

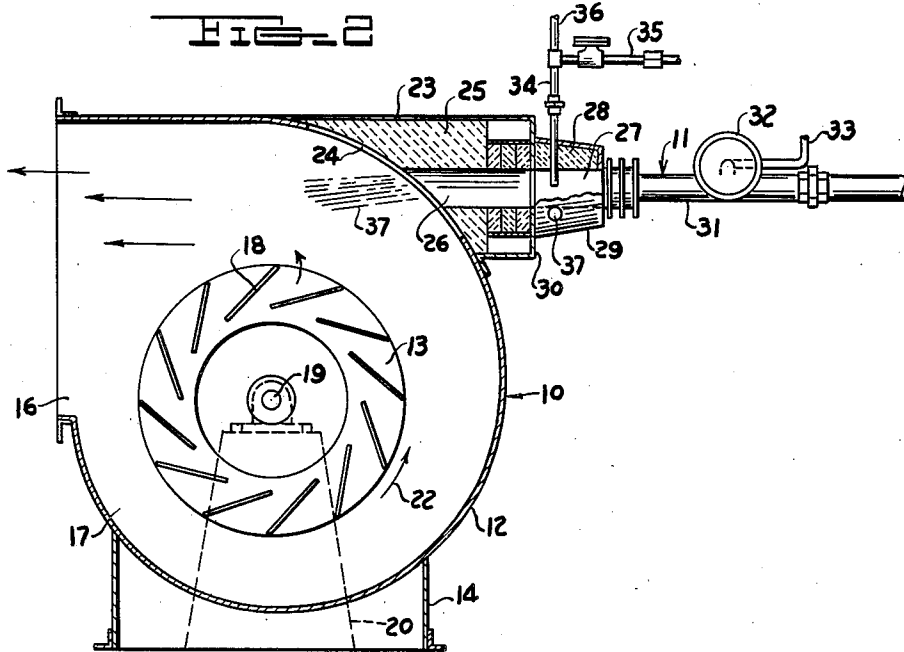
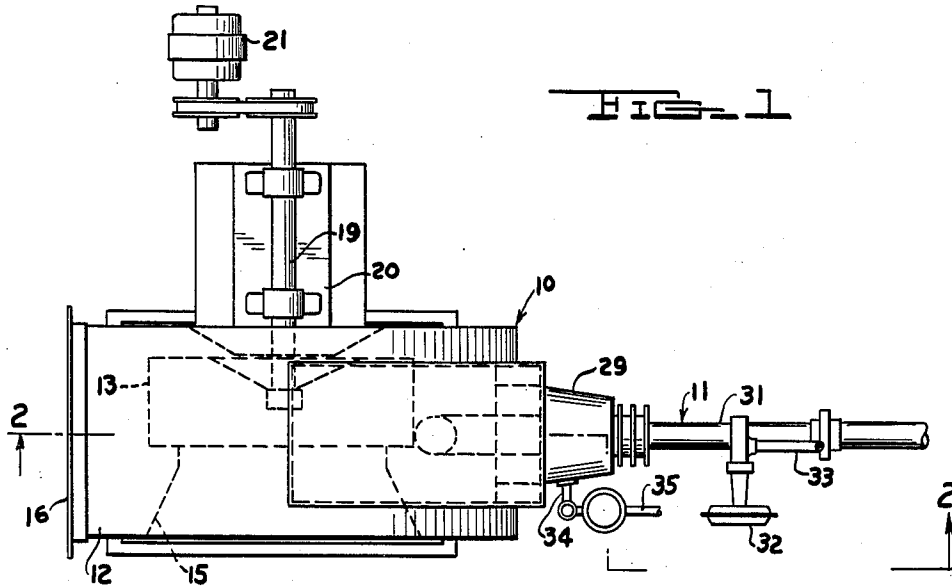
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HEATING APPARATUS

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HEATING APPARATUS

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This invention relates generally to heating apparatus and refers more particularly to improvements in forced air heating assemblies of the type embodying a blower.

In air heating equipment embodying a blower for forcing air to a point of demand, it has been the custom to position an electrically operated heating element in the form of a grid at the discharge opening of the blower, so that air issuing from the blower passes through the grid in heat conducting relation thereto. Other heat exchange units have been used, such for example, as coiled or serpentine tubing, either finned or plain, and providing a circuitous passage for a heating medium.

Regardless of which specific type of heat exchange unit is selected, the latter is ordinarily so positioned with respect to the blower that air discharged from the blower must pass through the unit in heat conducting relation thereto. Thus the heating efficiency of assemblies embodying either of the types of heat exchange units noted above depends largely on the surface area of the unit available for contact with the air, and upon the length of time the air remains in the heating zone, or in other words, upon the velocity of the air passing through the unit. In instances where a substantial volume of air is forced through the unit at a relatively high velocity, heating units of considerable capacity and heat radiating area must be provided in order to adequately heat the air. Inasmuch as the heat exchange units are positioned in the direct path of air issuing from the blower, it follows that the heat radiating surfaces on such units obstruct the flow of air and create a turbulence which tends to reduce air velocity. Accordingly, the capacity of the blower must be increased to compensate for the drop in velocity of the air caused by the resistance to flow of air through the unit, and the cost of the heating assembly is thereby greatly increased.

With the above in view, it is one of the objects of this invention to provide a forced air heater assembly having means for substantially elevating the temperature of the air as it approaches the blower discharge opening without obstructing or otherwise resisting the air flow. In fact with this invention the air is heated without the necessity of flowing the air in contact with heat radiating surfaces, and as a consequence, the efficiency of a heater assembly of given size to deliver the required volume of heated air at the desired velocity is greatly increased.

Another object of this invention is to provide

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a heater assembly wherein the air discharged by the blower is heated by introducing a stream of extremely hot gas into the blower casing adjacent the discharge opening, and wherein the stream of gas is caused to flow in the general direction of air flow in the blower casing. Thus the stream of hot gases tends to assist rather than obstruct the flow of air while heating the same, and costly heat exchange units of the general type noted above, with their accompanying disadvantages, are eliminated.

A more detailed object of this invention is to burn a combustible gaseous mixture in a chamber and to discharge the products of combustion into the blower casing adjacent the air discharge opening. As a result the air passing through the blower casing to the discharge opening is effectively heated by the products of combustion without resisting or otherwise interfering with the air flow.

A further feature of this invention is to attach the burner to the blower casing in a manner to provide a compact, self-contained unit which is relatively inexpensive to produce and does not appreciably increase the overall dimension of the blower.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawing, wherein:

Figure 1 is a semidiagrammatic plan view of a heater embodying the features of this invention; and

Figure 2 is a sectional view taken substantially on the plane indicated by the line 2—2 of Figure 1.

As shown in the drawing the heater apparatus selected for the purpose of illustrating this invention comprises a blower 10 of the centrifugal type and a burner 11. The blower 10 in turn comprises a casing 12 and a fan 13 of the sirocco type. The casing 12 is preferably formed of sheet metal and may be provided with a pedestal 14 enabling supporting the casing on suitable supporting structure not shown herein. An inlet opening for air 15 is formed in one side of the casing, and an outlet opening 16 is formed in the front wall of the casing. As shown particularly in Figure 2 of the drawing, the inlet opening 15 is connected to the outlet opening 16 by a passage 17 which extends around the periphery of the fan 13 and in accordance with conventional practice, gradually increases in cross sectional area in the direction of rotation of the fan to the outlet opening 16.

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The fan 13 comprises a cage provided with the usual vanes 18 and is secured at its center to a drive shaft 19. The drive shaft 19 extends through the side of the casing opposite the inlet opening 15, and is journaled on a suitable support 20. The outer end of the drive shaft is connected to a suitable prime mover, such for example, as an electric motor 21.

The fan 13 is driven by the motor 21 in the direction of the arrow 22 in Figure 2 of the drawing, and in response to this rotation, the vanes 18 draw air through the inlet opening 15 and discharge the air into the passage 17. The air discharged into the passage 17 is also moved by the fan through the passage to the outlet opening 16 and is discharged from the latter in the form of a blast or stream of air.

The purpose of the burner 11 is to heat the air flowing through the passage 17 to the discharge or outlet opening 16. The burner 11 comprises a housing 23 preferably formed of sheet metal and secured to the rear wall of the casing 12 adjacent the top of the latter directly opposite the outlet opening 16. The front end of the housing is open and communicates with the passage 17 in the blower casing 12 through a slot or opening 24 formed in the rear wall of the casing 12. The housing 13 is preferably lined with a suitable refractory material 25 adapted to withstand extremely high temperatures and having a passage 26 therethrough communicating at the front end with the interior of the housing 12 through the opening 24. The rear or outer end of the passage 26 communicates with the interior of a combustion chamber 27 formed in a refractory body 28. The body 28 is enclosed by a metal case 29, and the latter is secured to the rear wall 30 of the housing 23.

The combustion chamber 27 is connected to a fuel supply conduit 31, and the latter in turn communicates with a source of fuel supply not shown. The fuel employed may be natural or artificial gas or oil or may be any suitable gaseous or liquid fuel, as desired. In any case the fuel employed is mixed with the proper amount of air by means of a suitable mixer indicated in the drawing by the numeral 32 and connected to an air supply through a conduit 33. The combustible mixture thus obtained is introduced to the combustion chamber 27, and is ignited in the latter by a suitable pilot. The pilot is connected to the lower end of a conduit 34 which projects into the combustion chamber 27 through an opening formed in one side of the latter, and is connected adjacent the upper end to the source of fuel supply through a conduit 35. The proper amount of air is mixed with the fuel by a suitable air connection indicated by the numeral 36. If desired an electrically operated ignition device 37 may be provided in the combustion chamber for igniting the pilot when it is desired to initially start operation of the blower.

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As the fuel mixture in the chamber 27 burns, the gases expand and the products of combustion are projected into the casing 12 through the passage 26 in the form of a flame 37. As shown in Figure 2 of the drawing, the blast of intensely hot gases, or in other words, the flame 37, is projected into the air passage 17 in the general direction of flow of the air through the passage to the outlet opening 16 in the casing 12. Thus the products of combustion not only substantially elevate the temperature of the air flowing through the passage 17 to the outlet opening 16 in the casing 12, but in addition, accomplish this result without interrupting or resisting movement of the air through the passage 17. Also due to the intense heat of the gaseous products of combustion discharged into the blower, the temperature of the air is elevated substantially above the temperatures heretofore obtainable by passing the air through heat exchange units. Moreover the capacity of the blower need not be enlarged to compensate for the resistance offered by conventional heat exchange units to the flow of air there-through. In addition the burner 11 is of very simple construction, and may be produced at a cost considerably less than orthodox heat exchange units.

What I claim as my invention is:

1. An air heater comprising a casing having an axial inlet and tangential outlet, a rotary centrifugal impeller within said casing, an extension of said casing opposite said tangential outlet, a refractory lining within said extension, and a burner within said lining for directing its flame and products of combustion within and in the direction of air current discharged through said tangential outlet.

2. An air heater comprising a casing having an axial inlet and tangential outlet, a rotary centrifugal impeller positioned eccentrically within said casing to form a peripheral current progressively increasing in cross section towards said tangential outlet, an extension of said casing opposite said tangential outlet, a refractory lining in said extension, a burner within said refractory liner directed to discharge its flame and products of combustion within and in the same direction as the air discharged through said tangential outlet.

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