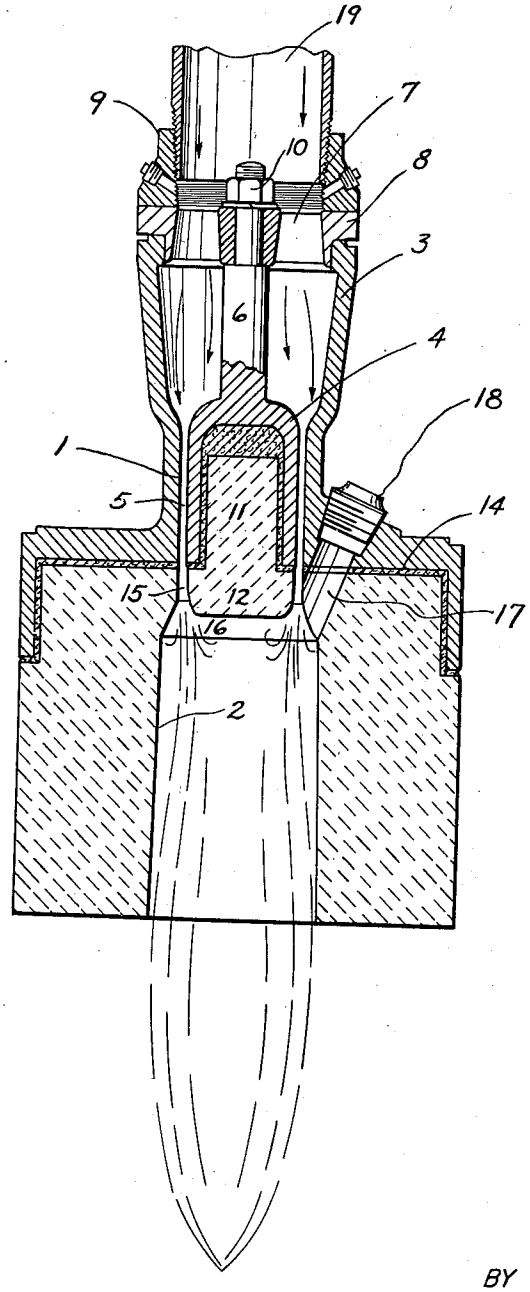
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GAS BURNER, INCLUDING COMBUSTION TUNNEL

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GAS BURNER INCLUDING COMBUSTION TUNNEL

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2 Claims. (Cl. 158—99)

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This invention relates to industrial burners wherein combustion is had of a mixture of gas and air supplied under pressure to a port or orifice which discharges into a tunnel wherein combustion takes place, with ignition commencing at the mouth of the port.

An object of the invention is to provide a long orifice of narrow annular sectional form for high velocity operation yet permitting operation at low mixture pressures without flashback.

Another object is to provide such an orifice for employment of a plug replaceable as to size for adjustment of the effective orifice area. For the purpose and as a further object, the invention contemplates employment of a standard outside orifice diameter of standard length, equal substantially to such diameter, so that the general orifice proportions and anti-flashback performance will not be greatly affected by the diameter of plug employed, all being of the same length.

A further object of the invention is to provide a tunnel form and size, in relation to the port, such as to produce a sudden reduction of pressure, with turbulence and consequent acceleration of combustion of the stream emerging from the port, and to cause such rapidly expanding stream to intimately contact the tunnel wall just beyond the plug; whereby fuels of different combustion rates may be employed without requiring changes in tunnel dimension.

Another object is to locate an ignition pipe in such relation to the burner port that there will be a slight suction at the port before ignition, and ignition may be had with a minimum of mixture in the tunnel.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing which is a longitudinal sectional view illustrating an embodiment of the invention.

With reference now to the drawing, the burner comprises body means having a straight-through passageway and including a cylindrical restriction or neck portion 1 with a substantially cylindrical enlargement or tunnel 2 downstream thereof and preferably a convergent portion 3 leading to the neck portion. The tunnel 2 is provided in a refractory block and the other principal parts are preferably of cast metal; as indicated in the drawing and as is usual in the art.

According to this invention, the length of the restricted portion 1 of the body means is substantially equal to its diameter.

Further, plug means generally indicated at 4 is provided having a cylindrical head portion concentrically disposed in the body means restriction 1 to there effect an annular orifice 5 of effective length equal to its outer diameter, the inner diameter of the orifice being determined by the diameter of the plug head portion.

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The plug head portion is supported by a shank portion 6 mounted in a spider 7, having collar part 8 clamped between the body portion 3 and a fitting 9 as by flange bolts not illustrated, a nut 10 securing the plug and spider together.

Preferably, the plug head is of metal and hollow along the orifice, and includes a refractory part with a shank member 11 cemented within the hollow and a head member 12 overlying the downstream extremity of the plug metal.

The metal and refractory parts of both the body means and the plug head are cemented together in a transverse plane 14 and elsewhere as indicated in the drawing, the plane 14 being located at the downstream end of the port 5, the cooperative refractory parts of plug 4 and tunnel 2 being proportioned as illustrated to provide slight enlargement of the annular passage, immediately downstream of the cylindrical orifice 5 and at the upstream end of the tunnel, as indicated at 15. The tunnel 2 thus includes a short divergent section 16, the plug 4 terminates therewithin, with a bluntly rounded or convergent; so that the passageway leads from the relatively restricted orifice or port 5 into the relatively enlarged tunnel, by way of a relatively short zone of divergence contiguous to each end.

For ignition of the main burner described, the body means is provided with a pipe 17 having a removable closure such as the plug 18. The inner end of the pipe 17 is located at the short divergent entrance section 16 of the tunnel 2. By such location, when the closure 18 is removed for ignition purposes, the sudden reduction in pressure of the combustible mixture emerging from the main burner port, creates a suction effective in the pipe 17 to assist ignition, so that ignition may be had with a minimum of gas within the tunnel. After ignition, however, such suction is substantially reduced because of the expansion of the main stream which takes place in the zone 16.

The burner being in operation, served with a suitable gas-air mixture through a supply line 19, as indicated by the arrows, a flame will be produced as indicated in broken lines, its combustion taking place largely within the tunnel 2. The greatest rate of combustion and consequent highest rate of expansion will occur in the divergent zone 16.

Characteristics of operation are that the stream emerging from the orifice 5 and eventually comprising only products of combustion, will "peel off" from the end of the plug and produce a high turbulence just downstream thereof in the zone 16, thereby speeding up combustion in this area. Downstream therebeyond the flame will intimately contact the wall of the tunnel, thus further improving the flame-retaining characteristic.

Also, flashback at low mixture pressures is practically eliminated by the described proportions of the orifice, the arrangement permitting use of plug sizes giving an increase of effective port sizes up to 100 per cent beyond the minimum.

While in the example disclosed the portion 1 of the body means providing port 5 in the burner passageway has been illustrated and referred to as cylindrical, and constituting a restriction in the body means, it will be appreciated that such portion need not necessarily have a convergent upstream approach thereto, nor need the parts be necessarily cylindrical, although such features are desirable, the former for better flow characteristics and the latter for ease of manufacture, an essential being that the orifice 5 be of narrow sectional form and substantial length and provide a relatively high velocity therethrough. Hereinafter, in the claims, the portion 1 of the body means may be referred to as a neck, and terms implying circular sectional form employed nevertheless.

Similarly, while in the specific form herein illustrating the invention, the plug means 4 is a composite structure, it will be appreciated that in some instances the plug means might be entirely of metal, and in others entirely of refractory material.

What I claim is:

1. In a burner of the class described: body means having a straight through opening leading from an inlet for combustible gas mixture, and including an elongated substantially cylindrical combustion tunnel portion open at its downstream end, an elongated relatively restricted neck portion leading toward the upsteam end of said tunnel portion, and a relatively short flaring portion interconnecting said tunnel and neck portions and providing a zone of divergence in flow from said neck portion and to said tunnel portion, and plug means fixed within said opening to provide a narrow elongated annular passageway through said neck portion for discharge into said tunnel portion by way of said zone, said plug means extending convergently downstream beyond said neck portion, and having its downstream end located within said zone, and there formed with a flat central face and a rounded edge about said face.

2. In a burner of the class described: body means having a straight through opening including an elongated substantially cylindrical combustion tunnel portion open at its downstream end, an elongated relatively restricted neck portion leading toward the upstream end of said tunnel portion, and a relatively short flaring portion interconnecting said tunnel and neck portions and providing a zone of divergence in flow from said neck portion and to said tunnel portion, and plug means disposed within said neck portion to there provide a narrow elongated annular port for discharge into said tunnel portion by way of said zone, said plug means extending convergently downstream beyond said neck portion, and having its downstream end located within said zone and formed with a flat central face and a rounded edge about said face, and said body means having an ignition pipe leading to said zone, whereby to be responsive to suction effect caused by said divergence.

ROBERT M. BUCK.

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