

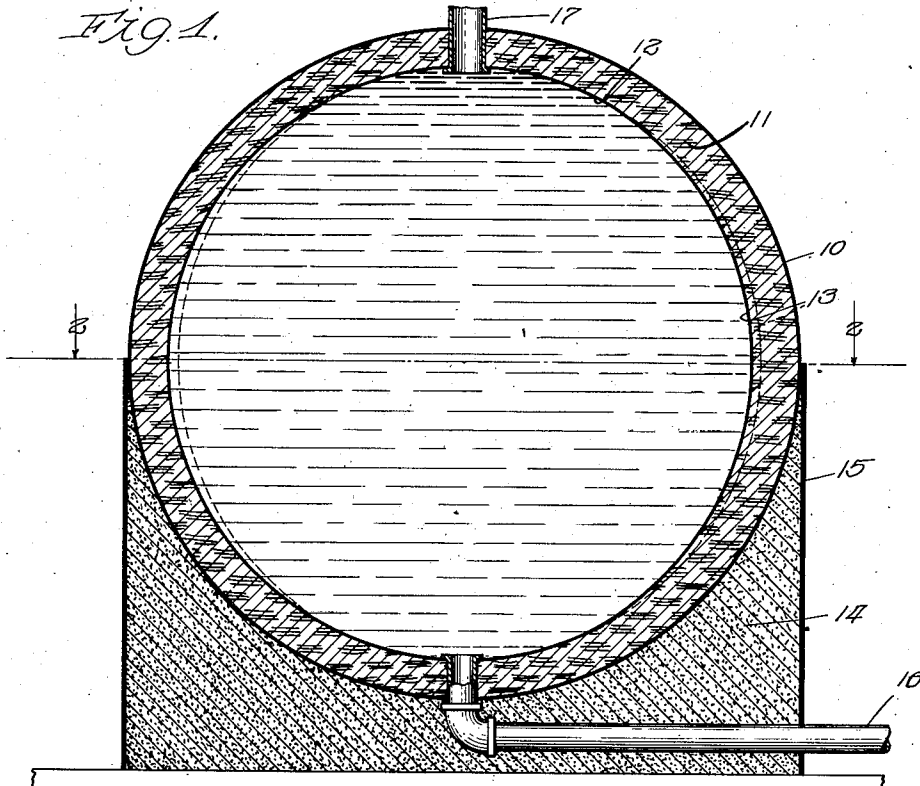
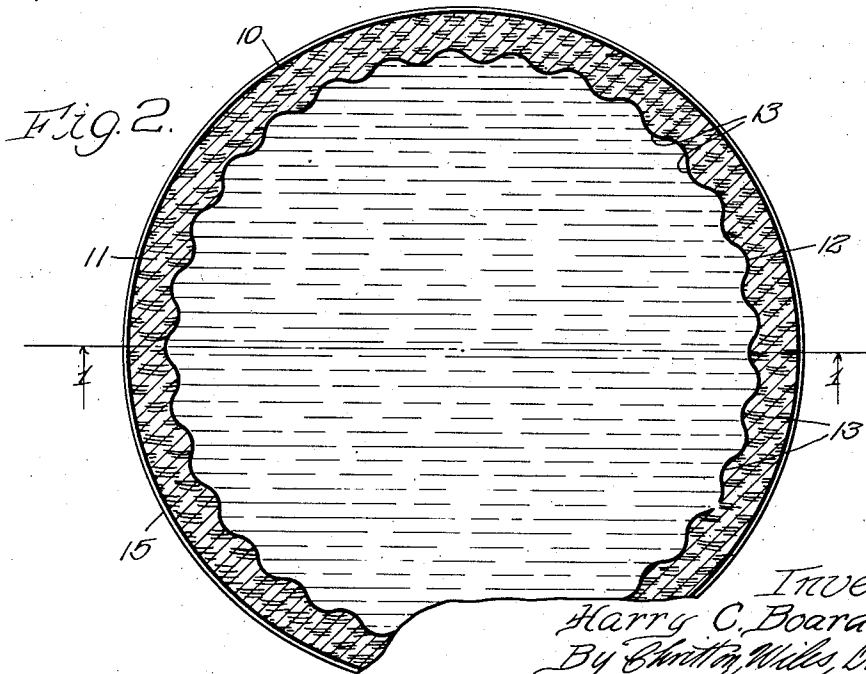
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2,393,964

STORAGE VESSEL

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STORAGE VESSEL

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3 Claims. (Cl. 220—10)

This invention relates to a storage vessel and more particularly to a vessel adapted for storing liquids at abnormal temperatures above or below atmospheric.

The invention has particular reference to storing material such as liquefied natural gas which may be stored at a temperature as low as -260° F. At these temperatures normal carbon steel is brittle and will not withstand the necessary pressure, whether due to liquid head or to vapor pressure or both.

On the other hand metals which will withstand low temperatures of this order without losing their ductility are quite expensive and the construction of a tank of such metal involves very considerable cost. In accordance with the present invention a composite storage vessel is prepared comprising a thin flexible membrane of cold-ductile metal, a surrounding insulating layer, and an outer pressure retaining shell of ordinary carbon steel. The insulating material is selected to transmit pressure uniformly from the inner flexible membrane to the surrounding shell.

The shape of the vessels may be of any conventional form, for example, it may be spherical, spheroidal, or cylindrical.

The invention is illustrated in the drawing in which Figure 1 is a sectional elevation of one form of the device, and Figure 2 is a sectional plan view taken along the line 2—2 in Fig. 1.

The structure comprises an outer sheet metal pressure shell 10 composed of the ordinary carbon steel plates welded together at their edges. Inside the pressure shell is a layer of suitable insulating material 11 which may, for example, be cork bonded together sufficiently so that it will not have a tendency to flow. Inside the cork is the flexible membrane 12 composed of thin sheets of cold-ductile metal such as a high nickel alloy. This membrane rests upon the insulating material and any pressure exerted against it is transmitted by the insulating material to the shell 10. The membrane 12 may be provided with corrugations 13 as shown in Figure 2. The corrugations are preferably arranged on a vertical axis, the corrugations vanishing toward the poles of the

vessel. These corrugations are greatly exaggerated in proportion in the drawing and only are of sufficient size to permit lateral movement of the membrane due to compression of the insulating material. In some cases the insulating material may be sufficiently compact to avoid the necessity for these corrugations or the builder may prefer to permit plastic or other flow of the membrane. The vessel is illustrated as supported in a bed of packed sand 14 maintained within a framework 15. Draw-off means 16 are provided in the bottom of the vessel and inlet means 17 are provided for introducing liquid to the container.

The pressure vessel may, of course, be designed for withstanding gas pressure, liquid pressure, or any combination of the two and its shape and the thickness of the individual plates are selected in accordance with known engineering data in accordance with the stresses which the vessel has to accommodate.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom.

What I claim as new, and desire to secure by Letters Patent, is:

1. A pressure vessel adapted to stand temperatures markedly below normal minimum atmospheric temperatures, comprising a sheet metal pressure shell of substantially spherical form, a layer of insulating material within the pressure shell and supported thereby; and a gas-tight thin membrane of metal alloy retaining its strength at temperatures as low as -260° F. and supported by said insulation and characterized by corrugations in said membrane extending circumferentially from pole to pole of the sphere, said corrugations increasing in depth from a minimum at the poles to a maximum at the equator of said vessel.

2. A vessel as set forth in claim 1, in which the corrugations have a vertical axis.

3. A vessel as set forth in claim 1, in which the insulation is cork.

HARRY C. BOARDMAN.