

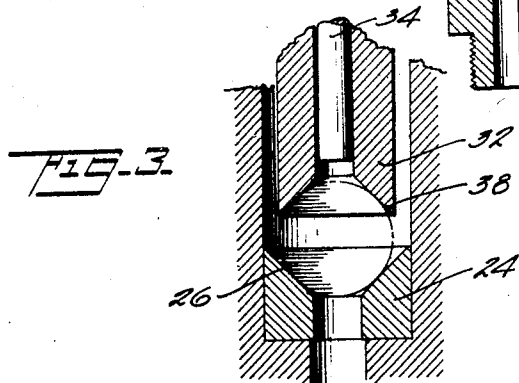
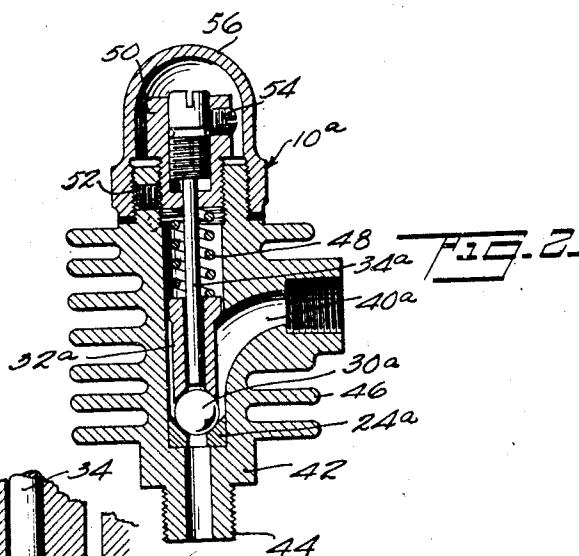
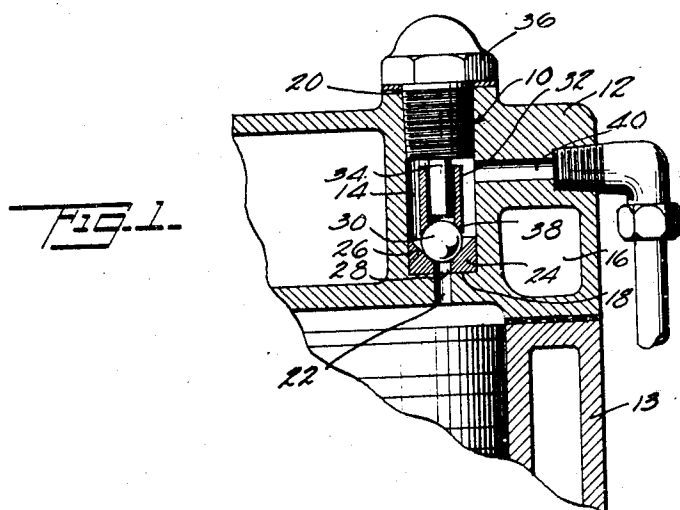
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A. MOORE

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PRESSURE REDUCING OR RELIEF VALVE

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INVENTOR
Arlington Moore
BY
Dyke, Holden & Schaines
ATTORNEYS

UNITED STATES PATENT OFFICE

ARLINGTON MOORE, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO
MAXMOOR CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

PRESSURE REDUCING OR RELIEF VALVE

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My invention relates to means for controlling the delivery of gases under pressure; and the same has for its object more particularly to provide a simple, efficient and durable device which permits of the discharge of small quantities of the gases at reduced pressure from the available supply thereof without the device becoming clogged due to any impurities, such as carbon, in said gases.

10 Another object of said invention is to provide a device of the character specified in which the passages thereof are relatively ample in size not liable to clog, and in which a vibrating valve member operating within
15 relatively constricted limits serves to control the delivery of the gases in relatively small quantities through said passages, and to maintain by the vibratory movement thereof the clearance between the same and its seat
20 substantially free from foreign matter.

Further, said invention has for its object to provide a device of the character specified which is capable of controlling the passage or discharge of high pressure gases at relatively
25 high temperatures, such as the cylinder gases of an internal combustion engine.

Further, said invention has for its object to provide a device of the character specified in which the means for controlling the extent
30 of opening of the movable valve member acts as a support for a freely movable centering member serving to insure the return of the valve member to closed position properly seated.

35 Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, my invention consists in the novel features of construction, and in the connection, combination and arrangement of parts
40 hereinafter more fully described and then pointed out in the claims.

In the accompanying drawing:

45 Figure 1 is a sectional elevation of one form of device constructed according to and embodying my said invention, the device being shown incorporated within the water-backed portions of the cylinder head of an
50 internal combustion engine;

Fig. 2 is a sectional elevation showing a modification; and

Fig. 3 is an enlarged detail sectional view showing the formation of the valve seat and centering member.

Referring to the drawing, the pressure device or element 10 at Fig. 1, shown as one example, is incorporated in the water-backed head 12 of the cylinder 13 of an internal combustion engine. The head 12 is provided with a cylindrical recess or chamber 14 formed therein; the latter being surrounded by the water-containing spaces 16 of the head 12 for cooling the element. The recess or chamber 14 has a base 18 and is open at the opposite end 20. A passage 22 of reduced cross-section through the head 12 provides communication between the interior of the cylinder 13 and the recess or chamber 14. A separate valve seat 24 disposed within the pressure element upon the base 18 is provided with a conical recess 26 having a passage 28 registering with the passage 22. The passages 22 and 28 are sufficiently large so as not to become readily clogged by any carbon or other solids present in the gases. A spherical valve member, such as the ball 30, is adapted to rest within the recess 26 to close the device, and is lifted by the escaping cylinder gases so that the passage is open at all times when the cylinder pressure exceeds the pressure on the other side of the ball. The ball 30 is freely movable, except for its own weight and that of the centering sleeve 32 therefor loosely sliding on the stem 34. No spring is employed for retaining the ball seated in the device shown at Fig. 1.

A threaded plug 36, having an air tight gasket and closing the upper end 20 of the chamber 14 carries the stem 34 which projects downward towards the ball 30 and provides a stop for limiting the movement of said ball. The plug 36, when properly adjusted axially serves to control the amount of play or vibratory movement of the valve 30. The sleeve 32 is provided with a conical recess 38 at the lower end thereof adapted to engage the ball 30 to return the same to and retain the same centrally upon the seat 24 within the recess 26. As shown more clearly

at Fig. 3, the conical recesses 26 and 38 have the surfaces thereof at an angle of substantially 45° to the axis so that the conical surfaces thereof as the ball 30 strikes the same are normal to the radii of the ball and the stresses imposed on the ball are transmitted towards the center thereof and not eccentrically. This prevents the ball from becoming flattened or distorted, prolonging the life thereof and insuring that the ball will evenly seat to prevent leakage even after considerable use thereof. The members 24 and 30 are preferably made of heat-resisting chrome steel, chrome nickel steel, or the like. The chamber 14 above the ball 30 is provided with a lateral outlet 40 through which the gases are conducted. The stem 34 is so positioned that the maximum size of the clearance between the ball and its seat when the ball is lifted is substantially less than the size of the passages 22 and 28. The size of the clearance is such as to not unduly decrease the pressure within the cylinders, and the rapid vibratory movement of the ball 30 serves to maintain said clearance substantially free from solid matter.

At Fig. 2, I show a pressure element or valve casing 10a which is separate from the cylinder wall, the same being adapted to be screwed into the cylinder head preferably in place of the pet cock. The valve shown at Fig. 2 is constructed to permit of the passage of engine gases, when the pressure in the cylinder exceeds a predetermined amount, which is always in substantial excess of the highest normal compression pressure being encountered in a particular engine. In the form shown, the same comprises a casting 42 having a screw threaded neck 44 which may be screwed into the engine cylinder preferably into the pet cock hole, and the heat radiating fins 46 serving as a substitute for or the equivalent of the water-backed construction shown at Fig. 1. The device contains the preferable ball valve 30a adapted to be seated against the seat 24a and a follower 32a which is held against the ball valve by a spring 48. The tension of the spring is adjusted by screwing the plug 50 in or out, and said plug is locked in adjusted position by a lock screw 52. Stop means are provided for limiting the extent of opening of the ball valve 30a. In the form shown, the same comprises a screw pin or stem 34a screwed in plug 50 and extending through aligned openings therein and in the follower member 32a. Pin 34a is locked in adjusted position by a locking screw 54. Cap 56 preferably encloses the adjusting parts so that the adjustment once made will not be unnecessarily tampered with or disturbed. The pressure casing or element 10a is provided with an outlet 40a at the other side of the ball valve through which the cylinder gases are discharged.

The spring pressure on the ball valve 30a

is so adjusted that the valve is not opened on the compression stroke even when the normal compression pressures are at the highest. Under these circumstances it, of course, does not open on the exhaust stroke during which the pressures are relatively low, and being in the nature of a check valve, it of course, doesn't open on the suction stroke, so that it is open only during that part of the power stroke when the pressures in the cylinders exceed that for which the valve is set.

The pressure element or valve embodying my said invention is capable of resisting intense heat without deterioration thereof. The valve is sensitive and in operation does not clog. The ball is always maintained properly centered with respect to the seat to provide, when the valve is closed, as upon the suction stroke of the engine, an airtight closure.

In my invention, the extent of opening of the ball 30, 30a is adjusted to prevent undesirable reduction in pressure within the cylinder.

Further, in my invention the means for limiting the extent of opening of the valve also serves to retain the follower or centering member 32, 32a in operative relation to the ball at all times to insure that the ball returns to seated position within the conical recess therefor.

This application is a continuation in part of my application Serial No. 26,265, filed April 27, 1925, which application resulted in Patent No. 1,766,671, granted June 24, 1930, in part a continuation of my application Serial No. 228,210, filed October 24, 1927, and in part a continuation of my application Serial No. 280,205 filed May 24, 1928.

I claim:

1. A device of the character described comprising a hollow portion, a valve seat therein having a recess and an inlet passage into said recess at the base thereof, a ball valve disposed within said hollow portion for movement therein and adapted to engage said seat to close said inlet passage, and means at the opposite side of said ball valve for limiting the movement thereof and including a portion having a recess cooperating with said valve seat for maintaining said ball centered relative to said seat, said last named recessed portion having a passage therein leading from the recess therein and venting into the interior of said hollow portion.

2. A device of the character described comprising a hollow portion, a valve seat therein having a conical recess and an inlet passage into said recess at the apex thereof, a ball valve disposed within said hollow portion for movement therein and adapted to engage said seat to close said inlet passage, and means at the opposite side of said ball valve adjusted to limit the extent of movement of the ball valve from said seat to obtain a maximum

valve opening of a size substantially less than the size of said inlet passage, and including a portion having a conical recess cooperating with said conical valve seat for maintaining said ball centered relative to said seat, said last named portion having a passage therein leading from the recess therein and venting into the interior of said hollow portion, and said conical recesses having an inclination of substantially 45° relative to the axes thereof, whereby to transmit the impact stresses radially of the ball valve during vibratory movement thereof.

3. A device of the character described comprising a member having a passage there-through, a valve therein for controlling said passage, a member for controlling the extent of opening of said valve, and a tubular member having a recessed inner end freely movable on said second named member for maintaining said valve centered to insure the return thereof to seated position.

4. A device of the character described comprising a hollow member having a valve seat including a conical recess, and a passage into said member through said valve seat, and an outlet from said member, a ball valve adapted to seat in said recess, a stem disposed axially within said member for controlling the extent of opening of said ball valve, and a sleeve sliding on said stem, and having a conical recess receiving said ball valve for maintaining said ball valve centered to insure the return thereof to seated position.

5. A device of the character described comprising a hollow member having a valve seat provided with a 45° conical recess, and an inlet passage to the interior of said member through said valve seat, and an outlet from said member, a stem in said member extending towards said valve seat, a sleeve sliding loosely on said stem and having a 45° conical recess in the end thereof adjacent to said first named recess, and a spherical valve member disposed between said valve seat and said sleeve, and adapted to be received within said conical recesses.

6. A device of the character described comprising a hollow member having an open end, an inlet passage at the opposite end, and a laterally disposed outlet passage, a valve seat therein having a passage registering with said inlet passage, and a conical recess, a ball valve adapted to seat within said conical recess, a threaded plug closing the open end of said hollow member, a stem thereon extending towards said ball valve, and a sleeve loosely sliding on said stem, and having a conical recess to receive said ball valve at the side thereof opposite said first named recess for maintaining said ball valve centered.

7. A device of the character described comprising a hollow member having an open end, and inlet and outlet openings, cooling means disposed about said member, a ball valve dis-

posed within said member for controlling said inlet opening, an adjustable plug closing the open end of said member, a stem thereon serving upon adjustment of said plug to control the extent of opening of the ball valve, and a sleeve freely slidable upon said stem and having a conical recess at the lower end thereof adapted to receive said ball valve.

8. A device of the character described comprising a hollow member having an open end, an inlet passage, and a lateral outlet, means for cooling said device, a valve seat disposed within said member and having a conical recess therein in communication with said passage, a ball valve on said valve seat; said valve seat and said ball valve being composed of a heat resisting metal, an adjustable plug closing the open end of said member, a stem extending inwardly from said plug towards said ball valve for controlling the extent of opening thereof, and a sleeve slidably disposed about said stem, and having a conical recess at the lower end thereof adapted to receive said ball valve to cause the same to properly seat when the same returns to closed position.

9. A device of the character described comprising a hollow member having a valve seat therein provided with a conical recess, and an inlet passage of a size ample to prevent clogging extending through said valve seat, a vibratory ball valve disposed within said member above said valve seat, a stem facing said ball valve and serving to limit the movement thereof, and a member slidably disposed about said stem and having a conical recess adapted to receive said ball valve; said ball valve and said conical seat having a maximum clearance therebetween of a size substantially less than the size of said inlet passage, and subject to the vibratory action of said ball valve, whereby to restrict the flow of gases through said device without liability of clogging.

10. A device of the character described comprising a member having a passage there-through and a valve seat, a ball valve adapted to seat thereon to close the passage, a stem at the side of said valve opposite said seat for controlling the extent of opening of the valve, and a sleeve sliding on said stem and adapted to project beyond said stem to engage the valve for maintaining said valve centered to insure the return thereof to seated position.

11. A device of the character described comprising a member having a passage there-through and a recessed valve seat, a ball valve adapted to seat therein to close the passage, a stem at the side of said valve opposite said seat for controlling the extent of opening of the valve, and a sleeve sliding on said stem and having a recessed inner end adapted to project beyond the stem to engage the ball for centering the same.

12. A device of the character described comprising a member having a passage there-through and an apertured recessed valve seat, a ball valve adapted to seat thereon, a stem at the opposite side of said valve serving to limit the valve opening to less than that through the aperture in the valve seat, and a gravity operated sleeve sliding on said stem and having a recessed inner end adapted to project beyond said stem and constantly engage said valve to center said valve while allowing full rotary movement thereof between said recesses.

In testimony whereof, I have signed my name hereto.

ARLINGTON MOORE.

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