

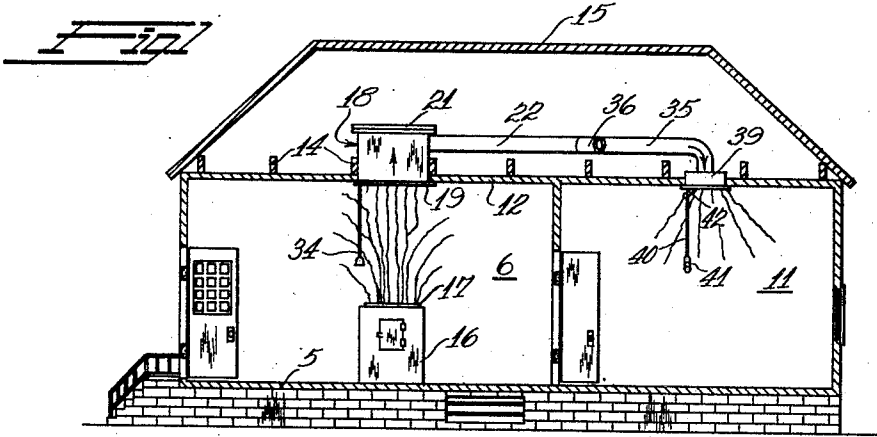
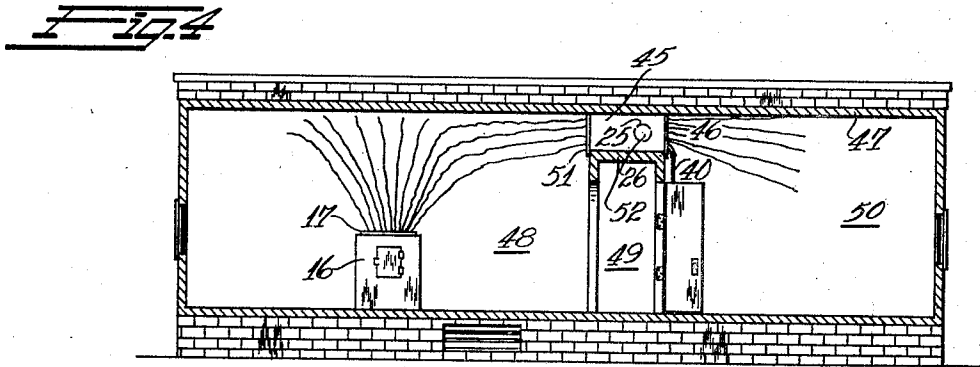
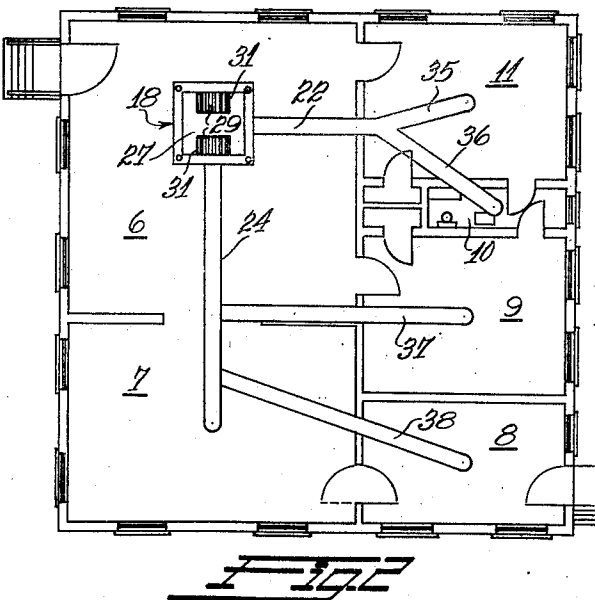
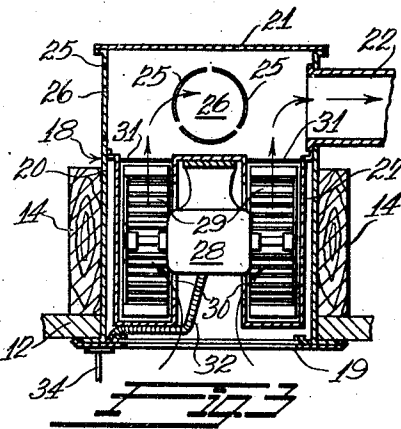
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AIR HEATING APPARATUS AND SYSTEM

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AIR HEATING APPARATUS AND SYSTEM

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7 Claims. (Cl. 237—50)

This invention relates to methods and means for heating and circulating air in groups of interconnected rooms such as are set apart as a unit in a large building or such as constitute the living quarters of a small house. My invention is concerned particularly with the heating and ventilation of a group of rooms, all or nearly all on the same floor level, through the use of air as the distributing and heating medium.

In recent years the trend in low cost housing has been towards the construction of compact homes consisting of living room, kitchen, bath and one or two bedrooms, with little or no basement and substantially no attic space, and usually with all rooms on the same floor. During this period there also have appeared upon the market several types of oil burning space heaters designed to replace coal stoves. Like the latter, most oil stoves are of the convection type where cool air passes upwardly over the heated surfaces and "stratifies," so to speak, in dead layers that are warm near the ceiling and progressively colder in the direction of the floor. The room in which the heater is disposed, or into which it discharges if located below the floor level, becomes overheated, even though the doors to the other rooms are opened to effect some circulation, and the other rooms remain too cold. This condition can be improved somewhat, but inadequately, by employing a fan to augment the circulation. In order to obtain substantially uniform room temperatures in homes of the type under discussion, and in older houses having no piping system connected with a hot water or steam furnace, it has been necessary to connect the air heater directly to the several rooms by individual ducts and also, usually, to provide cold air return ducts. All of this is too expensive for the type of home under consideration and, moreover, most of them lack the basement necessary to ensure proper air flow upward.

Therefore, it is the primary object of the present invention to devise a heating method or system, and appropriate apparatus of low initial and installation costs, for inexpensively but substantially uniformly heating the various rooms of a compactly arranged group with circulating air that is heated by a single burner unit.

Basically, my invention resides in the provision of an air heater located within or discharging warm air directly into one of the rooms (hereafter called the primary room), a warm air receiver mounted adjacent the ceiling level of the primary room and connected by simple ducts and/or registers with the upper parts of the other

rooms, an electric fan in the receiver for forcing air toward said other rooms and means for returning the cooled air to the primary room from the adjacent or outlying rooms. The last mentioned means may be doors or doorways, or it may consist of grilles or registers disposed at low level to afford intercommunication. No connection need be made between the receiver and the heater itself. When the fan operates, either by manual or automatic control, hot air is taken from the ceiling level of the primary room and distributed to the other rooms. At each register or discharge end of a duct provision may be made to regulate or stop the circulation by means of a damper or the like. If the fan is stationary, or the dampers closed the heater operates to heat only the primary room, which usually is the living room. When heat is desired in any or all of the other rooms the fan switch is actuated and the proper dampers opened. Aside from regulation of the heater itself to vary its output, the amounts of heat to the other rooms can be regulated by periodic stopping and starting of the fan, or by regulating the fan speed, or by shifting the dampers. Various obvious automatic schemes of control and regulation may be employed, but for inexpensiveness and simplicity manual control is preferred.

In addition to eliminating overheating and air stratification in the primary room, my improved system maintains the air in the other rooms thoroughly mixed and non-stratified by virtue of discharge of warm air under forced draft into the upper levels thereof, and it assures an adequate ventilation of all the rooms. Means may be incorporated in the plenum chamber of the receiver, or in direct association with the heater, to control or simply increase moisture content of the circulated air.

From the foregoing discussion, it may be seen that some of the major and subordinate objects of the present invention are to heat a group of rooms with a system that is low in cost, that is easily and cheaply installed, that requires a minimum of useful space, that is easily regulated and controlled, that can maintain substantially uniform temperatures in the various rooms as well as in the various spaces of each room itself, and that augments the ventilation of the several rooms through constant circulation and recirculation.

Further important objects are to devise an improved fan and plenum chamber unit, and to provide a novel structure for facilitating con-

nection of a desired number of distributing ducts to the plenum chamber.

The foregoing and other objects of my invention will clearly appear from a study of the following detailed description when taken in conjunction with the accompanying drawing and the appended claims.

In the drawing:

Fig. 1 is a vertical section taken through the representation of a one-floor house equipped with one suitable embodiment of my heating system.

Fig. 2 is a diagrammatic plan view of the arrangement seen in Fig. 1, with the roof removed and the cover of the distributing unit detached.

Fig. 3 is an enlarged view, in vertical section, of the heat distributing unit of Figs. 1 and 2.

Fig. 4 is a view similar to Fig. 1 but disclosing a modified form of heating system preferred for attic-less homes.

With continued reference to the drawing, where like characters are employed to designate like parts and with particular reference for the moment to Figs. 1 and 2, there is shown a house of the type that has small attic space and usually no basement and comprising a floor 5, rooms 6, 7, 8, 9, 10 and 11 provided with the usual doors or doorways, a ceiling 12 just below the structural joists 14 and a roof 15.

In one of the rooms—in this instance the living room 6—there is disposed at low level a space heater 16 which preferably has a top grille 17 for the upward discharge of hot air. This heater may be a coal stove or any other type of hot air stove or furnace, either manually or automatically controlled and operated; and it might in some circumstances be disposed in a cellar or small basement with its grille 17 flush with the floor, the principal requirement being that its heating surface be exposed to currents of relatively cold air drawn from the surrounding space and from the adjoining rooms. The most essential requirements are that the heater produce an upward draft of hot air in the same room within which is located the face of a grille 19 of an air receiving and distributing unit 18, and that the grille face be disposed at or adjacent the ceiling level so as to receive the warmest air possible. In the embodiment under discussion, this is effected by placing the heater and the grille 19 in vertical alignment.

The unit 18 (see Fig. 3 also) comprises a housing 20 having an imperforate cover 21 and having its other walls closed except for the openings of the grille 19 and except for one or more lateral openings formed in the plenum chamber adjacent the top for connection with one or as many as four conduits such as the pipes 22 and 24. Each lateral opening preferably is formed by making a circular series of disconnected slots 25, thus providing a disc-like plate 26 that may be knocked out readily "on the job" if it is desired to connect a pipe to that particular wall of the housing. As the slots are formed at the factory, and as simple conduits such as conventional stove-pipe may be used to carry off the heated air, any home owner or unskilled workman can install the apparatus. The housing 20 may be of any suitable size and shape, but preferably is rectangular and designed to fit between and be attached for support to a pair of the joists 14.

Secured to and disposed within the lower part of the housing 18 there is an internal sheet metal structure 27 designed to support an electric motor 28 and to house a pair of impeller type fans 29 that are carried and driven by said motor. This

structure opens to the grille 19 by way of large apertures 30 that supply warm air to the centers of the fans, and it has two top openings 31 about ninety degrees in length with respect to the fan peripheries. When the motor is rotating, air is passed under a light forced draft along the path indicated by the arrows through the unit and into the ducts 22, 24 and any others that may be needed and attached. The motor is controlled through a cable 32, and the element 34 represents either a pull chain or a drop switch that may be utilized in association with said cable to start and stop the motor.

Individual ducts may be extended from the unit 18 to the several rooms, or as shown the ducts 22 and 24 may have branches 35, 36 and 37, 38, respectively. The unit housing and the ducts may be covered with a sheet insulation if desired. The discharge ends of the ducts project downwardly into grilles or registers 39 fitted in the ceilings of the various rooms, and preferably these registers include dampers under convenient manual control for regulating or shutting off the downward flow of warm air into the rooms. For example, a vertical rod 40 having a handle 41 may be connected to a shiftable damper operating lever 42. In some cases, depending upon the building construction, one or more of the conduits may be led down into the stud space or into the upper part of a hallway or the like and thence branched laterally through the upper parts of certain room walls. It is important that the ducts and their branches feed into the outlying rooms at high levels and that means, such as doorways or return registers at low levels (not shown) be utilized to return the cooler air to the heater 16 for reheating and recirculation.

In operation, the hottest air from the heater passes directly to the unit 18, but substantial portions of the heat pass by convection throughout the primary room 6. By closing the fan switch and opening one or more of the dampers of the registers 39 the adjacent rooms can be heated as desired. By regulating the rate of combustion in the heater itself, by controlling the fan and by regulating the dampers substantially perfect heat control is obtained for all of the grouped rooms. Through constant circulation and recirculation, stratification of the air into layers of different temperature is avoided, and the rooms are kept well ventilated.

In the summer months the unit 18 may be utilized for cooling purposes. By closing all registers, removing the housing cover 21 and opening an attic window, the fans may be utilized to draw cool air into the rooms and to force the warmer air outwardly through the attic window. Or, by leaving the cover 21 as shown, and opening the register dampers, a constant circulation and recirculation of air may be effected.

In Fig. 4 there is illustrated a modified type of system that is designed especially for use in homes that have neither an attic nor sufficient space between the roof and the ceiling to permit the installation just described. Here a distributing unit 45, which differs from the unit 18 only in the substitution of a grille or register 46 for the imperforate cover 21, is mounted in horizontal position just below the ceiling 47 of a house having a primary room 48 heated by the burner 16, a hallway 49, an adjacent room 50 and several other rooms (not seen). The unit has a grille 51 corresponding to grille 19 of the unit 18, and of course is provided with the internal fan and housing structure of the unit 18, the fan motor

having a suitable switch control and the grille 46 preferably having a damper or shutter controlled by the rod 40.

The unit 45 may be decorated and attached in exposed condition to the ceiling or the wall structure but preferably is concealed as shown between the level of the ceiling 47 and a dropped hallway ceiling 52. Its housing has knock-out plates 26 for attachment of pipes to convey warm air to other rooms of the group. Being disposed at a high level it receives hot air adjacent the ceiling of the primary heated room 48 and distributes it to the upper levels of the other rooms in obvious manner, recirculation being effected by transfer of cool air to the heater 16 through the open doorways.

Various further modifications may be made within the scope of my invention. For instance, in some cases the fan and plenum chamber unit may be installed in a wall near the ceiling and equipped with ducts that are disposed within the stud space and projected directly through the wall to discharge into several rooms. In another case the fan unit structure may be mounted in a side wall adjacent the ceiling to receive air from a primary room and to discharge into a natural built-in plenum chamber such, for example, as the space provided by a drop ceiling in a small hallway, and the ducts may branch from this plenum chamber to the various other rooms. Therefore, I wish to be limited, as is customary, only by a reasonably liberal interpretation of the appended claims.

What is claimed is:

1. In a system for heating a group of compactly associated rooms that have a common floor level, a heater designed to discharge its entire useful heat output at low level into a selected primary room of the group, a receiver embodying power-driven means disposed adjacent the ceiling level to withdraw warm air from said primary room, and means forming a plurality of ducts likewise adjacent the ceiling level for conveying the warm air under forced circulation from said receiver to the other rooms of the group.

2. In the system defined in claim 1, said ducts having their outlet ends so disposed as to discharge into said other rooms at high levels, and there being means permitting the flow of cool air at low levels from said other rooms to said primary room.

3. In a group of compactly associated rooms having a substantially common floor level, a

heater mounted within and designed to discharge its entire useful heat output at low level by convection and radiation into a selected primary and normally occupied room of the group, a receiver disposed adjacent the ceiling level to withdraw warm air from said primary room, a plurality of conduits disposed above said ceiling level and connected between said receiver and the other rooms of the group, and means in said receiver for starting and stopping the circulation of warm air therethrough.

4. In the system defined in claim 3, said starting and stopping means comprising an electric fan disposed between the receiver intake and the inlet ends of said conduits.

5. Apparatus for heating a one-story house of the type comprising several rooms having ceilings grouped below a common roof, said apparatus comprising a space heater supported by the floor of one of the rooms, a warm air receiver mounted between the ceiling level and the roof and in communication with said one room adjacent the ceiling thereof, said receiver being free of connection to said heater, a plurality of conduits connected to said receiver and disposed between said roof and the ceiling level with their outlet ends arranged to discharge into the upper portions of the other rooms, and means associated with said receiver to force warm air into and through said conduits.

6. In the apparatus defined in claim 5, means for diverting the entire output of said receiver from said conduits and into the space between said roof and the ceiling.

7. A heating and ventilating device for dwellings comprising an air distributing chamber having an inlet passage for communication with a pre-determined room of the dwelling and a main exhaust passage, said passages being spaced with relation to each other, a power-driven fan disposed in the chamber between the inlet and exhaust passage, auxiliary ducts for communication with other rooms of the dwelling and entering the chamber through the side walls thereof between the fan and the main exhaust passage, whereby in the open condition of the main exhaust passage air forced by the fan will be discharged through the main exhaust passage, and means for closing said main exhaust passage to cause the air forced by the fan to be discharged from the chamber into said auxiliary ducts.

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