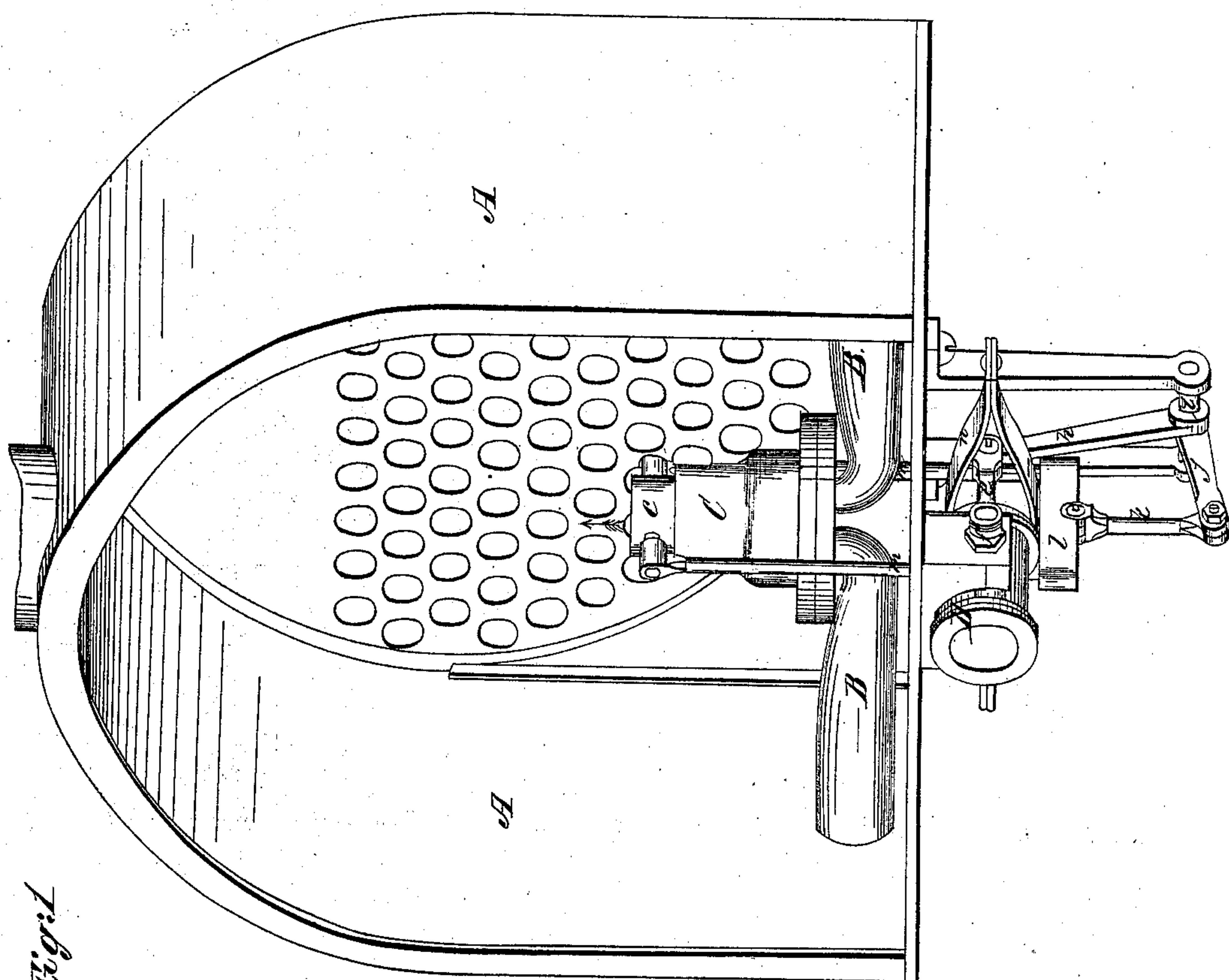
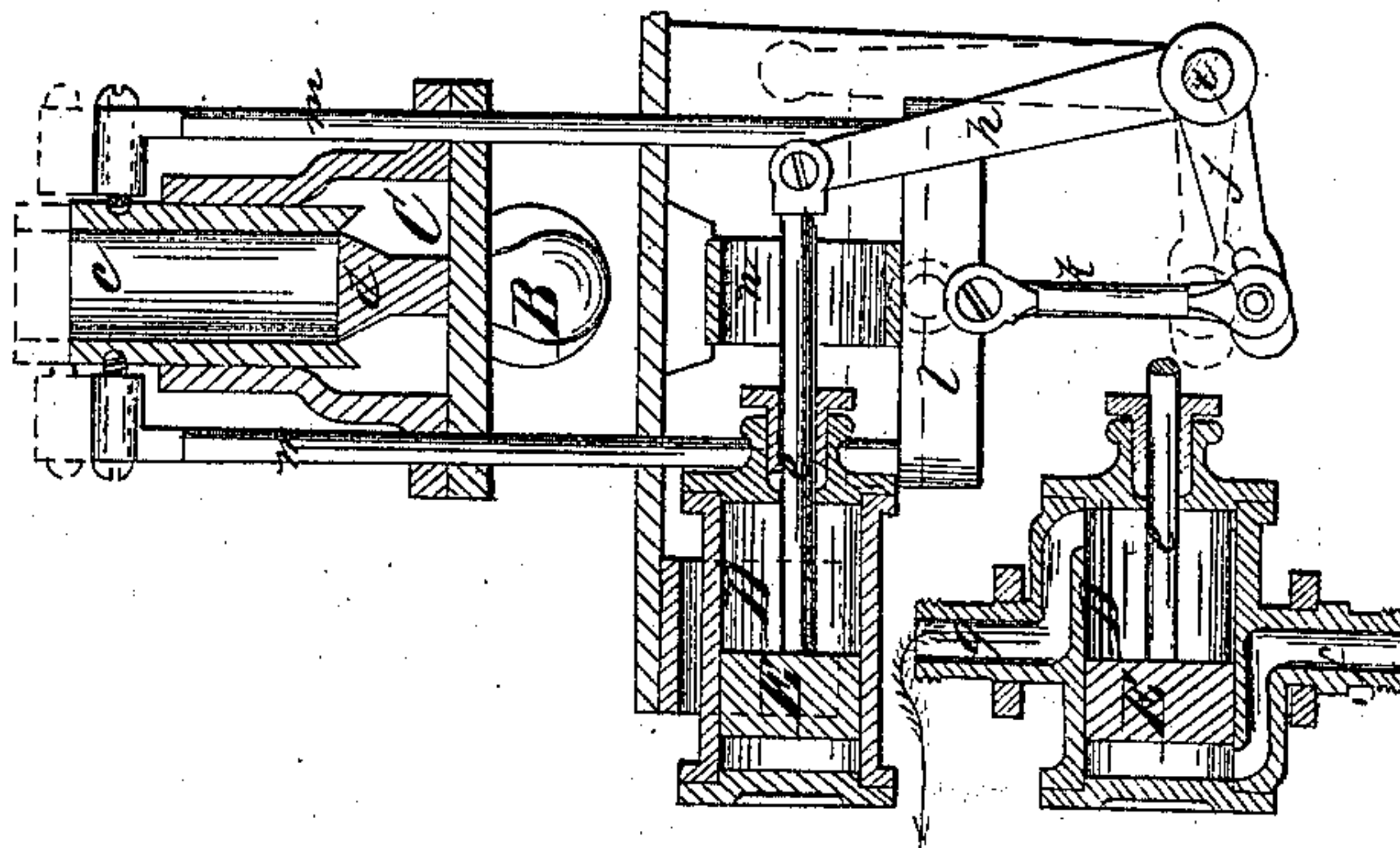


*J. E. Wooten,*  
*Exhaust Mechanism for Locomotives.*  
*No 12,805. Patented May 1, 1855.*



*Fig. 1*



*Fig. 2.*



# UNITED STATES PATENT OFFICE.

JOHN E. WOOTTEN, OF PHILADELPHIA, PENNSYLVANIA.

## ARRANGEMENT OF MEANS FOR REGULATING THE DISCHARGE OF EXHAUST-STEAM IN LOCOMOTIVES.

Specification of Letters Patent No. 12,805, dated May 1, 1855.

*To all whom it may concern:*

Be it known that I, JOHN E. WOOTTEN, of Port Richmond, city and county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in the Apparatus for Regulating the Discharge of the Exhaust-Steam in Locomotive-Engines, commonly known as the "Variable Exhaust"; and I do hereby declare that the following is a full, clear, and exact description of the nature and operation of the same.

Reference is had to the annexed drawings, forming part of this specification, and wherein—

Figure 1 is a general view of the interior of the smoke box of a locomotive, and showing, externally, the essential parts embraced in my improvements. Fig. 2 is a vertical section of these parts, in their proper working position and arrangement. Fig. 3 is a section of one of these parts, singly, and of which full description will be hereafter made.

Like letters refer to like parts in all the different figures.

(A) (A) represent the sheets of the ordinary smoke-box of a locomotive; (B) (B) the ordinary exhaust steam pipes, one from each working cylinder.

(C) is a central steam chamber, directly under the chimney and open to both exhaust pipes and containing the regulating valve for enlarging or contracting the opening for the final discharge of the steam.

(c) is a tube or valve, whose bottom edge is formed to fit closely, when required, to the conical or beveled edge of the central cone or plug, shown in section at (d). The part (d) is formed upon the bottom of the chamber (C), and is therefore stationary. The valve (c) may be elevated or depressed, by an arrangement which will be hereafter explained; and in proportion to its elevation or depression will it increase or diminish the opening between its lower edge, and the beveled seat upon the plug (d). Through this opening, when the valve is raised from its seat, the exhaust steam is finally discharged. The drawings show the valve (c) upon its seat, leaving no opening for the escape of steam. This opening is only obtained, and graduated, when the engine is in use, by the operation of parts hereinafter described.

(D) is a steam cylinder, suspended upon

trunnions (f) (g) and being capable of an oscillating motion thereon.

(E) is a piston, fitting closely within the cylinder, and having a rod, (e) through one head of the cylinder, as shown in the sections Figs. 2 and 3. A steam passage is formed through each trunnion, the two passages extending to opposite ends of the cylinder, as shown in Fig. 3, which is a horizontal section of the cylinder, in the plane of its longitudinal and transverse axes.

The trunnions (f) and (g) project outward, beyond the bearings in which the cylinder is suspended. Upon the outer surface of each trunnion is formed a screw, for attaching a suitable coupling or connection, for a steam pipe. In the drawing, these pipes are not shown, as they are but continuations of the respective passages, (f) and (g). The pipe, connecting directly with the steam passage (f), is extended to and connected with any convenient point upon the boiler, either above or below the water line;—the pipe opening into the boiler, so as to become filled with the steam or water therein, and to transmit the same through the steam passage (f), to the corresponding face of the piston (E). The pipe, connecting with the steam passage (g), is extended through the bottom plate of the smoke box, and attached at any convenient point upon the chamber (C) and to communicate freely with it. This pipe therefore transmits the pressure of the exhaust steam, in the chamber (C), directly to that face of the piston which corresponds to the passage (g). When both of the steam pipes are properly connected, the piston (E) is pressed upon one side by steam, or water, directly from the boiler; and on the other side by steam from the exhaust steam chamber (C). The piston rod (e), is connected to the upper end of the arm or lever, (h) fastened to a shaft (i), on which is also fastened an arm (j), at right angles with arm (h). A link (k) connects the outer end of arm (j) with a cross-beam (l), to which are attached upright rods (m) (m), attached also at their upper ends to the regulating valve (c). The connections of the several parts are so made, (as clearly exhibited in Fig. 2) that the valve (c) shall be elevated or depressed by the movement of the piston (E) in the cylinder (D). Between the cross-beam (l) and a block on the



bottom plate of the smoke box, is an elliptical steel spring (*n*) of any required extreme of elasticity. This spring is compressed according to the elevation of the beam (*l*) moved by the steam on the piston (*E*), or, reciprocally, the rise of the beam (*l*) is limited by the elasticity of the spring (*n*). In this manner, the pressure of steam from the boiler, acting on the piston (*E*), and in combination with the elasticity of the spring (*n*), the two forces acting reciprocally on each other, operates to regulate the position of the valve (*c*) and thereby the area of the discharging passage of the steam, from the exhaust steam chamber (*C*).

Whenever, in any position of the parts, the pressure on the piston shall exceed the elasticity of the spring, the piston will be moved in the cylinder (*D*), and by its intermediate connections will raise the valve (*c*), giving a larger opening for the escape of the exhaust steam, and thereby diminishing its force of discharge. By diminishing the force with which the exhaust steam is discharged, the draft through the tubes of the locomotive, is also diminished,—as with the “variable exhausts” already in use.

Whenever, in any position, the pressure on the piston shall be less than the elasticity of the spring the latter will draw down the valve (*c*) closer to its seat, whereby the force of discharge of the exhaust steam will be increased, and thereby the strength of the draft upon the fire of the locomotive.

As before described, the passage (*g*) of the cylinder (*D*), communicates by a pipe with the interior of the chamber (*C*). The object of this communication is that of counteracting, within the cylinder (*D*), the effect of the pressure of the exhaust steam on the lower edge of the valve (*c*). The area of the piston (*E*), and of the annular section of the tubular valve, (*c*), are in such proportion to each other that a pressure upon one, acting through the levers (*h*)

and (*j*) will nearly or quite exert, or balance, a corresponding pressure on the other. The impulsive and irregular action of the exhaust steam, on the lower edge of valve (*c*) is thus counteracted, through the piston and its connections, as before described, and the valve (*c*) is maintained steadily in its place.

As it might be sometimes desirable to produce a stronger or weaker discharge of the exhaust steam, under a given pressure of steam within the boiler, a slot is made in the outer end of the arm (*j*), in which the link (*k*) can be fastened by a screw and nut, at different distances from the shaft (*i*). When the lower end of the link (*k*) is fastened in the end of the slot nearest the shaft (*i*), the pressure on the piston (*E*) is transmitted through an increased leverage to move the valve (*c*), and to raise it higher from its seat than if the end of the link (*k*) had been fastened in the outer end of the slot in the arm (*j*). The adjustment of the lower end of the link (*k*), within the slot, may be made by means of a screw and nut, as shown in the drawing; or, if thought necessary, the link (*k*) might be attached to a hand lever, within constant reach of the engineman, to be regulated at his pleasure.

Having thus fully described the nature and operation of my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

The arrangement of the piston *E*, within the cylinder *D*, in communication with the steam or water space of the boiler, and with the exhaust chamber *C*, in relation to the spring *n*, rods and levers and beams *h*, *j*, *k*, *l*, *m*, and valve *c*, operating as, and for the purposes herein set forth.

JOHN E. WOOTTEN.

Witnesses:

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GEO. M. CLARKE.