinder of the engine; B, the piston; C, the piston rod; D, the steam chest; E, the slide valve; F, the slide valve rod; *a*, *a'*, the tappets on the valve rod, and *b*, the tappet arm on the piston rod. All the above parts are of the usual form and construction, except that the valve is not rigidly connected with its rod, but contains a recess *c*, that receives a hook or projection *d*, on the rod, which hook or projection is made shorter than the recess in order that the valve may be allowed to move some distance without the rod.

The valve is connected with the piston rod *e*, of a piston *f*, working in a very small steam cylinder *g*, which is contained within the steam chest D. This cylinder is packed closely at each end and has two ports *i*, *i*, above, or on either side for admitting steam to it from the steam chest and an exhaust port *o*, for exhausting it, such admission and exhaustion of steam being controlled by a valve *h*, working over the said ports and a cut off plate *j*, working on the back of the valve to open and close two passages *k*, *k*, which are made in it for the admission of steam to the ports *i*, *i*. The valve *h*, is connected by a rod *n*, with the valve rod F. The cut off plate merely rests upon the slide valve and the length of its movement is controlled by two fixed stops *l*, *l*, the length of movement allowed being equal to half the length of stroke of the main slide valve E, minus the length of the ports in the small cylinder and slide valve. The amount of play allowed to the hook *d* of the main slide valve rod F, in the recess *c*, in the valve E, is equal to the aforesaid length of movement allowed to the cut off plate.

To describe the manner in which the valve E, is operated we will first suppose the steam port *m*, of the engine to be open and the engine piston B, to have so nearly finished its stroke to the right, that the tappet arm *b*, is just coming in contact with the tappet *a'* to move the valve to effect the reversal, as represented in black outline in Fig. 1. At this time the ports *i*, *i*, of the small cylinder are closed, and so have been from the commencement of the stroke of the engine piston B. The piston B will continue its motion beyond the above point until it brings the valve E, to a central position over the ports as shown in red outline in Fig. 1, when, both steam ports being closed, the motion of the piston ceases, and the motion of the valve E, would cease also, but that in moving from the black to the red positions aforesaid, the valve rod F, moves the small valve *h*, and opens the port *i*, to admit steam to the small cylinder *g*, to act on the piston *f*, for the purpose of driving the valve E, to the end of its stroke, and opening the port *m'* for reversal as shown in Fig. 3. During the greater portion of that part of the movement of the valve E, produced by the piston *f*, the valve rod F, and valve *h*, are stationary as the projection or hook *d*, on the rod

is moving from end to end of the recess *c*, but just before the stroke of the valve E, is completed the end of the recess comes in contact with the said projection or hook and the remainder of the stroke causes the valve *h*, to be moved far enough for its passage *k*, to be closed by the cut off *j*, the movement of the valve E, ceases. The ports *i*, *i*, of the cylinder *g*, remains closed and the valve E, stationary and all the valve gear in the condition represented in Fig. 2, until the engine piston in its movement to the left brings the tappet arm into contact with the tappet *a*, when the valve E, is operated upon in a manner in every respect precisely the reverse of that herein above described, which will be readily understood. The ports *i*, *i'*, are made of such width where they enter the cylinder *g*, and are in such position that the piston *f*, at the instant the cutting off is effected just passes the edge of the opposite port to that through which the steam has been entering the cylinder to drive it, and so allows the steam in the cylinder to exhaust. This is illustrated best in Fig. 2, where the port *i*, is supposed to be just closed, and the steam which has just acted on the piston is exhausting through *i'*. The opening from the valve cylinder *g*, into the latter port though necessarily very small, is wide enough, as nearly the whole time occupied by the movement of the engine piston is allowed for the exhaustion of the valve cylinder.

What we claim as our invention and desire to secure by Letters Patent is—

Connecting the slide valve E, and its tappet rod F, in such a way as to allow either a certain amount of motion independently of the other, and combining them with a steam cylinder *g*, piston *f*, slide valve *h*, and cut off *j*, so as to operate substantially in the manner herein described.

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Witnesses:
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I. G. MASON.

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