

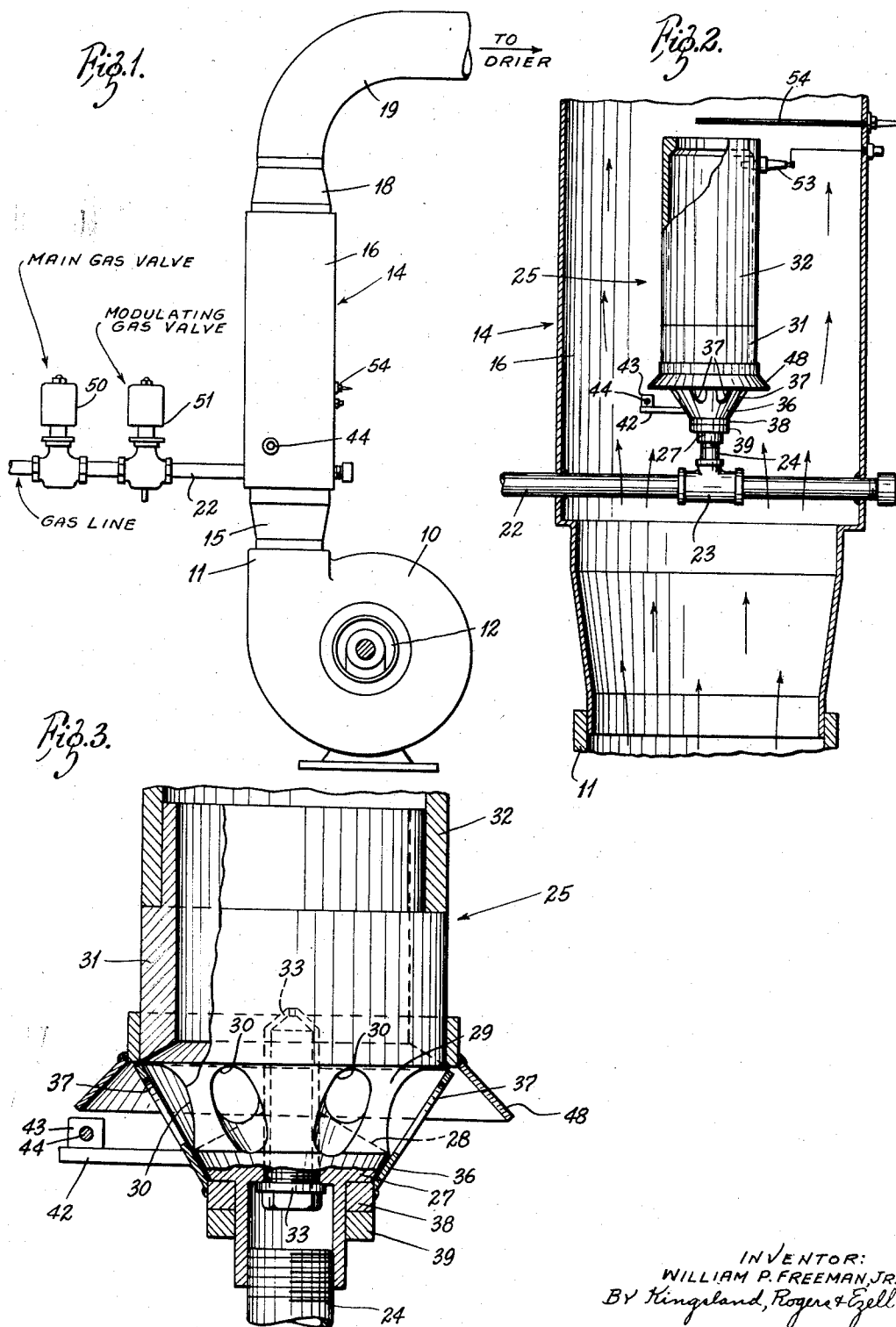
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HIGH VELOCITY HEATER

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HIGH VELOCITY HEATER

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The present invention relates to an air heater. In particular, this is an air heater designed to produce high heat content in a high velocity air stream.

In many uses, and especially in connection with the processing of cotton in cotton gins, a high volume of hot air is required. This may be obtained by the direct method of passing an air stream over an exposed burner, such as a gas burner. Heretofore, some such heaters have been provided with gas burners to supply the required amount of heat. One commercial burner now on the market can supply up to two million B. t. u.'s per hour and can supply air volumes varying from two thousand to eight thousand cubic feet per minute.

The present heater, although more compact and requiring much less floor space than the former heaters, can nevertheless supply more heat. For example, a heater requiring no more than about six square feet of floor space (for the blower) may deliver three million B. t. u.'s per hour and twelve thousand C. F. M.

Specifically, the present heater is designed to be installed into and supported primarily by the outlet opening of the air blower, although it may be connected into the inlet if necessary. It occupies little more space horizontally than does the outlet of the air blower; and indeed, it almost equals a section of the hot air duct.

The present invention involves not merely a heater shell of the dimensions above suggested, but also a burner capable of use therewith. A directly-heating burner of the capacity here required must be capable of operation in an unusually high velocity air stream, if the dimensions are to be maintained. Therefore, the features of the present burner include the directing of a sufficient amount of primary air to the fuel jet to insure combustion at the burner barrel, and also the provision of an air stream at the top of the burner that will not have such velocity as to interfere with efficient combustion. Stated differently, the present burner is designed for use in a high velocity air stream, and has means to insure reduced secondary air velocity at the flame end of the barrel, to improve combustion, and yet to preserve adequate primary air to the gas nozzle.

These various features will be described hereafter in detail, and their functional advantages will appear.

In the drawings:

Figure 1 is an elevation of the heater of the present invention mounted upon a blower;

Figure 2 is a vertical diametrical section through the lower part of the heater showing the burner partly broken away; and

Figure 3 is a vertical section through the lower part of the burner.

In Figure 1, a blower 10 is of a type that may be mounted on a suitable floor or other support, with its outlet opening 11 facing upwardly. It has an inlet 12 that usually extends horizontally. The blower may be of a capacity to deliver from two thousand to twelve thousand C. F. M.

The heater casing 14 of the present invention has a

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lower, downwardly converging part 15 the bottom edge of which is flanged so as to fit into the outlet 11 of the blower 10. The fit is such as to insure a satisfactory support of the heater casing 14 in the outlet 11.

Above the tapered portion 15 of the heater casing 14, the casing then continues upward in a vertical section 16 that is somewhat enlarged in cross section. This vertical section 16 is tubular, but need not be circular. Above the portion 16, the casing again converges in a section 18 that is connected into the ducts such as the duct 19.

A fuel pipe 22 is carried across the heater casing 16 as illustrated in Figure 2, so that it can be supported thereon. Medially of the heater casing 16 the fuel pipe 22 has a T 23 connected with a nipple 24 upon which the burner is mounted. The burner is generally designated at 25.

The burner 25 includes a casting 27. This casting 27 is tubular at its lower end so as to be threaded over the nipple 24. It has a partition above this lower part that provides a tapering upper wall 28; and this wall is surrounded by a flaring lateral wall 29 through which a plurality of air holes 30 extend. Above the flaring wall 29 the burner casting has a vertical wall 31 over which a barrel 32 is fitted. The wall 28 has a vertical central opening into which is fitted a gas burner spud 33, which receives gas from the nipple 24.

The flaring wall 29 of the burner casting is surrounded by a conical air regulator 36 shaped to fit over the flaring wall. The regulator 36 has ports 37 corresponding to the ports 30 of the casting 27. The regulator is attached to a ring 38 rotatable around the lower tubular part of the casting 27, and held in place by a collar 39 that is secured to the casting.

An adjustment arm 42 is secured to the regulator 36 and projects outwardly from it, with a swivel nut 43 at the outer end of the arm. The nut 43 receives an adjusting screw 44, the end of which is accessible outside the heater casing for manual adjustment of the regulator.

An outwardly flaring skirt 48 is mounted on the burner casting 27, to overhang the ports 30 and 37. With air of the high velocities indicated, the skirt may extend about half way down the ports. It is designed to have the effect of a scoop for primary air to the burner jet, and a deflector of the main air stream to produce reduced pressure at the end of the burner barrel.

The length of the burner 25 is about one-third the length of the main section of the heater casing. This insures that the flame, if normal, will not extend beyond the casing. Actually, the flame is usually longer than the burner itself, but shorter than the casing, thus providing an important factor of safety.

In the preferred arrangement, the gas line 22 has a main on-and-off gas valve 50 and a modulating gas valve 51. The main gas valve may be of the solenoid type and may be operated by suitable manual or automatic controls, or both, as is known in the art. The modulating valve 51 is conventionally motor driven and is designed to vary the amount of gas supplied in accordance with the heat at a critical point in the system, so that the burner will maintain the temperature at that point reasonably constant, as will appear hereafter.

The main gas valve 50 is also interconnected with a spark igniter 53 and a flame-responsive device 54 by conventional means (not illustrated). The arrangement is preferably a warp-switch type of safety igniter, with the main valve opened and the igniter energized, on demand for heat, and kept in those conditions for a predetermined starting period. If combustion occurs within the period, the flame device 54 will respond, opening the starting circuit and closing a running circuit for the main valve 50. If combustion does not occur for any reason

within the period, the main valve will be reclosed. Since the foregoing is a typical ignition device, well known commercially, it is not illustrated in detail.

Operation

When there is a demand for heat, a suitable control will be operated to open the main gas valve 50 and start the igniter, as aforesaid. Assuming that combustion takes place, the main gas valve will be maintained open and the modulating gas valve can modulate to regulate the amount of fuel to suit the demand for heat.

The gas is supplied through the fuel pipe 22 up through the nipple 24, into the lower end of the casting 27, and thence into the spud 33. This gas emits from the spud 33 with some velocity, thereby tending to entrain air into the stream of gas.

The blower 10 is normally put in operation simultaneously with the starting of the ignition. This blower directs a very large volume of high velocity air upwardly through its outlet 11 and into the lower end of the heater casing.

Some of this air, in its upward travel, strikes the flaring skirt 48 and is thereby scooped into the ports 30. The size of these ports is determined by the relative positions of the cone 36 with its holes 37, and the conical portion 29 with its holes 30. This scooped air is then delivered inwardly to the inside of the burner casting and upwardly therethrough, where it mixes thoroughly with the gas emitting from the spud 33. When it reaches the top of the burner barrel 32, it is ignited by the spark at the igniter plug 53, and produces flame. The gas mixture is supplied with additional air from the outside of the burner barrel 32 so that flame is present above the barrel.

The scoop 48 has a function in addition to its function of collecting secondary air to pass into the barrel 32. The high velocity air moving upwardly outside of the barrel 32 has a tendency to draw the combustion mixture from within the barrel upwardly at such high velocity as to produce poor combustion and to elevate the flame above the top of the barrel. The scoop 48, however, deflects the upstream of high velocity air outwardly toward the sides of the casing in the manner indicated by the arrows, so that there is a lower pressure condition of this air adjacent the mouth of the burner barrel 32. Consequently, there is less tendency of the combustion mixture to be drawn out of the barrel and diffused so that poor combustion obtains. To the contrary, the best arrangement provides good combustion at the outlet of the barrel with the secondary air augmented by the upstream, but at somewhat reduced pressure at the outlet of the barrel. Of course, as the combustion takes place and the air within the casing is expanded, there is an even flame and a high velocity of hot air within the casing.

The primary air mixture is adjusted by turning the screw 44, which, by its engagement within the swivel nut 43, moves the arm 42, and with that arm moves the cone 36 so as to change the registry of the holes 37 and the holes 30, and thereby change the net area of the primary air openings.

It should be evident that this heater has many advantages over past heaters. In the first place, the heater itself is small in size, being little larger than the outlet of the blower. Consequently, the blower itself defines the floor space requirements for this heater. Heretofore, heaters of this type have normally been horizontally arranged with a very substantial amount of floor space required. In many places, such as in a cotton gin plant where drying air is required, floor space is at a premium.

And even if the present heater were used on the inlet side of the blower and in a horizontal position, the amount of floor space required would be smaller than previous heaters, a condition that is made possible by the design of the burner to operate in high velocity air. It is to be noted particularly here, however, that the vertical mounting of the burner is an especial subject of the present design. Not only does it minimize floor space requirements, as already noted, but it also eliminates the requirement of the passage of hot air through the blower, with the consequent deleterious effects on the mechanical parts of the blower.

What is claimed is:

1. A burner construction for a high heat delivery in a high velocity air stream, comprising: an elongated tubular casing adapted to interconnect with the outlet of a high velocity air blower; a burner having an elongated tubular barrel supported within the casing in alignment therewith, and spaced substantially from the walls of the casing to provide an air-stream space in the casing outside the barrel and the barrel being positioned so as to have an upstream end toward the end of the casing connected with the blower, and an opposite downstream end, the length of the barrel being less than that of the casing and the ends of the barrel being spaced from the ends of the casing, providing a combustion space in the casing beyond the downstream end of the barrel; a gas fuel supply means to admit gas into the upstream end of the barrel; means to regulate the flow of air through and around the barrel, to produce a flammable fuel and air mixture in the casing adjacent the downstream end of the barrel, the regulating means including primary air-admitting means at the upstream end of the barrel having a port to admit primary air from the air stream into the barrel adjacent the fuel supply means, to mix with fuel in the barrel and to emit from the downstream end of the barrel for combustion there, the regulating means including also a deflector projecting outwardly on the outside of the barrel, to deflect the air stream away from the barrel toward the walls of the casing adjacent the downstream end of the barrel to reduce the air velocity at such end, so that flame may exist in the combustion space instead of being blown way downstream of the barrel, the deflector and casing providing passage for the air within the casing outside of the barrel.

2. The construction of claim 1, wherein the barrel is cylindrical, and the deflector comprises a skirt-like device around the outside of the barrel adjacent the upstream end of the barrel.

3. The construction of claim 1, together with a high velocity blower having an outlet opening, and wherein the tubular casing has its end reduced in diameter, upstream of the barrel, to afford the interconnection with the blower outlet.

References Cited in the file of this patent

UNITED STATES PATENTS

1,510,636	Vermeyen	Oct. 7, 1924
1,781,263	Lilge	Nov. 11, 1930
1,874,488	Franklin	Aug. 30, 1932
2,395,666	Kaufmann	Feb. 26, 1946
2,508,792	Ludwig	May 23, 1950
2,553,091	Horning	May 15, 1951
2,627,307	Westling	Feb. 3, 1953
2,658,308	Fowler et al.	Nov. 10, 1953
2,673,726	Oldenkamp	Mar. 30, 1954