

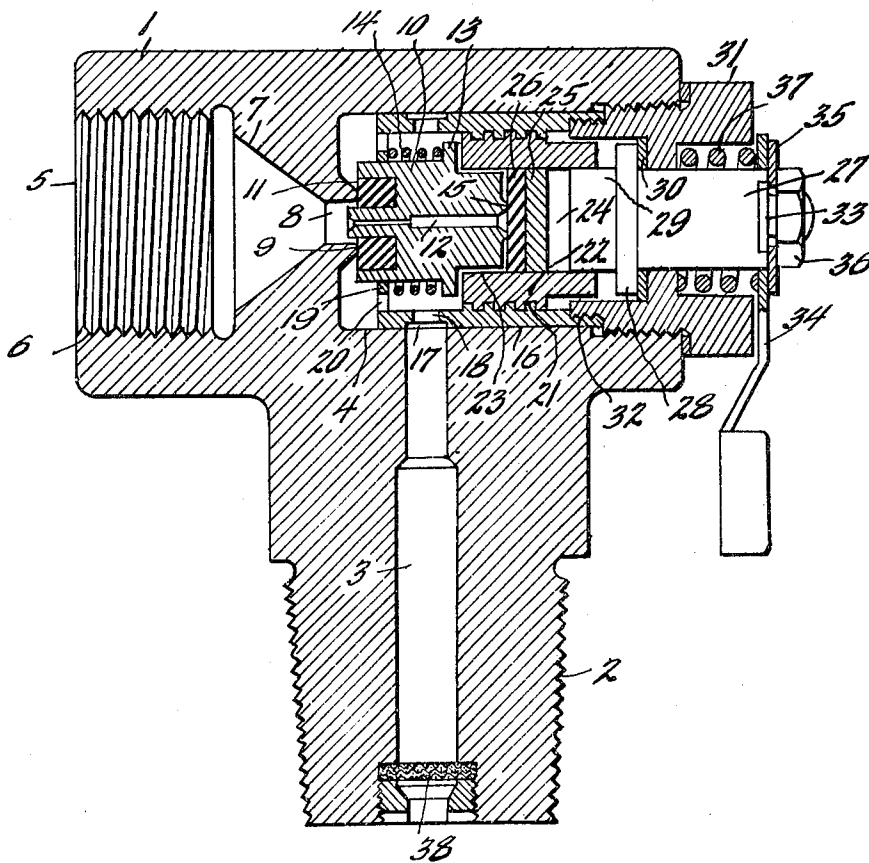
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HIGH PRESSURE CUT-OFF VALVE FOR GAS CYLINDERS

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**HIGH PRESSURE CUT OFF VALVE FOR
GAS CYLINDERS**

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2 Claims. (Cl. 137—495)

The invention relates to a cut-off apparatus for gas at high pressure, more specially to a main cut-off valve for an oxygen cylinder. In the prior art a security cut-off device has been described for the tap of oxygen cylinders and the like which security cut-off device is automatically closed by the streaming of the gas against the action of a spring when too much gas passes the tap. Such apparatus has to be combined with a main cut-off valve which can be operated by hand.

It is an object of the invention to improve the cut-off apparatus of an oxygen cylinder or the like containing a gas at high pressure as well as to produce such apparatus incorporating both security and simplicity of operation.

To achieve this end the cut-off apparatus, according to the invention, is provided with two cut-off elements mounted at the inlet of the fixed cut-off seat of the device of which one element is the main valve and can be operated manually and in which the other element is an auxiliary valve which in the closed position of the main valve is also forced to closed position by the main valve. The closing force of both valves in series is transmitted to the fixed seat. In the opened position of the main valve the auxiliary valve is free to assume either the closed or the opened position responsive to the influence of the gas on it. The auxiliary valve is provided with a small orifice through which, in the opened position of the main valve and the closed position of the auxiliary valve, some gas can escape slowly to build up pressure at the discharge end, which pressure is then employed to open the auxiliary valve.

Preferably the areas of the surfaces at both ends of the auxiliary valve and the dimension of the closing seats are chosen in such a manner that in the closed position of the cut-off apparatus the gas pressure on those surfaces produces a resultant closing force on the auxiliary valve.

A preferred form of apparatus according to the invention will now be described with reference to the accompanying drawing. In the drawing a cross-section of such an apparatus is shown, adapted to be directly connected to an oxygen cylinder at one side and to a reducing valve at the other side. The casing of the apparatus is indicated by the number 1. This casing 1 is provided with a conically threaded part 2 which is adapted to be screwed on the oxygen cylinder. Centrally within the threaded part 2 a passage 3 is provided for the gas inlet from the cylinder to the cut-off device. This passage 3 communicates with a cylindrical chamber 4 of which the axis is perpendicular to the axis of the passage 3, whereby both axes intersect each other. Coaxial with the chamber 4 is a passage 5 internally threaded at 6 to receive the connection of the reducing valve (not shown). This passage 5 connects via a conic part 7 with a restricted port 8, which in turn communicates with chamber 4 and around which a seat 9 for the auxiliary valve 10 is formed. This auxiliary valve has a hard-rubber valve ring 11 and a restricted passage or orifice 12, consisting in a wider part at the right side and a narrower part at the left side. Further, the auxiliary valve is provided with a medial

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collar 13 against which a spiral spring 14 rests and at one end with a valve seat 15. A sleeve 16 is reciprocally disposed in the chamber 4. Around its outer periphery this sleeve is provided with a circular groove 17 communicating with the passage 3. A plurality of openings 18 connect this groove 17 with the hollow interior of the sleeve 16. Further on one end this sleeve 16 has a collar 19 projecting inwardly in a plane perpendicular to the axis. This collar has openings 20 uniformly spaced around its circumference. The spring 14 abuts against the collar 19, which axially slidably receives and guides the auxiliary valve 10. Further over part of its length the sleeve 16 is provided with a thread 21. By preference this thread 21 is of the multiple type having a relatively great pitch, so that rotation thereof together with the main valve through an angle less than 360° will move both valves from the full-open to the closed position. Cooperating with this thread 21 is an externally threaded sleeve 22. The sleeve 22 has a cylindrical bore 23 in its left end and a square opening 24 in its right end. This bore 23 and opening 24 communicate with each other to facilitate manufacture, and a small cylindrical plate 25 is fixed at the lower end of the bore 23. Against this plate 25 rests a hard-rubber disc 26.

The operating element of the valve consists in a shaft 27 with a collar 28 and a projecting head 29 of square cross-section slidably received in the square opening 24. The collar 28 abuts against a fiber ring 30 which is supported in the socketed end of a nut 31 threaded into the end of chamber 4. A reduced end portion 32 of nut 31 is threadedly connected to the sleeve 16 to hold this sleeve in place. The shaft 27 is cylindrical with two flat surfaces such as 33 around which a handle 34 with a corresponding opening fits. A ring 35 and nut 36 secure the handle 34 in position on shaft 27. In a counterbore within the locking nut 31 is mounted a spiral spring 37 pushing the handle 34 to the right and thus via the locking ring 35 and the nut 36 exercising a force to the right on the shaft 27 by which this shaft is pushed to the right. This causes the collar 28 to be pressed in fluid tight relation against the fiber ring 30. As will be described further on the gas pressure acts to the right against the collar 28 to improve the sealing action of the fiber ring 30.

The operation of the apparatus is as follows: The oxygen at high pressure (for example 150 atm.) passes through a plurality of filters 38 into passage 3, and through port 18 into the space within the sleeve 16 between the seat 9 of the auxiliary valve 10 and the collar 28. When it is desired to institute a flow of gas through the device the handle 34 is rotated. At this rotation the square head 29 similarly rotates the sleeve 22 to shift the sleeve 22 to the right thus moving the ring 26 away from seat 15 to open position.

Between the seats 9 and 15 the opposite ends of the auxiliary valve 10 are exposed to the same gas pressure. However, the seat 15 has a smaller outer diameter than the seat 9. Thus in the closed position of the device the gas exercises on the auxiliary valve 10 a force which is directed to the left. Thus, when the sleeve 22 moves to the right, the auxiliary valve 10 initially remains in the shown position. The hard-rubber disc or plate 26, however, moves to the right with sleeve 22 and permits gas to pass through port 12 into discharge passage 5. The full gas pressure still acts on the freed seat 15 and urges the auxiliary valve firmly against the seat 9 against the force of spring 14 until sufficient gas has passed through bore 12 and into passage 5 to substantially increase the gas pressure within passage 5. Eventually the thrust of the gas in passage 5 will sufficiently augment the thrust of spring 14 until at least the spring 14 is able to move the auxiliary valve 10 to the right by which the seat 9 is freed. This then permits a full flow of gas through

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the port 8 into passage 5 rather than merely through restricted orifice 12.

By initially causing the gas to flow through orifice 12 there is prevented any strong pressure surge on the reducing valve. When the valve is completely open, the spring 14 will, of course, urge auxiliary valve 10 against disc 15 and the gas can stream in large quantity through the ring shaped slot 17 and the borings 18 and then through the borings 20 along the seat 9 to the reducing valve. Should a rupture occur in a pipe to which the valve supplies gas, or should the reducing valve fail, then in a short time a very great quantity of gas will escape. The small number of relatively narrow openings 20 in the collar 19 of the sleeve 16 will in such event cause a strong throttling of the gas by which the pressure at the discharge side of these openings will decrease considerably. By this the balance of forces on the auxiliary valve 10 is disturbed and the gas acts on the faces thereof with a greater force to the left on this auxiliary valve than the force with which the gas acts at the left side of the openings 20 on this valve. The resultant of the gas pressures against the action of the spring 14 now closes the auxiliary valve 10, by which is prevented that too much gas can escape and cause accidents.

I claim:

1. A back surge minimizing fluid flow valve comprising a housing defining a cylindrical valve chamber having front and rear axial ends, and formed with an axial discharge port through its forward end surrounded by a relatively large diameter valve seat within said chamber, a first valve member reciprocable axially within said chamber to and from seating relation with said seat, said member having a restricted orifice extending in an axial direction therethrough for communicating with said port when the valve member engages said large diameter seat, a seat of relatively small diameter compared to that of

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said first mentioned seat formed around the rear end of said orifice, a second valve member movable axially in said chamber rearwardly of the first member to and from operative engagement with said small diameter seat, said second valve member including operating means for selectively urging it into engagement with said small diameter seat with sufficient force to seat said first valve member against said large diameter seat, a fluid inlet passage in said housing in substantially unrestricted communication with both ends of said first valve member, whereby the opposite ends of said first valve member externally of said seats are exposed to fluid pressure within said chamber in the seated relation of both members, and the relatively larger area of said second member around said smaller diameter seat enabling the fluid pressure to urge said first valve member against said large diameter seat until the passage of fluid through said orifice permits an increase in pressure on the front end of said first member, and spring means active on said first member to unseat same from the large diameter seat when the fluid pressures on opposite ends thereof approach near equalization.

2. The combination of claim 1 wherein said operating means is a manually controllable threaded means for moving the second valve member axially in said chamber.

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