S. P. THACHER.

TANK.

APPLICATION FILED JUNE 27, 1917.

1,297,305. Patented Mar. 11, 1919.

Fig. 2.

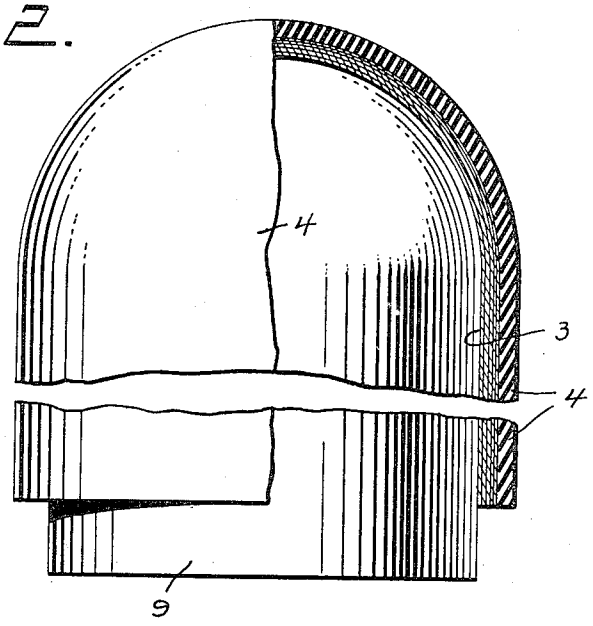
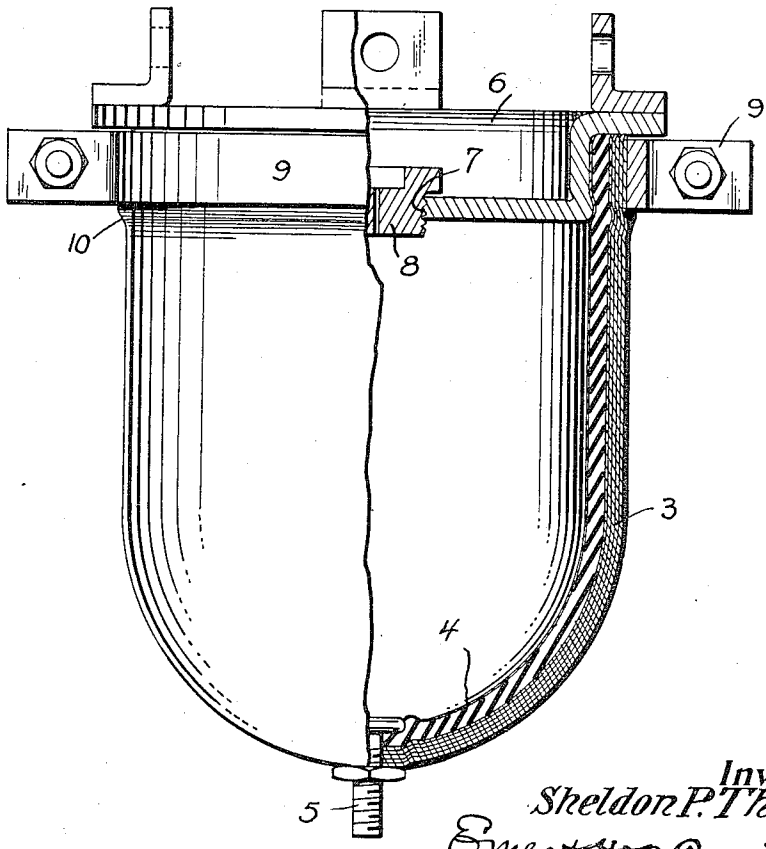


Fig. 1.



Attest:

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his Atty.

by

UNITED STATES PATENT OFFICE.

SHELDON P. THACHER, OF WEEHAWKEN, NEW JERSEY, ASSIGNOR TO NEW YORK BELTING & PACKING COMPANY, A CORPORATION OF NEW YORK.

TANK.

1,297,305. Specification of Letters Patent. Patented Mar. 11, 1919.

Application filed June 27, 1917. Serial No. 177,161.

To all whom it may concern:

Be it known that I, SHELDON P. THACHER, a citizen of the United States, residing at Weehawken, county of Hudson, and State of New Jersey, have invented certain new and useful Improvements in Tanks, of which the following is a full, clear, and exact description.

My invention relates to tanks, and more particularly to a non-frangible tank which, in the event of puncture thereof by a projectile or otherwise, automatically seals itself in a manner to prevent the material escape of the fluid contents of the tank.

When metal or other tanks commonly used for storing gasolene, or other hydrocarbon, for use in connection with the engine of an airplane, are struck by a projectile, an opening is formed therein, the capacity of which permits the contents of the tank to flow rapidly therefrom, not only endangering the aviator by reason of a failure of power, but frequently resulting in the ignition of the contents of the tank from the engine exhaust, adding the danger of fire and explosion to that resulting from loss of power.

A tank made in accordance with my invention, is so constructed that a projectile may penetrate the same without forming a large or jagged opening therein, the opening formed by such a projectile being instantly closed in its entirety, or to an extent to prevent the escape of the liquid therefrom in a stream, thus eliminating the dangers resulting from loss of the hydrocarbon contained in the tank or the ignition thereof in the manner above referred to.

The essential characteristics of my invention are: a tank casing of non-frangible, substantially non-elastic, flexible material having a continuous expansible lining normally held under compression by the tank casing, so that in the event of a projectile penetrating the tank, the material of the casing will not have the effect of tearing the lining, and the lining independently of any action of the fluid contents of the tank, will substantially instantly expand about the opening left by the projectile in a manner to close the same, either entirely, or sufficiently to prevent the escape of the fluid from the tank in a stream.

In the event that a projectile pass entirely through the tank and is blunted, or "mushrooms", as a result of its impact, this projectile in leaving the tank will not have the effect of causing the material of the casing to produce a large rent in the lining because the bullet must pass through the lining, before it engages the material of said casing.

The invention consists primarily in a tank embodying therein a casing of non-frangible, and substantially non-elastic flexible material and a substantially continuous expansible lining; and in such other novel features of construction and combination of parts; and in the novel steps practised for producing a tank, all as hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings:

Figure 1 is a view, partly in elevation and partly in section, of a tank embodying my invention; and

Fig. 2 is a view, partly in elevation and partly in section, illustrating the method or art of making said tank.

Like numerals refer to like parts in both of said views.

In the embodiment of my invention shown in the drawings, I have shown at 3 a tank casing composed of canvas or other suitable textile material which, while possessing the properties of being non-frangible, substantially non-elastic, and flexible, is sufficiently strong to sustain the load of the contents of the tank. This casing may consist of a single ply, or a plurality of plies, of material. The casing 3 is provided with a lining 4 bonded thereto in a manner to prevent separation of the lining from the casing as a result of the impact of a projectile therewith. The lining 4 may be, and preferably is, of uniform thickness throughout and is formed of an expansible material held under compression by the casing 3 so as to permit it to instantaly expand in the event of the puncture of the tank at any point thereof, irrespective of the level of the hydrocarbon or other fluid contents of the tank.

The upper portion of the tank is cylin-

drical and the bottom thereof is hemispherical, a construction which insures the desired uniformity in the compression of the lining 4, the density of this lining being greatest at the face of the inner wall of the tank.

Preferably the lining 4 is composed of a soft vulcanized rubber, the casing 3 being coated or impregnated with rubber, or rubber solution to facilitate a substantially permanent bond between the casing and its lining.

The bottom of the tank is provided with a fitting 5 having an outlet port therein through which the contents of the tank may be withdrawn, and the top of said tank is provided with a closure 6 having a filling nozzle 7 provided with the usual vented, closure cap 8 to prevent the accumulation of gases within the tank. The tank is secured in relation to the closure 6 by means of the clamp ring 9, screws or other suitable devices being used for making connection between the tank proper and its closure. Preferably the closure 6 is made of metal or other suitable material to facilitate the mounting of the tank upon an airplane or other structure and the portion thereof cooperating with the ring 9 is provided with a bead 10, in increase the binding action of said ring.

To secure the desired permanent compression of the lining 4, the tank proper is constructed by first applying the fabric of the casing 3 to a mandrel and forming an outer stratum or strata of raw or green rubber, or a suitable rubber composition of the desired thickness upon said fabric. The rubber is vulcanized while still on the mandrel, and after vulcanization, the fabric with the vulcanized rubber thereon, is stripped from the mandrel, the casing 3 and its lining, in thus removing them from the mandrel, being reversed so as to bring the rubber upon the inside thereof. Hence, while in building up the tank, the stratum of rubber will be more remote from the axis of the tank than the fabric casing, after the tank has been removed from the mandrel, this condition will be reversed and the diameter of the exposed face of the rubber will be very materially reduced, this reduction resulting in the compression of the entire mass of rubber. The lack, or substantial lack, of elasticity in the casing 3 will maintain this compression of the rubber. The lining 4 will have the greatest density adjacent the inner face thereof, the density being graduated toward the casing 3.

To prevent deterioration of the lining 4 by contact with gasolene or other hydrocarbon, I provide the inner face of said lining with a dressing of a material insoluble in hydrocarbon, such as shellac.

By making the upper portion of the tank cylindrical and the bottom thereof hemispherical, every portion of the lining 4 will be placed under the required degree of compression by the turning of the tank in removing it from the mandrel, and this compression will be maintained irrespective of the volume of the hydrocarbon contained in the tank.

I prefer to have the lining 4 of uniform thickness throughout, although if desired, the thickness of this lining may be varied without departing from the spirit and scope of the invention.

In the production of a tank made in accordance with my invention, I first fit the fabric or other fibrous material composing the casing 3 upon a mandrel 9. This fabric may be so cut, woven or otherwise formed, as to properly fit said mandrel, and as heretofore stated, the fibers thereof are either coated or impregnated with a suitable rubber composition or solution to bond the different plies thereof together and to bond the lining thereto. After the fabric has been so placed upon the mandrel, the lining is built up upon the casing from green or raw rubber or rubber composition, to the desired thickness. When the lining has been so built up, the tank while still on the mandrel, is subjected to a vulcanizing temperature for the necessary length of time. After the rubber is properly vulcanized, the tank is removed from the mandrel, as heretofore described, being turned inside out when removing it from the mandrel, or thereafter. The inner face of the lining is then coated with shellac or other substances insoluble in the material to be stored in the tank, to protect the rubber from said material.

When a tank made in accordance with my invention is installed upon an airplane it may be suitably braced by stays or other devices to prevent its swaying with changes in position of the airplane or by reason of air currents. The manner of mounting the tank forms no part of my invention, but care should be taken to avoid the presence of metal parts in the immediate vicinity of the tank, since splinters from such parts would be apt to tear jagged gashes in the casing 3 and its lining 4, of a form and size which would prevent the elasticity developed in the lining 4 from closing the same.

The flexibility or pliability of the casing 3 is essential not only to permit the turning of the tank to place the lining under compression, but to avoid such resistance to the penetration of a projectile as would result in such mutilation as would preclude the effective sealing thereof.

It is not my intention to limit the invention to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. A tank comprising an inner wall of vulcanized rubber held under compression, a protective coating of shellac covering the exposed inner surface of said wall, and a relatively inexpansible outer wall for supporting the inner wall.

2. A tank having a wall composed of a layer of rubber and a layer of relatively inexpansible material vulcanized to the rubber, the rubber being normally under a state of gradually increasing compression toward one of its faces characteristic of rubber flexed in that direction after vulcanization.

Signed at New York, county and State of New York, this 23d day of June, 1917.

SHELDON P. THACHER.