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CONTAINER FOR COMPRESSED GASES AND LIQUIDS

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This invention relates to the transportation, storage and use of compressed and liquefied gases and has for an object to provide a closed container for such materials which may be safely and economically transported and stored and from which the gas or liquid may be subsequently withdrawn for use without escape and loss of the gas, by attaching a suitable control valve thereto.

An object of this invention, accordingly, is to provide a closure for containers of compressed or liquefied gases which shall be small and light in weight, for transportation and storage, which shall be safe, and which can be replaced by a valve when desired to allow the controlled withdrawal of the contents of the container, when in use. Other objects will appear from the disclosure.

Briefly described, the apparatus of the invention includes a container of the usual type, having sufficient strength and made of suitable material to retain and withstand the gas or liquid under the required pressure and having a suitable outlet passageway which (after the container has been filled) may be closed by a suitably strong and impervious but fragilable diaphragm and/or by a plug that can be forced inward or otherwise removed. This diaphragm or plug forms a gas-tight connection with the surrounding walls of the outlet and is preferably made of thin sheet metal which may be easily broken or pierced, or of a soft, and if desired fusible alloy that can be forced inward or otherwise removed to open the container. This diaphragm or plug may also form the safety device required by the regulations. In the exterior portion of the outlet to the container, there are provided means such as a screw thread for making a gas-tight connection with an appropriate form of gas-control valve. The latter may be of any suitable type, but is preferably characterized by having an elongated valve stem adapted to protrude beyond the valve housing into the outlet of the container, and having a sharp point, with which to pierce the diaphragm, or to push the plug out of its seat. The end of the valve stem is preferably pointed or sharp when a frangible diaphragm is employed, but when a soft plug is used in the outlet of the container, which is to be pushed out of place by the valve stem, the latter may be blunt.

In use, the container may be filled with the compressed gas or liquid which has previously been cooled below its boiling point and...
closed by the means described without attaching a valve mechanism of any sort. It is then ready for shipment to the consumer, who may store it until required. He then attaches a valve to the outlet and by forcing the valve stem against the metal diaphragm or plug, either punctures the diaphragm or pushes the plug out of the seat thereby releasing the compressed gas or liquid. As an alternative the closure may be removed by fusing or otherwise. Further escape of the gas is prevented, however, by again turning the valve stem until the valve engages the valve seat and closes the container against further outflow of the contents.

A preferred embodiment of the invention will be described with reference to the accompanying drawings, in which:

Fig. 1 is a cross section of a cylindrical container, transversely of the outlet, with parts broken away;

Fig. 2 is a cross section of a nut and metal diaphragm for closing the same;

Fig. 2a is a cross section of a nut and tapered fusible plug;

Fig. 3 is a side view and cross section of a valve suitable for attachment to the outlet of the container shown in Fig. 1;

Fig. 4 is a cross section of a modified form of valve; and

Fig. 5 is a cross-sectional view of the valve of Fig. 4, assembled with the container, in operative position.

The container may consist as shown in the drawings (Fig. 1) of an outer retaining wall or shell (1) of generally cylindrical shape (or other closed vessel) with an outlet at 2 in the form of a somewhat extended passageway surrounded by a wall or neck 3. The inside of the neck is conveniently screw threaded as indicated at 4 and may be constricted at its inner end to form a conical valve seat 5, and a shoulder 6 adapted to receive a gasket or washer 7.

The container may be filled with the compressed gas by first cooling the material to a temperature below its boiling point and then pouring the liquid into the cylinder, like any substance which is normally liquid under atmospheric conditions. The container is then closed by inserting the metallic diaphragm into the outlet and sealing the same in position in any convenient manner.

Thus, as shown in Fig. 2, the metallic diaphragm 8 (conveniently made of a thin sheet brass disc) may be mounted as by soldering the same (across the bottom of) a nut 9, which is threaded on the outside to fit the screw thread 4 and serves to hermetically seal the outlet of the container with the aid of the gasket 7. The nut may then be screwed firmly into position against the gasket 7 and shoulder 6 by means of a screw driver inserted into a cross slot 10.

If a plug of soft metal is used it will preferably be made of alloy metal that will melt as required by the regulations of the Interstate Commerce Commission as interpreted by the Bureau of Explosives. It may be in the form of a tapered plug 8 mounted as shown in Fig. 2a in a conical opening in the nut 9 which can be screwed into the outlet neck 3 of the container, the larger end of the cone being on the inside of the container. It may also be inserted directly in the opening 2, the latter being threaded accordingly. The nut will preferably carry a slot 10 so that it may be put in place by a screw driver.

As thus closed, the cylinder may be safely shipped and stored until the contents are to be used, thus eliminating the necessity of providing any valve or valve protection device whatever and at the same time providing a container which is more resistant to the exigencies of handling than those herebefore employed.

When the contents of the cylinder are required for use, a valve such as shown in Fig. 3 may be screwed into the threaded end of the outlet 2. This valve may comprise a substantially hollow cylindrical body portion or housing 12 with a threaded valve stem 13, mounted longitudinally thereof and having a square end 14 by which it may be advanced or retracted by turning in the usual way. The stem 13 may be advanced beyond the screw-threaded end 16 of the body portion 12 and the conical end 15, which is pointed, is adapted to pierce the diaphragm 8 and also to engage the conical valve seat 5. The housing 12 may be provided with a lateral opening 17 which may be connected to a hose or other means (not shown) for leading the effluent stream of compressed gas to the point of use.

In use, the valve stem is first retracted to a position within the screw-threaded end 16 which is then inserted into the outlet of the container vessel and threaded inwardly into engagement with the nut 9 or against an intervening washer 18 as shown in Fig. 2. The valve stem is then advanced until the pointed end pierces the diaphragm 8. Then, with another turn of the stem, the valve 15 is seated against the conical valve seat 5 thus positively closing the container against any escape of the gas. These movements may be effected almost simultaneously.

Also the outlet 17 may be closed with a cap, which is cemented as a protection against dirt. This will still further prevent the escape of gas.

The effluent stream of gas through the valve may now be controlled by the usual operation of turning the valve stem forward and back,—until the container is emptied of its compressed gas contents. The valve housing may then be removed by unscrewing from the outlet 2 and used on another cylinder of gas in a similar manner, the
empty container being reshipped for a fresh supply or discarded.

A modified form of valve construction is shown in Fig. 4 in which the cylindrical portion 20 carries a valve seat 21 within the hollow cylindrical portion 22 and a longitudinal valve stem 23 and a valve 24 thereon intermediate the ends and adapted to engage the seat 21. Projecting from the cylindrical portion is a free end 25, which is pointed at 26 and protrudes through the end 27 of the cylindrical portion. The latter is provided with a screw-threaded exterior surface 28.

For use with this form of valve, the container may be constructed, filled, and closed as above described. The stem 23 of the modified form of valve is retracted, drawing the point 26 within the body portion. The screw-threaded end 27 is then inserted into the outlet of the cylindrical container (which, however, in this case need not be provided with the valve seat 5) until it bears upon the gasket 18 on the nut 9. The valve stem 23 is then advanced until the end 26 punctures the diaphragm 8 or pushes the plug 8 out of its seat and through the opening 2 into the container. With another turn of the valve stem the valve head 24 bears against the valve seat 21 effectively closing the outlet of the container. Further control of the gases, which are thus released is effected by advancing or retracting the valve in the customary manner.

Containers, when constructed and closed in accordance with the invention, may thus be shipped without being provided with any valve mechanism, and without employing any protecting cap. They are thus more compact and lighter in weight, as well as safer for shipment than containers which are assembled with a valve. At the point of use they may be stored until required and then only such valves are necessary as may be required for the cylinders actually being emptied. When a cylinder has been emptied, the valve is removed and applied to a full container while the empty cylinder is returned for refilling. The nut and punctured diaphragm may be thrown away or left in the container.

I claim:

1. In combination, a container for compressed or liquefied gases, having strong retaining walls, and an outlet passageway, a safety device of low melting point hermetically sealing the outlet, a valve housing connected to the outer end of said outlet, a valve stem in said housing adapted to push the safety device inward of the container, and a valve to control the outflow of the contents of the container.

2. In combination, a container for compressed or liquefied gases, having strong retaining walls, and an outlet passageway, a safety device of a soft metal hermetically sealing the outlet, a valve housing connected to the outer end of said outlet, a valve stem in said housing adapted to push the safety device inward of the container, and a valve to control the outflow of the contents of the container.