CONTAINER FOR COMPRESSED GASES AND LIQUIDS

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This invention relates to containers for compressed gases and liquids and more particularly to the novel construction of such containers and the discharging passages and mechanism therefor.

It is a general object of the present invention to provide a closed container for the storage and use of compressed and liquefied gases which may be safely and economically transported and stored and from which the gas or liquid may be subsequently withdrawn for use without escape or loss of the gas by the attachment of a suitable valve controlling mechanism thereon.

An important feature of the present invention resides in the simple manner of constructing the containers from two substantially hemispherical shells welded together at their meeting edges.

Another important feature of the invention resides in the provision of a container for compressed or liquefied gases having a discharge spud with a self-contained valve therein, together with a discharge and valve operating mechanism adapted to be applied over the spud to operate the valve and to restrain and direct the delivery of the discharged gases.

Still another important feature of the invention resides in the provision of a discharge spud for gas containers having therein a loose valve member to cooperate with the discharge passage therefor and a plug for locking the valve in position.

A further feature of the invention resides in the provision of a safety means which may comprise a fusible plug directly in the valve member.

A still further important feature of the invention resides in the provision of a casing adapted to be secured onto the spud and to include a rod adapted to engage said plug to release the valve, and in which casing is provided a discharge passage through which the escaping gases are directed.

Another important feature of the invention resides in the provision of means to prevent the extraction of the plug and hence of the valve so that the container cannot be refilled except by destroying a portion of the valve mechanism.

Other and important features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and following specification, wherein is disclosed the single exemplary embodiment of the invention, with the understanding, however, that such changes and variations may be made therein as fall within the scope of the appended claims.

In said drawing:

Figure 1 is a central section through a container and valve mechanism constructed according to the present invention, showing the valve closed;

Figure 2 is an enlarged fragmentary view of the valve mechanism showing the valve in open position;

Figure 3 is a transverse section on line 3-3 of Figure 1 showing the locking means for the valve plug; and

Figure 4 is a perspective view of the valve member or cone.

In the transportation and storage of compressed or liquefied gases (which are usually either irritating, such as sulphur dioxide, chlorine, or ammonia or inflammable such as petroleum, and in any case may be the cause of considerable damage if suddenly released), it is essential to prevent the escape of the material and at the same time to provide for its convenient and regulated withdrawal when it has been brought to the place of use. This has heretofore been done in steel cylinders which are provided with an inlet to which is attached a suitable valve mechanism.

The container is filled through the valve, the valve is then closed, and the container with its valve is shipped to the desired destination. In order to insure against damage to the valve, which usually projects beyond the end of the cylinder and consequently forms a particularly vulnerable part of the whole apparatus, the Interstate Commerce Commission now requires that the valve mechanism of such containers shall be protected by a cap or the like while in transit.

It is also required that the containers shall be provided with a suitable safety device. In practice the safety device has heretofore been either a frangible disc on the body of the container or in the valve which will rupture if the pressure in the container becomes excessive or a fusible plug that will melt if the container is overheated to a point where the pressure therein would become dangerous.

The present practice involves an unusually large investment in cylinders and in valves and caps for the cylinders which are in transit and storage, and this is especially great when the individual containers are small because of the increased number of valves per unit volume of gas. Furthermore, this practice incurs a considerable expense by increasing the weight and volume of the containers, thus increasing the transportation charges both when filled and returned empty.
The cylinders are so expensive that they must be used many times, and they are often refilled by others than those who make the product shipped in them. In the case of liquid sulphur dioxide, for example, this sulphur dioxide must be not only very pure but absolutely clean, dry, and free from all dirt. To clean cylinders, and in practice it often happens that sulphur dioxide, for example, charged into small cylinders by others than the manufacturers of sulphur dioxide, is ruined because the small cylinders were not absolutely clean. Therefore, it is very desirable to have a cylinder that is so cheap it would not be used a second time, and also it would be desirable to have a means for making even the expensive cylinder so that it could not be refilled except at a point where it could be properly handled, everything considered.

The present invention not only reduces the actual weight of the container itself but lowers its cost to a point where it can be used but once and discarded. Full safety is provided by adequate means for discharge of the gas in case of excessive temperatures or pressures and in which the necessary mechanism for withdrawing the gases can be applied by the user and need not be shipped back and forth with the container.

Referring now to the drawing, there is disclosed at 10 the substantially spherical container for the compressed or liquefied gases. It is preferably formed of metal of only sufficient thickness to meet the specifications of the Interstate Commerce Commission to thus stand the maximum pressure which will occur therein by virtue of the normal temperature attained by the gas. Being spherical permits a minimum thickness to meet these specifications. Conveniently, this container is formed of an upper hemispherical pressed metal shell 11 and a corresponding lower hemispherical shell 12. These shells may be formed of any suitable material, for instance steel, and treated interiorly and exteriorly for the prevention of rust, corrosion, or the like in any well-known manner. The two shells are secured together by welding as at 14 along their meeting edges to form the gas-tight container.

One of the shells is provided with an outlet spud 15 preferably attached at its center by passageway through an opening 16 in the shell and being welded thereto as at 17. This outlet spud is in the form of a cylinder of metal having a flat outer end 18. It is provided with a small, central, longitudinal bore 20 forming the gas discharge passage and with a larger counterbore 21 extending from this passage to the outer end of the plug.

At the junction of the bore and counterbore there is provided a tapered passage 22 or valve seat into which loosely fits the valve member, or cone 24, best shown in Figure 4 as comprising a slightly truncated cone of any suitable metal having its conical surface tapered at the same angle as the valve seat 23 and preferably ground to the seat to insure gas tightness. It is truncated as at 25, leaving its lower end of about the same diameter as the gas passage 20. Longitudinally it is drilled as at 26 from end to end and filled with suitable fusible metal having a melting point such that the gas will be released when the temperature of this valve reaches a point where the pressure within the container would be dangerous. To provide both for the passage of gas from the bore holding the fusible metal and for the reception of a tool to grind the valve into its seat, a lateral kerf 27 is provided in the base 28 of the valve so that no matter whether the plug, to be later described, is pressing against the base or not, the gas can escape through this kerf to the sides of the valve.

The counterbore 21 is internally threaded as shown to receive the threads on the outer surface of the separate valve operating plug 30 which is of such length that, when screwed in until its lower end 31 engages the base of the valve and holds it tightly on the seat, the outer end 32 is substantially flush with the outer end 18 of the spud.

The lower end of the counterbore is undercut or enlarged as at 35 to provide a shoulder 36 at the lower end of the threads in the counterbore. Extending from this shoulder to the outer end of the spud and beside the counterbore is a series of small passages 38 through which gas can flow either when the plug is partially unscrewed to allow the valve to unseat or in the event of melting of the fusible element, the gas then passing through the passage 20, the bore 26, the kerf 27, the enlargement 35 of the counterbore, and the passages 38 to the end of the spud.

In order that the valve may be proof against refilling, the inner portion of the plug is provided with a circular channel 40 into which is fitted a spring ring 41, the size of which is such that, when compressed, its outer diameter is no greater than that of the base of the threads in the plug so that, with the ring compressed, the plug can be screwed into place, but when the ring passes beyond the shoulder 36, it automatically expands and forms a permanent lock, forever preventing removal of the plug from the spud while the ring remains intact.

The present invention provides, with the aid of the separate valve cone, it prevents unauthorized persons from refilling the containers with sub-standard gases or with improperly purified and cleaned gases, as previously mentioned. Furthermore, the expansion ring prevents the plug from blowing out as might ordinarily happen if it were unscrewed too far by an inexperienced person.

The present container is so cheap that it does not need refilling and is proof against refilling by unauthorized persons. The loose, small, lightweight valve part is so constructed that any attempt to force gas, either compressed or liquefied, into the container immediately presses this valve against its seat so that substantially nothing can be put into the container. The valve is so light in weight that even if the container is placed upside down so that gravity tends to hold the valve off of its seat, it is blown back on the seat by the gases attempting to enter.

With the plug 30 tightly screwed into position, the container is in condition for shipment, is provided with the required safety device, and has but a very small protruding spud which is of such adequate strength that it need not be protected by a cap, although a small pipe cap may be applied if desired. The spud and its cap add but little to the volume and weight of the container and thus effect a great saving in freight and in the space required for shipment and storage.

In order to be able to withdraw the contents of the container, a fusible-melting mechanism is provided. It includes a gas-tight casing 50 of substantially cylindrical form having the enlarged end 51 internally threaded as at 52 to fit over the tapered pipe threads on the exterior of the spud. The head of the joint can be made gas-tight with little difficulty and without the use of packing. A lateral port 53 from the casing is threaded internally and externally as at 54 for
the reception of a conductor tube for withdrawing
the gas or liquid so that it can be drawn off
without wasting or admixture with air. A valve
plug operating rod 55 extends through and out
of the upper end of the casing and is suitably
packed as at 56 to permit it to have both revo-
tional and longitudinal movement in the casing.
At its outer end it is provided with any means
to permit it to be rotated, such as a suitable han-
dle 60 and internally with a flange 57 to prevent
its complete withdrawal through the packing.
The inner end of this stem is provided with a
shouldered non-circular portion 88 to cooperate
with a correspondingly shaped recess 59 in the upper
end of the plug 30.

When the discharge casing is applied to the
spud, the handle 60 is pressed inwardly and
manipulated until the end 88 of the stem engages
in the recess in the plug when, by turning the
handle, the plug can be partially unscrewed, giv-
ing control of the valve for regulating the rate
of discharge or for closing the valve to stop the
discharge. The user need be provided with only
the number of valves required to be in use at one time, whereas there may be
hundreds of containers of gas in transit or stor-
age for him. This materially reduces the in-
vestment necessary in valve mechanisms, and
since the safety valve parts in the spud are ex-
tremely simple, the containers can be thrown
away if desired because of their relatively low
cost.

If it is desired to refill the containers, author-
ized persons can, by drilling longitudinally of
the plug a hole slightly larger than the minimum
diameter at the channel 40, release the lower
end of the plug as well as the ring 41 so that the
upper portion of the plug can be withdrawn.
Then, by the application of the proper tool, the
ring can be engaged and withdrawn, after which
the lower unthreaded end of the plug can be
shaken out. A new plug after filling the con-
tainer will provide for further use. It will, of
course, be understood that the cylinders are filled
with liquefied gas which has previously been
cooled below its boiling point so that the liquid
can be poured in and then the valve and plug
applied without difficulty.

Having thus described the invention, what is
claimed as new and desired to be secured by Let-
ters Patent is

1. The combination with a container for com-
pressed or liquefied gases, of an outlet spud ir-
removably secured thereto and having a bore and
counterbore communicating with the interior of
the container, a valve seat between said bores, a
valve member adapted to cooperate with said
seat to close said bore, a plug having threaded en-
gagement with the walls of said counterbore and
adapted to press the valve onto its seat, and
means to prevent the complete removal of said
plug, large valve member being unattached so
that pressure of entering fluid automatically
seats it.

2. The combination with a container for com-
pressed or liquefied gases, of an outlet spud se-
cured thereto and having a small bore communi-
cating with the interior of the container and a
large counterbore extending to the end of the
spud, said counterbore having an enlargement
at its junction with the bore, a valve seat between
said enlargement and bore, a loose valve member
for said seat, a plug having threaded engagement
with the walls of the counterbore and adapted
to press the valve onto its seat, and means on
said plug to expand into said enlargement when
the plug is screwed into the counterbore to pre-
vent its complete withdrawal.

3. The combination with a container for com-
pressed or liquefied gases, of an outlet spud sec-
cured thereto and having a small bore communi-
cating with the interior of the container and a
large counterbore extending to the end of the
spud, said counterbore having an enlargement at
its junction with the bore, a valve seat between
said enlargement and bore, a loose valve member
for said seat, a plug having threaded engagement
with the walls of the counterbore and adapted to
press the valve onto its seat, means on said plug
to expand into said enlargement when the plug
is screwed into the counterbore to prevent its
complete withdrawal, and an open gas passage
from said valve to the end of said spud.

4. The combination with a container for com-
pressed or liquefied gases, of an outlet spud sec-
cured thereto and having a small bore communi-
cating with the interior of the container and a
large counterbore extending to the end of the
spud, a valve seat between said counterbore and
bore, a conical valve member for cooperation
with said seat, a plug having threaded engage-
ment with the walls of said counterbore and
adapted to press the valve onto its seat, said
valve having a fusible core registering with said
bore, there being a lateral passage from said core
into said counterbore and a passage from said
counterbore to the outside of said spud.

5. The combination with a container for com-
pressed or liquefied gases, of an outlet spud sec-
cured thereto and having a bore and counterbore
communicating with the interior of the container,
a valve seat between said bores, a loose valve
member adapted to cooperate with said seat to
close said bore, a plug having threaded engage-
ment with the walls of said counterbore and
adapted to press the valve onto its seat, means to
prevent the complete removal of said plug, a cas-
ing adapted to have gas tight engagement with
said spud and having a lateral outlet, a rod ex-
tending through said casing and rotatably and
longitudinally movable in a wall thereof, and
means on said rod to engage and operate said
plug to permit the withdrawal of regulated quan-
tities of gas from the container.

6. The combination with a container for com-
pressed or liquefied gases, of an outlet spud se-
cured thereto and externally threaded, said spud
having a central bore communicating with said
container and a counterbore extending to the
outer end of the spud, a loose valve cone co-
operating with a seat at the junction of the bore
and counterbore, a plug having threaded engage-
ment with the walls of the counterbore and
adapted to engage said cone to close the con-
tainer, a passage from the cone to the outer end
of the spud, a casing for threading engagement
over said spud and having an outlet passage, a
stem having a slidable, rotatable and gas-tight
fit in a wall of said casing, and means thereon
to engage said plug to control said valve.

7. The combination with a container for com-
pressed or liquefied gases, of an outlet spud se-
cured thereto and externally threaded, said spud
having a central bore communicating with said
container and a counterbore extending to the
outer end of the spud, an undercut in said
counterbore, a loose valve cone cooperating with
a seat at the junction of the bore and counter-
bore, a plug having threaded engagement with
the walls of the counterbore and adapted to en-
gage said cone to close the container, means on said plug to expand into said undercut to prevent removal of the plug, a passage from the cone to the outer end of the spud, a casing for threaded engagement over said spud and having an outlet passage, a stem having a slidable, rotatable and gas-tight fit in a wall of said casing, and means thereon to engage said plug to control said valve.

8. The combination with a container for compressed or liquefied gases comprising in combination, a pair of substantially hemispherical, metal shells, means welding the edges of said shells together to form a gas-tight chamber, a spud irremovably attached to one of said shells, a normally closed non-refillable valve in said spud, and detachable valve operating means engaged over said spud.

9. A container for compressed or liquefied gases comprising in combination, a pair of substantially hemispherical, metal shells, means welding the edges of said shells together to form a gas-tight chamber, a spud irremovably attached to one of said shells, a normally closed non-refillable valve in said spud, and detachable valve operating means engaged over said spud.

10. A valve structure for a gas container comprising in combination, a spud, an unattached valve member in said spud, non-removable means engaging said spud to press the valve closed, and operating means for said means engageable over said spud and including a gas discharge port.

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