

D. FERNALD.
REFRIGERATING TANK OR VESSEL.
APPLICATION FILED DEC. 10, 1918.

1,412,802.

Patented Apr. 11, 1922.

Fig. 1.

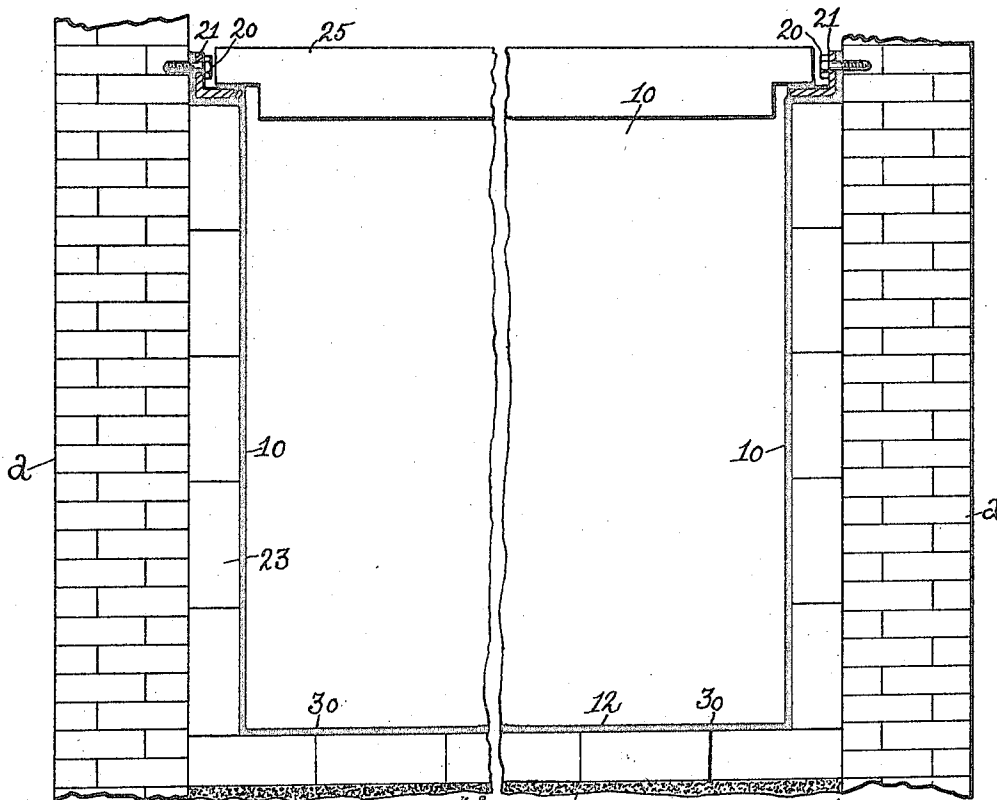


Fig. 3. b

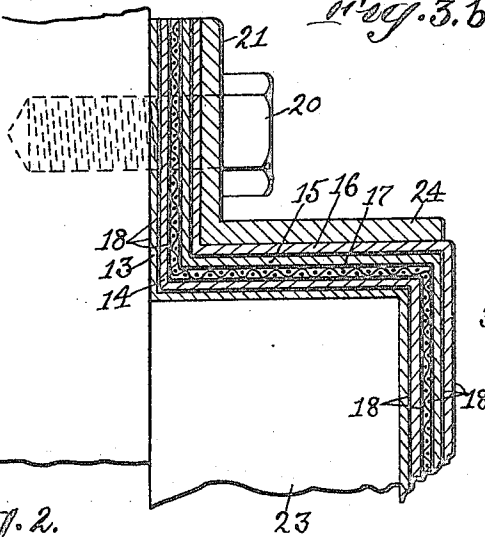
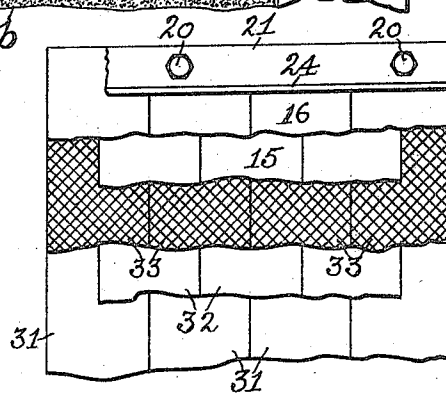


Fig. 2.



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REFRIGERATING TANK OR VESSEL.

1,412,802.

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Application filed December 10, 1918. Serial No. 266,155.

To all whom it may concern:

Be it known that I, DANA FERNALD, a citizen of the United States, residing in the city, county, and State of New York, have
5 invented an Improvement in Refrigerating Tanks or Vessels, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing
10 like parts.

This invention relates to a waterproof or liquid tight tank or vessel, and particularly to tanks or vessels of this character which are of large size or capacity.

15 The invention is especially designed and adapted to be embodied in large size freezing or refrigerating tanks, which are employed in artificial refrigeration and commonly known as brine tanks.

20 As now commonly constructed and known to me, tanks of the character described are usually made of steel plates brought into the room, in which the tank is to be erected, in small sections and riveted together in a
25 position more than two feet above the floor on which it is finally to stand. After being tested for leaks in this position it is raised off its temporary supports and lowered into its final position. The spaces between the
30 sides of the tank and the walls of the room, usually seven inches all around, are then filled in with cork or other heat insulating material. Tanks thus made are expensive, difficult to construct and assemble and in the
35 process of lowering into place are subject to strains, which are liable to start rivets and develop leaks, which become known only after the steel tanks are in position, and which leaks permit access of the liquid
40 to the cork or other insulating material, with the result that the insulating value of the latter is seriously impaired.

The present invention has for its object to provide a simple, inexpensive and highly
45 efficient refrigerating tank of large capacity, which is free from the objectionable features above referred to.

To this end, the tank or vessel, which may be of any suitable construction, such
50 as wood, metal, concrete, or other non-metallic material of the proper strength, is provided with a waterproof lining or membrane, having upright sections composed of reinforced waterproof fibrous material,
55 which are mechanically supported at their

upper ends above the level of the brine or other liquid in the tank, so as to relieve the fibrous layers from weight and strain and avoid piercing the lining below the normal water level by fastening devices, whereby
60 leakage and rupture of the fibrous lining is avoided and a durable and efficient waterproof tank of large capacity is produced at a minimum expense and with a minimum of labor.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Fig. 1 represents in vertical section one form of refrigerating tank embodying this
70 invention.

Fig. 2, a detail on an enlarged scale to show more clearly the construction of the waterproof lining membrane preferred by
75 me and shown in Fig. 1, and

Fig. 3, a detail in elevation on an enlarged scale to illustrate the method of building up the lining or membrane member preferred
80 by me.

Referring to the drawing, *a* represents
80 the upright walls of a tank or vessel of large size or capacity and such as now commonly used in artificial refrigerating plants, and *b* the bottom of said tank or vessel.
85 The tank or vessel may be square, oblong or other suitable shape, and in large plants these tanks are usually about twenty-five feet wide and seventy feet long, and are designed to contain brine and the coil of
90 pipes through which the refrigerant such as ammonia is circulated, said brine and pipes being omitted from the drawing as they are not necessary for a full understanding of the invention.

The upright walls *a* of the tank are represented as made of brick and the bottom
95 *b* of concrete, but they may be made of wood, metal or other suitable material.

In accordance with this invention the tank or vessel is provided with a waterproof
100 lining or membrane, which is represented by the heavy black line *c* in Fig. 1. The lining or membrane *c* is composed of upright sections 10 and a bottom section 12, and said upright sections 10 are composed
105 for the best results of a plurality of layers of fibrous material preferably felt or fabric, which layers are adhesively affixed together, waterproofed and reinforced, and mechanically suspended from their upper ends by
110

means of the reinforcement for the fibrous material, whereby the felt or other fibrous layers are relieved from strain, and piercing of the fibrous lining below the normal level of the brine or other liquid in the tank is avoided.

In the present instance the upright sections 10 of the lining or membrane as shown in Fig. 2 are composed of four layers 13, 14, 15, 16 of felt or other fibrous material, a reinforcement for said layers, herein represented as a layer 17 of wire mesh, and layers 18 of waterproofing material, such as liquid asphalt, pitch or other bituminous material. The upright sections 10 of the lining or membrane are supported at or near their upper ends above the level of the liquid in the tank by mechanical means, which co-operates with the reinforcement 17 to sustain the weight of said upright sections, avoid puncturing the lining below the liquid level and relieve the fibrous layers from strain, so that the latter are not liable to be weakened to such extent as to develop leaks.

In the present instance, I have illustrated one means for mechanically supporting the upright sections, which consists of a series of bolts 20 extended through the reinforcement 17 and a bar 21 which engages the outer layer of fibrous material and is secured in fixed relation to the upright walls *a* by the bolts 20, so as to clamp the upright sections 10 to said walls. The clamping bar 21 may and preferably will be made as an angle bar when a heat insulating layer of cork or other suitable material 23 is interposed between the upright walls *a* and the upright sections 10 of the lining or membrane, and in this case the horizontal member 24 of the clamping bar may be used, as a support for the cover 25 of the tank.

The bottom section 12 of the lining may be composed of reinforced fibrous layers like the upright sections, as for instance, when the ground forms the bottom of the tank, but in those cases where the bottom of the tank is made solid or stable it is not necessary to make the bottom of the lining of reinforced fabric for its entire area, as the reinforced fabric comprising the upright sections 10 may be made long enough to form the portion of the bottom adjacent to the upright sections, as for instance, for the distance of one or two feet from the upright sections and then the bottom 12 is completed by a substantially thick layer of asphalt or other waterproofing material. In Fig. 1, the reinforced fibrous layers may be supposed to extend from the upright sections 10 to the points 30, and the portion of the bottom between the points 30 may be composed of asphalt or other waterproofing material.

In building up the lining *c* shown in Fig. 1, it is preferred to proceed as follows: A layer of hot asphalt is applied to the inner

surface of the insulating layer 23 to the top surface thereof and to the wall *a* above the said insulating layer. This layer of hot asphalt has applied to it strips 31 of felt with their edges abutting as shown in Fig. 2 to form the felt layer 13 of Fig. 2. The outer surface of the layer 13 is then coated with a layer 18 of hot asphalt, and on this asphalt layer strips 32 of felt are laid to form the layer 14 shown in Fig. 2 with the edges of its strips abutting and breaking joints with the edges of the strips of layer 13. A layer 18 of hot asphalt is then applied to layer 14 and strips 33 of wire mesh or other reinforcing material are then applied to the layer of asphalt to form the reinforcing layer 17, after which additional layers 18 of hot asphalt and strips of felt or fabric to form the layers 15, 16 are applied in the same manner as the strips of the layers 13 and 14. After the last felt layer 16 has been laid and the hot asphalt layer 18 applied to it, the upright section 10 is clamped to the upright wall of the tank above the insulating layer and consequently above the level of the brine when the tank is filled with the latter, with the result that the upright section of the lining is hung from above the level of the liquid in the tank, is not pierced by fastening devices below the level of the liquid in the tank, and is relieved from stretching strains by the reinforcement which takes the strain off of the fibrous layers, consequently, the tank is provided with a durable, inexpensive and highly efficient waterproofing lining.

The lining is herein shown as applied to a tank having an interior layer 23 of heat insulating material, but it is not desired to limit the invention in this respect as in some cases the insulating layer 23 may be omitted. So also, the reinforcing member is shown as a wire mesh but it is not desired to limit the invention to this particular form of reinforcing member.

Furthermore, it may be preferred to secure the lining to the wall of the tank by the clamping bar, but it is not desired to limit the invention in this respect.

When the heat insulating layer 23 is employed, it may be materially reduced in thickness inasmuch as the waterproof lining possesses heat insulating value, and as a result the capacity of the tank may be increased without diminishing the efficiency thereof, and a material saving in cost thus effected.

From the above description, it will be seen that the reinforced waterproof lining enables refrigerating tanks and especially tanks of large size and capacity to be made absolutely waterproof, of long life and at a materially reduced cost. Furthermore, if any leaks should occur in the course of time, the lining can be quickly and easily repaired without removing it from the tank.

I have specifically described the invention as embodied in a refrigerating tank, but it is not desired to limit the invention in this respect, as it is equally applicable to tanks or vessels employed for other purposes, as, for instance, electrolytic, leaching and other liquid holding tanks or vessels.

Claims:

1. The combination with a tank or vessel of the character described having walls of material height, of a waterproofed lining for said tank or vessel having upright sections composed of metallicly reenforced waterproofed fibrous material adhesively affixed to said walls, devices for clamping said upright sections to said walls near the upper ends of the latter, means for securing said clamping devices to said walls and for engaging the metallic reenforcement of the lining to support the latter at its upper end and relieve the fibrous material from weight and strain and permit the portion of the lining below the level of the liquid in the tank to be free from punctures.

2. The combination with a tank or vessel of the character described having walls of material height, of a waterproofed lining adhesively affixed to said walls and composed of a plurality of layers of fibrous material and a layer of re-enforcing material between said fibrous layers, said fibrous layers being composed of abutting strips, with the strips of one layer arranged to cover the joints formed by the strips of another layer, means for clamping the upper

ends of the lining to said walls, and devices for securing said clamping means to said walls and for engaging said re-enforcing layer for the purpose specified.

3. The combination with a tank or vessel of the character described having walls of material height, of a layer of heat-insulating material on the inner side of said walls and terminating below the upper ends thereof, a lining of re-enforced waterproofed fibrous material adhesively affixed to said heat-insulating layer and to the walls of the tank above said heat-insulating layer, devices for clamping the portion of the lining above the heat-insulating layer to said walls, and means for securing said clamping devices to said walls and for engaging the re-enforcement of said lining to sustain the weight of the latter and permit the portion of the lining below the liquid level in the tank to be free from punctures.

4. The combination with a tank or vessel of the character described having walls of material height, of a lining of waterproofed fibrous material adhesively affixed to said walls and provided with a re-enforcement, and devices affixed to the inner surfaces of said walls near their upper ends and engaging the re-enforcement of said lining to support the weight of the latter for the purpose specified.

In testimony whereof, I have signed my name to this specification.

DANA FERNALD.