

Dec. 30, 1941.

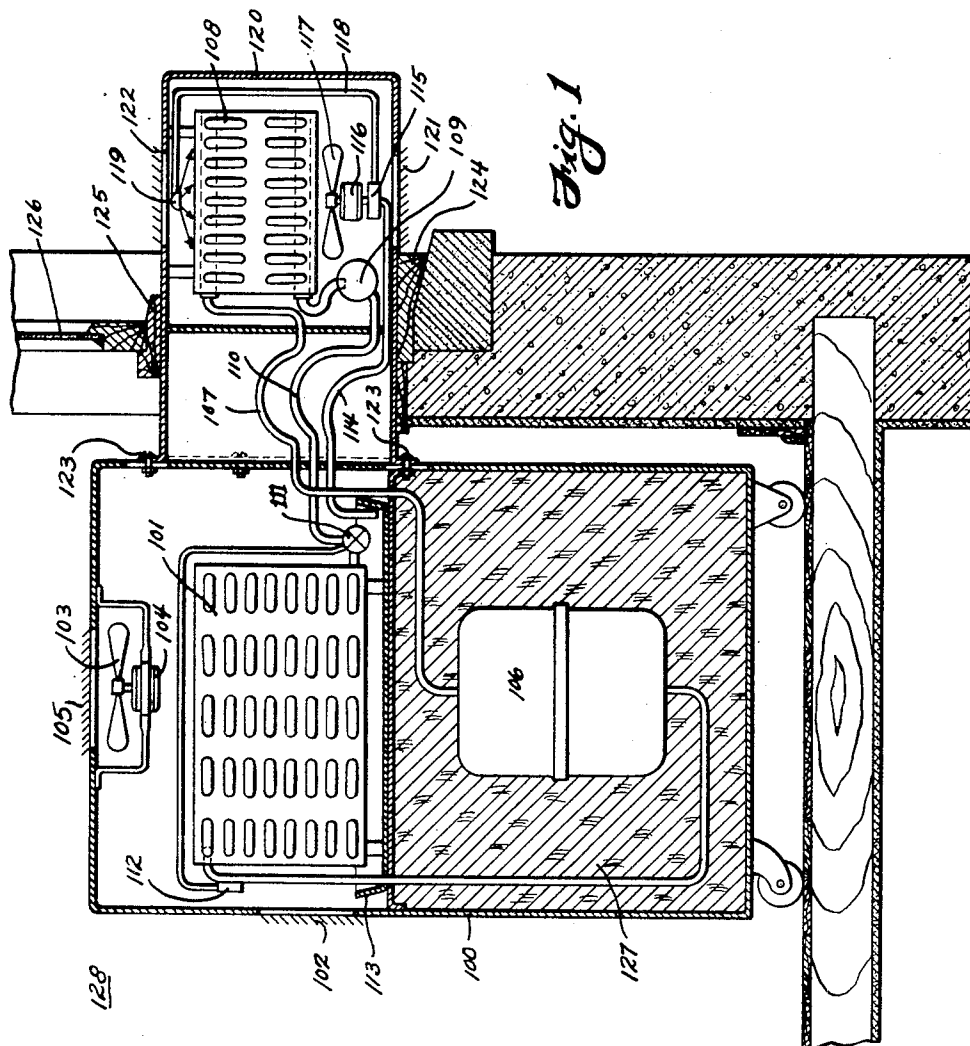
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2,268,451

REFRIGERATING APPARATUS

Filed Dec. 31, 1938

5 Sheets-Sheet 1



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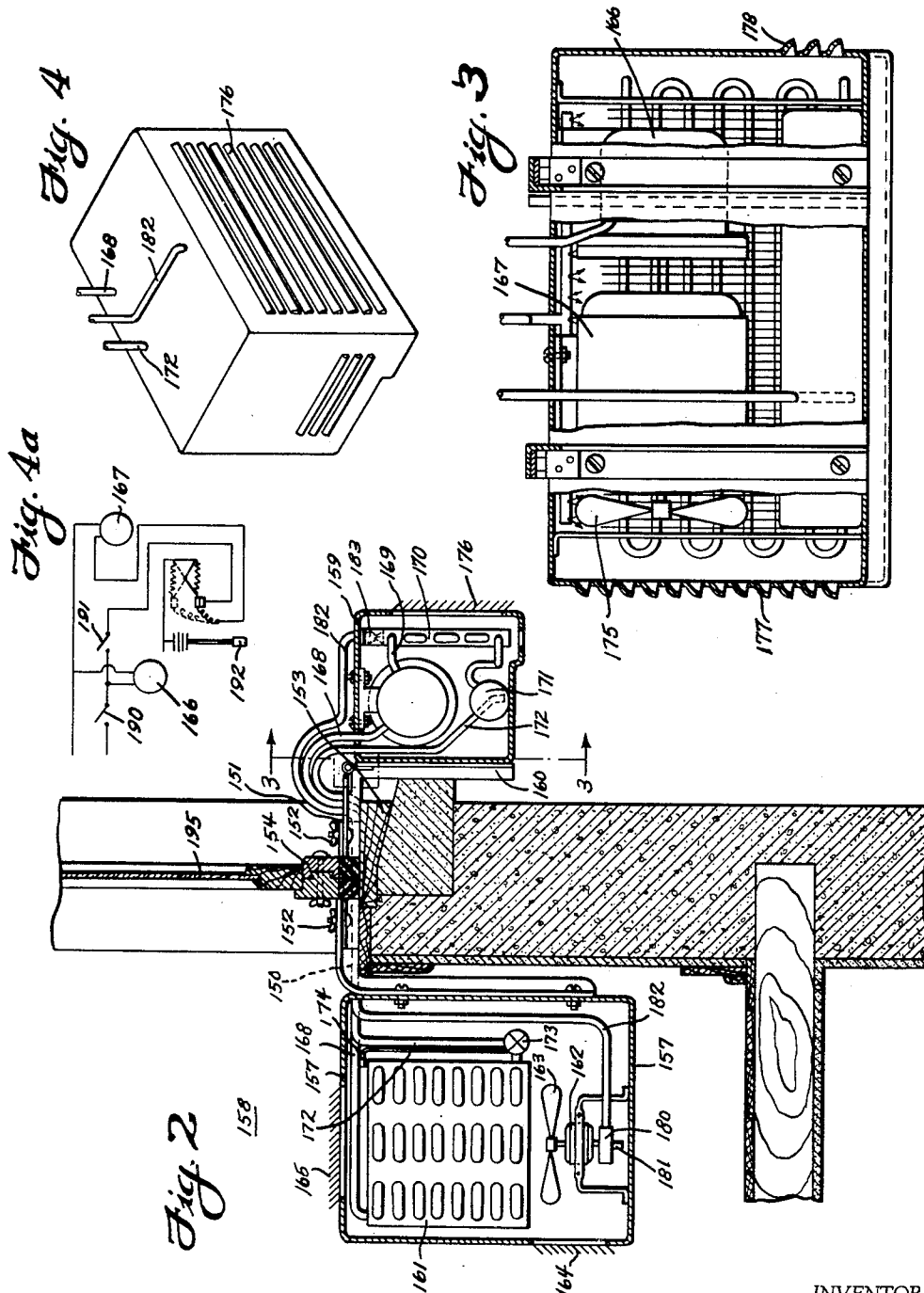
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5 Sheets-Sheet 2



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5 Sheets-Sheet 3

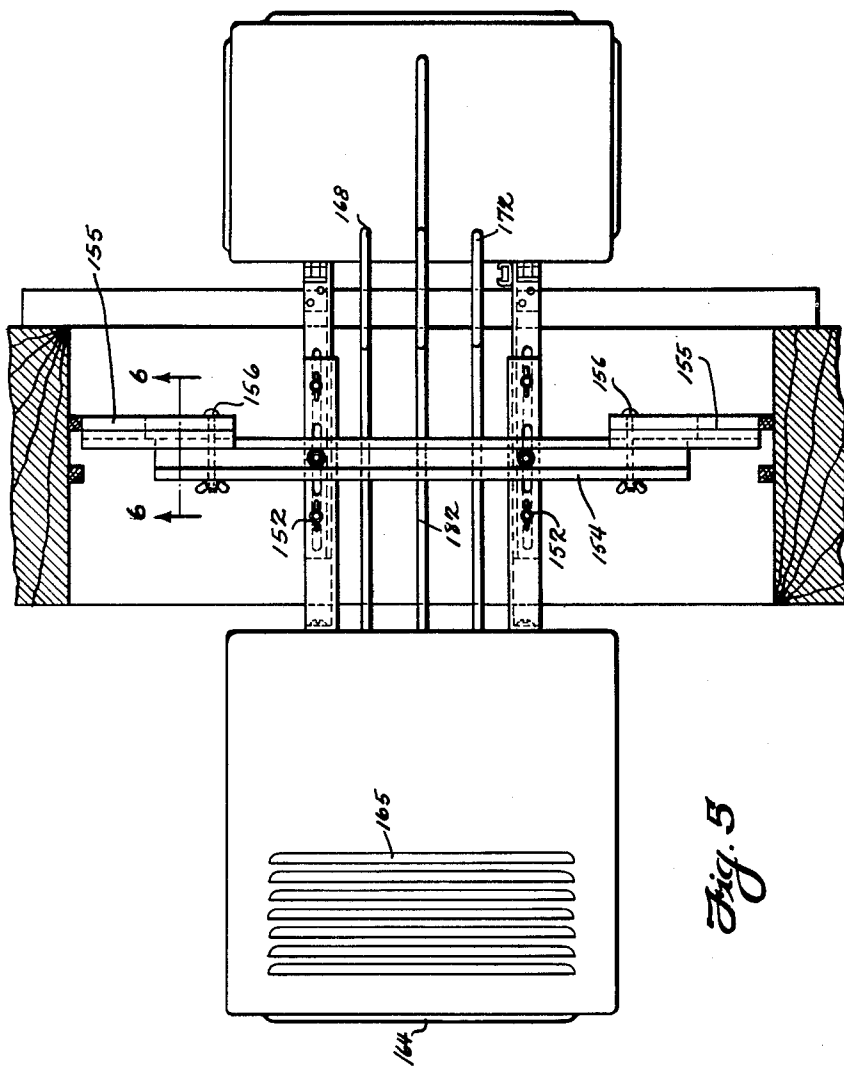


Fig. 5

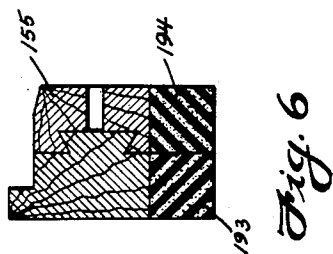


Fig. 6

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Fig. 7

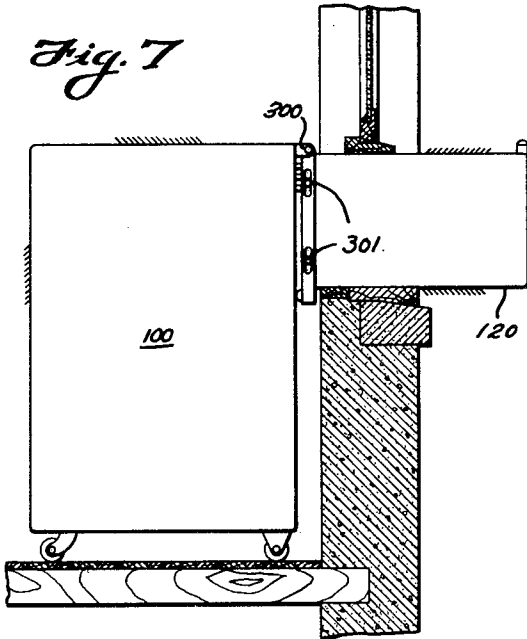
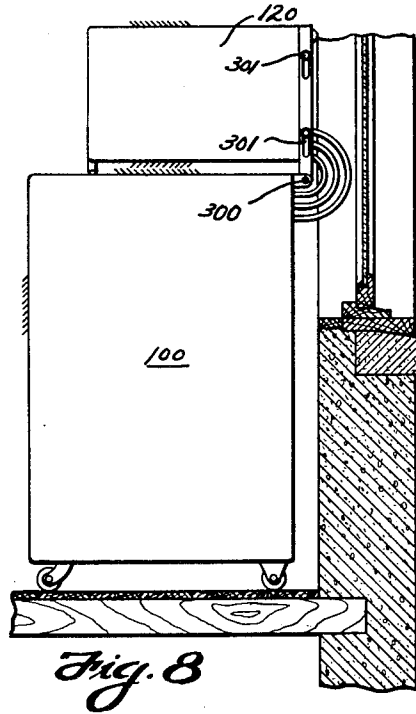
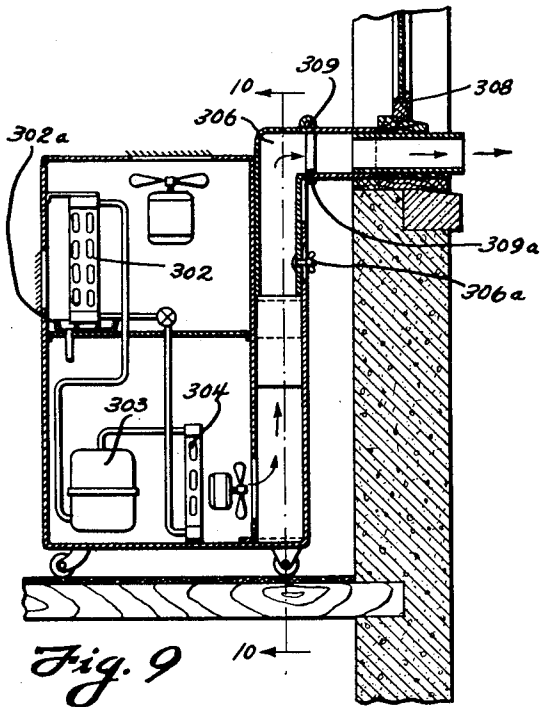
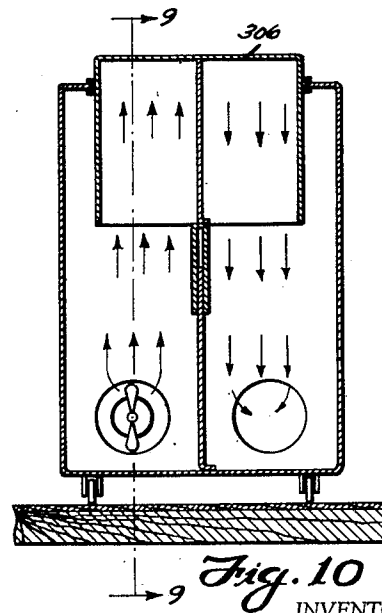


Fig. 10
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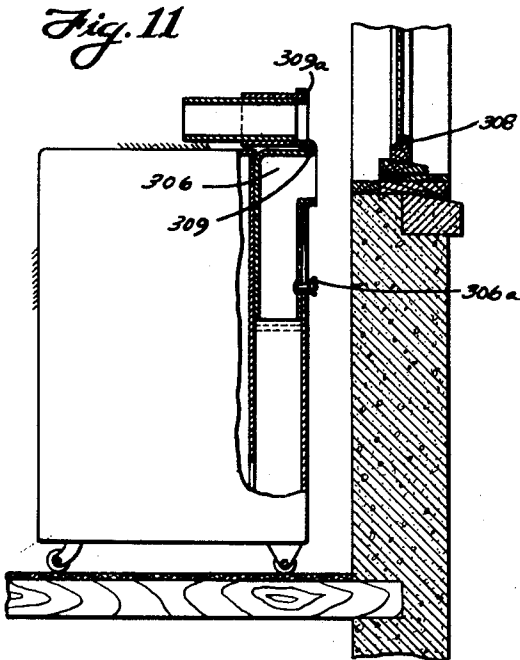
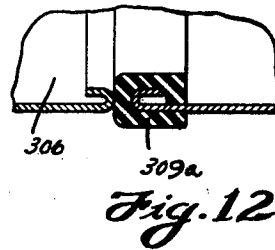
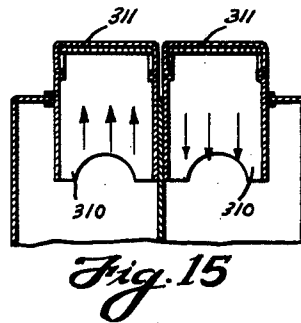
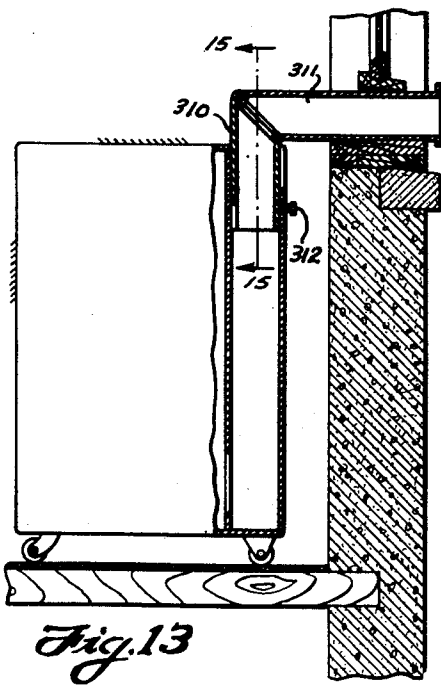
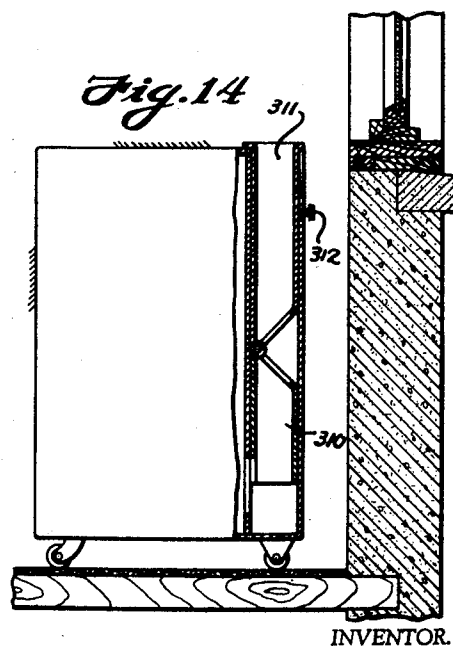
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REFRIGERATING APPARATUS

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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,268,451

REFRIGERATING APPARATUS

Harry B. Hull, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Application December 31, 1938, Serial No. 248,679

1 Claim. (Cl. 62-129)

This invention relates to refrigerating apparatus and more particularly to apparatus for conditioning the air for an office or for a private home or the like.

This application is a continuation in part of my copending application Serial No. 749,773 which was filed on October 24, 1934.

It is an object of this invention to provide a self-contained room cooler or conditioner which is adapted to be installed in rooms or other enclosures without the necessity of connecting water pipes to the cooler.

In constructing conditioning apparatus of this type it is desirable to place the conditioning apparatus immediately adjacent a window. However, it is not always desirable to arrange the apparatus in such a manner that the window is obstructed. It is an object, therefore, of this invention to provide a unitary room cooler in which the window opening remains unobstructed at least part of the time.

Another object of this invention is to provide a self-contained room cooler or conditioner which may be completely assembled before shipping whereby it is not necessary for those installing the unit to make any complicated connections or adjustments.

Still another object of this invention is to provide a conditioning unit having a portion passing through the window but arranged in such a manner as to permit the window to be fully closed or fully opened without the necessity of moving the conditioning unit away from the window.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical cross sectional view somewhat diagrammatic of a room cooler embodying features of my invention;

Fig. 2 is a vertical cross sectional view somewhat diagrammatic of a further modification in which the complete high side is placed outside the room;

Fig. 3 is a vertical cross sectional view taken along lines 3-3 of Fig. 2;

Fig. 4 is a view in perspective of a portion of Fig. 2;

Fig. 4a is a diagrammatic representation of the electrical control for the apparatus shown in Fig. 2;

Fig. 5 is a plane view of the apparatus shown in Fig. 2;

Fig. 6 is a fragmentary cross sectional view taken on line 6-6 of Fig. 5;

Fig. 7 is a side view of a cabinet similar to the cabinet shown in Fig. 1 but with a slightly different arrangement for adjustably supporting the condenser outside of the window;

Fig. 8 is a view similar to Fig. 7 showing the condenser unit positioned within the room;

Fig. 9 is a vertical sectional view taken on line 9-9 of Fig. 10 and partly diagrammatic showing a further modification of my invention in which the condenser is mounted within the machinery compartment within the room;

Fig. 10 is a sectional view taken on line 10-10 of Fig. 9;

Fig. 11 is a side view of the apparatus shown in Figs. 9 and 10 with parts broken away and with the air duct swung away from the window;

Fig. 12 is a fragmentary sectional view showing the feature of construction;

Fig. 13 is a view somewhat similar to Fig. 11 showing a slightly modified air duct arrangement;

Fig. 14 is a view similar to Fig. 13 showing the same apparatus with the air ducts telescoped within the main casing; and

Fig. 15 is a fragmentary sectional view taken on line 15-15 of Fig. 13.

Apparatus embodying features of my invention may take various forms. For example, the units may be of the type having the condenser mounted outside of the window or may be of the type having the condenser mounted within the room but having air ducts passing through the window.

In the modification shown in Fig. 1 the cabinet 100 houses an evaporator 101 in its upper part. Air from the room enters at 102, flows over the outer surfaces of the evaporator 101 through the action of the fan 103 driven by the motor 104. The cooled air is discharged through the opening 105. The refrigerant from the evaporator 101 is compressed by a motor-compressor unit hermetically sealed within casing 106, where the refrigerant is compressed and discharged through the pipe 107 to the condenser 108. The condensed refrigerant is gathered in the receiver 109 and flows through the pipe 110 to the expansion valve 111. Moisture condensed on the evaporator 101 is gathered in the drip pan 113 and flows therefrom through the pipe 114 to a pump 115 driven by a motor 116. This motor may also conveniently drive the fan 117 which circulates air over the condenser 108. The condensed

moisture pumped through pump 113 may then flow through the pipe 118 to the spray-head 119 placed over the condenser 108. Here the condensed moisture is evaporated on the outer surface of the condenser 108 and is absorbed by the air flowing over the condenser. The air which is circulated by the fan 107 may enter the casing 120 through opening 121 and leave the casing through opening 122. The casing 120 may be adjustably secured at 123 to the cabinet 100 so that the same may rest on the sill 124. If the width of the casing 120 is not identical with that of the window, a suitable structure made of wood, rubber or the like may be placed along the sides of the casing 120 to seal the sides of the casing with the sides of the window, and the false sill 125 may be placed on top of the casing 120. The sash 126 may be made of a size to compensate for the new height of the sill 125. The casing of the motor 106 of the motor-compressor unit may be embedded in insulation 127. Thus all the heat generated by the motor and compressor in the casing 106 is dissipated through gaseous refrigerant flowing through pipe 107 to the condenser 108. The motor in casing 106 and motor 116 may be controlled by any automatic thermostatic switch similar to switch 47' while the motor 104 may be controlled in a manner similar to 13'. Thus the motor in casing 106 and motor 116 operate in response to conditions in the room 128 simultaneously through the action of the thermostat corresponding to thermostat 47 and motor 104 may be caused to operate through the medium of a hand switch corresponding to hand switch 54.

In the modification shown in Figs. 2 to 6 inclusive, the compressor, together with its motor, may also be placed outside of the window. In this modification a U-shaped bracket means or structure is formed by the arms 150 and 151 adjustably secured together at 152 to compensate for any wall width. This U-shaped structure is hung over the sill 153, and a false sill structure 154 is arranged therewith to engage with the sash. Thus the false sill is provided with lateral adjusting strips so that the false sill may be adjusted to any width of window desired. This lateral adjustment is secured by means of the bolts 156.

The air cooling casing 157, is secured to the arms 150 and hangs in the room 158 while the heat dissipating casing 159 is secured to the arms 151 through the medium of the hinged brackets 160. An evaporator 161 is placed in the casing 157 together with a motor 162 which drives the fan 163. The fan 163 causes air to flow from the room 158 through the opening 164 over the evaporator 161 and be discharged back into room through the opening 165. The refrigerant is caused to circulate through the system by means of a compressor 166 which is driven by a motor 167 both located within the casing 159. Refrigerant in the evaporator 161 flows through the pipe 168 to the compressor 166 whence it is discharged in compressed condition through the pipe 169 to the condenser 170. The refrigerant there condensed is gathered in the receiver 171 and flows therefrom through the pipe 172 to the expansion valve 173 which is provided with a thermostatic bulb 174. The action of the valve 173 and bulb 174 is substantially identical with that of valve 24 and bulb 27 of Fig. 1. The motor 167 also drives a fan 175 which causes air to flow from the inlet 176 over the condenser 170 and be discharged through the outlet 177. In

addition, if desired, a small air inlet may also be provided at 178 along one side of the casing 159. All of the connections between the casings 157 and 159 may pass through the false sill 154 as will be readily understood.

The moisture condensed on the evaporator 161 gathers at the lower portion of the casing 157 and enters the pump 180 through the pipe 181. The pump 180 may be driven by the fan 162 and discharges the condensate through the pipe 182 to the spray-head 183 placed over the condenser 170. As heretofore described with respect to Fig. 6, this condensate then evaporates as it flows over the condenser 160 and is discharged to the atmosphere outside of the room.

The motor 162 may be controlled by a hand switch 190 so that the fan 163 may be operated without refrigeration, if desired. When refrigeration is desired the hand switch 191 is also closed after which the thermostat 192 causes the motor 167 to operate in accordance with conditions in the room 158.

The false sill structure may be of any character desired. Conveniently the central section 154 may rest on a central rubber section 193. The extensions 155 may rest on extension rubber sections 194. The sections 154 and 155 are laterally adjustable as heretofore described for any size window and they are of such a width that a sash 195 rests on both the sections 154 and 155 and thus makes a substantially air-tight joint at the lower portion. The sash may be shortened by cutting off the lower portion, or, if necessary, a new sash of proper length may be substituted. The sill structure herein shown is merely exemplary and it is to be understood that any sill structure may be used, as for example, a sill of the exact dimensions to fit the window.

In the modification shown in Fig. 7 the general arrangement is very much the same as the general arrangement shown in the modification illustrated in Fig. 1. However, besides being vertically adjustable, the condenser housing is pivotally supported on the main cabinet 100 by means of the hinged connection 300. With this arrangement it is possible to swing the condenser housing 120 into the position shown in Fig. 8. In this position it is possible to completely close the window. Vertical adjustment of the condenser and its housing 120 is made possible by the pin and slot connections 301 which permit raising or lowering the condenser housing 120 at will so as to compensate for differences in window heights.

In Fig. 9 I have shown a slightly different arrangement in which the refrigerating system comprises an evaporator 302 mounted within the upper compartment of the cabinet and in which a motor-compressor unit 303 and a condenser 304 are mounted within a lower compartment of the cabinet. The condenser 304 is cooled by means of air which is brought into the cabinet through one section of the double air duct 306. The air duct 306 as best shown in Fig. 10 has one passage for bringing in outside air and another passage for discharging the air after it has circulated through the condenser compartment. In order to make it possible to completely close the window 308, that portion of the air duct which projects through the window is provided with a hinged joint at 309 whereby the outer portion of the air duct may be swung into the position shown in Fig. 11. The duct 306 is vertically adjustable so as to compensate for differ-

ent window heights. A bolt 306a holds the duct at the desired height.

Condensate which forms on the evaporator collects in the drip pan 302a. The condensate water may be disposed of in any of several well-known ways. For example, it may be discharged into the sewer, or it may be drained or pumped to the outside of the building in any suitable manner. The particular means for disposing of the condensate forms no part of this invention except insofar as it forms a part of the complete combination.

In Fig. 12 I have shown a detail of the rubber gasket 309a used in sealing the joint between the hinged sections of the duct 306. With this type of gasket little or no air leakage takes place at the hinged joint.

Referring now to Figs. 13, 14 and 15, it will be observed that by changing the arrangement of the hinge and by providing two independent ducts, each of which comprises sections 310 and 311, one or both of the ducts may be completely dropped out of sight as shown in Fig. 14. With both of the ducts arranged as shown in Fig. 13, outside air may be caused to circulate over the compressor and condenser mechanism and thereafter return to the outside.

The arrangement of the evaporator, compressor, and condenser in the modification shown in Figs. 13 through 15 is the same as the arrangement shown in Fig. 9. A set screw 312 is provided for holding each duct in its proper position. With the arrangement shown in Figs. 13 through 15 the one duct, constituting the condenser intake ducts through which the air is brought into the condenser compartment, may be placed in the position in which it is shown in Fig. 14 whereby air from the room is caused to circulate through the condenser compartment and the other duct through which the air leaves the condenser may be arranged to discharge the heated air outside the window. With this arrangement, large quantities of foul room air could be discharged to the outside whenever desired. The necessary make-up air would obviously enter through cracks and other openings.

During certain seasons of the year it is desirable to remove moisture from the air without lowering the temperature of the air in the room. Under such circumstances it would be possible to dehumidify the air merely by operating the conditioning apparatus with both ducts in the position shown in Fig. 14. In this manner air from the room could be circulated over the evaporator in its usual manner and room air could also be caused to circulate over the condenser and be discharged back into the room. With this arrangement the air circulating over the evaporator has moisture removed therefrom but all of the heat

which is removed from the air is discharged back into the room along with the condenser air. By virtue of this novel duct arrangement it is apparent that there are several different ways in which the room air may be treated. As pointed out hereinabove, room air may be circulated over the evaporator and outside air may be circulated over the condenser and returned to the outside. Another possibility is to circulate room air over the evaporator and to circulate room air over the condenser and thereafter discharge the condenser air to the outside. A third possibility is to circulate room air over the evaporator and to circulate room air over the condenser and then back into the room. A fourth possibility is to circulate room air over the evaporator, bringing outside air into the condenser compartment and thereafter discharging the condenser air into the room. With this last arrangement the room air is dried without reducing the indoor temperature and at the same time fresh air is introduced. This latter arrangement is often desirable for basement game rooms and the like.

The modification shown in Figs. 13 through 15 has many of the same advantages as the modification shown in Figs. 2 through 6 in that it is possible to completely close or completely open the window without moving the main conditioning cabinet. Furthermore, the conditioning apparatus does not interfere with the amount of light and sunshine entering the room when the outside air ducts are in the position shown in Fig. 14.

Another advantage of the arrangement shown in Figs. 13 through 15 is that the conditioning apparatus may be moved from one room to the other without dismantling and without the necessity of completely removing the window air ducts, since the air ducts may be telescoped into the cabinet as shown in Fig. 14 during the moving process. It will also be noted that with the ducts positioned as shown in Fig. 14, the cabinet gives a pleasing appearance and does not detract from the appearance of the room.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claim which follows:

What is claimed is as follows:

In a room cooling unit, a main cabinet, air cooling apparatus mounted within said cabinet, an air flow passage within said cabinet, an air duct having a first portion communicating with said passage and a second portion normally projecting from said cabinet at an angle to said first portion, and means whereby both portions of said duct may be telescoped into said passage.

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