

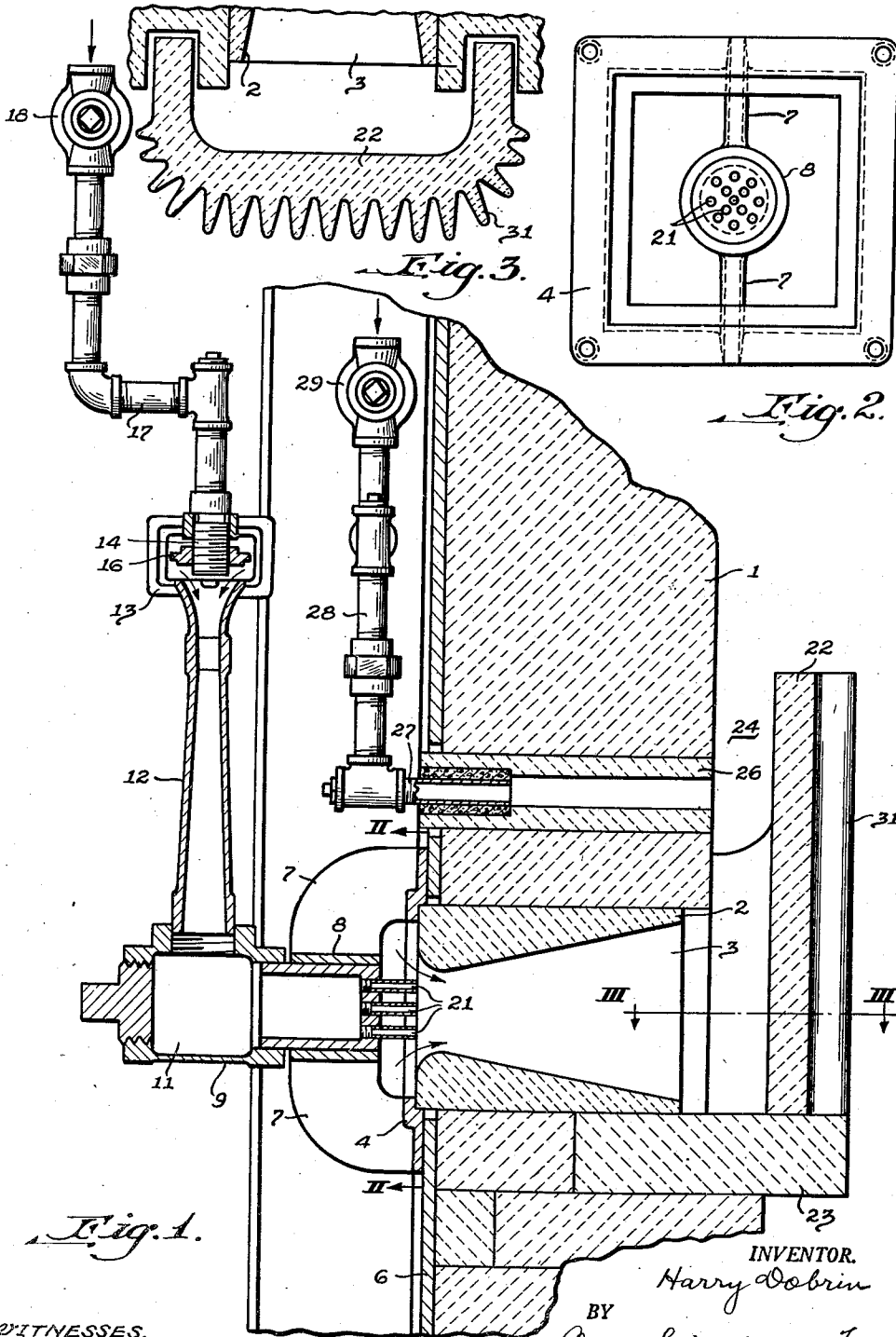
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H. DOBRIN

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GAS BURNER

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WITNESSES.
E. J. Maloney.
V. A. Peckham.

INVENTOR.
Harry Dobrin
BY
Brown, Britchlow & Flick
his ATTORNEYS.

UNITED STATES PATENT OFFICE

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GAS BURNER

Harry Dobrin, Pittsburgh, Pa., assignor to
Furnace Engineers, Inc., Pittsburgh, Pa.

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7 Claims. (Cl. 158-7)

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This invention relates to gas burners, and more particularly to those used for industrial purposes.

It is among the objects of this invention to provide a gas burner which is quiet in operation, which consistently produces a luminous flame, which can be turned very low without flash-back, and which does not burn out.

In accordance with this invention a burner block is provided with a venturi having its ends open to atmosphere. This block generally is mounted in the side wall of a furnace. A hollow jet member outside of the furnace is mounted adjacent to, but spaced outwardly from, the inlet of the burner block. This member is provided in its front wall with a plurality of closely spaced outlets that face the inlet of the burner block venturi. Jet tubes are mounted in these outlets from which they extend forward to the venturi inlet where they preferably terminate in a vertical plane substantially coinciding with the outer end face of the burner block. The jet member is also provided with an inlet to which the outlet of a Venturi mixing tube is connected. The inlet of this tube is adapted to receive primary air, either under pressure or direct from atmosphere, and to receive high or low pressure gas that is supplied to it through a suitable nozzle. The gas and air are quietly mixed together in the Venturi tube and are further mixed in the jet member. From the latter the mixture is directed by the jet tubes into the burner block venturi. The mixture of gas and air issuing from the jet tubes draws surrounding secondary air from atmosphere into the burner block where it mixes with the aspirating mixture to further combustion. As the flame issues from the burner block it strikes a vertical baffle member that deflects it upwardly along the wall of the furnace. Directly above the burner block there is a passage through the wall through which raw gas is directed into the rising flame to make it luminous without increasing the temperature at the inner end of the burner block.

The preferred embodiment of the invention is illustrated in the accompanying drawing in which Fig. 1 is a vertical section through my burner as applied to an industrial furnace; Fig. 2 is a view taken on the line II-II of Fig. 1 showing the front of the casting and the jet member supported by it; and Fig. 3 is a horizontal section taken on the line III-III of Fig. 1.

Referring to Fig. 1 of the drawing, the refractory wall 1 of a furnace is provided with an opening through it in which a refractory burner block

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2 is mounted. This block has a horizontal passage 3 through it of proper Venturi design. Encircling the outer end of the block is a rectangular frame 4, (Fig. 2) secured to the metal shell 6 of the furnace and forming a part of a casting that projects away from it. The inner marginal area of this frame is provided with a recess into which the outer end of the burner block projects so that the frame will be centered relative to the block. The casting also includes upper and lower arms 7 that support a ring 8 integral with them and coaxial with the passage through the burner block. This ring receives and supports the front end portion of a jet member 9 provided with a mixing chamber 11. The outer or rear portion of this member has an inlet opening in its upper side to which the lower end of a venturi mixing tube 12 is connected. The upper end of this tube is shown as being open to atmosphere but it may be connected to a source of air under pressure if desired. At the top of the tube there is a yoke 13 that supports an externally threaded nozzle 14 the lower end of which projects a short distance into the center of the upper end of the tube. An air regulating disc 16 is threaded on this nozzle and can be screwed up and down on it to control the size of the air inlet around the nozzle. The nozzle is connected by means of piping 17 and a valve 18 to a source of gas under high pressure so that the stream of gas entering the Venturi tube will draw in primary air from the atmosphere and mix with it in the tube. If it is desired to connect the mixing tube inlet to air under pressure, then the gas supplied to it can be under low pressure as it will not have to aspirate the air.

The front wall of the mixing chamber in jet member 9 is provided with a plurality of closely spaced horizontal outlet openings of small diameter. Although a smaller number might be satisfactory, it has been found that this burner operates in the desired manner when there are about a dozen of these openings, as shown in Fig. 2. Screwed into each of these openings is a jet tube 21, necessarily very small, and preferably having an interior diameter of about $\frac{1}{8}$ inch. These tubes extend forward toward the inlet of the burner block venturi 3. For best performance it has been found that their front ends should lie in a vertical plane coinciding substantially with the adjacent outer end face of the burner block. It will be noted that the outer end of venturi 3 is open to atmosphere and that there is considerable space between the front end of the group of jet tubes and the wall of the

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venturi. It is through this space that secondary air is drawn by the mixture of gas and air issuing from the jet tubes into the burner block. If the front ends of the tubes terminate behind the block, too much secondary air is likely to be drawn in, while if they project into the block, they become too hot.

The combustible mixture burns quietly in the burner block venturi, and combustion continues as the mixture leaves the block. The flame entering the inside of the furnace is deflected upwardly by a vertical refractory baffle 22 mounted on a shelf 23 projecting into the furnace from below the burner block. The baffle is spaced from the burner block and the wall of the furnace only a short distance to form a narrow flue 24 for the flame. As the flame rises in this flue, raw gas is fed into it from the inner end of a refractory tube 26 that passes through the furnace wall directly above the burner block. The outer end portion of this tube has an enlarged inside diameter in which a metal nipple 27 is cemented. This nipple is connected by suitable piping 28 and a valve 29 to a source of gas under pressure. The fluid passing from the tube into the burner flame is raw gas which maintains the flame luminous. As this gas is introduced above the burner block, the temperature of the flame at the inner end of the block is not raised by the additional gas. Therefore, refractory material can be used instead of a metal alloy, and the wall of the furnace directly below the burner block is not burned out. Also, by supplying the raw gas above the burner block, there is no danger of the gas being consumed without making the flame luminous.

The burner block temperature also is held down by leaving its outer end open, because the secondary air drawn into it has a cooling effect. This open outer end decreases the noise that would otherwise occur in the burner block, while the shape of venturi 3 avoids eddies therein and thereby further minimizes noise.

The dividing of the gas and air mixture into a plurality of jets by the small jet tubes permits turn down of the burner without flash back, and it adds to the quiet operation of the burner. As the gas and air mixture in chamber 11 is forced to seek its way out through the jet tubes, turbulence takes place in the chamber and thus causes more thorough mixture of the gas and air. The jet tubes are maintained cool by the secondary air flowing around them.

Baffle 22 becomes very hot. It is therefore desirable to increase its radiating surface by providing it with a plurality of integral fins 31 preferably extending vertically in horizontally spaced relation as shown in Fig. 3.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A gas burner comprising a burner block provided with a venturi having its ends open to atmosphere, a hollow jet member adjacent to but spaced from the inlet of said venturi and provided with a plurality of closely spaced parallel outlets facing said inlet, parallel jet tubes mounted in said outlets and extending forward to the

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Venturi inlet, said jet member being provided with an inlet disposed at substantially a right angle to its outlets, a Venturi mixing tube having its outlet connected to the inlet of said member, the inlet of said tube being adapted to receive primary air, means for supplying gas to said tube inlet, the mixture of gas and air issuing from said jet tubes drawing secondary air into said burner block venturi to promote combustion of said mixture therein, and means for directing raw gas into the burning mixture of gas and air issuing from the outlet of the burner block venturi.

2. In combination with a furnace wall, a gas burner comprising a burner block mounted in the wall and provided with a venturi having its ends open to atmosphere, the outer end face of said block being substantially planar, a hollow jet member adjacent to but spaced from the inlet of said venturi and provided with a plurality of closely spaced parallel outlets facing said inlet, parallel jet tubes mounted in said outlets and extending forward to the Venturi inlet with their front ends lying in a plane substantially coinciding with the adjacent end face of said block, said jet member being provided with an inlet, a Venturi mixing tube having its outlet connected to the inlet of said member, the inlet of said tube being adapted to receive primary air, and means for supplying gas to said tube inlet, the mixture of gas and air issuing from said jet tubes drawing secondary air into said burner block venturi to promote combustion of said mixture therein.

3. In combination with a furnace wall, a gas burner comprising a burner block mounted in the wall and provided with a horizontal venturi having its ends open to atmosphere, a hollow jet member adjacent to but spaced from the inlet of said venturi and provided with a plurality of closely spaced horizontal outlets facing said inlet, horizontal jet tubes mounted in said outlets and extending forward to the Venturi inlet, said jet member being provided with an inlet, a Venturi mixing tube having its outlet connected to the inlet of said member, the inlet of said tube being adapted to receive primary air, means for supplying gas to said tube inlet, the mixture of gas and air issuing from said jet tubes drawing secondary air into said burner block venturi to promote combustion of said mixture therein, a vertical baffle member adjacent to but spaced from said wall and the outlet of the burner block venturi to deflect upwardly along the wall the flame issuing from said block, and means disposed above the burner block and extending through the wall for directing raw gas into said rising flame to make the flame luminous.

4. In combination with a furnace wall, a gas burner comprising a burner block mounted in the wall and provided with a horizontal venturi having its ends open to atmosphere, the outer end face of said block being substantially planar, a hollow jet member adjacent to but spaced from the inlet of said venturi and provided with a plurality of closely spaced horizontal outlets facing said inlet, horizontal jet tubes mounted in said outlets and extending forward to the Venturi inlet with their front ends lying in a plane substantially coinciding with the adjacent end face of said block, said jet member being provided with an inlet disposed at substantially a right angle to its outlets, a Venturi mixing tube having its outlet connected to the inlet of said member,

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the inlet of said tube being adapted to receive primary air, means for supplying gas to said tube inlet, the mixture of gas and air issuing from said jet tubes drawing secondary air into said burner block venturi to promote combustion of said mixture therein, a vertical baffle member adjacent to but spaced from said wall and the outlet of the burner block venturi to deflect upwardly along the wall the flame issuing from said block, and means disposed above the burner block and extending through the wall for directing raw gas into said rising flame to make the flame luminous.

5. In combination with a furnace wall, a gas burner comprising a burner block mounted in the wall and provided with a horizontal venturi having its ends open to atmosphere, a hollow jet member adjacent to but spaced from the inlet of said venturi and provided with a plurality of closely spaced horizontal outlets facing said inlet, horizontal jet tubes mounted in said outlets and extending forward to the Venturi inlet, said jet member being provided with an inlet, a Venturi mixing tube having its outlet connected to the inlet of said member, the inlet of said tube being adapted to receive primary air, means for supplying gas to said tube inlet, the mixture of gas and air issuing from said jet tubes drawing secondary air into said burner block venturi to promote combustion of said mixture therein, a vertical baffle member adjacent to but spaced from said wall and the outlet of the burner block venturi to deflect upwardly along the wall the flame issuing from said block, and a plurality of heat-radiating fins projecting from the side of said baffle member opposite said flame.

6. In combination with a furnace wall, a gas burner comprising a burner block mounted in the wall and provided with a horizontal venturi having its inlet end open to atmosphere at one side of the wall and having its outlet end at the other side of the wall, a hollow jet member adjacent to but spaced axially from the inlet of said ven-

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turi and provided with a plurality of closely spaced horizontal outlets facing said inlet, horizontal jet tubes mounted in said outlets and extending forward to the Venturi inlet, means for supplying fuel to said jet member, the fuel issuing from said jet tubes drawing air into said burner block venturi through its inlet to promote combustion of said fuel therein, a vertical baffle member adjacent to the outlet of the burner block venturi but spaced from it and said wall to deflect upwardly along the wall the flame issuing from said block, and means disposed above the burner block and extending through the wall for directing raw gas into said rising flame to make the flame luminous.

7. In combination with a furnace wall, a gas burner comprising a burner block mounted in the wall and provided with a horizontal venturi having its inlet end open to atmosphere at one side of the wall and having its outlet end at the other side of the wall, a hollow jet member adjacent to but spaced axially from the inlet of said venturi and provided with a plurality of closely spaced horizontal outlets facing said inlet for directing jets of fuel into the Venturi inlet, said jet member being provided with an inlet, a Venturi mixing tube having its outlet connected to the inlet of said member, the inlet of said tube being adapted to receive primary air, means for supplying gas to said tube inlet, the jets of fuel entering said burner block venturi from the jet member drawing secondary air into said block venturi through its inlet to promote combustion of said fuel therein, a vertical baffle member adjacent to the outlet of the burner block venturi but spaced from it and said wall to deflect upwardly along the wall the flame issuing from said block, and means for directing raw gas toward said baffle and into the burning mixture of air and gas supplied through the venturi, whereby to make the rising flame luminous.

HARRY DOBRIN.