

(No Model.)

2 Sheets—Sheet 1.

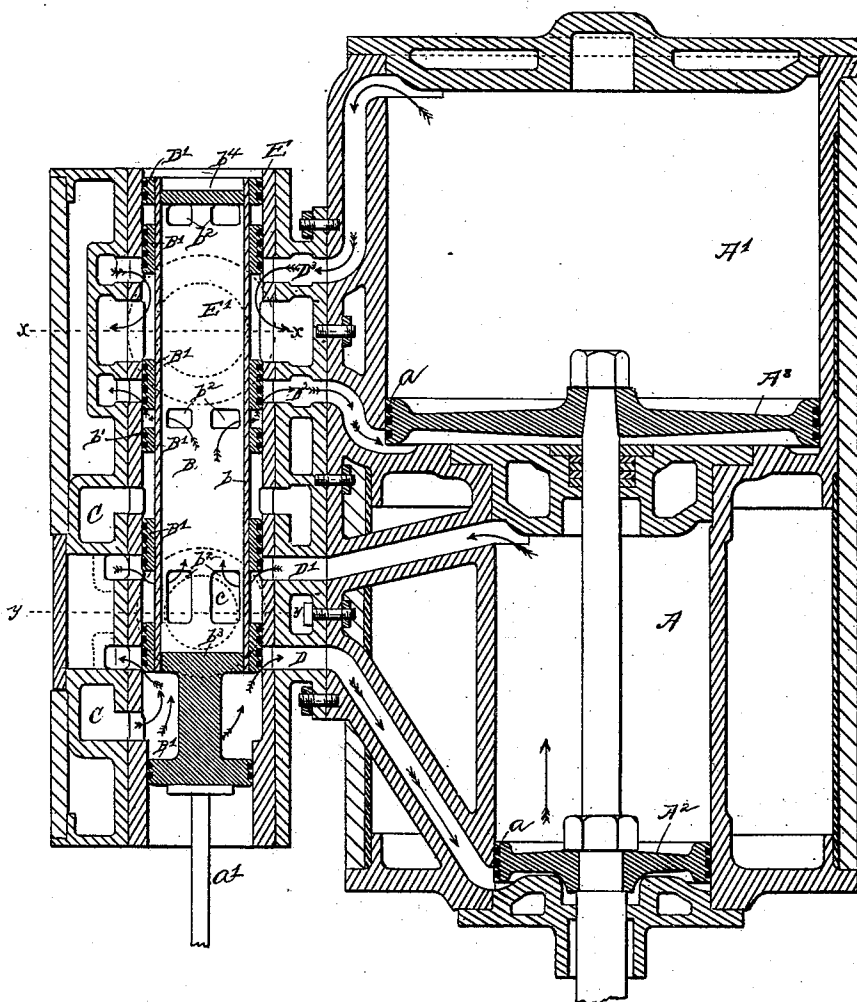
H. CANFIELD.

## BALANCED PISTON VALVE FOR COMPOUND ENGINES.

No. 477,924.

Patented June 28, 1892.

Fig. 1.



**WITNESSES:**

Ch Ferguson  
Wm M. Shiff

**INVENTOR**

*Hobart Canfield*

BY Edwin H. Brown HIS ATTY'.

(No Model.)

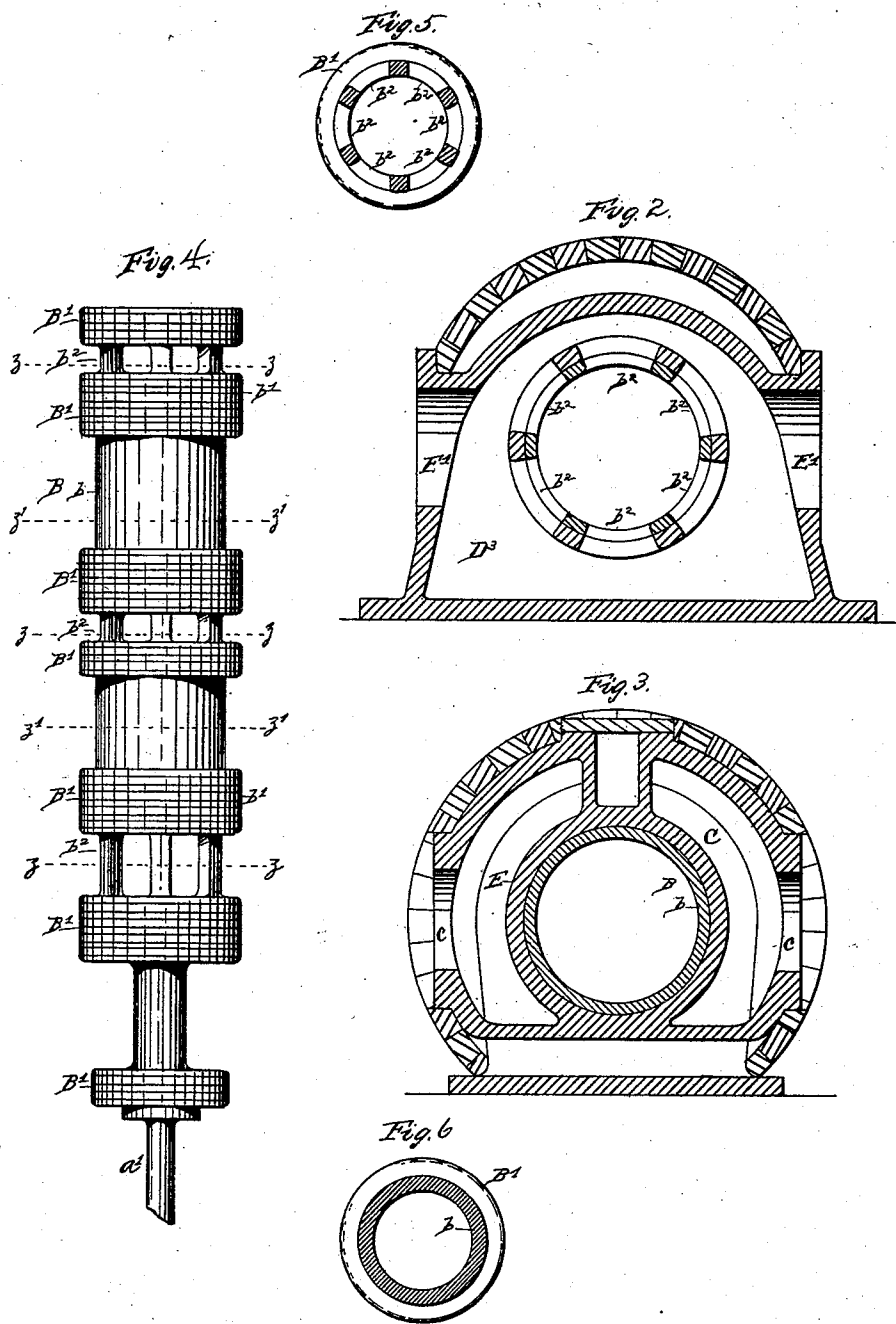
2 Sheets—Sheet 2.

H. CANFIELD.

BALANCED PISTON VALVE FOR COMPOUND ENGINES.

No. 477,924.

Patented June 28, 1892.



WITNESSES:

*Chas. F. Johnson*  
*Wm. M. Cluff*

INVENTOR

*Hobart Canfield*

BY *Edwin H. Brown* H/S ATT'Y.

# UNITED STATES PATENT OFFICE.

HOBART CANFIELD, OF MORRISTOWN, NEW JERSEY.

## BALANCED PISTON-VALVE FOR COMPOUND ENGINES.

SPECIFICATION forming part of Letters Patent No. 477,924, dated June 28, 1892.

Application filed April 23, 1891. Serial No. 390,077. (No model.)

*To all whom it may concern.*

Be it known that I, HOBART CANFIELD, of Morristown, in the county of Morris and State of New Jersey, have invented a certain new and useful Improvement in Balanced Piston-Valves for Compound Engines, of which the following is a specification.

This invention relates to balanced valves of the piston class employed in compound marine locomotives and stationary engines; and it consists of a single piston-valve governing the admission and exhaust of steam from both the cylinders, the said valve having a reduced end, whereby the valve is balanced, and reciprocating in a steam-chest casing open at both its ends.

In the accompanying drawings, Figure 1 is a longitudinal section of a cylinder steam-chest and valve embodying my improvement. Fig. 2 is a transverse section through the line *xx* of Fig. 1. Fig. 3 is a transverse section through the line *yy* of Fig. 1. Fig. 4 is a side view of the valve. Fig. 5 is a section through either of the lines *zz* of Fig. 4, and Fig. 6 is a section through either of the lines *z'z'* of Fig. 4.

Referring by letter to the drawings, A designates the high-pressure cylinder, and A' is the low-pressure cylinder, on the same center line with the first-named cylinder. The cylinder A is provided with a piston A<sup>2</sup> and the cylinder A' has the piston A<sup>3</sup>. These pistons are connected together in the usual manner and may be provided with the usual packing-rings *a*.

B designates the piston-valve, consisting, essentially, of the hollow cylinder *b* and the piston-heads B', which are here shown as seven in number, although a greater or less number may be used without departing from the spirit of my invention. The head B' at one end of the valve is of smaller diameter than the other heads, and the cylindric portion of the valve between said end head and the next adjacent head is of less diameter than the cylindric portion between the other heads. By this construction the entering steam has an increase of pressure on the second head over that of the first or reduced head, whereby the valve is perfectly balanced in

its operation. Each of the piston-heads B' may be provided with annular channels, into which metal packing-rings *b'* are fitted and properly doweled to break joints. Port-openings *b*<sup>2</sup> extend through the cylinder *b* between certain of the heads B'. The openings *b*<sup>2</sup> for the passage of live steam are shown as larger than the other openings *b*<sup>2</sup>. Closures or heads *b*<sup>3</sup> *b*<sup>4</sup> are provided at the respective ends of the cylinder *b*. From the closure *b*<sup>3</sup> a valve-rod *a'* extends to connect with any well-known driving mechanism, whereby a reciprocating movement is imparted to the piston-valve.

C designates the steam-chest, into which steam may be admitted through the opening or openings *c*. As shown in the drawings, the steam-chest C is located opposite the high-pressure cylinder A.

D D' D<sup>2</sup> D<sup>3</sup> designate steam ways or ports providing for the entrance of steam to the high-pressure cylinder and for the exhaust therefrom to the low-pressure cylinder. The liner E is also provided with ports communicating with the ports D D' D<sup>2</sup> D<sup>3</sup>.

Of course in this construction of valve there is no pressure of steam on the ends thereof. In the drawing Fig. 1 it will be seen that the pistons A<sup>2</sup> A<sup>3</sup> are about to be moved in the direction indicated by the arrow adjacent to the piston A<sup>2</sup>, and the various arrows show the course of the steam and exhaust. For instance, steam is admitted to the high-pressure cylinder through the port D, the exhaust passes from the high-pressure cylinder through the port D' to the interior of the valve by way of ports *b*<sup>2</sup> and through the port D<sup>2</sup> into the low-pressure cylinder, and the exhaust from the low-pressure cylinder escapes through the port D<sup>3</sup> to an exhaust-outlet E'. Of course when the direction of the valve movement is reversed the live steam is admitted to the high-pressure cylinder through the port D' and the exhaust is through the port D into the low-pressure cylinder through the port D<sup>3</sup>, the exhaust thereupon being through the port D<sup>2</sup>.

Having described my invention, what I claim is—

In a balanced valve, the combination of a steam-chest, a valve-casing open to the atmos-

phere at both its ends, a hollow piston-valve  
having end closures, and a number of piston-  
heads on said valve, the head at one end hav-  
ing a less diameter than the other heads and  
5 the head adjacent to said end head having a  
greater bearing surface for steam than the  
other heads, substantially as specified.

In testimony whereof I have signed my  
name to this specification in the presence of  
two subscribing witnesses.

HOBART CANFIELD.

Witnesses:

C. R. FERGUSON,  
S. O. EDMONDS.