Dec. 12, 1933. J. H. IRONS, SR 1,938,833

CONVERTIBLE HEATING, COOLING, AND VENTILATING MEANS

Filed Dec. 30, 1931 2 Sheets-Sheet 1

Fig. 1.

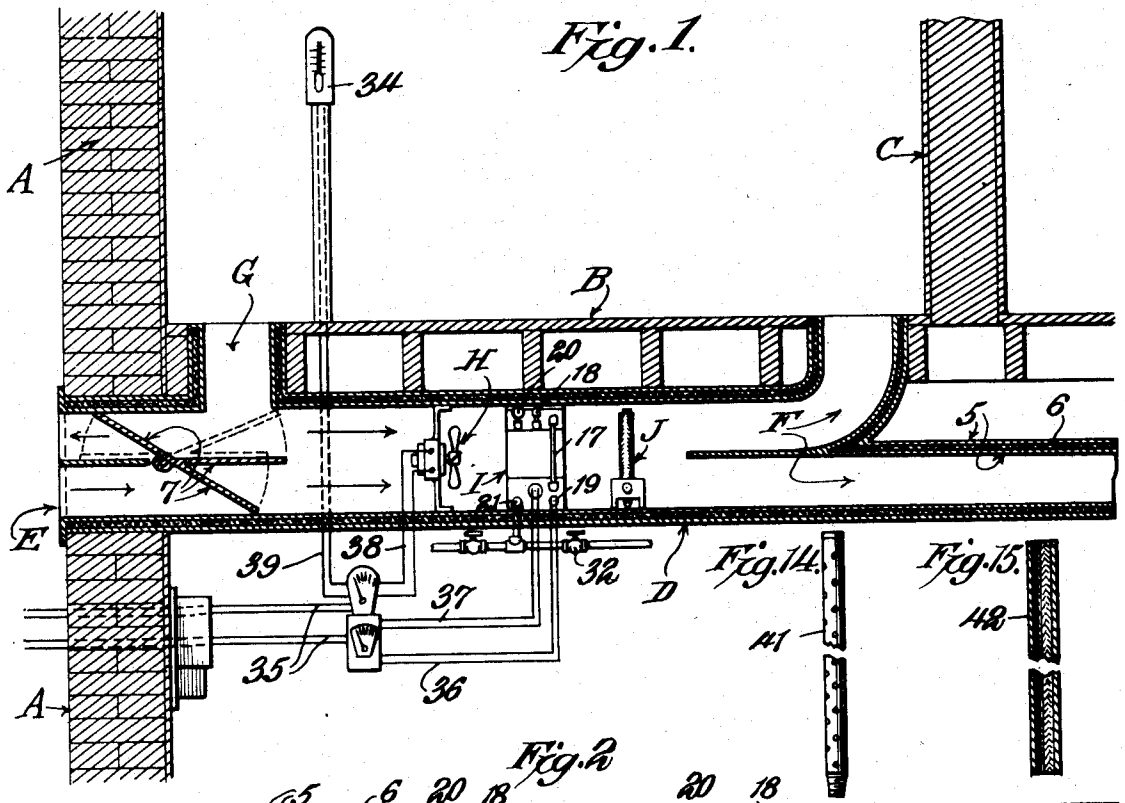


Fig. 14.

Fig. 15.

Fig. 2

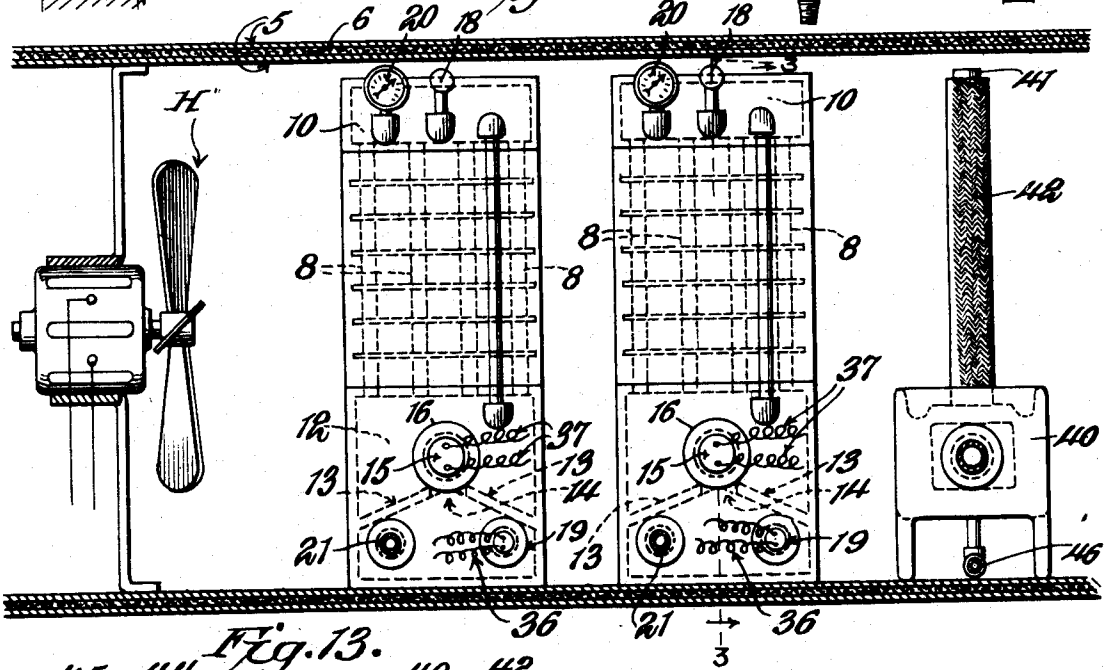
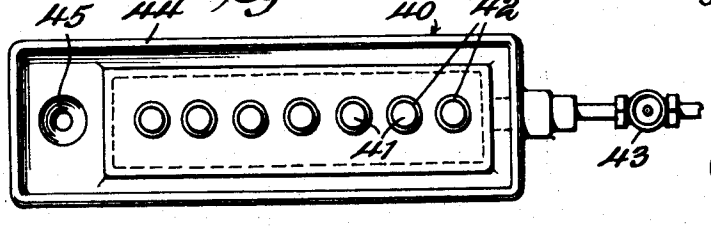


Fig. 13.



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CONVERTIBLE HEATING, COOLING, AND VENTILATING MEANS

Filed Dec. 30, 1931 2 Sheets-Sheet 2

Fig. 3.

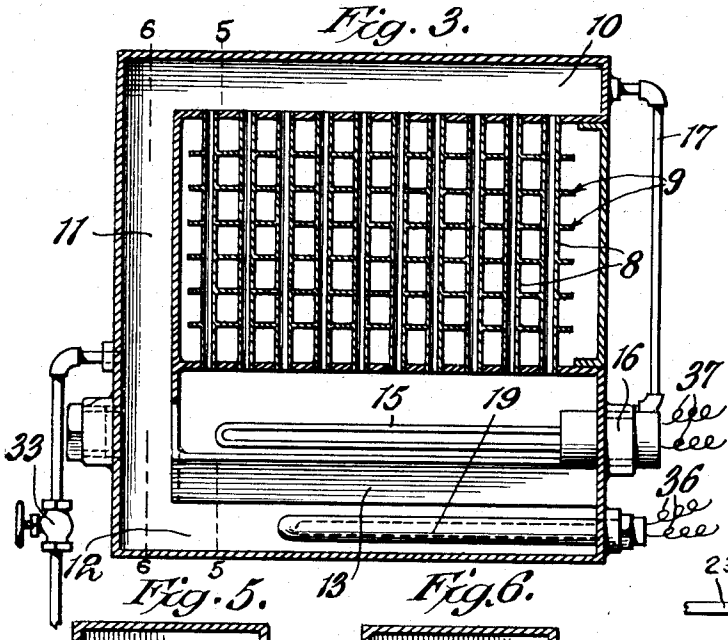


Fig. 4.

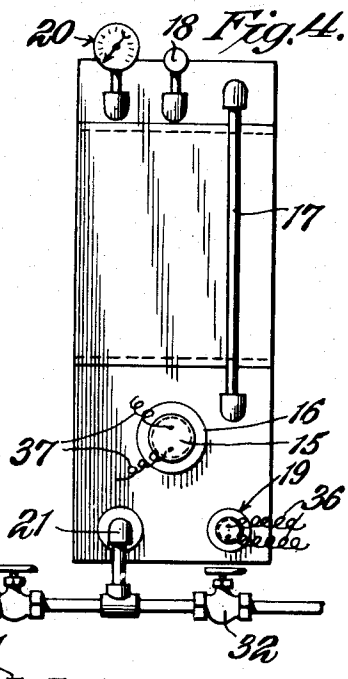


Fig. 5.

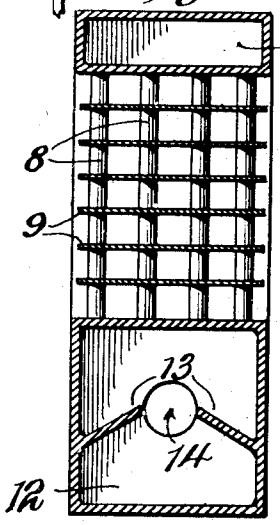


Fig. 6.

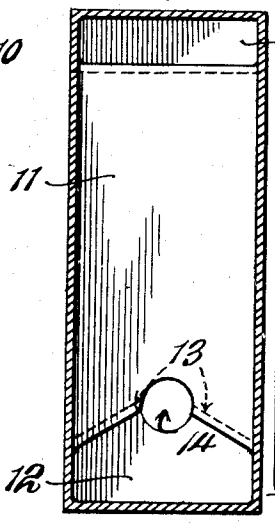


Fig. 11.

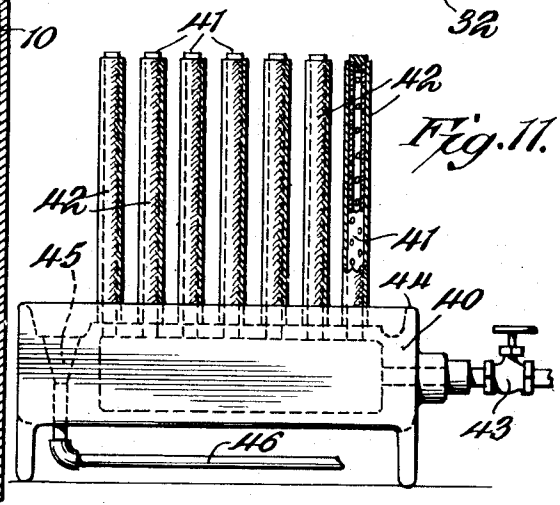


Fig. 10

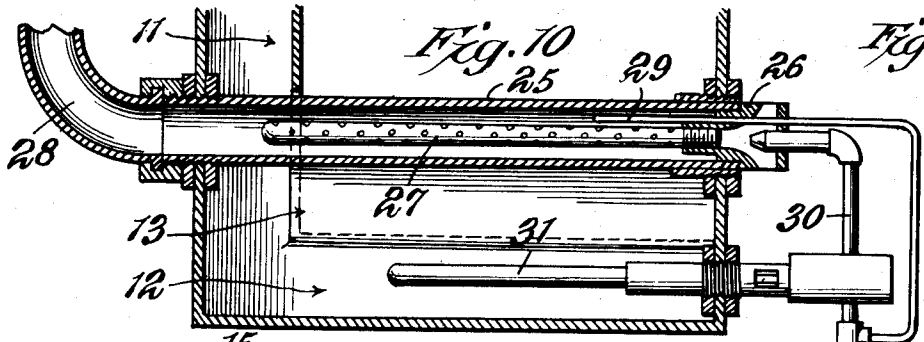


Fig. 12.

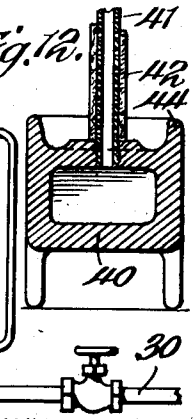


Fig. 7.

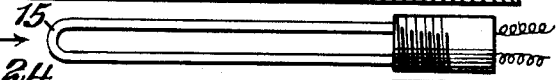
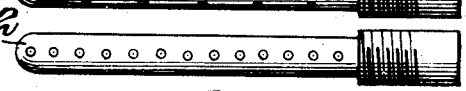


Fig. 8



Fig. 9.



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UNITED STATES PATENT OFFICE

1,938,833

CONVERTIBLE HEATING, COOLING, AND VENTILATING MEANS

John H. Irons, Sr., Saratoga Springs, N. Y.

Application December 30, 1931
Serial No. 583,876

14 Claims. (Cl. 257—8)

The invention relates generally to devices for heating, cooling and ventilating houses or other buildings, and has for an object to provide novel means for circulating air through the house or building, and for heating and humidifying the circulated air during cold weather, said means including devices convertible for cooling instead of heating the circulated air during warm weather.

In the ordinary hot air, hot water, or steam heating devices used in heating dwellings, the extremely dry air is detrimental to health because the dryness of the air produces an irritation to the mucous membranes of the air passages of the respiratory system, an ideal condition for the development of diseases of the respiratory system.

A few very complicated and costly devices have attempted to remedy this condition in cold weather, using one kind or another of heating element for heating purposes. Again, most houses and buildings have no means of cooling the interior in hot or warm weather without opening the doors or windows, thus admitting dust, dirt, noise, and insects, all of which are disagreeable and unsanitary. Also, the usual custom in most dwellings is to open windows in sleeping rooms at night for ventilating purposes, unduly chilling the rooms in winter, and admitting dust, noise, and insects in summer, all of which is unnecessary.

In my new improved and simplified device I seek to overcome all of these faults in a simple and practical system which can be built and installed at low cost because of its extreme simplicity, and which is adaptable to the use of electricity, gas, volatile oils, alcohol, gasoline, or other heating elements as heating units in cold weather, and which is convertible so that by the simple use of cold water it can be used for cooling the dwelling or other building in warm or hot weather. As only a small amount of liquid is used in my improved system, a relatively small amount of heat is required to raise and maintain it at the required temperature, hence I am able to operate the system at a relatively low cost.

In my improved system, I employ a combination of new and highly efficient heating, cooling, humidifying unit described hereinafter, and by employment of which air is drawn from the outside of a building in varying proportions or from the floors of the rooms of the building by one or more exhaust fans located in a rectangular casing which contains the heating, cooling, and humidifying units, and is forced through these units and, after being heated or cooled to the required temperature and given the proper humidity, is forced into the several rooms of the building at any desired temperature. This apparatus is so constructed as to furnish the required warm temperature during cold weather and also to furnish a cool temperature in hot weather. The individual heating, cooling, humidifying units may be used separately or in combination to produce the desired temperature of either warm or cold air in order to meet the requirements of the building served.

Another object of the invention is to provide a novel means for conducting and controlling the flow of air to and from the conditioning units and the rooms or compartments through which the air is circulated.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends, the invention still further resides in the novel details of construction, combination, and arrangement of parts, all of which will be first fully described in the following detailed description and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1 is a diagrammatic sectional view illustrating the invention in use.

Figure 2 is an enlarged detail sectional view of a duct embodying one circulating, heating, or cooling and humidifying unit, the unit elements being shown in elevation.

Figure 3 is a vertical cross section taken on the line 3—3 on Figure 2.

Figure 4 is an end elevation of one of the convertible heating or cooling units.

Figures 5 and 6 are vertical cross sections taken on the lines 5—5 and 6—6, respectively, on Figure 3.

Figure 7 is a detail view of a cartridge type electrical heating element.

Figure 8 is a view similar to Figure 7 of a hot water or steam type heating element.

Figure 9 is a view similar to Figure 7 of a cold water distributer element.

Figure 10 is a detail sectional view illustrating a thermostatically controlled, gas burning heating means for the unit shown in Figure 3.

Figure 11 is a detail side elevation illustrating a form of evaporative cooling or humidifying unit, parts being shown in section.

Figure 12 is a detail vertical cross section of the unit shown in Figure 11.

Figure 13 is a plan view of the unit shown in Figure 11.

Figure 14 is a detail view of one of the water tubes of the cooling or humidifying unit.

Figure 15 is a detail sectional view of one of the wicking sheaths for the cooling or humidifying unit water tubes.

In the drawings I have somewhat diagrammatically illustrated the invention in use in a dwelling. In this illustration A represents the outer wall of the house, B the floor dividing the cellar and the main or street floor, and C a wall separating individual rooms. An air duct D is provided and includes an entrance E opening through the wall A and discharge portions F for delivering conditioned air to the individual rooms or compartments. The ducts also include return throats G which return air to the duct D from lower strata in the rooms and after circulation of the air about the rooms.

I have disclosed in each of Figures 1 and 2 a single air conditioning unit which consists of an exhaust fan H which serves to suck air into and force it along the duct D, one or more convertible heating or cooling units generally designated I, and an evaporative cooler or humidifier generally designated J. One of the units I is shown in detail in Figures 3 to 6 of the drawings, and one of the units J is shown in detail in Figures 11 to 15.

The duct D preferably is formed of inner and outer thicknesses 5 of brass or copper in order to prevent corrosion and an interposed layer 6 of asbestos or other insulating material. A three-leaf control valve 7 is positioned in the duct adjacent the return portion G and is capable of adjustment, as indicated in full and dotted lines, to enable operation on the closed circuit principle (see full lines), during which time no fresh air will be drawn into the duct; or a controlled amount of fresh air may be admitted to circulation and a similar amount of spent air expelled, as indicated in dotted lines.

I will now describe more particularly the unit I which I have termed a convertible heating and cooling unit. It comprises a series of vertical tubes 8 having horizontal fins 9. The tubes open at top and bottom into chambers, the upper or condensing chamber 10 being relatively small and connected at one end with a return chamber or pipe 11 disposed between the tubes and the outer wall and which in turn opens into the lower heating or generating chamber 12. The generating chamber 12 has two thin, metal, baffle plates 13 extending from the sides at the bottom upward at an angle of about thirty degrees toward the center of the chamber with a restricted opening 14 therebetween. The heat chamber 12 is adaptable by slight modification for use of electricity or gas, alcohol or volatile oils as the heating medium.

When electricity is employed as the heating medium, an electric cartridge 15 is screwed into the receiving boss 16, and it will be observed that this heating unit lies in or just above the opening 14 between the baffle plates 13 and directly under the vertical tubes 8. The electric current passing through the electric cartridge 15, which is submerged in the water or other liquid employed as the heat transferring medium, heats the water to a high temperature, which hot water or steam, rising through the radiator tubes 8 imparts heat to the horizontal fins 9, thus heating the air being forced through the duct D and in contact with the tubes and fins by the exhaust fan H. The water which has cooled while passing upward through the vertical tubes 8 to the upper condensing chamber 10 passes down the return pipe or chamber 11 at one end of the unit to the lower or generating chamber 12 under the heater unit to be again heated and recirculated.

When the unit I is used as a hot water boiler, it is provided with a water gage 17, a safety valve 18, and thermostat 19 to control the flow of current or fuel.

When the unit I is used as a steam boiler, it is provided with the water gage 17, the safety valve 18, a liquid electric pressure thermostat which may also be generally designated 19 and which automatically turns off the heat unit when the pressure reaches the maximum of one to three pounds, which the operator can regulate at will, and a steam gage 20.

The unit I is provided with an intake 21 and perforated cartridge type water distributor 22 for the admission of water or other liquid to the boiler and with a waste pipe 23 connected with the sewage system for flushing and for draining off the water from the unit. The temperature of the water in the hot water type of unit may be regulated and maintained by an electric thermostat 19 of any approved type mounted in the lower chamber and which opens or closes the current circuit to the heating unit 15 automatically.

When using this type of unit as an auxiliary boiler, two slight changes are necessary. The inlet or supply pipe 21 of the unit leads to a hot water or steam cartridge 24 which is screwed into a receiving boss in the unit and acts as the heating element of the auxiliary boiler. A return pipe from the lower chamber of the auxiliary boiler may be screwed into the opening used for the thermostat in the generating boiler and through this return pipe the condensation may be returned to the generating boiler unit.

By slight modification in the generating chamber this unit is adapted for the use of gases, alcohol, volatile oils, or other combustibles. In order to accomplish this, I screw into the generating chamber a thin, copper retort 25 or tube of ⅛ inch thickness which passes entirely through the generating chamber and is surrounded by the water or other liquid contained therein. One end of the retort is equipped with a fitting 26 to receive the gas cartridge heater unit 27, pierced with small holes at intervals through which the flame jets reach the inner sides of the retort, the heat passing through the walls of the retort and heating the liquid in the unit which in turn heats the tubes 8 and radiator fins 9. The other end of the retort is connected with a pipe or tube 28 to carry off the burnt gases to the chimney. The gas or gaseous oils are ignited by a pilot flame afforded by the burner 29 and flow of gas from the supply line 30 to the heater unit 27 may be automatically controlled by a thermostatic control 31 of any approved type and the operation of which is generally understood in the art.

This unit I is convertible into a cooling unit for cooling air during warm or hot weather by simply discontinuing the use of the various forms of heating units and opening the cold water valve 32 leading to the water intake distributor connection 21 at the front of the cooling unit and also opening the cold water waste valve 33 at the rear of the unit, allowing cold water to enter the unit through a cold water cartridge 22. This allows a constant stream of cold water under pressure, usually from 60° Farenheit or lower to circulate through the radiator generator cooling the

tubes and fins. The flow of air from the exhaust fans is forced through the air spaces between tubes and fins, thereby cooling the air and forcing it through the air duct D to the various rooms of the building. When the warm air has been reduced to the desired temperature, a thermostatic control 34 shown diagrammatically in Figure 1 controlling the flow of current to the fan H will act to stop the fan and thus discontinue the flow of cool air to the building. When the temperature rises beyond the degree set by the thermostat, the fans will again be set into motion and will again force the cool air to the various rooms of the building.

In the diagrammatic showing of the invention illustrated in Figure 1, electric service or feed lines are indicated at 35, the wires connecting the thermostat 19 with the control switch at 36, the wires connecting the electric heating unit 15 with the control switch at 37, the wires connecting the fan and the control switch at 38, and the wires connecting the room thermostat 34 with the control switch at 39.

I will now describe more particularly my evaporative cooling or humidifying unit J. This unit is shown in Figures 11 to 15 of the drawings and is composed of a horizontal rectangular hollow casting 40 or base of brass or other non-corrosive metal into which is screwed one or more series of vertical pipes or tubes 41 of the same metal, the tops of which are sealed and the sides of which are pierced by a series of minute holes. These vertical pipes are surrounded by a piece of woven fabric 42 or wicking or other porous material having absorbing properties. Water is admitted to the hollow base of this cooling and vaporizing radiator unit under pressure through a needle valve 43 which regulates the flow. The water passing upward into the pipes saturates the absorbent wick covering 42 and, as the forced draft of air passes over the wicking, water rapidly evaporates, adding moisture to the air as desired in connection with the other units of my heating, cooling, humidifying and ventilating system. In cool or cold weather when the system is being used for heating purposes, only a sufficient amount of water is vaporized to give the proper proportion and amount of humidity to the air as it passes through the system.

In warm or hot weather when the system is being used for cooling purposes a larger amount of water is passed through the unit J, which, under the forced draft of air passing through the radiator unit, very rapidly evaporates the water and in turn very rapidly lowers the temperature of the air to a refreshing cool temperature. As any desired amount of pure outside air can be passed through the system under control of the regulator valve 7, windows or doors need never be opened for ventilation, thus eliminating all noise, dust, dirt and insects from outside the building, the exclusion of which is very desirable and greatly improves the sanitation of the home. This new type of vaporizing, humidifying and cooling unit may be used in units of one or more to perform their functions in combination with the other heating or cooling units of the system as may be required.

In case any excess of water is forced through the wicking it runs down the vertical pipes to the base, the sides of which are raised as at 44 to catch any such excess water and cause it to be conveyed to the sewage system through a hole or drain 45 at the rear end of the base and thence through a waste pipe 46 to the sewage system.

Excellent results are obtainable from the general construction and arrangement of the above units shown and described, and therefore such construction and arrangement is preferable. However, such variations may be made as specific requirements of installation may dictate, without departing from the scope of the invention, as pointed out in the appended claims.

I claim:

1. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, and means to circulate a heating or cooling medium through said chambers and tubes.

2. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, and means to circulate a heating or cooling medium through said chambers and tubes; and thermostatically controlled means to stop and restart operation of the air forcing means accordingly as the temperature of the heated or cooled air varies from a predetermined degree.

3. In a convertible air cooling and heating system the combination of an air duct having a fresh air entrance, a delivery portion leading to a room or compartment, and a return portion leading from the room or compartment; an air circulating fan positioned in the duct intermediate the duct portions; and a convertible air heating and cooling unit mounted within the duct intermediate the fan and the delivery portion of the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, and means to circulate a heating or cooling medium through said chambers and tubes.

4. In a convertible air cooling and heating system the combination of an air duct having a fresh air entrance, a delivery portion leading to a room or compartment, and a return portion leading from the room or compartment; an air circulating fan positioned in the duct intermediate the duct portions; a convertible air heating and cooling unit mounted within the duct and in contact with which said air passes; and a control valve positioned adjacent the

duct entrance and the return portion and adjustable to permit ingress of fresh air and for causing egress of all air as it is spent or for permitting ingress and egress of controlled amounts of fresh and spent air.

5. In a convertible air cooling and heating system the combination of an air duct having a fresh air entrance, a delivery portion leading to a room or compartment, and a return portion leading from the room or compartment; an air circulating fan positioned in the duct intermediate the duct portions; a convertible air heating and cooling unit mounted within the duct and in contact with which said air passes; and a control valve positioned adjacent the duct entrance and the return portion and adjustable to permit ingress of fresh air and for causing egress of all air as it is spent or for permitting ingress and egress of controlled amounts of fresh and spent air, said duct comprising inner and outer non-corrosive metal layers and an interposed layer of insulation.

6. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, means to circulate a heating or cooling medium through said chambers and tubes, and means for automatically controlling the heat of the heating or cooling medium when used for heating purposes; and thermostatically controlled means to stop and restart operation of the air forcing means accordingly as the temperature of the heated or cooled air varies from a predetermined degree.

7. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, and means to circulate a heating or cooling medium through said chambers and tubes including a heating or cooling medium supply line and a perforated medium distributer cartridge connected to said line and disposed beneath the baffle plates.

8. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, and means to circulate a heating or cooling medium through said chambers and tubes including heating or cooling medium supply line and a perforated medium distributer cartridge connected to said line and disposed beneath the baffle plates, a waste line, and a control valve in each of the supply and waste lines.

9. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a mounting boss, an electric cartridge heating unit removably mounted in the boss, and means to circulate a heating or cooling medium through said chambers and tubes.

10. In a convertible air cooling and heating system the combination of an air duct, means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a mounting boss, an electric cartridge heating unit removably mounted in the boss, means to circulate a heating or cooling medium through said chambers and tubes, and means including a thermostat projecting into the lower chamber for automatically energizing or de-energizing the electric heater unit accordingly as the heat of the heating or cooling medium varies from a predetermined degree.

11. In a convertible air cooling and heating system the combination of an air duct, means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a mounting boss, an electric cartridge heating unit removably mounted in the boss, means to circulate a heating or cooling medium through said chambers and tubes, and means including a thermostat projecting into the lower chamber for automatically energizing or de-energizing the electric heater unit accordingly as the heat of the heating or cooling medium varies from a predetermined degree; and thermostatically controlled means to stop and restart operation of the air forcing means accordingly as the temperature of the heated or cooled air varies from a predetermined degree.

12. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced

to provide a restricted passage therebetween, a tubular retort extending through the lower chamber beneath the baffle plates, a gas burner tube projecting within the retort, means to supply gas to the burner tube, and means including a thermostat projecting into the lower chamber for automatically discontinuing or restarting operation of the gas burner accordingly as the heat of the heating or cooling medium varies from a predetermined degree.

13. In a convertible air cooling and heating system the combination of an air duct; means to force air through the duct; and a convertible air heating and cooling unit mounted within the duct in contact with which said air passes and comprising spaced upper and lower chambers, spaced flow tubes affording communication between the upper and lower chambers, a return chamber communicating between the upper and lower chambers, baffle plates in said lower chamber spaced to provide a restricted passage therebetween, a heating unit mounted for optional use adjacent the restricted passage, and means to circulate a heating or cooling medium through said chambers and tubes; and an evaporative cooler or humidifier unit disposed in the duct beyond the convertible unit in the direction in which the air is forced.

14. In a convertible air cooling and heating system, a convertible cooling or heating unit comprising a casing having a lower chamber, an upper chamber, and a return chamber communicating between the upper and lower chambers, spaced hollow flow tubes communicating between the upper and lower chambers, radiating fins on said tubes, baffle plates in the lower chamber extending inwardly and upwardly in spaced relation to provide a restricted passage therebetween, means to supply a heating or cooling medium to the lower chamber beneath the baffle plates and for circulating said medium through said chambers, a heater unit projecting into the lower chamber above and adjacent the restricted space between the baffle plates, and means including a thermostat projecting into the lower chamber beneath the baffle plates for controlling operation of the heater unit according to temperature variations in the heating or cooling medium.

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