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CONTAINER FOR LIQUEFIED GASES

Odd Arnold Hansen, Buffalo, and Lyman A. Bliss,
New York, N. Y., assignors to The Linde Air
Products Company, New York, N. Y., a corpo-
ration of Ohio

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This invention relates to containers for liquefied gases, and particularly to containers of the insulated type for gases which exist in the liquid phase only at temperatures below 273° K.

The invention has for its object generally an improved construction and arrangement of parts in containers of the character indicated, which is efficient, economical and readily manufactured.

More specifically, it is an object to provide a container for liquefied gases with a pressure vessel constructed with a lining or basket arranged to conserve liquid and to avoid losses due to splashing in case the container is moved or transported.

It is also an object to provide pressure vessels for containers of the character indicated with a spaced lining or basket construction which has a closed-in top and provided with conduit means whereby the pressures within and without the basket are equalized.

Still another object is to provide a construction in pressure vessels having a spaced inner lining or basket with an improved arrangement affording passage of the pressure equalizing conduits through the walls of the pressure vessel in a manner which yields a tight joint when finished, but has desired clearances when being assembled or adjusted.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is a view mainly in vertical cross-section showing a container for liquefied gases constructed in accordance with the invention;

Fig. 2 is an enlarged fragmentary sectional view showing a detail in the construction of the container shown in Fig. 1; and

Fig. 3 is a similar view of a modified form of the constructional detail shown in Fig. 2.

Referring now to the drawing, 10 denotes a pressure vessel, here shown as spherical in form and disposed within and spaced from an outer casing or envelope 11, the intervening space being preferably filled with heat insulating material 12, which may be of any suitable char-

acter, for example, porous magnesium carbonate.

The pressure vessel 10 has a relatively thick wall and is secured in the casing in any convenient manner, for example, by means of cables or chains 13 that are anchored at one end to the interior cylindrical wall portion of the casing 11 and at the other end to lugs on a supporting ring 14 which holds the pressure vessel 10. A filling connector 15 is shown as passing through the dome of the casing 11 and extending into the pressure vessel 10. A withdrawal connection 16 for gas material in the liquid phase is shown as leading from the bottom of the pressure vessel and the wall of the casing 11 to the exterior. Withdrawal connections for gas material in the gas phase may, of course, be provided, but the showing thereof has been omitted in the interests of clearness of illustration.

In the practice of the present invention, the pressure vessel 10 is provided with a complete lining or basket 18 which has a closed-in top and is spaced from the inner wall of the pressure vessel by spacing means 19 that may be laterally disposed so as to afford ring-like supports which support the basket in substantially horizontal planes. The basket thus provided is relatively thin and has a shell-like space surrounding the same within the pressure vessel, which insulates the basket from the relatively thick wall of the pressure vessel; the latter being generally a few degrees warmer than the basket itself. The connections at 15 and 16 are arranged to communicate with the interior of the basket.

Since the pressure within and without the basket 18, in the pressure vessel, will not equalize of itself by reason of the basket construction here employed, special pressure equalizing means are provided. The means here shown as illustrative comprise one or more conduit members 20 arranged to establish communication between the spaces on the interior and exterior of the basket 18. Care, however, is taken in arranging these members so that liquid splashing in the basket will not pass through such members into the shell-like space about the basket. To this end, such conduit members are preferably tubular in form and extend from a region or zone within and near the top of the space enclosed by the basket to a region or zone without the basket in the shell-like space near the bottom thereof. The tubular conduit 20 here shown is disposed on the outside of pressure vessel 10 and passes through the wall thereof at the upper end to communicate with the interior of the basket 18

and through the wall at the lower end to communicate with the shell-like space on the exterior of the basket.

In order that the passage of the conduit 20 through the wall of the pressure vessel 10 may be effected in a manner which is both fluid-tight and readily manufactured, the wall of the pressure vessel is preferably initially bored with an opening larger than is required for the passage of the conduit alone and is afterwards fitted with a reducing bushing that is easily inserted and made fluid-tight. An advantageous arrangement for achieving this end is shown in Fig. 2.

Here an opening 21 is shown in the wall of the pressure vessel through which passes a nipple 22 extending outwardly from the wall of the basket. This opening clears the nipple amply for the reception of a bushing 23 which is here shown as screw threaded on the outside for engagement with the bore of the opening 21. The bushing itself has an opening sufficient to fit snugly around the nipple passing therethrough. The protruding end of this nipple affords convenient means on which to anchor a down-turned end of the conduit 20, the outermost portion of the nipple being preferably slightly expanded for this purpose, as indicated at 24, after bushing 23 has been put over nipple 22. To make the parts when thus in place fluid-tight, brazing is preferably applied at the joints as indicated at 25.

An alternative form for making this connection is shown in Fig. 3, where the nipple itself does not form part of the conduit that affords the communication. Here the wall of the basket 18 is provided with a nipple 28 that is but slightly smaller in diameter than that of the pressure vessel. When in place, the outer end of the nipple is rolled over against the wall of the pressure vessel and a recessed plate 30 clamped down over it. This plate also carries as an integral part thereof an inwardly extending nipple or bushing 31 which fits into the nipple 29 and provides support for a pipe connection 32 that is brazed thereto and provides the communicating passage through the wall of the pressure vessel with the space within the basket. The plate 30 is secured in place by means of a bolt 33 that engages with the wall of the pressure vessel, the plate being preferably made fluid-tight by brazing as shown applied at 34. These constructions are seen to be adapted to provide fluid-tight passage through the wall of the pressure vessel with the shell-like space about the basket by omitting the nipple on the basket wall and employing instead short pipe connections that pass only through the pressure vessel wall.

Since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. In a container for liquefied gas, the combination comprising a relatively thick-walled pressure vessel having a spaced inner basket for holding the liquefied gas, said basket being provided with a top portion sealing off the space within the basket from that without the same, the said space without the basket being shell-like and serving to insulate thermally the basket

from said vessel, and an unrestricted passage means on the outside of said vessel and communicating respectively with the space within said basket and with the shell-like space about said basket for equalizing the pressures in said spaces.

2. In a container for liquefied gas, the combination comprising a relatively thick-walled pressure vessel having a spaced inner basket for holding the liquefied gas, said basket being provided with a top portion sealing off the space within the basket from that without the same, the said space without the basket being shell-like and serving to insulate thermally the basket from said vessel, and an unrestricted conduit member disposed on the outside of said vessel and arranged to communicate at one end with the space within said basket and at the other end with the shell-like space without said basket, whereby the pressures in said spaces may be quickly equalized.

3. In a container for liquefied gas, the combination comprising a relatively thick-walled pressure vessel provided with a spaced inner basket having a closed-in top and adapted for holding the liquefied gas, the intervening shell-like space serving to insulate thermally the basket from said vessel, the wall of said pressure vessel being formed with openings in two different portions thereof, means in an opening in one of said portions extending into and establishing communication with the space within said basket, and an unrestricted conduit member arranged to connect an opening in the other portion with said communication means in a fluid-tight manner.

4. In a container for liquefied gas, the combination comprising a pressure vessel provided with a spaced inner basket having a closed-in top and adapted for holding the liquefied gas, the intervening shell-like space serving to insulate thermally the basket from said vessel, the wall of said pressure vessel being formed with openings in both the upper and lower portions, nipples secured in the wall of said basket and communicating with the interior thereof, said nipples when in place extending through the openings in the upper portion of said pressure vessel wall, and tubular members disposed on the exterior of said pressure vessel arranged to connect the openings in the lower portion of said pressure vessel wall with said nipples in a fluid-tight manner.

5. In a container for liquefied gas, the combination comprising a pressure vessel provided with a spaced inner basket having a closed-in top and adapted for holding the liquefied gas, the intervening shell-like space serving to insulate thermally the basket from said vessel, the wall of said pressure vessel being formed with openings in both the upper and lower portions, nipples secured in the wall of said basket and communicating with the interior thereof, said nipples when in place extending through the openings in the upper portion of said pressure vessel wall and clearing the same by a substantial margin, bushings in said openings in said pressure vessel wall arranged to embrace said nipples and to fill said clearances, said bushings being sealed in said openings in a fluid-tight manner, and tubular members on the outside of said pressure vessel connected to said nipples in a fluid-tight manner.

6. In a container for liquefied gas, the combination with an insulating envelope having a supporting casing, of a relatively thick walled pressure vessel supported in said insulating envelope, an inner basket disposed in spaced relation with-

in said pressure vessel and having a closed in top, the intervening shell-like space serving to insulate thermally the basket from said vessel, and conduit means disposed in said insulating envelope communicating with the space within said basket at one end and with said shell-like space at the other.

7. In a container for liquefied gas, the combination with an insulating envelope having a supporting casing, of a relatively thick-walled pressure vessel supported in said insulating envelope, an inner basket disposed in spaced relation with-

in said pressure vessel and having a closed in top, the intervening shell-like space serving to insulate thermally the basket from said vessel, a tubular member disposed in said insulating envelope communicating with the space within said basket at its upper end and communicating with said shell-like space at its lower end, and liquid withdrawal connections communicating with the space within said basket at the lower end.

ODD ARNOLD HANSEN.
LYMAN A. BLISS.

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