To all whom it may concern:

Be it known that I, Fred W. Wolf, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Refrigerating Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in refrigerating apparatus, and more particularly to refrigerating apparatus of the compression type and consists of the matters hereinafter described and pointed out in the appended claims.

The object of the invention is to provide a refrigerating unit, more particularly intended for domestic use, which is adapted to be applied to any of the usual refrigerators by simply cutting an opening in the top wall of the refrigerator for the reception of the expansion coil.

The particular type of refrigerating apparatus embodied in my invention as shown herein is such as that described in an application filed by me on the 23rd day of December, 1913, Serial No. 808,889. The many uses of my improved refrigerating unit will appear as I proceed with my specification.

In the drawings:

Figure 1 represents a perspective view of a unitary refrigerating apparatus, made in accordance with my invention.

Fig. 2 is a view representing a refrigerating apparatus of the domestic type, partly in elevation, and partly in section, with my unitary refrigerating apparatus in position thereon, to cool the interior of the same.

Referring now to that embodiment of my invention illustrated in the accompanying drawings: 5 indicates as a whole a refrigerating apparatus, preferably of the domestic type, which may be of any suitable material and construction. As shown, the top wall 6 of said refrigerator is provided with an aperture or opening 7 therethrough.

8 indicates, as a whole, my improved unitary refrigerating apparatus. Said apparatus comprises primarily a base or support 10 which is adapted to rest upon the top wall of the refrigerator and to cover the opening 7 therein. The said base 10 is preferably made of wood and rectangular in form and generally longer than it is wide, and is provided in its bottom side with a sheet of felt or like material 11, which may be attached thereto in any suitable manner. Said felt effectually seals the interior of the box and absorbs any vibrations which might occur, thus reducing to a minimum the objectionable sounds which might be caused by vibration due to the moving of the various parts.

Mounted on the base 10 and toward one end thereof, is located an upright compressor 12 fixed to a block or standard 13 which is rigidly attached to said base 10. Near the other end of said base 10 is located a motor 14 for driving said compressor. 15 indicates a driven pulley adapted for the operation of the compressor 12, which pulley is operatively connected by means of one or more belts 16 to the motor 14. Said pulley 15 is of comparatively large diameter, and to accommodate the same, a pit 18 is formed in the base 10 in the vertical plane of said pulley, into which the bottom of the pulley extends. The wheel 15 is made heavy to act as a fly wheel and preferably the spokes 17 thereof are constructed to form fan-like spiral blades which act when the fly wheel is rotated to produce a current of air over the top of the refrigerator, effecting a continual change in the atmosphere surrounding the same.

18 indicates, as a whole, the condensing coil. Said coil is made of tubing of a comparatively small cross section and of a comparatively thin wall, and comprises a plurality of vertically spaced, horizontally disposed loops 19, which approximate in size and form the plan of the base 10. Said loops occupy a maximum of horizontal space without extending beyond the edges of said base.

The loops may be supported from the base in any suitable manner, but, as illustrated, are attached to upright bars 20 located near the corners of the base 10 on the outside of said coils at the corners thereof, the lower ends of said bars being bent to form feet by means of which said bars are attached to said base 10. The loops are held
in supporting engagement upon the bars 20 by means of second bars or strips 21 located on the inside of said coil at the corners thereof, adjacent the upright bars 20 and attached to said bars 21 in any convenient manner.

As many loops 19 are used in said condenser coil 18 as will be required to properly air cool the refrigerant therein, but by the construction and arrangement described, the vertical height of the top coil above the base 10 will be approximately level with the top of the compressor 12 so that the operating parts of the system will be inclosed, thus acting as a guard about said operating parts.

Each loop is of substantially the same plan as the common base 10 upon which all parts of the system are supported and by making said condensing coil of a tubing of small cross sections and of thin metal, a maximum of radiating surface is obtained so that air cooling is sufficient to properly condense the refrigerant therein.

The top loop 19 of the coil 18 has an inlet end 22 which is connected to the discharge side of the compressor 12 in such manner as to receive the compressed refrigerant from the cylinder thereof. The bottom loop 19 of the coil has an outlet end 23 which is arranged to extend through an aperture 24 formed in the base 10 near that end upon which the compressor 12 is mounted, and is there connected by means of an expansion valve 25 to the inlet end 26 of an expansion coil 27. Interposed between the outlet end 23 of the condenser coil 18 and the inlet end 26 of the expansion coil 27, is a by-pass pipe 28 in which is located a high pressure safety valve 29, which valve is designed to relieve the condenser coil of a pressure higher than that at which it is designed to operate.

What is referred to above as an "expansion coil 27" may be any desired form of chamber for the expansion of the refrigerant. As herein shown it is located in a plane below the base 10 and preferably under that end of the base 10 upon which the compressor 12 is mounted and is arranged in the form of a plurality of vertically spaced apart series or nests 27a, 27b and 27c. Each nest 27a, 27b and 27c comprises a plurality of horizontal, alternately arranged layers of W-shaped loops of pipe, the lowest layer of pipe in each nest or series being connected to the uppermost layer of pipe in the adjacent series below. The lowest layer of pipe of the nest or series 27c is connected at its outlet end to an upright pipe 27d which extends through a second aperture 27e formed in the base 10 and said pipe 27d is connected at its upper end to the inlet side of the compressor 12. In plan, each series or nest is made rectangular in form and said series are supported from the base 10 in the following manner:

The series or nests of pipe 27a, 27b and 27c of the expansion coil are supported from the base 10 by means of a plurality of vertically arranged bars 30 which engage the outside surfaces of the corners of each of said series or nests and said bars 30 depend from and are attached to the base piece 10 by means of angularly extending feet 30a. Arranged to engage the inside surfaces of the corners of each nest or series 27a, 27b and 27c and coating with said bars 30 to support said nests or series is located a plurality of second bars 31 which are suitably attached at spaced intervals to the bars 30 in any convenient manner. The lowermost series of coils 27a and 27b are arranged to support upon each upper layer thereof a plate 32 in which is formed cup-shaped depression 33, in which is placed drinking water to be frozen into ice, which ice is adapted for table use. Said depression may be made in any desired shape or form so that the water therein when frozen will partake of the shape or form thereof.

Should it be so desired, I may find it convenient to add to the system a thermostatic control device so arranged that when a certain predetermined low temperature has been reached within the interior of the box in which the expansion coil 27 is located, the motor 14 operating the system will be stopped through the action of said thermostatic control device 34, and when the temperature within the refrigerator has reached a predetermined high degree, the motor 14, through the thermostatic control device 34, will be again started, thus putting the system into operation. Such a thermostatic control could be conveniently mounted upon one of the bars 31 so as to be under the influence of the temperature within the refrigerator.

I may also find it preferable to have as a part of my unitary system, a safety motor lead control switch 35, which may be conveniently located upon the upper surface of the base 10 between the motor 14 and the compressor 12. This switch control is arranged to prevent burning out of the motor armature under the resistance imparted thereto during the starting of the compressor. Said switch box 35 forms a convenient location for the main starting switch 36, said switch being suitably connected with the main source of current for operating the motor.

My unitary refrigerating apparatus is intended especially for use with sulfurous acid (SO2) as the refrigerant. Such refrigerant, on account of its low boiling point, may be more easily condensed and liquefied by air cooling without the use of a cooling water. My apparatus provides a large superficial area in the condensing coil so as to furnish the necessary amount of
radiation and at the same time provides such a condensing coil in connection with the other parts of the apparatus that the whole refrigerating system may be mounted upon one common base.

It is apparent from the foregoing description that the refrigerating system herein described constitutes a refrigerating unit complete in itself and may be applied to any ordinary domestic refrigerator. All that is required is to provide an opening in the top wall of the refrigerator of a size permitting the expansion coil 27, with its supporting bars 31 and 32 to be inserted therethrough.

When the unitary system is placed in position described upon the top wall thereof, with the expansion coil within the refrigerator, the felt pad 11 effectually seals the interior of the refrigerator from the outside atmosphere.

The switch mechanism is then connected to the ordinary electric light socket or drop cord, and the device as a whole is ready to operate.

While in describing my invention, I have referred to certain details of mechanical construction and arrangement. I do not wish to limit myself thereby, except as may be pointed out in the appended claims.

I claim as my invention:

1. A refrigerating unit adapted to be applied to a refrigerator box having an opening in one wall thereof, comprising a base adapted to bear against the said wall of the refrigerator box and to close the opening therein, a compressor, a motor for driving the same and a condenser, all supported on said base, an expansion coil extending from said base and adapted to be inserted through the said opening in the wall of the refrigerator box, means connecting said expansion coil in supporting relation to said base and conduits extending through said base and operatively connecting said condenser and said compressor with said expansion coil.

2. A refrigerating unit adapted to be applied to a refrigerator box having an opening through the top wall thereof, comprising a base adapted to bear against said top wall of the refrigerator box and to close the opening therethrough, a compressor, a motor for driving the same, and an air cooled condensing coil, all supported on said base, an expansion coil depending from said base and adapted to be inserted through the said opening in the top wall of said refrigerator box, means connecting said expansion coil in supporting relation to said base, and conduits extending through said base and operatively connecting said condensing coil and said compressor with said expansion coil.

3. A refrigerating unit adapted to be supported on the top of a refrigerator box having an opening therethrough, comprising a base, adapted to rest on the top wall of said refrigerator box and to close the opening therein, an insulation pad fixed to the bottom of said base adapted to engage the top wall of said box and to effectually seal said opening, a compressor, an electric motor for driving said compressor, and an air cooled condensing coil, all arising from and attached to said base, an expansion coil depending from and supported by said base, said expansion coil being adapted to be inserted through the opening in the top wall of said refrigerator box, and conduits extending through said base and operatively connecting said condensing coil and said compressor with said expansion coil.

4. A refrigerating unit adapted to be supported on the top of a refrigerator box having an opening therethrough, comprising a base, adapted to rest on the top wall of said refrigerator box and to close the opening therein, a compressor, an electric motor for driving said compressor, an expansion coil depending from and supported by said base, said coil being arranged in a series of nests of pipes, a plurality of vertically arranged bars attached to and depending from said base, said bars engaging each of said series of nests of pipes, means for attaching the expansion coil to said bars, said expansion coil and bars being adapted to be inserted through the said opening in the top of said refrigerator box, and conduits extending through said box and connecting said condenser coil and said compressor with said expansion coil.

5. A refrigerating unit adapted to be applied to and removed bodily from a refrigerator, comprising a base, a compressor and a motor mounted thereon and arranged in driving connection, an expansion coil suspended beneath the base and connected through the base with said compressor, and a condensing coil supported on the base and connected with the compressor and through the base with the expansion coil.

6. A refrigerating unit adapted to be applied to and removed bodily from a refrigerator, comprising a base, a compressor and a motor mounted thereon and arranged in driving connection, an expansion coil suspended beneath the base and connected through the base with said compressor, a condensing coil supported on the base and exposed to the air above the base, and connections from the condensing coil to the compressor and through the base to the expansion coil.

7. A refrigerator unit adapted to be applied to a refrigerator box having an opening in one wall thereof, comprising a base, adapted to bear against the said wall of the refrigerator box, a compressor and driving motor therefor, a condenser and an expansion coil, all supported by said base and suitably connected together, said expansion coil
being adapted to be inserted through the said opening in the wall of the refrigerator box.

8. A refrigerator unit adapted to be applied to a refrigerator box having an opening in one wall thereof, comprising a base adapted to be supported by said refrigerator box, a compressor, motor, condenser and expansion coil, all supported by said base and suitably connected together, said expansion coil being adapted to be inserted through the said opening in the wall of the refrigerator box.

9. The combination with a refrigerator box having an opening in one wall thereof, of a refrigerating device comprising a base adapted to be supported by said box, an expansion coil supported by said base and adapted to be inserted through said opening, a compressor, a motor, and a condenser, and means for operatively connecting the various parts.

10. The combination with a refrigerator box having an opening in the top wall thereof, of a refrigerating device comprising a base resting on the box over said opening, an expansion coil including several loops of piping supported entirely by said base and adapted to be inserted through said opening, a compressor, a motor and a condenser, and means for operatively connecting the various parts.

11. The combination with a refrigerator box having an opening in one wall thereof, of a refrigerating unit having a base adapted to bear against said wall of the refrigerator box and having an expansion coil adapted to be inserted through said opening.

12. The combination with a refrigerator box having an opening in one wall thereof, of a refrigerating unit comprising a base supported by the wall of said box, an expansion coil insertible and withdrawable through said opening, a compressor mounted on the base directly opposite said opening, connections through the base from the compressor to the expansion coil, a motor and condenser, and means for connecting the various parts.

13. The combination with a refrigerator box having an opening in the top wall thereof, of a refrigerating device comprising a base resting on the box over said opening, an expansion coil including several loops of piping supported entirely by said base and adapted to be inserted through said opening, a compressor mounted on the base entirely above the top wall of said refrigerator box, a motor and condenser, and means for operatively connecting the various parts.

14. A refrigerating unit adapted to be applied to a refrigerating box and comprising a base, a compressor and motor mounted on said base, a condenser mounted on the base in upright position to permit free circulation of cooling air, and an expansion coil or chamber suspended from the base in said box.

15. A refrigerating unit adapted to be applied to a refrigerating box and comprising a base, a compressor, motor and condenser mounted upon the base in compact relation, an expansion coil or chamber suspended from the base in close proximity to the base, and means to operatively connect the various parts.

16. A refrigerating unit adapted to be applied to a refrigerator box, and comprising a base, a compressor mounted upon the base near one end thereof, a motor and condenser mounted on the base, an expansion chamber suspended beneath and close to the base under that end upon which the compressor is mounted, and means to operatively connect the various parts.

In testimony, that I claim the foregoing as my invention I affix my signature, in the presence of two witnesses, this 30th day of April A. D. 1914.

FRED W. WOLF.

Witnesses:

T. H. ALFREDS,
KARL W. DOLL.