Jan. 1, 1935. M. RESEK ET AL 1,985,950

ENAMELED CONDENSER

Filed March 7, 1932 4 Sheets-Sheet 1

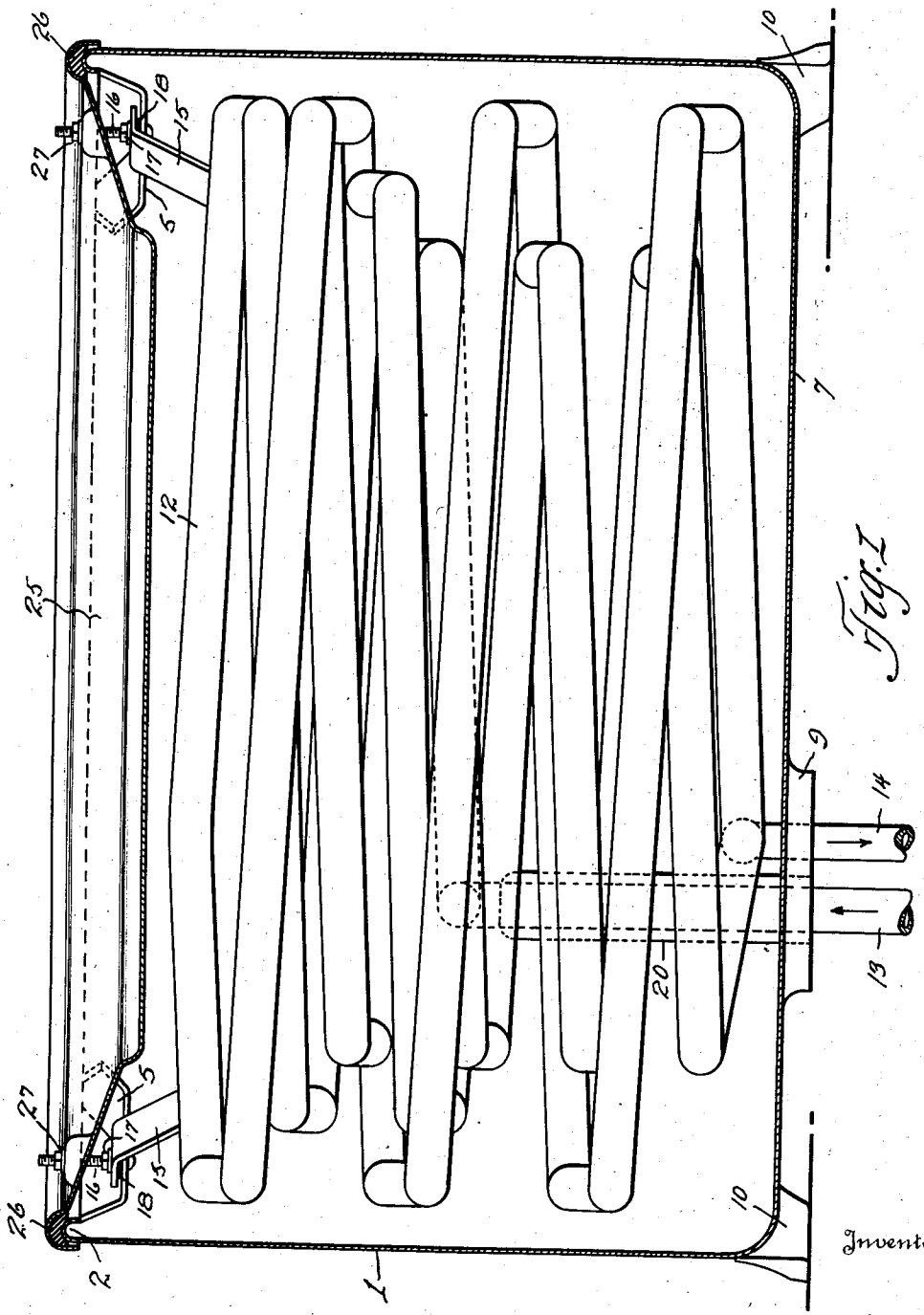


Fig. 1

Inventors

Marc Resek and
Theodore B. Focke

By Hull, Brock & West

Attorneys

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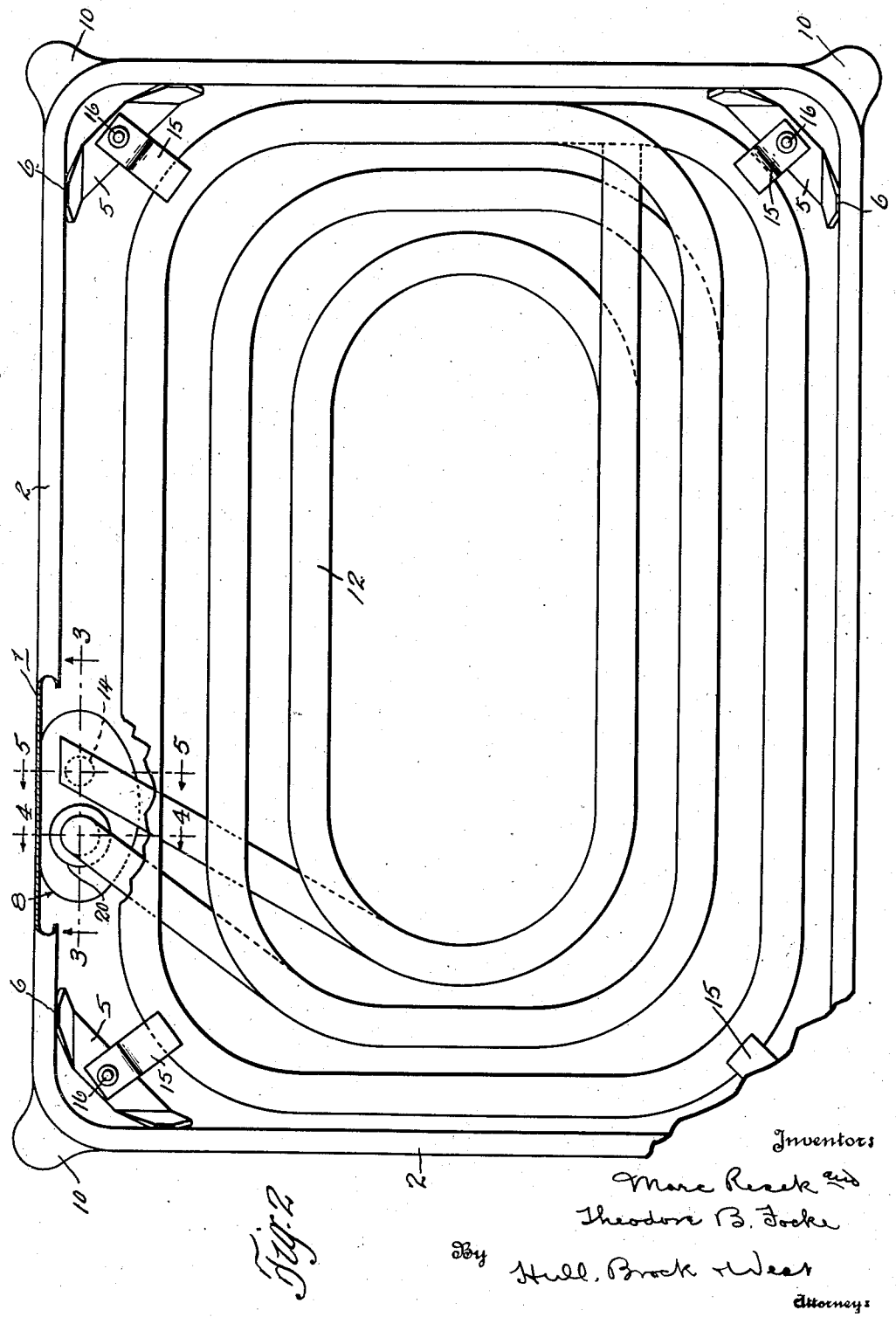


Fig. 2

Inventors:
Marc Resek and
Theodore B. Focke
By Hull, Brock & West
Attorneys

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ENAMELED CONDENSER

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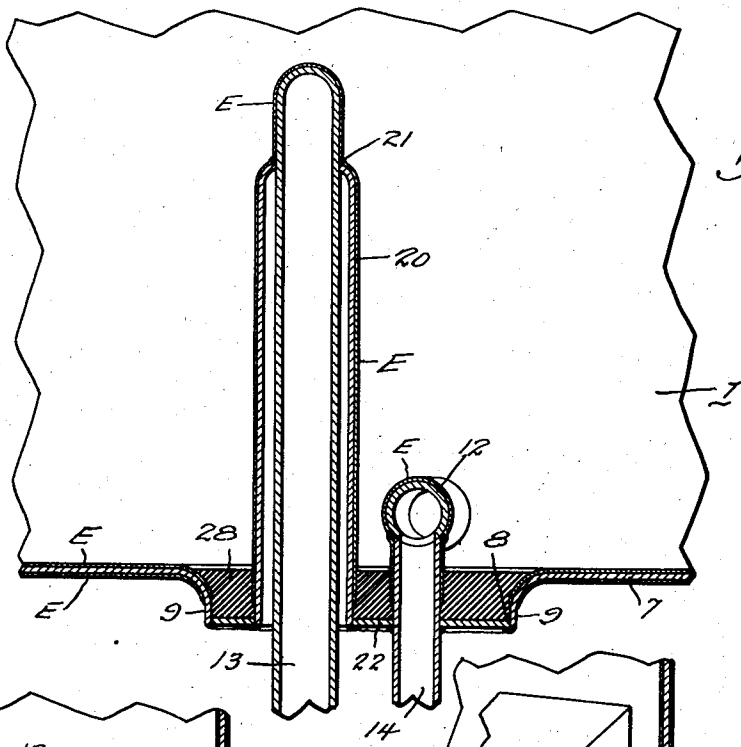


Fig. 3

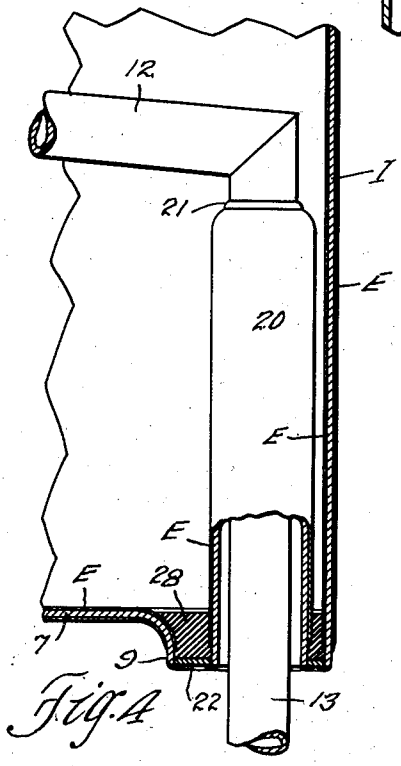


Fig. 4

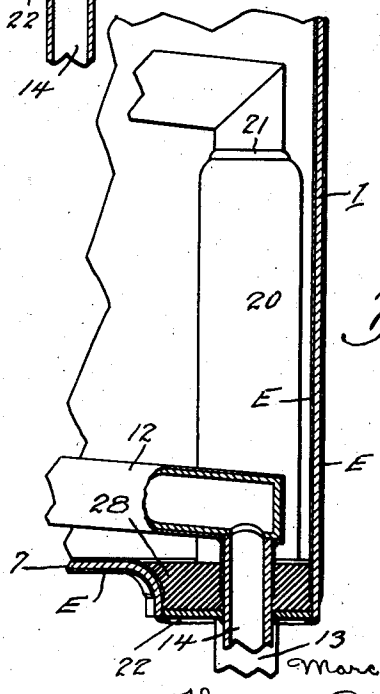


Fig. 5

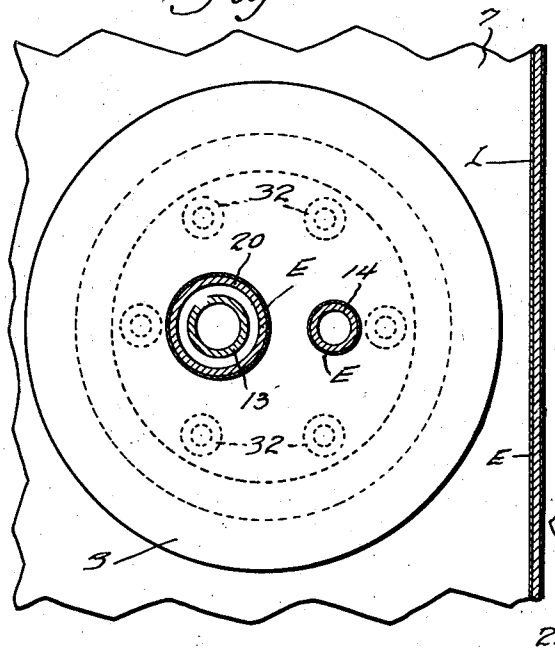
Inventors
Marc Resek
Theodore B. Focke
By Hull, Brock & West
Attorneys

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ENAMELED CONDENSER

Filed March 7, 1932 4 Sheets-Sheet 4

Fig. 8



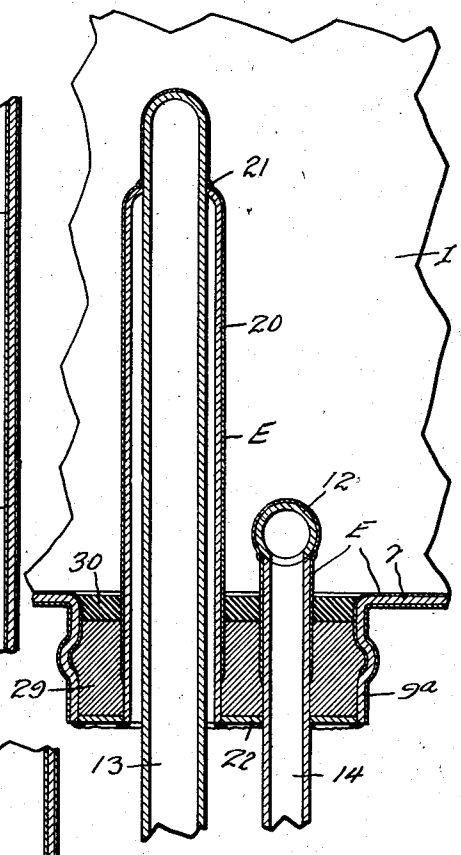


Fig. 6

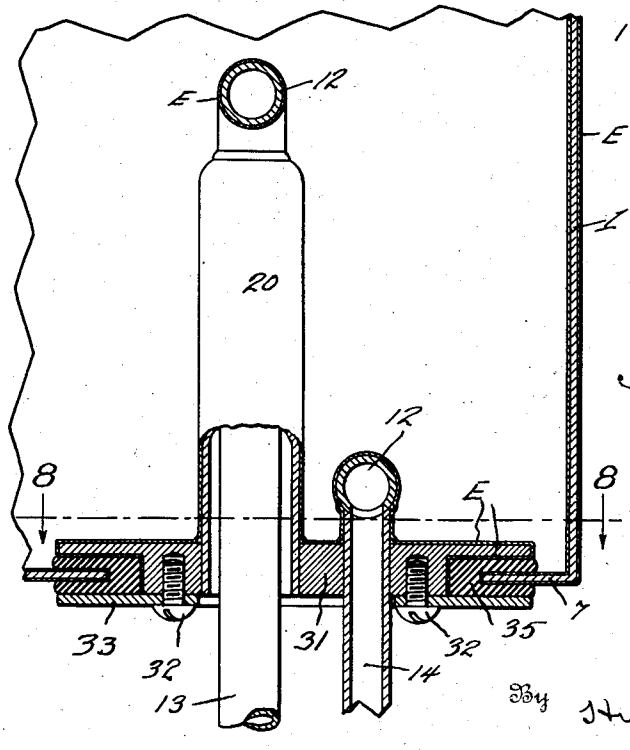


Fig. 7

Inventors

Marc Resek and

Theodore B. Focke

By Hull, Brock & West

Attorneys

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UNITED STATES PATENT OFFICE

1,985,950

ENAMELED CONDENSER

Marc Resek and Theodore B. Focke, Cleveland Heights, Ohio, assignors to Perfection Stove Company, Cleveland, Ohio, a corporation of Ohio

Application March 7, 1932, Serial No. 597,210

18 Claims. (Cl. 257—229)

In the construction of modern artificial refrigerators it is highly desirable to finish many of the parts in vitreous enamel, not alone for the sake of appearance and hygiene, but because of the protective virtue of this kind of surface coating. For example, the condenser tank, constructed of sheet iron or steel in the interest of economy, may be enameled inside as well as out for the purpose of fortifying the metal against the corrosive effects of the water or other cooling solution; and, for the same reason, the condenser coil or circulating unit—which is desirably made of steel because this metal is best suited to hold the commonly used refrigerant, ammonia—may be coated on its exterior with vitreous enamel.

In the final construction of the condenser, the coil or circulating unit is, of course, situated within the tank with its terminals extended through the wall thereof with a leakproof joint, such joint being preferably effected by welding as this makes a mechanically strong as well as a permanently fluid-tight connection. It is found to be neither practical nor expedient, however, to assemble the tank and circulating unit before enameling them because of the fact that it is practically impossible to properly inspect the work and make sure that every bit of the surface is covered. An exposure of the slightest area of metal would render the entire structure unfit for service.

It is the primary purpose of our invention to provide a construction, and a method of producing the same, which afford the advantages of allowing the tank and coil or circulating unit to be separately enameled and inspected and then assembled with each terminal of the coil or circulating unit extended through an opening in a wall of the tank and connected thereto with a mechanically strong and fluid-tight joint, preferably effected by welding.

To facilitate the assembling of the parts and to promote good appearance of the finished product the invention advocates extending the terminals of the coil or circulating unit through the bottom of the tank. To avoid, when the outfit is in use, unduly heating the water or other cooling solution in the condenser tank by the high temperature of the vapors delivered from the generator to the condenser, our invention has, as a further object, the provision of means for insulating that portion of the vapor conduit extending from the point at which it enters the tank to where it is desired that its contents be subjected to the influence of the cooling agent.

Other and more general objects are to provide a relatively simple and inexpensive yet highly efficient method and construction through which the previously mentioned advantages are attained and which expedite and cheapen manufacture.

In the accompanying drawings, wherein like reference characters designate corresponding parts throughout the several views, Fig. 1 is a sectional front elevation of a condenser constructed in accordance with the invention; Fig. 2 is a plan view of the same; Figs. 3, 4 and 5 are sectional details, on a scale somewhat enlarged over that of the previous views, on the respective lines 3—3, 4—4 and 5—5 of Fig. 2; Figs. 6 and 7 are views, similar to Fig. 3, of modifications of the invention, and Fig. 8 is a section on the line 8—8 of Fig. 7.

The tank, which is designated generally by the reference numeral 1, is shown as rectangular in plane and as drawn from sheet metal with the upper edge of its peripheral wall curled inwardly and over, as shown at 2, so as to present a smooth upwardly facing curved rim. Extending diagonally across each corner of the tank adjacent its upper edge is a bracket 5 whose ends are turned upwardly and are welded at 6 to the inwardly curled edge of the peripheral wall. The bottom of the tank is designated 7 and adjacent one side is provided with an opening 8 (Fig. 2) that is surrounded by a depending flange 9. Legs 10 are welded or otherwise secured to the corners of the tank.

12 is the circulating unit or coil, and its inlet and outlet ends or terminals are designated 13 and 14, respectively. The unit or coil 12 is adapted to be supported in proper position within the tank, with its terminals 13 and 14 extending through the opening 8 in the bottom 7, by hangers 15 that are welded or otherwise secured to the upper portion of the unit 12 and extend upwardly and outwardly therefrom and have horizontal extremities that overlie the central portions of the brackets 5. Bolts 16 are extended upwardly through aligned holes in the brackets and hangers, and nuts 17 are applied thereto for drawing the parts toward each other, washers 18 of suitable material being interposed between the hangers and brackets.

A sleeve 20 surrounds and is spaced radially outwardly from the inlet end or terminal of the coil or circulating unit 12 and at its upper end is contracted to fit about the same. A liquid-tight joint is made at 21, as by welding, between the contracted end of the sleeve and the coil or unit.

A plate 22, that is designed to fit within the flanged opening 8 of the bottom 7, has an aperture through which the outlet terminal 14 extends, and a larger opening within which is engaged the lower end of the sleeve 20. The plate is secured to the sleeve and aforesaid terminal 14 by welding, and a similar connection is made between the periphery of the plate 22 and the edge of the flange 9.

A cover 25 is applied to the top of the tank and its edge is formed to provide a downwardly facing channel that is occupied by a gasket 26 of suitable material, such as relatively soft rubber, that bears upon the rim of the tank. The cover is provided with apertures through which the bolts 16 extend, and nuts 27 are applied to the bolts for drawing the cover down firmly upon the tank.

The tank 1 is coated inside and out with vitreous enamel, and the circulating unit or coil 12 is similarly coated on its exterior, the coating extending over the outer side of the sleeve 20. In the larger detail views (Figs. 3 to 8) the enamel coatings are designated E. As will be noted by reference to Figs. 3, 4 and 5, the enamel coating stops short of the lower edge of the flange 9 and of the corresponding edge of the sleeve 20 and terminates above the plane of said plate on the outlet end or terminal 14 of the coil or circulating unit. This is to permit the welding of the plate 22 to said parts, as above described. To protect the exposed metal of the flange 9, sleeve 20 and unit 12, as well as the inside surface of the plate 22, from the contents of the tank, a deposit 28 of a suitable substance, such as an asphaltum compound known as "Hydrolene", is placed within the basin effected by the flange 9 and plate 22.

According to the present preferred procedure under our improved method of producing the above described condenser, the unit constituting the tank, and the coil or circulating unit, are separately coated with vitreous enamel and the enamel is wiped off of the lower edge of the flange 9 and the corresponding end of the sleeve 20 and is similarly removed from the end or terminal 14 of the unit 12 to about the plane of the wiped portion of the sleeve. The enamel coating on both units is then baked in the usual way and thereafter the plate 22 is welded to the lower end of the sleeve 20 and to the terminal 14. Next, the coil or circulating unit 12 is placed within the tank and the terminals 13 and 14 are projected through the opening 8 in the bottom 7 so that the plate 22 is disposed across said opening. The parts are then adjusted until the underneath surface of the plate 22 is substantially flush with the edge of the flange 9, when said plate and flange are connected together by welding.

In the modification of the invention illustrated in Fig. 6, the flange 9^a of the bottom 7 is made deeper than the corresponding flange of the previously described form and intermediate its upper and lower edges is provided with an inwardly facing groove. The plate 22 is connected to the terminal 14 of the unit 12 and to the lower end of the sleeve 20, as in the previous case, and its peripheral portion is welded to the lower edge of the flange 9^a. To protect the exposed metal of the parts within the bottom of the basin formed by the plate 22 and the flange 9^a, said basin is filled to above the plane of the groove of the flange 9^a with a body 29 of type metal or the like, such material being selected and poured when hot for the reason that it expands when cooled thereby to tighten itself within the embrace of the flange. On top of the body 29 of metal may be placed a deposit 30 of suitable sealing material, such as that used in the previously described embodiment.

In the form of the invention illustrated in Figs. 7 and 8, a relatively heavy plate 31, having openings for the reception of the end of the sleeve 20 and the outlet terminal portion of the unit 12, is welded to said parts. The plate is rabbeted about its edge, and to its under side is secured, as by screws 32, an annulus 33. The portion of the plate 31 of reduced diameter is adapted to be extended through an opening in the bottom 7 of the tank 1 and the same is considerably less in diameter than said opening. A channel-shaped gasket 35, of suitable packing material, embraces the portion of said bottom 7 about the aforesaid opening and occupies the rabbet of the plate 31 within which it is compressed by the annulus 33 thereby to effect a fluid-tight joint between the wall of the tank and the plate 31. Enamel coatings are shown, on the one hand, as encasing the portions of the unit 12 and plate 31 that are within the tank and as extending entirely about the portions of the bottom 7 surrounding the opening therein.

As may be supposed from what has previously been said, the purpose of the insulating sleeve 20 is to protect the contents of the tank 1 from the high temperature of the vapors as they are delivered to the condenser from the generator. It is, of course, essential that an intimate heat exchanging relation exist between said vapors and the cooling agent in the tank from a certain point onward, so as to first dehydrate and then condense the refrigerant vapors; but it would reduce the efficiency of the condenser quite materially if the cooling agent were subjected to the heating influence of the vapors from the point at which the vapor delivery conduit enters the tank.

This will be better understood when it is explained that the upper portion of the circulating unit or coil serves as a dehydrator and pre-cooler, and that the lower portion acts as the condenser. For greater efficiency, a stratification of the body of cooling liquid or water is essential, the cooler portion being at the bottom of the tank and the warmer at the top. This causes the refrigerant vapors as they pass through the circulating unit to be dehydrated and pre-cooled and then condensed, the latter being performed at a lower temperature and consequently a lower pressure than would be the case if the temperature throughout the tank were the same. An advantage of condensing at a lower pressure is that less time is required to start the subsequent refrigeration period as the pressure differential between the condensing and evaporating phases is then less to overcome.

By insulating the inlet end of the circulating unit or coil for some distance above the bottom wall of the tank in the manner already described, it is evident that the desired stratification of the body of cooling liquid or water is effected. The heat of the incoming vapors cannot be imparted to the lower portion of the body of liquid, and before the vapors reach the condensing portion of the circulating unit or coil they will have given up much of their heat so as not to materially affect the temperature of the cooler portion of the body of liquid.

While the terms "enamel" and "vitreous enamel" are used throughout the description and the claims to describe the surface coating on the tank and on the circulating unit or coil, it is to be understood that any equivalent material—that is,

any material of the character making it advantageous to coat the parts before assembling them—is intended to be embraced by the aforesaid terms.

Having thus described our invention, what we claim is:—

1. A condenser of the character described comprising an enamel coated tank having an opening in one of its walls, the portion of the wall about said opening being devoid of enamel, an enamel coated circulating unit within the tank having a portion extending through said opening, said portion being devoid of enamel, a fused fluid-tight joint between said portion of the circulating unit and the portion of the tank surrounding said opening, and material covering said joint that is impervious to the cooling liquid intended to be placed within the tank.

2. A condenser of the character described comprising a tank having an opening in one of its walls, the tank being enamel coated excepting about the edge of said opening, a circulating unit within the tank having a portion extending through the aforesaid opening, said unit being enamel coated excepting the portion in opposed relation to the edge of the aforesaid opening, a member welded to the aforesaid portion of the unit and having its peripheral portion similarly joined to the wall of the tank surrounding the opening therein, and a deposit of material arranged to shield said member, in the zone of its connections with the tank and unit, from the contents of the tank.

3. A condenser of the character described comprising a tank having an opening in one of its walls surrounded by a flange, the tank being coated with enamel excepting adjacent the edge of said flange, a circulating unit within the tank having a portion extending through said opening, the unit being coated with enamel excepting the portion that is opposed to the edge of said flange, a plate welded to said portion of the circulating unit and having its periphery similarly joined to the edge of the flange so as to effect a fluid-tight connection with both the tank and circulating unit, and a body of material enclosed by said flange for protecting the plate, in the zone of its connections with the tank and unit, from the contents of the tank.

4. A condenser of the character described comprising a tank having an opening in its bottom wall surrounded by a depending flange, the tank being enamel coated excepting adjacent the edge of said flange, a circulating unit situated within the tank with its inlet and outlet terminals extending through said opening, a member closing said opening and surrounding and welded to the terminals of the circulating unit, the edge portion of said member being welded to the edge of the aforesaid flange, and a deposit of protective material within the enclosure of the aforesaid flange, the portion of the circulating unit that is exposed to the contents of the tank being coated with enamel.

5. A condenser of the character described comprising a tank having an opening in its bottom wall that is surrounded by a depending flange, the tank being coated with enamel excepting adjacent the edge of said flange, a circulating unit situated within the tank and having its inlet and outlet terminals extending through said opening, a sleeve surrounding and spaced radially outwardly from the inlet terminal of said unit and extending from the region of said flange into the tank to a point remote therefrom, a plate having openings through which the terminals of the circulating unit project, the plate being welded to the outlet terminal and to the sleeve surrounding the inlet terminal, the peripheral portion of the plate being similarly joined to the edge of the aforesaid flange, a deposit of protective material within the enclosure of the flange and overlying said plate, the portions of the circulating unit and the aforesaid sleeve that are exposed to the interior of the tank being coated with enamel.

6. A condenser of the character described comprising an enamel coated tank having an opening in one of its walls, an enamel coated circulating unit within the tank having a portion extending through said opening, the adjacent parts of the tank and unit in the region of said opening being devoid of enamel and welded together, and a material covering said parts that is impervious to the cooling liquid intended to be placed within the tank.

7. A condenser of the character described comprising an enamel coated tank having an apertured depression in one of its walls, and an enamel coated circulating unit within the tank having a portion projecting through the aperture of said depression, the parts of the tank and unit in the region of the aperture being devoid of enamel and welded together, and a material deposited within the depression for protecting said parts from the contents of the tank.

8. A condenser of the character described comprising a tank having a depression in its bottom wall that is provided with apertures, a circulating unit situated within the tank and having its inlet and outlet terminals extending through said apertures and welded to the tank in the region thereof, the tank and circulating unit being enamel coated excepting where welded together, and a deposit of protective material within the depression and covering the welded parts and the tank and circulating unit.

9. A condenser of the character described comprising a tank having an opening in its bottom wall and provided with brackets adjacent its top, a circulating unit situated within the tank and having a portion extending through the aforesaid opening, means for connecting said portion to the surrounding part of the bottom wall with a fluid-tight joint, the circulating unit being provided with hangers overlying said brackets, and means for connecting said hangers to the brackets.

10. A condenser of the character described comprising an open top tank having a hole in its bottom wall, brackets adjacent the open top of the tank, a circulating unit situated within the tank with its terminals extending through the hole in the bottom wall thereof, said unit being provided with hangers overlying the aforesaid brackets, means for securing the hangers to the brackets, and means effecting a fluid-tight joint between the terminals of the circulating unit and the portion of the bottom wall of the tank surrounding said hole.

11. A condenser of the character described comprising an open top tank having a hole in its bottom wall, brackets adjacent the top of the tank, a circulating unit situated within the tank with its terminals extending through the hole in the bottom wall thereof, means for effecting a fluid-tight joint between said terminals and the portion of the bottom wall surrounding said hole, the circulating unit having hangers overlying the aforesaid brackets, bolts extending upwardly

through the brackets and hangers for binding them together, a cover for the tank having apertures through which said bolts pass, and means for binding the cover to the tank through the medium of said bolts.

12. A condenser for artificial refrigerators comprising a tank, a circulating unit within the tank whose inlet terminal extends through the bottom wall thereof, and means for insulating the inlet end portion of the circulating unit from the contents of the tank.

13. A condenser for artificial refrigerators comprising a tank, a circulating unit within the tank having its inlet terminal extending through the bottom portion of the tank, and an insulating sleeve surrounding the inlet end portion of said unit within the tank.

14. A condenser for artificial refrigerators comprising a tank and a circulating unit within the tank having its inlet end extending through the bottom wall of the tank, and an insulating sleeve surrounding and spaced from the inlet end portion of the circulating unit and extending from the bottom wall of the tank along said unit to a point remote from said wall.

15. A condenser for artificial refrigerators comprising a tank, a circulating unit within the tank whose inlet terminal extends through a wall thereof, and means for insulating the inlet end portion of the circulating unit from the contents of the tank for a distance inwardly of said wall.

16. A condenser for artificial refrigerators comprising a tank, a circulating unit consisting of an upper dehydrating and precooling portion and a lower condensing portion situated within the tank and having its inlet terminal extending through the bottom of the tank, and insulating means surrounding the inlet terminal of said unit within the tank substantially throughout the height of the condensing portion of the circulating unit.

17. A condenser for artificial refrigerators comprising a tank and a circulating unit consisting of an upper dehydrating portion and a lower condensing portion situated within the tank and having its inlet end extending through the bottom wall of the tank, and an insulating sleeve surrounding and spaced from the inlet end portion of the circulating unit and extending from the bottom wall of the tank along said unit throughout the height of the condensing portion thereof.

18. A condenser of the character described comprising an enamel coated tank having an opening in one of its walls, an enamel coated circulating unit within the tank having a portion extending through said opening, said portion of the unit and the portion of the tank surrounding the aforesaid opening being devoid of enamel for joining purposes, a fused fluid-tight joint between said portion, and material covering said joint that is impervious to the cooling liquid intended to be placed within the tank.

MARC RESEK.
THEODORE B. FOCKE.