Dec. 18, 1934. E. R. SCHAEFFER 1,984,551

STRUCTURE, SUCH AS TANK ROOF

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Fig. 1.

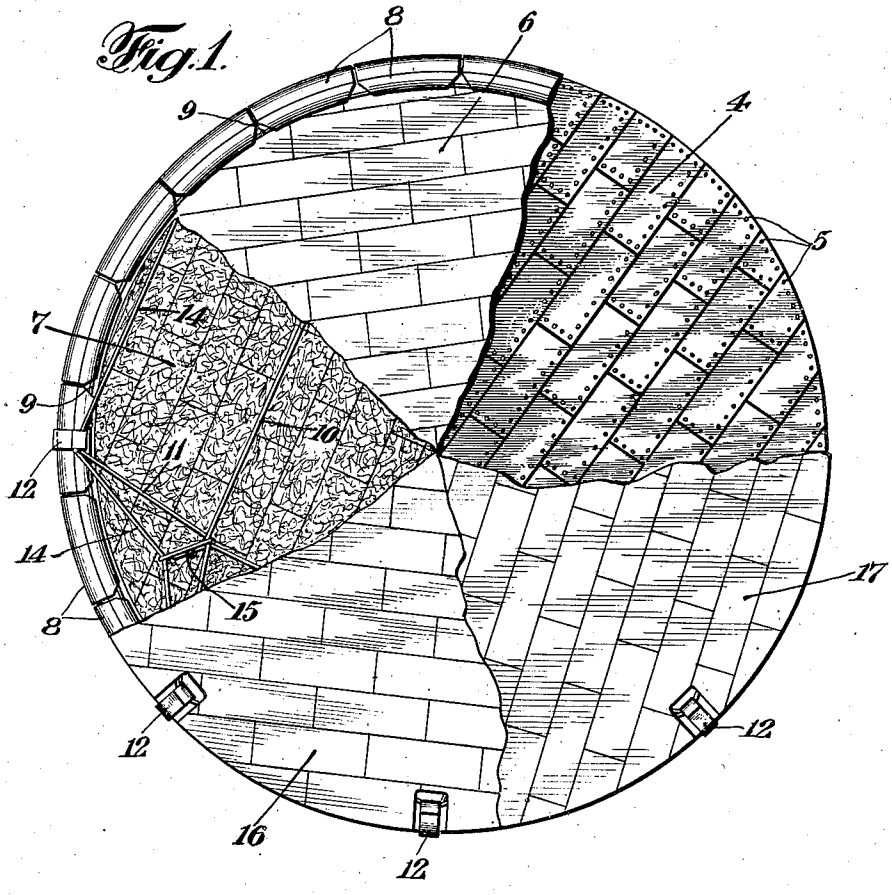
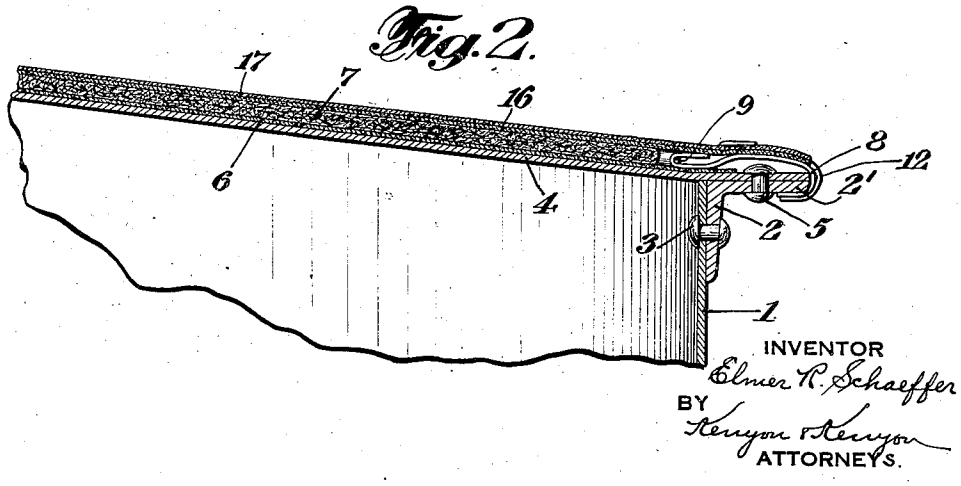


Fig. 2.



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Fig. 3.

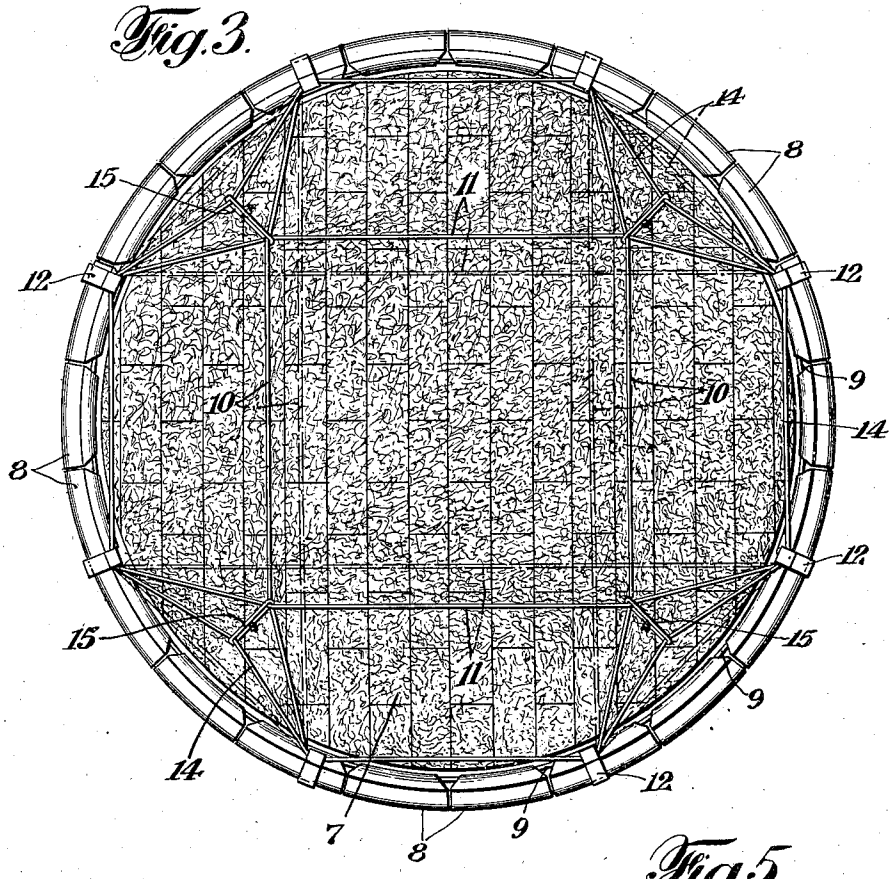


Fig. 4.

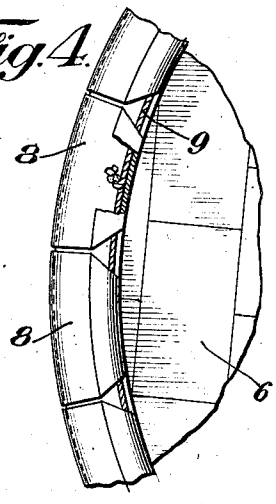
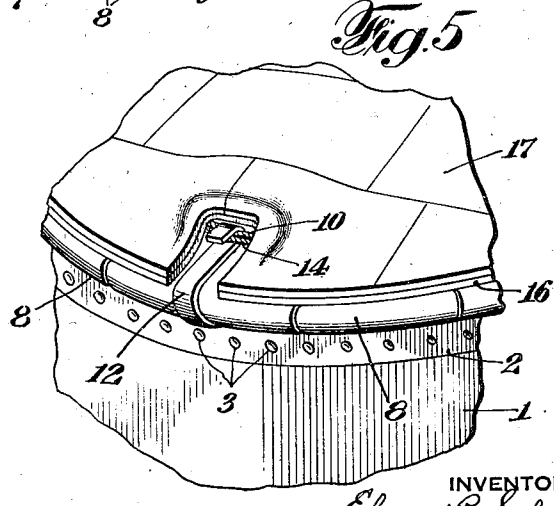


Fig. 5.



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UNITED STATES PATENT OFFICE

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STRUCTURE, SUCH AS TANK ROOF

Elmer R. Schaeffer, New York, N. Y., assignor to The Philip Carey Manufacturing Company, a corporation of Ohio

Application October 3, 1930, Serial No. 486,097

14 Claims. (Cl. 220—1)

My invention relates to structures, such as tank roofs, and more particularly to metal roofs for oil storage tanks.

Ordinary metal roofs are practically never gas tight, there being leaks around the rivet heads and at plate laps which result in large losses of the stored fuel. Ordinary paint containing a drying oil does not stop these leaks as the oil does not become completely dry in the presence of petroleum vapors. In places where it does dry, it begins to scale in a short time when exposed to such vapors if they contain sulphur compounds.

In order to keep down the temperature of the vapor in tanks for the storage of hydrocarbons, the roofs of these tanks are sometimes covered with heat insulating materials. Such materials contain asphalt, which is also softened by the hydrocarbon vapors. Difficulty has also been encountered in securely fastening the insulation in place on such roofs.

One of the objects of my invention is to provide an improved roof which is free from gas leaks, and effectively insulated against the heat and protected against the weather.

Another object of the invention is to provide improved means for securing the insulation in place.

Other objects, features and advantages will appear more fully in the following detailed description and the appended claims.

The accompanying drawings forming a part of this specification illustrate an oil tank containing one embodiment of the invention.

In the drawings, Fig. 1 is a top plan view of the tank with a portion of the covering material for the roof removed so as to show successive layers applied to the roof.

Fig. 2 is a fragmentary vertical cross section of the same.

Fig. 3 is a top plan view of the roof with the uppermost layers of roofing material removed to illustrate more clearly the means employed for securing the heat insulating material in place.

Figs. 4 and 5 are respectively fragmentary plan and perspective views illustrating details of construction.

Referring to the drawings, the tank has the usual cylindrical steel shell or side wall 1 around the upper rim of which an angle iron 2 is secured as by rivets 3. The ankle iron is arranged with one of its flanges 2' horizontal. The conical roof 4 of the tank, as shown, is formed of a number of sheet metal plates overlapped and riveted together as shown in Fig. 1, the roof being supported on the flange 2' and secured thereto by suitable means such as the rivets 5.

In order to prevent the escape of vapor through leaks around the rivets and at the plate laps, I preferably cover the portions of the roof where such leaks are likely to occur with a suitable paint. Before applying this paint, the roof or the portions thereof to which it is applied, are preferably thoroughly cleaned. A suitable paint, and the one which I prefer to use, is disclosed in my application Ser. No. 473,771 filed August 7, 1930 and entitled "Improvements in protecting composition for materials and process of making and applying same". If desired, this paint may be applied to the entire upper surface of the roof 4.

In applying the paint, a drying oil such as corn oil may be treated with sulphur at a high temperature or with sulphur chloride and the resulting product applied while it is hot. The oil will fill all of the crevices where vapor leaks are apt to appear and will soon become viscous and rubberlike. An application of sulphur chloride is now made, preferably with a spray, whereupon the rubberlike material will become gummy but will not harden and crack at low temperatures. The melting point of the resulting gummy material is several hundred degrees above temperatures which have been recorded on the tops of such tanks. This paint thus affords an effective seal against the escape of the hydrocarbon vapors.

The painted roof 4 is now covered with a layer 6 of a flexible roofing material. This material may also be designed to a considerable degree to be impervious to the vapors in the tank. It may comprise the usual flexible roofing formed of asbestos felt or paper impregnated with bituminous composition such as asphalt or coal tar. This flexible roofing covers the entire roof 4. It may be secured to the roof 4 by first mopping the roof in spots with hot asphalt and applying the roofing material before the asphalt has cooled.

Covering the roofing 6 is a layer of suitable heat insulating material 7, either a rigid boardlike material or a heavy felted, flexible material may be used. This material extends over the entire central portion of the roof, its periphery being arranged a short distance inwardly of the cylindrical wall 1. It may be secured to the roofing material 6 by covering the latter with hot asphalt and applying the heat insulating material 7 before the asphalt has cooled.

To hold the insulation material in place and to

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prevent the same from breaking loose from the roof, suitable fastening means are employed. As shown (Fig. 3) the fastening means consist of a plurality of intersecting pairs of wires 10—10 and 11—11 which extend across the roof and bear down upon the insulation 7. These wires are secured to the roof at spaced points around the periphery thereof. As shown, each pair of wires 10—10 and 11—11 has connecting end portions forming therewith a loop, the loop being secured to the roof by means of hooks 12, the outer portions of which engage over the flashing 8 while the inner hook-shaped portions engage about the wires. The same hooks also hold in place an endless wire 14 extending peripherally around the tank. To place the various wires under tension, I connect the intersections of each two wires 10 and 11 with a free intermediate portion of the peripheral wire 14 by tensioned wire loops 15. By drawing tight on the wires forming loops 15 and then twisting the ends thereof so as to hold them in position, the wires 10, 11 and 14 are moved from the dot and dash position shown in Fig. 3, where the wires 10—10 and 11—11 are parallel, to the solid line position shown in that figure, whereupon all of the wires are held under tension and firmly bear upon the insulation 7 and retain the same in position.

I now apply above the insulation 7 and the wires referred to another layer of flexible roofing material similar to the material 6, this layer being also secured in position as by applying hot asphalt to the insulation 7 and placing the roofing material 16 thereon before the asphalt cools.

The flashing at the upper peripheral edge of the tank is, as shown, composed of a number of metallic, hooklike members 8, the outer portions being arched above the rivets 5 and hooked over the flange 2'. To secure the members 8 in position, any suitable means may be employed. As shown, a wire 9 extends under the rear hook-shaped portions of the flashing members. By tensioning this wire and securing the ends thereof together, as by knotting (Fig. 4), while the wire is under tension, the flashing members may be effectively held in place.

The whole roof is preferably capped with a layer 17 of asbestos felt impregnated with bituminous composition such as asphalt and surfaced with a heat reflecting material such as finely divided aluminum. The layer 17 may be cemented to the layer 16 as by hot asphalt. The layers 16 and 17 extend over the flashing 8 to the outer edge of the roof 5 and the flange 2', the flashing affording a smooth surface above the rivets 5 to which the edge portion of the layer 16 may be cemented, as by hot asphalt.

While I have described the preferred form of my invention, it is understood that modifications within the scope of the appended claims may be made without departing from the spirit of the specification.

I claim:

1. A structure having a convex roof, a protecting covering for said roof, and securing means for said covering including a plurality of flexible holding members under tension extending across the roof to hold said covering against the same.

2. A structure having a convex roof, a protecting covering for said roof, securing means for said covering including a plurality of intersecting flexible holding members arranged above the roof to hold said covering against the same, and means applied to the intersections of said members for holding the same under tension by maintaining each of said holding members at the point of intersection thereof displaced angularly from normal position with respect to the longitudinal extent of said holding members.

3. A structure having a convex roof, a protecting covering for said roof, securing means for said covering including a plurality of intersecting pairs of flexible holding members arranged above the roof to hold said covering against the same, and means applied to the intersections of said members for holding the same under tension by maintaining said intersections drawn in a downward direction toward a point on the periphery of said roof.

4. A structure having a convex roof, a protective covering for said roof, and securing means for said covering including a plurality of intersecting elongated flexible holding members extending across the roof, an elongated holding member arranged adjacent the edge of the roof, and means connected to said last-named member and the intersections of said first named members for holding said members under tension, said intersecting holding members and said holding member adjacent the edge of the roof overlying said covering.

5. A structure having a conical roof, a protective covering for said roof and securing means for said covering including a plurality of wires extending across the roof between different points in the periphery thereof, a wire arranged adjacent the periphery of the roof, and means connected to said peripheral wire and said first named wires for holding the wires under tension, said peripheral wire and said wires extending across the roof overlying said protective covering.

6. A structure having a side wall, a flange projecting from the upper edge portion of the side wall, a roof, means for securing the roof to said flange, a rigid flashing covering said securing means, and protective roofing material having its edge portion extending over said flashing, said flashing being made up of a plurality of preformed sections.

7. A structure having a side wall, a flange projecting from the upper edge portion of the side wall, a roof, means for securing the roof to said flange, a rigid flashing arched over said securing means, and roofing material having its edge portion extending over said flashing, said flashing being made up of a plurality of preformed sections linked together by flexible connecting means adapted to maintain said flashing members in position over said securing means.

8. A structure having a side wall, a flange projecting from the upper edge portion of the side wall, a roof, means for securing the roof to said flange, a rigid flashing covering said securing means and hooked over said flange, and protective roofing material having its edge portion extending over said flashing, said flashing being in the form of a plurality of articulated sections and being maintained in position by flexible tension members extending across the roof between spaced points of said flashing.

9. A structure having a side wall, a flange projecting from the upper edge portion of the side wall, a roof, means for securing the roof to said flange, a plurality of flashing members arranged over said securing means, a flexible tension member connecting said flashing members to hold the same in place, and protective roofing material having its edge portion extending over said flashing members.

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10. A structure having a side wall and a roof, a flange projecting from the upper edge portion of said side wall, a roof, means for securing said roof to said flange, a plurality of preformed metallic flashing members covering said securing means, hooks attached to said flashing members, and tension means applied to said hooks of said flashing members for maintaining flashing members in position, said tension means extending across the roof between a plurality of spaced points on the periphery of said roof.

11. A structure with a convex roof having a substantially circular periphery, a protective covering for said roof, a wire adjacent the periphery of said roof overlying said protective covering, and fastening means for said wire at spaced points about the periphery of said roof, said wire being substantially taut between said spaced fastening means and over said protective covering thereby holding the edge of said covering on said roof.

12. A structure having a conical roof, a protective covering for said roof, and securing means for said covering including a plurality of pairs of intersecting flexible lines overlying said covering between spaced points adjacent the periphery thereof, fastening means for said lines at said spaced points adjacent the periphery of said roof, a line extended about the periphery of said roof substantially overlying said covering and maintained in position by said fastening means, and tensioning means applied at intersections of said lines and at points in said peripheral wire intermedial said fastening means adapted to maintain said intersecting wires and said peripheral wire drawn toward one another at said points where said tensioning means is applied thereto thereby maintaining said intersecting wires and peripheral wire under tension.

13. A structure having a convex roof, a protective covering for said roof, and securing means for said covering including a plurality of intersecting lines overlying said covering between different spaced points in the periphery thereof, fastening means at said spaced points for said lines, a line extended about the periphery of said roof overlying said covering, fastening means at spaced points for maintaining said peripheral wire in position and means for tensioning said intersecting wires and said peripheral wire applied to the intersections of said intersecting wires and points intermediate the securing means for said peripheral wire.

14. A structure with a side wall and a convex roof, a flange projecting from the upper edge portion of said side wall, means for securing said roof to said flange, a plurality of preformed flashing members covering said securing means, tension means applied to said flashing means for maintaining the same in position, a covering for said roof, a flexible holding member overlying said covering adjacent the periphery thereof and maintained in position by means cooperating between said flashing and said holding members and a second covering for said roof overlying said holding member and said flashing.

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