The present invention relates to a building, such as a house, and a method of regulating the temperature thereof.

In particular, the invention comprehends a house having a unique construction by means of which a new application of heat thereto can be obtained, and a new circulation of the heating medium may be had. Specifically, it involves a construction whereby heat may be applied beneath the floors of the building whereby the floors are caused to act as primary radiation surfaces for heating the rooms. In addition, the construction provides for releasing certain parts of the heat into the rooms after it has circulated beneath the floors; and subsequently the system includes withdrawing the said air after it has been caused to circulate through the rooms and thence returning it to the furnace.

Hereinfore in the heating of buildings, and particularly houses, the application of heat to each room has been effected by directing the heat from one concentrated location, generally adjacent the floor. Even where a return duct is provided on the floor, unevenness of heat distribution and in particular, stratification, inevitably obtains. This condition is heightened by the effect of windows which, either through leakage or the presentation of cold surfaces, cause cold air currents that drop to the floor while the hot air, of course, is rising to the top of the room.

The present construction comprehends also a new method of heating which perhaps may be understood from the discussion previously given. This method involves applying the heat beneath substantially the entire area of the floor of the building from a single point, releasing the air into the room at the point remote from the entry point, withdrawing the air from a point so located with respect to the release point that the air is caused to circulate through the room, and re-heating the air for subsequent circulation.

With the entire area of the floor heated, the warm air given to the air within the room, by virtue of its contact with the floor, produces a circulation in which the warmed air lifts toward the ceiling, displacing colder air downward where it is heated by contact with the warm floors. Any cold air that may come in from the windows, naturally, falls but, since the floor is heated, this cold air immediately becomes heated and mixes with the remaining tempered air of the room. By this method stratification of air within the room is reduced to a minimum.

Whereas in ordinary heating systems the admitted average temperature differential between floor and ceiling, at a certain given low outside temperature, is 20°, and actually may be as high as 26°, with the present method and construction, this differential is reduced to a fraction of this value and rarely runs higher than 10°. Furthermore, with the floor warm and with the circulation described, the feet and legs of the room occupants are kept warm, although it may be that the upper parts of the body are relatively cooler. If there should be a marked differential, it does not produce the discomfort, since the feet and lower legs are most sensitive to heat maladjustments. In other words, if these lower portions are warm and comfortable, ordinarily the condition of the upper parts of the body may vary somewhat without causing discomfort. The adverse is also true that cold feet and ankles produce discomfort, although the upper parts of the body may be quite comfortable.

Following this same theory of procedure, the construction and method may be employed for cooling the building in hot weather. As will be evident, it is possible to reverse the system. However, this is not necessary. By substituting a refrigerating coil for the furnace, the air may be circulated across this coil and, as so cooled, be forced beneath the floor of the room and subsequently circulated there-through, being withdrawn at the ceiling. This produces, perhaps, an exaggerated condition of stratification, since the principal application of cold is made at the floor. However, this provides that the lower portions of the occupants are cool and comfortable, although there may be a somewhat greater heat condition at their upper portions. Again noting the fact that the lower portions and, in particular, the feet and ankles are most sensitive to temperature maladjustments, the persons may be comfortable in this condition of heat distribution in the room.

In the present invention, it is proposed to distribute the air throughout the floors of a building, it being discharged beneath the floor of each story from strategic outlets. Structurally this is accomplished by employing web or otherwise open beams for the floor.

It is an object of the invention to provide a new method of tempering the area of a building, by tempering the floors thereof.

It is a further object of the invention so to temper the air by providing an outlet for tempered air at one point beneath the floor of the building and from this point circulating it...
throughout the area beneath the floor aforesaid.

It is a further object after circulation of the tempered air beneath the floor to discharge the said air into the room.

It is a further object to withdraw air from the room in such wise as to cause circulation of the tempered air through the room.

More specifically, it is a object of the invention to direct air beneath the floor of a story of a building having a plurality of rooms, thence to circulate the air beneath the floors and discharge it into the several rooms, and finally to withdraw the air from the rooms, at points so situated relative to the release point, that the tempered air is caused to circulate throughout the rooms.

It is a further object to provide, as set forth in connection with the previous objects, means to temper the air either by heating means or cooling means.

It is a further object to provide means to adjust the flow of the tempered air so that the proper relative quantities between stories may be had.

Further objects will appear in the description to follow. Throughout this specification and claims, where the expression “tempering the air” is used, such is designed to mean either heating the air or cooling the same.

In the drawings:

Fig. 1 is a vertical section of a two story building showing the application of the invention taken on the line 1—1 of Fig. 2.

Fig. 2 is a horizontal section of the first story, taken on the line 2—2 of Fig. 1.

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 2 showing the floor beam construction and release discharge.

Fig. 4 is a section on the line 4—4 of Fig. 2 looking lengthwise of the beams.

Fig. 5 is a horizontal section looking down through the furnace and into the fire box taken on the line 5—5 of Fig. 1.

Fig. 6 is a horizontal section on the line 6—6 of Fig. 1 showing the cold air manifold.

Fig. 7 is a vertical section enlarged from Fig. 1, showing a portion of the air withdrawal passages.

Fig. 8 shows the air withdrawal passages with the molding broken away and looking directly at the passages.

Fig. 9 is a view similar to Fig. 7 but showing the construction at points at which no withdrawal passages are provided.

The building comprises side walls 10 covered by a top wall 11 shown cut away in Fig. 1. A lower floor, generally indicated at 12, and an upper floor, generally indicated at 13, extend between the side walls and divide the house into a basement 14, first story 15, and a second story 16. In the building shown each story is divided into four rooms, these representing any arrangement of rooms that may be desired. On the first floor, there are provided partitions generally indicated at 17, 18, 19 and 20. Corresponding partitions are found on the second floor, one of which is shown at 21. Partitions 17 and 18 divide out a room A; partitions 18 and 19 divide out a room B; partitions 17 and 20 divide out a room C; and partitions 19 and 20 divide out a room D. It is understood that the partitions on the second story correspondingly divide the story into rooms E, F, G and H located respectively over rooms A, B, C and D. The partition 21 directly over the partition 18 separates rooms E and F. As shown in the plan of Fig. 2 suit-

able doorways may be provided in the partitions.

The floors 12 and 13 are similar in construction. In each are provided beams 25. Figs. 3 and 4 show that these beams are open and, in the specific construction employed, consist of opposed angle irons 26 and 27 spaced by latticed elements 28. Consequently, these beams provide an open space throughout the area beneath the floor.

Laid across the tops of the beams is an underflooring 30 that may be of any suitable material, such as concrete. A floor covering 31 is laid over the underflooring: 30 and may be of wood, cork, or the like.

Beneath the beams, there spans an upper ceiling 32 which, with the underflooring 30, encloses the space between the two and around the beam. Within any finished room, a ceiling cover 33 is provided, certain details of which will be given hereinafter.

Within the basement 14, and preferably centrally therein, there is located a furnace generally indicated at 35. This includes a fire box 36 from which there extends a smoke manifold 37 designed so as to have a plurality of vertical passages 38 therethrough, and from the outer end of which there extends the smoke pipe 39.

A fuel control 40 is provided on the front of the furnace and the same is thermastically actuated as will be understood in the art. A shelf 41 surrounds the furnace and in this there is provided a thermastically actuated air circulation of 42. An outlet conduit 43 from the pump 44 enters a vertical enclosure 44 that surrounds the fire box 36. The enclosure 44 is narrowed above the fire box into the conduit 45 that extends upwardly through the floors 31 and 32, extends through the ceilings 32 and 33 of the first floor, whence it may convey some of the heat from the conduit 45 to the space beneath the lower floor 31. A vertical riser 46, somewhat smaller than the conduit 45, extends into the latter and passing upwardly through the floors 31 and 32, extends through the ceilings 32 and 33 of the first floor, whence it may convey some of the heat from the conduit 45 to the space beneath the second floor 32. Reference to Fig. 2 shows that both of these conduits are centrally located of the building, this being the preferable location.

The action of the blowers 47, therefore, draws air through the smoke manifold 37 to preheat the same, then forces this air over the fire box to bring it to the desired temperature, and finally forces it through the flue 45 and riser 46 to discharge it beneath both floors where it may heat the same. A gate valve 48 is located at the junction of the conduit 45 and riser 46, and may be swung by a suitable outside handle to close, or partially to close, either the conduit or the riser.

As has been noted, this hot air is released into the rooms. To obtain the most desirable circulation, the release outlets are provided on the two walls of the room opposite the central passages of the heating flues. This is indicated by the arrows in Fig. 2. To accomplish this, release openings are provided adjacent the floor along these two opposite walls. For instance, referring to room A, Figs. 3 and 4 show horizontal lines across the beams. Fig. 3 being across the beams. Along these two walls, the floor 30 terminates short of the side walls 10 and is provided with short vertical risers 50. The floor surface 31 may be conveniently turned up along these risers as at 51. Along the walls 10 inside the building are provided inside walls 52 spaced from the walls 10, and this space is desirably filled with insulation 53. The walls 52
and insulation 53 adjacent the release openings terminate short of the floor and slightly above the risers 50. A flanged molder 54 is secured to the bottom of the walls 52, its extension 55 overhanging the risers 50 concealing the top of the same and providing the outlets 56. If desired, material 57 and 58 may be provided to round the corners and direct the air flow from the space surrounding the beams 25 out the release passages 56. Preferably the molder 54 is carried around the room to provide uniform appearance. However, except for the walls in which it is desired to have the release passages, the opening providing them is closed either by carrying the walls 52 down or the risers 50 up.

The hot air thus circulates completely beneath the floors of the rooms and is released into the rooms along the walls opposite the flues 45 and the riser 46.

It is provided also that the air may be withdrawn from the rooms. It is most desirable that this be done at the ceilings thereof and as nearly as may be opposite the discharge openings 56. This is to this end, each room is provided with a molder 60 around it and near the ceiling. This molder is flanged outwardly at 61 and is secured at the top of the wall 52, this wall being secured to the studs 63 on the partition. Insulation is not necessary for the partition as is the case for the outer walls. The ceiling 62 is continued around and downwardly as at 64 until it meets the upper edge of the walls 52. This manner of formed walls and ceiling is not necessary since, if desired, the walls 52 may continue up until they join the ceiling in the usual manner.

Between certain studs, the depending portions 64 of the ceiling 33 are provided with openings 65 that lead into the space between the studs, this space being enclosed by the studs and the walls 52, as is clear from Fig. 2. For the second story, since the studs terminate at the floor, a conduit 66 is provided to communicate the space between the designated studs of the second story with corresponding ones on the first story, whereby a cold air conduit is effected extending from adjacent the ceiling of the second story down to the floor of the first story.

As is shown in Fig. 2, this cold air duct for the two upstairs rooms and E in is in the partition wall 10; the duct for the upper floor rooms G and H is provided in the partition wall 20; the duct for rooms A and C is provided in partition wall 17 and that for rooms B and D is provided in partition wall 19. Of course, other arrangements of the ducts may be employed, or conduits separate from the walls may be used if desired, but it adds simplicity to use the space between certain studs as described.

Opening on the floor of the first story, the furnace shell 45 on the cold air intake side is provided with a manifold 68. This manifold communicates with each of the cold air inlets within the partition walls and flares out at 69 over the smoke manifold 37 of the furnace itself. In this portion 69 are provided flanges 70 and a refrigeration coil 71 that extends across this passage. The refrigeration coil is provided with a cut-off 72 so that it may be rendered inoperative.

In the practice of the method, the furnace is thermostatically controlled, as is well known in the art, by the temperature of the building. The floor 42 is likewise thermostatically controlled so as to deliver air at constant temperature, this being effected by varying its speed in proportion to increase in temperature of the furnace. Preferably the air is delivered at a temperature of approximately 100 to 110° F. The air enters the enclosure 44 whence it is forced up beneath the floors to every story. In order to obtain proper division of the air between stories, the valve 46 is adjusted to cut-off part of the flow from either the conduit 45 or riser 46, and thereby direct more to the other. The valve may of course be left in neutral position. The remote location of the release passages 56 causes this air to pass completely across beneath the floors before it is released into the rooms. It is evident that the cold air ducts run to the intake end of the blower 42. The room passages for these cold air ducts are located diagonally opposite the release passages 56 so that the air from the release passages is caused to pass diagonally across the room and from floor to ceiling, hence it is brought again down across the filters and smoke manifold, and into the blower for recirculation.

In hot weather the furnace is not used and instead the refrigerating coil 71, carrying a refrigerant from a suitable refrigerating mechanism, is rendered operative. The blower operates the same as with the furnace, drawing the air across the coil 71 to cool the same, thence forcing it up beneath the floors. Or, if desired, the direction of the blower 42 may be reversed, causing the cold air to enter the rooms at the ceilings thereof, whence it falls to the floors and is drawn out the passages 56. This last is not necessary, as is explained above.

It is preferable, though not absolutely necessary, to have rooms on different floors exhaust into different cold air ducts, since otherwise the action of the blower might cause more air to be drawn from one story than from another. Quite obviously, the points of the various cold air ducts, as well as the hot air passages, are proportioned to the needs of the particular building.

It thus may be seen that a new building construction and new method of tempering the air in buildings has been provided. It may be used with any type of building and any type of fuel.

What is claimed is: 1. In a method of regulating the temperature of a building having a plurality of rooms on one floor, the steps of passing air through a tempering medium, discharging said air into the floor of the building at a central point, causing said air to radiate from said point across beneath said floor and thereby cause the floor to assume a temperature corresponding to the temperature, releasing said air into each room remotely from said discharge point and adjacent the floor, exhausting said air adjacent the ceiling of each room and across from said releasing points, and directing said exhaust air back into said tempering medium.

2. An air tempering system for a building having at least two stories, a floor for each story, partition walls over each floor dividing the stories into a plurality of rooms, means beneath each partition wall providing an enclosed space and heat conducting relation to said floor, a tempering means, an enclosure around the same, means conducting tempered air from said tempering means to the space beneath each floor, and discharging into said spaces at approximately the centers of such spaces, means for adjustably controlling the division of the air between the floors, release passages adjacent the edges of the floor.
remote from discharging points to release the tempered air into the rooms at points remote from the discharge points, a withdrawal opening adjacent the ceiling of each room across the room from the release passages, withdrawal conduits enclosed by said partition walls, and leading from said openings to said tempering means enclosure, there being at least one withdrawal conduit for each story, and a blower in said enclosure applying positive pressure to force air across said tempering means, under said floors to temper the same, and into said rooms, and also applying negative pressure to withdraw said air through said withdrawal conduits.

3. An air tempering system including an air tempering means, a floor comprising beams the webs of which are provided with multiple openings whereby the channels between the beams are in free communication, flooring laid over the beams and closing the top thereof, ceiling over the bottom of the beams and enclosing the bottom, conduit means from the tempering means discharging air into the floor space adjacent one side of the room, whereby the air may flow radially from the conduit under the entire floor, release outlets along the floor edge of the room opposite the discharge conduit to release the air into the room, a withdrawal opening in the room at the ceiling on a wall adjacent the discharge conduit, a withdrawal conduit extending from the withdrawal opening through the wall to the tempering means, and a blower to circulate the air as above.

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