Feb. 8, 1949. H. P. WAGNER 2,461,096

SELF-SEALING GASOLINE TANK

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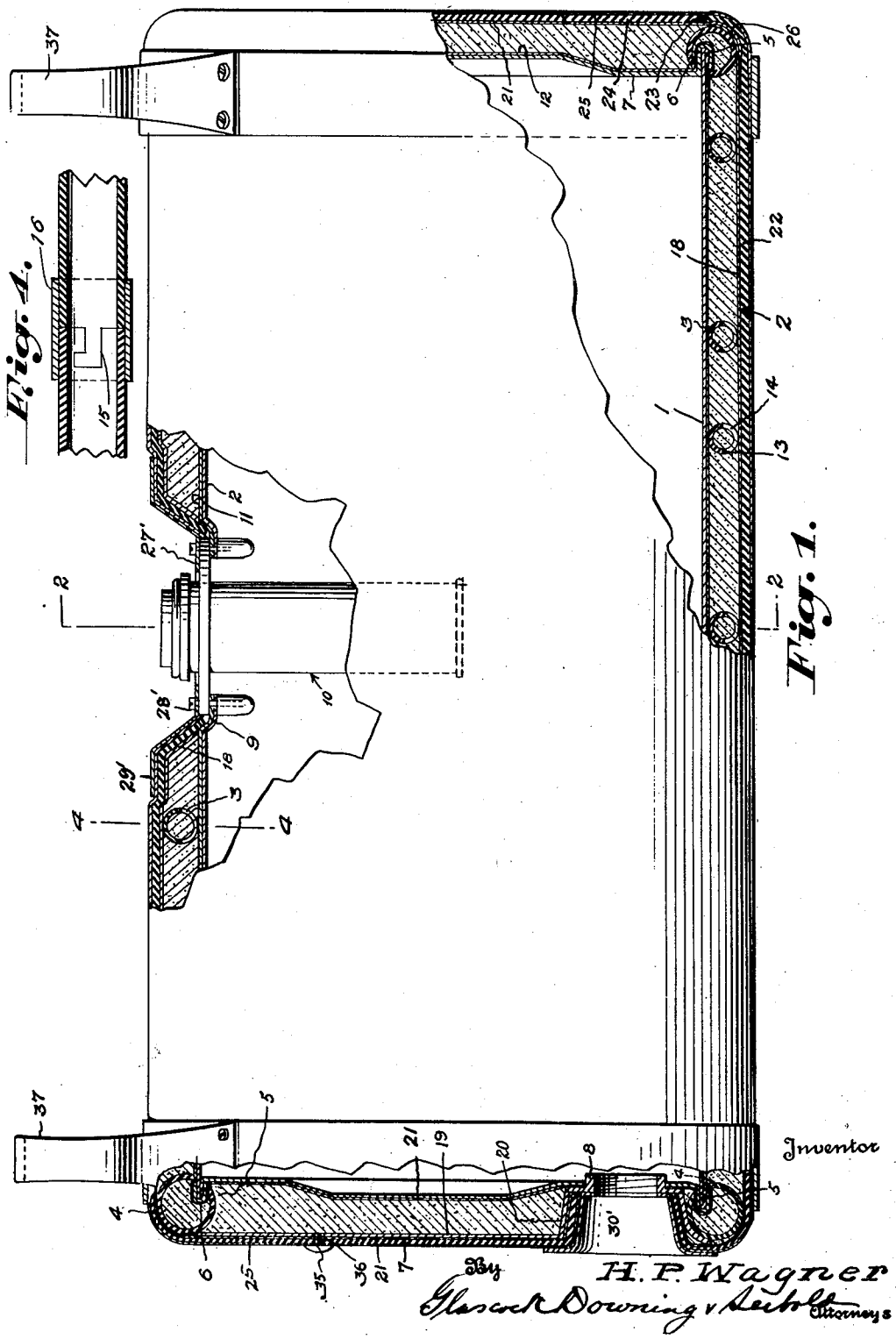


Fig. 4.

Fig. 1.

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Fig. 2.

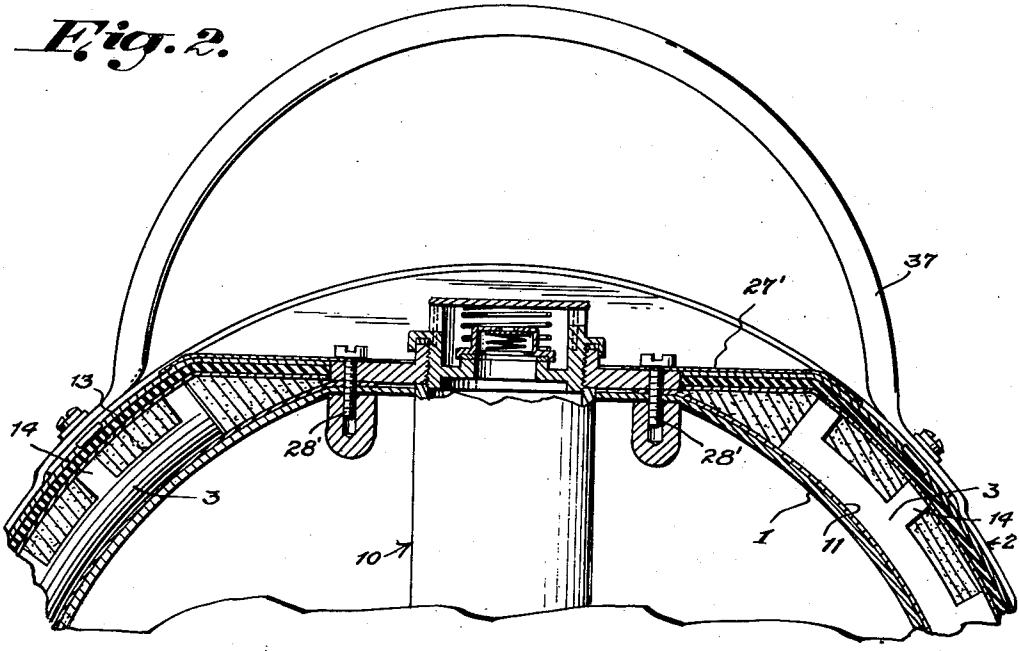
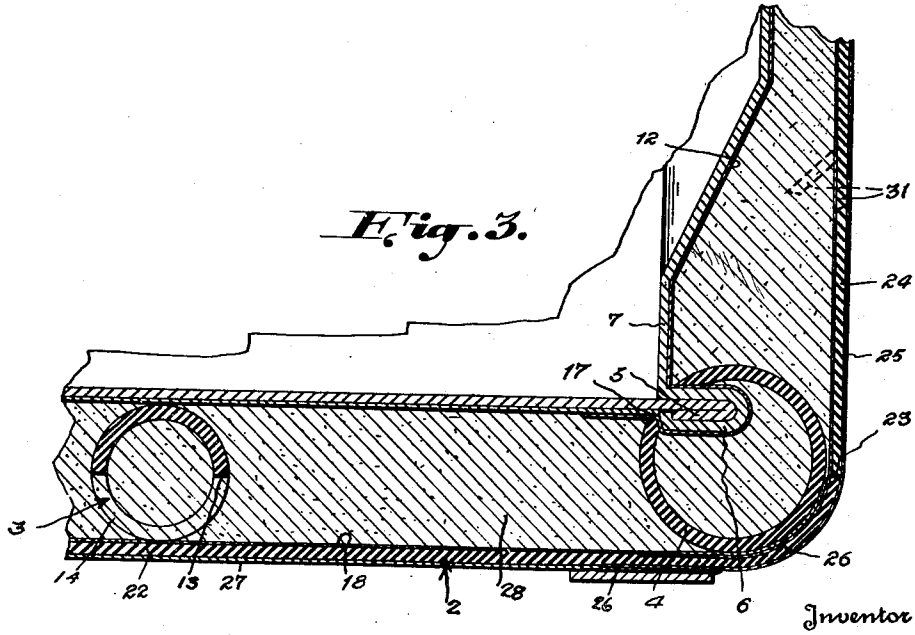


Fig. 3.



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Fig. 5.

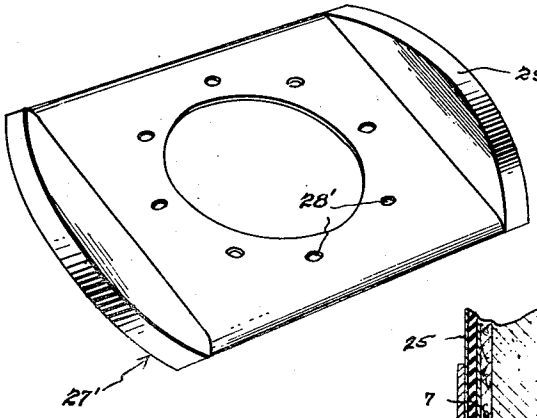


Fig. 7.

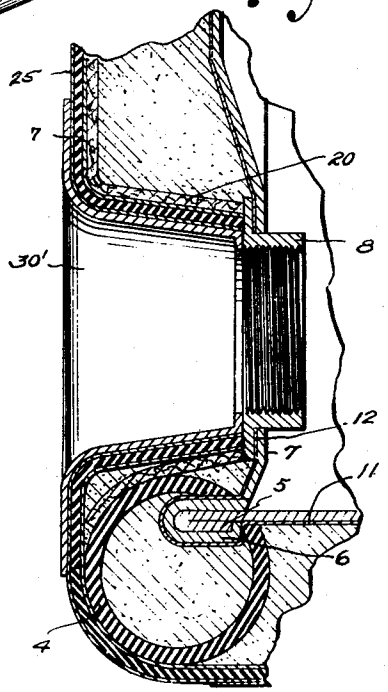
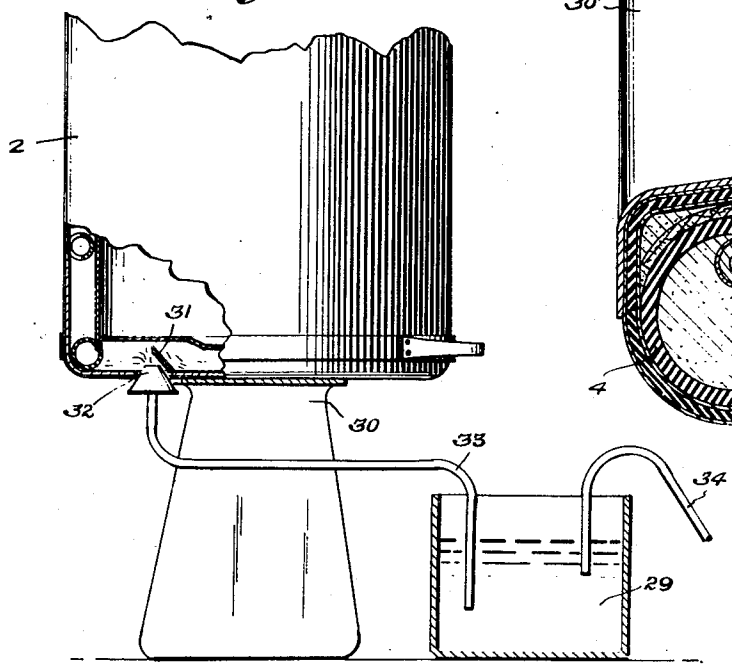


Fig. 6.



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SELF-SEALING GASOLINE TANK

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Application August 28, 1943, Serial No. 500,420

7 Claims. (Cl. 154—41)

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This invention has reference generally to that class of inventions known as metallic receptacles and more particularly relates to a self-sealing gasoline tank and method of constructing the same, the tank being adapted for use on combat tanks and for other purposes.

As its primary aim and object the invention contemplates the provision of a double wall tank for receiving a sealing compound or sealant between the walls and including means for yieldably spacing the outer flexible wall from the inner rigid wall.

As an additional and equally important object the invention consists in a novel construction of an outer wall of flexible layers and a method of forming such wall.

A further aim and object of the invention resides in the provision of a tank of the above character involving the use of a novel sealing compound provided between the walls which, upon rupturing of either of the walls of the container, the material of the sealing compound having previously been put under slight compression, immediately flows to close the rupture, the invention including the heating of the completed tank in a closed room to a temperature of approximately 150° F., then removing and allowing the same to stand and cool for 12 hours, the compound expanding approximately 10% in volume on congealing while the flexible outer wall, including the gum coating, actually shrinks on the slight heating.

More specific objects of the invention consist in the provision of improved means for interlocking the ends of the resilient spacing members to each other when arranged about the wall of the inner tank and for applying and spacing other flexible members about the interlocked or chimed ends of the inner container, the members being constructed so as to allow the sealing compound not only to pass throughout the complete area between the inner and outer walls but, owing to their hollow construction, allow the sealing to completely fill the same.

A still further object of the invention resides in the provision of a device of the above character which permits of the use as an inner tank or container of a conventional jettison type tank now in use in the armed forces and in employing in connection therewith nonmetallic synthetic

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materials for producing the outer wall and the completed tank thereby resulting in a saving of vital war materials.

Other objects, as well as the nature, characteristic features and scope of the invention will be more readily apparent from the following description taken in connection with the accompanying drawings and pointed out in the claims forming part of this specification.

The invention is clearly illustrated in the accompanying drawings in which:

Figure 1 is a longitudinal vertical sectional view through the improved tank.

Figure 2 is a fragmentary cross sectional view taken on line 2—2 of Figure 1.

Figure 3 is a longitudinal sectional detail through a portion of the end of the tank on an enlarged scale.

Figure 4 is an enlarged transverse sectional detail on line 4—4 of Figure 1.

Figure 5 is a perspective detail, and

Figure 6 is a diagramatic view indicating generally the method of filling the tank with a sealant.

Figure 7 is a sectional detail through the bung opening.

Referring now, more particularly, to the accompanying drawings in which similar reference numerals designate corresponding parts throughout the various views, there is provided the improved tank comprising generally a double wall structure including an inner wall 1, an outer flexible wall generally designated 2, the walls being spaced from each other by the improved resilient spacing means 3 and 4.

Although any type of an inner metallic container may serve as the inner tank in the double wall construction, it has been found expedient to employ a conventional jettison type tank which includes a cylindrical metallic wall with bent over ends 5 which are embraced by the crimped or beaded edges 6 on the outer edges of dished-like end plates 7. One end plate is fitted with a conventional bushing 8 for receiving an outlet pipe or bung, not shown, while the cylindrical wall is also depressed on one side as at 9 and fitted with a combined filling and filtering element generally designated 10 and of a conventional construction.

In carrying out the invention it has been found desirable to apply about the outer surface of the

cylindrical inner wall 1 a sheet of flexible material 11 preferably composed of 1-ply 18-ounce duck skim coated on both sides with Wagner gum (the reaction product of ethylene dichloride and a freshly prepared solution of sulfur in an aqueous sodium sulfide solution). The end edges of this material are arranged in overlapping relation and are heated and pressed firmly together to form a homogeneous mass.

Likewise, a similar layer 12 is arranged on the outer surface of the ends of the inner container.

In constructing the tank it is first desired to arrange the spacing elements on the inner tank or container 1 and in reducing this feature of the invention to practice it has been found expedient, though not absolutely essential, to arrange seven of such elements circumferentially about the wall of the tank 1, said elements preferably being constructed from hose also formed of Wagner gum. The hose before being applied is slotted as at 13 to a depth equal to one-half of the diameter thereof, each slot being approximately 2" long with a section 14 of of approximately 1" of uncut hose remaining between the ends of the slot in order that the sealing compound of the type disclosed in my prior Patent 2,403,836 dated July 9, 1946, may readily flow through and between the slotted rings and the double wall. The ends of the hose-like elements 3 may be scarfed in any suitable manner such as, for instance, shown at 15 in Figure 4 at their meeting ends and said ends being further held together by a covering of tape 16. The elements 4 are also of a cylindrical hose-like structure, there being preferably provided fourteen pieces which are slotted longitudinally as at 17 for engagement about the chimed or interlocked ends 6 of the inner container in suitably spaced relation so that the compound may flow through and between and by the same.

The parts are now in position to receive the laminated outer wall 2 and in reducing this feature of the invention to practice there is employed for the inner layer 18 another piece of 18-ounce duck provided with a double skimmed coating of Wagner gum, the same being wrapped around the hose assembly area, the ends being drawn tightly, arranged in overlapping relation and heated at this point and pressed together to form a homogeneous mass. It has been found desirable to employ a disc-like member 19 preferably of fibrous material, the same being fitted to lie against the inner edge and adjacent the outer periphery of the inner circumference defined by the slotted hose-like elements 17, said disc having a tubular extension 20 which seats about the edge of the bung bushing 8. If desired, a further disc may be fitted at the other end of the tank structure but this is not desired for a reason that will become apparent. There are now employed two disc-like pieces 21 of double skim coated duck which are approximately 10" larger in diameter than the effective area of the outside of the tank and these form covers for both end areas, being suitably scarfed or cut out at their outer edges where they are turned in to overlie and smoothly engage the inner duck layer 18, being drawn taut, heated and pressed to form a homogeneous mass therewith. Next there is applied the intermediate layer 22 which is preferably formed of synthetic rubber and consists, for instance, of 50% standard Wagner gum and 50% of reclaimed rubber, or 50% of Wagner gum and 50% of Thiokol F. A. (a polysulfide gum). It is preferably in the form of a calendered sheet and is wrapped around the inner layer 18, drawn taut with the overlapped edges arranged to adhere to each other by the application of heat. This layer 22 extends to a point as shown at 23 beyond the hose pieces 17 and two disc-like pieces 24 of the same material are applied at the ends of the tank and over the duck pieces 21 constituting the innermost layer. The edges of these pieces 24 are heated so as to be homogeneously connected with the wrapping 22 at the point 23. It is to be noted that this synthetic rubber material is such that it will resist in brittleness down to minus 20° F.

In providing the outermost layer there are employed two flange-like covers 25 preferably formed from disc-like pieces of double skim coated duck having an outside diameter 10" larger than the tank with the inturned flanged portions being suitably cut so that they are applied as at 26 to the layer 22. These flanged portions after being drawn taut are heated and pressed so as to be homogeneously connected with said layer 22. Finally, a further sheet of double skim coated duck 27 is wrapped about the intermediate synthetic rubber layer on the wall and over the flanged ends of the outer end covers 25 as shown clearly in Figure 3 and constitutes the outermost layer, the end edges being arranged in overlapping relation and after being drawn taut are heated and pressed to form a homogeneous connection while the side edges, of course, are likewise similarly treated so as to be homogeneously connected to the flanged covers 25.

As shown in Figures 1, 3 and 5, a channeled plate 27^1 is fitted over the attaching flange of the combined filling and strainer element 10 and suitably fastened as at 28^1 to the inner tank. It is also to be noted that the channel sides are inclined and arched at the upper edges and formed with curved lateral flanges 29^1 which acts to clamp against the adjacent portions of the outermost fabric layer.

The tank is now ready to receive the sealing compound 28 and in this instance it may be said that the sealing compound is the same as that employed in my prior Patent 2,403,836 granted July 9, 1946 and preferably consists of 25 pounds of 70% zinc chloride solution and 10 pounds of starch, consisting preferably of four parts of corn starch and six parts of a specially treated tapioca or potato starch which has been found to contain a large part of starch inhibitors. This mixture has added thereto approximately 50 cc. glacial acetic acid which is maintained at 50° F. for four to five hours, at which time it becomes freely flowable. It is now ready for insertion into the tank through a standard processor which, as shown in Figure 6, includes a receptacle 29 for containing, for instance, about 100 pounds. In filling it is preferred that the tank be placed in an inverted condition on end, that is, with the bushing 8 at the top, the bottom resting on a suitable support 30 while a tongue 31 is cut on an angle as shown, to receive preferably a rubber nozzle 32 on the outer end of a hose connection 33 leading from the receptacle 29 the same having been previously placed under air pressure as at 34. After a vent opening 35 has been arranged in the top end and air pressure applied to the sealant, the latter flows through the tube 33 and nozzle 32 into the void area in the bottom, displacing air and discharging it through the vent opening 35. Continued pressure causes the sealant to flow gradually upward with the air pressure being varied or adjusted to counterbalance

the sealant. The sealant, of course, flows between the walls through, into and by the hose-like spacing members. After the space between the inner and outer tanks has been completely filled a small rubber stopper **36** is placed in the vent opening and heated so as to be thoroughly sealed. Then with the nozzle **32** still in position the entire tank is inverted, the air pressure cut off and the nozzle removed. The pressure of the compound or sealant causes the tongue to move to a closed position and it is covered by a patch.

The completed tank is now placed in a room which is heated to 150° F. and allowed to stand for approximately five minutes. It is then removed and allowed to cool and let stand for a period of approximately twelve hours. The sealant expands approximately 10% in volume on congealing while the flexible laminated layer actually shrinks on the said slight heating. As a result the sealant area is put under slight pressure between the double walls so that in the event of a bullet passing through and rupturing the outer wall or both walls the sealant under compression immediately flows to close the rupture.

In actual use the tank herein described is of 25-gallon capacity and in this connection it may also be observed that the hose-like elements **3** are preferably of ⅞'' outside diameter while the hose-like pieces **4** are preferably of 1¼'' outside diameter, to insure the formation of a symmetrical tank.

In order to facilitate quick manipulation of the tank, loop-like handles **37** are fitted over the end edges.

It is believed in view of the foregoing that a further and detailed description of the operation of the invention is entirely unnecessary. Likewise, it is believed that the advantages of the invention will be readily apparent. It is to be noted, however, that it is preferable to fasten the laminated layer about the inner surface of the tubular extension **20** by means of a fastening and clamping sleeve **30¹** having an internal annular flange seating against the bushing **8** and an external annular flange clamping against the outer flexible end wall as shown clearly in Figure 7 on the engagement of the sleeve in the position shown.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a tank construction, an inner metallic tank including side and end walls in interlocking engagement with each other, a flexible outer tank surrounding the inner tank, spaced hollow and slotted yieldable means arrranged between the walls of the tanks and about and between the interlocking edges of the inner tank and the adjacent parts of the flexible tank for maintaining the respective walls in suitable spaced relation, and a sealant under compression arranged between the inner and outer tank walls and movable in and between the resilient spacing means.

2. In a tank construction, the combination, in a metallic tank having interlocked chimed ends, of a series of endless slotted resilient elements arranged in suitably spaced relation about the side walls of the tank, a series of slotted tubular elements of slightly larger diameter arranged in spaced relation about the chimed edges of the inner tank, an outer laminated flexible tank arranged about the inner tank and spaced therefrom by the resilient elements, and a sealing compound arranged under compression between the inner and outer tanks.

3. A method of rendering a metallic tank for gasoline self-sealing, consisting in wrapping resilient tubular elements in suitably spaced relation about the outer surface of the metallic tank, applying other resilient elements in spaced relation about the end edges of the metallic tank, alternately wrapping pre-treated fabricated material, and sheeted rubber-like material respectively about the side and end walls of the tank and about the resilient elements thereon to form an outer laminated flexible tank, heating and pressing said layers of fabricated material and rubber-like material so as to homogeneously fasten them in position, and inserting a sealant between the outer surface of the metallic tank and the flexible tank.

4. A method of rendering a metallic tank for gasoline self-sealing, consisting in wrapping resilient tubular elements in suitably spaced relation about the outer surface of the metallic tank, applying other resilient elements in spaced relation about the end edges of the metallic tank, alternately wrapping pre-treated fabricated material and sheeted rubber-like material respectively about the side and end walls of the tank and about the resilient elements thereon, heating and pressing said alternately wrapped layers so as to homogeneously fasten them in position, inserting a sealant between the outer surface of the metallic tank and the formed laminated structure arranged thereabout, heating the complete structure in a closed room at a temperature of approximately 150° F. for a period of approximately five minutes, then removing and allowing the tank to stand for approximately 12 hours, thereby placing the sealant under compression and causing the shrinkage of the pre-treated layers.

5. In a tank construction an inner metallic tank, a flexible outer tank arranged in space surrounding relation with respect to the inner tank, a sealant under compression arranged between the tanks and endless resilient tubular elements arranged between the tanks to maintain the tanks in spaced relation and provided with slots forming passageways through which the sealant may pass.

6. In a tank construction, an inner metallic tank, a flexible outer tank surrounding the inner tank, spaced hollow resilient means arranged between the tanks and about and between the end edges of the inner tank and the adjacent parts of the flexible tank for maintaining the tanks in suitably spaced relation and including endless tubular members constructed of resilient material and provided at their outer portions with a series of suitably spaced slots and a sealant under compression arranged between the inner and outer tank walls and movable in and between the resilient spacing means.

7. In a tank construction, an inner metallic tank including side walls and end walls in interlocking engagement therewith, a flexible outer tank surrounding the inner tank, spacing means arranged between the inner and outer side walls of the tanks and about and between the interlocking edges of the inner tank and the adjacent parts of the flexible tank for maintaining the respective walls in suitably spaced relation, said spacing means including a plurality of slotted tubular yieldable elements, the slotted portions of which engage the interlocked ends of the inner tank while the tubular elements are arranged in suitably spaced relation about the interlocked

portions of the inner tank and a sealant under compression arranged between the inner and outer tank walls and movable in and between the spacing means.

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