Sept. 15, 1942. G. A. BRACE 2,295,988

REFRIGERATION

Filed April 24, 1939 5 Sheets-Sheet 1

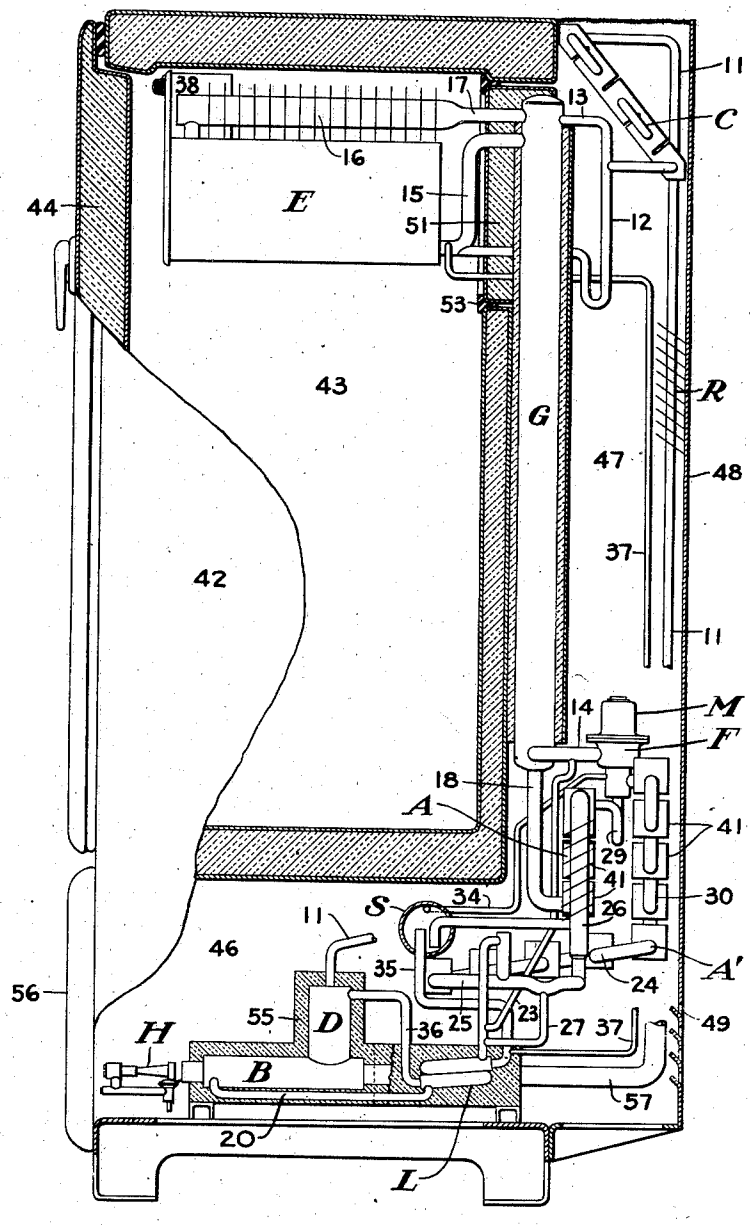


Fig. 1

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REFRIGERATION

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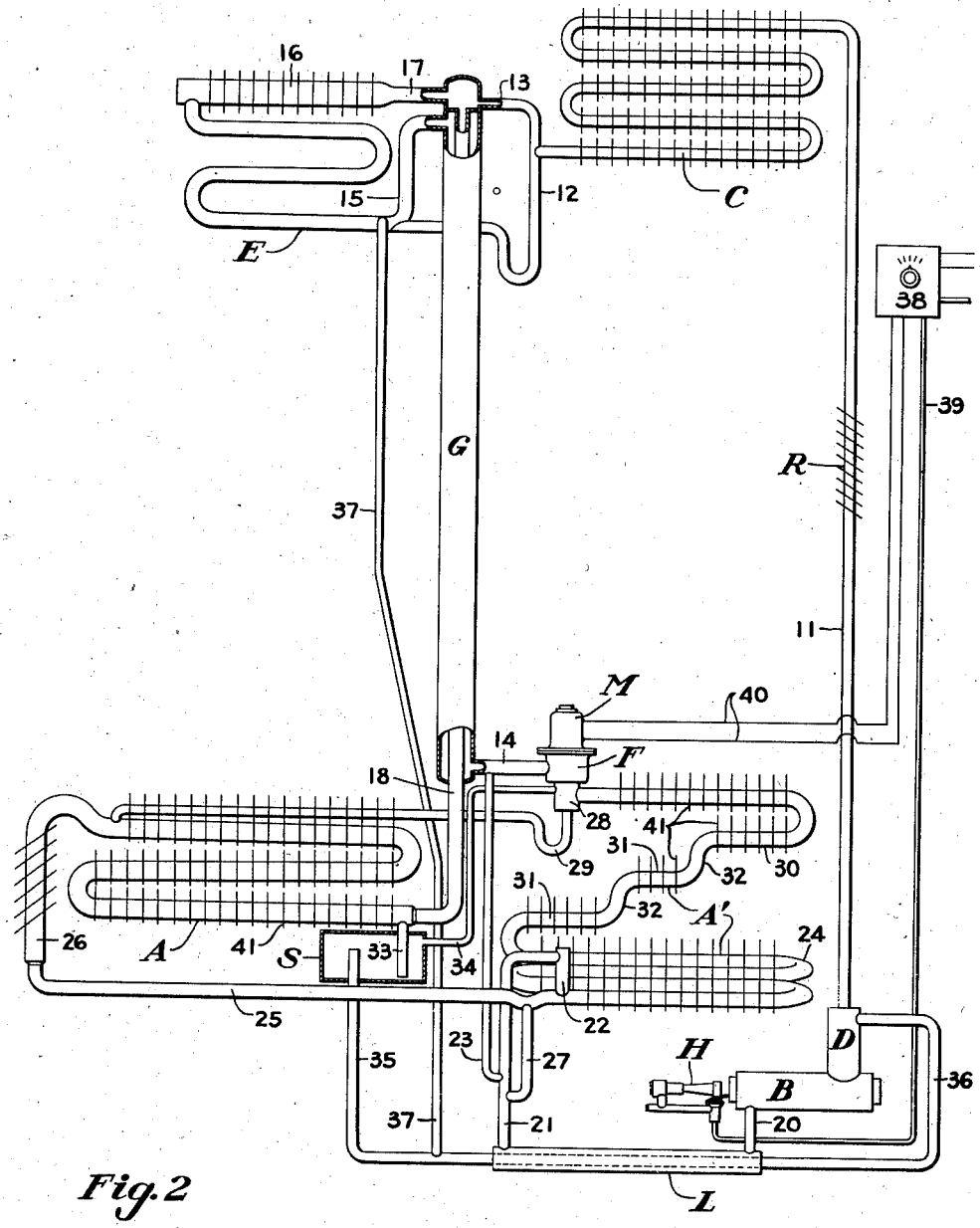


Fig. 2

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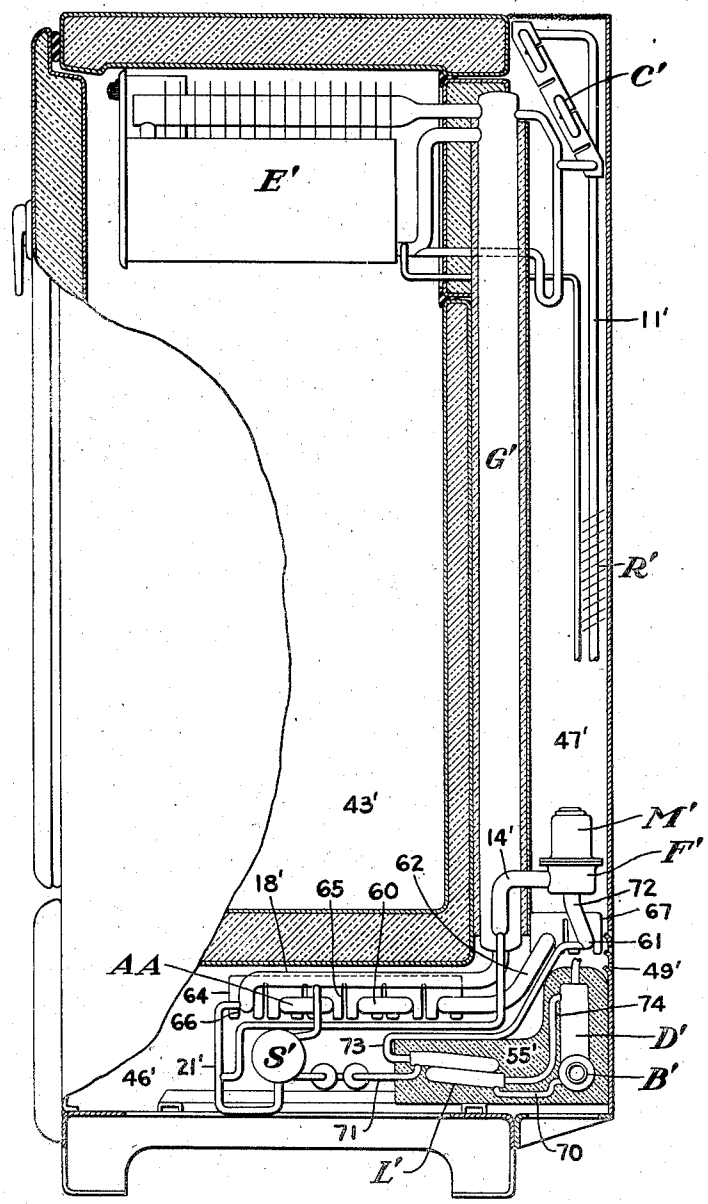


Fig. 3

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REFRIGERATION

Filed April 24, 1939 5 Sheets-Sheet 4

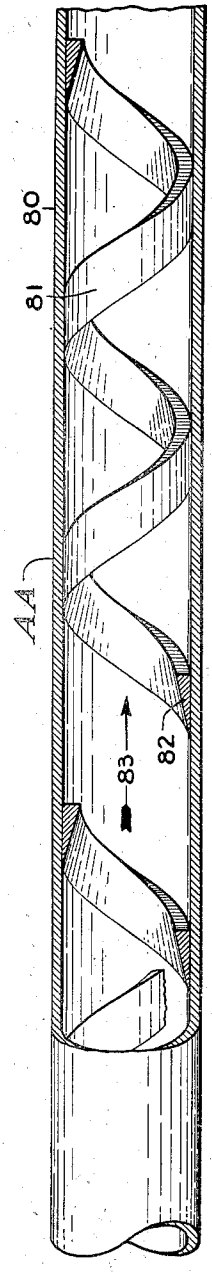


Fig. 4

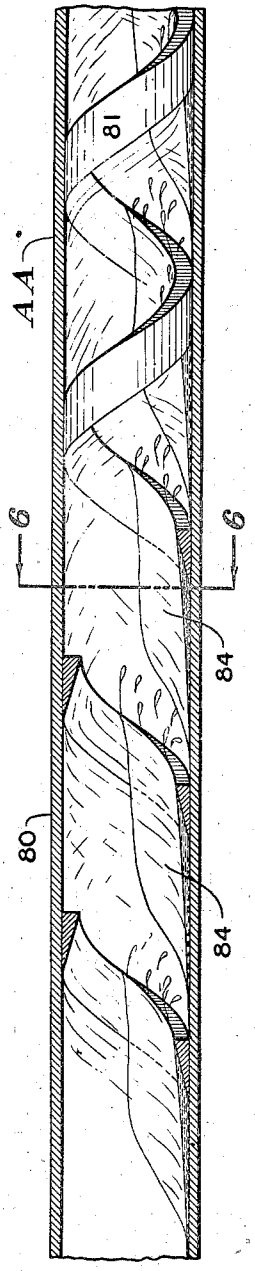


Fig. 5

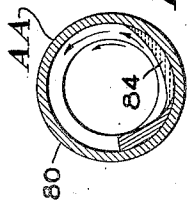


Fig. 6

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REFRIGERATION

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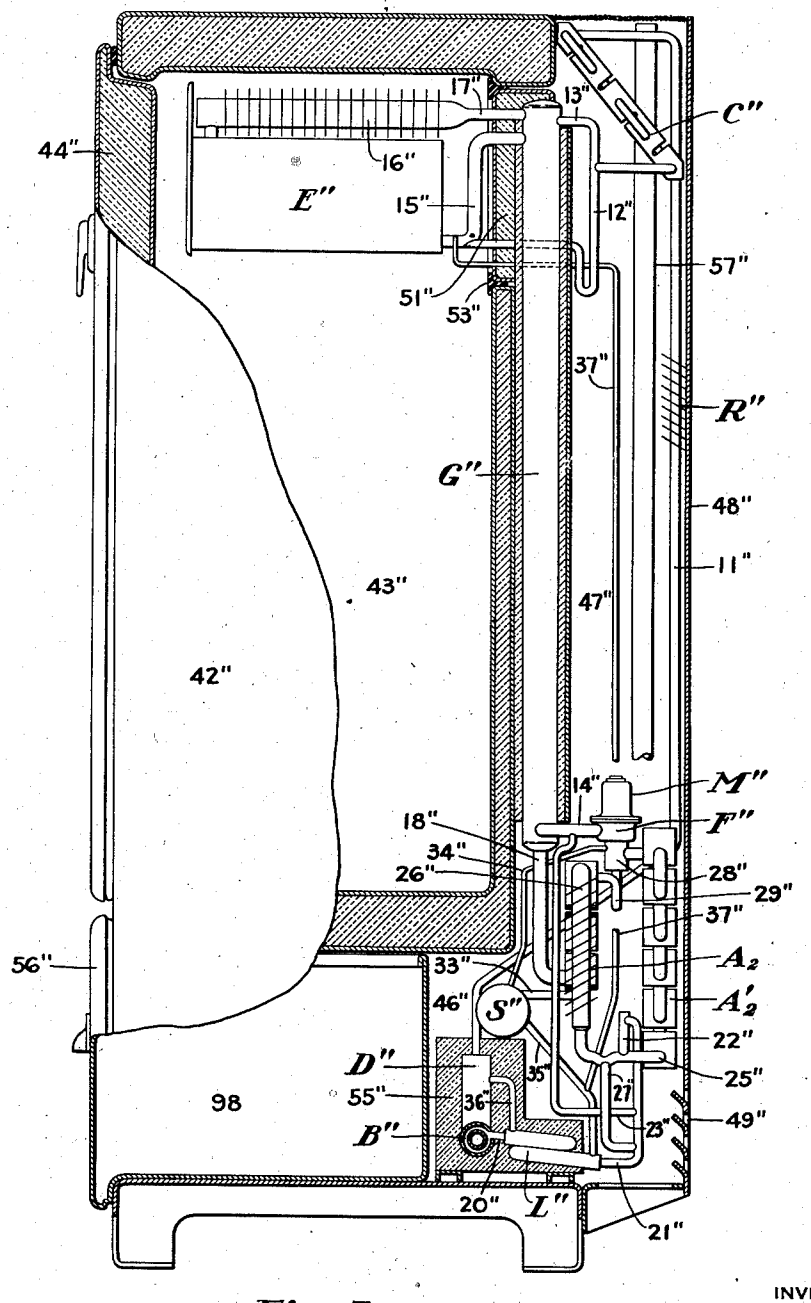


Fig. 7

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Patented Sept. 15, 1942 2,295,988

UNITED STATES PATENT OFFICE

2,295,988

REFRIGERATION

George A. Brace, Winnetka, Ill., assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application April 24, 1939, Serial No. 269,673

32 Claims. (Cl. 62—119.5)

This application relates to the art of refrigeration and more particularly to a novel absorption refrigerating system.

The present application contains subject matter divided from my co-pending application, Serial No. 248,671, filed December 31, 1938. The present invention also relates to certain improvements over my co-pending application Serial No. 220,196, filed July 20, 1938. The said co-pending application discloses an absorption refrigerating system of the type utilizing an inert pressure equalizing medium in which all fluids are positively circulated through their respective circuits by a small mechanical circulator for the pressure equalizing medium. The liquid refrigerant supplied to the evaporator is propelled upwardly therethrough as it is evaporating into the pressure equalizing medium by the sweeping or dragging action exerted on the liquid refrigerant by a relatively high velocity stream of the pressure equalizing medium. The absorption solution is elevated from the level of the boiler to a higher elevation in an absorber vessel through which it is propelled by the sweeping or dragging action exerted thereon by a relatively high velocity stream of pressure equalizing medium. The absorption solution then flows by gravity in its path of flow back to the boiler through another absorber element.

My co-pending application Serial No. 248,671 discloses an absorption refrigerating system providing a novel means for regulating the flow of the fluids therethrough under all normal conditions of operation.

The present application is directed to certain improvements over the refrigerating system disclosed in my said two co-pending applications and also to novel arrangements of the various forms of apparatus within a domestic refrigerating cabinet in order to achieve the highest usefulness of the above-mentioned refrigerating system.

It is a further object of the present invention to provide an absorption refrigerating system including a tubular air-cooled absorber having a portion thereof positioned partly beneath the storage compartment in a horizontal or an inclined position and having another portion thereof in the rear air-cooling flue.

It is a further object of the invention to provide an absorption refrigerating system in which the absorber is of the type in which the absorption solution is circulated therethrough by the inert gas and is provided with a plurality of sections, parts of which are positioned in the rear air-cooling flue and other parts of which are positioned at least partially in the mechanism compartment beneath the insulated food storage compartment.

It is a still further object of the present invention to provide an absorption refrigerating system of the air-cooled type in which the absorber includes a combined elevating, absorbing and heat rejecting element which extends across the rear portion of the cabinet in a series of short steps each of which is provided with air-cooling fins.

It is another object of the present invention to provide an absorption refrigerating system of the type in which the absorber consists of a plurality of finned sinuous vertically positioned sections, all of which are positioned entirely within the rear portion of the air-cooling flue.

Heretofore, absorption refrigerating systems of the type above referred to have been arranged in a cabinet construction with the mechanism distributed in a lower mechanism compartment and a vertically extending cooling air flue. This arrangement was very wasteful of space and practically prevented the provision of a storage chamber in the cabinet beneath the refrigerated food storage compartment. Additionally, with prior arrangements, it was necessary to construct the lower mechanism compartment at a relatively great height which resulted in an expensive cabinet construction and an appreciable wastage in space.

Accordingly, it is an object of the present invention to provide an absorption refrigerating system in which the mechanism is distributed in a compact efficient manner in a rear air cooling flue and in the extreme rear portion of the lower compartment whereby a storage compartment of substantial size may be formed in the cabinet beneath the refrigerated food storage compartment.

It is still another object of the present invention to provide a three-fluid absorption refrigerating system in which a most efficient and compact arrangement of the apparatus in a cabinet is provided.

More specifically it is an object of the present invention to provide a refrigerating apparatus in which the absorber is horizontal and has the major portion thereof located below the analyzer which may be higher than the mechanism compartment customarily provided beneath the food storage chamber.

In prior constructions it has been absolutely essential to incline all portions of the absorber because the liquid flows therethrough by gravity and even if the absorber is installed in an absolutely level position the operation thereof is uncertain and a large non-functioning body of absorption solution collects therein. Heretofore a horizontal absorber has not been possible because a slight tilt to the apparatus, induced for example by an uneven floor, caused the liquid to "pocket" and to block the gas flow.

Accordingly it is an important object of the

present invention to provide an absorption refrigeration system in which all or part of the absorber may be positioned horizontally without suffering adversely from any tilt which the apparatus may have.

It is another object of the present invention to provide an absorber in which the solution is propelled by the inert gas over an obstruction in a manner to project the liquid as a spray and to cause the gas and liquid to scour across the interior walls of the absorber.

Other objects and advantages of the invention will become apparent as the description proceeds when taken in connection with the accompanying drawings, in which:

Figure 1 is a side elevational view, partly in section, of a refrigerator cabinet construction embodying the present invention.

Figure 2 is a diagrammatic representation of the absorption refrigerating system illustrated in Figure 1 in connection with a cabinet.

Figure 3 is a side elevational view, partly in section, of a modified form of the invention.

Figures 4 and 5 are enlarged detail sectional views of an absorber construction.

Figure 6 is a cross-sectional view taken substantially on the line 6—6 of Figure 5.

Figure 7 is also a side elevational view, partly in section, of a still further modification of the invention.

Referring now to the drawings in detail and first to Figures 1 and 2 thereof, there is disclosed an absorption refrigerating system of the three-fluid type comprising a boiler B, an analyzer D, an air-cooled rectifier R, a tubular air-cooled inclined condenser C, an evaporator E, a gas heat exchanger G, a liquid heat exchanger L, a pair of tubular air-cooled absorber vessels A and A', a solution reservoir S, and a circulating fan F which is driven by a suitable electrical motor M which is hermetically sealed into the system. The above described elements are suitably connected by a plurality of conduits forming a plurality of gas and liquid circuits constituting a complete refrigerating system to which reference will be made in more detail hereinafter.

The above described system is charged with a suitable refrigerant, such as ammonia, a suitable absorbent, such as water, and a pressure equalizing medium preferably a dense inert gas, such as nitrogen.

The boiler B may be heated in any suitable manner as by an electrical cartridge heater or by a combustible fuel burner. In the instant case a gas burner H is illustrated.

Referring now to Figure 2, the refrigerating system per se will be described. The application of heat to the boiler B generates refrigerant vapor from the strong solution therein contained. The vapors so generated pass upwardly through the analyzer D in counterflow relationship to strong solution flowing downwardly therethrough, whereby further refrigerant vapor is generated from the strong solution by the heat of condensation of absorption solution vapor liberated in the boiler. The resulting refrigerant vapor is conveyed from the analyzer D to the top portion of the condenser C by a conduit 11 which includes the air-cooled rectifier R wherein absorption solution vapor which passes through the analyzer is condensed. The refrigerant vapor is condensed in the condenser C by heat exchange with ambient air and is discharged through a conduit 12 including a U-shaped liquid seal portion into the bottom portion of the evaporator E. The condenser is vented by a conduit 13 to the rich gas side of the gas heat exchanger.

The evaporator E may be of any suitable or desired construction, a preferred construction being illustrated in the co-pending application of Curtis C. Coons and William H. Kitto, Serial No. 386,395, filed April 2, 1941. The bottom portion of the evaporator is supplied with lean pressure equalizing medium which discharges from the circulating fan F through the conduit 14, the outer path of the gas heat exchanger G, and the conduit 15 which opens into the bottom portion of the evaporator E. The evaporator E is constructed of relatively small diameter tubing, as will be explained in more detail hereinafter, wherefore the inert gas flows therethrough at a relatively high velocity which is sufficient to sweep or drag the liquid refrigerant through all portions thereof as it is evaporating into the inert gas stream to produce refrigeration. The rich mixture of pressure equalizing medium and refrigerant vapor formed in the evaporator E and in the box-cooling conduit 16 thereof is conveyed from the box-cooling conduit 16 through a conduit 17 to the inner path of the gas heat exchanger G from which it is conveyed by a conduit 18 to the lower portion of the absorber A.

The weak solution formed in the boiler B by the generation of refrigerant vapor therefrom is conveyed from the boiler by a conduit 20, the outer path of the liquid heat exchanger L, and a conduit 21 into an upstanding chamber 22 which communicates with the bottom portion 24 of the absorber A'. The bottom portion 24 of the absorber A' comprises a plurality of sinuous serially connected individually finned inclined conduits, as will be apparent from the inspection of Figures 1 and 2. The individual absorber tubes are parallel and are not alternately oppositely inclined as is essential in the gravity flow type of apparatus. The bottom portion of the absorber A' is at an elevation slightly above the liquid level prevailing in the boiler-analyzer system B—D. In order to elevate the lean solution to the bottom portion 24 of the absorber A', a small gas bleed-off conduit 23 is connected between the circulating fan discharge conduit 14 and the elevating conduit 21 below the liquid level prevailing therein whereby the weak solution is elevated into the bottom portion 24 of the absorber A' by gas lift action.

The bottom portion of the absorber A' is connected to finned air-cooled discharge conduit 26 of the absorber A by means of a conduit 25. A small dip is formed in the conduit 25 just ahead of its point of connection with the vessel 22 which is drained by means of a conduit 27 into the lean solution elevating conduit 21. This conduit takes care of any solution finding its way into the conduit 25 from the absorber A and also drains any solution which may flow counter to the inert stream in the absorber A'.

The upper portion 30 of the absorber A' consists of a series of horizontal off-set vertically spaced short finned conduits 31 which are serially connected by short riser conduits 32.

The absorber A', like the evaporator E, is constructed of a relatively small diameter tubing and is connected in circuit in a manner which will be described hereinafter in order to permit the inert gas to flow upwardly therethrough at a relatively high velocity. The inert gas propels the absorption solution supplied to the bottom portion of the absorber A' from the vessel 22 upwardly

through the absorber A' as it is absorbing the refrigerant vapor content of the inert gas and is rejecting the heat of absorption to cooling air flowing over the fins mounted thereon.

The absorption solution and inert gas which have traveled upwardly through the absorber A' discharge into a separating chamber 28 which is connected to the suction inlet of the circulating fan F. The inert gas content of the mixture flows into the circulating fan where it is first placed under pressure and then discharged into the conduit 14 as described heretofore. The absorption solution, however, settles to the bottom of the chamber 28 from which it is conveyed through a conduit 29 which includes a U-shaped liquid seal portion to the upper gas outlet portion of the absorber A. The absorption solution flows downwardly through the absorber A in counterflow to the rich mixture pressure equalizing medium flowing upwardly therethrough from the rich gas conduit 18. The heat of absorption is rejected to air flowing over the outer walls of the absorber vessel and the strong solution formed therein is discharged through a conduit 33 into the solution reservoir S. The absorber A as a whole lies in a substantially vertical plane but the individual serially connected tubes thereof are preferably alternately oppositely inclined to the horizontal to provide for gravity flow of the solution.

The absorbers may be constructed from a continuous tube bent into the desired shape or from a plurality of preformed sections which are suitably joined together as by welding or brazing. Each absorber tube element is preferably provided with individual fins 41. As illustrated the fins are offset from the tube in the direction of the air flow. This arrangement produces most efficient heat rejection to the air stream with a minimum fin area and a minimum of air flow resistance.

The solution reservoir S is vented by means of a small conduit 34 to the suction inlet of the circulating fan F. The strong solution in the reservoir is returned to the analyzer D by way of the conduit 35, the inner path of the liquid heat exchanger L, and a conduit 36. The drain conduit 37 for the evaporator also connects to the strong solution return conduit 35.

The operation of the apparatus is regulated by a control 38 which may be of any desired type, though a preferred construction is disclosed and claimed in the co-pending application of Curtis C. Coons, Serial No. 148,424, filed June 16, 1937, Patent No. 2,228,343. Gas is supplied to the burner H through a conduit 39 which passes through the regulating mechanism 38. Electrical energy is supplied to the circulating motor M by means of electrical conductors 40 which also pass through and are controlled by the mechanism 38.

The operation of the system, insofar as it has not been described above, is as follows: The gas lift pump which serves to supply the lean absorption solution to the bottom portion of the absorber A' provides a means whereby the rate at which solution is supplied to the absorber is substantially constant and is independent of transient system disturbances, as fully described in my co-pending application Serial No. 248,671, filed December 31, 1938. This arrangement is also advantageous because it permits the level of the absorber to be substantially independent of the level of the boiler as the gas lift pump is capable of elevating the liquid through a relatively very small or a relatively very great height as may be desired without in any way affecting the operation of the system as a whole.

The absorber A' is made of relatively small diameter tubing whereby the inert gas travels therethrough at a velocity sufficient to sweep or drag the liquid refrigerant from the bottom to the top portion of the absorber as it is absorbing refrigerant vapor and is rejecting the heat of absorption to cooling air through the medium of the fins mounted on the absorber tubes. After the inert gas and absorption solution have traversed the absorber A', the lean inert gas is discharged into the suction inlet of the circulating fan and the somewhat enriched absorption solution is conveyed through the conduit 29 to the absorber A.

The absorber A is made of large diameter tubing and, as will be apparent from the description above of the inert gas circuit, the gas and liquid flow therethrough in counterflow relationship. This is made possible by the fact that the large diameter tubing of which the absorber A is constructed causes the gas to flow therethrough at a relatively low velocity whereby it does not propel the absorption solution which flows through the absorber A solely by gravity.

With the arrangement illustrated the absorber A carries the burden of the absorbing load and will operate at a relatively high temperature. After the solution has traversed the absorber A it has reached its highest refrigerant concentration and is consequently returned to the analyzer. The inert gas refrigerant vapor mixture, however, is then cooled in the conduit 26 and returned to the inlet of the absorber A' by means of the conduit 25 at which point the relatively lean inert gas is brought into intimate contact with the leanest absorption solution to be found in the system. The absorber A', therefore, acts as a stripping absorber for the inert gas and will operate at a temperature lower than that prevailing in the absorber A. This is an advantageous arrangement by reason of the fact that the inert gas is materially cooled in the absorber A' and the absorption solution is also discharged therefrom into the principal absorber A in a relatively cool condition which promotes absorption in the principal absorber.

It is characteristic of this invention that the absorption solution and liquid refrigerant are both circulated through a portion of the system solely by the sweeping and dragging action of the relatively high velocity stream of inert gas flowing through the same conduit. The propelling characteristics of the inert gas are functions of a number of factors which will be delineated generally below.

The propelling power of the inert gas stream is a function of its density, pressure, and velocity of flow through the evaporator or elevating absorbers. In general, an increase in the value of any one or more of the above enumerated factors results in an increase in the lifting power of the inert gas. Other things being equal, the velocity of the inert gas will be a function of the effective cross-sectional area of its path of flow, and an increase in the effective cross-sectional area of that path results in a decrease in gas velocity.

It is for these reasons that the cross-sectional areas of the elevating absorber sections and of the evaporator are materially less than the cross-sectional area of the counterflow absorber section. For example, it has been found that a propelled stream of nitrogen will circulate liquid

upwardly through an evaporator or an absorber conduit of a size suitable for domestic use having an inside diameter of approximately one-half inch, a pressure differential of between two and four inches of water between the gas inlet and outlet connections to the evaporator or absorber, and with a total system pressure ranging between 270 and 400 pounds per square inch. Under the conditions just enumerated it has been found that liquid will flow counter to the gas stream in a conduit, such as the counterflow absorbers disclosed herein, having an inside diameter of approximately one inch or more. These dimensions are illustrative only and are not limiting since other conditions permit conduit sizes different from those mentioned.

A continuous stream of the inert gas traverses the evaporator and absorber and conveys the liquid refrigerant and absorption solution through horizontal or slightly sloping conduits by sweeping or dragging the liquid along the bottom of the conduit, but in substantially vertical or elevating conduits, such as the return bends connecting the substantially horizontal evaporator and absorber conduits, the gas is blowing through a body of the liquid. Therefore, in the horizontal or slightly inclined conduits the gas stream sweeps over a stream of liquid which it propels and agitates by exerting a frictional drag thereon; whereas, in the substantially vertical conduits the gas is blowing through a relatively large body of the liquid in the lower portions of such conduits with which it is in intimate contact. The friction and impact of the gas blowing through the bodies of liquid in the riser or elevating conduits drags or sweeps a portion of that liquid upwardly into the next conduit section. Thus, absorption takes place in the elevating absorbers through the action of a high velocity gas stream propelling a liquid through a horizontal or inclined conduit and through the action of a gas stream forcing itself through a body of liquid in an elevating conduit while conveying part of the body of liquid to a higher elevation. The gas and liquid contact in the evaporator is also of two types; that is, the gas sweeps or drags the liquid through horizontal or slightly inclined conduits and blows or blasts through columns of liquid in the elevating conduits of the evaporator.

Thus, in the instant disclosure the absorption solution is swept through a long sinuous conduit having a rather gentle incline in the portion **24** of the absorber A' and is then elevated vertically at a rather rapid rate in the substantially vertical portion **30** of the absorber A'. However, in the vertical portion of the absorber the elevation takes the form of a plurality of short vertical steps connected by horizontal finned conduits. Thus, in this form of the absorber the gas and liquid contact is of the most intimate character and both the liquid and the gas are in a constant state of turbulence and are constantly scrubbing the wall of the absorber conduit to promote heat rejection therefrom which is a material factor in allowing this portion of the absorber to operate at a relatively low temperature.

The gas has been described as being propelled at a high velocity, but this is to be interpreted in relation to the other conditions prevailing within the system. For example, in the particular embodiment disclosed the gas velocity need be only of the order of a few feet per second in order to circulate the fluids and to promote effective absorption and evaporation if a dense inert gas like nitrogen is utilized.

The flow of inert gas through the evaporator and absorber is substantially continuous and steady though there is a pressure gradient from the inlet to the outlet portions thereof due to the throttling action of the liquid, particularly in rising conduits, on the gas stream. This insures substantially continuous uniform propulsion of liquid through the evaporator and absorber and continuous absorption of refrigerant whenever the refrigerating mechanism is operating.

The arrangement of the apparatus within the cabinet will now be described. The cabinet, which is generally designated at **42**, comprises an insulated refrigerating compartment **43** which is closed by an insulated door **44**. The cabinet construction includes a mechanism and storage compartment **46** which is located beneath the insulated storage compartment **43** and a rearwardly vertically extending cooling flue **47**. The flue **47** has been shown somewhat exaggerated in depth in the accompanying drawings for the sake of clarity and enclosed by a rear panel **48** which may be provided with louvres at any desired point; as shown, there are a plurality of louvres **49** at the lower rear portion thereof and the bottom of the flue **47** is directly open to cooling air adjacent the surface upon which the cabinet is supported.

The gas heat exchanger G is partially embedded in the rear wall of the compartment **43** and in a removable insulated window element **51** through which the evaporator gas inlet and outlet connections **15** and **17** respectively pass. The arrangement is such that the evaporator, the window **51**, and the gas heat exchanger may be inserted from the rear of the box as a unit with the remaining portion of the refrigerating apparatus and the window element will then seal an opening provided therefor in the rear wall of the chamber. A suitable sealing gasket **53** is provided to make the margin between the window element **51** and the rear wall of the compartment **43** completely air-tight.

The condenser C extends across the upper portion of the flue **47** in an inclined position whereby air which passes over any one portion thereof will not thereafter contact another portion of the condenser. The rectifier R may be formed on a vertical conduit or the conduit **11** may extend transversely across the compartment **47** and adjacent the rear panel **48** thereof at about ⅔ the way from the lower end of the air flue.

The lower tubular inclined portion **24** of the absorber A' extends upwardly and rearwardly at a slight incline from the mechanism compartment **46** to substantially the rear bottom portion of the flue **47** after which it joins the step by step substantially vertical upper portion **30** of the absorber A'. The absorber A extends vertically in the lower portion of the flue **47** and inwardly of the elevating section **30** of the absorber A'.

The boiler B, analyzer D, and the liquid heat exchanger L are encased in a suitable block of insulating material **55** and are positioned lengthwise of the compartment **46** but preferably adjacent one side wall thereof in such manner that the burner H is adjacent the removable front panel **56** of the compartment **46**. The various conduits which interconnect the numerous elements constituting a complete refrigerating system are suitably arranged within the compartments **46** and **47** as illustrated. The boiler is provided with a suitable waste products of combus-

tion flue 57 which extends to the rear of the air flue 47 and then extends upwardly in one corner thereof to be removed from the path of cooling air flowing over the absorber, rectifier and condenser.

Thus the lower portion 24 of the stripping absorber A' is supplied with the coolest available cooling air and the air which flows over any individual flight or tube of the portion 24 of the absorber A' does not thereafter contact another portion of that absorber and also by reason of the step by step arrangement of the absorber section 30, any air which is passed over the fins on one of the conduit sections 31 does not thereafter contact any other of such conduit sections whereby all are enabled to operate at a very low temperature. The absorber A, however, is for the most part contacted by air which has already passed over some portion of the absorber A'. This is not objectionable in the present system by reason of the fact that the stripping absorber A' does not materially heat the air stream as the relatively small amount of heat which is discharged therefrom is spread over a very great heat rejecting area and, further, because of the fact that the absorber A normally operates at a higher temperature than the absorber A' and rejects the bulk of the heat of absorption from the system at such higher temperature. For this reason the absorber A may be relatively small in size.

After the cooling air has traversed the various absorber sections it traverses the rectifier and condenser and discharges from the top of the cabinet through the open top of the air cooling flue which may be covered with a screen, a reticulated plate or by some similar construction.

It is apparent from Figure 1 that with the arrangement herein disclosed a portion of the absorber and a portion of the evaporator overlie each other and that the remainder of the absorber is substantially vertically below the condenser and in the air flue and rearwardly of the evaporator and the portion of the absorber coincident therewith.

Referring now to Figure 3, there is disclosed a modified form of the invention. Certain elements shown in Figure 3 are identical with corresponding elements illustrated in Figures 1 and 2 and are, therefore, given the same reference characters primed.

In the form of the invention illustrated in Figure 3, there is provided a three-fluid absorption refrigerating system which is extremely compact and in which the mechanism compartment of the cabinet may be made extremely shallow.

The absorber AA comprises a horizontal section 60 which is in the form of a continuous sinuous tube or conduit which is serially connected to a smaller horizontal section 61 which, as illustrated, comprises a single U-shaped tube. The conduit 62 which connects the absorber sections 60 and 61 may be positioned at one side of the apparatus as illustrated in Figure 3, or it may extend across the rear portion of the mechanism compartment 46' and rise at a gentle incline from the level of the absorber section 60 to the level of the absorber section 61. The absorber section 60 is provided with a plurality of fins 64 only one of which is shown. The fins 64 are offset upwardly from the tube 60 in order to provide for the most efficient form of heat rejection from the absorber and they are constructed by stamping a continuous sheet of thin material with a plurality of deep slots 65 which serve substantially to prevent heat transfer between adjacent portions of the fin which are in intimate heat transfer relationship with adjacent conduits of the absorber section 60 and they are also provided with shallower but wider slots 66 which embrace the individual tubes of the absorber section 60. The absorber section 61 is provided with fins 67 which are constructed in the same manner in which the fins 64 are constructed.

In the form of the invention illustrated in Figure 3, the boiler B' extends transversely of the compartment 46' and in the extreme rear portion thereof. As is apparent from Figure 3, the boiler-analyzer, liquid heat exchanger system is in the extreme lower rear portion of the mechanism compartment 46' and the compartment 46' is so shallow that the top portion of the insulating block 55' extends up into the rear air-cooling flue 47' substantially to or above the level of the lowest portion of the bottom wall of the insulated storage compartment 43'. It is also to be noted that the absorber section 60 is at an elevation below the upper portion of the analyzer D.

In this form of the invention the lean solution discharged from the boiler is conveyed into the solution reservoir S' by way of the conduit 70, the liquid heat exchanger L', and a conduit 71 which includes a looped fin portion which acts as a solution pre-cooler. The lean solution is conveyed from the solution reservoir S' into the rich gas conduit 18' adjacent its point of connection with the absorber section 60 by means of a gas lift pump 21'. The pump 21' corresponds to the pump 21 previously described. However, there is no necessity for a vessel such as the vessel 22 in this form of the invention; therefore, the pump 21' discharges directly into the gas conduit. The strong solution which has passed through the absorber is conveyed from the lean gas conduit 72 to the inner path of the liquid heat exchanger by means of a conduit 73 and it is conveyed from the liquid heat exchanger into the upper portion of the analyzer D by means of a conduit 74.

The remaining portions of the apparatus are substantially identical with portions heretofore described and will not be described in detail herein.

Enlarged detail views of sections of the absorber AA are shown in Figures 4, 5 and 6. The absorber tubes 80 are provided interiorly thereof with helical wire or ribbon inserts 81. As illustrated the inserts 81 are triangular in cross-section to provide relatively elongated surfaces 82 which are inclined inwardly of the tube 80 in the direction of flow of the gas stream which is indicated by the arrows 83.

The action of the inserts is depicted in Figures 5 and 6. As the inert gas blows or sweeps the absorption solution along the tube the same is raised on one side of the tube in the direction of the advance of the helix due to the spiral motion which is imparted to the gas stream by the relatively rapidly flowing gas stream. The liquid is not only raised along one side of the tube but it is also blown off the high end of the surface 82 in the form of a spray which intimately mixes with the gas stream and then forcibly strikes the wall of the tube at an oblique angle. This action further splashes the liquid which also efficiently imparts the heat of absorption to the tube because the helical motion of the gas and solution causes both to scrub the inner wall of

the tube. The insert 81 causes the solution to form turbulent shallow pools 84 of the solution which rise on one side thereof under the impetus of the gas stream. The inserts 81 may be retained in the absorber tubes by frictional engagement with the walls thereof or they may be secured to the tubes by welding, brazing, tinning or the like if desired.

The insert 81 increases the resistance offered by the absorber to the flow of the inert gas, however, that is compensated by the fact that the superior gas and liquid contact and the improved heat rejection permit the use of a smaller vessel. In particular the increased flow resistance is not material in an absorber such as that disclosed in Figure 3 as the inert gas is not called upon to elevate the liquid except for the small distance between the sections 60 and 61 of the absorber AA.

Though only one insert has been specifically disclosed other forms and arrangements may be provided if desired. For example, inserts having other cross-sections may be used and a plurality of axially spaced long pitch inserts may also be provided.

In the operation of this form of the invention a regulated and controlled quantity of absorption solution is fed into the rich gas conduit 18' adjacent its point of connection with the lower absorber section 60 by means of the gas lift pump 21'. The liquid so supplied is propelled through the horizontal absorber section 60, the elevating conduit 62 and the absorber section 61 by the inert gas flowing therethrough. The specific action of the liquid and gas is described above. Therefore, the gas flows in a spiral path. The solution flows in a spiral path, as a spray in its passage from pool to pool. The cooling air flows at right angles to the axis of the absorber tubes and to the general direction of flow of the gas and liquid. After passing through the absorber section 61, the strong solution is then returned to the analyzer as described heretofore.

Cooling air may be admitted into the bottom portion of the mechanism compartment 46' in any desired manner. As illustrated, cooling air flows directly through the bottom portion thereof. The cooling air passes over all portions of the absorber 60 and due to the arrangement thereof air which passes over any one section of the fins 64 does not thereafter contact another portion of such fin and the deep slots 65 effectively prevent heat transfer between sections of the fin which are in heat transfer relationship with adjacent sections of the absorber 60. After passing over the absorber section 60 the cooling air flows to the right, as viewed in Figure 3, and thence upwardly through the flue 47'. Additional cooling air is admitted through the louvres 49' to flow over the right-hand side of the absorber section 61, as viewed in Figure 3, which is the last portion of the absorber in which the gas and liquid are in contact. This enables this section of the absorber to operate at a very low temperature. The air which is passed over the absorber section 60 flows over the left-hand side of the absorber section 61 before passing into the flue 47'.

In this form of the invention the utmost compactness of the apparatus is achieved by placing the absorber in a horizontal plane which is level with or even below the upper portion of the analyzer D. This permits the mechanism compartment to be made of a minimum depth with a consequent saving in valuable cabinet space.

If desired, the absorber section 61 can be omitted in whole or in part. If the absorber section 61 is omitted, the conduit 62 will simply terminate in a separation vessel similar to the separation vessel 28 which will be drained to the liquid heat exchanger and will discharge the gas into the suction side of the circulating fan F'.

While it is apparent that this form of the invention does not provide relatively as much absorbing area as that described in connection with Figure 1, it is highly satisfactory for small size units or for units adapted to be used in relatively cool climates where exceptionally large heat rejecting areas are neither necessary nor desirable. On the other hand, the present form of the invention is much simpler than that disclosed in connection with Figure 1 and is of course much more compact and cheaper to manufacture.

In Figure 7 there is illustrated another modification of the invention, certain portions of which are identical with elements previously described in connection with Figures 1 and 2 and are therefore given the same reference characters double primed with the exception of the absorber section to which subscripts will be appended to distinguish reference characters previously used.

This form of the invention is identical with that disclosed in Figure 1 except in the following respects. The absorber section A'_2 corresponding to the absorber section A' of Figure 1, consists solely of a vertical section which is substantially identical with the section 30 of the absorber A'. The boiler has been placed in the rear part of the mechanism compartment 46'' and extends transversely thereof to provide space in the front portion of the compartment 46'' to receive a vegetable drawer 98 which carries the closure 56'' for the compartment 46''.

If desired, still greater compactness in the assembly may be provided by moving the solution reservoir S'' and the boiler-analyzer liquid heat exchanger assembly to the right, as viewed in Figure 7, so that the bottom portion of the chamber 46'' may extend substantially to the level of the top of the insulating block 55''. If this arrangement is desired, the absorbers A_2 and A'_2 may be elevated within the flue 44 in order to accommodate the solution reservoir substantially directly beneath the absorber A_2. This construction will economize on cabinet space but it will also cut down on the available capacity of the storage bin 98 by the amount by which the depth of the chamber 46'' is diminished.

In this form of the invention the cooling air enters the apparatus through the bottom portion of the compartment 46'' and through the louvres 49'' and passes upwardly through the flue 47'' over the absorbers A_2 and A'_2, the rectifier R'', and the condenser C'' in a straight line path of flow offering a minimum resistance to the flow of cooling air and providing an extremely compact assembly which will permit the provision of a vegetable bin in the bottom portion of the apparatus beneath the insulated storage compartment 43''.

Thus, in the course of the present invention there is disclosed in one form of the invention an arrangement in which the bulk of the absorbing process occurs at a high temperature and in which the inert gas is stripped of refrigerant vapor in an elevating absorber so arranged that it is subjected to the coolest available cooling air and also arranged in such fashion that air which

once passes over a portion of the absorber does not thereafter contact any other portion thereof. By reason of this arrangement the bulk of the absorption occurs at a relatively high temperature and the inert gas is stripped of refrigerant vapor at a relatively low temperature and under conditions that relatively low temperature gas and solution are ultimately discharged from the stripping absorber.

In the form of the invention illustrated in Figure 3, a single horizontal absorbing element is disclosed having portions in the mechanism compartment and other portions in the rear air-cooling flue, so constructed and arranged to provide a system having maximum efficiency consistent with extreme simplicity of construction and operation.

In still another form of the invention there is provided a refrigerating system in which all portions of the absorber are positioned in the rear air-cooling flue and in which the apparatus is arranged in a most compact manner and will provide for a vegetable storage bin in the mechanism compartment beneath the insulated refrigerated storage compartment. In this form of the invention straight line air flow is provided for all air-cooled portions of the apparatus and the arrangement is such that a minimum resistance is offered to the flow of the cooling air.

It is within the purview of the invention to reverse the absorber arrangements of Figures 1 and 7; that is, the elevating absorber may be supplied with the rich gas from the evaporator and the counterflow absorber may act as a final stripping absorber.

The absorbers utilized with the form of the invention disclosed in Figures 1 and 7 may also be provided in whole or in part with inserts such as that illustrated in Figures 4 to 6.

I claim:

1. Absorption refrigerating apparatus of the three-fluid type embodying an evaporator, a condenser, an absorber, and a boiler connected in circuit, a cabinet having an insulated storage compartment, a lower mechanism compartment and a vertically extending side air flue, said apparatus being characterized by an air-cooled absorber section in said flue, means for supplying absorption solution thereto and means for propelling a mixture of inert gas and refrigerant vapor to be absorbed through said absorber section under conditions such that the absorption solution is propelled through said section by the inert gas refrigerant vapor mixture.

2. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that it includes a tubular air-cooled absorber portion in said duct and means for circulating a mixture of inert gas and refrigerant vapor upwardly through said absorber portion with sufficient force to propel absorption solution upwardly therethrough.

3. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that portions of said absorber are positioned in said air duct and in said mechanism compartment, and means for circulating a mixture of inert gas and refrigerant vapor through said absorber portions with sufficent force to propel absorption solution therethrough.

4. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that it includes a horizontal portion of said absorber in said mechanism compartment and another portion thereof in said air duct, and means for circulating a mixture of inert gas and refrigerant vapor through said absorber portion with sufficient force to propel absorption solution therethrough.

5. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that said absorber lies in an inclined plane in said mechanism compartment, and means for circulating a mixture of inert gas and refrigerant vapor through said absorber with sufficient force to propel absorption solution therethrough.

6. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that said absorber includes a plurality of substantially horizontal vertically spaced offset conduit sections provided with heat rejecting fins in said air duct, short lifting conduits connecting the adjacent ends of adjacent substantially horizontal conduits whereby the cooling air rising through said duct does not pass over more than one set of fins on said offset conduits, and means for circulating a mixture of inert gas and refrigerant vapor through said absorber portion with sufficient force to propel absorption solution therethrough.

7. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and an air-cooled absorber having a horizontal portion consisting of a plurality of parallel serially connected tubes in said mechanism compartment and another horizontal portion consisting of a plurality of parallel serially connected tubes in said air duct and positioned at an elevation above said first mentioned horizontal portion.

8. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas in-

cluding an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that said absorber includes an upstanding portion in said duct and another portion in said compartment, and means for circulating a mixture of inert gas and refrigerant vapor through said absorber portions with sufficient force to propel absorption solution therethrough.

9. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler and a tubular air-cooled absorber, said apparatus being characterized by the fact that said absorber includes a portion in said air duct and an inclined tubular portion in said compartment, and means for circulating a mixture of inert gas and refrigerant vapor through said absorber portions with sufficient force to propel absorption solution therethrough.

10. Refrigerating apparatus comprising an insulated cabinet having a lower shallow mechanism compartment and an upstanding air flue, a three-fluid refrigerating mechanism including a boiler-analyzer in said mechanism compartment arranged with the analyzer extending into the lower portion of said air flue, a tubular air-cooled absorber lying in a substantially horizontal plane in said compartment and below the level of the upper portion of said analyzer, connections for the circulation of an absorbing solution through a circuit including said absorber and said boiler-analyzer, and means for circulating an inert gas refrigerant vapor mixture through said absorber under conditions such that the absorbing solution is circulated thereby.

11. Refrigerating apparatus comprising an insulated cabinet having a lower shallow mechanism compartment and an upstanding air flue, a three-fluid refrigerating mechanism including a boiler-analyzer in said mechanism compartment, a tubular air-cooled absorber lying in a substantially horizontal plane in said compartment, connections for the circulation of an absorbing solution through a circuit including said absorber and said boiler-analyzer, means for circulating an inert gas refrigerant vapor mixture through said absorber under conditions such that the absorbing solution is circulated thereby, said absorber comprising a sinuous conduit provided exteriorly thereof with heat rejecting fins, and means within said conduit for imparting a helical motion to the inert gas refrigerant vapor mixture and for breaking the propelled stream of solution into a spray.

12. Absorption refrigerating apparatus comprising a solution circuit including an absorber and a boiler, an inert gas circuit including said absorber and an evaporator, means for supplying refrigerant vapor produced in said boiler to said evaporator in liquid phase, said absorber comprising an elongated finned conduit, means for propelling an inert gas refrigerant vapor mixture therethrough with sufficient velocity to sweep or drag the absorption solution therethrough, and means within said conduit arranged to present an obstructing surface to the flow of gas and liquid which is inclined inwardly of said conduit in the direction of such flow.

13. Absorption refrigerating apparatus comprising a cabinet including an insulated storage chamber, a mechanism compartment beneath said chamber and an air duct along one side of said chamber, an evaporator in said chamber, a generator in said compartment, a condenser in said air duct, a horizontal tubular absorber in said compartment comprising a sinuous tube having a plurality of parallel tubular sections and a plurality of heat rejecting fins attached thereto and offset upwardly thereof each of said fins contacting each of said tubular sections and means connecting said evaporator, generator, absorber and condenser in circuit to form a refrigerating system.

14. Absorption refrigerating apparatus comprising a cabinet including an insulated storage chamber, a mechanism compartment beneath said chamber and an air duct along one side of said chamber, an evaporator in said chamber, a generator in said compartment, a condenser in said air duct, a tubular absorber having portions thereof in said compartment and other portions thereof in said air duct at an elevation above said portions in said compartment, each of said portions of said absorber comprising a continuous tube and a plurality of heat rejecting fins attached thereto and offset upwardly thereof and means connecting said evaporator, generator, absorber and condenser in circuit to form a refrigerating system.

15. Refrigerating apparatus comprising a boiler, a tubular air-cooled absorber, a condenser and an evaporator and a power driven circulator connected in circuit to form a three-fluid refrigerating system of the type in which absorption solution is circulated through said absorber by the frictional drag of an inert gas stream thereon, an insulated cooling chamber, a compartment extending below and along the rear wall of said chamber, means providing for flow of cooling air through said compartment, said condenser being mounted in an inclined position across the top of the vertically extending portion of said compartment, said absorber being mounted in an upright position in the lower part of the vertically extending portion of said compartment, said boiler being mounted adjacent the lower rear corner of said compartment but out of the direct path of flow of cooling air therethrough, and a storage chamber in the lower front portion of said compartment.

16. That improvement in the art of absorption refrigerating systems using a refrigerant, an absorbent therefor and a gaseous medium inert with respect to the refrigerant and the absorbent which includes the steps of applying heat to a solution of the refrigerant in the absorbent to liberate refrigerant vapor, liquifying the vapor, evaporating the liquid in the presence of gaseous medium, propelling solution weakened by generation of refrigerant vapor therefrom through an absorbing zone in heat transfer relationship with a stream of cooling air by the dragging action of a propelled stream of a mixture of the gaseous medium and refrigerant vapor, imparting a swirling motion to said mixture and projecting the solution in the absorbing zone into the mixture of gaseous medium and refrigerant vapor in the form of a spray.

17. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and a pair of absorbers, a solution circuit including a generator and said absorbers, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase,

means for circulating the inert gas through said inert gas circuit, a cabinet including an insulated storage chamber housing said evaporator and a vertical cooling air flue, said absorbers being mounted in upright positions in said flue, one of said absorbers being constructed of small cross-sectional area conduit whereby the propelled stream of inert gas will circulate absorption solution therethrough and the other of said absorbers being constructed of larger cross-sectional area conduit whereby the inert gas and absorption solution may flow in opposite directions therethrough.

18. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and a pair of absorbers, a solution circuit including a generator and said absorbers, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, means for circulating the inert gas through said inert gas circuit, a cabinet including an insulated storage chamber housing said evaporator and a vertical cooling air flue, said absorbers being mounted in upright positions in said flue, one of said absorbers being constructed of small cross-sectional area conduit whereby the propelled stream of inert gas will circulate absorption solution therethrough and the other of said absorbers being constructed of larger cross-sectional area conduit whereby the inert gas and absorption solution may flow in opposite directions therethrough, said conduit of small cross-sectional area comprising a plurality of co-planar offset vertically spaced substantially horizontal sections serially connected by substantially vertical riser sections, air cooling fins attached to said substantially horizontal sections, and an inclined section consisting of a sinuous finned conduit positioned at least in part beneath said insulated storage chamber.

19. Absorption refrigerating apparatus of the three-fluid type embodying an evaporator, a condenser, an absorber, and a boiler connected in circuit comprising a cabinet having an insulated storage compartment, a lower mechanism compartment and a vertically extending side air flue, said absorber including an air-cooled section in said flue positioned above the level of the lower part of said storage compartment, and an air-cooled section in said mechanism compartment, said absorber sections being so arranged with respect to said flue that the air streams passing over each of said sections are substantially independent.

20. Absorption refrigerating apparatus of the three-fluid type embodying an evaporator, a condenser, an absorber, and a boiler connected in circuit comprising a cabinet having an insulated storage compartment, a lower mechanism compartment and a vertically extending side air flue, said absorber comprising a conduit provided with heat rejecting fins lying in said mechanism compartment, said evaporator being positioned in said storage compartment directly above said absorber, means for supplying refrigerant vapor produced in said boiler to the bottom portion of said evaporator in liquid phase, means for supplying absorption solution to said absorber, and means for propelling an inert gas refrigerant vapor mixture through a circuit including said evaporator and said absorber with sufficient force to propel the liquid refrigerant and the absorption solution through said evaporator and said absorbers respectively.

21. An absorber adapted for use in an absorption refrigerating system comprising an elongated conduit, heat rejecting fins mounted on the exterior wall of said conduit, and a helical obstructing element extending along the inner wall of said conduit, said obstructing element being formed to provide an inclined surface on one wall thereof extending inwardly of said conduit.

22. Absorption refrigerating apparatus of the three-fluid type embodying an evaporator, a condenser, an absorber and a boiler connected in circuit, a cabinet having an insulated storage chamber housing said evaporator and a heat rejecting chamber forming a cooling air duct receiving said absorber, said condenser and said boiler, said absorber comprising an elongated finned conduit, means for supplying absorbing solution thereto, and power driven means for circulating an inert gas through said conduit with sufficient velocity to propel the absorbing solution therethrough, the direction of flow of the inert gas and absorbing solution through said conduit being such that they flow in the same general direction as the cooling air flowing through said chamber.

23. Refrigerating apparatus comprising a cabinet including an insulated food chamber, a mechanism compartment below said food chamber and an upstanding air duct, an absorption refrigerating system of the type utilizing an inert gas including an evaporator positioned in said chamber, a condenser, a boiler, a tubular air-cooled absorber, and means for propelling an inert bas through said absorber with a velocity sufficient to sweep or drag the absorption solution therethrough by the frictional drag of the inert gas, said apparatus being characterized by the fact that said absorber includes a horizontal portion in said mechanism compartment and another horizontal portion in said air duct.

24. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and a pair of absorbers, a solution circuit including a generator and said absorbers, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, means for circulating the inert gas through said inert gas circuit, a cabinet including an insulated storage chamber housing said evaporator and a vertical cooling air flue, said absorbers being mounted in upright positions in said flue, one of said absorbers being constructed of small cross-sectional area conduit whereby the propelled stream of inert gas will circulate absorption solution therethrough, the other of said absorbers being constructed of larger cross-sectional area conduit whereby the inert gas and absorption solution may flow in opposite directions therethrough, said solution and inert gas circuits being arranged in such fashion that inert gas is supplied to the bottom portion of both of said absorbers and solution is supplied to the bottom portion of said small cross-sectional area absorber and to the upper portion of said larger cross-sectional area absorber.

25. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and a pair of absorbers, a solution circuit including a generator and said absorbers, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, means for circulating the inert gas through said inert gas circuit, a cabinet including an insulated storage chamber housing said evaporator and a vertical cooling air flue, said absorbers being mounted in upright positions in said flue, one

of said absorbers being constructed of small cross-sectional area conduit whereby the propelled stream of inert gas will circulate absorption solution therethrough, the other of said absorbers being constructed of larger cross-sectional area conduit whereby the inert gas and absorption solution may flow in opposite directions therethrough, said conduit of small cross-sectional area comprising a plurality of co-planar offset vertically spaced substantially horizontal sections serially connected by substantially vertical riser sections, and air-cooling fins attached to said substantially horizontal sections.

26. Absorption refrigerating apparatus comprising a solution circuit including an absorber and a boiler, an inert gas circuit including said absorber and an evaporator, means for supplying refrigerant vapor produced in said boiler to said evaporator in liquid phase, said absorber comprising an elongated finned conduit, means for propelling an inert gas refrigerant vapor mixture therethrough with sufficient velocity to sweep or drag the absorption solution therethrough, and a helical ribbon having an inclined face in said conduit, said ribbon being arranged in such fashion that the gas and liquid always ride over the inclined face thereof.

27. Refrigerating apparatus comprising a cabinet construction including a cooling compartment and a machinery and heat rejecting compartment, an absorption refrigerating mechanism associated with said cabinet including an evaporator, an absorber, a boiler, an upstanding analyzer, means for conveying enriched absorption solution from said absorber to said analyzer, and a condenser connected in circuit, said evaporator being positioned in said cooling compartment and the remaining parts of said refrigerating mechanism being positioned in said machinery compartment, said apparatus being characterized by the fact that said absorber comprises a horizontal air-cooled portion positioned below the portion of said analyzer which receives absorption solution from said conveying means.

28. Refrigerating apparatus comprising a cabinet construction including a cooling compartment and a machinery and heat rejecting compartment, an absorption refrigerating mechanism associated with said cabinet, an evaporator in said cooling compartment and an absorber in said machinery compartment connected to said evaporator to form an inert gas circuit, a boiler assembly in said machinery compartment connected to said absorber to form an absorption solution circuit, means for liquefying refrigerant vapor produced in said boiler assembly and for supplying the liquid to said evaporator, said apparatus being characterized by the provision of a horizontal air-cooled section of said absorber located below the upper portion of said boiler assembly and means in said inert gas circuit for forcing the inert gas to flow through said absorber with a velocity sufficient to sweep or drag the absorption solution therethrough.

29. Refrigerating apparatus comprising a cabinet construction including a cooling compartment and a machinery and heat rejecting compartment, an absorption refrigerating mechanism associated with said cabinet, an evaporator in said cooling compartment and an absorber in said machinery compartment connected to said evaporator to form an inert gas circuit, a boiler assembly in said machinery compartment connected to said absorber to form an absorption solution circuit, means for liquefying refrigerant vapor produced in said boiler assembly and for supplying the liquid to said evaporator, said apparatus being characterized by the provision of a horizontal air-cooled section of said absorber located below the upper portion of said boiler assembly and another portion positioned above said boiler assembly, and means in said inert gas circuit for forcing the inert gas to flow through said absorber with a velocity sufficient to sweep or drag the absorption solution therethrough.

30. An absorber adapted for use in an absorption refrigerating apparatus of the type utilizing an inert pressure equalizing medium comprising an elongated conduit formed to provide a plurality of parallel straight runs connected by return bend portions all lying in a common plane, a plurality of identical heat rejecting fins attached to said absorber, each of said fins being constructed and arranged in heat conducting relationship with consecutive straight runs of said conduit, inert pressure equalizing medium supply and discharge connections for said conduit, and absorption solution supply and discharge connections for said conduit.

31. An absorber adapted for use in an absorption refrigerating apparatus of the type utilizing an inert pressure equalizing medium comprising an elongated conduit formed to provide a plurality of parallel straight runs connected by return bend portions all lying in a common plane inclined to the vertical, a plurality of identical heat rejecting fins attached to said absorber, each of said fins being constructed and arranged in heat conducting relationship with consecutive straight runs of said conduit, inert pressure equalizing medium supply and discharge connections for said conduit, and absorption solution supply and discharge connections for said conduit.

32. Absorption refrigerating apparatus comprising a cabinet structure having an insulated refrigerating chamber and a mechanism compartment extending below and along one wall of said refrigerating chamber, said refrigerating chamber being arranged for circulation of cooling air therethrough, an evaporator in said refrigerating chamber, a tubular air cooled condenser in said mechanism compartment connected to supply refrigerant liquid to said evaporator, a generator in said mechanism compartment connected to supply refrigerant vapor to said condenser, an absorber in said mechanism compartment comprising a plurality of parallel straight runs serially connected by return bend portions, a plurality of identical heat rejecting fins in heat conducting relationship with said straight runs of said absorber, each of said fins being positioned in heat conducting relationship with a plurality of said straight runs, means providing for circulation of absorption solution between said generator and said absorber, and means providing for circulation of inert gas between said evaporator and said absorber.

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