

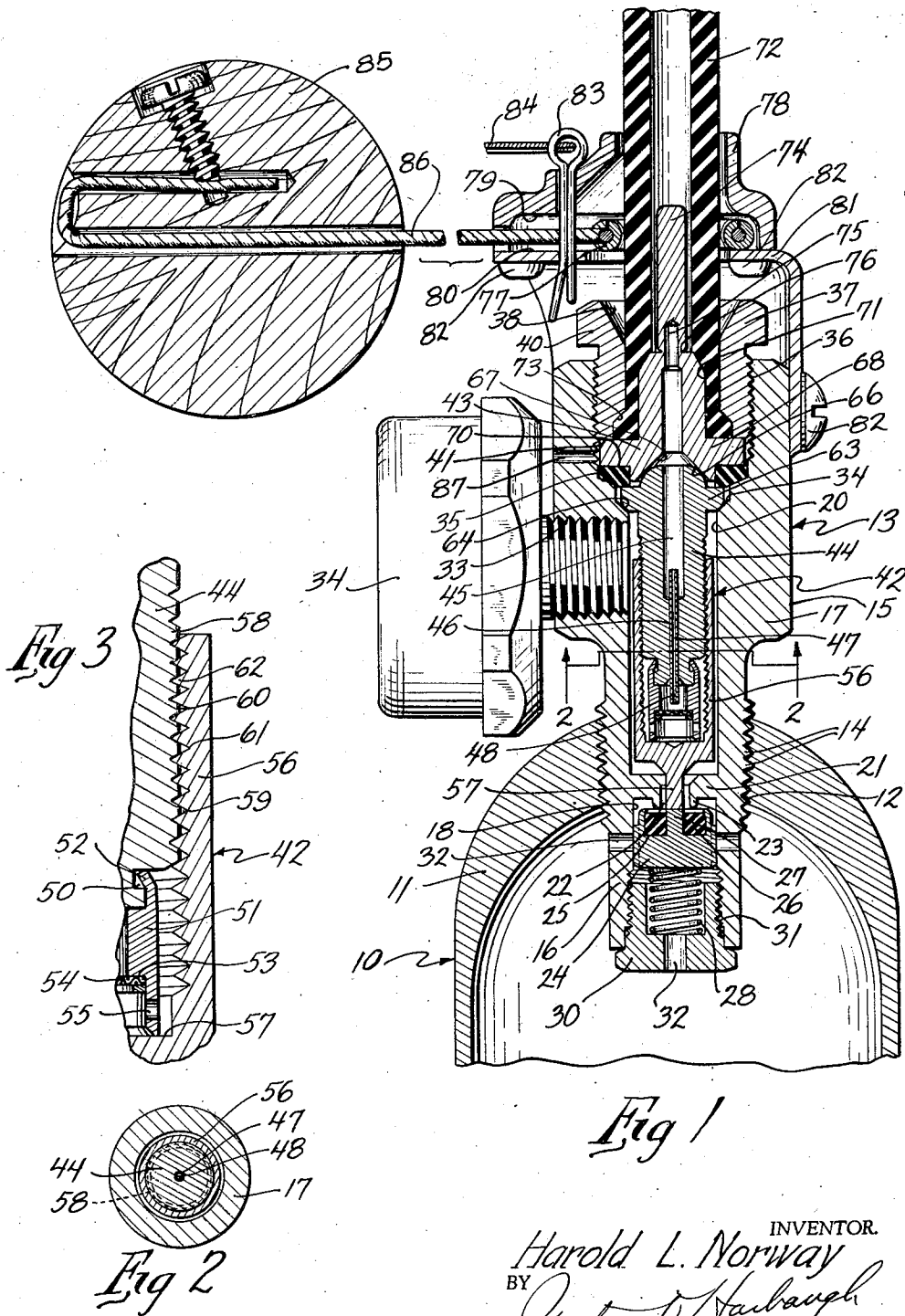
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DISPENSING DEVICE WITH FLOW RESTRICTOR AND FRANGIBLE OUTLET CLOSURE

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DISPENSING DEVICE WITH FLOW RESTRICTOR AND FRANGIBLE OUTLET CLOSURE

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The present invention relates to an improved means for filling and metering gas from a pressure bottle or container.

As a general rule, it is desirable with containers which are expected to store gas at high pressure, such as oxygen at 2000 pounds per square inch, to form the container with a single opening in order to avoid the danger of weakening the container by the presence of other openings and to avoid the need for additional stock in the wall of the container to strengthen the container around secondary openings.

The present invention not only makes it possible to fill the container with gas and dispense the gas through a single opening in the wall of the container but it also enables the performance of these operations through a single opening in a fitting connected to the single opening in the container.

A further result of the invention resides in the simplicity and compactness of the elements and their arrangement for accomplishing the filling and dispensing operations mentioned.

Another object of the invention is to provide a construction in which rigidly inspected metering parts can be removed at any time for checking or replacement and used again in the same or in conjunction with other containers.

Another object of the invention is to provide a device for dispensing at a low pressure the gas which is stored under high pressure in which the critical parts can be removed and checked at any time without discharging the cylinder.

A further object of the invention is to provide a dispensing device for bottled oxygen in which the presence of oxygen in the bottle at the required pressure can be determined at a glance as well as the readiness of the device for operation when emergency arises.

These being among the objects of the invention, other and further objects will be apparent from the drawings, the description relating thereto, and the appended claims.

Referring now to the drawings:

Fig. 1 is a vertical section taken through the device illustrating the preferred embodiment of the invention as mounted in place upon the upper end of a pressure container.

Fig. 2 is a section taken upon the line 2-2 in Fig. 1.

Fig. 3 is an enlargement of a portion of Fig. 1 at approximately where the line 2-2 is located.

Referring now to the drawing, the upper and reinforced end 11 of a metal bottle or container 10 is shown threaded as at 12 to receive a fitting

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indicated generally at 13. The bottle is made of drawn metal and of sufficient weight and strength to qualify for the storage of a gas under pressures as much as 3000 pounds per square inch and although the fitting 13 is constructed to work with such pressures its general organization can be used in connection with lower pressures and gases, other than oxygen, where filling of the container and the metering of gas from the container is desired through a single opening.

The fitting has a body 15, made preferably of brass, such as naval brass, to resist salt water corrosion, and the body is threaded with a tapered pipe thread 14 to be received in the threaded opening 12 on the container. An integral portion 16 of the body extends inside of the container and an integral portion of the body extends beyond the container as at 17. Both portions are bored from opposite ends in axial alignment to provide an inner bore 18 and an outer bore 20 separated by an integral partition or wall 21 preferably disposed within the outer contour of the container 10 where the wall 21 would not be affected if the exposed portion 17 of the body was broken off.

The wall 18 has a passage 22 therethrough surrounded by a valve seat 23 facing the inner bore 18 which serves as a valve compartment for a valve member 24 having an annular cavity 25 in the upper face thereof receiving a washer 26 which cooperates with the valve seat 23. The washer 26 surrounds a metallic post 27 integral with the valve member 24 and preferably coextensive with the washer 26 in a position coaxial with the passage 22 when the valve is closed.

The outer contour of the valve member is hexagonal to establish a guided relationship with the wall of the bore 18 without obstructing the flow of gas past the valve 24, and the washer 26 is urged into sealing contact with the valve seat by a compression spring 28 disposed behind the valve member as held in place by a retainer 30 threaded into the bore as at 31. The retainer and the walls of the bore 18 are apertured as at 32 for the flow of gases between the valve compartment and the interior of the container.

Considering now the structural characteristics of the upper portion 17 of the body, the body is enlarged to provide greater stock and is laterally apertured and threaded as at 33 to receive a pressure gauge 34 disposed in open communication with the bore 20. Beyond the aperture 33 the bore 20 is enlarged to a conical seat 34 and a conical shoulder 35. Outwardly of the shoulder 35 the body is threaded as at 36 to

receive an externally threaded nipple nut 37 having a flared mouth 38 within an enlarged hex-shaped portion 40 which is used for wrenching. At its inner end the nut 37 is flattened as at 41 to provide a driving shoulder to establish pressure seals among and between parts received in the bore 20. These parts comprise a removable metering unit 42 held in place by a retainer 43 driven by the nut 37.

The metering unit 42 is made up of a supporting member 44 having a passage 45 therethrough reduced as at 46 to hold in sealed relation a capillary type or orifice member 47 having a very small hole 48 therethrough which hole is of a size and length sufficient to afford a flow of a predetermined number of cubic feet of gas at atmospheric pressure on one side with the other end of the capillary tube subjected to a high pressure.

The lower end of the supporting member 44 is reduced and circumferentially grooved as at 50 (see Fig. 3) to receive the upper end of a ferrule 51 whose edge 52 is spun into the groove 50. The ferrule is shouldered as at 53 to support a very fine filter screen 54 beyond which the ferrule is laterally apertured as at 55 to permit the flow of gas through this screen 54 into the hole or passage 48 of the capillary tube.

The supporting member 44 is received in the open end of a cup-like sleeve 56 which has a protuberance 57 at its lower end adapted to engage the post 27 to unseat the valve 24. As shown in Fig. 3, the supporting member 44 and the sleeve 56 are threaded together and held in predetermined relationship by the lower ends of the ferrule 51 resting against the bottom 57 on the cup-shaped sleeve 56. The threading employed for this engagement is such that it will permit the flow of gas between the root of one thread and the mutilated crest of the mating thread. In the particular instance illustrated the thread 58 of the supporting member 44 is flattened as at 60 to provide a passageway 59 between the top of the flattened portion 60 and the root 61 of the thread 62 upon the sleeve 56.

With this arrangement all the gas present in the compartment 20 under high pressure flows through the circuitous passage 59 for the purposes of heat exchange with the surrounding parts to prevent freeze-ups which might arise due to the chilling effect of gas expansion on any moisture that might be present in the gas discharged at the reduced pressure. This heat exchange includes the capillary tube in event it is made of metal rather than a drawn piece of glass tubing, the one shown preferably being made of platinum.

At its outer end the supporting member 44 is provided with a radial flange 63 having a rounded edge 64 defining a surface of revolution adapted to contact the conical seat 34 in metal to metal sealed relationship. The length of the ferrule 51 is such in its relationship as a spacer that the rounded edge 64 does not engage the conical seat 34 until the protuberance 57 at the lower end of the sleeve 56 engages the post 27 and unseats the valve 24. The upper edge of the flange 63 contacts the bottom face of a resilient washer 65, preferably made of neoprene, when the washer is resting at its outer edge upon the shoulder 35 and the protuberance 57 is barely in contact with the post 27. Beyond the flange 63, the supporting element 44 is terminally rounded as at 66.

The rectilinear force upon the metering unit

42 necessary to open the valve and establish a sealed relationship between a rounded edge 64 on the conical surface 34 is provided by the nipple nut 37 as borne through the retainer 43 having a conical face 67 which engages the rounded end 66 of the supporting member in a metal to metal sealing contact. Surrounding the conical face a square shoulder 68 is provided upon the retainer 43 to telescope into and engage the washer 65 on its upper face, the shoulder 70 being wide enough radially to cover the top of the washer. Above the shoulder 70 the retainer is cut away as at 71 to provide a shoulder which is engaged by the end 41 of the nut 37 and to receive the end of a rubber hose 72 which is held in place between the inner wall of the nut and the reduced portion 71 with an enlarged space 73 being provided in the nut 37 in which a portion of the rubber hose may be disposed to prevent the hose from slipping from place.

Attached to, preferably as an integral part of the retainer 43 within the hose 72, is a break-off nipple 74 into which a passage 75 leads from the conical face 67. The body of the nipple is weakened at its root by a groove 76 so that a pull upon the outer surface of the rubber hose near the upper end of the nipple 74 would break or rupture the nipple at the weakened point to provide an opening which permits gas to flow from the capillary tube into the hose. The tube 72 leads to a point where the gas thus discharged is used.

The pull required to rupture the nipple is exerted by a ring 77 encircling the hose as held in place by a housing 78 having a guideway 79 for edgewise movement of the ring where it rests against the upper face 80 of a bracket 81. The bracket also supports the housing on the fitting body by suitable means such as screws 82.

Accidental lateral movement of the ring is prevented by a cotter pin 83, but when the cotter pin is removed by pulling the warning tag 84 fastened to it, a strong pull upon the ball 85 which is secured to the ring by a cable 86 will displace and rupture the nipple to start the flow of gas from the container.

When filling the container, the metering unit 42 is removed and replaced by a filling member (not shown). The filling unit which is interchangeable with the elements described may be an integral assembly or made up of separate parts but preferably its volume in size is such as to fill substantially the bore 20 in order to reduce the waste of the gas which would escape from the bore 20 when the filling device is removed preparatory to inserting the metering unit. The check valve 24 opens under the applied pressure of the filling gas and closes the filling connection is removed.

Furthermore, from the construction shown and described, it will be apparent that the gauge 34, being in open communication with the bore 20 at all times, will indicate not only when the maximum filling pressure is reached, but also will indicate the pressure of the gas stored in the container when the metering unit is in place without the nipple 74 being ruptured, and further will indicate the remaining amount of gas present in the container at a given time of discharge after the nipple 74 is ruptured.

After the container is filled to the full limit as determined by the gauge registration, the connection is loosened enough for the valve 24 to close. Further loosening of the connection opens the compartment to a passage 87 through

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the wall of the fitting 13 which relieves the residual pressure present in the bore 20, to avoid the parts being blown into the operator's face when finally loosened.

The filling connection (not shown) is then removed and the filling adapter taken out of the bore 20 to be replaced by any one of a number of metering units such as that described. The hose 12 and the retainer and nut 37 are threaded into place. As this threading proceeds the retainer engages the top of the supporting member 44 upon the rounded surface 66 and then the top of the washer 65. Further movement downwardly then opens the valve 24 and the pressure in the container is released into the bore 20. This released pressure forces the washer 65 outwardly, establishing a temporary seal between the retainer 43 and the wall of the bore 20 after which further movement of the nut compresses the washer to assure the seal at this point and presses the metal to metal contacts into sealed relation to confine the flow of gas through the passage 59 and the capillary tube.

The housing 78 and the bracket 81 are then fastened in place and the device is ready for emergency operation to supply gas in a metered amount for any use desired.

Having thus described the preferred embodiment of the invention including certain explanations of the use and function for the elements and the relationships described, it will be readily apparent to those skilled in the art that various changes and modifications can be made without departing from the spirit of the invention the scope of which is commensurate with the appended claims.

What is claimed is:

1. A gas dispenser comprising a pressure container, a body member connected to the container with a passage therein in communication with the container, a check valve in the passage for controlling the flow of gas through the passage, a compartment in the body beyond the check valve, means for closing the outer end of the compartment including an interchangeable destructible element for draining the container, and a removable element interchangeable with other elements disposed in said compartment between the closing means and check valve and adapted to engage and open said check valve when held in place by said closing means, said removable element including two metal members having a helical passage between them constituting the sole outlet between the open check valve and destructible element.

2. A gas metering construction for a gas dispensing device comprising two members threaded together with one of the threads constructed to provide a passageway between it and the other thread for the flow of gas past the threaded engagement in heat exchange relationship therewith, a spacer means for determining the depth to which one member may be threaded into the other, a metering conduit means carried by one of the members in heat exchange relationship therewith, and means upon one of the members adapted to be one of two mating elements for establishing a seal between the elements to confine the flow of gas from one side of the seal to the other side through said passageway and conduit means.

3. A gas metering construction for a gas dispensing device comprising two members threaded together with one of the threads constructed to

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provide a passageway between it and the other thread for the flow of gas past the threaded engagement in heat exchange relationship therewith, a spacer means for determining the depth to which one member may be threaded into the other carrying a fine filter screen, and a metering conduit means carried by one of the members and absorbing heat therefrom as gas flowing therethrough is expanded.

4. A gas metering construction for a gas dispensing device comprising two members threaded together with one of the threads constructed to provide a passageway between it and the other thread for the flow of gas past the threaded engagement, a ferrule for determining the depth to which one member may be threaded into the other and dividing the remaining space between the members into two compartments, a metering conduit means carried by one of the members accessible from one of the compartments, and filter means carried by the ferrule, said metering conduit means being in heat exchange relationship with said two members.

5. In a device of the class described having a gas storage pressure container, a body secured to the container and having a passageway through the body, a check valve for controlling the flow of gas through the passageway, a gas flow metering unit disposed in said passageway and including two members threaded together with the thread upon one member sectionally truncated to provide a curvilinear passage for the flow of gas, one of said members having a metering orifice, the gas flowing through said passageway being in heat exchange relationship through the body of said one of said members with the gas flowing through said orifice, means for sealing the outer end of said metering unit with respect to the body including a conduit member for conducting to a point of use the gas metered by the metering unit, said metering unit acting to hold said check valve open while held in cooperating position with said sealing means.

6. In a device of the class described having a gas storage pressure container, a body secured to the container and having a passageway through the body, a check valve for controlling the flow of gas through the passageway, a gas flow metering unit disposed in said passageway and including two members threaded together, said threads providing a passageway between them for the flow of gas, one of said members having a metering orifice, means for sealing the outer end of said metering unit with respect to the body including a flexible member for conducting to a point of use gas metered by the metering unit and a break-off nipple disposed in the conduit member, said metering unit acting to hold said check valve open while held in cooperating position with said sealing means.

7. In a device of the class described having a gas storage pressure container for oxygen under high pressure, a body secured to the container and having a passageway through the body, a check valve for closing in the direction of flow of gas from the container, a gas flow metering unit disposed in said passageway beyond the check valve and including two members threaded together with a curvilinear passage between them for the flow of gas, one of said members having a metering orifice, a filter carried by one of the members, means for sealing the outer end of said metering unit with respect to the body including a flexible conduit member for conducting to a point of use gas metered by the metering unit,

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a break-off nipple on said sealing means disposed inside the conduit member, said metering unit acting to hold said check valve open while held in cooperating position with said sealing means.

8. A gas dispenser having a high pressure container, including a fitting body mounted in the wall of the container and having an integral portion extending inside the container, said body being bored from opposite ends and separated by an internal flange having a valve port facing inwardly within the outer contour of the container, a check valve mounted in the bore in the integral portion and closing against said port, a metering device received in the bore outwardly of said flange, and engaging said valve and sealing means closing said outer bore and displacing said metering device inwardly to open said check valve, said sealing means including a dispensing conduit and an element controlling the flow of gas into the conduit.

9. For use in a gas dispensing system, a fitting having a body threaded intermediate its ends to be received in the opening of a high pressure container, said body having axially aligned bores therein separated by an apertured wall into an inner valve chamber and an outer compartment, a check valve in the valve chamber for normally closing flow through said aperture means sealing the outer end of the compartment, gas flow metering means in said compartment held in place by said sealing means and holding said valve open, and means carried by said flow metering means for establishing a sealed relationship between said sealing means and the flow metering means when said valve is open.

10. A gas metering construction for a gas dispensing device comprising two members threaded together with one of the threads constructed to provide a passageway between it and the other thread for the flow of gas past the thread engagement in heat exchange relationship with the members, said passageway terminating at one end in a compartment defined by the two members, a metering conduit means carried by one of the members in heat exchange relationship therewith and terminating at one end in said compartment, and means upon one of the members including a sealing element separating the other of said ends of said passageway and said conduit means from each other to confine the flow of gas through said passageway and conduit means from one side of the sealing element to the other.

11. A gas dispenser comprising a pressure container, a body member connected to the container with a passage therein in communication with the container, a check valve in the passage for controlling the flow of gas through the passage, a compartment in the body beyond the check valve, means for closing the outer end of the compartment including interchangeable elements for draining the container, a removable

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element having a capillary conduit therethrough and disposed in said compartment between the closing means and check valve for engaging and opening said check valve when held in place by said closing means, and a pressure responsive device in open communication with the container ahead of said capillary conduit when said check valve is open, said pressure responsive device cooperating with said interchangeable elements to indicate the gas volume present in the container only when the check valve is open for filling and for draining the container.

12. A gas dispenser comprising a pressure container, a body member connected to the container with a filler passage therein in communication with the container, a check valve in the passage for controlling the flow of gas through the passage, a compartment in the body beyond the check valve, means for closing the outer end of the compartment including a seal and interchangeable elements for draining the container and a frangible nipple enclosed in a flexible eduction conduit, and an axially movable element disposed in said compartment between the closing means and check valve and adapted to engage and open said check valve when moved and held in place by said closing means, said axially movable element being engaged by said seal to establish a seal before opening the check valve.

13. A gas dispenser comprising a pressure container, a body member connected to the container with a filler passage therein in communication with the container, a check valve in the passage for controlling the flow of gas through the passage, a compartment in the body beyond the check valve, means for closing the outer end of the compartment including interchangeable elements for draining the container and a frangible closure enclosed in a flexible eduction conduit, an axially movable element disposed in said compartment between the closing means and check valve and adapted to engage and open said check valve when moved and held in place by said closing means, said axially movable element engaging one of said elements in a metal to metal sealing contact to establish a seal during the time the check valve is open.

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