March 18, 1930. G. W. GAIL 1,751,317

EVAPORATOR ELEMENT

Filed March 23, 1928 2 Sheets-Sheet 1

Fig. 1.

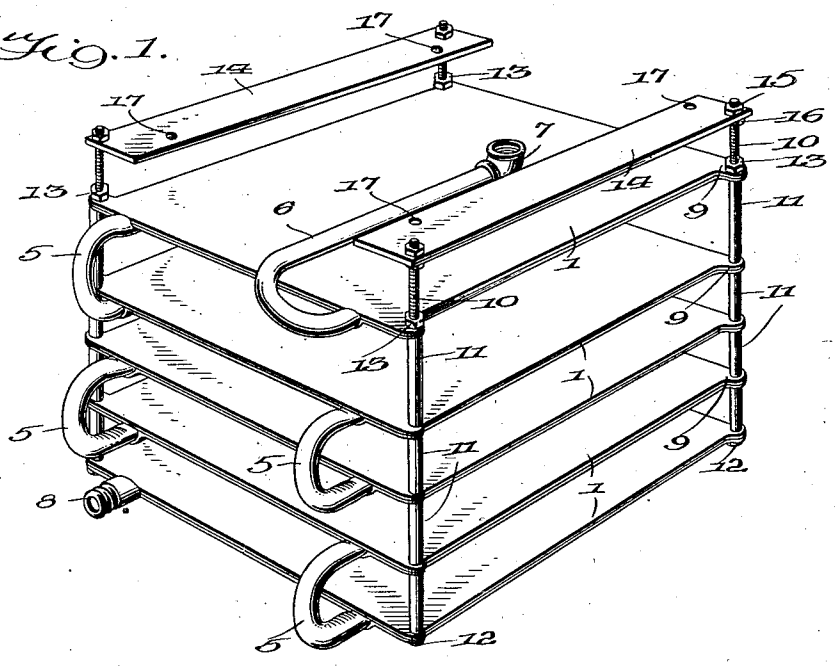
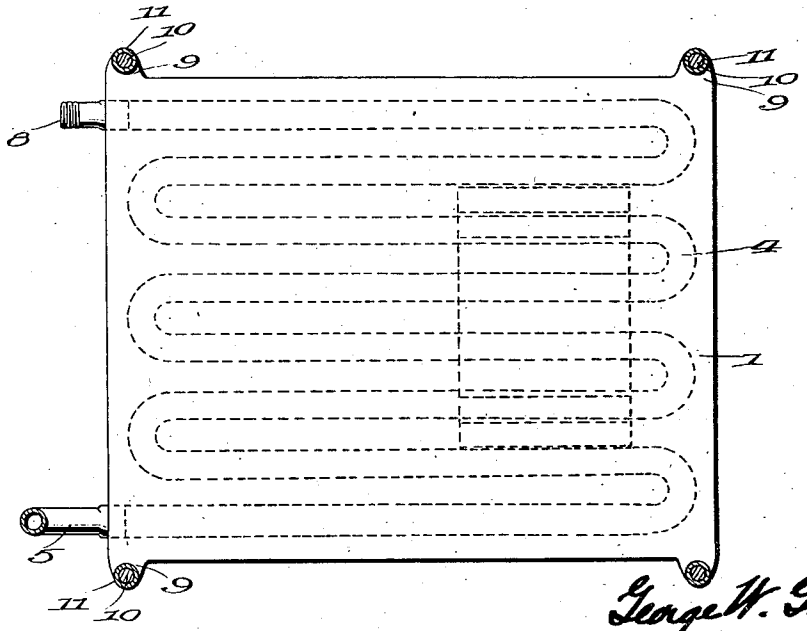


Fig. 2.



Inventor

George W. Gail,

By R. Clyde Orcutt. Attorney

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EVAPORATOR ELEMENT

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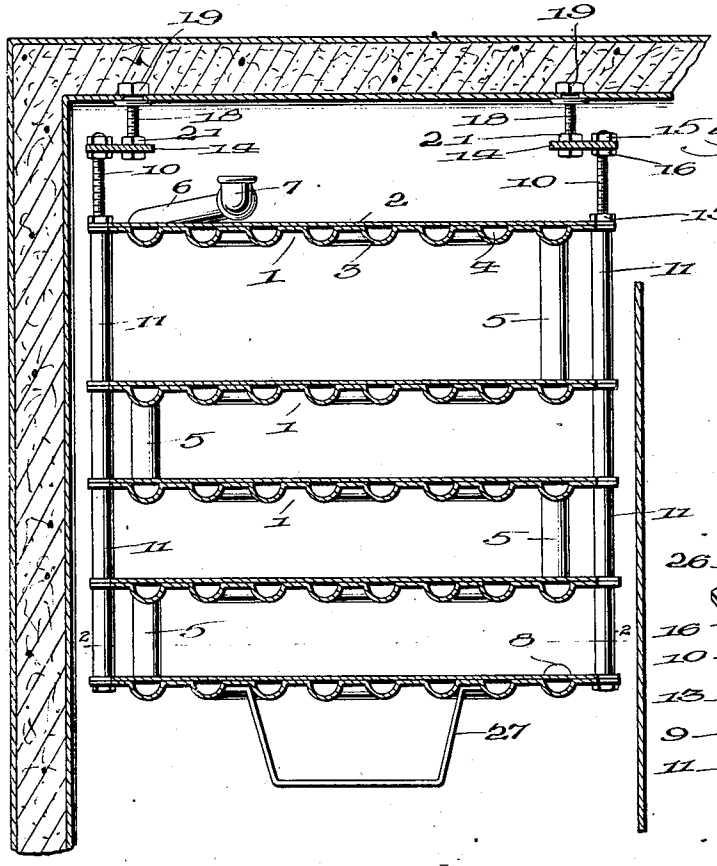


Fig. 3.

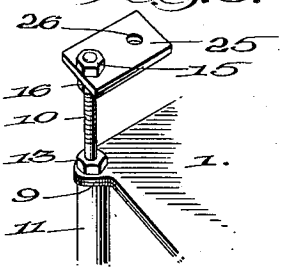


Fig. 5.

Fig. 6.

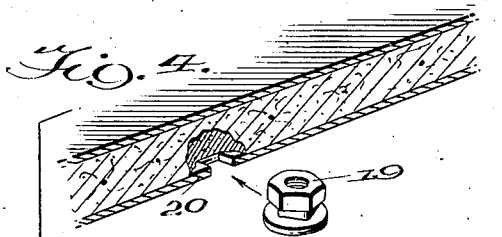
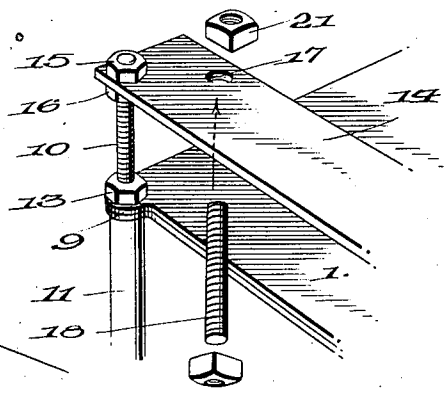
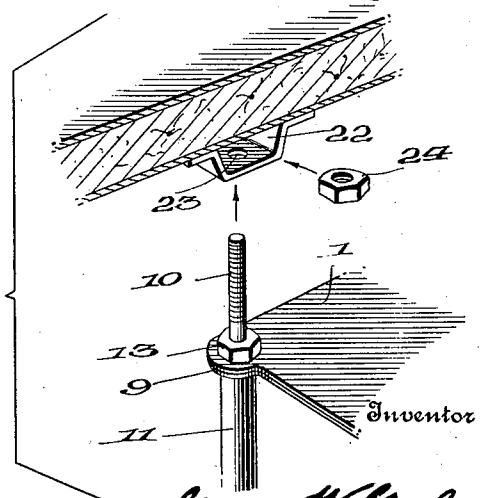


Fig. 4.





Inventor

George W. Gail,

By R. Clyde Leavitt Attorney

Patented Mar. 18, 1930 1,751,317

UNITED STATES PATENT OFFICE

GEORGE W. GAIL, OF RUXTON, MARYLAND, ASSIGNOR TO KULAIR CORPORATION, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF DELAWARE

EVAPORATOR ELEMENT

Application filed March 23, 1928. Serial No. 264,243.

This invention relates to certain improvements in the evaporator elements for refrigerating machines, with particular reference to machines of the household or domestic type, although not specifically limited thereto.

The apparatus as covered by the present invention is the same general type of evaporator or heat exchange unit as disclosed in the copending application of George W. Gail and Abraham J. Kusel, filed January 13, 1927, Serial No. 160,960, but since the filing of that application there have been made certain improvements and refinements which tend to improve appearance and rigidity, and simplify construction, with resulting decrease in manufacturing cost. These improvements relate chiefly to the manner of connecting up or assembling the individual units and the manner in which the assembled evaporator is mounted in the refrigerator.

The construction herein disclosed is the result of continual experimental work and practical demonstrations, and represents the latest form of apparatus, the object of the invention being to produce a device of this character involving the use of a series of superimposed plate like heat exchange units with means for rigidly connecting these units together in an easily assembled manner and at the same time providing a structure capable of being handled, transported and mounted in operative position without in any way distorting the apparatus or interfering with or destroying the fluid tight connections.

This is accomplished by securing the four corners of each of the superimposed plate like units by a tie bolt arrangement, said units being held in spaced relation by tubular members or sleeves carried by the bolts between each unit and the whole clamped together by nuts or the like as clearly shown in the drawings. In this construction, as distinguished from the prior apparatus as covered in the copending application above referred to, the assembly of the individual shelf-like units to form the complete heat exchange unit is greatly facilitated, because the spacing tubes are cut to proper length, thus giving the desired space relation of the various "shelves". The insertion of these spacing tubes and tie rods, and the tightening of the bolts being all that is necessary for positioning the various shelves. This spacing is predetermined to match the connecting tubes previously formed into U-shape, and thus the structure provides a quick method of connecting tube assembly, acting as a jig, and the U-tubes may then be permanently connected by a method such as brazing, welding, or soldering.

Aside from providing a simple and rigid means of connecting or assembling these individual plate like heat exchange units these bolts or threaded rods form a very satisfactory and efficient means for supporting the assembled element from the top of the refrigerator compartment, in a manner to be hereinafter more fully described.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which

Fig. 1 illustrates in perspective the assembled apparatus;

Fig. 2 is a horizontal sectional view taken on line 2—2 of Fig. 3, half way between lowermost shelf unit and unit next above it;

Fig. 3 is a view partly in section and partly in elevation showing the manner of mounting the evaporator element in the refrigerator compartment;

Fig. 4 is an enlarged detail view illustrating the preferred manner of securing the evaporator element in position; and

Figs. 5 and 6 show modifications of other means of mounting or securing the evaporator in operative position.

Referring to the drawings in detail the improved apparatus comprises a series of superimposed heat exchange units 1 so mounted one above the other in spaced relation.

Referring specifically to Fig. 3 these heat exchange units 1 each comprise a flat upper plate or sheet 2 and a lower corrugated plate 3, said plates being held together by a process of seam and spot welding to form a continuous serpentine passageway 4 as illustrated in dotted lines in Fig. 2. The passageways of the respective units 1 are connected by curved pipe sections 5, the top unit being provided with an elongated pipe sec-

tion 6 having mounted on the end thereof, a pipe coupling or the like 7 adapted to be connected with a condenser (not shown) forming a part of the conventional household refrigerating apparatus. It is to be of course understood that an expansion valve is to be mounted intermediate pipe coupling 7 and the pipe running to the condenser to provide an operative construction, these latter elements, however, form no part of the present invention and need no further description. Likewise the bottom unit 1 of the assembled evaporator element is provided with a coupling 8 by which said evaporator element is connected to the intake of the usual compressor (not shown) in a manner well known in the art.

In this type of evaporator element, as previously described in the above referred to copending application, these superimposed units 1 were secured together by sheet metal angle brackets or the like either soldered, brazed or welded to said units. It has developed, however, that this means of assembling the units was not sufficiently rigid to meet the requirements of apparatus of this type and in order to overcome these defects and as disclosed in the present application the corners of these units are provided with apertured projections or extensions 9 for receiving bolts or rods 10, a separate rod being provided at each of the four corners of the respective units. In order to properly space said units 1, as the same are being assembled on the rods 10, a tube or sleeve section 11 is interposed between the respective heat exchange units 1 in an obvious manner. The lower end of each bolt or rod 10 is provided with a nut or head 12 and after the necessary number of units are assembled according to the capacity of the evaporator required said units 1 are clamped in position by nuts or the like 13. It is to be noted that the bolts or tie rods 10 are extended above the top heat exchange unit 1 for the purpose of providing a means of supporting or suspending the assembled element within the box or refrigerator compartment. This is accomplished by securing to the upper ends of the tie rods or bolts 10, oppositely disposed sheet metal plates or straps 14, the ends of these respective plates 14 being secured in position by clamp nuts or the like 15 and 16. Each end of the sheet metal plates 14 is provided with an aperture 17 for receiving a stud bolt or similar fastening 18 (see Fig. 4) which bolt is threaded into a nut or the like 19 rigidly secured in the top of the refrigerator compartment 20 in any approved manner and after being properly adjusted as to height the bolt 18 is clamped to the plates 14 by a lock nut 21.

As an alternative construction or manner of supporting the evaporator element in a refrigerator compartment and as shown in Fig. 6, the upper inner face of the refrigerator box may be provided with a U-shaped member or a strap 22 constructed with an aperture 23 to receive directly the upper end of the tie bolt 10, said parts being secured together by a nut or a similar threaded fastening 24. A still further modification is shown in Fig. 5, where in place of the extended plate 14 as shown in Fig. 4, a short plate section 25 can be used, said plate section 25 being provided with an aperture 26 corresponding to the aperture 17 in the construction as shown in Fig. 4. It is of course to be understood that the modifications as shown in Figs. 5 and 6 apply to all four corners of the evaporator element.

Referring to Fig. 3 secured to the bottom unit 1 by spot welding or the like is a sheet metal U-shaped bracket 27 for supporting the thermostat immediately adjacent the evaporator element which not only provides a novel support for this apparatus forming a necessary part of a refrigerating system, but places and maintains said thermostat in proper position to accurately control the desired temperature in the refrigerating compartment.

As shown (see Fig. 1) the plates 14 are secured to the upper ends of the tie rods 10 by nuts or the like 15 and 16, and the uppermost unit 1 is clamped in position by nuts 13, the upper ends of said bolts 10 being provided with threads to permit this construction but obviously said construction could be modified by using sleeves similar to sleeves 11 between the plates 14 and the upper unit 1, thus eliminating the necessity of so long a threaded portion at the upper ends of the rods 10 and also eliminating the nuts 13 and 16. Conversely the rods 10 could be threaded throughout their entire length and nuts such as 13, 15 and 16, used for spacing and securing the units 1 in assembled position, and thereby doing away with the use of the interposed sleeves 11.

What I claim is:

1. An expander element for refrigerating machines, comprising a series of substantially flat plate like heat exchange units provided with passageways, superimposed one upon the other, conduits connecting the passageways of the respective units and means independent of said conduits for rigidly clamping the said units together in spaced relation.

2. An expander element for refrigerating machines, comprising a series of substantially flat plate like heat exchange units, provided with passageways, superimposed one upon the other, conduits connecting the passageways of the respective units and a common means, independent of said conduits for rigidly clamping said units together in spaced relation.

3. An expander element for refrigerating machines, comprising a series of substantially

flat plate like heat exchange units, provided with passageways, superimposed one upon the other, conduits connecting the passageways of the respective units and means, independent of said conduits for rigidly clamping said units together in spaced relation, said clamping means also providing a means for suspending the element in a refrigerating compartment.

4. An expander element for refrigerating machines, comprising a series of substantially flat plate like heat exchange units, provided with passageways, superimposed one upon the other, conduits connecting the passageways of the respective units, tie rods passing through said superimposed units independent of said conduits, means carried by said rods and positioned between the superimpose corners of said units to maintain the units in spaced relation and means for clamping all of said parts together, said clamping means also providing a means for suspending the element in a refrigerating compartment.

5. An expander element for refrigerating machines, comprising a series of substantially flat plate like heat exchange units, provided with passageways superimposed one upon the other, conduits connecting the passageways of the respective units, tie rods passing through said superimposed units independent of said conduits, means carried by said rods and positioned between the superimposed corners of said units to maintain the units in spaced relation, means for clamping all of said parts together and means associated with the upper ends of said tie rods for suspending the element within a refrigerator compartment.

6. An expander element for refrigerating machines, comprising a series of substantially flat square plate like heat exchange units, provided with passageways, superimposed one upon the other, conduits connecting the passageways of the respective units, tie rods passing through the corners of said superimposed units independent of said conduits, sleeve sections carried by said rods and positioned between the superimposed corners of said units to maintain the units in spaced relation and nuts or the like threaded on said rods for clamping all of said parts together.

7. An expander element for refrigerating machines, comprising a series of substantially flat plate like heat exchange units superimposed one upon the other, tie rods passing through the corners of said superimposed units, sleeve sections carried by said rods and positioned between the superimposed corners of said units to maintain the units in spaced relation and supporting elements carried by the upper ends of said rods for suspending the element within a refrigerator compartment.

In testimony whereof I affix my signature.

GEORGE W. GAIL.