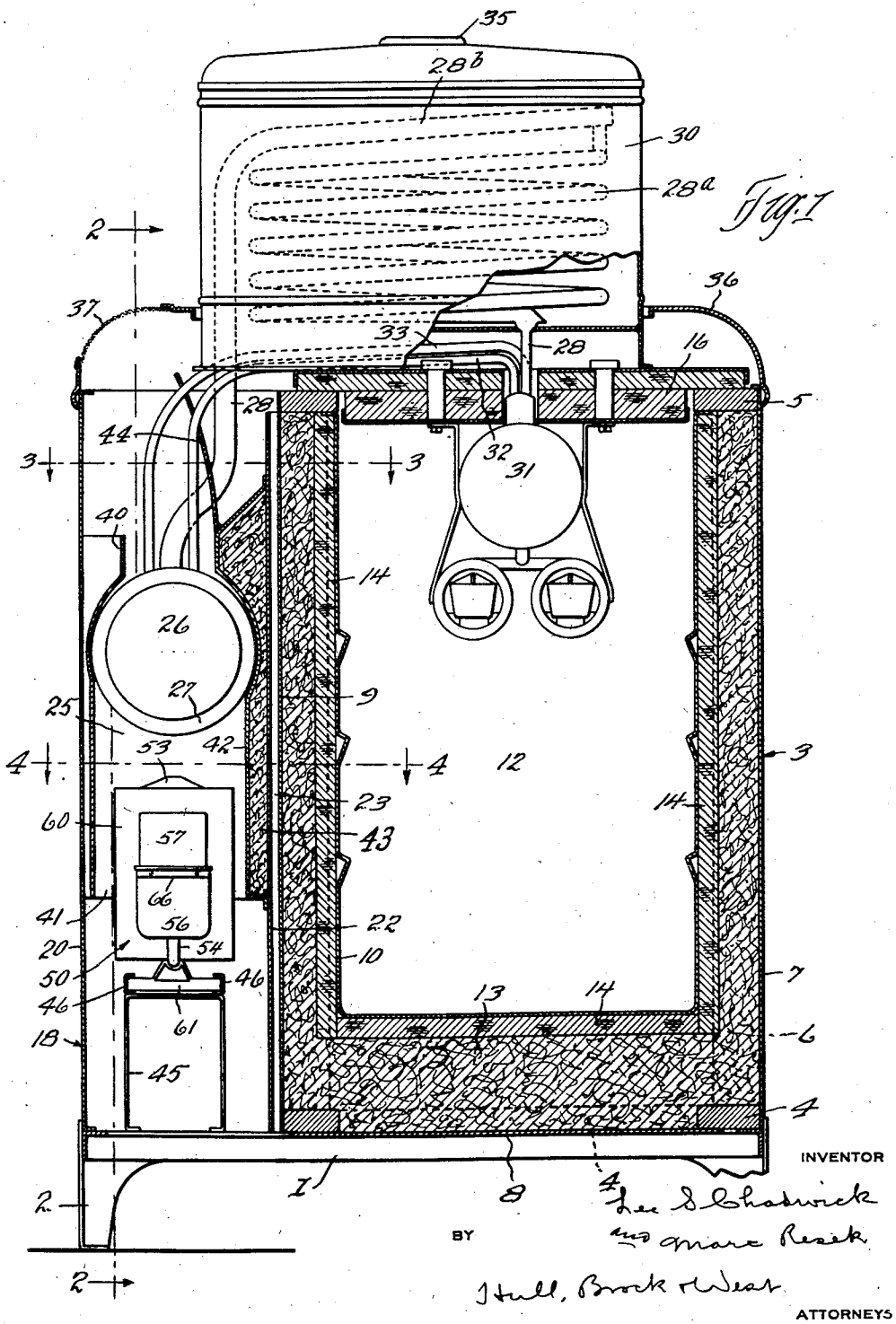
Feb. 16, 1932. L. S. CHADWICK ET AL 1,844,932

COMBUSTION REFRIGERATION APPARATUS

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COMBUSTION REFRIGERATION APPARATUS

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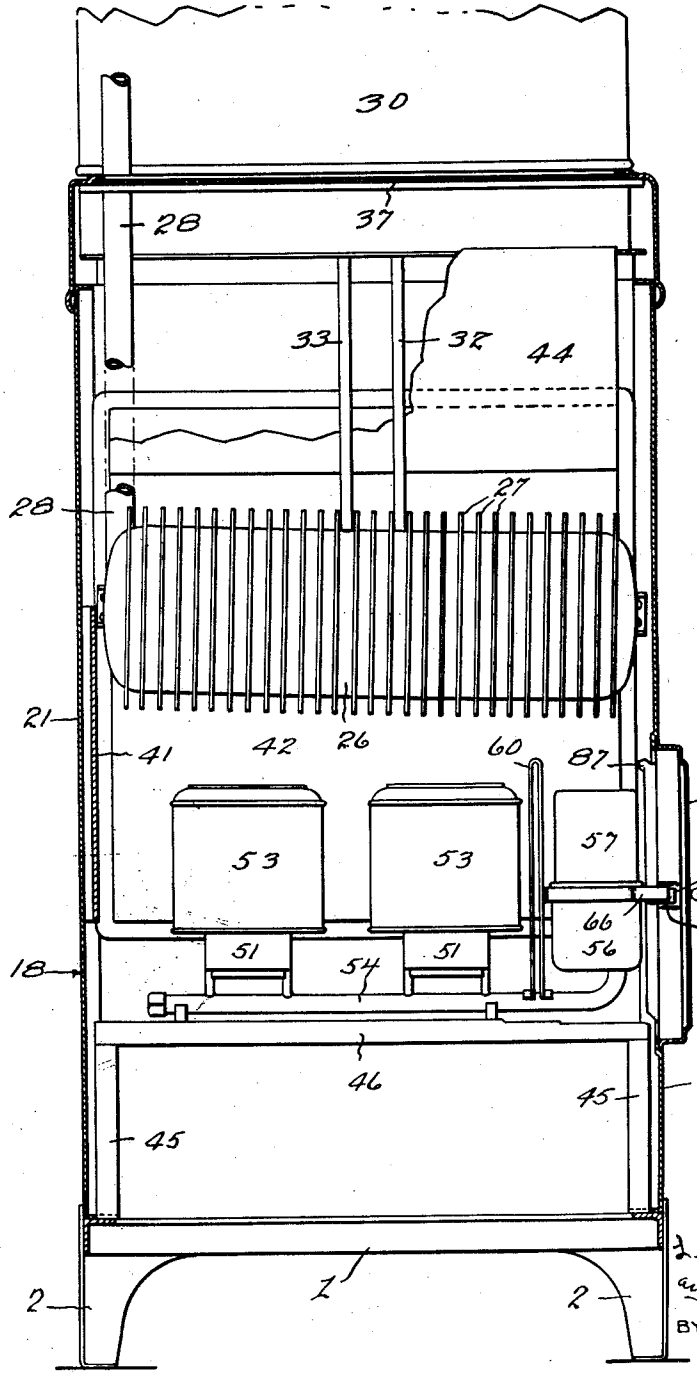


Fig. 2

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COMBUSTION REFRIGERATION APPARATUS

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Fig. 3

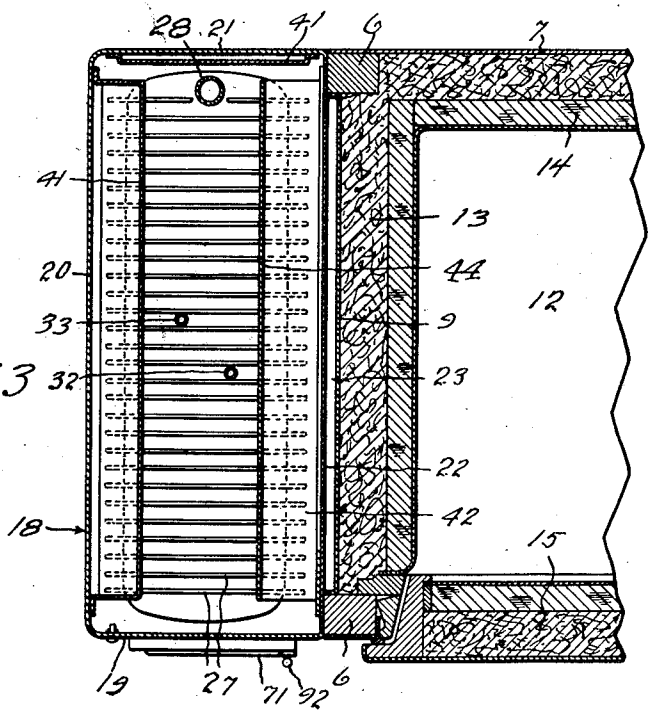
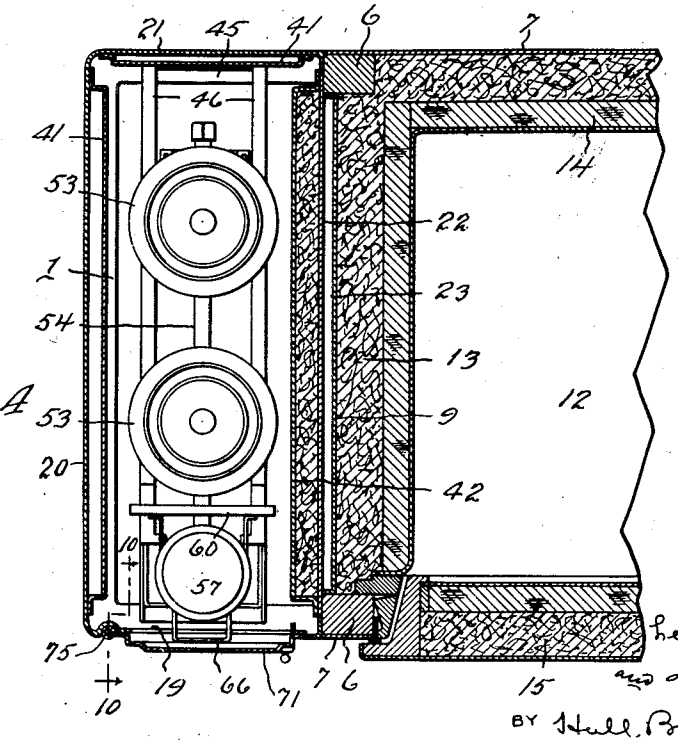


Fig. 4



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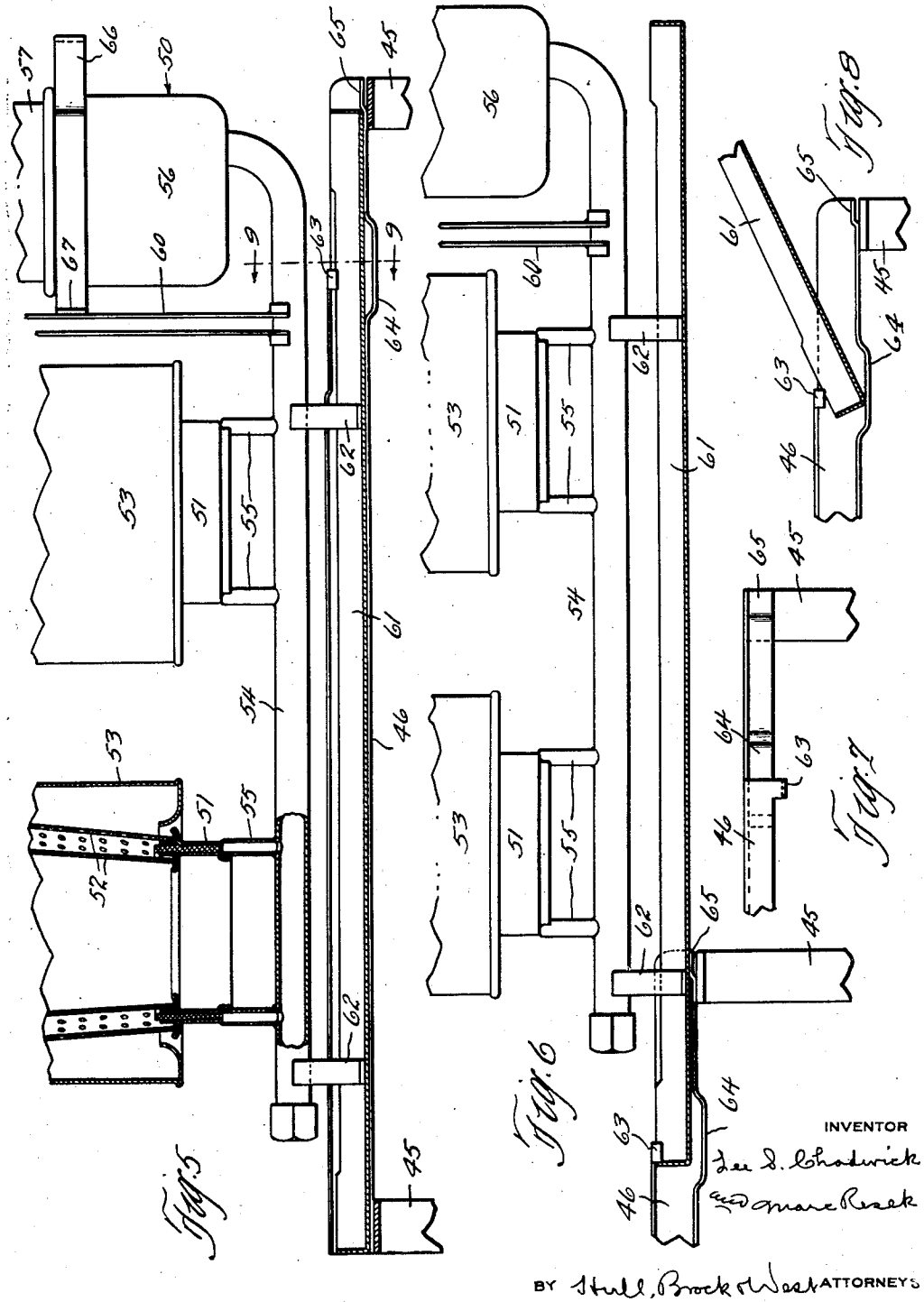
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Fig. 11

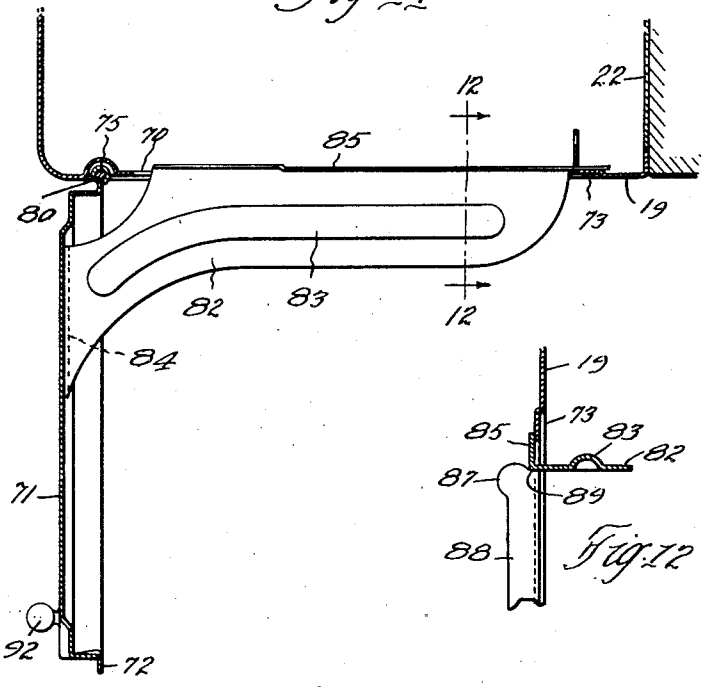


Fig. 12

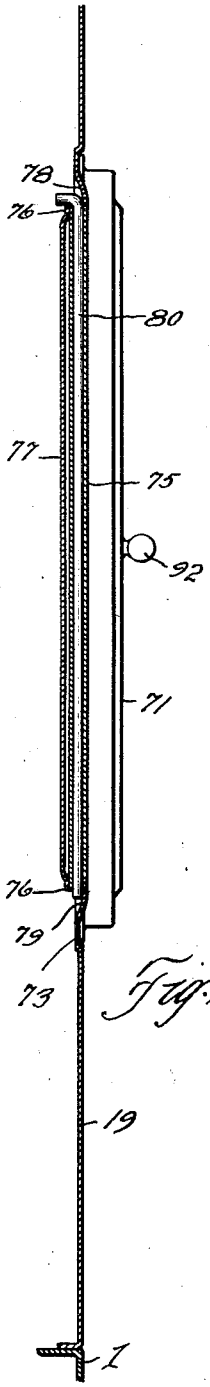


Fig. 10

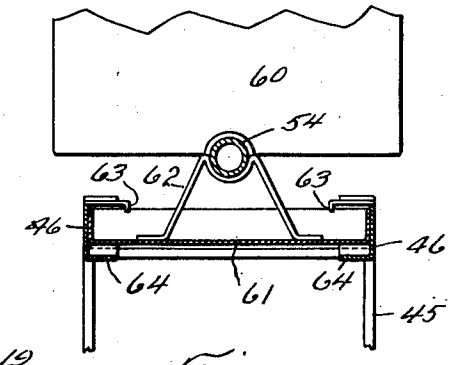


Fig. 9

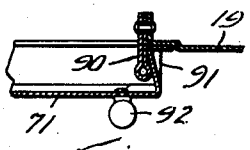


Fig. 13

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COMBUSTION REFRIGERATION APPARATUS

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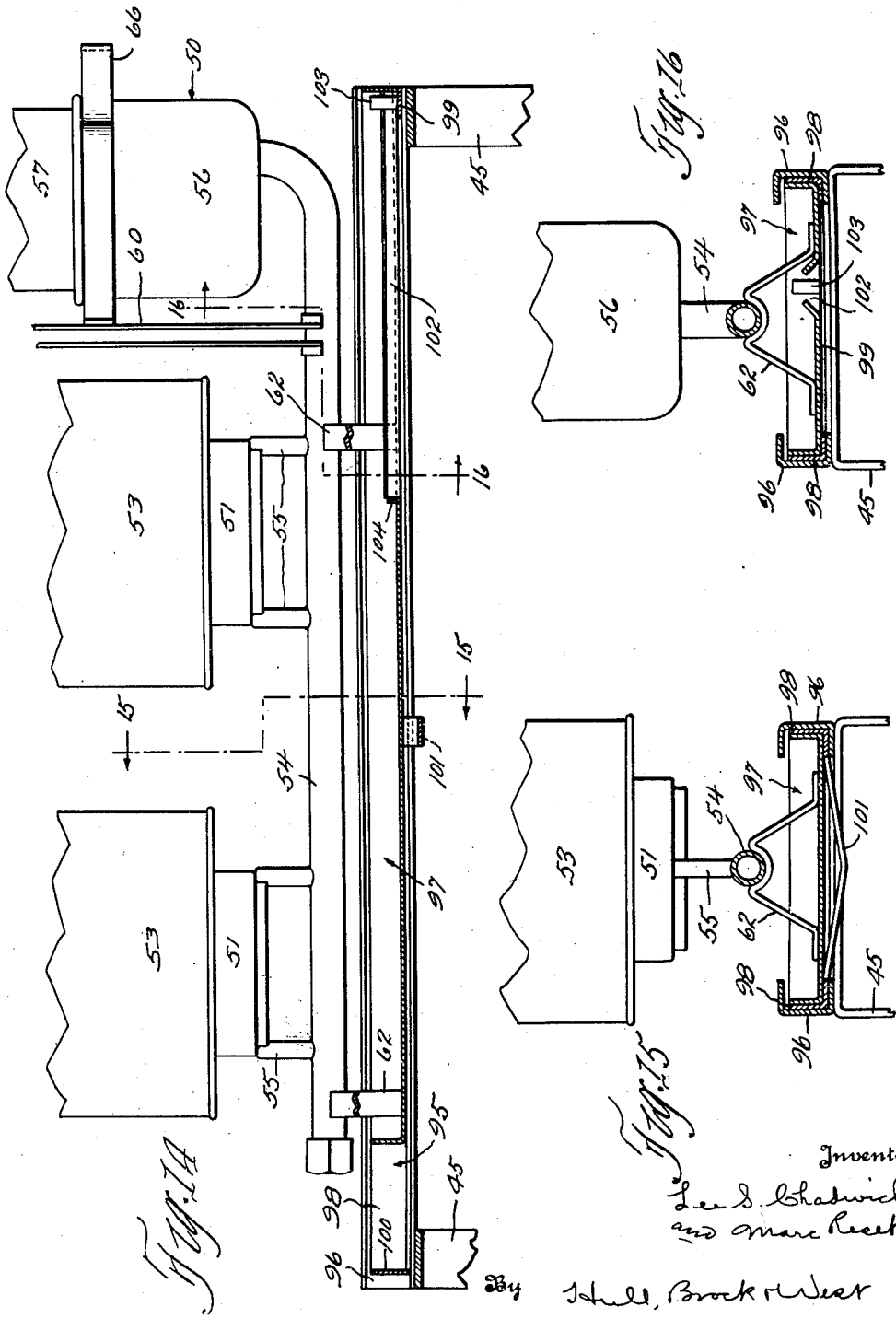


Fig. 14

Fig. 16

Fig. 15

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Patented Feb. 16, 1932 1,844,932

UNITED STATES PATENT OFFICE

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COMBUSTION REFRIGERATION APPARATUS

Application filed June 26, 1929. Serial No. 373,740.

This invention relates to improvements in intermittent absorption refrigerators of the type wherein a combustion device, particularly of the oil burning variety, is used for supplying heat to the generator.

Among the several objects of the invention are to provide refrigeration apparatus of the above mentioned character that is so constructed as to expedite heating and/or cooling of the generator-absorber; to provide apparatus of the aforesaid nature that is so constructed that the maximum efficiency is realized from the heating medium; to provide in apparatus of the class aforesaid means for more effectually insulating the refrigeration compartment from the heat of the combustion device; to provide in an apparatus of the class aforesaid means, preferably ventilated, to protect the walls of the cabinet from the intense heat of the combustion device so as to prevent discoloration of or injury to said walls; to provide a substantial and compact oil burning unit for apparatus of the class referred to; to so mount the unit that it is especially convenient of lighting, filling, removal and insertion; and to so construct the apparatus that the oil burning unit is readily accessible.

The above objects, with others hereinafter appearing, are attained in the embodiment of the invention illustrated in the accompanying drawings wherein Fig. 1 is a sectional front elevation of refrigeration apparatus incorporating our improvements; Fig. 2 is a left hand sectional side elevation of the apparatus on a somewhat enlarged scale over that of Fig. 1, the plane of section being indicated by the line 2—2 of the former view; Figs. 3 and 4 are fragmentary sections through the apparatus on the respective lines 3—3 and 4—4 of Fig. 1, and on the same scale as Fig. 2; Fig. 5 is a fragmentary sectional side elevation of the oil burning unit, the same being shown in normal position with respect to its support; Fig. 6 is a similar view of said unit showing it in the position that it occupies with respect to its support when withdrawn from the cabinet for lighting and filling purposes; Fig. 7 is a fragmentary plan of the support for the oil burning unit; Fig. 8 is a detail in sectional side elevation of the forward end of the support with the tray that constitutes a part of the oil burning unit in the act of being removed therefrom; Fig. 9 is a sectional detail on the line 9—9 of Fig. 5; Fig. 10 is a sectional detail on the line 10—10 of Fig. 4, showing the construction of the hinge by which the door is connected to the casing of the apparatus through which door access is had to the oil burning unit; Fig. 11 is a horizontal sectional detail through the door and adjacent portion of the casing in the region of the top of the door, the door being shown in open position; Fig. 12 is a sectional detail on the line 12—12 of Fig. 11; Fig. 13 is a detail of the door latch; Fig. 14 is a view similar to Fig. 5, showing a modification of the oil burning unit, and Figs. 15 and 16 are sections on the lines 15—15 and 16—16, respectively, of Fig. 14, the views being taken as though looking in the direction of the arrows associated with the respective lines.

Taking up a detailed description of the invention by the use of reference characters, 1 designates a base that is shown as constructed of angle iron and as supported a suitable distance above the floor by legs 2 that are applied to the corners of the base. Occupying the greater portion of the area of the base is a cabinet that is designated generally by the reference numeral 3. This cabinet extends from the front to the rear of the base and from the left hand side (as viewed from the front) to a point considerably beyond the transverse center thereof, and it is made up of a rectangular bottom frame 4, and a similar top frame 5, whose corners are connected by posts 6. Panels 7 of sheet metal or the like are applied to the front, rear and right hand sides of the structure formed of the rectangular frames 4 and 5 and the corner posts 6, and plate 8 closes the opening of the bottom frame 4. A side panel 9 is supported by and between the front and rear corner posts 6 that are on the left hand side of the cabinet and, as best shown in Figs. 3 and 4, the panel 9 is flanged at its front and rear edges and inset from the outer surfaces of said corner posts

6 for a purpose that will presently appear.

Occupying the enclosure formed by the panels 7, 8 and 9, and spaced a suitable distance from said panels, is a shell or liner 10, preferably of sheet metal, that encloses the refrigeration compartment 12. Suitable insulating material, designated 13, is packed within the space between the shell or liner 10 and the panels 7, 8 and 9, the shell or liner, in the present instance, being shown as having applied to its outer sides slabs or layers 14 of insulating material, such as compressed ground cork. The front of the shell or liner 10 is open and registers with a door opening in the front wall that is adapted to be closed by a door 15 that is suitably insulated. An insulated top wall 16 is applied to the top of the cabinet, its marginal portion resting directly upon the top frame 5.

The portion of the base 1 that is unoccupied by the cabinet 3 is surmounted by a casing designated generally by the reference numeral 18 and consisting of front, side and rear walls 19, 20 and 21, respectively, the right hand edges of the front and rear walls being flanged inwardly and connected to the adjacent corner posts 6 of the cabinet. The right hand side wall 22 of the casing 18 is formed by a metal plate whose vertical edges are secured to the adjacent posts 6, and by reason of the fact that the left hand panel 9 of the cabinet is inset from the plane of the surfaces of the posts 6 to which the wall 22 is secured, an air space 23 is provided between said wall and panel that is open at top and bottom, as clearly shown in Fig. 1. The space enclosed by the casing 18 will be referred to as a flue or combustion chamber, the same being designated 25.

Occupying the flue or combustion chamber 25 is a generator-absorber 26 that consists of a cylindrical vessel that is surrounded from end to end by spaced apart heat abstracting fins 27. The generator-absorber is inclined slightly upwardly from front to rear, and from its high point rises a delivery conduit 28 that enters a tank 30 which surmounts the cabinet 3 and overhangs the same slightly to the left so as to be central of the structure comprising said cabinet 3 and the casing 18. The delivery conduit 28 continues downwardly in the form of a coil, designated 28^a, and descends through the bottom wall of the tank and through an opening in the top wall 16 of the cabinet into an evaporator 31 that is suitably suspended from said top wall within the upper portion of the refrigeration compartment 12. It will be noted that the bottom wall of the tank 30 is spaced a material distance above the top wall 16, and extending from the evaporator 31 through the space between said walls and thence downwardly within the flue 25 to where they enter the generator-absorber 26 are a gas return conduit 32 and a siphon tube 33, the latter serving to return, at the beginning of each heating-condensing period, liquid left in the evaporator at the conclusion of the preceding cooling-evaporating period. The upwardly inclined part of the delivery conduit 28 that occupies the top portion of the tank 30, and is designated 28^b, constitutes a dehydrator for returning to the generator-absorber any absorbent fluid that is condensed therein during the heating-condensing period. The tank 30 is adapted to be filled with water or other cooling liquid through an opening in the top wall of the tank that is normally closed by a cap 35.

A shell 36 extends over the top of the cabinet 3 and casing 18 about the tank 30, and has an opening above the flue 25 that is covered by a screen or grid 37.

Shields 40, 41 and 42 are applied to the inner sides of the respective walls 20, 21 and 22 of the casing 18, and the space between the shield 42 and the wall 22 is filled with suitable insulating material designated 43. It will be noted that parts of the shields 40 and 42 conform somewhat to the contour of the generator-absorber and are in close proximity to the heat-abstracting fins 27 thereof, and that they converge as they rise about the vessel. A deflector 44 extends upwardly from the upper inner portion of the shield 42 and leans over toward the aforesaid opening of the shell 36 that is covered by the screen or grid 37.

Brackets 45 rises from the front and rear sides of the base 1 within the flue 25 and support inwardly facing channel bars 46 which, with said brackets, constitute a support for the oil burning unit designated generally by the reference numeral 50. This unit includes oil burners 51, equipped with commingling tubes 52 and drums or chimneys 53, and said burners are rigidly connected to an oil supply pipe 54 by means of tubular risers 55 through which the wick space of the burners communicates with the pipe 54. The forward end of the pipe 54 is connected to a distributing cup 56 into which a bottle-like reservoir 57 is adapted to be inserted. In accordance with common practice, the reservoir may be equipped with a valve that is opened when the reservoir is inserted into the cup and an accumulation of liquid within the burners and the distributing cup to the approximate level of the mouth of the reservoir causes the latter to be liquid sealed thereby to prevent further flow from the reservoir excepting as the supply within the system is depleted. A shield 60 is shown as supported by the pipe 54 between the distributing cup and the adjacent burner to protect the contents of the cup and reservoir from the more intense heat of the burner. The pipe 54 is rigidly secured to a shallow tray 61 through brackets 62.

The upper flanges of the channel bars 46 are cut away for a suitable distance back from the forward ends of said bars and are formed at their front ends to provide depending stops 63. Below said stops, the bottom flanges of the channel bars are depressed, as shown at 64, and the forward extremities of said flanges are elevated slightly, as indicated at 64. The oil burning unit 50 is equipped with a handle 66 formed by the central portion of a substantially U-shaped member that is engaged about and secured to the upper end of the distributing cup 56 and has its rear ends turned outwardly and fastened at 67 to the shield 60.

Fig. 5 shows the oil burning unit 50 in normal position with respect to its support, and by grasping the handle 66 the unit may be slid forwardly to the position illustrated in Fig. 6 when the rear wall of the tray 61 engages the stops 63. At this time, the tray bears upon the elevated forward extremities 65 of the bottom flanges of the channel bars 46, and the tray, with the parts surmounting it, is held in substantially horizontal position. The oil burning unit is withdrawn to the position shown in Fig. 6 for lighting purposes, and for replenishing the supply of oil by the refilling of the reservoir 57 or the substitution of a filled reservoir for an empty one, although for this purpose, it is of course not necessary to withdraw the unit as far as shown in Fig. 6. When it is desired to remove the unit entirely from the apparatus, it may be tilted upwardly at the front end so as to permit the rear end of the tray 61 to drop within the depression 64 of the channel members 46 thereby to allow the rear wall of the tray to escape the stops 63. Such a position of the tray with respect to said stops is illustrated in Fig. 8, and obviously with the parts in this position the unit may be drawn forwardly and lifted clear of the supporting structure.

Access to the oil burning unit is had through an opening 70 in the front wall 19 of the casing 18, said opening being adapted to be closed by a door 71 whose marginal flange 72 is arranged to seat against a depressed portion 73 of said wall 19 about the opening 70. The door is hingedly connected to the casing in the following manner: One of the vertical edges of the door is formed to provide a sleeve 75 whose end portions are seated within semi-cylindrical bearings 76 that occur at the extreme upper and lower ends of a depression 77. Said depression accommodates the major portion of the sleeve 75 and is deep enough to avoid friction between the parts. The wall 19 is slit horizontally at points spaced apart the length of the sleeve 75, and the portions immediately above the upper slit and below the lower slit are projected outwardly or in a direction opposite to that of the aforesaid depressions 77 to form pintle seats 78 and 79. With the ends of the sleeve 75 engaged with the bearings 76, a pintle 80 is inserted downwardly through the sleeve until its lower end is in contact with the pintle seat 79, and its upper end is in engagement with the seat designated 78, the latter end of the pintle being turned over to form a head.

A member 82 (see Figs. 10, 11 and 12), formed of sheet metal and ribbed at 83 to give it stiffness, has one of its ends provided with a downwardly turned flange 84 that is secured to the inner side of the door adjacent the top thereof, and an edge at right angles thereto flanged upwardly as shown at 85 for engagement, when the door is open, with the inner surface of the wall 19 above the door opening 70. The end of the flange 85 remote from the door is extended beyond the body portion of the member and, as the door approaches full position, rides over an enlargement 87 of a flange 88 that is turned inwardly from the adjacent vertical edge of the door opening and drops into a notch 89 beyond said enlargement so as to hold the door open. When the door is urged toward closed position, the member 82 yields and the extension of its flange 85 overrides the enlargement 87 to release the door and allow it to swing freely to closed position in which position it is held by a spring latch 90 that engages a depressed portion 91 formed in the flange of the free edge of the door.

The door 71 is equipped with a handle 92 by means of which the door may be opened when it is desired to gain access to the oil burning unit for the purposes of lighting, filling or cleaning the same, it being necessary of course to use enough force to overcome the yielding resistance of the spring latch 90. With the door open, the handle 66 may be grasped and the oil burning unit withdrawn from the casing partially or wholly, as hereinbefore explained, depending upon whether the fuel supply is to be replenished, the burners lighted, or the parts cleaned. For lighting purposes the unit may be withdrawn to the position shown in Fig. 6 while for cleaning, it is preferably disengaged from the support, in the manner shown in Fig. 8, and taken away for the purpose.

When the burners are lighted, the unit is slid back to normal position and the door closed when the heat from the burners will rise directly in contact with the generator-absorber 26 and pass upwardly about the same, the products escaping through the opening in the shell 36 that is covered by the screen or grid 37. The shields 40 and 41 protect the casing walls to which they are applied from the intense heat of the burner, thus preventing discoloration of any finishing coat applied to the walls, and at the same time conserve much heat that would

otherwise be wasted by radiation. The spaces between the shields 40 and 41 and the respective walls to which they are applied are open at the top and bottom and air circulation is permitted therethrough. The space between the shield 42 and the wall 22 is preferably packed with insulating material so as to retard as much as possible the passage of heat from the flue or combustion chamber 25 through the wall 22. Transfer of heat from the latter wall to the panel 9 of the cabinet 3 is practically entirely obviated by the air circulating space between said wall and panel.

By forming the shields 40 and 42 in the manner shown, so that they will follow, to a certain extent, the contour of the generator-absorber, the heat from the burners is caused to wipe up about the sides of said vessel and between the fins 27 thereof throughout practically the whole circumference of the vessel and from end to end thereof. The lighting of the burners initiates what is known as the heating-condensing period of the cycle of operation of the apparatus and such period continues until the fuel supply afforded by the capacity of the reservoir is exhausted and the burners go out. The cooling-absorption period then begins, the same being promoted with considerable rapidity by the fresh air rising through the flue 25 about and in close proximity to the generator-absorber, the heat being carried away through the opening in the top of the flue.

If it should be found desirable to have the oil burning unit capable of being withdrawn from the casing 18 further than is permitted by the construction already described and illustrated in detail in Figs. 5 to 9, the modification shown in Figs. 14 to 16 may be employed. Here an intermediate slide 95 is interposed between the inwardly facing channel bars 96 (shown as supported by the previously mentioned brackets 45) and the burner base or tray 97. The slide 95 comprises L-shaped side members 98 that are connected together at their forward ends by a horizontally disposed cross piece 99 and at their rear ends by a vertically disposed cross piece 100. Intermediate their ends the base flanges of the side members 98 are connected together by a transverse bar 101 which is depressed, after the slide has been inserted into the channel bars, so as to constitute a stop that is arranged to engage the top cross member of the front bracket 45 to limit the outward movement of the slide.

The burner tray or base 97 is slidably supported upon the base flanges of the side members 98 and, when the parts are in normal position, is held against upward displacement by the top flanges of the channel bars 96. The bottom wall of the base or tray 97 has a longitudinal slot 102 for the reception of a pin 103 that rises from the cross member 99 of the slide 95. The material of the base or tray 97 on the opposite sides of the slot 102 is flanged upwardly, as best shown in Fig. 16, and the opening between said upwardly flanged portions at the rear end of the slot is closed by a wall 104. The front wall of the tray closes the space between said upwardly turned portions at the forward end of the slot. Thus the slot is surrounded by a wall that will prevent leakage through said slot of any oil that drips from the parts of the oil burning unit above; and it is to be noted from Fig. 16 that the slot is offset to one side of the medial line of the base or pan 97 so that any oil dripping from the fuel supply pipe 54 will fall into the tray and not through the slot.

When it is desired to withdraw the oil burning unit from the casing, the handle 66 is grasped and the unit pulled forwardly, the burner base or tray 97 moving in the slide 95 until the rear wall 104 of the slot 102 engages the pin 103, and the slide 95 moving forwardly until its transverse bar 101 engages the cross member of the forward bracket 45. When the parts are in this position very little of the burner base or tray extends into the channel bars 96 and on this account the oil burning unit may be readily lifted from the slide 95.

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

1. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing the refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber in the combustion chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and evaporator, a combustion device situated within the lower portion of said chamber in operative relation to the generator-absorber and a shield between the combustion space of said chamber and the adjacent wall of the cabinet and spaced from the latter to provide an air space between the shield and wall.

2. In refrigeration apparatus of the intermitent absorption type, the combination of a cabinet enclosing the refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber in the combustion chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and evaporator, and a combustion device situated within the lower portion of said chamber in operative relation to the generator-absorber, the wall for the combustion chamber adjacent the cabinet being spaced there-

from to provide an air space between the wall and cabinet, said space being open at top and bottom.

3. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing the refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber within said chamber, an evaporator within the refrigeration compartment, communicative connections between the generator-absorber and evaporator, a combustion device within the lower portion of the combustion chamber in operative relation to the generator-absorber, air directing members spaced inwardly from the side walls of the combustion chamber and rising on opposite sides of the combustion device and generator-absorber and following part way about the generator-absorber the contour of the latter whereby products of combustion and fresh air passing upwardly through the combustion chamber are caused to flow in close proximity to the generator-absorber.

4. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing a refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber in the nature of a relatively large flue that has its air receiving end opening through the bottom of the structure and its discharge end opening through the top of the structure, a generator-absorber in said chamber, an evaporator within the refrigeration compartment, a condenser surmounting the cabinet and extending into the top portion of the combustion chamber, communicative connections between the generator absorber, evaporator and condenser, a combustion device located within the lower portion of the combustion chamber in operative relation to the generator-absorber, and means for directing products of combustion and fresh air rising through the combustion chamber about and in close proximity to the generator-absorber and away from the condenser.

5. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing a refrigeration compartment, a casing alongside the cabinet enclosing a combustion chamber, a generator-absorber equipped with a plurality of spaced-apart laterally extending heat abstracting fins located in the combustion chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and the evaporator, a combustion device situated in the lower portion of the combustion chamber in operative relation to the generator-absorber, and members rising on opposite sides of the combustion device and extending about the opposite sides of the generator-absorber close to the heat abstracting fins thereof whereby the products of combustion and fresh air rising through the combustion chamber are entrained about the generator-absorber between the heat abstracting fins thereof.

6. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing a refrigeration compartment, a casing alongside the cabinet enclosing a combustion chamber, a generator-absorber in the nature of a cylindrical vessel surrounded by circumferentially extending heat abstracting fins and horizontally disposed within the combustion chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and the evaporator, a combustion device situated in the lower portion of the combustion chamber in operative relation to the generator-absorber, and members rising on opposite sides of the combustion device and having curved portions extending about the opposite sides of the generator-absorber close to the heat abstracting fins thereof whereby the products of combustion and fresh air rising through the combustion chamber are entrained about the generator-absorber between the heat abstracting fins thereof.

7. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet having insulated walls enclosing a refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber located within the combustion chamber, an evaporator in the refrigeration compartment, communicative means connecting the generator-absorber and the evaporator, a combustion device situated within the lower portion of the combustion chamber in operative relation to the generator-absorber, and an insulated shield between the combustion chamber and the adjacent cabinet wall.

8. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing a refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a wall separating said chamber from the adjacent wall of the cabinet, the former wall being spaced from the latter wall so as to provide an air space between the two walls, a generator-absorber located within the combustion chamber, an evaporator in the refrigeration compartment, communicative means connecting the generator-absorber and the evaporator, a combustion device situated within the lower portion of the combustion chamber in operative relation to the generator-absorber, and an insulated shield for pro-

tecting the wall of the combustion chamber that is adjacent the cabinet from the heat of the products of combustion.

9. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing a refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber within said chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and the evaporator, a combustion device situated in the lower portion of the combustion chamber in operative relation to the generator-absorber, and shields rising about the combustion device and the generator-absorber for protecting the walls of the casing from the heat of the products of combustion.

10. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet enclosing a refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber within said chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and the evaporator, a combustion device situated in the lower portion of the combustion chamber in operative relation to the generator-absorber, and shields rising about the combustion device and the generator-absorber for protecting the walls of the casing from the heat of the products of combustion and for entraining said products and fresh air rising through the combustion chamber about, and in close proximity to, the generator absorber.

11. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet having insulated walls enclosing the refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber in the combustion chamber, an evaporator in the refrigeration compartment, communicative connections between the generator-absorber and the evaporator, a combustion device within the lower portion of said chamber, and a shield between the combustion space of said chamber and the adjacent wall of the cabinet.

12. In refrigeration apparatus of the intermittent absorption type, the combination of a cabinet having insulated walls enclosing a refrigeration compartment, a casing joined to one side of the cabinet and constituting with the cabinet a unitary structure, said casing enclosing a combustion chamber, a generator-absorber within said chamber, an evaporator within the refrigeration compartment, communicative connections between the generator-absorber and the evaporator, a combustion device in the lower portion of the combustion chamber, and means adjacent said device for shielding the casing wall from the heat of the products of combustion.

In testimony whereof, we hereunto affix our signatures.

LEE S. CHADWICK.
MARC RESEK.