

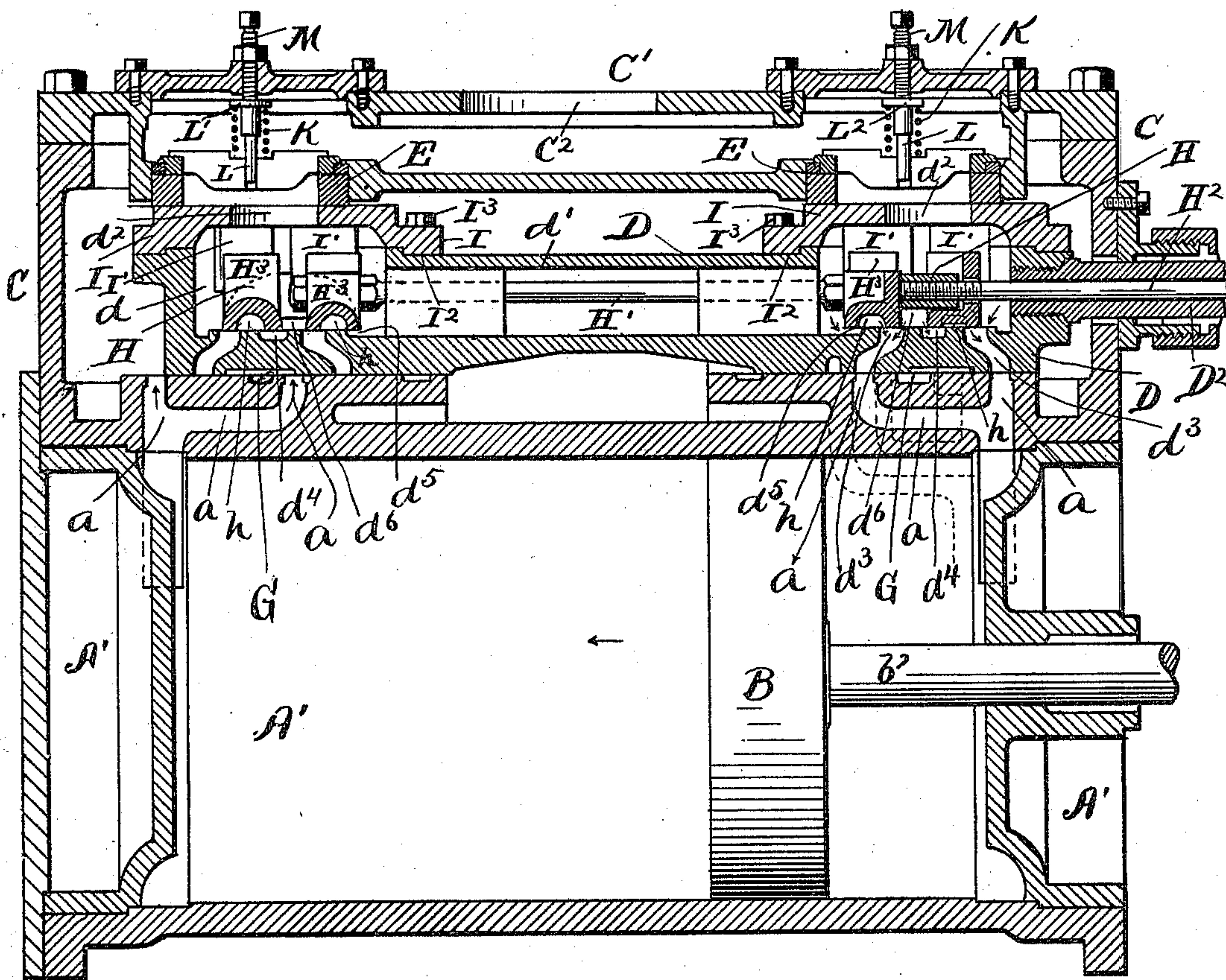
(No Model.)

2 Sheets—Sheet 1.

A. K. MANSFIELD.  
CUT-OFF VALVE MECHANISM.

No. 533,177.

Patented Jan. 29, 1895.



*Fig. 1.*

Witnesses  
E. B. Gilchrist  
Exors

Inventor,  
Albert K. Mansfield  
By Suggett & Suggett  
his attorneys.

(No Model.)

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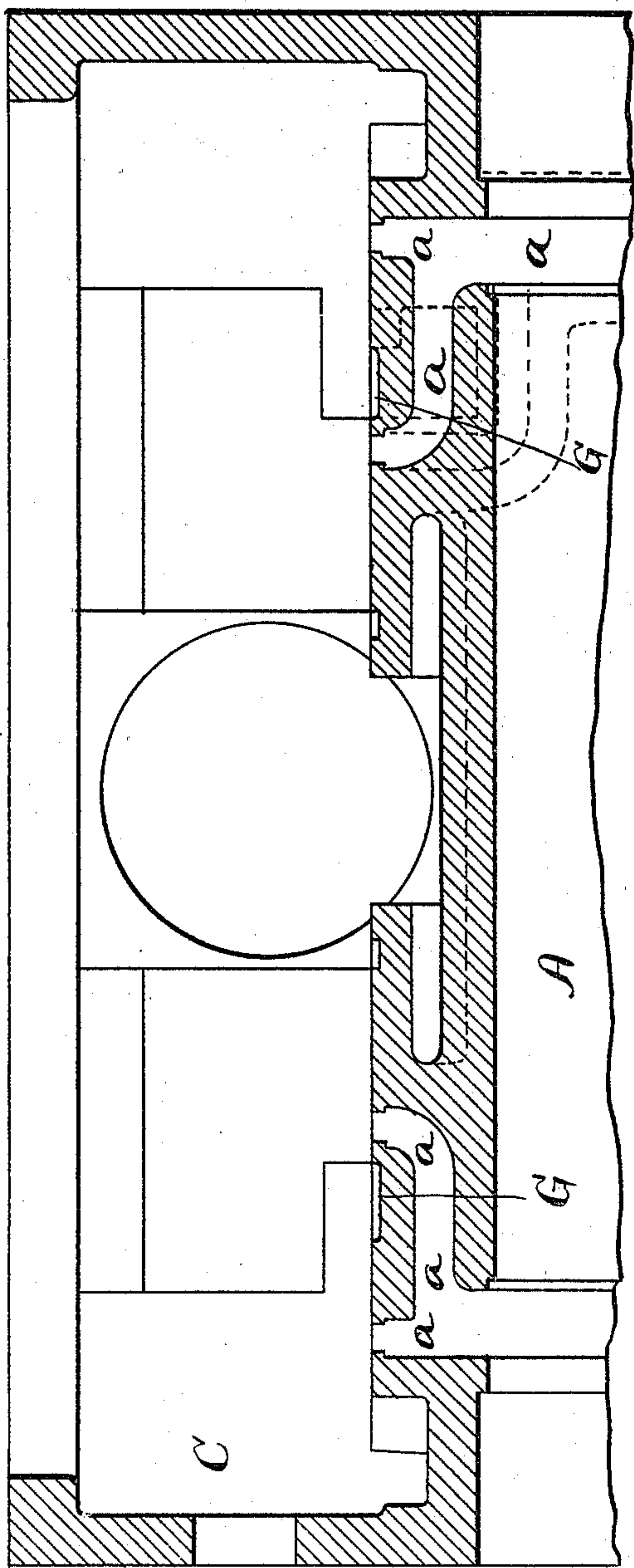


Fig. 2.

Witnesses.  
E. B. Gilchrist  
C. H. Worn

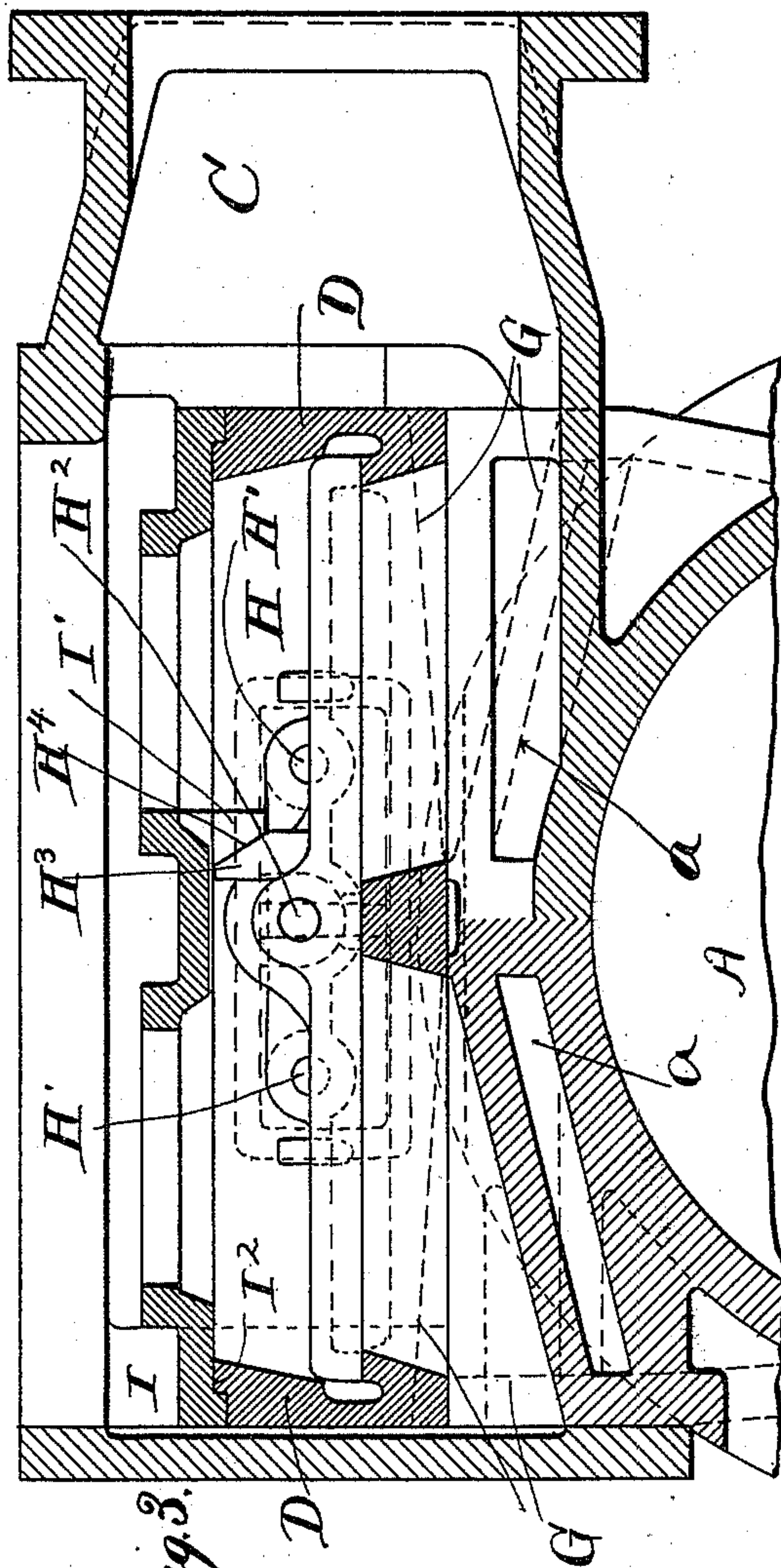


Fig. 3.

Inventor.  
Albert K. Mansfield  
By Seggett & Seggett  
his Attorneys.



# UNITED STATES PATENT OFFICE.

ALBERT K. MANSFIELD, OF CLEVELAND, ASSIGNOR OF ONE-HALF TO THE  
BUCKEYE ENGINE COMPANY, OF SALEM, OHIO.

## CUT-OFF-VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 533,177, dated January 29, 1895.

Application filed December 4, 1893. Renewed November 12, 1894. Serial No. 528,554. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT K. MANSFIELD, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Cut-Off-Valve Mechanism for Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in valve-mechanism for steam-engines; and it consists in certain features of construction and in combinations of parts hereinafter described and pointed out in the claims.

This invention consists more especially in an improvement of the construction disclosed in United States Letters Patent No. 162,714, dated April 27, 1875, to J. W. Thompson, and in United States Patent No. 364,207, to C. W. Barnaby, dated June 7, 1887.

In the accompanying drawings, Figure 1 is a vertical central and longitudinal section through a steam-cylinder, valve-chest and valves, illustrating the application of my invention. Fig. 2 is a vertical central longitudinal section through the body of the steam-chest with the valves removed, showing the adjacent portion of the cylinder and exhibiting that side of the steam-chest opposite to the side shown in Fig. 1. Fig. 3 is a transverse section, showing the valves in end elevation in position within the steam-chest.

Referring to the drawings, A designates the cylinder that is closed at the ends by means of heads A', in the usual manner, and is fitted with a piston, B, secured upon a piston-rod b. Steam is admitted to and exhausted from opposite sides of the piston through ports a a in the cylinder-shell at the ends of the cylinder, a reciprocating main valve D being employed to admit steam alternately to opposite sides of the piston, said valve being actuated, by suitable valve-gear, endwise of a valve-chest C that is rigid with the cylinder, and is closed by a hollow cover or back, C', to which steam from the boiler is admitted by a pipe (not shown) communicating with an opening, C<sup>2</sup>, in the outer shell of the cover.

The main valve is of the box or chambered type and is composed of a pair of end steam-

chambers d, connected by a longitudinal passage or tubular body d' and working between equilibrium or balance-rings E in the inner shell of the valve-chest-cover, and faces on the cylinder surrounding the ports a.

Each of the steam-chambers d is provided with a supply-opening d<sup>2</sup> that communicates with spaces in the adjacent equilibrium or balance-ring E, and in the casing of each chamber d are provided two delivery-ports d<sup>3</sup> that lead from the chamber to the seat for said chamber and through which steam passes into the adjacent cylinder-ports a a, when said ports d<sup>3</sup> are brought over the respective ports a a in the traverse of the valve when said ports d<sup>3</sup> are not closed by the cut-off valve mechanism hereinafter described.

The interior of the main valve is continuously in communication with the steam-supply, and in the reciprocation of the main valve steam is admitted to and exhausted from the cylinder ports at opposite ends of the cylinder, and simultaneously admitted to and exhausted from opposite sides of the piston into the valve-chest which is provided with an outlet communicating with a condense or exhaust pipe. (Not shown.)

The construction thus far described is substantially the same as that disclosed in the Barnaby patent hereinbefore referred to, excepting that there are two ports a a in each end of the cylinder-shell, one being a branch port of the other, both of said ports a a connecting with the chamber of the valve-chest, and the main valve is provided with two ports d<sup>3</sup> d<sup>3</sup>, as already indicated, leading from each steam-chamber of said valve and adapted to open into the adjacent ports a a in the cylinder, and an exhaust-port, space, or passage-way, G, is provided between each pair of ports a a, said exhaust-space or passage-way being so located that when the outer port of either pair of ports a a exhausts into the chamber of the valve-chest, the other or inner port of said pair of ports shall exhaust into the adjacent exhaust-space or passage-way G aforesaid, as shown at the left hand at Fig. 1, exhaust-passage-ways G, of course, being in open relation with the chamber of the valve-chest.

It is the usual practice to so construct and



set valves of the class illustrated that they shall properly control the opening and closure of the exhausting-cylinder-ports and the opening of the cylinder-ports receiving steam, the closure of the latter being effected and controlled by a cut-off-valve working within the main valve over the steam-ports thereof, said cut-off valve being under the control of the governor, and traversing over the steam-ports of the main-valve, said cut-off-valve admitting steam through said ports to the cylinder and cutting off steam earlier or later in the stroke in conformity with varying conditions of load or pressure, or both, as regulated by the governor.

A feature of my invention of great importance consists in so constructing the cut-off-valve, that, in the unclosed position of said valve, steam shall simultaneously pass from the respective steam-chamber of the main-valve, to the ports leading from said chamber, at four different points, and, furthermore, in so constructing the cut-off-valve that the aforesaid ports shall be adapted to be simultaneously closed by the cut-off-valve.

The cut-off-valve referred to comprises two sections H H, substantially alike in construction, connected by one or more bolts, stems or rods, H', so as to move coincidently, and reciprocated by a common valve-stem, H<sup>2</sup>, passing freely through the stem, D<sup>2</sup>, of the main-valve, said sections of the cut-off-valve, being each provided with two internal recesses, chambers or passage-ways h that are open at the bottom to the main-valve faces which surround the ports d<sup>3</sup> d<sup>3</sup> of the main valve, and against which said cut-off-valve-sections fit.

The seats for cut-off-valve-sections H, which seats are formed by the ported walls of the steam-chambers of the main-valve, are recessed, as at d<sup>4</sup>, between the respective pair of ports d<sup>3</sup> d<sup>3</sup>, to enable steam to pass to the outer chamber or passage-way of the respective pair of chambers or passage-ways h of the cut-off-valve-sections in the unclosed position of the valve. The seats are cut away, as at d<sup>5</sup>, to enable steam to pass to inner chambers h of the valve-sections in the unclosed position of the valve. The arrangement of parts is such that the cut-off-valve sections are adapted to simultaneously admit steam to the respective pair of ports d<sup>3</sup> d<sup>3</sup> at four different points, as follows:—into the inner port of said pair of ports through the inner passage-way of the pair of passage-ways h; to the same port from the space d<sup>6</sup> formed between the two passage-ways of the pair of passage-ways h and that is in open relation with the surrounding chamber in the main-valve; to the outer port of the pair of ports d<sup>3</sup> from space d<sup>6</sup> via recess or chamber d<sup>4</sup> and outer passage-way of pair of passage-ways h, and to the same port d<sup>3</sup> directly from the surrounding steam-chamber in the main-valve, all as indicated by arrows, as shown at the right hand in Fig. 1, and the arrangement of parts is also such

that the cut-off-valve-sections H are capable of simultaneously closing, respectively, the adjacent steam passage-ways to the steam-cylinder.

The object of the important feature of my invention hereinbefore considered, is to provide greater area of ports or passage-ways for the quick admission of steam, or to reduce the necessary travel of the valve, thereby reducing the force required to overcome the inertia of starting the valve from a state of rest at each stroke of the engine, or both.

By the introduction of exhaust-spaces or passage-ways, G, that are arranged transversely between the main-valve and steam-cylinder, it will be observed that one-half of the exhaust-steam passes from the cylinder through inner ports a into said exhaust passage-ways, which also constitutes a feature of no inconsiderable importance. The volume of exhaust steam being greater at the outer ends of exhaust-passage-ways, G, than near the middle of the main valve, said passage-ways are enlarged, preferably gradually, toward their outer ends, as shown very clearly in Fig. 3, and the inner cylinder ports a are cored angularly, as shown in the same figure, to accommodate the aforesaid wedge-shaped exhaust passage-ways G without necessitating the location of the main-valve-seat farther from the cylinder bore. Said wedge-shaped passage-ways are preferably formed partly in the valve-seat and partly in the valve, as shown.

To prevent slight influences from lifting the cut-off valve-sections from their seats and prevent the valve-sections from being quickly forced to their seats by steam-pressure when the valve closes, the cut-off-valve-sections are provided with upwardly or outwardly-projecting preferably centrally located lugs or members H<sup>3</sup> that are preferably beveled, as at H<sup>4</sup>, and engage the corresponding beveled portions of inwardly-projecting lugs or members I' on the lids or covers I of the main-valve. By this construction the cut-off valve-sections cannot easily be lifted from their seats.

The lids or covers of the steam-chambers of the main valve are preferably secured in place by means of bolts or screws I<sup>3</sup>. (See Fig. 1.)

Another feature of my invention consists in having the lid or cover of the steam-chamber of the main valve, at the stem-end of the latter, shouldered or lipped, as at I<sup>2</sup>, (see Fig. 1,) over the body of the casing of said chamber. By the construction just described, the strength of the portion of the main valve in question is vastly increased and there is no liability of the end-wall, to which the valve-stem is attached, being pulled out by the pull of the stem, added to the pressure of steam.

Springs K (see Fig. 1) bear against the equilibrium or balance-rings, and serve to give a slight initial force to said rings, the springs being suitably mounted upon pins L suitably supported centrally of the balance-rings, being confined upon said pins below the



heads L' of the pins, the outer side of said heads being engaged by screws M that extend through correspondingly threaded holes in the outer shell of the valve-chest-cover.

5 The tension of the springs, by means of said screws, may be adjusted as required. It will, therefore, be observed that, by my improved construction, the springs may be used as an auxiliary force capable of easy adjustment  
10 from without to aid the balance or equilibrium-rings. I would here remark that the function of said rings is to hold the main valve to its seat, and their effective force is the steam-pressure per square inch times the  
15 area of the circle whose diameter is the diameter of the outside of the ring. If this force should be too small by an amount within the range of the springs, it is obvious that adjustment, by means of the aforesaid screws,  
20 will overcome the difficulty.

What I claim is—

1. The combination with a steam-cylinder, steam-chest rigid with the cylinder and the main valve comprising two end steam-cham-  
25 bers suitably seated within said steam-chest, of a cut-off valve arranged to operate endwise of the main-valve, and comprising two sections suitably seated in the two end-cham-  
30 bers of the main-valve, respectively, two ports leading from each of the aforesaid steam-chambers of the main-valve to the seat for said chamber, and two ports leading from said  
35 seat and communicating with the cylinder bore, said last-mentioned ports being adapted to communicate with the aforesaid ports in the main valve, and being adapted to also communicate with the chamber of the steam-  
40 chest, each of the aforesaid cut-off-valve-sections and seat for said sections being suitably constructed to form four distinct passage-  
ways to the ports in the seat for said section in the unclosed position of the cut-off-valve, and to be capable of simultaneously closing  
45 said ports, the arrangement of parts being substantially as and for the purpose set forth.

2. The combination with a steam-cylinder, steam-chest rigid with the cylinder and the main valve comprising two end steam-cham-  
50 bers suitably seated within said steam-chest, of a cut-off valve arranged to operate endwise of the main-valve, and comprising two sections suitably seated in the two end-cham-  
55 bers of the main-valve, respectively, two ports leading from each of the aforesaid steam-chambers of the main-valve to the seat for said chamber, and two ports leading from said  
60 seat and communicating with the cylinder bore, said last-mentioned ports being adapted to communicate with the aforesaid ports in the main valve, and being adapted to also communicate with the chamber of the steam-  
chest, each of the aforesaid cut-off valve-sections and seat for said sections being suitably  
65 constructed to form four distinct passage-ways to the ports in the seat for said section in the unclosed position of the cut-off valve, and to be capable of simultaneously closing

said ports, and an exhaust-space or passage-way formed between the casing of each steam-chamber of the main valve and the seat for  
70 said casing, said exhaust-spaces or passage-ways being adapted to communicate with one of the adjacent pair of cylinder-ports, substantially as set forth.

3. The combination with a steam-cylinder, 75 steam-chest rigid with the cylinder and the main valve comprising two end steam-chambers suitably seated within said steam-chest, of a cut-off valve arranged to operate end-  
80 wise of the main-valve, and comprising two sections suitably seated in the two end-chambers of the main-valve, respectively, two ports leading from each of the aforesaid steam-chambers of the main valve to the seat for  
85 said chamber, and two ports leading from said seat and communicating with the cylinder-bore, said last-mentioned ports being adapted to communicate with the aforesaid ports in the main valve, and being adapted to also  
90 communicate with the chamber of the steam-chest, each of the aforesaid valve-sections and seat for said sections being suitably constructed to form four distinct passage-ways  
95 to the ports in the seat for said section in the unclosed position of the cut-off-valve, and to be capable of simultaneously closing said  
ports, and an exhaust space or passage-way  
100 G formed between the casing of each steam-chamber of the main-valve and the seat for said casing, said exhaust-spaces or passage-ways being gradually enlarged toward their  
outer ends and adapted to communicate with one of the adjacent pair of cylinder-ports, substantially as set forth.

4. The combination with a steam-cylinder, 105 steam-chest rigid with the cylinder and the main valve comprising two end-steam-chambers suitably seated within said steam-chest, of a cut-off-valve arranged to operate endwise  
110 of the main-valve, and comprising two sections suitably seated in the two end-chambers of the main-valve, respectively, two ports leading from each of the aforesaid steam-chambers of the main-valve to the seat for  
115 said chamber, and two ports leading from said seat and communicating with the cylinder-bore, said last-mentioned ports being adapted to communicate with the aforesaid ports in the main valve, and being adapted to also  
120 communicate with the chamber of the steam-chest, each of the aforesaid valve-sections and seat for said sections being suitably constructed to form four distinct passage-ways  
125 to the ports in the seat for said section in the unclosed position of the cut-off-valve, and to be capable of simultaneously closing said  
ports, an exhaust-space or passage-way G  
130 formed between the casing of each steam-chamber of the main-valve, and the seat for said casing, said exhaust-spaces or passage-ways being gradually enlarged toward their  
outer ends and adapted to communicate with one of the adjacent pair of cylinder-ports, and said cylinder-port being cored angularly to



4  
accommodate the aforesaid wedge-shaped exhaust passage-ways without necessitating the location of the main-valve-seat farther from the cylinder-bore, substantially as set forth.

5 5. The combination with a suitably ported steam-cylinder, valve-chest rigid with said cylinder, and main valve arranged to operate in said chest and suitably ported, of the cut-off valve suitably seated in the main valve,  
10 the cut-off valve having one or more centrally-located lugs or projecting members and the main valve, on its lid or lids, carrying lugs or projecting members engaging said lugs or members on the cut-off-valve, substantially  
15 as set forth.

6. The main valve having a steam-chamber

at each of its ends, each chamber being suitably closed by a lid or cover provided with a supply-opening, said lids or covers being suitably secured to the casing of the respective chamber and the lid or cover of the chamber at the stem-end of the valve being lipped or shouldered over the casing of said chamber, as at I<sup>2</sup>, substantially as and for the purpose set forth. 20 25

In testimony whereof I sign this specification, in the presence of two witnesses, this 14th day of September, 1893.

ALBERT K. MANSFIELD.

Witnesses:

EDGE T. COPE,

HARRY D. BROWN.