

(No Model.)

2 Sheets—Sheet 1.

H. M. HUNT.
STEAM ENGINE PISTON.

No. 587,394.

Patented Aug. 3, 1897.

Fig. 1.

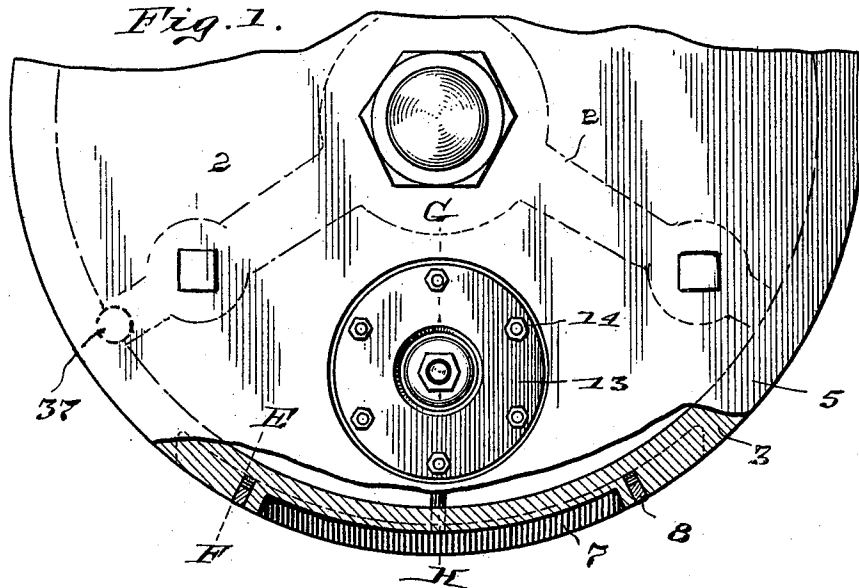


Fig. 2.

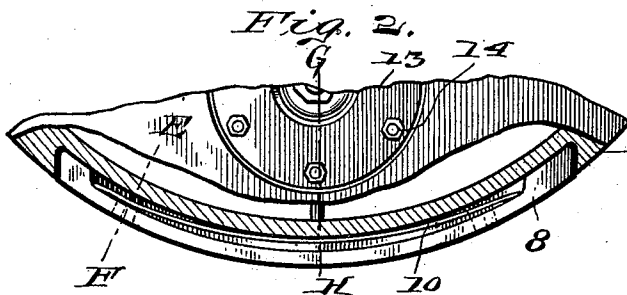


Fig. 3.

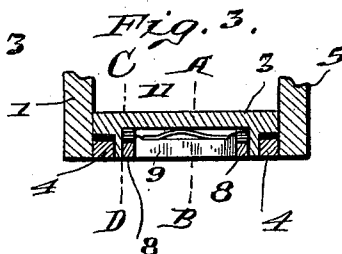
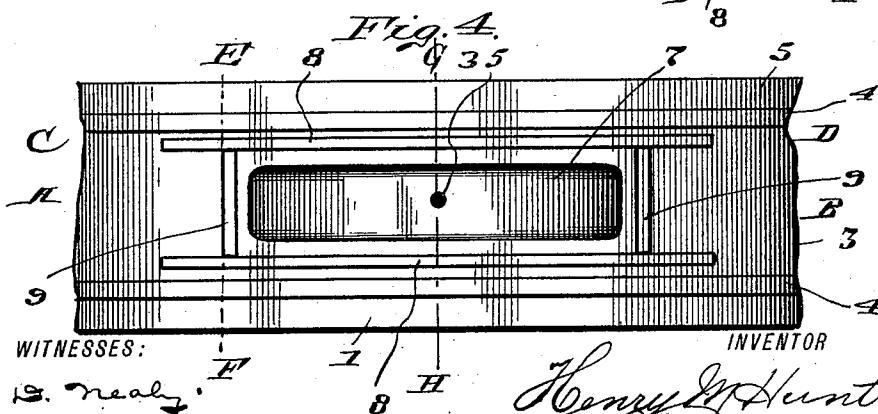


Fig. 4.



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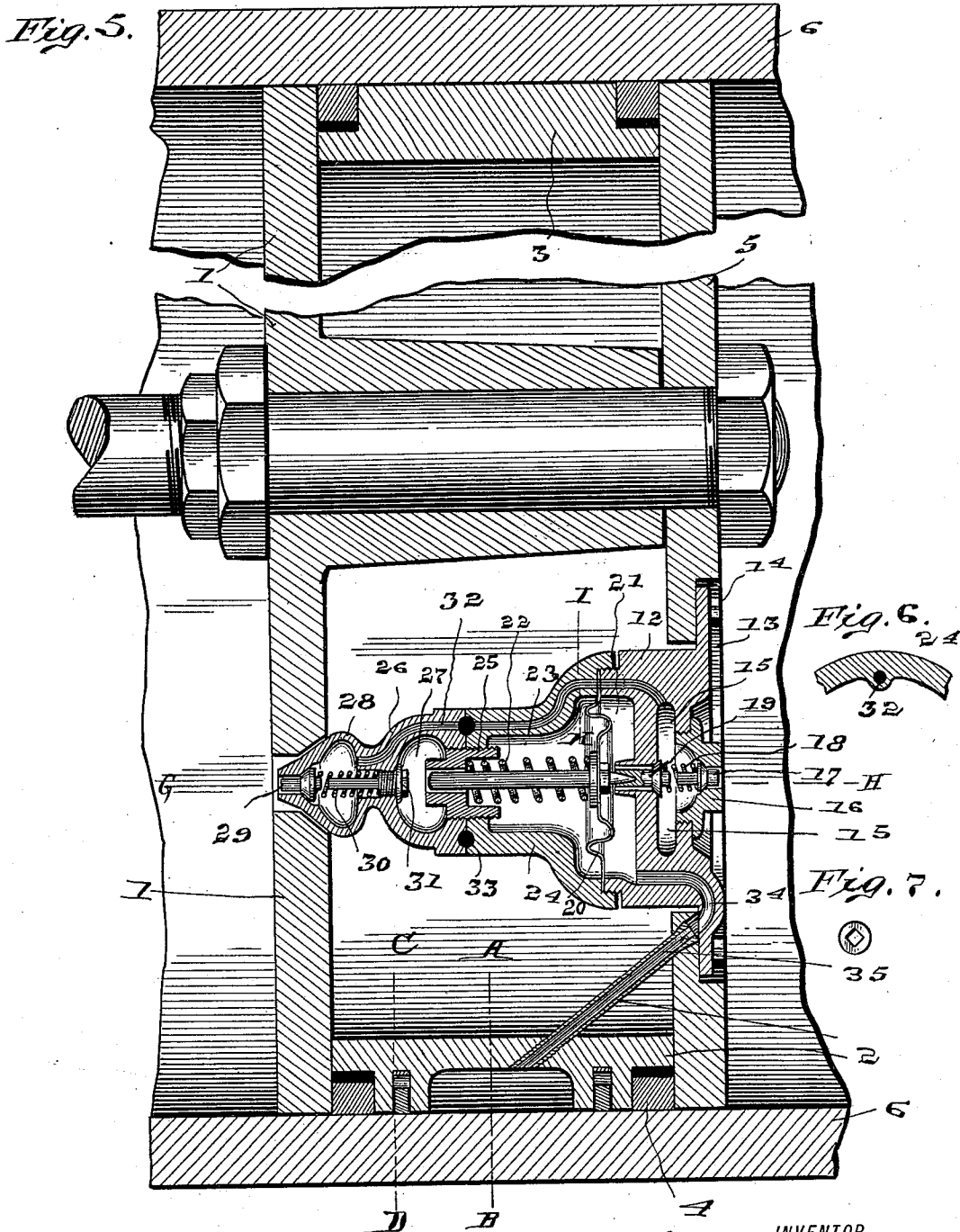
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2 Sheets—Sheet 2.

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WITNESSES:

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UNITED STATES PATENT OFFICE.

HENRY M. HUNT, OF INDIANAPOLIS, INDIANA.

STEAM-ENGINE PISTON.

SPECIFICATION forming part of Letters Patent No. 587,394, dated August 3, 1897.

Application filed January 6, 1897. Serial No. 618,137. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. HUNT, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Steam-Engine Pistons, of which the following is a specification.

My invention relates to certain new and useful improvements in pistons for steam-engines, and will be hereinafter set forth.

The objects of this my invention are to provide a means whereby the weight of the piston in horizontal engines will be counterbalanced by means of fluid-pressure, and to prevent the unequal wear on the interior surface of the cylinder in which said piston reciprocates, and to reduce the rubbing or sliding friction between the surfaces of said piston and cylinder. I attain these objects by means of the piston illustrated in the accompanying drawings, in which similar numerals of reference designate like parts throughout the several views.

Figure 1 is a part broken-off sectional elevational view of a piston embodying my invention and taken through the lines A B. (See Figs. 3 and 5.) Fig. 2 is a similar view taken through the line C D. (See Figs. 3 and 5.) Fig. 3 is a broken-off transverse sectional view of the piston, taken through the line E F. (See Figs. 1, 2, and 4.) Fig. 4 is a broken-off plan view of the piston, showing the reservoir or chamber for receiving the fluid under pressure for counterbalancing the weight of the piston and connected parts. Fig. 5 is an enlarged broken-off transverse sectional view of the piston, taken through the line G H. (See Figs. 1, 2, and 4.) Fig. 6 is a broken-off detail sectional view showing the connecting-port of the reducing-valve or pressure-regulator and is taken through the line I K, (see Fig. 5,) and Fig. 7 is an end view of the enlarged end of the connecting-pipe of the counterbalancing pressure-chamber.

The piston 1 may be of the usual form or any suitable form of construction, provided with the spider 2 and the bull-ring 3, which is reduced at its ends to receive the packing-rings 4, said bull-ring being turned out truly at its inner surface to accurately fit and to slide over the ends of the spider 2, in which

position it is held by means of the piston-follower 5, which is securely bolted to said piston. The piston, bull-ring, and packing-rings are accurately and truly turned at their exterior peripheries to fit and to slide in the cylinder 6.

In the bottom portion of the bull-ring 3 is formed the chamber 7, into which the fluid under pressure is introduced from either or both ends of the cylinder 6 of a pressure sufficient to counterbalance the weight of the piston and attachments connected therewith.

The chamber 7 is bounded by a series of grooves or recesses arranged in rectangular form and completely inclosing the said chamber 7, and in these grooves are fitted the packing-strips 8 and 9, which are forced outwardly to a bearing against the said cylinder by their springs 10 and 11 to form a steam-tight joint around said chamber.

It is obvious that the pressure of the fluid contained in the chamber 7 must be maintained at a fixed and uniform pressure, which fixed pressure is maintained by a suitable pressure regulator and reducer, hereinafter set forth.

In all engines of approved construction the actuating fluid, if an elastic fluid, is used expansively. Therefore the pressure of the fluid in the cylinder at the beginning of the stroke of the piston is greater and diminishes gradually as the said piston approaches the end of its stroke. Therefore in order to maintain a uniform pressure in the chamber 7 a pressure reducing and regulating device, which may be of any approved form of construction that can be applied in this case, must be used in connection with the piston, through which the fluid at its higher pressure will be introduced into the said chamber 7 at a fixed and previously-determined pressure, and when such fluid has been introduced into said chamber means must also be employed whereby the fluid will not return into either of the ends of the cylinder when the pressure is reduced therein. These objects are accomplished by the means which I will now proceed to describe.

The frame or casing of the pressure-regulator is composed of the piece 12, which is provided with the flange 13, which latter is

accurately fitted and secured to the piston-follower 5 by the securing-bolts 14. The piece 12 is also provided with the chamber 15, which is closed by the movable cap 16, screwed 5 firmly and securely therein, said cap provided with the valve 17, which permits the entrance of the fluid under pressure into said chamber 15, but is closed against its exit therefrom by the coil-spring 18. The pressure-regulating 10 valve 19 is also actuated to close against the fluid-pressure in the chamber by means of the flexible diaphragm 20, of any flexible material that is impervious to moisture and excessive temperatures, which diaphragm, when 15 the pressure has attained its maximum in the reduced-pressure chamber 21, moves against its counterspring 22 to release the valve 19 to permit it to close. The pressure-regulating spring 22, by which the pressure in the chamber 21 is regulated, is inclosed in the chamber 23 of the piece 24, which latter is interiorly threaded at its larger end to be screwed on the threaded end of the piece 12. Screwed 20 centrally into the piece 24 at the smaller end thereof is the pressure-regulating cap-nut 25, which is counterbored to receive the pressure-regulating spring 22, which nut is provided for the purpose of adjusting the tension of said spring 22 to regulate the fluid-pressure in the 30 said pressure-regulating chamber 21.

The piece 26 is jointed to the end of the piece 24 and firmly secured thereto by being centrally threaded and screwed on the end of the cap 25, said piece 26 also forming a lock- 35 nut by which the pressure-regulating nut 25 is held in its adjusted or set position. The said end piece 26 is tapered at its smaller end to accurately fit into the similarly-formed counterbore of the piston 1 and is provided 40 with the chambers 27 and 28. The chamber 28 is provided with the check-valve 29, which is closed by the coil-spring 30, by which said valve is promptly closed to prevent the escape of the fluid from the chamber 28, said spring 45 30 encircling the stem of the adjusting-nut 31, screwed into the said piece 26, by which latter the tension of said spring is set.

The end chambers 15 and 28 are connected together by the ports 32, which are formed in 50 the pieces 12, 24, and 26, and in order that communication may be maintained between said ports when connecting the parts I provide the annular grooves 33, which permit said connected pieces to be united irrespective 55 of the relative positions of said ports.

The reducing-chamber 21 is connected to the piston-counterbalancing chamber 7 by the port 34, connecting with the connecting-pipe 35, which is screwed into the bull-ring 60 3 at its threaded end, said connecting-tube provided with the tapered head 36, which accurately fits in the similarly-formed bore of the follower 5 to form a steam-tight joint. The end of the bore at the tapered head of the said 65 connecting-tube 35 is preferably formed square for the purpose of applying a suitable key therein when screwing said tube in place.

In order that the bull-ring 3 may be prevented from turning in the piston, I provide the set-pin 37, which is driven into the drilled hole 70 formed in the said bull-ring 3 and the end of the spider 2.

It is clear that the required pressure of the fluid in the chamber 7, formed in the under side of the bull-ring 3, when used in connection with horizontal engines is maintained at 75 a pressure required to permit the weight of the piston to be counterbalanced and to cause the said piston to float on the said fluid, thereby materially reducing the friction between 80 the under surface of the said piston against the interior under side of the cylinder in which it reciprocates.

Having thus fully described the construction and operation of this my invention, what 85 I claim as new and useful, and desire to cover by Letters Patent of the United States therefor, is—

1. A piston for horizontal steam or other engines having a recess or chamber in its under 90 side, and a continuous groove surrounding and inclosing said chamber, packing-strips fitted in said continuous groove, and means whereby the fluid under pressure is admitted to and the pressure thereof is regulated in 95 said chamber.

2. A piston for steam or other engines having a recess or chamber in its under side, and a rectangular groove surrounding and inclosing 100 said chamber, packing-strips fitted in said rectangular groove, and means whereby the fluid under pressure is admitted to and the pressure thereof is regulated in said chamber.

3. In a piston for horizontal steam or other engines, the combination of a piston having 105 a bull-ring and packing-rings surrounding the reduced ends of said bull-ring, a recess or chamber in the under side of said bull-ring, a rectangular groove surrounding and inclosing said chamber, packing-strips fitted in said 110 rectangular groove, and means whereby the fluid under pressure is admitted to and the pressure thereof is regulated in said chamber.

4. In a piston for steam or other engines, the combination with the bull-ring thereof 115 having a steam-tight chamber formed in its under side, means for connecting said chamber to the pressure end of the cylinder wherein said piston reciprocates, and for closing connection between said chamber and the ex- 120 haust or low-pressure end of said cylinder, and means for regulating the pressure of the fluid in said chamber and for preventing the escape of the fluid therefrom through its passage of entrance. 125

5. In a balanced piston for horizontal steam-engines, the combination with a piston having a chamber formed in its under side, of a regulating-valve intermediate between the 130 front and rear ends of said piston and communicating with the front and rear ends of the cylinder, suitable ports for connecting the said piston-counterbalancing chamber with said regulating-valve and suitable check-

valves at the induction-openings of said regulating-valve, substantially as and for the purpose set forth.

6. In a counterbalanced piston for steam-
5 engines, the combination with the piston thereof of a regulating-valve having two opposing end chambers and an intermediate pressure-regulating chamber, said opposing end chambers connected by a suitable port or
10 passage, of inwardly-opening valves seated in said end chambers, an outwardly-opening valve between one of said end chambers and said pressure-regulating chamber, a dia-

phragm inclosing said regulating-chamber, a suitable pressure-spring at the rear of said 15 diaphragm and means for regulating the tension of the same, all substantially as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing 20 witnesses.

HENRY M. HUNT.

Witnesses:

THOMPSON R. BELL,
JOSEPH RINGLAND.