This invention relates to an air circulatory system.

More particularly the present invention relates to an air circulatory system for heating and ventilating appropriate chambers, such as the rooms of a dwelling house, for utilization, and provides for the return of such used air, thereafter, to an appropriate chamber, followed by a re-flow of such air over the thermal and/or other conditioning unit or units to afford continuous conditioning of air in the system and continuous circulation of such conditioned air distributively throughout the utilization chambers of the system.

Advantageously, the air collection chamber is provided with means for admitting fresh air from the outer atmosphere, and regulating the admission of such fresh air into the circulatory system. Desirably, also, one or more of the utilization chambers are provided with means affording partial cut-off for such chamber or chambers from other component chambers of the system, such means allowing admission of conditioned air from the system to such partially cut-off chamber or chambers but effecting discharge of used air therefrom to the outside atmosphere rather than the return of such air into the system for re-circulation.

Embodiments of this invention in their essentials include an air-collection chamber, a plenum chamber spaced apart therefrom a distance determining one dimension of the utilization chambers to be provided with conditioned air, a conditioning conduit extending between the air-collection chamber and the plenum chamber, and communicating therewith at its ends, outlets from the plenum chamber into the utilization chambers, outlets from the utilization chamber into the air-collection chamber, a thermal or other conditioning unit or units positioned within the conditioning conduit, and air circulating means for effecting a forced circulation of air from the air-collection chamber through the conditioning conduit into the plenum chamber, and thence, distributively through the utilization chambers back to the air-collection chamber.

The present invention is particularly applicable to the heating and ventilating of dwelling houses, preferably one story dwellings having an attic insulated against the outside atmosphere to form the air-collection chamber of the system. Such dwelling houses may be designed without basement and have defined between the floor and an insulated false floor, the plenum chamber of the system. The conditioning conduit may extend vertically between such plenum chamber and the attic, i.e., air-collection chamber, at any convenient location in the house, and the remaining space between side-walls, floor, and ceiling of such house may be divided as desired into rooms, i.e., the utilization chambers of the system. The floor of each room is preferably provided with one or more air inlet from the plenum chamber, and the ceiling of each room is preferably provided with one or more air outlet openings into the attic, such ceiling openings being preferably at locations in the room remote from that of the floor openings. Air is drawn from the attic, by suitable air circulating means, and flows down through the conditioning conduit over a suitable heater, humidifier, cooler, or other conditioning unit or units positioned therein, into the plenum chamber for distribution through the variantly located floor openings of the room of the house. The used air from the rooms passes into the attic through the variantly located ceiling openings, and, as thus collected, is re-conditioned and re-circulated continuously, as desired.

Further features and objects of the present invention will be apparent from the following detailed description, together with the accompanying drawings, in which

Fig. 1 illustrates a vertical section, taken on the line 1—1, Fig. 2, of one preferred embodiment of the present invention;

Fig. 2 illustrates a horizontal section taken on the line 2—2 of Fig. 1.

Referring to the drawings which represent an application of the present air circulatory system to one type of dwelling house for heating and ventilating and otherwise air conditioning the same; illustrated therein is a dwelling house preferably one story and without basement. Such dwelling house has an attic as at 10 defined between a roof 11, gable ends 12 and 13, and a ceiling 14. Such roof and gable ends are preferably insulated against the outside atmosphere to, together with the ceiling, provide a tight air-collection chamber for the house.

The floor 15 of such dwelling house is provided with a false floor 16 spaced apart lowerly therefrom a distance greater than the depth of the joists 17. The flooring 15 and the false flooring 16 cooperate to form a unitary plenum chamber 18.
The plenum chamber 10 is spaced below the air-collection chamber 10 a distance equal to the desired height of the space to be provided with conditioned air. Such space is bounded by the exterior side walls 16, 20, 21 and 22, respectively of the house and may be divided into rooms as at A, B, C, D, E, etc., by suitable interior-wall partitions, see Fig. 2.

Extending between the air-collection chamber 16 and the plenum chamber 10, at any desired location within the house, and above the floor 5, is a conditioning conduit 23 normally entirely enclosed laterally by suitable walls 24. One or more doors 25, Fig. 2, may be provided for access into such conditioning conduit 23.

A thermal unit, such as the coal furnace 26, and/or other suitable air-conditioning units (not shown) is positioned within the conduit 23. As illustrated, the furnace 26 may comprise an inner structure 26a defining a combustion chamber, and an outer hood 26b defining, together with the inner structure 26a, a thermalizing passage 26c for air. A smoke pipe 27, communicating with the inner structure 26a, cooperates with the draft-opening 28 to promote, in the usual manner, combustion within the furnace. Such draft-opening 28 may communicate with the plenum chamber 18.

The conditioning conduit 23 is provided at its upper end with an air inlet port 29 affording passage for air, thereto from the air-collection chamber 16. Passage from the conditioning conduit into the plenum chamber 10 may be afforded the air by an outlet opening 30 at the lower end of such conditioning conduit. Advantageously, such outlet opening 30 forms the lower end of the thermalizing passage 26c, so that the air, forced by suitable air-circulating means as for instance by the suction fan 31, to enter the conditioning conduit 23 through the inlet port 29, will be forced through such thermalizing passage 26c in heat exchange relation with the thermal surfaces of the furnace 26, and will be discharged into the plenum chamber 18 as heated air.

A louver 32, suitably located in the floor 15, and preferably apportioned one or more to respective rooms A, B, C, and D, etc. of the house, see Fig. 2, are outlet means 32 for the plenum chamber 18, such means preferably taking the form of registers of the type adjustable from closed to open position. Such outlet means 32 are preferably located, respectively, adjacent respective windows, as at 33, Fig. 2, of respective rooms to attain equalization of room temperature during operation of the system.

Variants located in the ceiling 14, and preferably apportioned to respective rooms 16, 20, 21, and 22, respectively corresponding to the apportionment of the outlet means 32, are outlet means 34 from the respective rooms, i.e. utilization chambers to the attic, i.e. air-collection chamber. Such outlet means 34 are preferably positioned, respectively, at locations 30, Fig. 2, in the room 16, or other closed rooms 16, 20, 21, and 22 to effect substantially complete distribution of conditioned air throughout the room when the system is in operation. Also, such outlet means 34 preferably take the form of registers of the type adjustable from closed to open position.

Upon actuation of the suction fan 31, as by an electric motor preferably thermostatically controlled, air is drawn into the conditioning conduit 23 from the attic, i.e. air-collection chamber 16 through the port 29, is forced through the thermalizing passage 26c of the furnace 26, and out of the open end 30 thereof into the plenum chamber 10 for distribution through the variantly located outlet openings 32 into the respective rooms of the house. Such conditioned air is passed distributively through the respective rooms of the house for utilization and is removed therefrom, through the variantly located outlet 34, into the attic, i.e. air-collection chamber 16 for continued circulation through the system in a similar manner.

Admission of air to the system from the outside atmosphere may be had in varying degree by the air inlet 35 positioned preferably in a gable end of the attic, i.e. air-collection chamber 16. The degree of opening of such air inlet 35 may be regulated by suitable means, for instance by the louver 36c.

One or more of the rooms, i.e. utilization chambers, may be provided with a vent such as that indicated at 37, Fig. 2, variably adjustable between open and closed position. Such room exhaust is partially cut off from the air circulatory system properly by closure of the proper outlet opening or openings; in the illustrated case, the outlet opening 34. Consequently, when it is desirable to eliminate used air, such as air tainted with cooking odors as in the case of the kitchen, the vent 37 may be opened and the outlet opening 34 closed. Conditioned air may then be admitted to such room from the plenum chamber 18 through the opening 32, the discharge of used, tainted air being to the outside atmosphere through the open vent 37, rather than into the system for re-circulation. At such time the air inlet 35, controlling admission of air to the system from the outside, may be opened as required.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention as defined by the following claims.

I claim:
1. In an air circulatory system a plenum chamber, an air-collection chamber spaced apart from the said plenum chamber, air conduits connecting between said air-collection chamber and said plenum chamber and communicating at its respective ends therewith, air conditioning means operatively positioned in said conduit, a plurality of utilization chambers between said plenum chamber and said air-collection chamber, outlet means adjustable from closed to open position leading from said plenum chamber into said utilization chambers, outlet means adjustable from closed to open position leading from said utilization chambers into said air-collection chamber and said plenum chamber, and means for effecting circulation of air from said air-collection chamber through said conduit, and therewith in conditioning relationship with said conditioning means, into and throughout said plenum chamber, distributively into and throughout said utilization chambers, to return finally to said air-collection chamber for continued re-circulation.
2. In an air circulatory system a plenum chamber, an air-collection chamber spaced apart from and substantially co-extensive in opposing area with the said plenum chamber, a conduit extending between said air-collection chamber and said plenum chamber and communicating.
at its respective ends therewith, air conditioning means operatively positioned in said conduit, a plurality of utilization chambers comprehending the space between said plenum chamber and said air-collection chamber and adjacent laterally said conduit, outlet means adjustable from closed to open position leading from said plenum chamber into said utilization chambers, outlet means adjustable from closed to open position leading from said utilization chambers into said air-collection chamber, adjustable air-inlet means for establishing communication of the air-collection chamber with the outside atmosphere, and means for effecting a forced circulation of air from said air-collection chamber through said conduit, and therewith in conditioning relationship with said conditioning means into and throughout said plenum chamber, distributively into and throughout said utilization chambers, to return finally to said air-collection chamber for continued re-circulation.

3. In an air circulatory system a plenum chamber and said air-collection chamber spaced apart from the said plenum chamber, a conduit extending between said air-collection chamber and said plenum chamber and communicating at its respective ends therewith, air-conditioning means operatively positioned in said conduit, a plurality of utilization chambers between said plenum chamber and said air-collection chamber, outlet means from said plenum chamber into said utilization chambers, outlet means from said utilization chambers into said air-collection chamber, means for effecting a forced circulation of air from said air-collection chamber through said conduit therewith in conditioning relationship with said conditioning means into and throughout said plenum chamber, distributively into and throughout said utilization chambers, to return finally to said air-collection chamber for continued re-circulation, adjustable air-inlet means for establishing communication of said air-collection chamber with the outside atmosphere, and means for means for closing the outlet into the air-collection chamber from any utilization chamber provided with said vent means.

4. In an air circulatory system a plenum chamber, an air-collection chamber spaced apart from and substantially coextensive in opposing area with the said plenum chamber, a conduit extending between said air-collection chamber and said plenum chamber intermediate their boundaries and communicating at its respective ends therewith, air conditioning means operatively positioned in said conduit, a plurality of utilization chambers substantially coextensive with the space between said plenum chamber and said air-collection chamber, and said air-collection chamber surrounding said conduit, outlet means from said plenum chamber into said utilization chambers, outlet means from said utilization chambers into said air-collection chamber, and means for effecting a forced circulation of air from said air-collection chamber through said conduit, and therewith in conditioning relationship with said conditioning means into and throughout said plenum chamber, distributively into and throughout said utilization chambers, to return finally to said air-collection chamber for continued re-circulation, adjustable air-inlet means for establishing communication of said air-collection chamber with the outside atmosphere, and vent means in at least one of said utilization chambers adjustable from open to closed position, and means for closing the outlet into the air-collection chamber from any utilization chamber provided with said vent means.

5. In a system for air-conditioning a one story dwelling house, an attic insulated against the outside atmosphere, an insulated false floor beneath the floor of said housing, forming, together with said floor of the dwelling house, a plenum chamber, said plenum chamber being substantially coextensive with the floor proper, a conduit extending between said attic and said plenum chamber and communicating at its ends therewith, air-conditioning means operatively positioned within said conduit, outlet registers from said plenum chamber into the space between the floor and ceiling of the house, outlet registers from such space into the said attic, and means for effecting a forced circulation of air from said attic, through said conduit, and therewith in conditioning relation with the conditioning means, into and throughout the said plenum chamber, distributively into and throughout said space, to return finally to said attic for continued re-circulation.

6. In a system for air-conditioning a one story dwelling house divided into rooms, an attic insulated against the outside atmosphere, an insulated false floor beneath the floor of said housing, forming, together with said floor of the dwelling house, a plenum chamber, said plenum chamber being substantially co-extensive with the floor proper, a conduit extending between said attic and said plenum chamber and communicating at its ends therewith, air-conditioning means operatively positioned within said conduit, outlet registers from said plenum chamber into the various rooms of the house, outlet registers adjustable from closed to open position leading from said plenum chamber into the various rooms of the house into said attic, adjustable air-inlet means for establishing communication of the air-collection chamber with the outside atmosphere, and means for means for closing the outlet into the air-collection chamber from any utilization chamber provided with said vent means.

7. In a system for air-conditioning a one story dwelling house divided into rooms, an attic insulated against the outside atmosphere, an insulated false floor beneath the floor of said dwelling house, forming, together with said floor of the dwelling house, a plenum chamber, said plenum chamber being substantially co-extensive with the floor proper, a conduit extending between said attic and said plenum chamber and communicating at its ends therewith, air-conditioning means operatively positioned within said conduit, outlet registers adjustable from closed to open position leading from said plenum chamber into the various rooms of the house, outlet registers adjustable from closed to open position leading from the various rooms of the house into said attic, adjustable air-inlet means for establishing communication of the air-collection chamber with the outside atmosphere, and means for effecting a forced circulation of air from said attic, through said conduit, and therewith in conditioning relation with the conditioning means in at least one of the rooms of the house adjustable from open to closed position, and means for enforcing a forced circulation of air from said attic, through said conduit, and therewith in conditioning relation with the conditioning means.
8. In a system for air-conditioning buildings whose mid-portion is divided into utilization chambers, an air-collection chamber disposed near the upper part of the building, a plenum chamber disposed near the lower part of the building, a conduit connecting the air-collection chamber and the plenum chamber, air-conditioning means positioned within the conduit, outlets adjustable from closed to open position leading, respectively, from the plenum chamber into the utilization chambers of the mid-portion of the building, outlets adjustable from closed to open position leading, respectively, from the said utilization chambers of the mid-portion of the building to the air-collection chamber, and means for effecting a forced circulation of air from said air-collection chamber through said conduit, and thence in conditioning relationship with said conditioning means into and throughout said plenum chamber, distributively into and throughout said conduit, to return finally to said air-collection chamber for continued recirculation.

9. A system as recited in claim 8, wherein there is adjustable air-inlet means for establishing communication of the air-collection chamber with the outside atmosphere.

10. A system as recited in claim 8, wherein there is adjustable air-inlet means for establishing communication of the air-collection chamber with the outside atmosphere, and wherein there is vent means, adjustable from open to closed position, in at least one of the utilization chambers.

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