Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 1

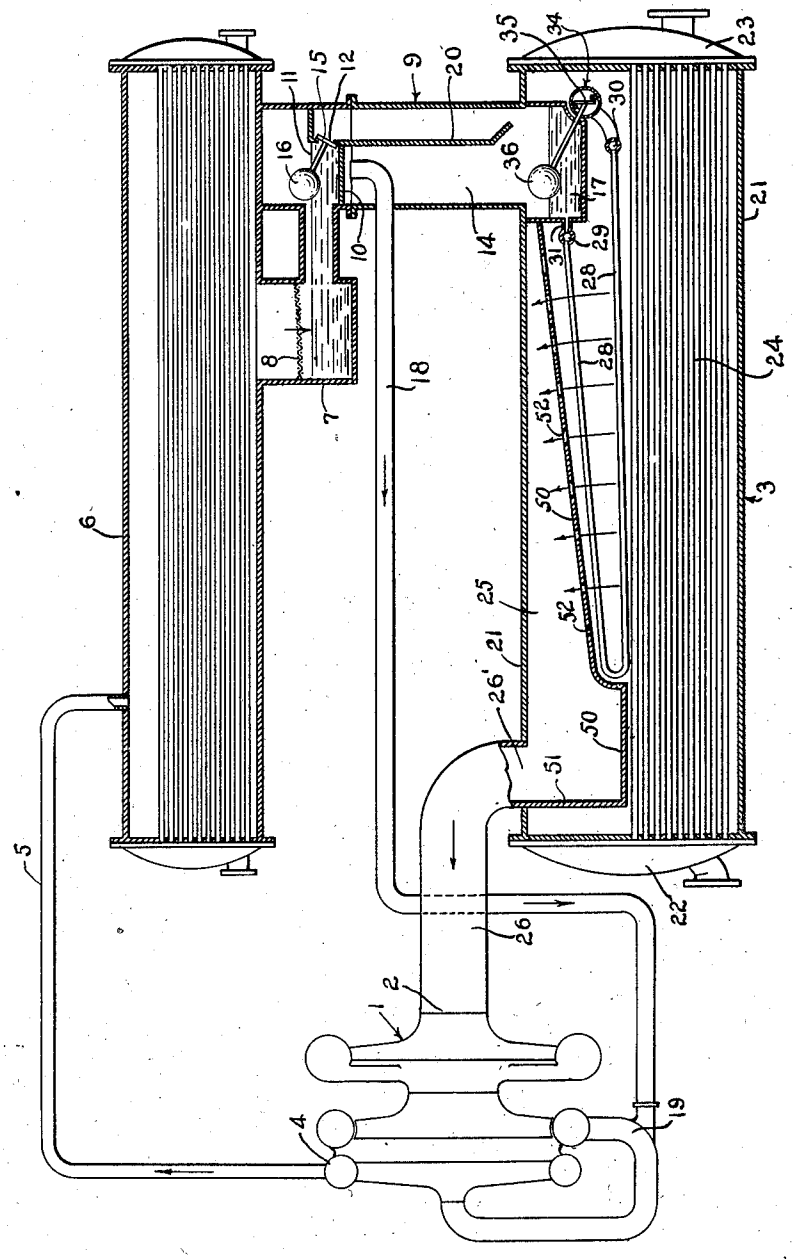


Fig. 1

Joseph R. Zwickl
INVENTOR
BY
ATTORNEY

Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 2

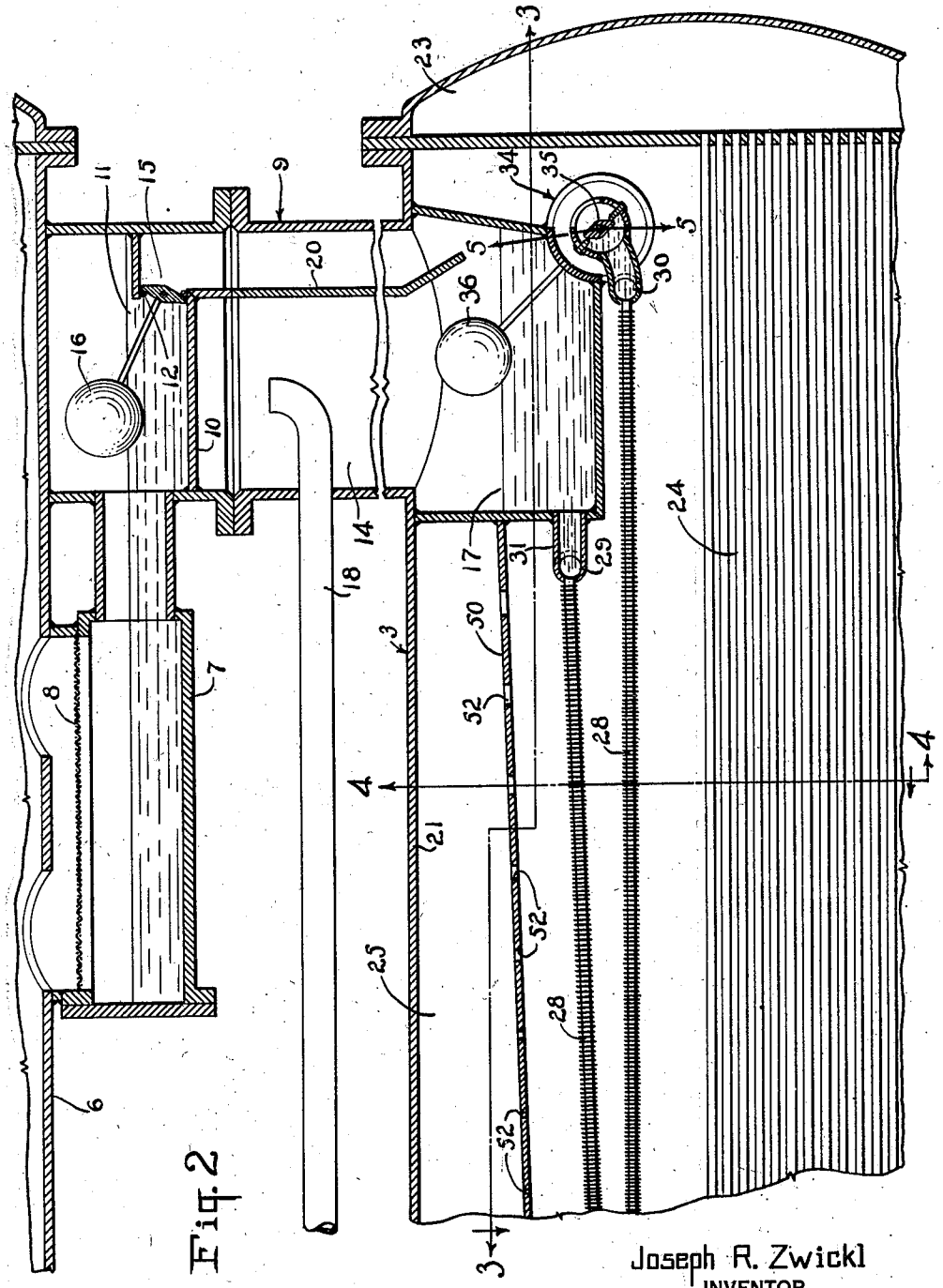


Fig. 2

Joseph R. Zwickl
INVENTOR

BY

ATTORNEY

Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 3

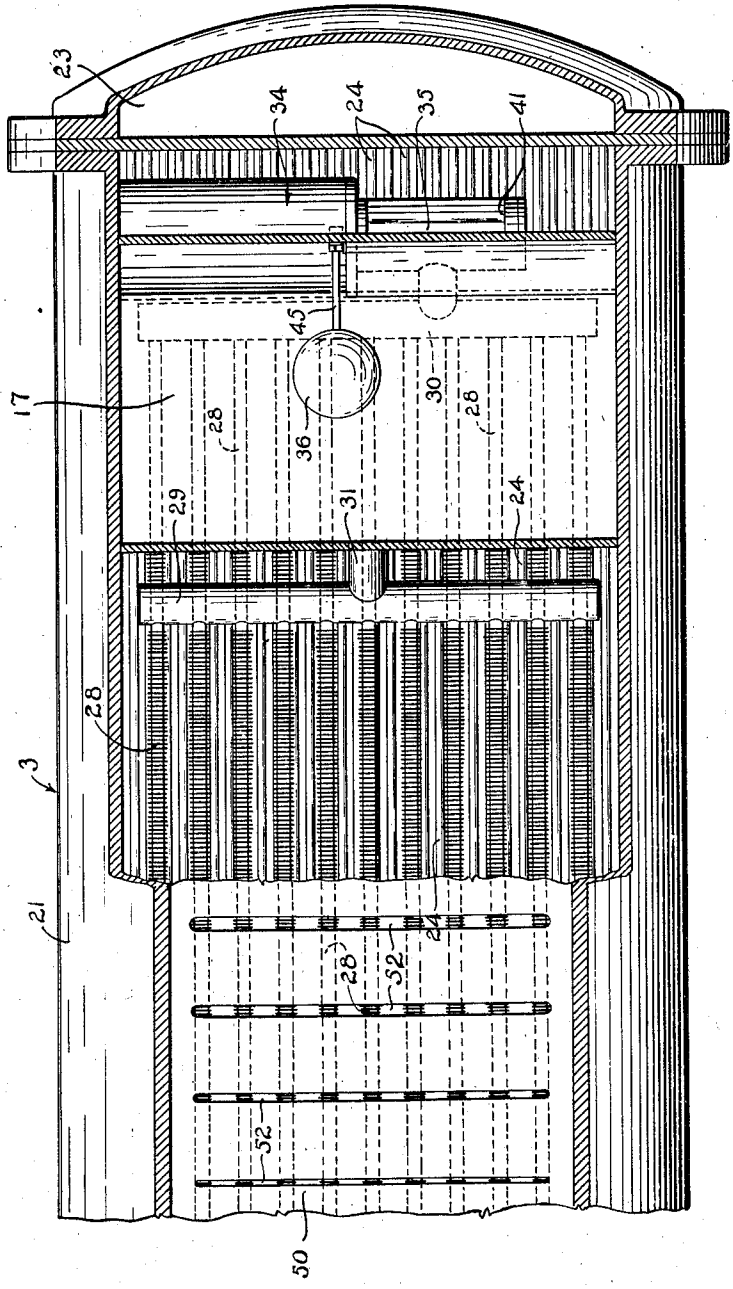


Fig. 3

Joseph R. Zwickl
INVENTOR
BY
ATTORNEY

Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 4

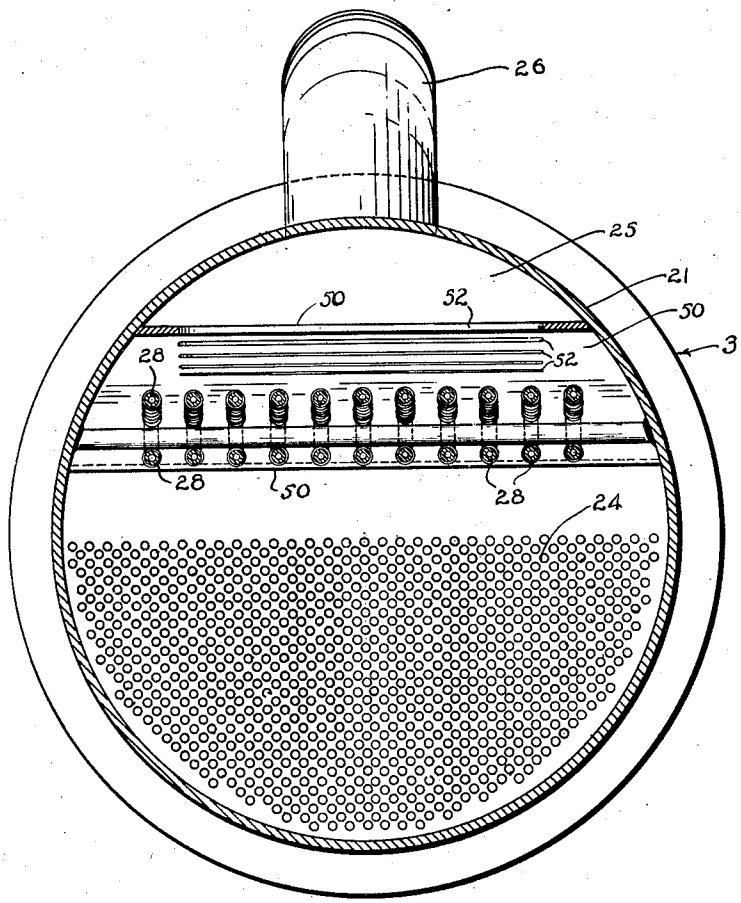


Fig. 4

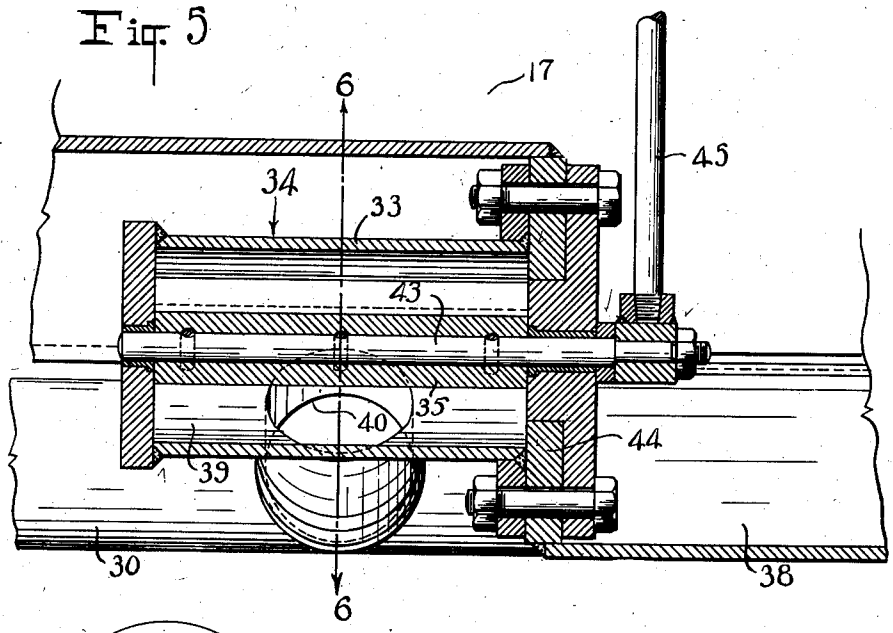
Joseph R. Zwickl
INVENTOR
BY
ATTORNEY

Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 5

Fig. 5



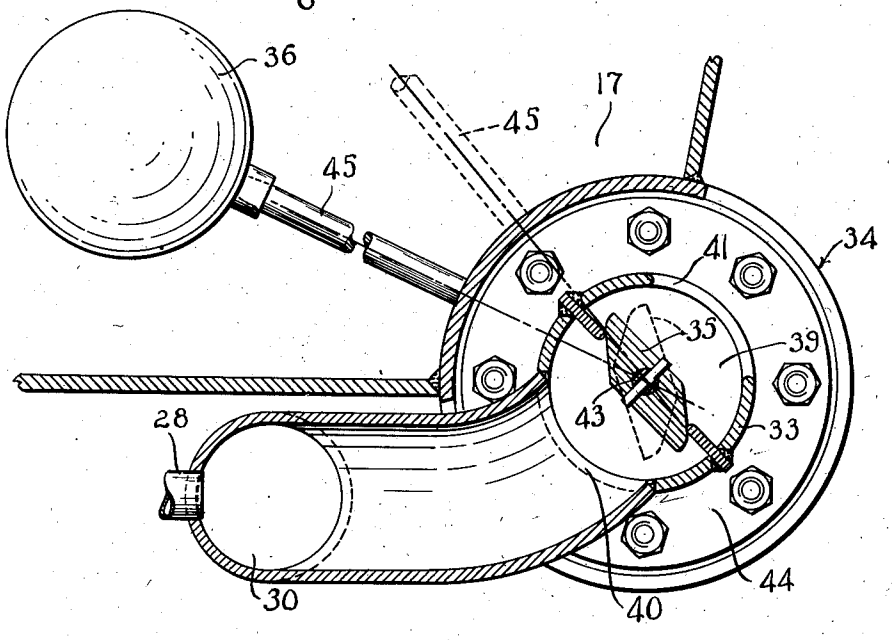


Fig. 6

Joseph R. Zwickl
INVENTOR
BY
ATTORNEY

Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 6

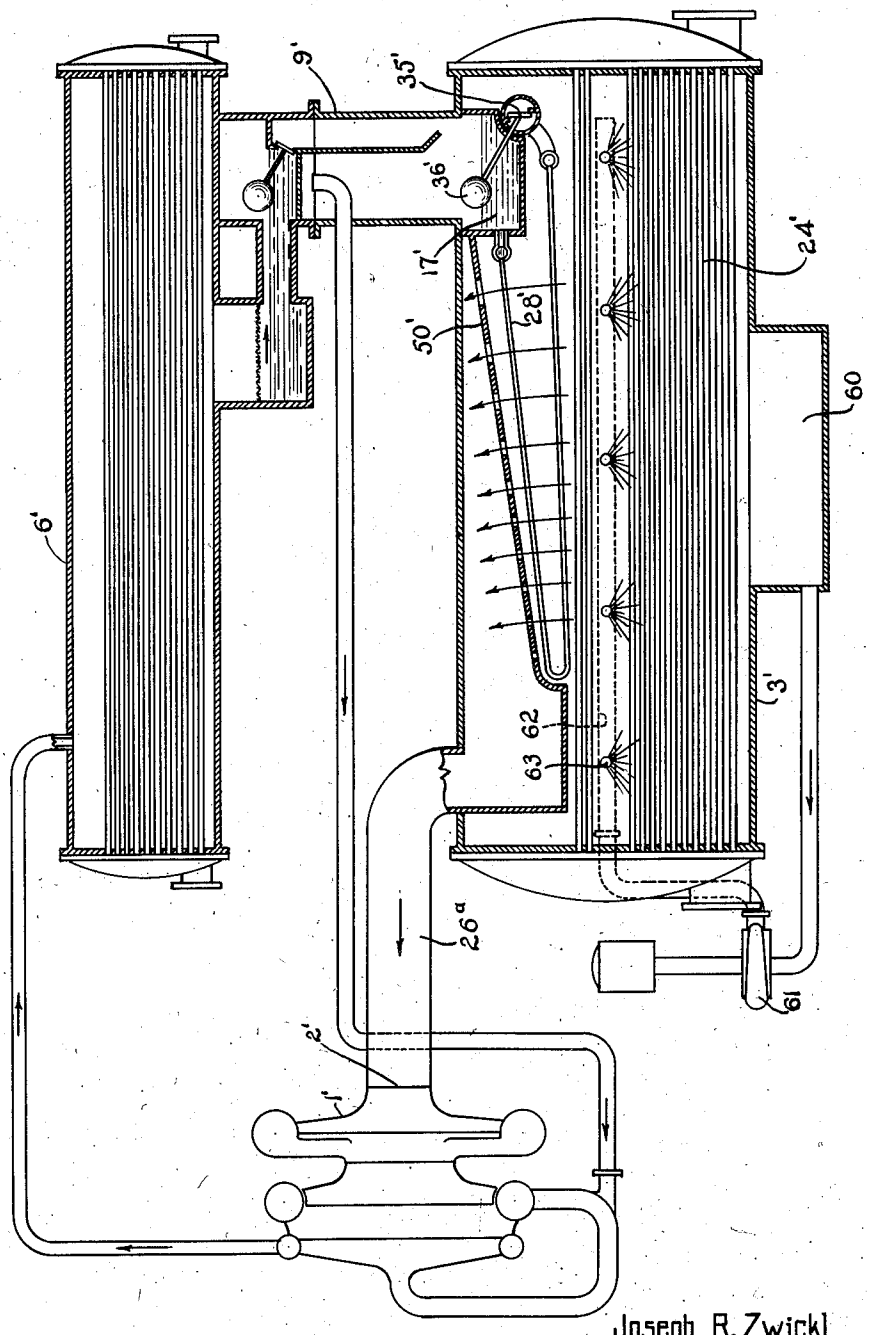


Fig. 7

Joseph R. Zwickl
INVENTOR
BY
ATTORNEY

Feb. 24, 1942. J. R. ZWICKL 2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Filed Dec. 6, 1940 7 Sheets-Sheet 7

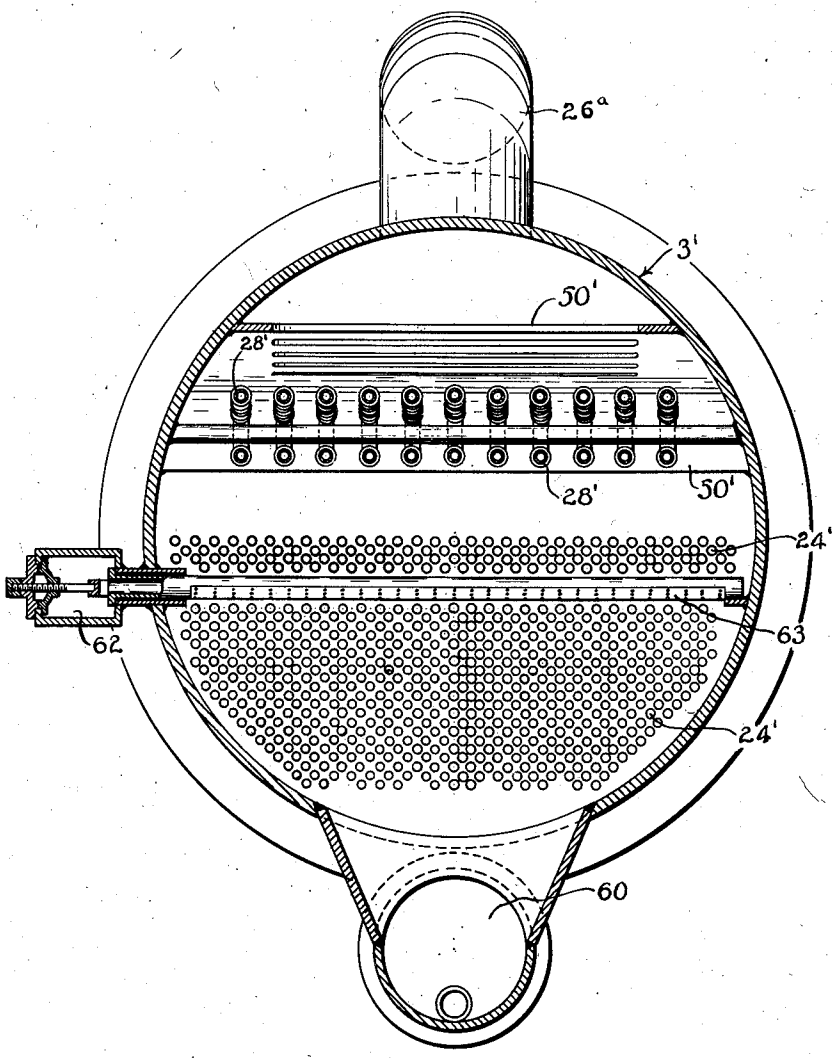


Fig. 8

Joseph R. Zwickl
INVENTOR
BY
ATTORNEY

Patented Feb. 24, 1942

2,274,391

UNITED STATES PATENT OFFICE

2,274,391

REFRIGERATING SYSTEM AND EVAPORATOR THEREFOR

Joseph R. Zwickl, East Orange, N. J., assignor to Worthington Pump and Machinery Corporation, Harrison, N. J., a corporation of Delaware

Application December 6, 1940, Serial No. 368,830

20 Claims. (Cl. 62—8)

This invention relates to refrigeration, and more particularly to a refrigerating system and apparatus employing a volatile liquid refrigerant, the refrigerant being evaporated in an evaporator or cooler for cooling a cooling medium, the system including a condenser for condensing the refrigerant vapor, and a compressor which compresses the vapor by centrifugal action to maintain a relatively low difference between the evaporating and condensing pressures, and delivers the refrigerant vapor from the evaporator to the condenser.

An object of the present invention is to provide a refrigerating system and apparatus of this type, embodying a novel and improved construction of evaporator and means of delivering the condensed refrigerant vapor thereto which will materially improve the efficiency of the entire system, reduce the size, weight and cost of the units embodied in the system, reduce horsepower requirements for a given tonnage of refrigeration, and will deliver a dry or slightly superheated refrigerant vapor to the compressor.

Another object of the present invention is to subject the condensed refrigerant to pressure reduction zones in its passage from the condenser to the evaporator, resulting in flashing or vaporization of a portion of the refrigerant prior to its entrance into the evaporator, and to deliver such flashed or vaporized refrigerant to an intermediate stage of compression of the compressor corresponding to its pressure relation to the suction pressure of the compressor, thereby reducing the work of compression and consequently its horsepower requirement, and to utilize the liquid refrigerant after it leaves the pressure reduction zone as a heating and drying medium for drying the vaporized refrigerant passing from the evaporator to the compressor.

A further object of the invention is to provide an improved type of evaporator for use in refrigerating systems, as above described, embodying a dryer coil therein for drying the evaporated refrigerant and to provide means to insure equal distribution of the refrigerant vapor over said coil during its passage across the coil and to the compressor inlet.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing a refrigerating system and evaporator therefor, of the preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a diagrammatic view of a refrigerating system and apparatus constructed in accordance with the present invention.

Figure 2 is a vertical longitudinal section through the improved evaporator.

Figure 3 is a horizontal longitudinal section through the improved evaporator taken on the line 3—3 of Figure 2.

Figure 4 is a vertical cross-section through the evaporator taken on the line 4—4 of Figure 2.

Figure 5 is a fragmentary section through a part of the evaporator taken on the line 5—5 of Figure 2.

Figure 6 is a cross-section taken on the line 6—6 of Figure 5.

Figure 7 is a diagrammatic view of a modified form of the system and apparatus.

Figure 8 is a vertical cross-section through a modified form of the evaporator.

Referring more particularly to the drawings, Figure 1 shows diagrammatically the improved refrigeration system embodying a compressor 1, which is shown as a multi-stage centrifugal compressor which compresses the refrigerant vapor by centrifugal action so as to maintain a relatively low difference between the evaporating and condensing pressure. The compressor 1 has its suction, indicated at 2, connected to the evaporator or cooler 3, from which it draws the evaporated refrigerant and in which it maintains the pressure as required for the particular installation.

The compressor 1 discharges from its final discharge 4 through a suitable discharge line, indicated at 5, into the condenser 6, where the compressed, vaporized refrigerant is condensed. From the condenser 6 the condensed refrigerant passes into the collection well 7, through a suitable strainer 8, and from thence through the connection 9 into the evaporator structure 3.

The compressor 1 may be of any approved type of multi-stage centrifugal compressor, and the condenser 6 may be of any approved type of condenser. However, the connection 9 and the evaporator 3 are of novel construction and operation, materially adding to the efficiency of the entire refrigerating unit.

The connection 9 has a partition 10 therein, forming a collection chamber 11 in the upper part of the connection 9, which is open to the well 7. The partition 10 is provided with an

opening 12, which opens into the flash chamber 14 of the connection 9. The opening 12 is controlled by a valve 15, operated by a float 16 resting upon the liquid refrigerant in the chamber 11.

Owing to the fact that the space 14 is under a lower pressure than the interior of the condenser 6, and consequently the well 7 and chamber 11, a part of the liquid refrigerant passing through the valve 15 into the chamber 14 will flash or vaporize, while the remaining liquid refrigerant will accumulate in the collection space 17 at the bottom of the connection 9. The vaporized refrigerant will pass upwardly in the connection 9 and out through a suitable connection 18 to an intermediate stage of the compressor 1, as indicated at 19. The flash gas, or vaporized refrigerant from the space 14, will be delivered to an intermediate stage of the compressor corresponding to its pressure relation to the suction pressure of the compressor.

A suitable baffle plate 20 is provided in the connection 9 to prevent the liquid refrigerant passing through the connection 9 from intermingling with the vaporized refrigerant or flash gas passing upwardly through the space 14 to the connection 18.

The evaporator or cooler 3 comprises an outer shell 21, as is customary in the construction of evaporators, and it has fluid boxes 22 and 23 at each end by means of which the cooling medium to be cooled in the evaporator enters and leaves the evaporator. The medium to be cooled passes through a plurality of circulating tubes 24 during its passage through the evaporator, as is also customary in evaporator structures.

The refrigerant cools the cooling medium passing through the tubes of the evaporator by its evaporation, occasioned by its heat exchange contact with the tubes, and the evaporated refrigerant passes into a collection space 25 in the top of the evaporator, from which it is drawn by the compressor 1 through the suction connection 26.

It has been found necessary to eliminate any unvaporized liquid from the refrigerant vapor and to dry same prior to its entrance into the suction 2 of the compressor 1 for increasing the efficiency of the refrigeration unit. For the purpose of drying such evaporated refrigerant a dryer coil structure 28 is mounted within the evaporator above the tubes 24 and between the tubes and the outlet 26' of the space 25, which outlet leads to the suction 2 of the compressor 1.

The dryer coil 28 consists of a plurality of looped tubes, preferably of the finned type, which have their inlet ends connected to a header 29 and their outlet ends connected to a header 30. The header 29 is connected by a suitable connection 31 to the collection space 17 for liquid refrigerant in the bottom of the connection 9, so that the liquid refrigerant passing from the condenser passes first into the header 29 and thence through the dryer coil 28, through the header 30, and thus this liquid refrigerant will serve as a heat exchange medium for heating and consequently drying the refrigerant vapor created by evaporation in the evaporator or cooler 3. The header 30 opens into the casing or housing 33 of the valve structure 34. A valve 35 is positioned in the housing 33 and is operated by a float 36 in the collection space 17, which float is moved by variation of the level of liquid refrigerant in the space 17. The valve structure 34 discharges into the evaporator 3, and thus both the flow of the liquid refrigerant through the dryer coils and its delivery into the evaporator 3 is controlled by the level of the liquid refrigerant in the collection space 17 in the bottom of the connection 9.

The valve structure 34 is shown in detail in Figures 5 and 6 of the drawings. While the valve housing 33 is carried by the connection 9, the interior of the housing is cut off from communication with the interior 17 of the connection 9 except through the header 29, coil 28 and header 30. This housing has an outer space or chamber 38, and an inner chamber 39, in which latter the valve 35 is positioned. The inner chamber 39 has an entrance opening 40 opening from the header 30, and an exit opening 41 on the opposite side of the valve 35 opening directly into the evaporator 3. The chamber 38 opens directly into the space 17. The valve 35 is carried by a suitable trunnion rod or shaft 43, extending outwardly through the head assembly 44 of the housing 33 and into the chamber 38. The float 36 is connected to the rod 43 within this chamber 38 by a suitable connection 45 for rocking the valve upon movement of the float so as to control the valve opening in proportion to the level of the liquid refrigerant in the space 17.

Owing to the fact that the outlet opening 26' is at one end of the vapor collection space 25 there would, under normal conditions, be a greater pull across the interior of the evaporator and the dryer coils 28 towards this outlet opening, caused by the suction action of the compressor. This would result in unequal distribution of the vaporized gas over the dryer coils, productive of inefficient drying of the vaporized refrigerant and relative inactivity of a large part of the dryer coil. For the purpose of preventing such action and for producing equal distribution of refrigerant vapor over the dryer coil during its passage into the space 25, distributor means have been provided for equally distributing the refrigerant vapor over the coil. Such distributing means co-acts with the suction pressure.

In the embodiment shown in the drawings the distributor means comprises a plate 50, which forms an inner wall for the space 25, being connected at one end to the connection 9 and at the other end to a partition 51, which aligns with the outer side of the outlet 26'. The plate 50 is provided with a plurality of slots 52 extending thereacross in spaced sets along the length of the plate. These slots are graduated in area, the slots of smallest area being nearest to the outlet 26' and the slots of largest area being farthest from the outlet 26'. The slots in the sets intermediate the smallest and largest area slots have their areas proportioned in proportion to the pressure pull of the compressor suction at their respective positions along the length of the plate 50, thus equally distributing the pressure pull of the compressor throughout the area beneath the plate 50 and consequently resulting in equal distribution of the vaporized refrigerant over the dryer coil 28 during the passage of such vapor to the collection space 25 and the suction 2 of the compressor.

In Figures 7 and 8 of the drawings a modified form of the system and evaporator is shown. In a refrigerating system of the type shown in these drawings a greater quantity of liquid refrigerant is circulated than is evaporated. In this modified form of system the compressor 1', condenser 6' and connection 9' are all the same in their construction as in the corresponding units in

the preferred form just described. The major features of the evaporator 3' are also the same, in that it includes the circulating tubes 24' for circulating the cooling medium through the evaporator, the dryer coil 28', a distributor plate 50', and a connection 26a to the suction 2' of the compressor. The delivery of the liquid refrigerant from the condenser to the evaporator is through the connection 9' and the dryer coil 28', and such delivery is controlled by a valve 35' which in turn is controlled by a float 36' in the collection space 17' in the bottom of the connection 9'. However, in this evaporator structure means are provided for circulating the liquid refrigerant through the evaporator 3'. The evaporator 3' has a collection well 60 at its bottom into which the liquid refrigerant flows. A circulating pump 61 takes the liquid refrigerant from the well 60 and delivers it to a feed channel 62 along one side of the evaporator. The feed channel 62 has a plurality of cross spray pipes 63 connected thereto at spaced intervals along its length which extend transversely through the nest of tubes 24' in the evaporator, by which means the liquid refrigerant is distributed over the tubes 24', below the spray tubes 63.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination, of an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a centrifugal compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof delivering liquid refrigerant to said evaporator, and a connection from said flash chamber to said compressor for delivering vapor direct to the compressor.

2. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination, of an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a centrifugal compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid connection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof delivering liquid refrigerant to said evaporator, a connection from said flash chamber to said compressor for delivering vapor direct to the compressor, a valve controlling delivery of liquid refrigerant from said collection chamber to said flash chamber, and a second valve controlling delivery of liquid refrigerant from the collection space to the evaporator.

3. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination, of an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a centrifugal compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof delivering liquid refrigerant to said evaporator, a connection from said flash chamber to said compressor for delivering vapor direct to the compressor, and a dryer coil in said evaporator for drying vaporized refrigerant passing from the evaporator to the compressor.

4. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination, of an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a multi-stage compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof, and a connection from said flash chamber to said compressor for delivering vapor from the flash chamber into the compressor at a point of intermediate pressure in the compressor.

5. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination, of an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a multi-stage compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof, a connection from said flash chamber to said compressor for delivering vapor from the flash chamber into the compressor at a point of intermediate pressure in the compressor, and means in said evaporator for drying vaporized refrigerant during its passage from the evaporator to the compressor.

6. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination of, an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a multi-stage compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and

a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof, a connection from said flash chamber to said compressor for delivering vapor from the flash chamber into the compressor at a point of intermediate pressure in the compressor, and a dryer coil in said evaporator receiving liquid refrigerant from said collection space and delivering it into the evaporator.

7. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination of, an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a multi-stage compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof, a connection from said flash chamber to said compressor for delivering vapor from the flash chamber into the compressor at a point of intermediate pressure in the compressor, a dryer coil in said evaporator receiving liquid refrigerant from said collection space and delivering it into the evaporator, and a valve controlled by the level of liquid refrigerant in said collection space for controlling the flow of liquid refrigerant through said dryer coil.

8. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, the combination of, an evaporator for the liquid refrigerant, a condenser for the refrigerant vapor, a multi-stage compressor which delivers the refrigerant vapor from the evaporator to the condenser and maintains a predetermined pressure in the evaporator, a connection between said condenser and evaporator to deliver liquid refrigerant from the condenser to the evaporator, a partition in said connection dividing it into a liquid collection chamber and a flash chamber, said connection having a liquid refrigerant collection space in the bottom thereof, a connection from said flash chamber to said compressor for delivering vapor from the flash chamber into the compressor at a point of intermediate pressure in the compressor, and means in said flash chamber for preventing liquid refrigerant entering the flash chamber from contacting vaporized refrigerant passing from the flash chamber to the compressor.

9. The herein described method of refrigeration which comprises the following steps, vaporizing volatile liquid refrigerant, compressing the vaporized refrigerant by a series of stage compressions and centrifugal action to maintain a relatively low pressure difference between the evaporating and condensing pressures of the refrigerant, heating the vaporized refrigerant after vaporization and prior to compression for drying it, condensing the compressed vapor, flashing a portion of the condensate, passing the vaporized condensate formed by said flashing to an intermediate stage of the compression action, and re-evaporating the unflashed portion of the condensate.

10. The herein described method of refrigeration which comprises the following steps, vaporizing volatile liquid refrigerant, compressing the vaporized refrigerant by a series of stage compressions and centrifugal action to maintain a relatively low pressure difference between the evaporating and condensing pressures of the refrigerant, heating the vaporized refrigerant after vaporization and prior to compression for drying it, condensing the compressed vapor, flashing a portion of the condensate, passing the vaporized condensate formed by said flashing to an intermediate stage of the compression action, and re-evaporating the unflashed portion of the condensate, said method embracing heating of the vaporized refrigerant by passing it in heat exchange relationship with the condensate returning to the circulating body.

11. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, and a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet.

12. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, and a collector for refrigerant to be vaporized, said collector delivering the refrigerant to said dryer coil, said coil discharging the refrigerant into the vaporizing portion of the evaporator.

13. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, a means for collecting refrigerant to be vaporized, said means delivering the refrigerant to said dryer coil, said coil discharging the refrigerant into the vaporizing portion of the evaporator, and a valve controlled by the level of refrigerant in said collection space for controlling the delivery of refrigerant from the dryer coil into the vaporizing portion of the evaporator.

14. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, and a distribu-

tor plate between said dryer coil and said outlet for maintaining equal distribution of vapor over said dryer coil.

15. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, a means for collecting refrigerant to be vaporized, said means delivering the refrigerant to said dryer coil, said coil discharging the refrigerant into the vaporizing portion of the evaporator, and a distributor plate between said dryer coil and said outlet for maintaining an equal distribution of vapor over said dryer coil.

16. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, a means for collecting refrigerant to be vaporized, said means delivering the refrigerant to said dryer coil, said coil discharging the refrigerant into the vaporizing portion of the evaporator, a valve controlled by the level of refrigerant in said collection space for controlling the delivery of refrigerant from the dryer coil into the vaporizing portion of the evaporator, and means in said shell between said dryer coil and outlet for maintaining equal distribution of vaporized refrigerant over said coil.

17. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant in its passage through said space to said outlet, a means for collecting refrigerant to be vaporized, said means delivering the refrigerant to said dryer coil, said coil discharging the refrigerant into the vaporizing portion of the evaporator, and distributor means between said dryer coil and outlet constructed and arranged to maintain a uniform vapor flow between the space about the dryer coil and the outlet over the full length of the vapor collection space for maintaining equal distribution of the vapor over the dryer coil.

18. In a refrigerating system, an evaporator including, a shell having a vapor collection space therein and an outlet for vapor, a dryer coil in said space, and a distributor means in said collection space between the dryer coil and outlet, said distributor means acting to maintain a uniform vapor flow between the space about the dryer coil and the outlet over the full length of the vapor collection space for maintaining equal distribution of vapor over the dryer coil.

19. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, a plurality of sprayers in said shell below said dryer coil, said shell having a collection space therein for liquid refrigerant, and means for circulating liquid refrigerant through said sprayers over said tubes and through said liquid refrigerant collection chamber.

20. In a refrigerating system in which a volatile liquid refrigerant is vaporized, the vapor condensed and the liquid refrigerant returned to be again vaporized, an evaporator comprising a shell having a vaporizing portion and an outlet for vaporized refrigerant, a plurality of tubes extending through said shell, said shell having a vapor collection space therein above said tubes through which the vaporized refrigerant passes to said outlet, a dryer coil in said space for heating the vaporized refrigerant on its passage through said space to said outlet, a plurality of sprayers in said shell below said dryer coil, said shell having a collection space therein for liquid refrigerant, means for circulating liquid refrigerant through said sprayers over said tubes and through said liquid refrigerant collection chamber, and a distributor plate between said dryer coil and said outlet for maintaining equal distribution of vapor over said dryer coil.

JOSEPH R. ZWICKL.