Aug. 20, 1935. F. H. CORNELIUS 2,011,754

FURNACE

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Fig. 1.

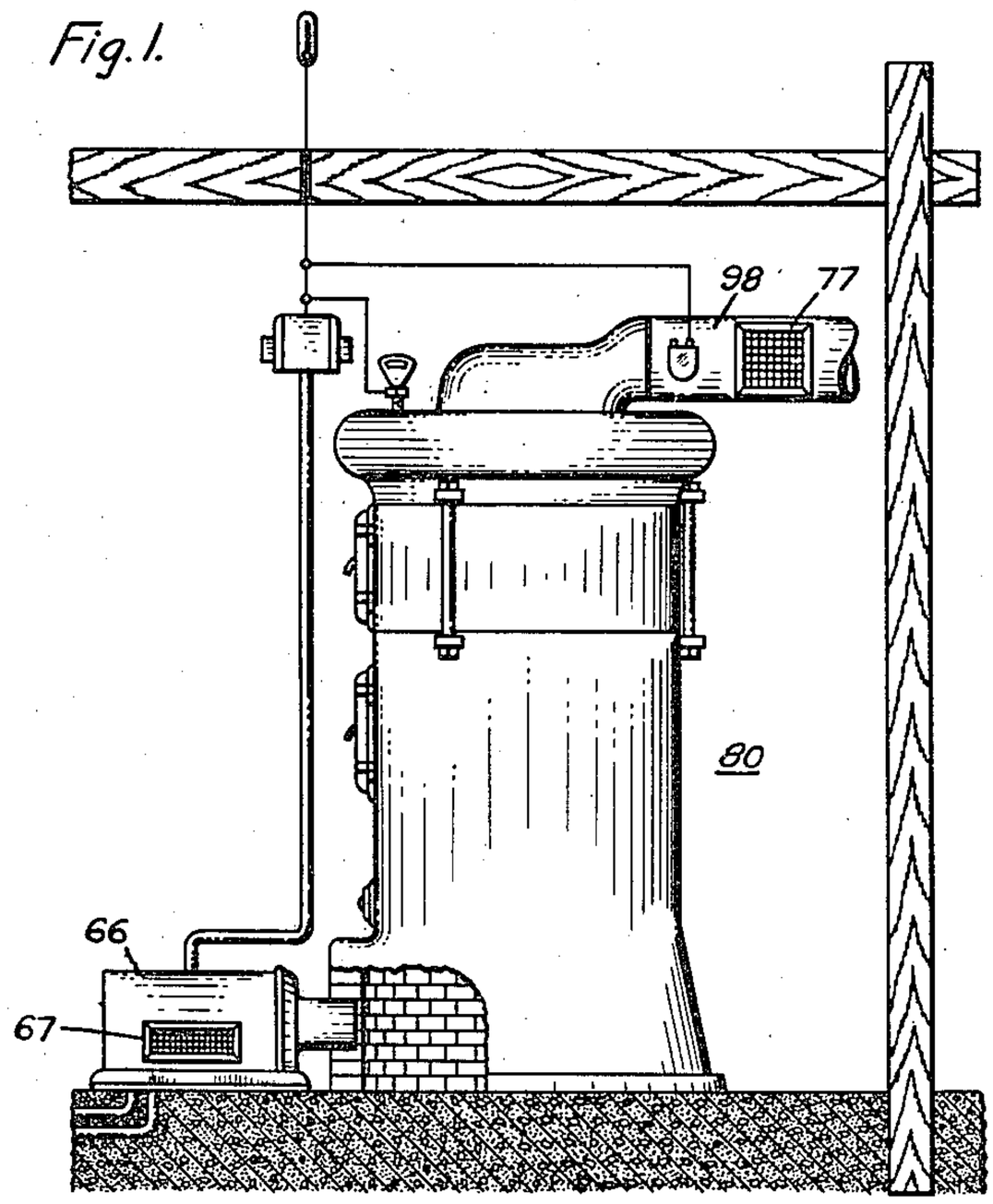


Fig. 2

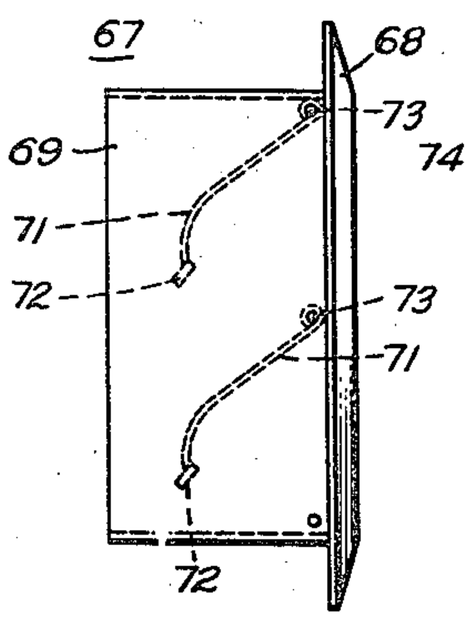


Fig. 3.

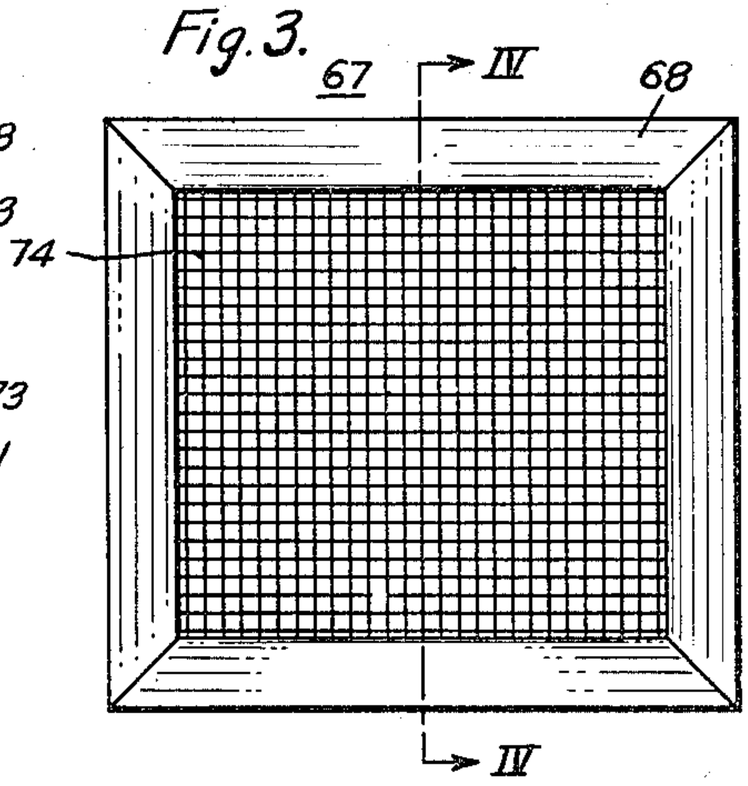
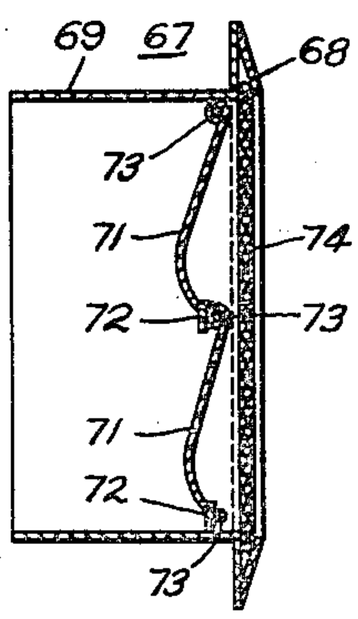


Fig. 4.



WITNESS

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Fig. 5.

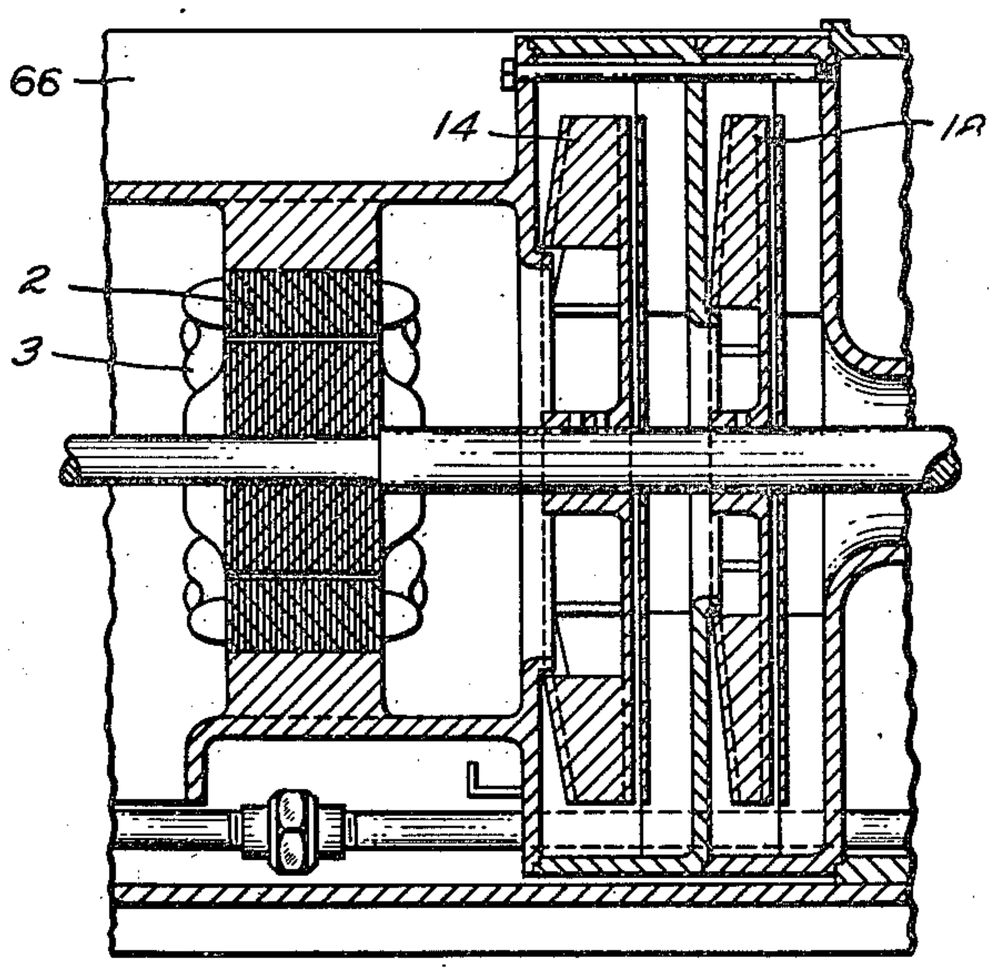
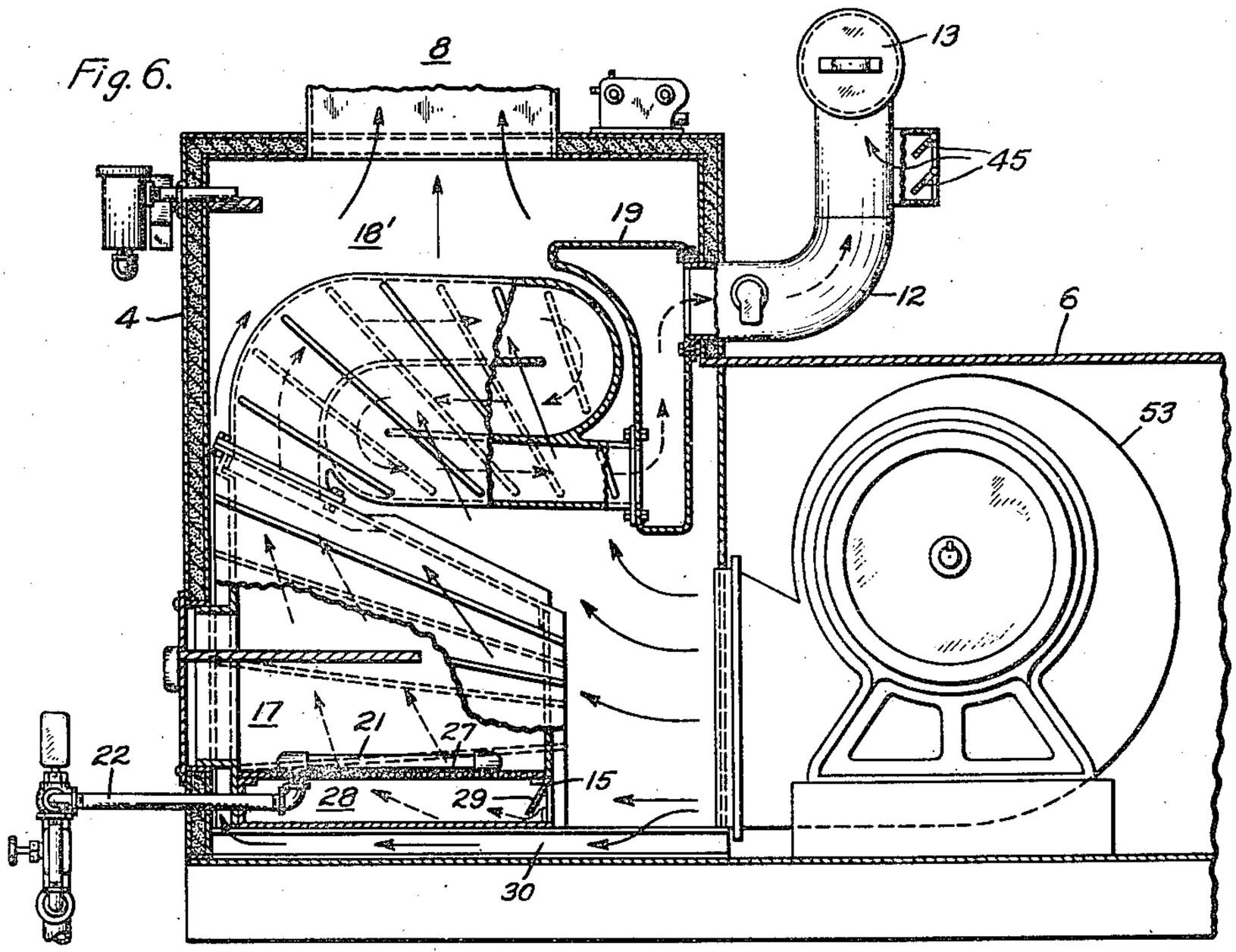


Fig. 6.



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Patented Aug. 20, 1935 2,011,754

UNITED STATES PATENT OFFICE

2,011,754

FURNACE

Frank H. Cornelius, Swissvale, Pa.

Application March 17, 1932, Serial No. 599,403

2 Claims. (Cl. 110—163)

My invention relates to furnaces for heating purposes, and it has special relation to the ventilating and draft-regulating features thereof, this application being a continuation in part of my copending applications Serial No. 270,605, filed April 17, 1928, Patent No. 1,855,339, issued April 26, 1932, and Serial No. 552,596, filed July 23, 1931.

One object of my invention is to provide a furnace with an enclosed casing having ventilating means therein that is actuated to open position by the current of air generated within the furnace burner.

A further object of my invention is to provide a sealed furnace with damper means in the flue and in the burner casing that shall automatically be closed or opened to correspond with the status of the burner to thereby prevent the fire box of the furnace from being cooled by a passage of air therethrough when the source of heat is cut off.

A still further object of my invention is to provide a pair of automatically operated dampers for a furnace of the above described type, one of which is provided on the combustion chamber in the path of the circulated air, the other of which is located in the smoke breeching, the latter damper being provided with louvers that are actuated with less effort than that required to operate the louvers of the first said damper.

Another object of my invention is to provide a draft-regulating device for a warm air furnace, jointly operated by the automatic action of gravity and gas stream pressure.

A more specific object of my invention is to provide a hinged shutter for opening or closing a passage for supplying air to a burner through the agency of a blower, together with a second hinged shutter in the furnace flue for so cooperating with the other shutter as to maintain a predetermined draft pressure during the active operation of the furnace.

Other objects of my invention will become evident from the following detailed description taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view in side elevation of a furnace system embodying my present invention;

Figs. 2 and 3 are views, in side and front elevation, respectively, of a portion of the apparatus shown in Fig. 1;

Fig. 4 is a view in section taken along the line IV—IV of Fig. 3;

Fig. 5 is an enlarged view in longitudinal section of a portion of the apparatus shown in Fig. 1; and

Fig. 6 is a view for the most part in longitudinal section, but partially in elevation, of a modification of the invention that is shown in Fig. 1.

In practicing my invention I provide an oil burner in which the air for atomization is supplied in a manner somewhat similar to that found in the art, but is combined with the additional structure that supplies all of the air required for combustion. Regulating means is supplied for the air at several parts of the structure so that complete combustion is assured under all conditions. I am able to accomplish this result by completely enclosing the burner end of my structure within the combustion chamber which thereby receives air only through the source of supply within the burner, a sufficiency of which is always assured when the burner is in operation.

The above said construction provides further novelty to my invention as regulating means may be supplied both on the burner and on the flue, so that the air is completely shut off from the heated combustion chamber when the air currents from the burner are shut off and the natural draft that would ordinarily pass therethrough will then automatically open a venting device in the flue or which will be opened when the natural draft is greater than that necessary to carry off the gases of combustion.

Referring to Figs. 1 to 4, inclusive, of the drawings, the structure here shown comprises a boiler 80 of any suitable type having, in particular, first, an oil-atomizing and injecting apparatus disclosed and claimed in my above-identified application, Serial No. 270,605, and provided with a cover 66 that may be of cast metal or of sheet iron construction, and, second, a smoke breeching or flue 98.

The cover 66 is provided with an automatic damper 67 that may be of any design that will be automatically operated by an inflow of air produced by the operation of the fans 14 and 18, driven by a motor 2, 3 of the above-mentioned oil-atomizing apparatus. The form preferred is shown in Figs. 3, 4 and 5 in which a frame 68 is the means for supporting the housing or rectangular shaped frame 69, in which the louvers 71 are pivotally supported on rods 73 and upon which they freely swing. In normal position when the burner is not operating the louvers 71 are not attracted to their open position, as shown in Fig. 2, but are in a lower or closed position, as shown in Fig. 4. The louvers 71 are provided with a fibre or felt strip 72 on its lowermost end

that abuts against the longitudinally disposed rods 73 to form a tight seal therewith.

The outer portion of the frame 68 is provided with a screen covering 74 to protect the louvers 71 from being distorted by any substance that might be inadvertently thrown thereagainst and to prevent the air currents passing therethrough from carrying paper or any other like material to within the air passages of the burner.

A frame 77, similar to that of the above described frame 68, with the exception that the louvers 71 thereof are arranged to operate with a less pressure than required to operate the louvers 71 of the frame 68, is provided in the flue 98 of the boiler as shown in Fig. 1. This difference of operation may be accomplished by enlarging the area of the louvers 71 of the damper 77, or by any other means well known in the art. With this construction, the damper 77 will be moved to its open position when the burner is inoperative by the draft in the flue and which may be closed thereafter by the forced draft supplied by the burner when in operation. The louvers 71 of the frame 77 may also be operated to open or partly open position when the burner is in operation if the force of the draft in the flue exceeds the air supply of the burner.

The burner of my furnace is completely sealed within the fire box and the air supplied thereto must necessarily pass through the damper 67 to supply the air, both for atomization and combustion. It will thus be seen that when the burner is not operating, the louvers 71 of the damper 67 will be in their closed positions and the louvers 71 in the damper 77 will be operated by the natural draft of the flue, by which means the said natural draft will be completely cut off from the furnace and the heat stored therein will not be lost or dissipated by the natural draft that is usually present in burners heretofore employed in the art and which passes directly through the fire box containing the stored heat. By this arrangement my damper system will prevent the excessive draft, that will be present in extra high or large flues, from cooling the combustion chamber while the burner is in operation. By such an arrangement of my dampers I procure a great saving in the amount of the fuel required by a furnace as the large percent that is usually wasted by the above said passage of air through the fire box is thus avoided.

By so installing my burner in the fire box of a furnace, I am able to operate it at a great saving by utilizing all of the heat produced by my burner by shutting it off from all drafts or passages of air when the burner is inoperative. I accomplish this by enclosing the burner in a casing in which an automatic damper is arranged that will be open when the burner is in operation and closed when the burner is shut off. A similar damper is arranged in the flue connected to the combustion chamber and is actuated to open position by the draft in the flue when the damper in the casing of the burner is closed. By this means, the heat stored up in the combustion chamber is not immediately passed out of the flue as heretofore has been the custom when the burner is inoperative, but is retained therein as stored heat to later give up its energy; to retain the temperature of the spaces to be heated. The natural draft in the chimney instead of causing air to pass from the heated surface of the combustion chamber, opens the damper in the flue and passes air therethrough from a source exterior of the combustion chamber.

Referring to Fig. 6, the structure here shown comprises a furnace, the front portion 4 of which houses a combustion chamber and heat exchanger and has a greater vertical dimension than the rear elongated portion 6 for housing a blower and an air filter. A suitable warm air outlet or house inlet 8 is provided above the front section 4 in accordance with usual practice.

The front section 4 is provided at its rear side above the corresponding rear section 6 of the furnace with a suitable stack or smoke box 12 communicating with a central vent or flue 13 for carrying off the combusted gases.

A closed combustion chamber 17 is provided in the front lower portion of the front section 4 and communicates with a heat exchanger 18' located above the combustion chamber, which in turn leads to a manifold 19 and thence to the stack or smoke box 12.

A source of heat, such as a gas burner 21 of any suitable type, is located near the bottom of the combustion chamber 17, communicating with a pipe 22, which is controlled as set forth in detail in my above-cited copending application, Serial No. 552,596.

Just below the burner 21 a perforated plate or grating 27 is suitably positioned for the purpose of permitting air for combustion purposes to flow from the enclosed chamber 28 below the grating through an apertured or louvered shutter 29, preferably of aluminum, which is hinged at its top edge, as indicated at 15. The shutter may have a suitable stop or damper to regulate the amount of air admitted. At the very bottom of the furnace an air passage 30 is provided for the double purpose of maintaining the outer walls of the furnace section cool and at the same time carrying the heat that would otherwise be wastefully radiated to the atmosphere up towards the warm air outlet 8.

For the purpose of regulating the draft through the smoke box, in conjunction with shutter 29, hinged shutters or louvers 45, preferably of aluminum, and requiring less gas-stream pressure to operate than louvers 29, are associated with the upper portion of the smoke box 12, being adapted to swing inwardly when the pressure differential between the atmosphere and the gases inside the smoke box or vent are sufficient to overcome the gravitational action on the shutters.

The shutter or louvered damper 45 in the stack thus creates a substantially constant pull or draft on the furnace, regardless of the temperature of the gases or the height of the chimney employed, into which the vent pipe is tapped. Since the pressure from the blower 53 in rear section 6 upon shutter or louvered damper 29, leading to the combustion chamber 17, is also constant, it follows that a fixed and positive draft will be obtained in the furnace while the blower is operating, which will usually occur while the gas valve is open, on account of the room thermostat control system I provide, as set forth in detail in my above-identified copending application, Serial No. 552,596.

In this way, the proper amount of air for combustion is admitted through the damper 29, while any variation of the chimney draft is automatically compensated for by the damper 45.

When sufficient heat has been supplied, the aforesaid thermostat will cause the gas valve to close and the blower to stop. As a result, the damper 29 closes by gravity to reduce the flow of air to the combustion chamber. However, the damper 45 in the vent pipe will remain open, part-

ly because it is made of lighter-gage material than the damper 29, and partly because of the pressure caused by the draft of the warm chimney drawing air from the furnace room through the damper 45. This action eliminates the usual passage of air in prior art devices, under similar shut-down conditions, through the combustion chamber and heat exchanger and into the chimney at a higher temperature than that at which it entered the combustion chamber. The use of these two dampers, in accordance with my present invention, thus results in relatively great economy of operation of intermittently operated furnaces.

It will be seen that I have thus provided simple yet effective means for ventilating and regulating the draft of a warm air furnace to achieve the advantages set forth above. While I have illustrated two different forms of my invention, I do not wish to be restricted to the specific structural details or arrangement of parts herein set forth, as other modifications thereof may be effected without departing from the spirit and scope of my invention. I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. The combination with fuel burning means, a furnace casing surrounding the burning means, an air inlet to supply the burning means, a blower for producing a flow of air through the inlet, a pivoted damper for controlling the air inlet adapted to automatically open by said flow of air and close when said blower is inoperative, a furnace flue having an opening therein, a pivoted damper for controlling said opening, said dampers being constructed and arranged so that the fluid pressure required to open the flue damper is less than that required to open the inlet damper, said flue damper being operable to open position by flue draft to relieve the suction on the furnace side of the inlet damper.

2. The combination with fuel-burning means, a furnace casing surrounding the burning means, an air inlet to supply the burning means, a blower for producing a flow of air through the inlet, a first pivoted damper for controlling the air inlet adapted to automatically open by said flow of air and close when said blower is inoperative, a furnace flue having an opening therein, a second pivoted damper of lighter-gage material than said first damper for controlling said opening, and being operable by less fluid pressure than that required to open the inlet damper, said flue damper being operable to open position by flue draft to relieve the suction on the furnace side of the inlet damper.

FRANK H. CORNELIUS.