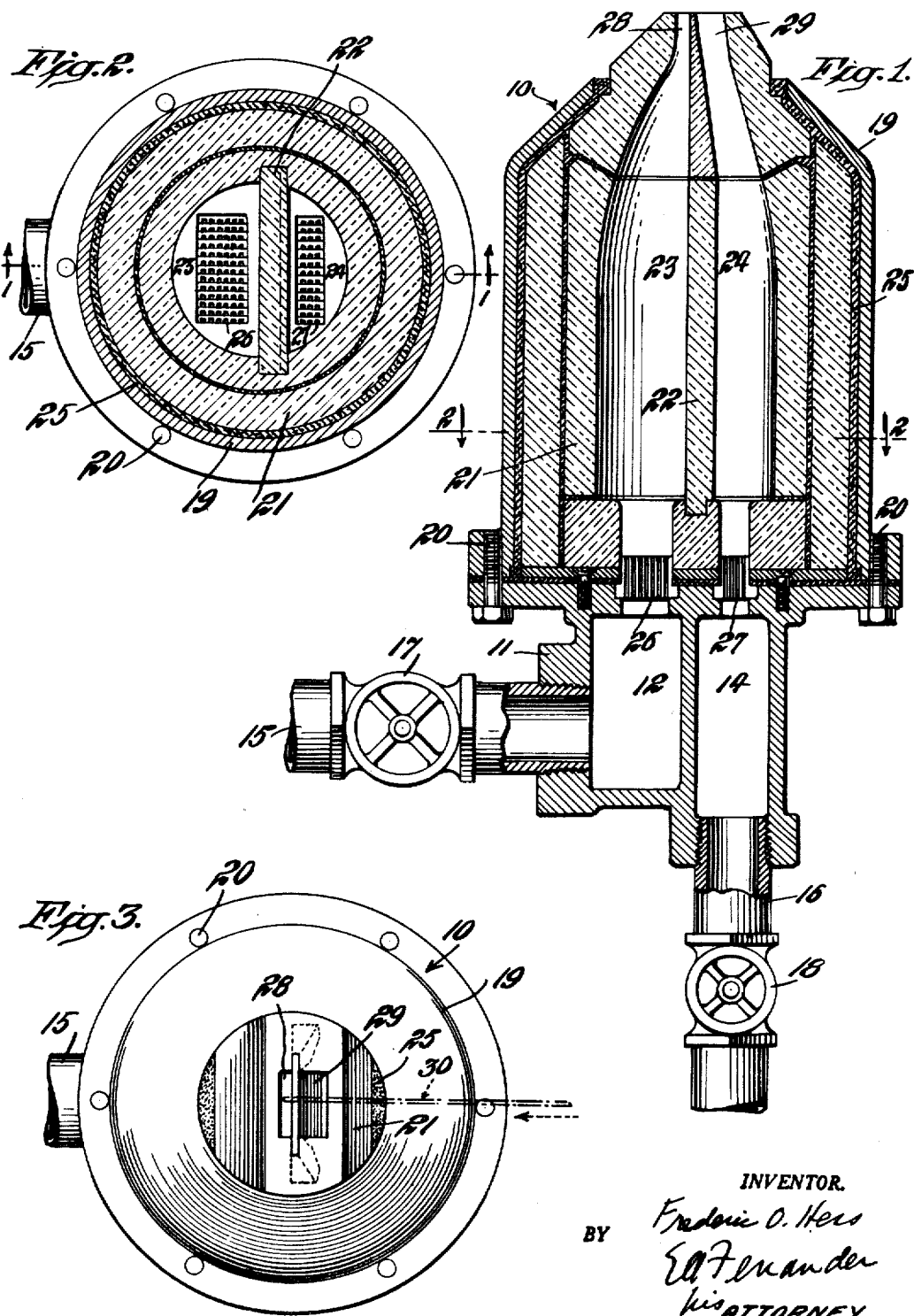


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GAS BURNER OF THE TYPE IN WHICH COMBUSTION IS  
ACCOMPLISHED IN A REFRACTORY  
LINED COMBUSTION CHAMBER  
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GAS BURNER OF THE TYPE IN WHICH  
COMBUSTION IS ACCOMPLISHED IN  
A REFRACTORY LINED COMBUSTION  
CHAMBER

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2 Claims. (Cl. 158—105)

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This invention relates to burners of the type having a refractory lined combustion chamber in which practically complete combustion of a combustible gaseous mixture is accomplished and from which heated products of combustion are discharged at a relatively high velocity through a restricted outlet in the form of a high temperature gas stream.

It is an object of the invention to provide an improvement in burners of this type, particularly to obtain better distribution of the high temperature heating gases produced by the burner. I accomplish this by providing a hollow partitioned body to form two combustion chambers whose restricted outlets are closely adjacent to one another so that work during its movement past the outlets at close range thereto is first heated by one high temperature gas stream and immediately thereafter is heated by the other high temperature gas stream.

Further, the combustible gaseous mixture is supplied to the inlets of the combustion chambers from separate hollow manifolds to each of which the gaseous mixture may be independently supplied at a controlled rate and pressure. By independently controlling the supply of combustible gaseous mixture to each combustion chamber, the character and physical properties of the high temperature gas streams may be individually regulated whereby each gas stream will precisely effect the desired heating of the work during its movement past the outlets.

The above and other objects and advantages of the invention will be more fully understood upon reference to the following description and accompanying drawing forming a part of this specification, and of which:

Fig. 1 is a vertical sectional view, taken at line 1—1 of Fig. 2, of a burner embodying the invention;

Fig. 2 is a sectional view, taken at line 2—2 of Fig. 1, to illustrate the burner more clearly; and

Fig. 3 is an end view looking toward the restricted outlets of the burner illustrated in Fig. 1.

Referring to the drawing, the gas burner 10 embodying the invention includes a hollow metallic base member 11 formed to provide two chambers 12 and 14. The chambers 12 and 14 serve as inlet manifolds for a combustible gaseous mixture which is delivered thereto from a suitable source of supply through conduits 15 and 16 connected to the inlets of the chambers. In the conduits 15 and 16 are connected manually operable valves 17 and 18, respectively, for individually controlling the pressure and rate at which the

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combustible gas mixture is supplied to the chambers 12 and 14.

One end of a hollow open-ended metallic shell 19 is removably secured at 20 to the base member 11. The shell 19 envelops and snugly holds in position a hollow refractory body 21 having a partition 22 which divides the interior thereof into two combustion chambers 23 and 24 extending alongside each other. As shown, the hollow refractory body 21 comprises a number of refractory parts formed of any suitable material, such as silicon carbide or beryllium oxide, which are united together in any suitable manner, as by a high temperature air-hardenable cement, for example. In order that the refractory body 21 will be rigidly held within the shell 19, a layer 25 of air-hardenable cement may be applied to the exterior surface of the refractory body before the latter is positioned in the shell.

The combustible gas mixture delivered to the inlet chambers or manifolds 12 and 14 flows therefrom through apertured screen members 26 and 27 which may be formed of beryllium oxide, for example, and positioned at the inlet ends of the combustion chambers 23 and 24. In this way the combustible gaseous mixture is subdivided into a multiplicity of small jets. In burners of the general type being described, practically complete combustion of the gas jets may be accomplished in the combustion chambers 23 and 24, as will be described presently, and the high temperature gases produced therein and consisting substantially entirely of heated products of combustion, are discharged through restricted outlets 28 and 29 as high temperature gas streams.

When the burner 10 is relatively cool and at a low temperature, it is placed in operation by initially supplying combustible gaseous mixture through the conduits 15 and 16 at a relatively low pressure which may be equivalent to a pressure corresponding to about 5 or 6 inches of water column, for example, so that the gaseous mixture discharged from the combustion chambers 23 and 24 can be ignited to produce and maintain flames at the outlets 28 and 29.

When the flames are being maintained at the outlets 28 and 29, the pressure of the gaseous mixture supplied through the conduits 15 and 16 may be momentarily reduced sufficiently to cause the flames to backfire through the outlets 28 and 29 onto the apertured screen members 26 and 27 in the combustion chambers 23 and 24. When this occurs a plurality of flames are produced and maintained at the upper ends of the small aperture formed in the screen members 26 and 27.

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When the flames are being maintained within the combustion chambers 23 and 24 at the top surfaces of the apertured screen members 26 and 27, the pressure of the gaseous mixture supplied through the conduits 15 and 16 may then be increased. After a short interval of time the flames maintained at the top surfaces of the screen members 26 and 27 effect such heating of the inner refractory linings that these surfaces are heated to high incandescent temperatures. The heating of the inner refractory linings to a highly incandescent condition and radiant heat therefrom promotes substantially complete combustion of the gaseous mixture in the combustion spaces 23 and 24 before the mixture reaches the outlets 28 and 29. From the outlets 28 and 29 are discharged gas streams at temperatures nearly equal to the temperatures in the combustion spaces 23 and 24.

By way of example and without limitation, the heated products of combustion may be discharged from the combustion spaces 23 and 24 through the restricted outlets 28 and 29 at elevated temperatures over a wide temperature range up to 2900° F. and higher, when a combustible gaseous mixture of air and ordinary gas, such as city gas having a B. t. u. rating of about 550 B. t. u. per cubic foot, for example, is supplied at a delivery pressure in the neighborhood of three pounds per square inch. Under such operating conditions the pressure in the combustion chambers 23 and 24 may vary over a wide range up to a pressure corresponding to 70 inches of water column and appreciably above that of atmospheric pressure. The heated gases may be discharged from the burner 10 through the outlets 28 and 29 over a wide velocity range up to a maximum velocity of 1000 feet or more per second.

In certain heating applications heating of work entirely by a single gas stream does not utilize the high temperature gases efficiently. This is particularly true when work of elongated extent is moved continuously into the gas stream at close range to the restricted outlet to be heated from the ambient temperature to a desired elevated temperature. In such cases the portion of the gas stream into which the work initially passes is in a sense acting to preheat the work. When heating of the work is accomplished by a single gas stream, all of the high temperature gases forming the gas stream are at the same high temperature and high velocity and at optimum values determined by the maximum temperature to which the work must be heated. While a portion of such gas stream can be employed to effect preheating of the work, experience has shown that such high temperature gases into which the work initially passes are not efficiently utilized.

Thus, in certain heating applications it is not necessary for the high temperature gases, in the portion of the gas stream into which the work initially passes, to be discharged from the burner outlet at the same high velocity as the gases in the portion of the gas stream into which the work finally passes to be heated to the desired elevated temperature. In many instances the work is heated more efficiently in its initial stage by discharging the heated gases against the work at a reduced velocity and at a reduced temperature.

One example of such heating is that of heating glass filaments or rods which are continuously fed into the high temperature gas streams for producing glass fibers. The portion of the gas stream into which the glass filaments are initially fed is desirably such that successive longitudinal

portions of the rods or filaments are heated to a temperature just short of the fusing temperature without any danger of distorting or otherwise adversely affecting the rod or filament by the velocity at which the gas stream impinges the work. After such preheating of the glass filament or rod, it is then made ready to be heated to its fusing temperature by the portion of the gas stream at the maximum velocity and maximum temperature for the most efficient production of glass fibers.

The burner 10 of the invention is especially suitable for the production of glass fibers from rods or filaments as well as other heating applications where precise control of the heating of work is necessary and desirable in the initial and final heating stages. By providing the burner 10 having two combustion chambers 23 and 24 alongside of each other, and independently controlling the supply of combustible gaseous mixture to each chamber, the temperature and velocity at which the gas streams are discharged from the outlets 28 and 29 can be accurately controlled. In this way, when work of elongated extent is fed at close range to the outlets 28 and 29, as indicated in dotted lines at 30 in Fig. 2, the temperature and physical properties of each gas stream can be independently regulated to effect the desired initial heating by the gas stream discharged from the outlet 29 into which the work initially passes; and the final heating by the gas stream discharged from the outlet 28 into which the work immediately passes from the first gas stream.

In the embodiment of the invention illustrated, the outlet 28 is more restricted than the outlet 29. Hence, by supplying the combustible gas mixture to the chamber 24 at a pressure less than that at which the gas mixture is supplied to the combustion chamber 23, the heating gases will be discharged from the combustion chamber 24 at a lower temperature and at a lower velocity than the heating gases discharged from the combustion chamber 23. This regulation of the temperature and velocity at which the heating gases are discharged from the outlets 28 and 29 can be positively controlled by independent adjustment of the valves 17 and 18.

It will now be understood that an improvement has been provided in which efficient distribution of the high temperature heating gases produced and developed in a single burner is obtained. In the illustrated embodiment of the invention, the outlets 28 and 29 are relatively close together whereby the gas streams discharged therefrom brush against each other and in effect form a single large gas stream. In this way, the work, after it once passes into the gas stream, will always be enveloped in an atmosphere of the heating gases during its movement past both of the outlets 28 and 29.

While a particular embodiment of the improved burner of the invention has been shown and described, it will be obvious to those skilled in the art that modifications and changes may be made without departing from the spirit and scope of the invention as pointed out in the following claims.

What is claimed is:

1. A burner comprising structure including a partitioned hollow body which provides two combustion chambers having inlets at one end and restricted outlets at the opposite ends, means providing two hollow manifolds each of which is in communication with a different one of the

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chambers at the inlet ends thereof, means to control individually the supply of a combustible mixture to each manifold whereby a combustible gaseous mixture may be independently supplied thereto at a controlled rate and pressure, means forming the inlets of the chambers providing a number of small passages for subdividing into a plurality of jets the gaseous mixture entering the chambers from the manifolds, the outlets and inner wall surfaces of the chambers being formed entirely of high temperature refractory material whereby substantially complete combustion of the jets may be effected in the chambers, and the outlets being disposed closely adjacent to one another so that the heated gases discharged from the chambers in the form of high temperature gas streams may be applied to work at close range to the outlets in such a manner that the work during its movement past the outlets will be impinged by the gas streams in succession.

2. A burner comprising structure providing two hollow bodies disposed alongside one another which form two combustion chambers having inlets at one end and restricted outlets at the opposite end, means providing two hollow manifolds each of which is in communication with a different one of the chambers at the inlet end thereof, means to control individually the supply of a combustible mixture to each manifold whereby a combustible gaseous mixture may be independently supplied thereto forming

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a controlled rate and pressure, means at the inlets of the chambers providing a number of small passages for subdividing into a plurality of jets the gaseous mixture entering the chambers from the manifolds, the outlets and inner wall surfaces of the chambers being formed entirely of high temperature refractory material whereby substantially complete combustion of the jets may be effected in the chambers, and the outlets being disposed closely adjacent to one another so that the heated gases discharged from the chambers in the form of high temperature gas streams may be applied to work at close range to the outlets in such a manner that work during its movement past the outlets will be impinged by the gas streams in succession.

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