

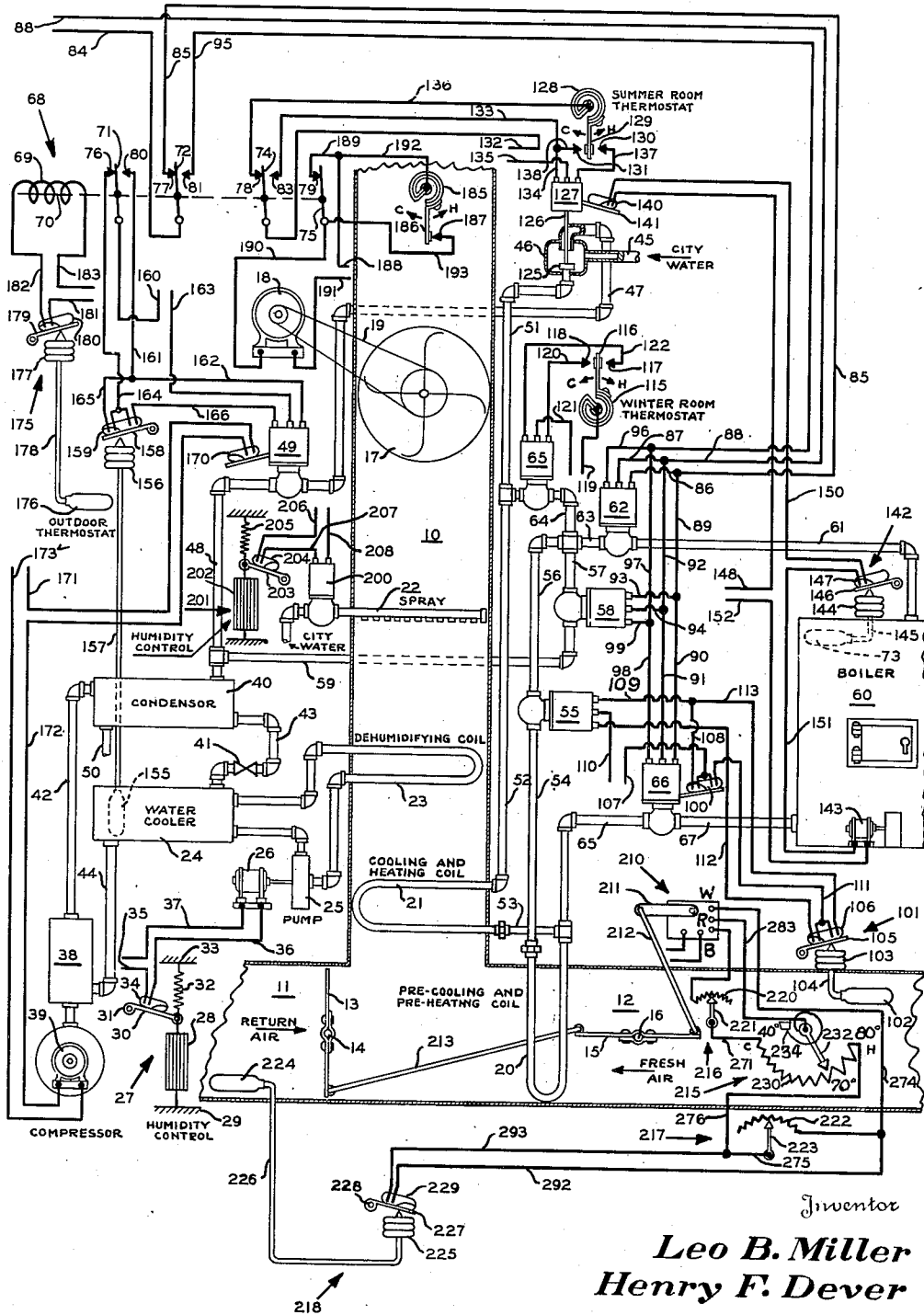
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AIR CONDITIONING SYSTEM

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AIR CONDITIONING SYSTEM

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The present invention relates to systems for controlling the condition of air delivered to a space and is directed particularly to systems of this type wherein the air delivered to the space is heated or cooled according to demands, together with means to increase or decrease the moisture content of the air, as well as to control the proportions of return air and fresh air that are furnished to the space.

One of the objects of the present invention is the provision of an air conditioning system in which heating or cooling fluid is selectively connected to coil means which heat or cool the air delivered to the space, the arrangement being such that the flow of heating fluid is directed to the coil means in one manner, whereas the supply of cooling fluid is directed to the coil means in a different manner.

More specifically, an object of the present invention is the provision of an air conditioning system in which heating fluid is directed to portions of a combined heating and cooling coil means in parallel and cooling fluid is directed to the coil means so that it flows therethrough in a continuous or series path.

A more specific object of the invention is the provision of an air conditioning system wherein a first coil is located in the path of return or withdrawn air, and a second coil is located in the path of the fresh air only, cooling fluid being directed to the coils in series so that it first passes through the first coil and then passes through the second coil, whereas heating fluid is directed to said coils in parallel. In the preferred form of the invention, means responsive to the conditions of the space to be controlled control the flow of cooling fluid to both said coils and also control the flow of heating fluid to one of said coils, while means responsive to outdoor conditions control the flow of heating fluid to the other of said coils.

Another object of the invention is the provision of an air conditioning system in which chilled or refrigerated water is supplied by means including a water cooled device, this chilled water being supplied to one air conditioning coil, whereas cooling water is supplied to another conditioning coil and is then utilized to cool said water cooled device.

More specifically, it is an object of the present invention to pass cooling water through an air conditioning device after which the cooling water is utilized to cool the condenser of a mechanical refrigeration system which also functions to condition the air to be controlled. Specifically, the

refrigeration system is utilized for the purpose of removing moisture from the air to be conditioned as by cooling a dehumidifying coil while the cooling water is first passed through a cooling coil and then through the condenser.

Another object of the invention is the provision of independent means to cool the water cooled device or condenser.

Other objects of the invention include the combination of the systems set forth above.

A further object of the invention is the provision of means, preferably automatic, to place the various systems heretofore set out on a cooling cycle or a heating cycle according to demands or necessity.

Still further objects of the invention include the controlling of the volumes of return or withdrawn air furnished to the space in combination with the cooling systems and combined heating and cooling systems disclosed above.

Other objects comprise the controlling of the fan or blower which delivers the air to the space and providing means for increasing the moisture content of such air when necessary.

Further objects include a complete combination of all of these functions or operations, as well as various sub-combinations thereof, and will be found in the detailed description, the drawing, and the appended claims.

For a more complete understanding of the invention reference may be had to the following detailed description and accompanying drawing which is a schematic showing of the complete system of the present invention.

Referring first to the drawing, the system of the present invention is shown applied to an air conditioning unit which is herein illustrated as comprising an air conditioning chamber 10 from which the conditioned air is discharged into the room or space to be conditioned. Communicating with the inlet of the air conditioning chamber 10 is a return air duct 11 and a fresh air duct 12 which respectively convey return and fresh air to the air conditioning chamber 10 under the control of any suitable mixing damper arrangement. The mixing damper arrangement is herein illustrated as comprising a return air damper 13 which is mounted in the return air duct 11 and is pivoted upon a shaft 14; and a fresh air damper 15 which is located in the fresh air duct 12 and is pivoted upon a shaft 16. Circulation of air to the space to be conditioned and through the air conditioning chamber 10 may be accomplished in any of the usual manners, such as by a fan 17 which is located in the air conditioning cham-

ber 10 and is driven by an electric motor 18 through suitable connections such as those illustrated by the belt 19. For the purposes of heating and cooling the air passing to the air conditioning chamber 10, a combined pre-cooling and pre-heating coil 20 is located in the fresh air duct 12 for pre-cooling or pre-heating the air passing therethrough, and a cooling and heating coil 21, which is in the nature of a main heating and cooling coil or re-cooling and re-heating coil, is located in the air conditioning chamber 10 so that both the fresh air and return air pass thereover. The air conditioning apparatus further includes a water spray 22 located in the air conditioning chamber 10 for the purpose of adding water to or humidifying the air passing therethrough, and a dehumidifying coil 23 also located in the air conditioning chamber 10 for the purpose of chilling the air passing therethrough sufficiently to remove moisture therefrom.

The dehumidifying coil 23 is supplied with chilled water from a water cooler 24. A pump 25 that is operated by an electric motor 26 circulates the chilled water from the water cooler 24 to the dehumidifying coil 23. This motor 26 is controlled by a moisture responsive control, generally indicated at 27. This moisture responsive control 27 includes an actuating element 28 which expands and contracts in response to changes in relative humidity and is herein shown as comprising a hair element. One end of the element 28 is fixed as indicated at 29, and its other end is secured to a switch carrier 30 that is pivoted as at 31. A spring 32 has one of its ends secured to the spring carrier 30, and its other end is secured as indicated at 33, the spring 32 operating to place the humidity responsive element 28 under tension at all times. The switch carrier 30 carries a mercury switch 34, and the arrangement is such that if the relative humidity reaches some excessive value of say 60%, the consequent expansion of the element 28 will be sufficient to allow spring 32 to move switch carrier 30 about its pivot 31 until the mercury switch 34 closes. Whenever the relative humidity drops to some value slightly below 60%, the contraction of the element 28 returns the mercury switch 34 to open position, as shown in Fig. 1 of the drawing. The mercury switch 34 controls the motor 26 by a circuit which includes a line wire 35, mercury switch 34, wire 36, motor 26, and a line wire 37. In this manner, chilled water is circulated to the dehumidifying coil 23 whenever the relative humidity of the air passing through the air conditioning chamber 10 exceeds 60%.

The water cooler 24 is cooled by a refrigeration system that includes a compressor 38 which is driven by an electric motor 39, a condenser 40, and an expansion valve 41 that controls the flow of refrigerant to an expansion coil contained within the water cooler 24. The compressor 38 operates in the usual manner to compress the refrigerant after which it passes to the condenser 40 by means of a pipe 42. The compressed refrigerant is then cooled, as will be hereinafter explained, after which it passes to the expansion valve 41 by a pipe 43. The expanded refrigerant after passing through the expansion coil (not shown) located in the water cooler 24, returns to the compressor 38 through a pipe 44.

City water, well water, or the like, is utilized to cool the condenser 40 as well as to cool the cooling coil 21 and the pre-cooling coil 20 during the

summer. This water flows from a supply pipe 45 to a three-way valve 46. The water may then pass by way of pipes 47 and 48 through an on-and-off electrically operated valve 49 directly to the condenser 40 and out a discharge pipe 50. This water may also flow from the three-way valve 46 through pipes 51 and 52 to the cooling coil 21, then by a pipe 53 to the pre-cooling coil 20 after which it flows through a pipe 54 and an electrically operated valve 55, a pipe 56, a pipe 57 and an electrically operated valve 58, and a pipe 59 to the condenser and out the discharge pipe 50.

During the winter operation the coils 20 and 21 are adapted to be connected in parallel with a suitable source of heating fluid which is herein shown as supplied by a hot water boiler 60. The hot water passes from the boiler 60 through a pipe 61, an electrically operated valve 62, and a pipe 63 where the circuit splits, one part going by way of a pipe 64 and electrically operated valve 65, pipe 52, coil 21, and pipe 53 to a pipe 65, whereas the other portion of the circuit goes by way of pipe 56, valve 55, pipe 54, and coil 20 to pipe 65. These combined returns then flow through an electrically operated valve 66 and a pipe 67 to the boiler 60.

The valves 58, 62, and 66 are directly controlled by a change-over relay generally indicated at 68. This relay includes a relay coil 69 that operates an armature 70. Armature 70 controls switch arms 71, 72, 74, and 75. Upon energization of relay coil 69, switch arm 71 engages a contact 76, switch arm 72 engages a contact 77, switch arm 74 engages a contact 78, and switch arm 75 engages a contact 79. When relay coil 69 is de-energized, switch arm 71 engages a contact 80, switch arm 72 engages a contact 81, switch arm 74 engages a contact 83, and switch arm 75 disengages its contact 79. The switch arm 72 and the contacts 77 and 81 constitute the switching mechanism that directly controls the valves 58, 62, and 66. The arrangement is such that with switch arm 72 engaging contact 77, the valves 62 and 66 are closed whereas the valve 58 is open. The closing circuit for valve 62 is as follows: a line wire 84, switch arm 72, contact 77, wire 85, wire 86, valve 62, wire 87, and return line wire 88. Similarly, the closing circuit for valve 66 is as follows: line wire 84, switch arm 72, contact 77, wire 85, wire 89, wire 90, valve 66, wire 91, wire 92, and return line wire 88. The opening circuit for valve 58 is as follows: line wire 84, switch arm 72, contact 77, wire 85, wire 89, wire 93, valve 58, wire 94, wire 92, and return wire 88. When switch arm 72 engages contact 81 the valves 62 and 66 are opened and the valve 58 is closed. The opening circuit for valve 62 is as follows: line wire 84, switch arm 71, contact 81, wire 95, wire 96, valve 62, and wire 87 to return line 88. Similarly, the opening circuit for valve 66 is as follows: line wire 84, switch arm 72, contact 81, wire 95, wire 97, wire 98, valve 66, wire 91, and wire 92 to return line wire 88. The opening circuit for valve 58 is as follows: line wire 84, switch arm 72, contact 81, wire 95, wire 97, wire 99, valve 58, wire 94, and wire 92 to return wire 88. In this manner, when coil 69 of change-over relay 68 is energized, the valves 62 and 66 are closed to prevent circulation of water to or from the boiler 60, and the valve 58 is opened to allow circulation of water to the condenser 40 after it has passed through the coils 21 and 20 in series. On the other hand, when coil 69 of change-over relay 68 is deenergized, valves 62

and 66 are opened to permit circulation of boiler water from the boiler 60 to the coils 20 and 21 in parallel, and the valve 58 is closed to prevent any of this boiler water from flowing to the condenser 40 by way of pipe 59.

The valve 55 is controlled by the change-over relay 68 indirectly through the medium of a switch 100 that is operated by valve 66 and is also controlled by an outdoor thermostat generally indicated at 101. The switch 100 is in the position shown when the valve 66 is closed. The outdoor thermostat 101 is shown as of the volatile fluid type and comprises a controlling bulb 102 that is connected to an expansible member 103, herein shown as a bellows, by a connecting tube 104. The bellows 103 operates a pivoted switch carrier 105 that in turn supports a mercury switch 106. The capsule 102, bellows 103, and connecting tube 104 are charged with the proper amount of suitable volatile fluid, as is well known in the art, so that whenever the temperature to which the bulb 102 responds is above 40° F., the mercury switch 106 is in the position shown wherein its left-hand electrodes are closed. If the temperature to which the bulb 102 responds falls appreciably below 40° F., then the volatile fluid pressure is reduced allowing bellows 103 to contract sufficiently to move mercury switch 102 to the opposite position wherein its right-hand electrodes are closed. As previously stated, the thermostat 101 is an outdoor thermostat, and its controlling bulb 102 may be conveniently located in the fresh air duct 12 as shown. With the mercury switch 100 in the position shown, the valve 55 is opened irrespective of the condition of mercury switch 106 by a circuit as follows: a line wire 107, left-hand electrodes of mercury switch 100, wire 108, wire 109, valve 55, and return line wire 110. The valve 55 is therefore always open when the valve 66 is closed by the change-over relay 68. When the valve 66 is opened by the change-over relay 68, the mercury switch 100 moves to a position opposite to that shown, wherein its left-hand electrodes are open and its right-hand electrodes are closed. Under these conditions, the valve 55 is placed under the control of the mercury switch 106 of outdoor thermostat 101. Assuming mercury switch 100 to be in such opposite position and the mercury switch 106 in the position shown, then the valve 55 closes by the following closing circuit: line wire 107, right-hand electrodes of mercury switch 100, wire 111, left-hand electrodes of mercury switch 106, wire 112, valve 55, and return line wire 110. However, if the outdoor temperature falls below 40° F. to close the right-hand electrodes of mercury switch 106, the valve 55 is opened by the following circuit: line wire 107, right-hand electrodes of mercury switch 100, wire 111, right-hand electrodes of mercury switch 106, wire 113, wire 109, valve 55, and return line wire 110. In this manner, with valves 62 and 66 open so as to connect the boiler 60 to the coil 20, the flow of heating fluid to the coil 20 is controlled by outdoor temperature through the valve 55 to permit the flow of heating fluid to the coil 20 only if the outdoor temperature falls below 40° F.

The valve 65 is controlled directly by a winter room thermostat that includes a bimetallic actuating element 115 that operates a switch arm 116 to move the same into engagement with a hot contact 117 when the room temperature is at or above 72° F. and to move the same into

engagement with a cold contact 118 when the room temperature is at or below 70° F. When the switch arm 116 engages cold contact 118, the valve 65 is opened by the following circuit: line wire 119, bimetallic element 115, contact blade 116, contact 118, wire 120, valve 65, and return line wire 121. When the contact blade 116 engages hot contact 117, the valve 65 is closed by a circuit as follows: line wire 119, bimetallic element 115, contact blade 116, hot contact 117, wire 122, valve 65, and return line wire 121. Therefore, when valves 62 and 66 are open for winter operation, the flow of heating fluid to the coil 21 is controlled by the winter room thermostat through the valve 65.

The three-way valve 46 includes a valve disc 125 which prevents communication with pipe 51 when in its lowermost position and prevents communication with pipe 47 when in its upper position. The valve disc 125 is carried by a valve stem 126 which is controlled by an electrical operator 127. This operator 127 is controlled by the combined action of a summer room thermostat and the switch arm 74 and contacts 78 and 83 of the change-over relay 68. The summer room thermostat includes a bimetallic actuating element 128 that controls a contact blade 129. When the room temperature rises to some value such as 80° F., the contact blade 129 engages a hot contact 130, and when the room temperature falls to some lower value of say 78° F., the contact blade 129 engages a cold contact 131. When the switch arm 74 is engaging contact 83, the operator 127 maintains the valve disc 125 in its lower position irrespective of the condition of the summer room thermostat. This circuit is as follows: line wire 132, switch arm 74, contact 83, wire 133, wire 134, operator 127, and return line wire 135. When the switch arm 74 is engaging contact 78, however, the operator 127 is under the control of the summer room thermostat. If the contact blade 129 engages its hot contact 130, the operator 127 is energized to raise the valve disc 125 by the following circuit: line wire 132, switch arm 74, contact 78, wire 136, bimetallic element 128, contact blade 129, contact 130, wire 137, operator 127, and return line wire 135. On the other hand, when the contact blade 129 engages the cold contact 131, the operator 127 is energized to move the valve disc 125 to its lower position by the following circuit: line wire 132, switch arm 74, contact 78, wire 136, bimetallic element 128, contact blade 129, cold contact 131, wire 138, wire 134, operator 127, and return line wire 135. In this manner, during winter operation when the relay coil 69 is deenergized the valve disc 125 is maintained in its lowermost position irrespective of the room temperature so that city water, well water, or the like, cannot flow to pipe 51. During summer operation, however, when relay coil 69 is energized the valve disc 125 is lifted to permit the flow of such cooling water to the pipe 51 and therefore to the coils 21 and 20, in series, whenever the room temperature becomes too high.

The boiler 60 has been illustrated herein as supplying the heating fluid to the coils 20 and 21 for winter operation, but it is to be understood that any suitable source of heating fluid could be utilized. The boiler 60 is controlled by a mercury switch 140 that is carried by an arm 141 which is operated by the operator 127 of the three-way valve 46. The boiler 60 is additionally controlled by a boiler control generally indicated at 142.

The boiler is herein shown as fired by an oil burner which includes a burner motor 143. The boiler control 142 operates to energize the burner motor 143 whenever the boiler water temperature falls to some minimum value thereby to maintain a predetermined minimum boiler water temperature, provided the three-way valve 46 is in the position shown. This boiler control 142 includes a controlling bulb 73 that is connected to an expandable member 144, herein shown as a bellows, through a connecting tube 145. This bellows operates a pivoted switch carrier 146 that supports a mercury switch 147. Whenever the boiler temperature falls to some predetermined minimum value such as 140° F., the mercury switch 147 closes, and when the boiler temperature rises to some slightly higher value the mercury switch 147 opens. The circuit for the burner motor 143 is as follows: line wire 148, mercury switch 140, wire 150, mercury switch 147, wire 151, burner motor 143, and return line wire 152. As a result, the burner motor circuit cannot be completed if the mercury switch 140 is in the position opposite to that shown by reason of valve disc 125 being in its upper position. In this manner, during summer operation the boiler control 142 can control the burner motor 143 whenever the summer room thermostat is not actually calling for cooling, whereby a supply of hot water is available in anticipation of a change to winter operation. During winter operation, however, the change-over relay is deenergized and the mercury switch 140 is always maintained in the position shown so that the burner motor 143 is continuously under the control of the boiler control 142 whereby a minimum boiler water temperature is always maintained.

During summer operation the flow of cooling water to the condenser by way of pipe 47 and the operation of the compressor motor 39 are controlled by a thermostat responsive to the temperature of the water in water cooler 24. This thermostat includes a controlling bulb 155 that is connected to an expandable element 156, shown as a bellows, by a connecting tube 157. The bellows 156 controls a pivoted switch carrier 158 that in turn supports a mercury switch 159. The mercury switch 159 is in the position shown wherein the left-hand electrodes are closed when the temperature of the water in water cooler 24 is sufficiently low. But if the temperature of the water in the water cooler rises to some predetermined high value, 42° F., for example, the mercury switch 159 moves to the position opposite that shown wherein the right-hand electrodes thereof are closed. When the relay coil 69 is deenergized so that switch arm 71 engages contact 80, the valve 49 is closed irrespective of the condition of mercury switch 159 by a circuit as follows: line wire 160, switch arm 71, contact 80, wire 161, wire 162, valve 49, and return line wire 163. When the apparatus is on summer operation by reason of energization of relay coil 69 so that switch arm 71 engages contact 76, then the valve 49 is directly controlled by the mercury switch 159. With the mercury switch 159 in the position shown in Fig. 1, the valve 49 remains closed by a circuit as follows: line wire 160, switch arm 71, contact 76, wire 164, left-hand electrodes of mercury switch 159, wire 165, wire 162, valve 49, and return line wire 163. But when the temperature of the water in water cooler 24 rises to 42° F. so as to move mercury switch 159 to the opposite position, the valve 49 is opened by the following circuit: line wire 160,

switch arm 71, contact 76, wire 164, right-hand electrodes of mercury switch 159, wire 166, valve 49, and return line wire 163. The valve 49 controls the mercury switch 170 to maintain the same in open position as long as valve 49 is closed but closes the mercury switch 170 when valve 49 opens. The mercury switch 170 controls energization of the compressor motor 39 by a circuit as follows: line wire 171, mercury switch 170, wire 172, compressor motor 39, and return line wire 173. In this manner the compressor motor 39 cannot be energized and the condenser water valve 49 cannot be opened when the apparatus is on winter operation. When the apparatus is on summer operation, however, the compressor motor 39 and the condenser water valve 49 are placed under the control of the chilled water thermostat.

The change-over relay 68 may be controlled manually or automatically in any manner properly to change the system from summer to winter operation, and vice versa, and is herein shown as controlled by an outdoor temperature change-over thermostat generally indicated at 175. This thermostat is also shown as being of the volatile fluid type and includes a control bulb 176 that is connected to an expandable member 177, in the form of a bellows, by a connecting tube 178. The bellows 177 operates a pivoted switch carrier 179 that supports a mercury switch 180. This change-over thermostat 175 is preferably of the type that operates on an appreciable temperature differential. Such differential thermostats are well known in the art, and in the present instance the mercury switch 180 is moved to closed position when the outdoor temperature rises to 75° F. and remains in closed position until the outdoor temperature falls to 70° F. This mercury switch 180 controls the energization of relay coil 69 by a circuit that includes a line wire 181, mercury switch 180, wire 182, relay coil 69, and return wire 183. In this manner, the change-over relay coil 69 is energized whenever the outdoor temperature rises to 75° F. and then remains energized until the outdoor temperature subsequently falls to 70° F.

The fan motor 18 is controlled conjointly by the change-over relay 68 and by a duct thermostat that includes a bimetallic actuating element 185 that positions a contact blade 186 to move the same from engagement with a hot contact 187 if the temperature of the air issuing from the air conditioning chamber 10 falls to some minimum value such as 65° F. During the summer operation when switch arm 75 is engaging contact 79, the fan motor 18 is continuously energized by a circuit as follows: line wire 188, wire 189, contact 79, switch arm 75, wire 190, fan motor 18, and return line wire 191. But during the winter operation when switch arm 75 is separated from contact 79, then the fan motor 18 is placed under the control of the duct thermostat by a circuit as follows: line wire 188, wire 192, bimetallic element 185, contact blade 186, contact 187, wire 193, wire 190, fan motor 18, and return line wire 191. In this manner the fan 17 operates continuously during the summer cycle and normally operates continuously during the winter cycle; but the fan 17 is stopped if the temperature of the air issuing from the air conditioning chamber 10 falls below the desired minimum value of 65° F. while the apparatus is operating on the winter cycle.

The spray 22 is supplied with water from any desired source, such as city water, under the con-

trol of a valve 200. This valve is controlled by a moisture responsive control generally indicated at 201 which includes a humidity responsive element 202 having one of its ends secured, and herein disclosed as a hair element. Its other end is connected to a switch carrier 203 that supports a mercury switch 204. A coiled spring 205 serves to maintain the humidity responsive element 202 under proper tension. Whenever the relative humidity of the room or space to be controlled is above some minimum value such as 40%, the parts are in the position shown wherein mercury switch 204 is in open position. But if the relative humidity falls below this minimum value of 40%, then the humidity responsive element 202 contracts sufficiently to move mercury switch 204 to closed position. The mercury switch 204 controls energization of the valve 200 by a circuit as follows: line wire 206, mercury switch 204, wire 207, valve 200, and return line wire 208. In this manner water is supplied to the spray 22 whenever the relative humidity of the room or space falls below the desired value of 40%.

The mixing dampers 13 and 15 are operated by a proportioning motor mechanism generally indicated at 210. This proportioning motor may be of the type shown and described in the Taylor Patent 2,028,110, dated January 14, 1936. This motor includes a crank 211 that is moved through a maximum of 180 angular degrees. The crank 211 is connected to the fresh air damper 15 by a link 212, and the fresh air damper 15 is, in turn, connected to the return air damper 13 by a link 213. As shown, crank 211 is in mid-position which causes the fresh air damper 15 to be wide open and the return air damper 13 to be closed. If crank 211 rotates in a clockwise direction, the damper 15 will be rotated counter-clockwise toward closed position and this will cause counter-clockwise rotation of damper 13 towards open position. Conversely, if the crank 211 rotates in a counter-clockwise direction from the position shown, the damper 15 will be rotated clockwise towards closed position and damper 13 will be simultaneously rotated counter-clockwise towards open position. Therefore, if the crank 211 rotates in either direction from mid-position, the fresh air damper will be moved towards closed position and the return air damper moved towards open position.

Upon reference to the Taylor patent, it will be found that the proportioning motor 210 is provided with a three-wire control circuit and is adapted to assume intermediate positions in accordance with the relative amounts of resistance connected across each side of the control circuit. The proportioning motor 210 is provided with three control terminals marked R, W, and B. When equal values of resistance are connected across terminals R and W and terminals R and B, the motor will assume mid-position as shown for causing the fresh air damper 15 to be wide open and the return air damper 13 to be closed. However, if the resistance between terminals R and W is decreased without corresponding decrease in resistance between terminals R and B, the crank 211 will rotate clockwise an amount proportionate to the change in resistance. Conversely, if the resistance between terminals R and B is decreased without corresponding decrease in resistance between terminals R and W, crank 211 will rotate in a counter-clockwise direction an amount proportionate to the change in resistance.

The motor 210 is adapted to be controlled by means of a potentiometer type outside temperature responsive thermostat 215, a return air thermostat 218, and rheostats 216 and 217. Referring to the thermostat 215, this thermostat is diagrammatically illustrated as consisting of a resistance 230 which cooperates with a slider 232 for forming a potentiometer controller for the motor 210. This slider 232 may be actuated in accordance with the fresh air temperature by any suitable type of thermostatic element such as a coiled bimetallic element 234 located in duct 12. This instrument may be so designed and adjusted as to cause the slider 232 to engage the right-hand end of resistance 230 when outside temperature rises to 80° F., while engaging the left-hand end of resistance 230 when outside temperature falls to 40° F. It should be noted that the resistance 230 is tapered in a manner to cause the electrical center of this resistance to be located at the point contacted by slider 232 when the outside air temperature is at 70° F.

Referring to the return thermostat 218, this thermostat may include a control bulb 224 located in the return air duct 11, this bulb being connected to a bellows 225 by means of a capillary tube 226. The bellows 225 actuates a mercury switch carrier 227 which is pivoted at 228 and which carries a mercury switch 229. Upon an increase in return air temperature, the vapor pressure of the volatile substance contained in bulb 224 will increase thus causing the bellows 225 to expand for tilting mercury switch 229 towards closed position. Upon a decrease in return air temperature, the bellows 225 will contract for allowing mercury switch 229 to be tilted towards open position. This instrument may be so designed and adjusted as to cause the mercury switch 229 to be closed when the return air temperature is at or above 85° F., while remaining open when the return air temperature is below this value.

The rheostat 216 may include a resistance 220 which cooperates with a slider 221. This rheostat is for the purpose of determining the minimum air flow position for the damper 15 when the system is operating on the heating cycle. The rheostat 217 is for the purpose of adjusting the minimum fresh air damper position when the system is operating on the cooling cycle and includes a resistance 222 and a slider 223. Referring now to the wiring between motor 210 and the various controllers, it will be noted that terminal R of motor 210 is connected by wire 283 to the slider 232, and that terminal B is connected by a wire 271 and rheostat 216 to the left-hand end of resistance 230. The right-hand end of resistance 230 is connected by wire 276, rheostat 217 and wire 274 to terminal W of the motor 210. The slider 232 therefore determines the portions of resistance 230 which are connected across terminals R and W and terminals R and B of motor 210. With the parts in the position shown, the return air temperature is below 85° F., which causes mercury switch 229 to be open. Also, the fresh air temperature is at 70° as indicated by the slider 232 engaging the electrical center of resistance 230. This engagement of slider 232 with the electrical center of resistance 230 causes the slider 232 to divide the resistance 230 equally into one portion which is connected across terminals R and B and another portion which is connected across terminals R and W. Due to the rheostats 216 and 217 being set for equal values of resistance, the same amount of

resistance is connected across terminals R and W as there is connected across terminals R and B. This has caused the crank 211 of motor 210 to assume mid-position in which the fresh air damper 15 is open and the return air damper 13 is closed.

If the outside temperature decreases below 70° F., the slider 232 will move to the left across resistance 230 thus decreasing the portion of resistance 230 which is connected between terminals R and B and increasing the portion of this resistance which is connected across terminals R and W. This will cause crank 211 to rotate in a counter-clockwise direction for thus closing damper 15 and opening damper 13 in proportion to the movement of slider 232 on resistance 234. Therefore, as the outside temperature falls below 70° F., the fresh air damper 15 will be moved towards closed position and the return air damper 13 will be moved toward open position. When outside temperature falls to 40° F., the slider 232 will engage the left-hand end of resistance 230, thus removing the entire resistance 230 from the circuit between terminals R and B, and placing the entire resistance 230 across terminals R and W. In the absence of rheostat 216, terminals R and B would be short-circuited which would cause the motor 210 to assume its extreme counter-clockwise position for completely closing fresh air damper 15 and completely opening return air damper 13. However, due to the resistance of rheostat 221, this substantial short circuit is prevented which causes the motor 211 to stop at a position short of closed position for damper 15. This provides for maintaining at least a minimum open position for damper 15 for thus providing a predetermined minimum amount of air for ventilation purposes at all times. By adjusting the rheostat 221, the minimum position for damper 13 may be varied as desired.

If outside temperature increases above 70° F., the slider 232 will move to the right across resistance 230, thus decreasing the portion of this resistance which is connected across terminals R and W and increasing the portion of this resistance which is connected across terminals R and B. This will cause the crank 211 to rotate in a clockwise direction for thus moving damper 15 towards closed position and moving damper 13 towards open position. When outside temperature rises to 80° F., the slider 232 will engage the right-hand end of resistance 230, thus placing the entire resistance 230 across terminals R and B and substantially short-circuiting terminals R and W except for the action of the rheostat 217. This rheostat 217 determines the minimum open position of the fresh air damper 15 when the system is operating on the cooling cycle. Thus if this rheostat is set for zero resistance, the damper will be closed completely, and as this thermostat is adjusted for increasing the portion of resistance 222 in circuit with terminals R and W, the minimum supply of fresh air will be increased. It will thus be seen that when the outside temperature is above 80° F., the damper 15 will remain slightly open an amount determined by the adjustment of rheostat 217 for providing the necessary air for ventilation purposes.

In the event that outside temperature rises to a value which imposes a load upon the cooling system which cannot be carried simultaneously with the load imposed by cooling the air for ventilation purposes, the space temperature

will rise above the setting of thermostat 218, thus causing closure of mercury switch 229. This mercury switch 229, it will be noted, is connected by wires 292 and 293 in a manner to short-circuit the rheostat 217. Thus when mercury switch 229 closes due to excessive space temperature, the rheostat 217 will be short-circuited for thus causing the damper 15 to close completely. This will reduce the load upon the conditioner for enabling it to maintain a satisfactory temperature within the conditioning space.

From the foregoing it will be seen that a full supply of fresh air is taken into the conditioning chamber 10 when the outdoor temperature is at some intermediate value, such as 70° F., and that the supply of outdoor or fresh air is reduced if the outdoor temperature either rises above or falls below this value. However, a larger fall in outdoor temperature is required in this particular embodiment of the invention to close off the supply of fresh air completely or to reduce the supply of fresh air to the manually set minimum than rise in outdoor temperature is required to bring about the same results. Further, if the room or space temperature becomes excessive because of the taking in of this minimum supply of fresh air of high temperature, then the fresh air damper is automatically moved to full closed position. It will be obvious that by changing the manner in which the resistance 230 is wound, the amount of temperature change required to move the damper from the position shown to either opposite position can be varied as desired.

Operation of the complete system

With the parts in the positions shown, the outdoor temperature has recently been at or above 75° F. since the mercury switch 180 of the change-over thermostat 175 is closed, but the outdoor temperature has lowered to substantially 70° F. as indicated by the position of the outdoor temperature responsive resistance thermostat 215. Since the outdoor temperature is substantially 70° F., the return air damper 13 is in closed position and the fresh air damper 15 is in full open position. The relay coil 69 of the change-over relay 68 is energized since mercury switch 180 is closed. As a result, the valves 62 and 66 are closed and the valve 53 is opened by the circuits heretofore set out. Also, the valve 55 is open and cannot be controlled by the outdoor thermostat 101. Similarly, the three-way valve 46 is under the control of the summer thermostat. The boiler control 142 can therefore operate the burner motor 143 whenever the summer room thermostat is not calling for heat, but the boiler water is prevented from flowing to the coils 20 and 21 by reason of the closure of valves 62 and 66. The room temperature is between the desired values of 73° F. and 80° F., and the chilled water temperature is below 42° F. Also, the relative humidity of the room or space is between 40% and 60%.

In the summer the relative humidity will be excessive rather than insufficient, so that the humidity control 201 will never operate to supply water to the spray 22. However, the relative humidity may often become excessive resulting in operation of humidity control 27 energizing the pump motor 26. Whenever this happens chilled water will be caused to flow through the dehumidifying coil 23 whereby to lower the temperature of the air passing thereover below its dew point temperature and cause a condensation of moisture therefrom. In this manner, the rela-

tive humidity may be lowered under the control of the humidity control 27. Whenever the chilled water has absorbed sufficient heat from the dehumidifying coil to raise the temperature of the same above 42° F. the controlling bulb 155 will cause movement of mercury switch 159 to its opposite position whereby valve 49 will be opened and compressor motor 39 will be energized. The refrigeration system thereupon operates to cool the water in the water cooler 24, and cooling water for the condenser is supplied by supply pipe 45 through the three-way valve 46, pipe 47, valve 49, and pipe 48 to the condenser. Whenever the temperature of the water in the water cooler 24 has been lowered sufficiently, the mercury switch 159 returns to the position shown in Fig. 1 thereby closing valve 49 and deenergizing the compressor motor 39. The fan 17, of course, is in constant operation during the summer cycle as heretofore explained.

If the room temperature should rise above 80° F., then the operator 127 will be energized to lift the valve disc 125. The water supply pipe 45 is thereupon connected to the coils 21 and 20 in series and in the order named. Water flows from supply pipe 45 through three-way valve 46, pipe 51, pipe 52, coil 21, pipe 53, coil 20, pipe 54, pipe 56, pipe 57, and pipe 59 to the condenser 40. In this manner, whenever the room temperature becomes excessive during the summer operation cooling water is directed through the coils 21 and 20, in series, to obtain a counter-flow action whereby the coolest water is utilized for the final cooling action, and this water is then used for a pre-cooling operation. Further, this water is then directed to the condenser 40 to cool the same irrespective of whether or not the compressor 38 is in operation. In this manner, the cooling water is used for as many purposes as possible before being discharged. During such period, the boiler control is unable to operate the burner motor since mercury switch 140 is open.

Rise in outdoor temperature will be accompanied by a gradual closing of the fresh air damper 15 and a gradual opening of the return air damper 13 until some maximum outdoor temperature is reached, such as 80° F., after which the fresh air damper 15 will remain in some minimum position depending upon the setting of rheostat 217. But if the room temperature rises too high because of the inability of the cooling apparatus to maintain it within the limitation of the summer room thermostat, then the thermostat 218 will shunt the rheostat 217 as heretofore described and cause a complete closing of the fresh air damper 15.

Whenever the outdoor temperature falls below 70° F., the supply of fresh air will also be gradually reduced, and the mercury switch 180 of change-over thermostat 175 will move to open position. The change-over relay 68 will thereupon be deenergized. Under these conditions the fan motor 18 is placed under the control of the duct thermostat to prevent operation of the fan if the discharge temperature becomes too low. Also, the valve 49, and therefore the compressor motor 38, can no longer be controlled by the water cooler thermostat.

In addition, the valves 62 and 66 will be opened, and the valve 58 will be closed. Further, the valve 55 will be placed under the control of the outdoor thermostat 101, and the three-way valve 46 will be maintained in the position shown. The boiler 60 is therefore con-

nected to the coils 20 and 21 in parallel. If the room temperature falls to 68° F., the valve 65 will be opened and boiler water will flow from the boiler 60 through pipe 61, valve 62, pipe 63, pipe 64, valve 65, pipe 52, coil 21, pipe 53, pipe 65 valve 66, and pipe 67 back to the boiler. The burner motor 143, of course, is now continuously controlled by the boiler control 142 to maintain a minimum boiler water temperature. In this manner the winter room thermostat permits circulation of boiler water to the coil 21 whenever the room temperature becomes too low while the system is operating on the winter cycle. If the outdoor temperature should fall below 40° F., then the outdoor thermostat 101 opens valve 55 whereby boiler water flows to preheating coil 20 as follows: from the boiler 60 through pipe 61, valve 62, pipe 63, pipe 56, valve 55, pipe 54, coil 20, pipe 65, valve 66 and pipe 67 to the boiler 60.

In the wintertime the relative humidity never becomes excessive so that pump motor 26 is never energized. On the other hand, the relative humidity often becomes too low during the winter, and in such an instance the humidity control 201 energizes valve 200 to allow the supplying of water to the spray 22 whereby to add moisture to or humidify the air passing through the conditioning chamber 10.

The system of the present invention, therefore, provides an arrangement in which cooling or heating is selectively applied to the air which is discharged into the room or space. This heating is accomplished in the winter by two coils which are in parallel, one being controlled by the room or space temperature, and the other being controlled by the outdoor temperature. In the summer the cooling is obtained by placing these coils in series so as to obtain a counter-flow action, and the cooling water is additionally utilized to cool the condenser of a refrigeration system, which, in the present instance, is utilized to supply cold water for dehumidifying purposes. This refrigeration system is under the control of a relative humidity control which also operates to supply cooling water to the condenser whenever the refrigeration system is in operation. This change-over from summer to winter operation, and vice versa, may be obtained in any desired manner but is herein obtained automatically by relatively wide fluctuations in outdoor temperature. In addition, the mixing dampers 13 and 15 are controlled to supply a minimum quantity of outdoor air at low outdoor temperatures, to increase this quantity of outdoor air gradually as the outdoor temperature rises to an intermediate or comfort value, and gradually to reduce the quantity of outdoor air to a minimum as the outdoor temperature continues to rise and becomes excessive. Further, manual means are provided to adjust these minimum quantities of outdoor air under extreme cold and extreme hot conditions, and automatic means are provided to prevent the taking in of this minimum quantity of outdoor air during the summer operation if the room or space temperature becomes excessive by reason thereof.

It will be apparent that many changes and modifications may be made in the specific system herein disclosed without departing from the spirit of the invention, and we therefore intend to be limited only by the scope of the appended claims.

We claim:

1. An air conditioning system of the class described, comprising, in combination, means to pass air to a space, first and second coils over which said air passes in the order named, a source of heating fluid, a source of cooling fluid, piping connections interconnecting said coils and sources of heating and cooling fluids, valve means in control of said connections, and control means controlling said valve means selectively to direct the heating fluid through said coils in parallel or to direct the cooling fluid through said coils in series.

2. An air conditioning system of the class described, comprising, in combination, means to pass air to a space, first and second coils over which said air passes in the order named, a source of heating fluid, a source of cooling fluid, piping connections interconnecting said coils and sources of heating and cooling fluids, valve means in control of said connections, and control means controlling said valve means selectively to direct the heating fluid through said coils in parallel or to direct the cooling fluid through said coils in series so that the cooling fluid first passes through said second coil and then through said first coil.

3. An air conditioning system of the class described, comprising, in combination, means to pass air to a space, first and second coils over which said air passes in the order named, a source of heating fluid, a source of cooling fluid, piping connections interconnecting said coils and sources of heating and cooling fluids, valve means in control of said connections, control means controlling said valve means selectively to direct the heating fluid through said coils in parallel or to direct the cooling fluid through said coils in series, and means responsive to the temperature of the space additionally controlling said valve means to permit such flow of cooling fluid to said coils when the space temperature becomes too high and to permit flow of heating fluid to at least one of said coils when the space temperature becomes too low.

4. An air conditioning system of the class described, comprising, in combination, means to pass air to a space, first and second coils over which said air passes in the order named, a source of heating fluid, a source of cooling fluid, piping connections interconnecting said coils and sources of heating and cooling fluids, valve means in control of said connections, control means controlling said valve means selectively to direct the heating fluid through said coils in parallel or to direct the cooling fluid through said coils in series, means responsive to the temperature of the space additionally controlling said valve means to permit such flow of cooling fluid to said coils when the space temperature becomes too high and to permit flow of heating fluid to one of said coils when the space temperature becomes too low, and a thermostat responsive to outdoor temperatures to additionally control said valve means to permit the flow of heating fluid to the other of said coils when the outdoor temperature falls to a predetermined value.

5. An air conditioning system of the class described, comprising, in combination, means to pass a mixture of withdrawn air and fresh air to a space, a first coil located in the path of said air mixture, a second coil located in the path of the fresh air only, a source of heating fluid, a source of cooling fluid, pipes connecting said sources of fluid and coils, valve means in

control of said connections, and means in control of said valve means selectively to connect the source of heating fluid to both said coils in parallel or to connect the source of cooling fluid to said coils in series.

6. In an air conditioning system, in combination, a first coil, refrigerating means including a water cooled condenser to supply refrigerated water to said first coil, a second coil, a supply of cooling water, means responsive to the temperature of the refrigerated water to operate said refrigeration system and to connect said supply of cooling water to the condenser thereof, and thermostatically controlled means responsive to air temperature to connect said supply of cooling water to said second coil and said condenser in the order named.

7. In an air conditioning system, in combination, a dehumidifying coil, a cooling coil, means to pass air to be conditioned over said coils, a refrigerating system including a water cooled condenser to maintain a supply of refrigerated water for said dehumidifying coil, a supply of cooling water, means responsive to the refrigerated water temperature to operate said refrigerating system and to connect the supply of cooling water to the condenser thereof, a moisture responsive control in control of the flow of refrigerated water to said dehumidifying coil, and thermostatically controlled means responsive to the temperature of the conditioned air operative to connect the supply of cooling water to the cooling coil and said condenser in series.

8. In an air conditioning system, in combination, means to withdraw air from a space and from the outside atmosphere and to deliver said mixture to the space, a refrigerated water coil located in the path of said mixture, a first cooling coil also located in the path of said mixture, a second cooling coil located in the path of only the fresh air, means to provide a supply of refrigerated water for said refrigerated water coil and including a water cooled device, and means to direct cooling water through said first cooling coil, second cooling coil, and said device, in series, and in the order named.

9. In combination, in an air conditioning system, a refrigerated coil, a second coil, means to pass air to be conditioned over said coils, means to supply refrigerated water to said refrigerated coil and including a water cooled device, a supply of cooling water, a supply of heating fluid, valve means in control of the flow of cooling water and heating fluid, and control means selectively operable to connect the supply of cooling water to said second coil and water cooled device in series or to connect the supply of heating fluid to said second coil only.

10. In an air conditioning system for a space, a refrigerated coil, a cooling and heating coil, means to supply refrigerated water to said refrigerated coil and including a water cooled device, a supply of cooling water, means responsive to demands for refrigerated water to operate said means and to direct cooling water to said device, a supply of heating fluid, and means including space temperature responsive means to direct the supply of cooling water through said cooling and heating coil and water cooled device in series upon an increase in space temperature or to direct the supply of heating fluid through said cooling and heating coil only, upon a fall in space temperature.

11. In an air conditioning system for a space,

a refrigerated coil, first and second combined cooling and heating coils, means to supply refrigerated fluid to said refrigerated coil and including a water cooled device, a supply of cooling water, means in control of said means and operable to connect the supply of cooling water to said device, and means including means responsive to the space temperature operable selectively to supply said cooling water to said two combined cooling and heating coils and the water cooled device in series, or to direct a supply of heating fluid only to said two combined cooling and heating coils.

12. An air conditioning system, comprising, in combination, means to supply withdrawn air and fresh air to a space, a dehumidifying coil and a cooling coil located in the path of the withdrawn air and fresh air, a second cooling coil located in the path of the fresh air only, a refrigeration system including a water cooled condenser for supplying refrigerated water to said dehumidifying coil, a supply of cooling water, and means responsive to the temperature of the space to control the flow of cooling water through said first cooling coil, second cooling coil, and condenser in series.

13. An air condition system of the class described, comprising, in combination, means to supply withdrawn air and fresh air to a space to be conditioned, a dehumidifying coil and a first cooling coil located in the path of travel of both the withdrawn air and fresh air, a second cooling coil located in the path of travel of only the fresh air, mechanical refrigeration means including a water cooled condenser to provide refrigerated water for the dehumidifying coil, a moisture responsive control in control of the flow of refrigerated water to the dehumidifying coil, a supply of cooling water, means to connect the supply of cooling water to said condenser when needed, a supply of heating fluid, and means including space temperature responsive means operable selectively to direct the supply of cooling water through said cooling coils in series and then through said condenser or to direct the supply of heating fluid only through said cooling coils.

14. In an air conditioning system, means to supply air to a space to be controlled, first and second combined heating and cooling coils arranged to change the temperature of said air, valve means operable to supply cooling fluid to said coils in series or to supply heating fluid to said coils in parallel, and means responsive to the space temperature and the outdoor temperature in control of said valve means.

15. In an air conditioning system, means to supply air to a space to be controlled, first and second combined heating and cooling coils arranged to change the temperature of said air, valve means to permit or prevent the supplying of heating or cooling fluid to said coils, means responsive to outdoor temperature in control of said valve means, additional valve means to direct the flow of the heating and cooling fluid to said coils but subject to the dominating action of said first valve means, and means responsive to space temperature in control of at least a portion of said additional valve means.

16. In an air conditioning system, means for supplying withdrawn air and fresh air to a space, a dehumidifying coil and a first combined heating and cooling coil located in the path of travel of the withdrawn air and fresh air, a second combined heating and cooling coil located only in

the path of travel of said fresh air, a mechanical refrigerating system including a water cooled condenser to supply chilled water for the dehumidifying coil, a moisture responsive control in control of the flow of chilled water to said dehumidifying coil, valve means to permit the supplying of heating fluid to said combined heating and cooling coils or to permit the supplying of cooling fluid to said coils and condenser, a condenser water valve to control an independent flow of cooling water to said condenser, means including a thermostat responsive to the temperature of said chilled water in control of the refrigeration system and said condenser water valve, and a master control in control of said valve means, said condenser valve, and refrigeration system selectively to operate said valve means to permit a cooling operation and place said chilled water thermostat in control of the condenser water valve and refrigerating system or to operate said valve means to permit a heating operation and prevent control of the condenser water valve and refrigeration system by said chilled water thermostat.

17. An air conditioning system of the class described, comprising, in combination, means for supplying air to a space to be conditioned, coil means located in the path of said air, master valve means selectively operable to place at least a portion of said coil means in communication with a supply of heating fluid or to place at least a portion thereof in communication with a supply of cooling fluid, two-position master control means in control of said master valve means, additional valve means to control the flow of said fluids to said coil means, and means responsive to the temperature of said space and outdoor temperature in control of said additional valve means.

18. An air conditioning system of the class described, comprising, in combination, means for supplying air to a space, coil means located in the path of said air, master valve means selectively operable to connect a source of heating fluid or a source of cooling fluid to said coil means, a two-position master control in control of said master valve means, additional valve means in control of the flow of heating and cooling fluid to said coil means, means responsive to the temperature of the space in control of said additional valve means to direct the cooling fluid through all of said coil means in series or to direct the heating fluid through only a portion of said coil means, and means responsive to outdoor temperature to direct heating fluid through another portion of said coil means.

19. In an air conditioning system, means for directing withdrawn air and fresh air to a space to be conditioned, a first coil in the path of both the withdrawn air and fresh air, a second coil in the path of said fresh air only, master valve means selectively operable to connect said coils to a supply of heating fluid or to a supply of cooling fluid, a two-position master control in control of said master valve means, additional valve means for supplementing the control action of said master valve means, means responsive to the conditions in said space controlling said additional valve means to direct the cooling fluid through said first and second coils in series in the order named or to direct heating fluid through said first coil only, and means responsive to outdoor conditions controlling said additional valve means to direct heating fluid through said second coil.

20. In a combined heating and cooling system, in combination, means to supply air to a space the temperature of which it is desired to control, coil means located in the path of said air, a source of heating fluid, a source of cooling fluid, valve means operable to connect a portion of said coil means to one of said fluid sources or to connect at least a portion of said coil means to the other of the fluid sources, means responsive to the temperature of the space to be controlled in control of said valve means, other valve means operable to connect said one of said fluid sources to another portion of said coil means, and means responsive to outdoor temperature in control of said other valve means.

21. In a combined heating and cooling system for a space, in combination, means to supply fresh air and air withdrawn from said space to the space, a coil in the path of the fresh air, a second coil in the path of air other than said fresh air, a source of heating fluid, a source of cooling fluid, valve means to selectively direct either the heating fluid or the cooling fluid to said second coil, means responsive to the temperature of the space in control of said valve means, other valve means controlling the flow of one of said fluids to said first coil, and means responsive to outdoor temperature in control of said other valve means.

22. In a combined heating and cooling system for a space to be controlled, in combination, means to supply a mixture of fresh air and return air to said space, a first coil in the path of said mixture of fresh and return air, a second coil in the path of the fresh air only, a source of heating fluid, a source of cooling fluid, master valve means to selectively permit the supplying of said heating fluid or cooling fluid to said coils, means responsive to outdoor temperature in control of said master valve means, supplementary valve means additionally controlling the flow of said fluids to said coils, means responsive to the space temperature controlling said supplementary valve means to permit cooling fluid to flow to both of said coils upon rise in space temperature and to permit heating fluid to flow to said first coil only upon fall in the space temperature, and means responsive to the outdoor temperature additionally controlling said supplementary valve means to permit the flow of heating fluid to said second coil if the outdoor temperature becomes too low.

23. A combined heating and cooling system for a space to be controlled, comprising, in combination, means to pass fresh air and other air to said space, a first coil in the path of the fresh air and a second coil in the path of the other air, valve means to control the flow of a heating fluid to said coils in parallel and the flow of a cooling fluid through said second coil and then through said first coil in series, and means in control of said valve means including space temperature responsive means and outdoor temperature responsive means.

24. An air conditioning system of the class described, comprising, in combination, means to pass a mixture of withdrawn air and fresh air to a space, a first coil located in the path of said air mixture, a second coil located in the path of the fresh air only, a source of heating fluid, a source of cooling fluid, pipes connecting said sources of fluid and coils, valve means in control of said connections, and means in control of said valve means selectively to connect the source of heating fluid to both said coils in parallel or to connect the source of cooling fluid to said coils in series so that the cooling fluid first passes through said first coil and then through the second coil.

25. In an air conditioning system, in combination, dehumidifying means for the air including a refrigeration system having a fluid cooled device, cooling means for cooling the air, selective means for selectively passing cooling fluid through said cooling means to said fluid cooled device or for passing said cooling fluid around said cooling means to said fluid cooled device, and means responsive to the condition of the air for controlling said selective means.

26. In an air conditioning system, in combination, dehumidifying means for the air including a refrigeration system having a fluid cooled device, cooling means for cooling the air, selective means for selectively passing cooling fluid through said cooling means to said fluid cooled device, or for passing said cooling fluid around said cooling means to said fluid cooled device, means influenced by the temperature of the conditioned air for controlling said selective means, and means influenced by the humidity of the conditioned air for controlling said dehumidifying means.

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