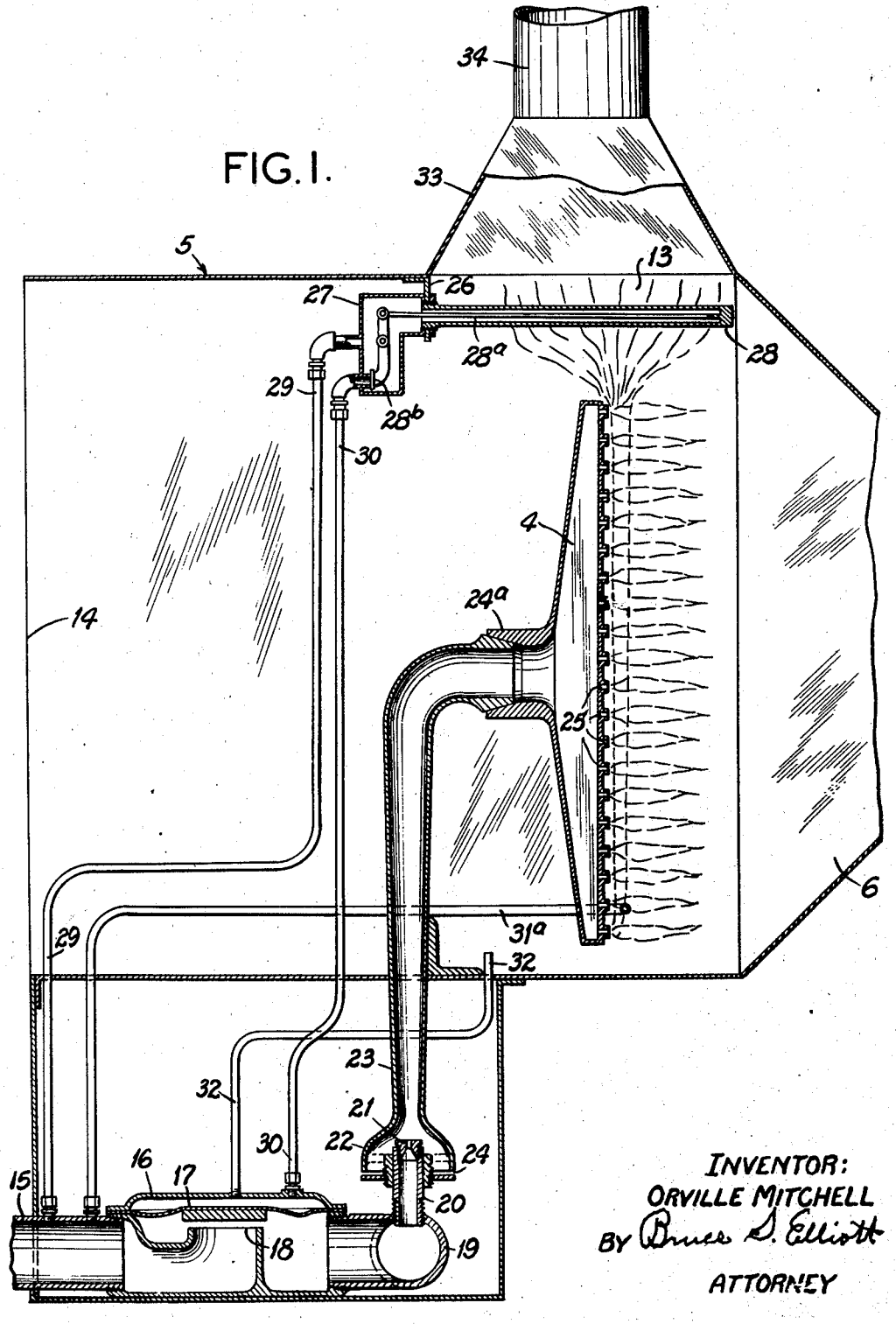
March 26, 1940. O. MITCHELL 2,194,713

AUTOMATICALLY CONTROLLED GAS BURNER

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FIG. 1.



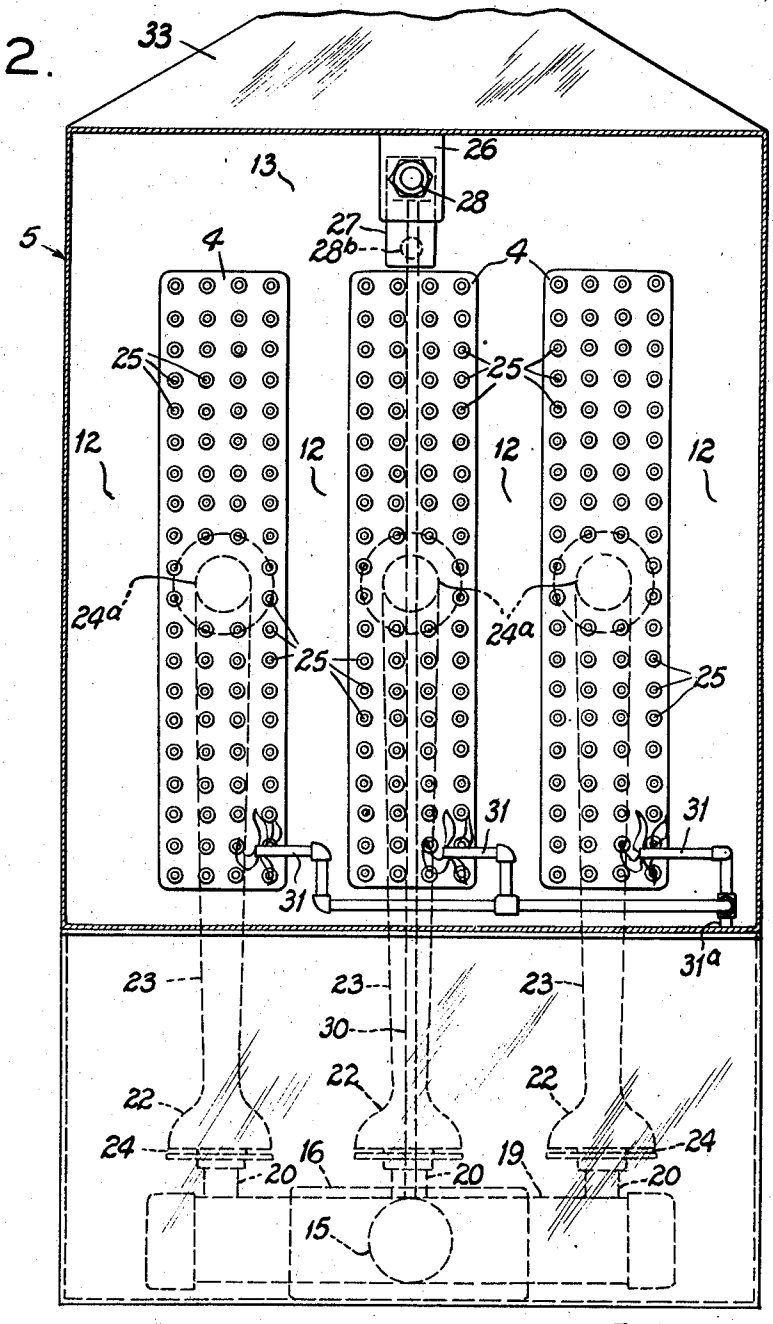
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AUTOMATICALLY CONTROLLED GAS BURNER

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FIG. 2.



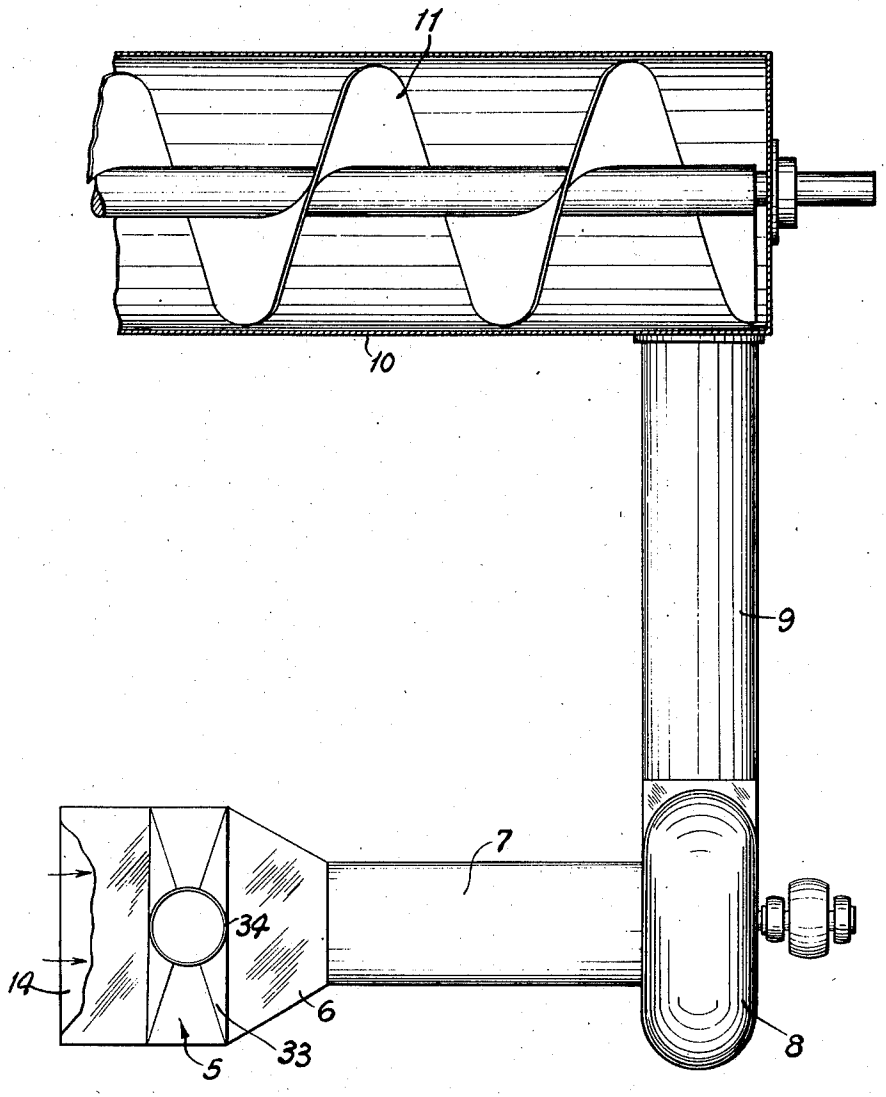
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AUTOMATICALLY CONTROLLED GAS BURNER

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FIG. 3.



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2,194,713

UNITED STATES PATENT OFFICE

2,194,713

AUTOMATICALLY CONTROLLED GAS BURNER

Orville Mitchell, Dallas, Tex.

Application January 30, 1939, Serial No. 253,592

6 Claims. (Cl. 263—19)

This invention relates to certain new and useful improvements in a gas heater for heating the air used in connection with cotton drying apparatus or machines, and has for its general object to prevent the overheating of the chamber housing inclosing the burners by the use of a simple valve control means mounted within the heating chamber above the burners so that normally it is surrounded by a current of cool air moving through the chamber while the gin and fan are in operation, but is impinged upon directly by the flames of the burner when the plant shuts down and no air is being forced through the chamber, whereby the higher temperature of the control means causes it to actuate a valve in the gas line to immediately shut off the gas supply and thus extinguish the burners.

More specifically stated, it is an object of the invention to provide a heat-actuated valve control device, which is normally unaffected by the heat of the burner, due to the current of cool air drawn into and through the casing of the burner causing the heat thereof, as well as the flames from the burner, to be projected away from the control device, but which, during such time as a current of cool air may not be passing through the casing of the burner, will be at once affected by the direct action of the flames of the burner, which are no longer projected away from it by the air current, and function to actuate a valve in a supplemental gas line, which permits the flow of gas to actuate a pressure-controlled valve in the main gas line to shut off the supply of gas to the burner.

Another detailed object of the invention is to provide a weighted diaphragm valve in the main gas line which is normally held open by the pressure of the gas to permit the flow of the latter to the burner, but which is arranged to have the gas pressure on its opposite sides equalized when the gas is passed thereto by the action of the heat-actuated control device to permit the weighted diaphragm to fall and cut off the supply of gas to the burner.

Finally, an important feature of the invention resides in the disposition of the burners in the surrounding casing in such manner as to provide a relatively large space above the burners for the free passage of air, and locating a heat control device in this space and so positioned above the burners as to be normally surrounded by the moving current of cool air, but to be subject to direct contact of the flames when, by stoppage of the air current, the flames are no longer projected forwardly and are permitted to ascend into contact with the control device.

It may be stated at this point that while a preferred form of the invention is illustrated, the same is not limited to any particular type of valve in the supply line for controlling the supply of gas to the burners, nor to any particular means that, through change in temperature, will actuate said valve to open and close it. For example, I have illustrated a tube containing an expansion rod for operating the valve in the supplemental gas line; but any other suitable form of thermostatic control, such as a conventional mercury tube and diaphragm valve, could be substituted for the one illustrated.

The application of heated air to seed cotton for removing excess moisture therefrom before it is ginned may be accomplished in various ways, a convention method consisting in conveying the cotton by means of a screw conveyor through troughs or chambers through which a stream of hot air is drawn or forced.

Two different means are now employed for heating air for drying the cotton, irrespective of the particular method or apparatus used for this purpose. One of the means is to force the air through a steam heated radiator having sufficient radiating surface to raise the stream of air to the desired temperature, after which the heated air is introduced into the machine or apparatus through which the cotton is passing, where it is brought into intimate contact with the seed cotton. The objection to the use of steam for heating air for this purpose is the cost of the radiator and boiler required for its employment.

The other means is to heat the air by means of gas heaters, and in localities where there is a supply of natural gas at a low cost, gas can be used at a considerable saving in cost of equipment, as well as in cost of operation, as compared with the use of steam; and since there are no objections to the products of combustion from the gas burners going along with the large volume of heated air to the machines in which the cotton is being agitated, a very simple and comparatively inexpensive gas heater can be used for the purpose.

One of the difficulties associated with the use of a gas heater, however, is that the fan which draws the heated air from the heater and exhausts it into the cotton agitating machine is operated from a line shaft in the gin plant; and since, for many reasons, it is necessary to often shut down the gin plant, the fan at such times

stops drawing air through the heating chamber as soon as the gin plant stops, and without dependable means for cutting off the gas supply to the burners during the interval of time when no air is being drawn through the heater, the housing around the heating chamber is seriously damaged by the excessive heat.

My invention overcomes this objection to the use of gas burners by providing automatic means for cutting off the supply of gas to the burners at such times as the gin plant or fan is not operating, as I will now proceed to describe.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a longitudinal cross section on an enlarged scale through a heater embodying my invention;

Figure 2 is a front view of the same; and

Figure 3 is a detached view partly in section and partly in elevation showing one manner of applying the heated air to the cotton while being agitated.

Referring now to the drawings the numeral 4 indicates the gas burners proper, which are mounted in a casing 5 having a reduced outlet portion 6 communicating with wind trunk 7, which in turn is connected to the intake of the hot air fan 8. A conduit 9 leads from the outlet of this fan to one end of the casing 10 of a cotton agitating device, which, in the embodiment shown, incloses a screw-conveyor 11, which conveniently may also act as the medium for distributing the cotton to the cotton extracting and cleaning machines mounted on the gin stands.

It is obvious, however, that the heated air could be supplied to any type of machine or apparatus in which the seed cotton is being agitated. In other words, it could be forced directly into the cotton extracting and cleaning machines mounted on the gin stands.

In the drawings, Figure 2, I have shown three gas burners 4 mounted in a vertical position in the casing 5, and these burners are not only spaced apart, and from the wall of the casing, to provide spaces 12 to permit air to pass between and around them, but are mounted in the casing in a manner to provide a relatively large space 13 for the passage of air between the tops of the burners and the upper wall of the casing. The rear of the casing is open, as indicated at 14, to permit free access of air to, and its passage through the entire area of the chamber surrounding the burners.

It is not essential to the invention that the burners be vertically arranged and in many instances I prefer to arrange them horizontally in which case the large space 13 will be provided above the top burner of the series.

The numeral 15, Figure 1, indicates a pipe through which gas is supplied to the burners 4. Provided in the length of this pipe is a valve chamber 16, in the upper part of which is mounted a weighted diaphragm valve 17, which controls a gas outlet port 18, provided at the inner end of the gas supply pipe 15. The pipe 15 supplies gas at a pressure sufficient to raise the weighted diaphragm valve 17 to open port 18, through which the gas flows into a header 19 having three vertically disposed outlet pipes 20, each of which is provided at its upper end with a small orifice 21 located in a small mixing chamber 22 provided at the bottom of an uptake pipe 23. Each mixing chamber 22 is provided with an adjustable opening 24, and the velocity at which the gas flows through each of the orifices 21 operates to siphon in through the opening 24 the right amount of air to insure as nearly perfect combustion as possible. Each uptake 23 leads to and communicates with the rear side of one of the burners 4, as indicated at 24, each of said burners having on its face, as shown by Figure 2, a large number of small outlets 25.

In addition to the relatively small amount of air drawn in through the adjustable opening 14, which passes on through the burners and goes with the products of combustion to the fan 8, the fan also moves a relatively large volume of air, which flows through from the rear to the front of casing 5 inclosing the burners, some of the air passing through the spaces 12, while the major portion of the air flows through the space 13 between the tops of the burners, or the top of the upper burner if the arrangement of burners be horizontal, and the upper wall of the chamber. In order to shut off the supply of gas to the burners at such times as the fan 8 may not be drawing cool air through the casing 5, I provide the following mechanism.

Supported on a hanger 26 depending from the top wall of casing 5 is a valve casing 27, and mounted on this casing, and communicating with the interior thereof is a tube 28 containing an expansion rod 28^a, or some other expansion element, which is adapted to operate a valve 28^b inside of the casing when expanded by heat. The tube 28 is located in the space 13 at a sufficient distance from the tops of the burners to insure that it is normally surrounded by the rapidly moving current of cool air drawn in by the fan and is thus unaffected by the heat of the burners. In other words, while the gin plant or fan, is in operation, the rushing current of cool air past the heat control device 28 prevents any heat reaching it except the relatively small amount which radiates through the rushing current of cool air.

Extending upward from the gas supply pipe 15 to the casing 27 of valve 28^b is a tube 29, and extending from the casing 27 to the valve chamber 16 is a similar tube 30, the upper end of which, within the casing, is controlled by valve 28^b. When this valve is opened by the expansion of rod 28^a, the gas will flow from the supply or pressure line 15 up through the tube 29 into the casing 27 and down through the tube 30 into the space above the diaphragm valve 17, thus equalizing the pressure on each side of the diaphragm so that, by reason of the weight of the diaphragm, it drops down and closes the port 18 through which the gas normally flows to the burners, thus immediately extinguishing the burners. This action occurs when the gin plant or fan stops, and there is no longer a current of cool air rushing through the chamber above the burners. This current of air, as previously stated, normally causes the flames from the burners to be projected forwardly or toward the outlet 6, as clearly illustrated in Figure 1. When, however, this current ceases, the flames naturally ascend, and lap upward far enough to impinge directly upon the tube 28 of the valve control device, which immediately causes the rod inside the tube to expand sufficiently to actuate valve 28^b in the casing 27 and permit the gas to flow in the manner described to equalize the pressure on opposite sides of diaphragm valve 17 and permit it to fall and close port 18. When the expansion rod cools sufficiently it contracts until the valve 28^b closes, which operates to release pressure above diaphragm valve 17, after which

the pressure of gas in the supply line again raises the diaphragm valve and re-establishes the flow of gas through port 18 to the series of burners 4.

To ignite the gas whenever it starts flowing through the jets of the burners I provide a pilot light 31 under each burner 4, supplied by a branch pipe 31a.

In order that the diaphragm valve 17 may operate properly, it is necessary to provide a space above the diaphragm with a small vent in order to release the pressure above the valve when the valve 28b is closed, to permit the valve to rise under the pressure from the gas line 15. I have indicated a small vent tube 32 for this purpose. Any other form of vent device however may be employed.

The control device described herein, the purpose of which is to prevent damage to the casing of the heater, is to be distinguished from a heat control device utilized for adjusting or regulating the intensity of the flame to control the temperature of the air being heated. It is obvious, however, that such type of heat control device can be used independently in connection with the heater and control device of this invention, for shutting off the burners entirely when the air current fails for any reason. In this connection, it may be stated that it is recognized that my control device is not entirely positive in operation, in that, in the simple embodiment shown, it does not act to permanently shut off the supply of gas, and, after a greater or less length of time, the burners will go on and off intermittently until the fan is started up. This, however, is of no consequence, as the gas consumption is trifling and the heat generated is not enough to damage the casing. However, if the plant is to be closed down for any considerable length of time, an ordinary hand-operated valve can be used to positively shut off the supply of gas until the heater is again to be operated. As indicated above, moreover, automatic means could be employed for this purpose if desired.

It now remains to describe an important, though not essential, feature of invention which contributes materially to the successful operation of the heat control device, and which can be better understood from the preceding description of the operation. This feature consists in the provision of a vent from the casing 5 located above the burners and may consist of a hood 33 opening into the casing and communicating at its upper end with a pipe 34 leading to the outer air. This vent serves the purpose of providing an upward draft on the flames from the burners when the fan is not operating, and permits of mounting the heat control device 28 higher above the burners and at the same time have the flames impinge directly upon it when the fan is not operating. It also permits the escape of any gas which might possibly leak into the casing when the heater is not in use and the pilot lights are not burning.

When the fan is running there is a slight down draft of fresh air through the vent pipe and over the heat control device, but the moment the fan stops, the heat from the burners immediately causes an up-draft through the vent from the top of the casing, causing the flames to rise to a higher point than they would without the vent, and which makes it possible to mount the control device high enough so that it will always be comparatively cool when the fan is running, but will be impinged upon directly by the flames from the burners when the fan stops and by the products of combustion passing out of the top of the casing through the vent referred to.

I claim:

1. In a gas fired heater, in combination with a casing having an inlet for cool air and an outlet for hot air, means for inducing a forced draught of air through said casing, a burner mounted in the casing in the path of the air current, a gas supply pipe connected to the burner, a valve in said pipe, and heat actuated control means for said valve mounted in said casing in position to be normally surrounded by the current of cool air, but to be subject to the direct heat of said burner when the air current fails to thereby actuate said valve and shut off the flow of gas to the burner.

2. In a gas fired heater, in combination with a casing having an inlet for cool air and an outlet for hot air, means for inducing a forced draught of air through said casing, a burner mounted in the casing in the path of the air current, a gas supply pipe connected to the burner, a valve in said pipe, and heat actuated control means for said valve mounted in said casing above the burner in position to be normally insulated by the current of cool air from the heat of the burner, but to be subject to the direct heat thereof when the air current fails to thereby actuate said valve and shut off the flow of gas to the burner.

3. In a gas fired heater, in combination with a casing having an inlet for cool air and an outlet for hot air, means for inducing a forced draught of air through said casing, a burner mounted in the casing in the path of the air current with its top at a considerable distance from the upper wall of said casing to provide a relatively large space for the passage of air above the burner, a gas supply pipe connected to the burner, a valve in said pipe, and thermostatic control means for said valve mounted in said casing in said air passage and above said burner in a manner to be normally insulated from the heat of the burner by the current of cool air flowing through said passage, and to be subject to the direct heat of said burner when the air current fails, to thereby actuate said valve and shut off the flow of gas to the burner.

4. In a gas fired heater, in combination with a casing having an inlet for cool air and an outlet for hot air, means for inducing a forced draught of air through said casing, a plurality of burners mounted in the casing in spaced relation to each other and positioned below the upper wall of said casing to provide a relatively large space for the passage of air above the burners, a gas supply pipe operatively connected to the respective burners, a valve in said pipe, and thermostatic control means for said valve mounted in said casing in said passage and above said burners in a manner to be normally insulated by the flow of cool air through said passage from the heat of the burners and to the subject to the heat of said burners when the air current fails, to thereby actuate said valve and shut off the flow of gas to the burners.

5. In a gas fired heater, in combination with an enclosed chamber having a cold air inlet and hot air outlet, one or more burners mounted within the chamber between its inlet and outlet and positioned so as to provide space above the burners for the free passage of air, a gas line for supplying gas to the burners, a valve in said line, and valve controlling means mounted within the casing and so positioned above the burners as to be normally

surrounded by a moving current of cold air, but in contact with the flames of the burners in the event the current of air ceases to flow, whereby the controlling means is actuated by the higher temperature to close said valve and shut off the gas supply.

6. In a gas fired heater, in combination with a casing having an inlet for cool air and an outlet for hot air, means for inducing a forced draught of air through said casing, a burner mounted in the casing in the path of the air current, a gas supply pipe connected to the burner, a valve in said pipe, heat actuated control means for said valve mounted in said casing in position to be normally surrounded by the current of cool air, but to be subject to the direct heat of said burner when the air current fails to thereby actuate said valve and shut off the flow of gas to the burner and a vent in said casing located above said burner.

ORVILLE MITCHELL.