E. FRIANT.

SELF SEALING RESERVOIR.

APPLICATION FILED JULY 7, 1920.

1,436,985.

Patented Nov. 28, 1922.

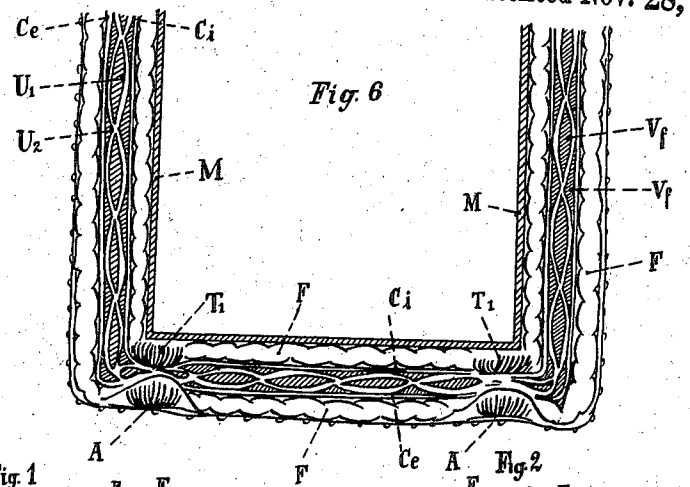


Fig. 6

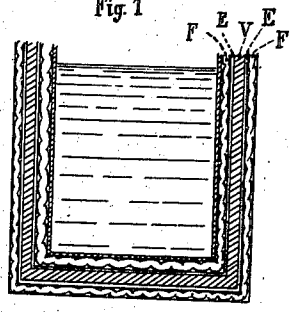


Fig. 1

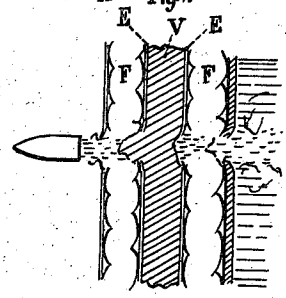


Fig. 2

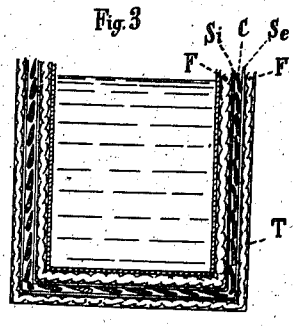


Fig. 3

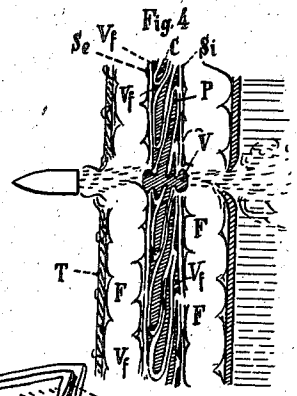


Fig. 4

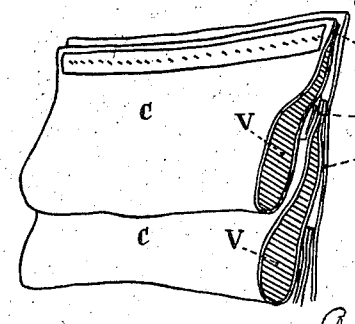


Fig. 5

Inventor
Emile Friant,
By Munn & Co
Atty.

Patented Nov. 28, 1922. 1,436,985

UNITED STATES PATENT OFFICE.

EMILE FRIANT, OF PARIS, FRANCE.

SELF-SEALING RESERVOIR.

Application filed July 7, 1920. Serial No. 394,590.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, EMILE FRIANT, citizen of the Republic of France, residing at 11 Boulevard de Clichy, Paris, Seine, in the Republic of France, have invented certain new and useful Improvement in Self-Sealing Reservoirs (for which applications for patents have been filed in France February 7, 1916, Patent No. 495,506, and May 24, 1919, Patent No. 21,452; in Great Britain July 5, 1920, Patent No. 146,867; in Belgium June 28, 1920, Patent No. 287,993; in Switzerland June 29, 1920, Patent No. 91,770; in Italy June 28, 1920, Patent No. 242/540; in Germany July 9, 1920; in Sweden June 30, 1920; and in Czecho-Slovak Republic July 9, 1920), of which the following is a specification.

This invention relates to an envelope which is so disposed as to render a reservoir containing any suitable liquid such that it is self-sealing, that is, to automatically and hermetically stop up the holes produced in the walls by the passage of one or more projectiles such as bullets or small fragments of shell. It can be employed especially to provide for the preservation of aeroplane gasoline tanks.

Figure 1 is a cross-section of a reservoir embodying my invention.

Fig. 2 is an enlarged detail vertical section of one of the walls.

Fig. 3 is a cross section of a modification.

Fig. 4 is an enlarged section of a reservoir wall corresponding to Fig. 3.

Fig. 5 is a perspective view of a portion of the structure shown in Figs. 3 and 4.

Fig. 6 is a modification of the structure shown in Fig. 3.

This disposition comprises two parts:

1. The first arrangement has for its object to prevent a tearing effect from being produced. It is a well known fact that when the bullet enters a metal receptacle filled with liquid it produces a hole having a diameter not appreciably greater than that of the bullet itself, but upon leaving the receptacle it usually causes a considerable hole in the second wall. It is therefore an important consideration to reduce this hole to a minimum.

The methods here proposed are as follows, to wit, a facing of cork or like substance in the interior of the tank; or the use of a coating of agglomerated cork or like material or a substance having the same qualities as cork; or again, the use of tanks provided with double walls having a free space between the same. On the other hand, and this is the simplest method, a metal can be employed which will not tear or burst, this being especially the case with aluminium. While it is true that it is only soldered or welded with difficulty, it affords a considerable advantage from the fact that it is much lighter than copper which is generally employed. For the present purpose the disposition may comprise the use of aluminium alone or a facing of this metal within a container having its walls made of another metal.

2. The second part of the invention has for its object to retain the liquid after the perforation of the walls. It consists in the following disposition, Figs. 1 and 2.

The double envelope E can be composed of two sheets of aluminium, for instance, contains a viscous substance V which is insoluble in the liquid which is to be retained without escaping. This double envelope is disposed within the wall of the container between two thicknesses of a fibrous substance F, the latter being packed in such manner as to make the best use of the elasticity of the substance after the projectile has passed through and thereby stop up the opening which is thus produced. After the walls have been perforated, the fibrous substance forms an obstacle to the viscous matter, and this latter which has already stopped up the holes in the perforated double envelope and thus arrested the liquid ready to issue out, can not continue to flow.

The fibrous substance can be replaced by a pulverulent substance which will constitute an equally efficient obstacle to the viscous matter, not by the effect of elasticity but by the falling of its particles. The fibrous or pulverulent substance disposed between the double envelope filled with viscous substance and the container may be impregnated with the liquid as soon as the container becomes perforated, but this will cause no series drawback. Among the fibrous substances, choice can be made preferably of wadding in sheets which is in cur-

rent use. It should be previously stripped of the layer of dried albumen which covers the same, and then disposed by folding or in like manner and held pressed together on each side of the double envelope E.

In the case where the liquid to be retained is gasoline, the viscous substance can be molasses or this latter mixed with glycerine which will maintain the fluidity even at low temperature or the substance can be constituted of pure glcyerin. By the effect of its own weight, a pressure will be exerted in the vertical space containing this substance adjacent to the sides of the reservoir which will be transmitted through the horizontal portion at the bottom and will effect the immediate closing of the hole left by the projectile.

An alternative method consists in the use of the second arrangement, Figs. 3, 4 and 5, Fig. 3 being a vertical general section and Fig. 4 a vertical detail section. This device consists of a double flexible envelope S*i* S*e* of a special rubber cloth which is not easily dissolved in the gasoline, such as can be found on the market. But in this case the weight of the material cannot serve to drive it into the space produced, so that it is preferable to make use of elasticity and compression. The rubber answers this purpose, since it expands under the sudden thrust of the projectile and considerably reduces the hole by resuming its normal shape. The construction can be preferably carried out by the use of rubber bags C disposed as represented in Fig. 5, having for instance five or six centimeters height while the width can be represented by the perimeter of the tank. These bags are each attached by their upper parts P to the internal walls of the double envelope of rubber cloth, one half of the first bag covering half the second and so on, as shown in Fig. 5, in such manner that the projectile will always encounter four sheets of rubber. The assemblage of these bags is imbedded in a kind of paste V*f* constituted by fibrous or pulverulent matter impregnated with viscous substance. The fibrous matter retains the viscous substance and assures the presence of the latter upon the whole extent of the double envelope. This assemblage is covered by the external wall of the double rubber cloth envelope. The latter is disposed as in the first method between two thicknesses of folded wadding and the whole is held pressed between the walls of the tank by means of a netting T or any other suitable means giving as practical a construction as possible. This arrangement is considered to be the one affording the greatest lightness.

The following alternative devices can be employed.

A. Instead of the double rubber cloth envelope there can be employed a double envelope formed by two sheets of rubber C*i*, C*e*, (Fig. 6) and this possesses an advantage over the former device from the fact that it will contract and thus partially close up the holes produced by the passage of the projectile.

B. Within this double envelope are disposed two sheets of rubber U^1 U^2, sewed together at intervals, filled and surrounded with viscous substance V. This disposition can be carried out by usual manufacturing methods and can be more readily and quickly put in place than the rubber bags constituting the second device of the patent. As in the first and second cases, the double envelope is disposed between two thicknesses of a fibrous or pulverulent substance F.

Another method consists in suppressing one of the two rubber sheets, and an alternative method employs two rubber sheets, U^1 and U^2, sewed together and containing the viscous matter.

In order to prevent this non-puncturing envelope from being crushed under the weight of the tank, a method can be employed which consists in disposing between the lower metal wall of the latter and the internal portion of the envelope, four rubber space blocks T′ secured to the envelope, this latter in turn resting by its outer part upon other rubber blocks also secured to the envelope, A, this construction being employed for instance at the four corners of the entire device, or four metal feet can be preferably secured to the lower corners of the reservoir and passed through the envelope, tightness around these legs being obtained by binding around them rubber sheets in a solid manner.

I claim:

1. A self-sealing fuel tank including a wall formed of sheet metal an interior protecting wall for the metal, and an exterior layer for preventing the escape of liquid contained in the tank upon the perforation thereof.

2. A self-sealing fuel tank including a wall formed of a layer of metal and exterior of the metal layers of viscous matter insoluble in the liquid, and a layer of a substance sufficiently elastic to prevent the outflow of the said viscous matter.

3. A self-sealing fuel tank including a metal wall, a layer of cork on the inside surface thereof, a layer of viscous material insoluble in the liquid to be contained in the tank on the other side and a layer of a substance sufficiently elastic to prevent the escape of said viscous material upon the perforation of said wall.

4. A self-sealing fuel tank including a wall formed of a layer of aluminium and layers of viscous matter insoluble in the

liquid and a layer of an elastic fibrous substance sufficient to prevent the outflow of the said viscous matter.

5. A self-sealing fuel tank including a wall formed of a metallic layer, a viscous substance insoluble in the liquid to be contained in said tank, means for sub-dividing the said viscous substance into compartments, and a layer of elastic substance to prevent the outflow of the viscous substance.

6. A self-sealing fuel tank including a wall formed of a metallic layer, a viscous substance insoluble in the liquid to be contained in said tank, rubber sheets sewed at intervals for containing said viscous substance and for subdividing the same into compartments, a double envelope containing said sewed rubber sheets, and a layer of fibrous substance.

7. A self-sealing fuel tank including a wall formed of aluminium, a viscous substance insoluble in the liquid to be contained in said tank, rubber sheets sewed at intervals to form pockets containing the said viscous substance, a double envelope containing the sewed rubber sheets, and a layer of fibrous material.

8. A self-sealing fuel tank including a wall formed of sheet metal, an interior protecting wall for the metal, and an exterior layer for preventing the escape of liquid contained in the tank upon perforation thereof including a net for supporting the exterior layer.

9. A self-sealing fuel tank including a wall formed of aluminium, a viscous substance insoluble in the liquid to be contained in said tank, rubber sheets sewed at intervals to form pockets containing the said viscous substance, a double envelope containing the sewed rubber sheets, a layer of fibrous material and a net for holding the fibrous material in place.

In testimony whereof I affix my signature.

EMILE FRIANT.