

June 9, 1942.

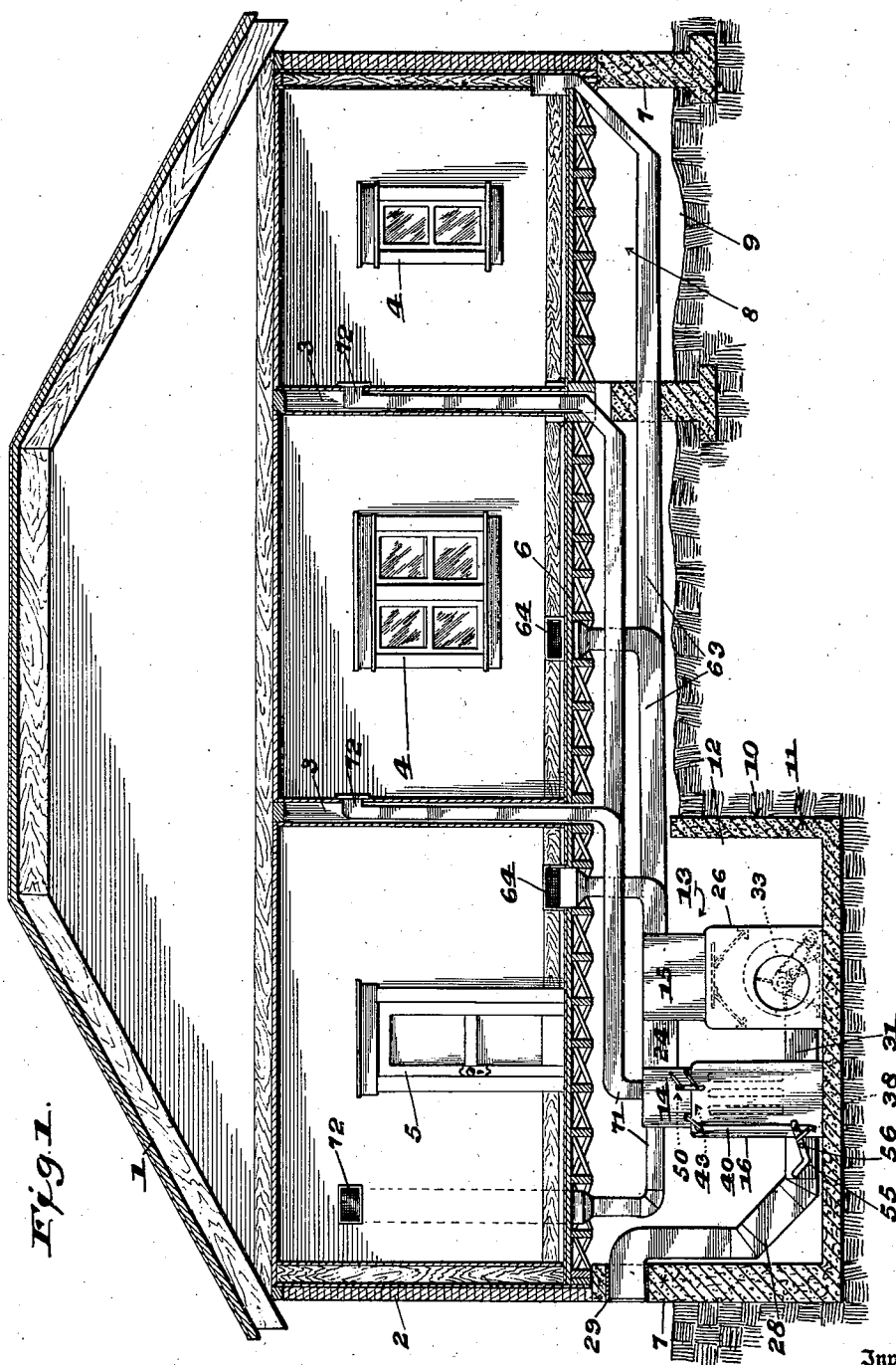
J. F. SHELTON

2,286,115

AIR TEMPERING APPARATUS

Filed Sept. 26, 1940

3 Sheets-Sheet 1



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Fig. 2

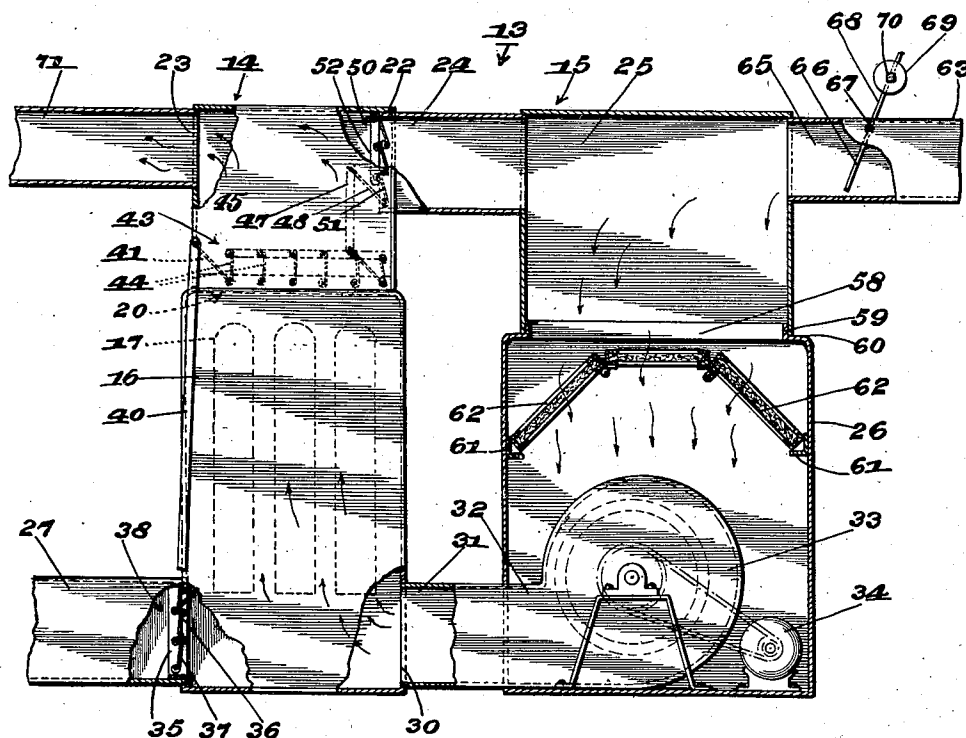
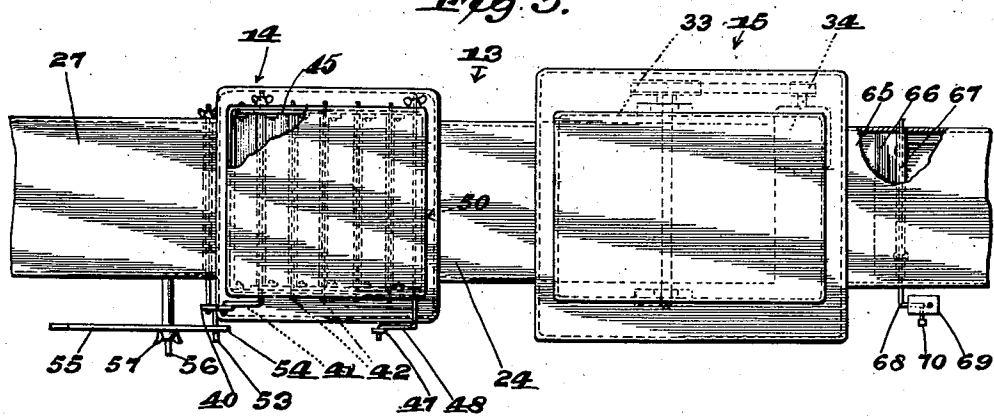


Fig. 3.



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Fig. 4.

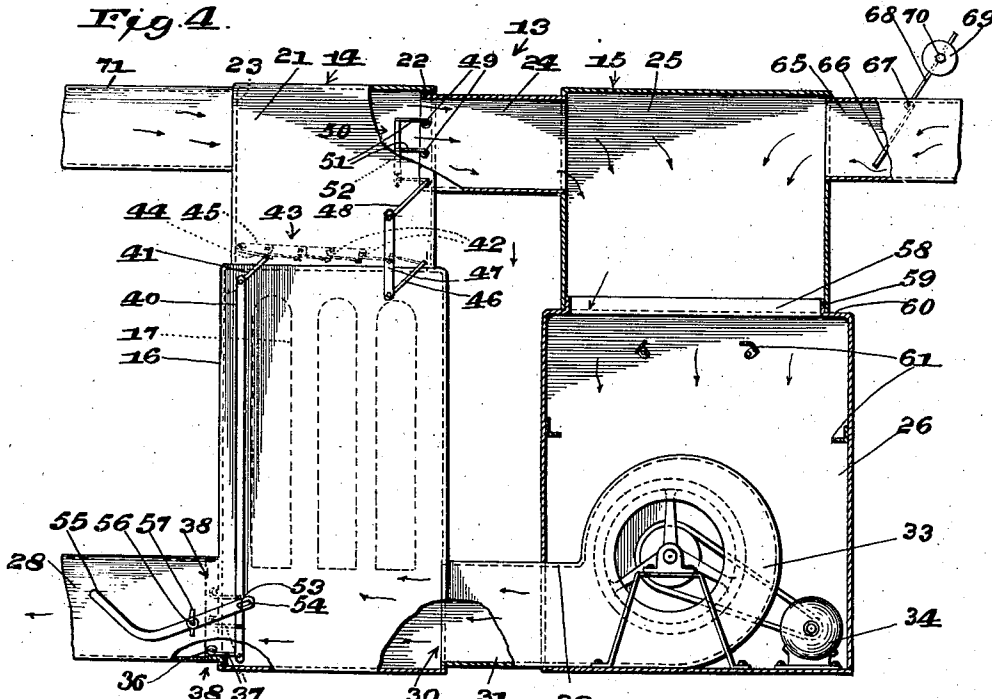


Fig. 5.

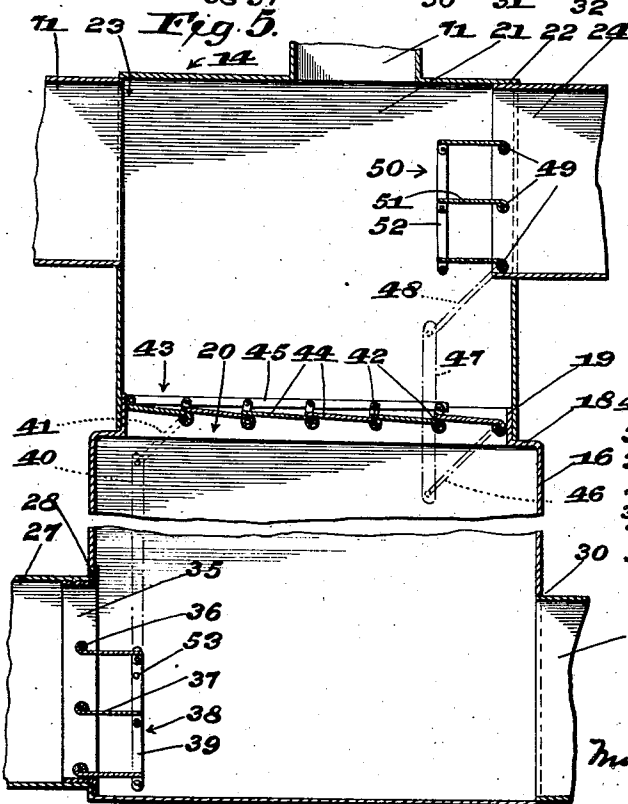
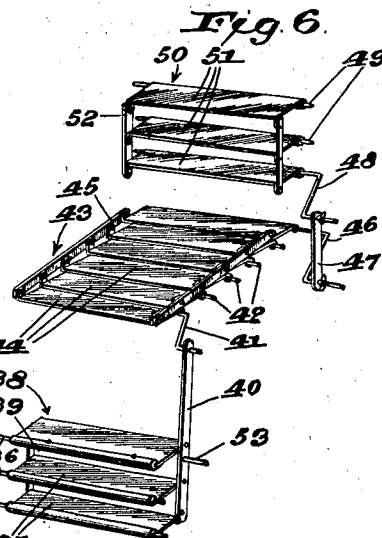


Fig. 6.



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UNITED STATES PATENT OFFICE

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AIR TEMPERING APPARATUS

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Application September 26, 1940, Serial No. 358,551

3 Claims. (Cl. 98—33)

This invention relates to improvements in air tempering apparatuses, herein more specifically identified as a reversible heating and ventilating system because of the capability of its dual use in tempering the air both in summer and winter. The system is herein described as being primarily intended for installation in a dwelling, but it is to be understood that said system may be used in any type of building wherein heated air is to be supplied in winter and cooled air in summer. The underlying principles of the invention will be readily understood from the following statements of the objects thereof:

First, to provide a dual system of tempering air throughout an entire year, embodying provisions for heating the air in winter and cooling the air in summer.

Second, to provide a multiple damper which, actually comprises a plurality or system of dampers, which multiple damper is capable of embodiment in old installations as well as new ones for the purpose of effecting the control of the heating unit.

Third, to provide a system of the character described wherein the foregoing multiple damper makes it possible to employ the same operation of the blower both for heating and cooling, and for reversing the flow of air to and from the rooms of the dwelling.

Fourth, to provide three definite methods of cooling the rooms of the dwelling in summer, said methods being clearly explained in the description below.

Fifth, to provide a multiple damper which enables controlling the suction side of the blower.

Sixth, to provide a system of the character described wherein the plenum chamber over the blower can be made to receive air either from the return ducts as under commonly known conditions, or from both the return and supply ducts under a certain setting of the multiple damper.

Seventh, to provide a damper system which is regarded as distinctly novel in itself, one of its advantages being the capability of installing it in any forced air heating system so as to convert said system into a cooling apparatus for summer use.

Eighth, to provide a novel method of distributing air which depends in a large measure on the herein disclosed multiple damper, but not necessarily on the specific construction thereof.

Other objects and advantages will appear in the following specification, reference being made to the accompanying drawings, in which:

Figure 1 is a diagrammatic cross section of a dwelling illustrating the installation of the improved heating and ventilating system.

Figure 2 is a vertical section of the combined tempering and blower apparatus, the setting of

the multiple damper being for winter operation.

Figure 3 is a plan view of the apparatus in Fig. 2.

Figure 4 is a partially sectional and side elevational view of the apparatus in Fig. 2, illustrating the multiple damper setting for summer operation.

Figure 5 is an enlarged section of a portion of the tempering unit, more particularly illustrating the multiple damper.

Figure 6 is a perspective view of the multiple damper hereinbefore referred to.

This invention is an improvement on the air tempering apparatus disclosed in an application for patent by Jack F. Shelton, filed August 30, 1939, Serial No. 292,752. In that application use is made of a damper arrangement for controlling the passage of air through a heating and cooling apparatus, but the arrangement for accomplishing that purpose in the instant invention is far more comprehensive in its scope of operation since it embodies a plurality of dampers capable of either coordinated operation as in most instances, or individual operation to suit certain specific needs.

The instant disclosure is that of the installation of the system in a house 1 which, for the purpose of convenient identification, includes outside walls 2, a number of partitions 3, a plurality of windows 4 and at least one door 5. The floor 6 is supported by a foundation 7 in the accustomed way, a sub-floor space 8 being defined above the ground line 9 by carrying the foundation to the requisite altitude, an excavation 10, desirably lined at 11 providing a cellar 12 in which the reversible heating and ventilating apparatus 13 is emplaced.

By referring to Fig. 2 this apparatus is seen to comprise what is herein known as the air tempering unit 14 and the blower unit 15. The unit 14 comprises a casing 16 to which the air treating element 17 is confined. The reason for this rather broad designation of the element 17 is to anticipate some variation in its character. For winter use the element 17 will comprise heating coils and all of the necessary apparatus that goes with them, while in summer said coils may either be converted into or replaced by refrigerating coils, again with all of the necessary apparatus.

The casing 16 has a top shoulder 18 with an upstanding flange 19 which constitutes the boundary of a very large opening 20, said opening in fact almost equalling the cross sectional area of the casing. A plenum chamber 21 surmounts the casing 16, use being made of the flange 19 to provide a stable and air-tight connection. Said chamber has at least two openings 22, 23, the first being used as the place of affixation of a duct connection 24 with a plenum chamber 25

which surmounts the casing 26 of the adjacent blower unit 15.

The casing 16 has a bottom opening 27 to which an exhaust duct 28 is attached. This duct leads off to an exhaust opening 29 in the foundation 7 above the ground line, and although not so shown said duct may be supplemented with a system of louvers which in practice are expected to exercise the usual advantages. Another bottom opening 30 in the casing 16 provides the place of connection of a transition piece 31 which is the virtual continuation of the outlet 32 of a blower 33 in the casing 26 of the unit 15. The fan of said blower is operated by a motor 34 which is subject to any desired mode of control.

A frame 35 is set in the bottom opening 27 (Fig. 5), in fact it is provided with a tight fit inside of the duct 28. The use of said frame is not necessarily adhered to, but it is shown at this particular place as providing a convenient mount for the ends of a plurality of shafts 36 to which the louvers 37 of a multiple damper 38 are secured. The free ends of these louvers are pivotally connected by a short link 39 on one end and by a strap iron tie rod 40 on the other side.

This rod extends up into the vicinity of the opening 20 where it is connected to the crank extension 41 of one of the shafts of a plurality of such shafts 42 of another multiple damper 43. The louvers 44 of this damper are secured to the respective shafts, the free ends of the louvers being connected by links 45. Instead of duplicating the frame 35 for the multiple damper 43 use is made of the upstanding flange 19 as the support for the louver shafts.

Another one of the latter shafts has a crank extension 46. One end of a link 47 is attached to this crank whence the link extends upwardly and makes connection at its other end to a crank extension 48 of one of the shafts of a plurality 49 of such shafts which constitute parts of a third multiple damper 50. The louvers 51 of this damper are secured to the shafts as before, their free ends being connected by links 52 as shown. This damper is embodied in the mouth of the duct connection 24 as in the instance of the damper 43 although a separate frame could be employed for its mounting.

Thus far it will be seen that the tempering unit 14 is supplemented with a system of multiple dampers which are so interconnected as to constitute a completely articulated damper system. Under usual circumstances it is intended that all of the multiple dampers shall be operated in a unitary manner. For this purpose the tie rod 40 has a stud 53 extending off to one side to a place of exposure on the exterior of the casing 16, where connection is made with the slotted end 54 of a hand lever 55. The pivot 56 on which this lever is turnable includes a wing nut 57 which is adapted to be tightened at the chosen position of the lever at which the desired setting of the multiple dampers is established.

With reference to the blower unit 15 it is seen that the casing 26 like the casing 16, has a very large opening 58, the boundary of which comprises a flange 59 upstanding from a shoulder 60 of the casing 26. The plenum chamber 25 is set down over the flange 59 to make a tight connection. The chamber 26 has a number of rests 61 on the inside (Fig. 4) upon which filter screens 62 (Fig. 2) are adapted to be set for the winter use of the apparatus. These screens are

desirably taken out for summer use of the apparatus, of which Fig. 4 is an illustration.

One or more return ducts 63 are connected to the plenum chamber 25 of the unit 15. Usually there is a plurality of these ducts as shown in Fig. 1, each extending off to a return grille 64 located substantially on the floor line and either in the outside walls or partitions of the house. Said return ducts actually merge into a single flue 65 which has direct connection with the plenum chamber 25, the purpose of this merging the ducts being to make a balanced damper 66 responsible to the total volume of returning air.

Said damper is located in the flue 65 where it is supported by a cross shaft 67. An arm 68 extending off and upward from this shaft carries a weight 69. There is a set screw 70 which provides for the adjustment of the weight so that the desired balance of the damper is obtainable.

The previously mentioned opening 23 of the plenum chamber 21 (Fig. 5) is to be regarded as representative of a number of such openings, each providing the place of connection for a supply duct 71 which leads off to a supply register 72 located high in the respective wall or pocket as clearly shown in Fig. 1.

The operation is readily understood. The usual arrangement of the multiple dampers 38, 43, 50 is as shown in the drawings, for example Fig. 6, according to which all three of said dampers are interconnected by the tie rod 40 and link 47. Thus it is plain that when the lever 55 is moved in a given direction there will be an instant response in each of the dampers, establishing a setting of the louvers in any position within the possible range of movement.

However, it is desired to point out at this place that for some installations it may be regarded desirable to suspend the universal adjustability of the multiple dampers and with that requirement in mind the tie rod 40 and link 47 are made so that they can be slipped off of the cranks 41, 46 and 48, leaving these cranks free for independent operation and consequently independent settings of the respective dampers.

But considering the apparatus as it will be used customarily, the winter setting of the multiple dampers will be as shown in Fig. 2. When the mid damper 43 is open as in this setting, the terminal dampers 38, 50 are closed. The operation of the blower 33 produces an indraft through all of the return ducts 63 to the plenum chamber 25, whence the air current is delivered to the casing 16 for warming by the element 17. It is then delivered to the plenum chamber 21 whence it is distributed to the rooms of the house through the supply ducts 71.

Under this winter setting the air is circulated through the rooms and the apparatus 13, any ordinary mode of freshening the air being adopted to avoid unduly vitiating the total volume. This mode may comprise a common expedient such as partly opening one of the windows.

The setting for summer use is illustrated in Fig. 4. The mid damper 43 is now closed and both terminal dampers 38, 50 are open. It is at this point whereat three possible methods of cooling are logically explained; first by converting the erstwhile heating element 17 into a refrigerating coil or, if it be chosen to place a refrigerating coil beside the heating coil which under this circumstance would naturally be dormant, air from the blower discharged over the refrigerating coil will be cooled and thus temper

the rooms. Second, for the morning hours while it is still cool inside of the house, the windows and doors should be kept closed to keep the rising outside temperature from entering the house. The blower 33 will then draw the air from the rooms through all of the ducts with return grilles at the floor level discharging it back into the rooms through the overhead registers.

The third mode of cooling is to induce natural ventilation. For this purpose the multiple damper setting will be as in Fig. 4. All of the windows should be open. Under this circumstance all of the ducts both return and supply will act as return or suction ducts. The blower 33 will induce an indraft both at the floor grilles 64 and the overhead registers 72, discharging the total volume of air into the exhaust duct 28 and inducing a breeze at each of the open windows.

The last arrangement is especially advantageous on warm summer nights when there is no breeze outside. By opening the windows and starting the operation of the blower 33 with the multiple dampers set as in Fig. 4, fresh air will be drawn in through the open windows with a force substantially equal to that of the air current driven by the ordinary electric fan.

The foregoing method of distributing the air is regarded as being distinctly novel. This method will operate as stated whether the multiple damper arrangement is built in as an integral part of an original installation, or whether it is added to any standard forced air heating system. The outstanding advantage is that the one system provides for the heating of the building in winter months and for its cooling in the summer months without subjecting the owner to the expense of an independent ventilating system.

I claim:

1. Air tempering apparatus for a building having a plurality of rooms, air supply registers at approximate ceiling height and return grilles at approximate floor level in each of the rooms, a blower unit and an air tempering unit, an independent plenum chamber embodied in each of the units, a connection between said chambers, an exhaust duct leading from the tempering unit, air supply ducts connecting the registers with the tempering unit plenum chamber, being adapted primarily for the pressure supply of air to said registers, return ducts connecting the grilles with the blower unit plenum chamber, being adapted primarily for the suction return of air, a duct connecting the blower unit with the tempering unit and a multiple damper arrangement including dampers located across the connection between the plenum chambers and dampers located across the exhaust duct, said three sets of dampers being interconnected, means for simultaneously operating the sets of dampers to close off and by-pass the tempering unit and at the same time to open said connection and exhaust duct for a common indraft of air from all of the rooms into all of the registers as well as all of the grilles thus to exhaust the air of the rooms from two points through both plenum chambers and out at the exhaust duct.

2. Air tempering apparatus for a building hav-

ing at least one room with a window which is adapted to be opened, an air supply register at approximate ceiling height and a return grille at approximate floor level in said room, a blower unit and an air tempering unit having a conduit connecting the lower portions of the blower unit and the air tempering unit, an independent plenum chamber embodied in the top of each unit, a connection between said chambers, an exhaust duct leading from the tempering unit substantially in line with the transition piece, an air supply duct connecting the register with the tempering unit plenum chamber, being adapted primarily for the pressure supply of air to said register, a return duct connecting the grille with the blower unit plenum chamber, being adapted primarily for the suction return of air, and a multiple damper arrangement including dampers located crosswise of the tempering unit, dampers located across the opening of the chamber connection and dampers located across the exhaust duct, said three sets of dampers being interconnected, and means for simultaneously operating the three sets of dampers to close off and by-pass the tempering unit and at the same time to open said connection and exhaust duct for a common indraft of air into the supply register as well as return grille, thus to induce an air current through the open window into the room for eventual discharge into the exhaust duct.

3. Air tempering apparatus for a building having at least one room with a window which is adapted to be opened, an air supply register at approximate ceiling height and a return grille at approximate floor level in said room, a blower unit consisting of a casing containing a blower, an air tempering unit consisting of a casing containing an air-treating element, a conduit connecting the blower outlet to the bottom of the tempering unit casing, an independent plenum chamber embodied in the top of each unit, a connection between said chambers, an exhaust duct leading from the tempering unit chamber substantially in line with the conduit, an air supply duct connecting the register with the tempering unit plenum chamber, being adapted primarily for the supply of air under pressure to said register, a return duct connecting the grille with the blower unit plenum chamber, being adapted primarily for the suction return of air, and a multiple damper arrangement including dampers located crosswise of the tempering casing above its contained element dampers controlling the flow of air through the connection between the plenum chambers and dampers controlling the flow of air through the exhaust duct, said three sets of dampers being interconnected, and means simultaneously operating the three sets of dampers to close access of the tempering unit casing to the respective plenum chamber and at the same time open said chamber to the respective connection and to open the respective casing to the exhaust duct for a common indraft of air into the supply register as well as return grille, thus to induce uni-directional flowing of a common current of air through both plenum chambers to induce an indraft at said open window and an eventual discharge into the exhaust duct.

JACK FENNER SHELTON.