

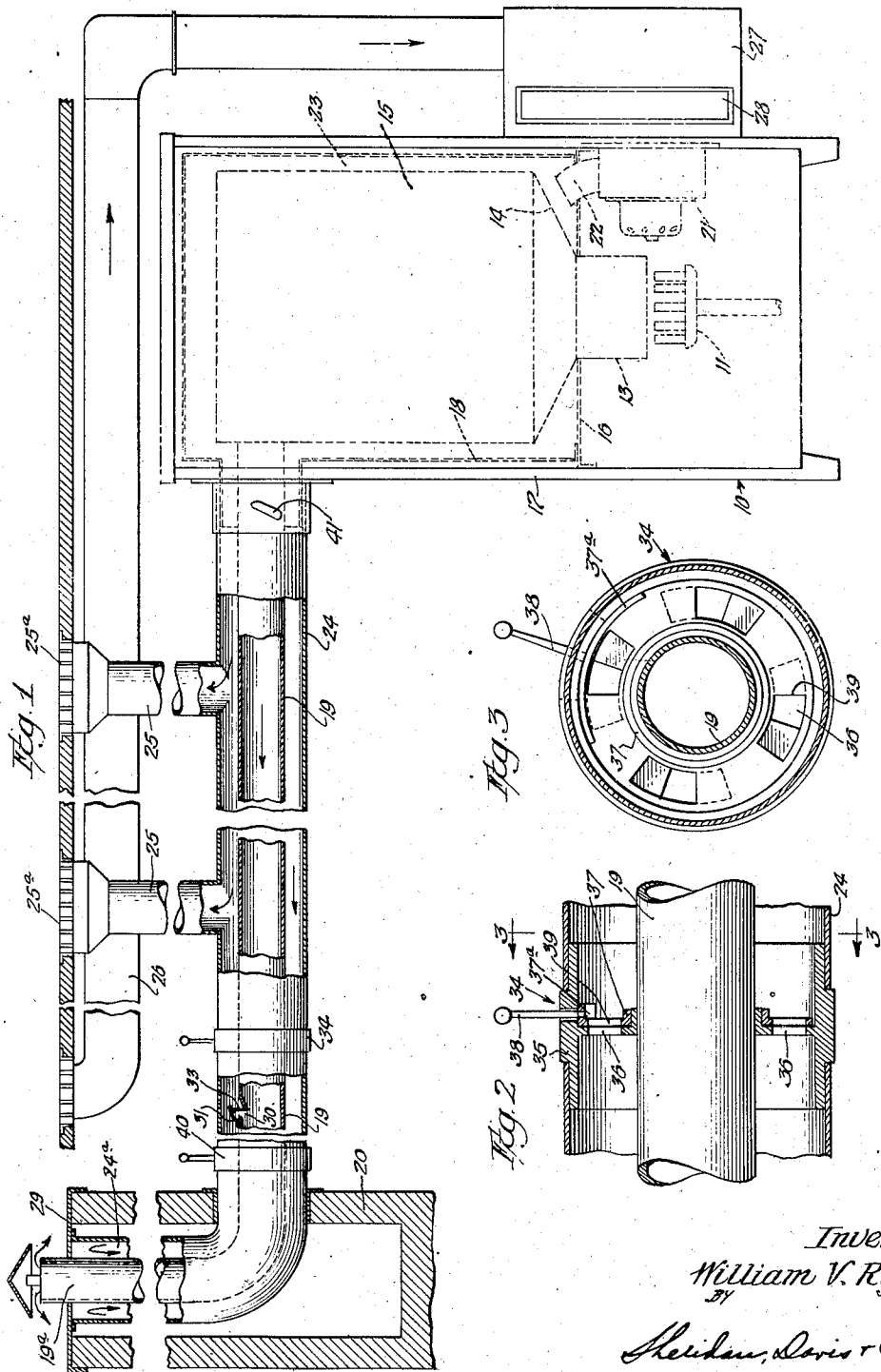
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2,385,652

HEATING APPARATUS

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HEATING APPARATUS

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2 Claims. (Cl. 237-55)

This invention relates to improvements in heating apparatus.

In the use of gas as a fuel in heating homes or other buildings where the heating apparatus exhausts the products of combustion into chimneys, difficulties have been encountered by reason of hausts the products of combustion into chimneys, during cold weather. In cold weather the condensate sometimes is sufficient in quantity to follow down the exhaust flue and drip upon the floor within the building or run down the wall beneath the chimney opening. In severe winter weather, there have been instances where the draft through a chimney has been impaired or practically eliminated by the freezing of the condensate within the chimney, thus causing back pressure within the furnace exhaust flue which has resulted in improper induction of sufficient secondary air for proper combustion purposes and has thereby created a condition hazardous to health as well as a reduction in the heating efficiency of the furnace.

It is an object of the present invention to provide improved heating apparatus which eliminates the formation of troublesome or dangerous condensate in chimneys and which by providing for an augmented flow of products of combustion through the exhaust flue and chimney assures an adequate supply of secondary air for the burner for maintaining the same at desired operating efficiency.

Another object of the invention is to provide means for preventing the formation of condensate within the chimney in objectional quantities and thereby avoid the inconveniences and dangers above referred to.

Other objects and advantages of the invention will be apparent from a consideration of the following specification and accompanying drawing wherein,

Figure 1 is an elevation (partly in section) of heating apparatus illustrating the present improvements;

Fig. 2 is an enlarged broken view of a main hot air duct and a control therein; and

Fig. 3 is an end elevation of the structure shown in Fig. 3.

In the drawing, 10 generally indicates a furnace designed to utilize gas, either natural, artificial or a mixture thereof, as fuel. The burner 11 comprises, in the form illustrated a plurality of gas tubes 12, the flames which form at the upper ends thereof when the gas is ignited extending into a cylindrical inlet 13 which projects downwardly from a conical base 14 of a heating drum or radiator 15. The radiator 15 is shown supported on

a transverse partition 16 within a suitable outer casing 17. Preferably surrounding the radiator 15 within the casing 17 is a casing 18, spaced from both the radiator 15 and the outer casing and also secured to the partition 16. The radiator 15 as well as the casing 18 are closed at their upper ends and make air tight contact with the supporting partition or base 16 for preventing pollution of fresh heated air with products of combustion from the burner.

The products of combustion rise from the burner into the radiator 15 and exhaust therefrom through a flue 19 extending into a chimney 20, in the embodiment of the invention illustrated, and upwardly therethrough for conveying the combustion products to the exterior of the building. The casing 18, which, as stated, surrounds the radiator receives air to be heated from a motor blower unit 21, the discharge nozzle 22 of which directs the air against the conical bottom 14 of the radiator and thence into a hot air manifold or distributing duct 24 which surrounds the exhaust flue 19. From the manifold 24 the hot air is distributed to the rooms to be heated by hot air ducts 25 two only being shown for the purpose of illustration.

A cold air return duct 26 delivers air from one or more places in the room or rooms to be heated to a casing 27 which communicates with the intake of the blower unit 21 whereby effective circulation of the air is provided. In the casing 27 is located a suitable air filter indicated by the numeral 28 for filtering dust and foreign particles from the air circulation system.

The air distributor duct or manifold 24, instead of extending merely beyond the air duct 25 most remote from the furnace 10, also extends into the chimney and upwardly to the upper end thereof where it is closed by a chimney cap 29. Throughout the length of the duct 25, therefore, it encloses the flue 19 and hence the air flowing within the duct 24 is in heat transfer relation with respect to the flue. The flue therefore constitutes in effect an extension of the heat radiating surface of the radiator 15 and the latter may be somewhat less in radiating surface than would otherwise be required and the size of the furnace therefore of smaller dimensions than would be the case were the radiator 15 of the size required to heat the air to the maximum degree. In fact the temperature of the heated air as it enters the duct 24 from the radiator chamber 23 may be and preferably is lower or at least not higher than the temperature of the air that enters the distributor duct 25 most remote from the furnace. The air in flowing along the duct 24 to

the remote duct 25 continues to absorb heat from the flue 19 and hence the room or area served by that remote duct 25 receives a proper portion of heat from the furnace notwithstanding that the velocity of hot air through that remote duct may be lower than through the other ducts 25 which are less remote from the blower. Hence, to compensate for the reduced velocity of air delivered to the different floor or wall registers 30, and the heat losses of the duct 24, the arrangement preferably is such that the air flowing along the duct 24 increases in temperature at least to that portion thereof with which the remote duct 25 communicates.

The air space within the duct 24 beyond the remote air distributor 25 constitutes an insulation shell for the flue 19 substantially or entirely throughout the portion of the latter that is exposed to temperatures within the chimney 20 and hence condensation of moisture or of other gases within the flue is prevented or substantially prevented. The vertical portion 24a of the duct 24 which is disposed within the chimney 20 preferably is spaced from the chimney walls and encloses the stack 19a and since the upper end of the chimney, as well as the upper end of the duct 24a are closed by the cap 29, the influence of exterior temperatures on the rising gases in the flue is at a minimum. By reason of this arrangement it is not necessary to maintain or attempt to maintain a relatively high stack temperature for the purpose of preventing or reducing condensation in cold weather as generally has been required heretofore. In fact, due to the insulation of the stack or vertical portion 19a of the flue by the surrounding jacket or duct 24a, condensation is avoided within the flue even under severe weather conditions since the space between the duct 24a and the stack 19a, while generally in a comparatively static condition, is or may be placed in direct communication with the hot air in the horizontal portion of the duct 24. Air circulation takes place within the air space of the vertical duct portion 24a, the hot air therein tending to rise to the top, thus preventing condensation near the cooler outlet end of the stack. By reason of the insulation of the stack as mentioned and the inhibition of condensation within the flue produced thereby, a lower temperature of the flue gases is feasible without likelihood that condensation will occur even during severe winter weather. For the purpose of further guarding against condensation in the stack and improving the operation of the furnace, the flue preferably is provided with a port 30 having a hood 31 adjacent the same and provided with an inlet at the forward or right hand side thereof as viewed in Fig. 1. Depending within the hood opening is a light weight pivoted check valve 32 which normally admits into the flue a small stream of air from the duct 24, the air being directed into the flue in the direction of the flow of gases within the flue. The valve 32 tends to swing normally to closed position but is swung to open position by the pressure of the air maintained within the duct 24 by the blower 21. The air admitted into the duct being hot and of relatively low humidity as compared with the flue gases reduces the relative humidity thereof and hence assists in maintaining the interior of the stack in a dry condition. The impulse given to the flue gases by the air injected into the same tends to augment the flow of the same vertically through the stack.

The quantity of fresh hot air delivered to the

flue through the port 30 preferably can be controlled by a suitable damper indicated generally by the numeral 34 positioned to the right of the port. The damper, in the form illustrated, comprises a stationary ring 35, having a central opening through which the flue 19 passes. A plurality of ports 36 are provided in the web of the member 35 which may be closed wholly or partially by the adjustable valve or damper 37 arranged for arcuate adjustment with respect to the member 35 by means of a handle 38 which projects through a slot in the ring 35, the slot being closed by a flange 37a of the damper 37. In wholly open or partially open positions, openings 39 of the damper register respectively fully or partially with the openings 36. The damper may be adjusted to the position wherein the openings thereof are out of registration with the openings 36 for preventing the passage of air from the duct beyond the damper. Hence during mild weather the handle 38 can be adjusted to reduce the quantity of air delivered to the flue. A second damper 40 similar to damper 34 is shown on the opposite side of the port 30, that is, between the port and the chimney, which may be employed when desired. By adjusting the damper, flow of air into the vertical portion of the duct 24 can be controlled. Hence in fall or spring or during mild winter weather no hot air may be required within the vertical section 24a of the duct 24 to prevent condensation or excessive cooling of the combustion gases within the flue and hence the damper 40 may be wholly or partially closed while in severe weather it may be opened.

When damper 40 is closed and damper 34 is wholly or partially opened, air will be directed into the flue in controlled amount for augmenting the flow of the products through the flue and assure an adequate flow of secondary air to the burner. Such and other settings of the dampers may be employed as weather conditions may render desirable. Should down-drafts tend to cause an impedance in the flow of combustion gases through the flue, they are resisted to some extent by the air pressure maintained within the duct 24 by the blower. Back flow of such gases into the duct 24 is prevented by the light weight valve 32 which acts as a check valve which is closed whenever pressure in the flue is in excess of the pressure within the duct 24. The flue 19 and manifold duct 24 are shown in horizontal position but such arrangement is not essential. It will be seen, however, that the injection of the air through the port 30 into the flue 19 augments the flow of gases toward and through the stack 19a and hence provides, in effect a forced draft of secondary air to the burner 11 and tends to prevent back pressure of gases within the flue 19 and stack 19a and improper combustion at the burner.

It will be understood that various automatic safety devices are employed, such as a gas control for shutting off the entire flow of gas to the burner should the motor of the blower stop for any reason, a pilot, a pilot control and other devices which need not be illustrated. A burner regulating thermostat 41 is shown, however, which interrupts the flow of gas to the burner whenever the temperature of the air entering the duct 24 reaches a predetermined maximum and restores the flow of gas when the temperature drops to a selected minimum. Other temperature control arrangements may be employed if desired.

While the vertical portion 24a of the duct 24 is shown within a chimney 20, it will be apparent

that the arrangement of the capped duct 24 in insulating relationship with respect to the vent pipe or stack 19a may be employed where no chimney is available if desired. Other modifications of the illustrated embodiment of the invention may be resorted to without departing from the spirit of the invention.

I claim:

1. Heating apparatus comprising a burner, a radiator into which the products of combustion pass from the burner, a flue extending from the radiator to a place of discharge, a casing enclosing said radiator, a duct extending from the casing and enclosing said flue substantially throughout the length of the latter in spaced relation with respect thereto and provided with a closure member at the discharge end of the flue, one or more heat distributor conduits extending from said duct in spaced relation therealong, means for forcing air to be heated into said casing and along said duct and through said conduit or conduits, and means for directing air under pressure from the

duct into said flue at a point between the conduit most remote from the casing and the closed outer end of the duct.

2. Heating apparatus comprising a burner, a radiator into which the products of combustion pass from the burner, a flue extending from the radiator to a place of discharge, a casing enclosing said radiator, a duct extending from the casing and enclosing said flue in spaced relation with respect thereto and provided with a closure member at the end thereof remote from the casing, one or more heat distributor conduits extending from said duct in spaced relation therealong, means for forcing air to be heated into said casing and along said duct and through said conduit or conduits, means for directing air under pressure from the duct into said flue at a point between the conduit most remote from the casing and the outer end of the duct, and adjustable means located between said means and said conduit for controlling the flow of air into the flue.

WILLIAM V. RIFLE.

CERTIFICATE OF CORRECTION.

Patent No. 2,385,652

September 25, 1945.

WILLIAM V. RIFLE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 7, strike out "hausts the products of combustion into chimneys," and insert instead --the condensation that occurs in the chimneys--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of December, A. D. 1945.

Leslie Frazer

First Assistant Commissioner of Patents.

(Seal)