

(No Model.)

3 Sheets—Sheet 1.

A. HORNE.
PRESSURE REDUCING VALVE.

No. 491,178.

Patented Feb. 7, 1893.

FIG. 1.

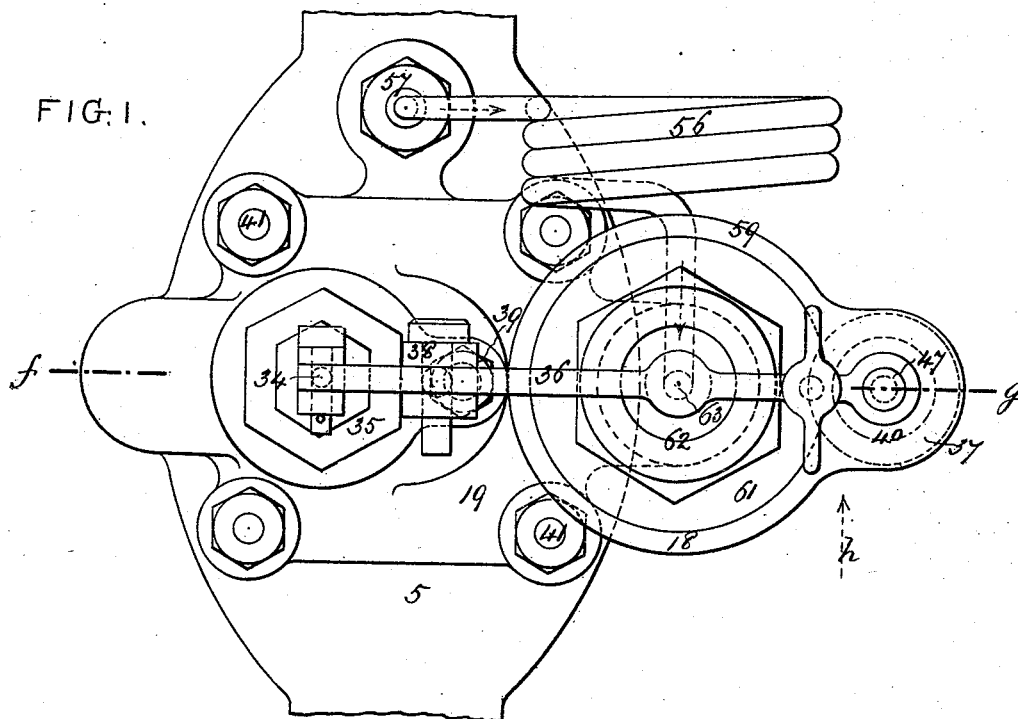
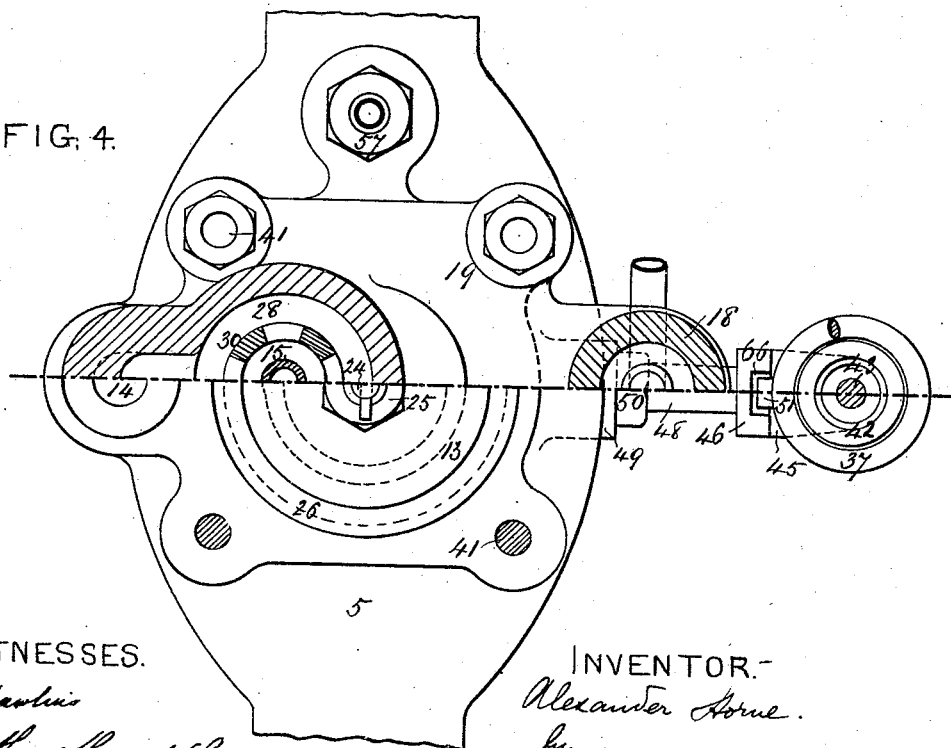


FIG. 4.



WITNESSES.

Martins
 Arthur Alexander Proyer

INVENTOR.-

Alexander Horne.

by Charles Aubrey Day. Attorney.

(No Model.)

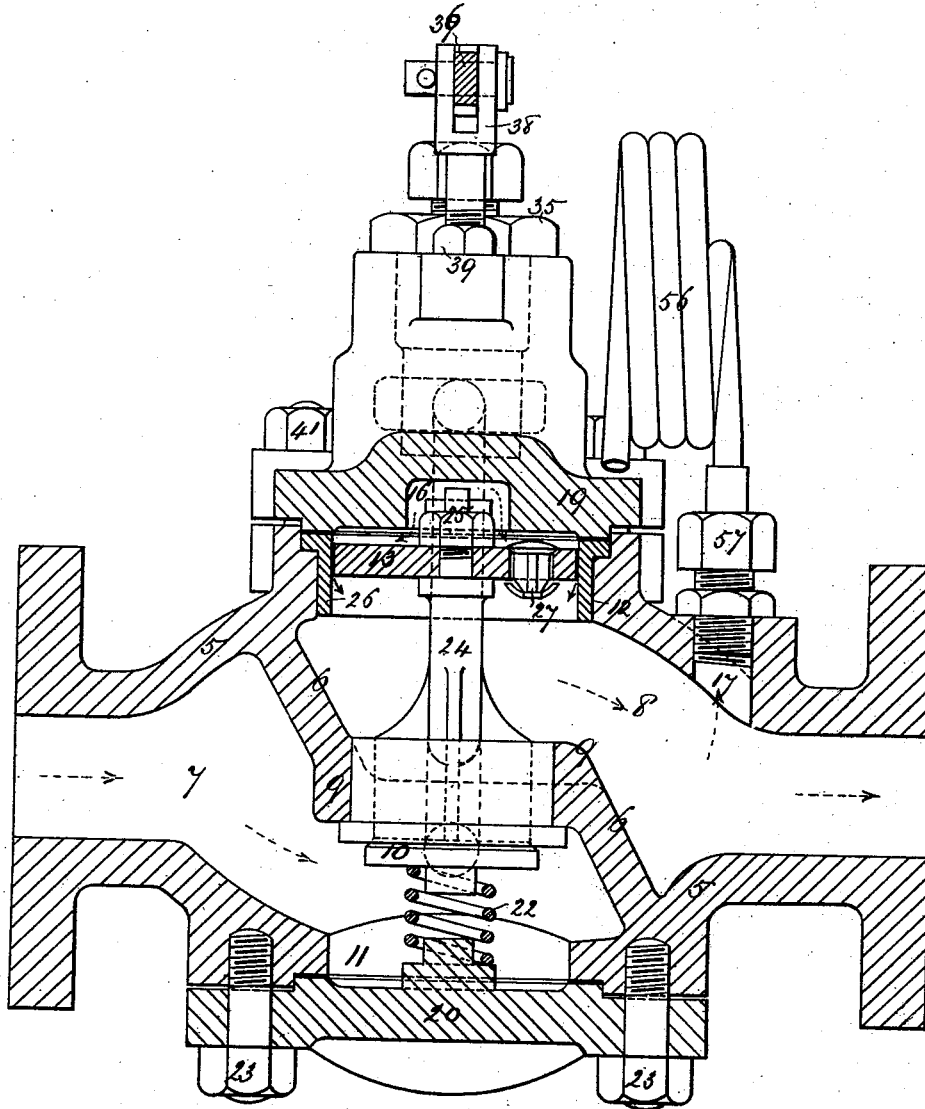
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Patented Feb. 7, 1893.

FIG. 2.



WITNESSES.

Hawkins
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INVENTOR.

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(No Model.)

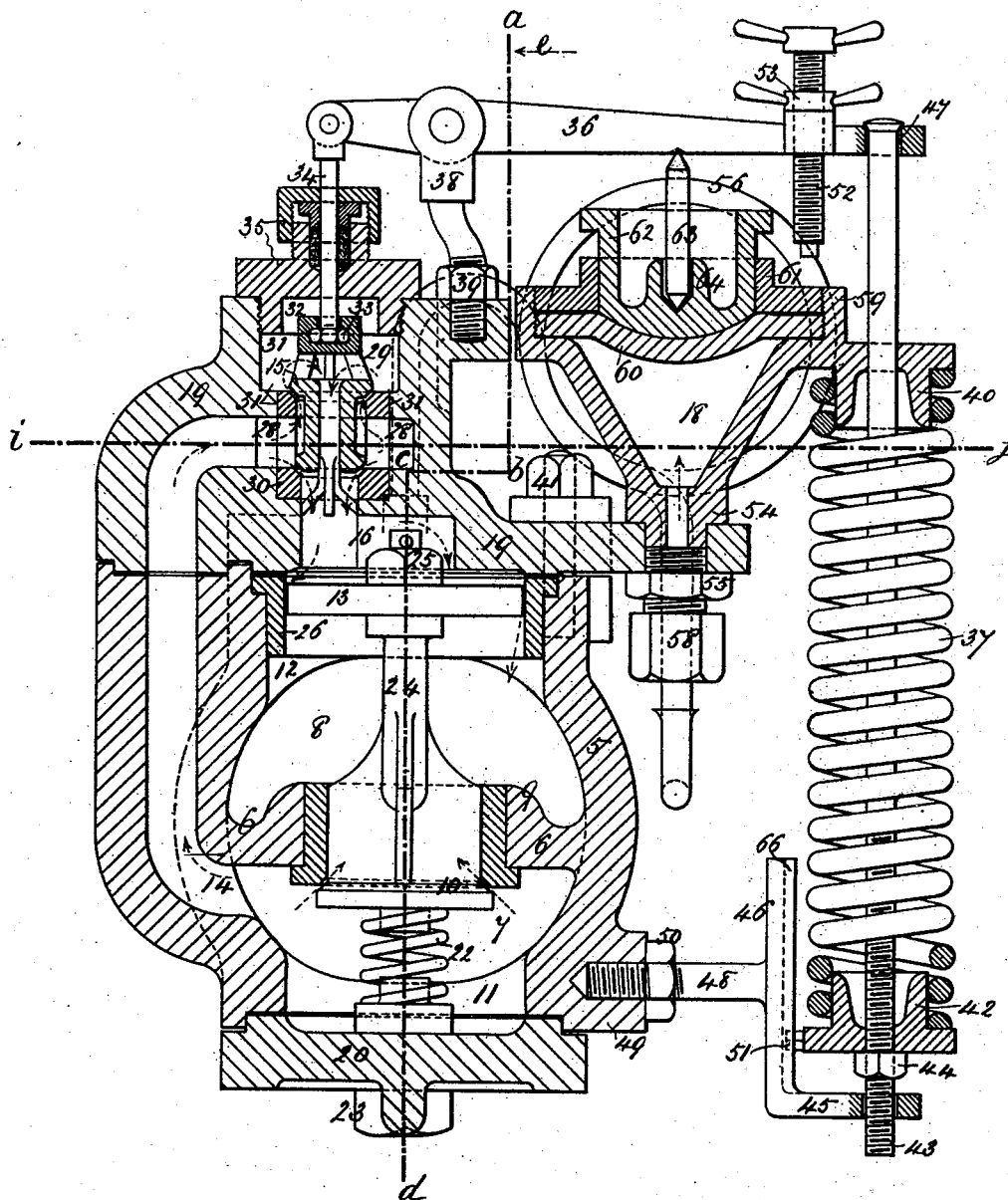
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A. HORNE.
PRESSURE REDUCING VALVE.

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Patented Feb. 7, 1893.

FIG. 3.



WITNESSES.

A. Rawlins
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Wm. J. Day
Charles Aubrey Day. Attorney.

UNITED STATES PATENT OFFICE.

ALEXANDER HORNE, OF CATHCART, SCOTLAND.

PRESSURE-REDUCING VALVE.

SPECIFICATION forming part of Letters Patent No. 491,178, dated February 7, 1893.

Application filed September 5, 1892. Serial No. 445,035. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER HORNE, engineer, residing at Cathcart, Renfrewshire, Scotland, have invented an Improved Pressure-Reducing Valve, of which the following is a specification.

This invention relates to an improved steam or other fluid pressure-reducing valve for use in marine and other engines, for enabling high-pressure steam to be taken direct from the boiler or generator and supplied to the engine at any desired reduced pressure, the improved reducing valve being easily adjusted to suit any pressure required, automatic in its action when once set, and usable, if required, as a by-pass valve to pass steam reversely through it.

In the improved reducing valve there are combined the following instrumentalities co-operating as described:—A main valve-chest formed with high- and low-pressure chambers, an interposed main valve and connected loosely fitting piston of greater area, and with opposite openings for the introduction and removal of the valve and piston, and with ports respectively leading from the high-pressure chamber to above the piston, and from the lower-pressure chamber to a water-charged chamber: a valve connected with a lever and controlling the port leading from the high-pressure chamber to above the piston: a spring device adjustable according to the pressure required in the low-pressure chamber, and tending to keep the controlling valve open: a water-charged chamber in communication with and under the same pressure as the low-pressure chamber, and tending to close the controlling valve when the pressure required in the low-pressure chamber is exceeded: a removable cover-casting closing the opening through which the piston is inserted and removed, and serving to carry the controlling valve and its controlling devices: and a removable bottom plate closing the opening through which the valve is inserted and withdrawn.

On the accompanying drawings:—Figure 1 represents a partial plan view, the flanges of the valve casing being omitted. Fig. 2 represents a longitudinal sectional elevation on the planes *a b, c d*, Fig. 3, looking in the direction of the arrow *e*, the main valve not

being shown in section. Fig. 3, represents a transverse sectional elevation on the plane *f g*, Fig. 1, looking in the direction of the arrow *h*. Fig. 4 is a partial plan, partly in section, the right hand upper half being a sectional plan on the plane *i j*, Fig. 3, and the left hand lower half a plan of the parts below the top cover.

The improved reducing valve is constructed with a main valve-chest 5, flanged and adapted for connection with the piping leading from the boiler and to the engine, and divided by an inclined partition 6, so as to form a high-pressure steam-inlet chamber 7, a low-pressure steam-outlet chamber 8, and an intermediate seating 9, for the main regulating valve 10. The valve-chest is also formed with an opening 11, concentric with the valve 10, and serving for the introduction and removal thereof and of its accessories, and with an opposite opening 12, serving for the introduction and removal of the piston 13, and of the means of connecting it with the valve. The valve-chest is also formed with a port 14, communicating (under the control of a valve 15,) between the high-pressure chamber and an inclosed space 16, above the piston, and with a port 17, communicating between the low-pressure chamber and a water-charged chamber 18.

The valve 15, and chamber 18, and their connecting and co-acting parts, hereinafter described, are all carried by a detachable cover-casting 19, which is adapted to close the opening 12, in the valve-chest, and is bolted to the latter at 41, the opening 11, therein being closed by a detachable plate 20, which is bolted to the valve-chest at 23.

The seating 9, is fitted with a cylindrical liner 21, against which the valve 10, is normally supported by a spring 22, which bears against the plate 20.

The valve 10, is connected with the piston 13, by a spindle 24, and screw-nut 25, so as to co-act therewith. The piston is of a greater area than the valve 10, and works loosely within a cylindrical liner 26, fitted to the opening 12.

The port 14, is formed partly in the valve-chest, and partly in the cover 19, and leads from the chamber 7, to a chamber 28, which surrounds the valve 15, and communicates

with an inclosed space 29, above such valve, and with the space 16.

The valve 15, is hollow and has upper and lower seatings on a liner 30, fitted in a recess 31, in the cover 19, the upper seating being of larger area than the lower seating so that the valve will be raised when subjected to pressure in the chamber 28, and steam from the chamber 7, will obtain access through both seatings and also through the valve to the space 16, as represented by arrows in Fig. 3.

The valve 15, is connected by a box 32, and screw-nut 33, to a spindle 34, which passes through a stuffing-box 35, (which screws into and closes the recess 31,) and is pivotally attached to a lever 36, by which the valve is brought under the action of an adjustable pressure-spring 37, which constantly tends to keep the valve open, and of the chamber 18, which tends (when the pressure in the chamber 8, exceeds the limit to which the spring 37, is adjusted) to overcome the spring and close the valve.

The lever 36, is centered in a standard 38, (which is screwed into the cover 19, and secured by a set-nut 39,) and is weighted, according to the required reduced pressure in the chamber 8, by the spring 37, which bears against an annular guide 40, projecting from the casing of the chamber 18, and against an adjustable annular guide 42, which can be set in any desired position on a rod 43, (according to the load required to be put on the lever) by a set-nut 44. The rod 43, is guided by the part 40, and by an extension 45, from a slotted index-plate 46, and is enlarged at its top end which engages with a through hole 47, in the lever 36, so as to tend to depress the same and open the valve 15. The index-plate 46, is made with a stem 48, (which screws into a boss 49, on the valve-chest 5, and is secured by a set-nut 50,) and is slotted at 66, to accommodate a pointer 51, projecting from the guide 42, and its face may be marked with any desired graduations acting as guides in adjusting the pressure of the spring 37.

The casing of the chamber 18, is preferably made of an inverted conoidal form (*vide* Fig. 3,) its inlet end 54, screwing into the cover 19, and being secured by a set-nut 55. The top part of the casing is enlarged and flanged at 59, and peripherally supports a flexible diaphragm 60, and a flanged ring 61, which screws within the rim 59, and serves to secure the diaphragm 60, and to guide a cylindrical cup 62, which rests on the central unsupported part of the diaphragm. The chamber 18, is placed in connection with the port 17, leading from the low-pressure chamber 8, (so as to be, at all times, under the same pressure as such chamber) by a tubular coiled siphon connection 56, secured by coupling 57, 58, and is kept charged with water to prevent steam from obtaining access to or escaping at the diaphragm. The diaphragm imparts the pressure it receives to the lever 36, by means of a conically ended pin 63, which

engages with a seating 64, in the cup 62, and with a seating in the underside of the lever 36: and by the like means (the pin 63, and cup 62,) the pressure exerted on the lever 36, by the spring 37, and rod 43, is communicated to the outer surface of the diaphragm, the parts co-acting to control the valve 15.

The action of the improved reducing valve is as follows:—Upon high-pressure steam being admitted to the chamber 7, it passes up the port 14, through the valve 15, into the chamber 16 *vide* the arrows Fig. 3 and depresses the piston 13, overcoming the spring 22, and causing the valve 10, to open and admit the steam to the chamber 8, *vide* the arrows Fig. 3 up to the pressure determined by the adjustment of the spring 37. Upon any increase of pressure in the chamber 8, the increased pressure becomes operative through the port 17, and connections 56, and chamber 18, *vide* the arrows Figs. 2 and 3 upon the diaphragm 60, and its co-acting parts 62, 63, and through such parts upon the lever 36, in overcoming the spring 37, forcing up the lever 36, and closing the valve 15. Thereupon, as the steam is shut off from above the piston 13, the valve 10, is closed by its spring 22, and by the high-pressure steam. Upon the pressure in the chamber 8, again becoming reduced to the limit determined by the adjustment of the spring 37, the latter again lifts the valve 15, whereupon, the high-pressure steam again depresses the piston and passes up through the main valve. The valve 10, during such times, is maintained in equilibrium by the opposing pressures over the piston and at the valve. Any steam which passes from above the loosely fitting piston immediately obtains access to the chamber 8. Such action is continuous and automatic, as when the spring 37, is once adjusted, no alteration of any part is required until a different reduced pressure is required in the chamber 8. Should the boiler pressure not equal the pressure required in the chamber 8, the full pressure of steam which enters the chamber 7, will pass the valve 10, to the chamber 8. The piston 13, is also fitted with a valve 27, opening upward, and the lever 36, is also provided with an adjustable screw 52, and set-nut 53, the former of which can be screwed down so as to force up the lever and hold the valve 15, on its seating, to prevent steam from passing through the port 14, when the reducing valve is required to be used as a by-pass valve (say) to pass steam from a donkey boiler to the engine-room, backward through the valve from the chamber 8, to the chamber 7: steam from the chamber 8, obtaining access through the valve 27, to above the piston, thus balancing the same and allowing the valve to open and act as a by-pass from the donkey boiler.

I claim as my invention:—

1. A reducing valve wherein are combined a valve-chest 5, formed with chambers 7, 8, openings 11, 12, and ports 14, 17, and fitted with a valve 10, and piston 13: a valve 15, piv-

otally attached to a lever 36: adjustable spring
operating devices 37, 42, 43, tending to open
the valve 15: a water-charged chamber 18,
connections 56, and devices 60, 62, 63, tend-
5 ing to close the valve 15: a cover-casting 19:
and bottom plate 20: as set forth.

2. A reducing valve, wherein are combined
a valve-chest 5, formed with chambers 7, 8,
openings 11, 12, and ports 14, 17, and fitted
10 with a valve 10, and piston 13, fitted with a
valve 27: a valve 15, pivotally attached to a
lever 36, fitted with a stopping device 52: ad-

justable spring operating devices 37, 42, 43,
tending to open the valve 15: a water-charged
chamber 18, connections 56, and devices 60, 15
62, 63, tending to close the valve 15, a cover-
casting 19: and bottom plate 20: as set forth.

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

ALEXANDER HORNE.

Witnesses:

JOHN A. STEVENSON,
JOHN C. FINLAY.