

2 Sheets—Sheet 1.

F. G. HOBART.
STEAM ENGINE.

No. 541,665.

Patented June 25, 1895.

Fig. 1

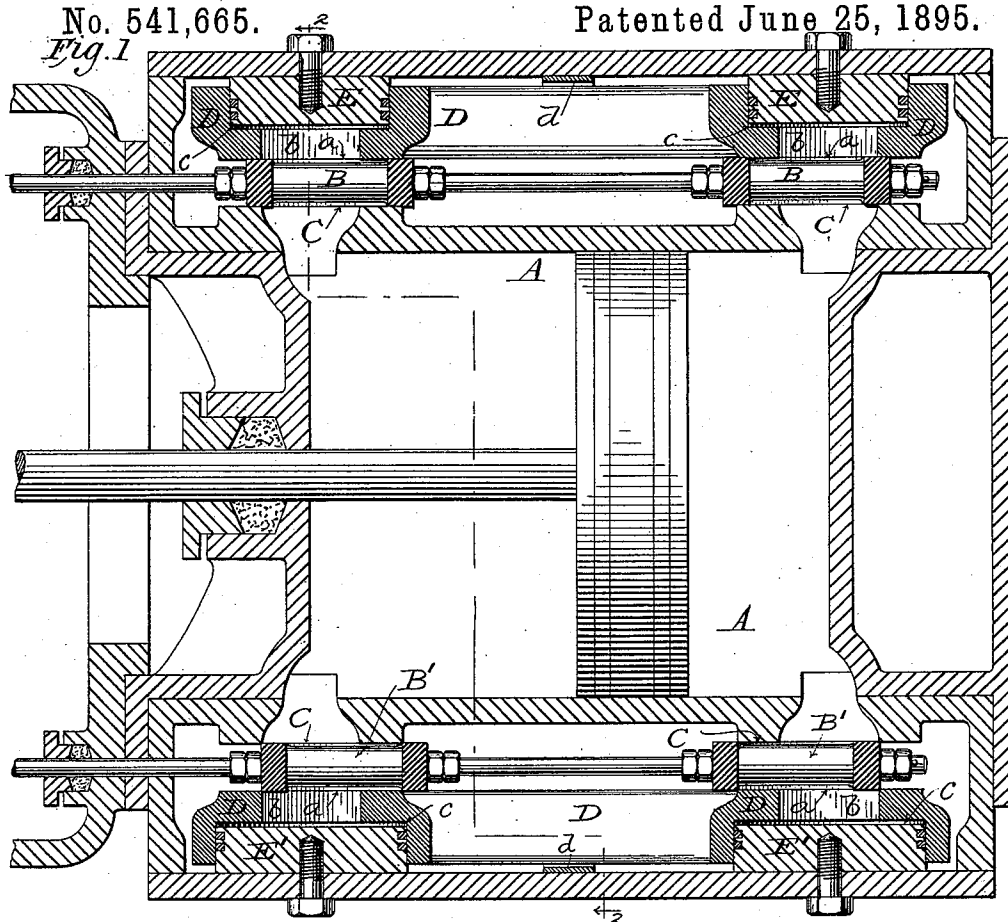
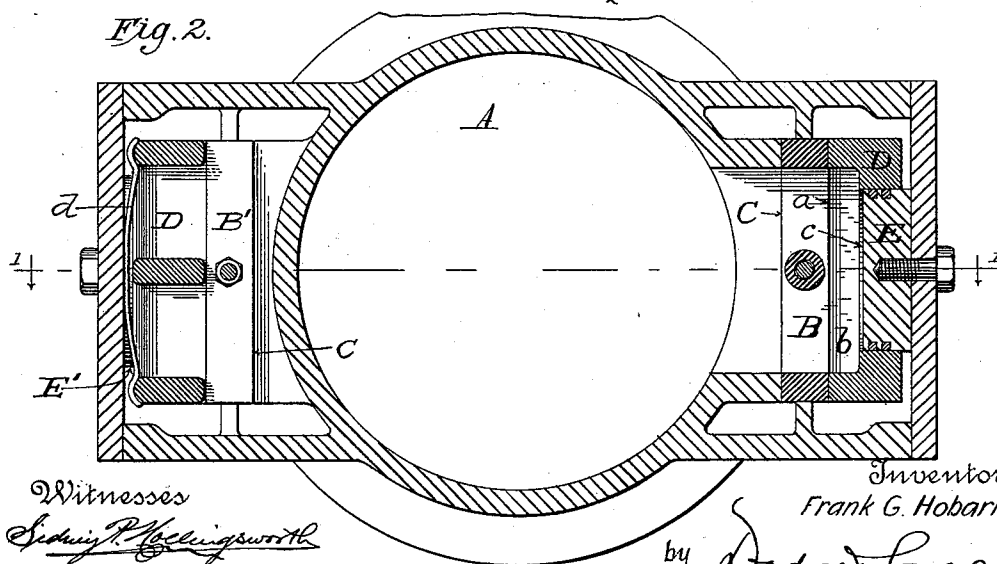


Fig. 2.



Witnesses

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Fig. 3.

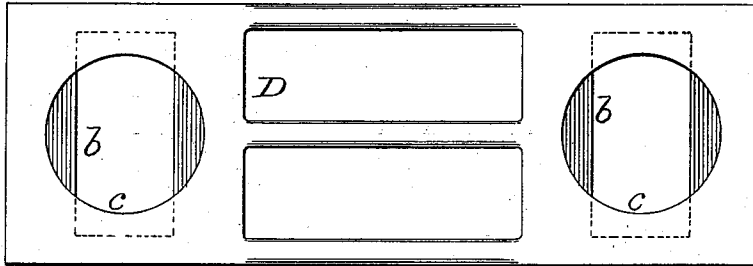


Fig. 4.

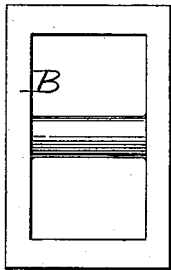


Fig. 5.

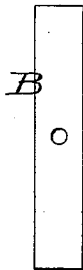


Fig. 6.

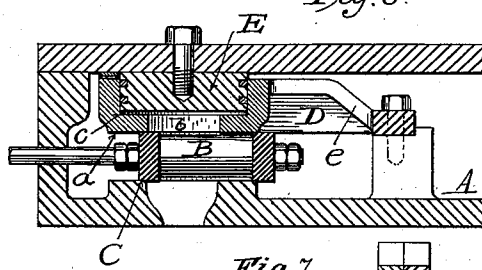


Fig. 7.

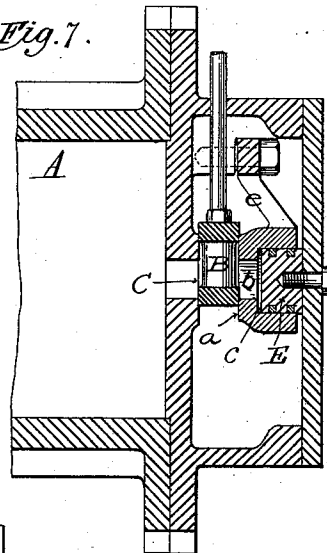


Fig. 9.

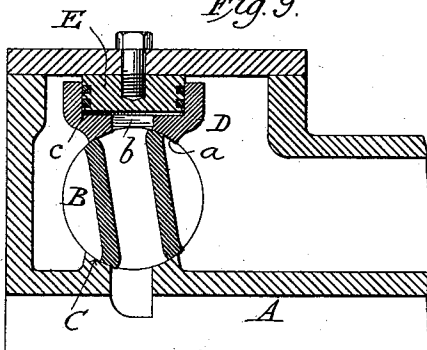
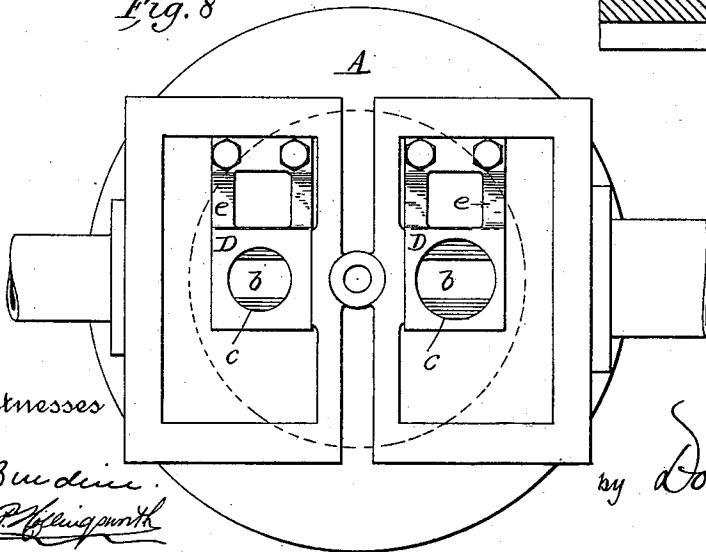


Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK G. HOBART, OF BELOIT, WISCONSIN.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 541,665, dated June 25, 1895.

Application filed April 16, 1894. Serial No. 507,739. (No model.)

To all whom it may concern:

Be it known that I, FRANK G. HOBART, a citizen of the United States, residing at Beloit, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention relates to that class of steam engines having two separate ports at each end of the cylinders, for the admission and exhaust of steam.

The objects of the invention are, first, to produce an engine in which the valves shall be so nearly balanced as to be easily operated, and which shall still be held to their seats by enough unbalanced pressure to keep them always steam tight; second, to produce an engine in which the valves shall be adapted for use as both steam and exhaust valves interchangeably,—the same patterns answering for both; third, to produce valves having four openings for inlet or outlet of steam, thus reducing the travel of the valve in this proportion; fourth, to produce a valve which may be easily adjusted to give the best possible distribution of steam under all circumstances; fifth, to produce an engine in which the valves will operate equally well at high and low speeds; and sixth, to produce a simple practical construction well adapted to economical manufacture.

In the drawings, Figure 1 is a longitudinal sectional view through a cylinder having my valves applied thereto on the line 1 1 of Fig. 2; Fig. 2, a transverse sectional view on the line 2 2 of Fig. 1; Fig. 3, a plan view of the relief-plate; Figs. 4 and 5, face and edge views of the valve; Fig. 6, a view illustrating a modification in the construction and arrangement of the relief-plate; Figs. 7 and 8, views illustrating the application of my invention to a cylinder having the valves in its head, and Fig. 9 shows the application of my invention to a rotary valve.

A indicates the cylinder, and B B' the valves, the latter working between the valve-seat C on one side and a corresponding seat on the relief plate D on the other side, thus giving four edges controlling the admission and exhaust of steam.

The valve B, which is rectangular in out-

line with an open rectangular space, has long been in use, and is not claimed herein, the invention relating to the means employed for balancing it and to the application of such means to both admission and exhaust valves.

Relief plate D may be made, as in Figs. 1, 2 and 3, of a single casting having two seats, one for each valve; or made as in the remaining figures, with each seat or end independent of the other. In all cases, however, it has on one face a seat or surface *a* in contact with the valve, and in said seat or surface an opening *b* having edges corresponding with the valve seat on the cylinder. On the opposite face there is a larger opening *c* of any desired shape, but preferably cylindrical, to receive a piston E, which is fitted steam tight in said opening by means of the usual packing rings, or in any other suitable manner.

Piston E is supported from the back by attachment to the chest cover, or in other suitable manner. The space below the piston is open to or in communication with the open space within the valve and thence with that end of the cylinder to which the valve is applied; the piston therefore acting to relieve the plate D from the steam pressure over its area, and by making it larger or smaller, a less or greater degree of pressure between the working surfaces can be secured. When used with an exhaust valve, B', the pressure within the cylinder usually exceeds that in the chest, and the piston E' should have an area a little in excess of the unbalanced area inclosed by the valve, the valve surfaces then being held in contact as before by a moderate force. Springs *d d* are inserted above the relief plate D, see Figs. 1 and 2, and serve to keep the valve surfaces in contact when the valve is open and all of the parts are in equilibrium.

In the construction shown in Figs. 1, 2 and 3, the two ends of the relief plate are rigidly connected, or cast in one piece, to prevent the relief plate from rolling as the valve travels under it. The same object is accomplished by the construction shown in Figs. 6, 7 and 8, in which the plate is provided with an arm or extension *e* on one side, which is bolted to lugs cast upon the cylinder or cylinder head.

In Fig. 9 the plate D is kept from rolling by

the piston fitting tightly into its recess in the plate, a method also applicable to other constructions, but not preferred.

I am aware that it has been attempted to balance a single valve which is used both for admission and exhaust of steam, by means of a relief plate, and one or more simple pistons fitted into the same, with the intention of relieving the plate of pressure over the area of said pistons; but this construction has failed to come into use for the reason that it is impossible to nearly balance a single valve which is used for both functions in this manner. The pressure upon such a valve varies with its travel, so that a piston with sufficient area to nearly relieve the valve from the pressure when in one position, would lift the plate from the valve when the latter is in another position, thereby causing great waste of steam. Again, if the area of the piston were made suitable for a position of least unbalanced pressure, that is when only one inlet port is covered; then in positions of greatest unbalanced pressure, that is when both inlet ports are covered, the pressure between the valve and its seat and between the valve and the plate becomes excessive and very detrimental, owing to the double surfaces exposed to sliding friction under this pressure. My construction is free from these objections, for, since each valve has but one port to cover when the valve is closed, there is a certain definite area to balance which does not change so long as the valve remains closed. When the valve opens, all the parts are in equilibrium. This difference is a radical distinction, and I limit my invention to a construction in which this distinction is present, to wit: to an engine having separate valves for separate ports.

I am also aware that it has been proposed to suspend, mechanically, the balancing mechanism of a valve, in order that the balance frame or plate may seat itself by gravity; but such an idea is wholly outside of my invention, and is not claimed by me.

Having thus described my invention, what I claim is—

1. In combination with an engine cylinder having separate inlet and exhaust ports; a separate open valve for each of said ports; an

open relief plate fitting against the inlet valve; and a piston fitted into said plate and adapted to relieve the said inlet valve of pressure over the area of said piston, substantially as shown and described.

2. In combination with an engine cylinder having separate inlet and exhaust ports; a separate open valve for each of said ports; an open relief plate fitting against the exhaust valve; and a piston fitted into said plate,—said piston having a sectional area greater than the unbalanced area of the valve, substantially as shown and described.

3. In combination with an engine cylinder having separate inlet and exhaust ports; a separate open valve for each of said ports; an open relief plate fitting against the valves; and pistons fitted into said plate and adapted to relieve the valve of pressure over the area of said pistons, substantially as shown and described.

4. In combination with an engine cylinder having separate inlet and exhaust ports; a separate valve for each of said ports; a relief plate D fitting against the valves and provided with openings *b* and *c* communicating with the opening through the valve, and the pistons E fitted to the openings *c*.

5. In combination with an engine cylinder having separate inlet and exhaust ports; a separate valve for each of said ports; a relief plate D fitting against the valves and provided with openings *b* and *c* communicating with the opening through the valve, the openings *b* being of a width equal to that of the ports; and the pistons E fitted to the openings *c*.

6. In combination with the cylinder A provided with separate ports C C C C; the inlet valves B B and exhaust valves B B'; the relief plates D D provided each with two sets of openings *b* and *c*; and pistons E E, and E' E' of different areas, fitting respectively into the relief plates of the inlet and exhaust valves.

In witness whereof I hereunto set my hand in the presence of two witnesses.

FRANK G. HOBART.

Witnesses:

L. HOLDEN PARKER,
L. E. PURVES.