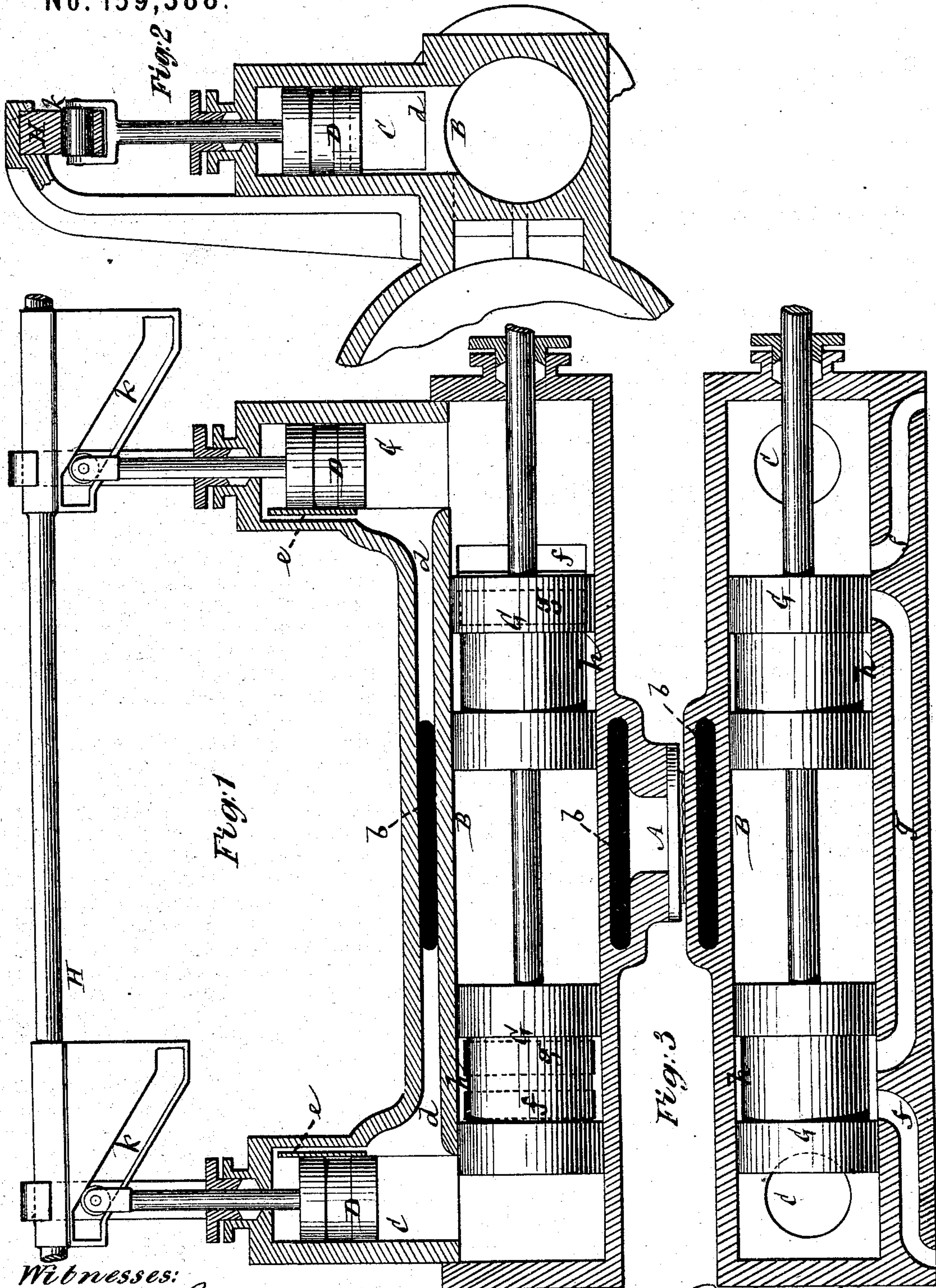


J. BULGER, Jr.  
Valve for Engines.

No. 159,388.

Patented Feb. 2, 1875.



Witnesses:

Michael Ryan,  
Fred Wagner

James Bulger, Jr.  
By his Attorneys  
Brown & Allen



# UNITED STATES PATENT OFFICE.

JAMES BULGER, JR., OF WILLIAMSBURG, BROOKLYN, NEW YORK.

## IMPROVEMENT IN VALVES FOR ENGINES.

Specification forming part of Letters Patent No. **159,388**, dated February 2, 1875; application filed December 30, 1874.

*To all whom it may concern:*

Be it known that I, JAMES BULGER, Jr., of Williamsburg, Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Valves for Steam-Engines; and I 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.

This invention consists in a certain combination, with a balanced main piston-valve, of duplicate balanced piston-regulating valves and passages, controlled by the latter for adjusting the supply of steam to the main valve in accordance with the requirements of the engine, said combination forming a very simple, practical, and efficient means, which not only embodies a balanced action of all the valves, but also a prompt regulation of the supply of steam to both ends of the main valve.

In the accompanying drawing, the regulating-valves are shown as arranged vertically, and the main valve horizontally; but this relative position of said valves may be reversed; or all the valves may be disposed horizontally or otherwise.

Figure 1 represents a vertical longitudinal section; Fig. 2, a vertical transverse section, mainly through the cylinder of one of the regulating-valves, and Fig. 3 a horizontal section through the cylinder of the main valve.

A is the main inlet for the steam to a jacket or annular space, *b*, surrounding the central portion of the cylinder B, in which the main valve works. In open connection with this annular space *b* are passages *d d*, which are in communication with the cylinders C C of the regulating-valves. These cylinders, which are arranged at opposite ends of the main-valve cylinder B, are in constant communication, at their inner ends, with said cylinder B beyond the throw or working stroke of the main valve, and the passages *d d* not only connect with the cylinders C C below the regulating-valves D D, but also, by branches *e e*, with the outer

ends of said cylinders above the regulating-valves. The main valve G G, which may be reciprocated by means of an eccentric, or otherwise, and controls the ports *f f*, which lead to opposite ends of the engine-cylinder, and the general exhaust-passage *g* is composed of duplicate pistons or heads, each formed with an annular exhaust-cavity, *h*. Said pistons or heads, as thus constructed and applied, will always be balanced, and are constantly exposed, at their outer opposite ends, to the incoming steam, each piston virtually forming a separate valve to its adjacent end of the engine-cylinder, thus economizing waste.

As only the outer end of the pistons operate over the ports and passage *f f* and *g*, exhaust-steam passing into the annular cavities *h* has no tendency to counteract the balanced action of the valve.

The regulating-valves D D are plain piston-valves; and, accordingly as they are simultaneously worked in or out, serve to open, shut off, or regulate the supply of steam by the passages *d d* to the cylinder of the main valves. As steam passes to both ends of the regulating-valves by the passages *d d* and their branches *e e*, said valves are perfectly balanced as regards pressure. The regulating-valves D D are simultaneously worked in or out, within their respective cylinders, by inclined slotted portions *k k* of a slide, H, or by any other suitable means. They may thus be operated by hand, or by the governor of the engine.

I claim—

The combination, with the double-piston main valve G G, of the regulating piston-valves D D and the steam-passages *d d*, with their branches *e e*, all for operation, in relation with each other and with the parts controlled by the main valves, substantially as shown and described.

JAMES BULGER, JR.

Witnesses:

HENRY T. BROWN,  
MICHAEL RYAN.