

June 24, 1958

R. D. REED
GAS BURNER HEADS

2,840,152

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2 Sheets-Sheet 1

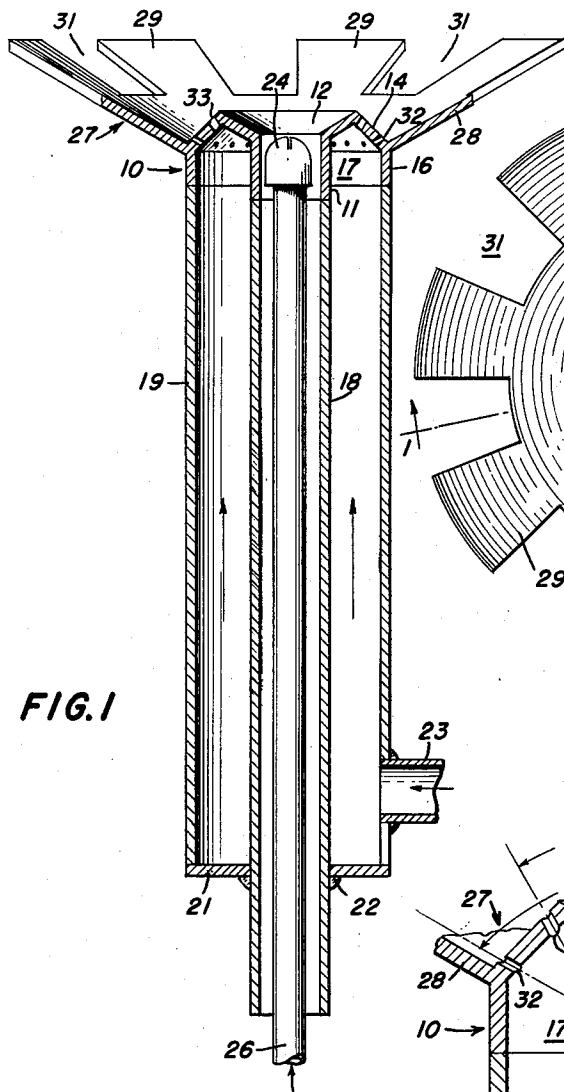


FIG. 1

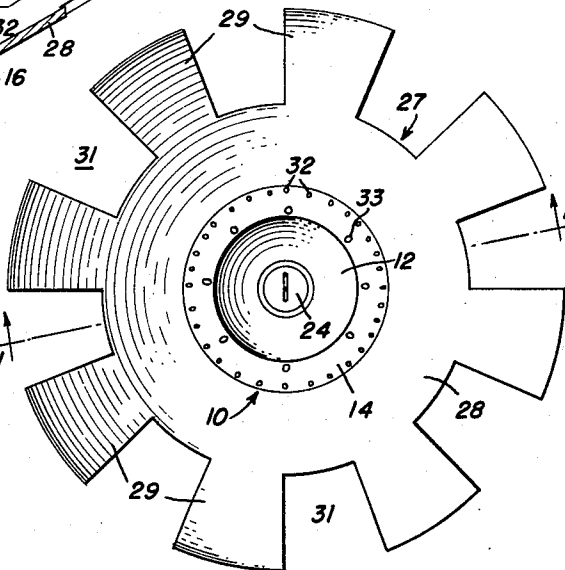


FIG. 2

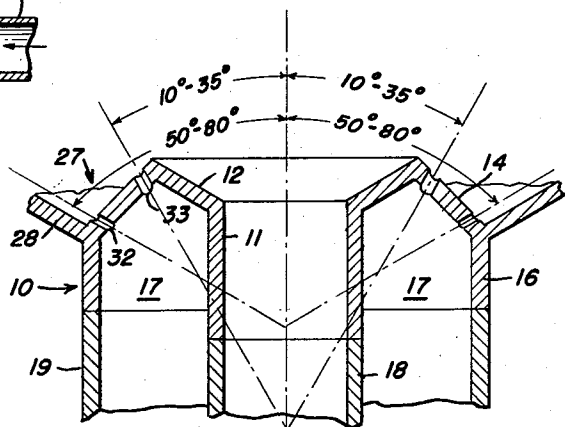


FIG. 3

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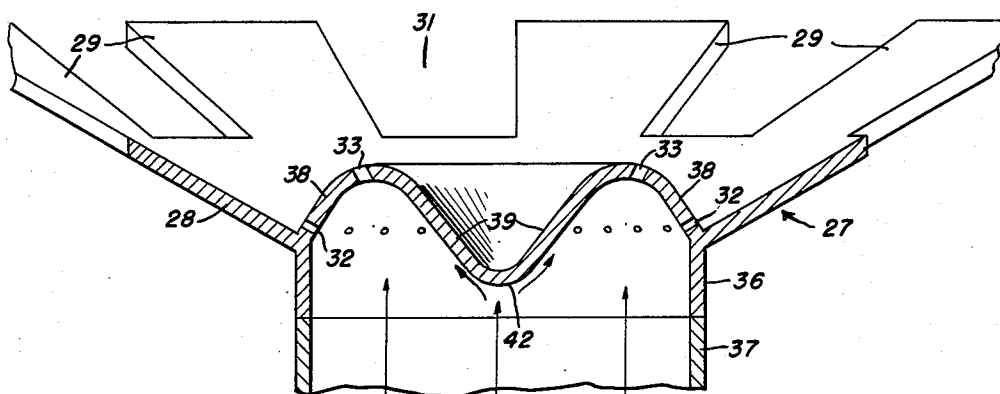


FIG. 4

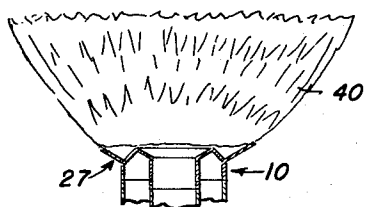


FIG. 6

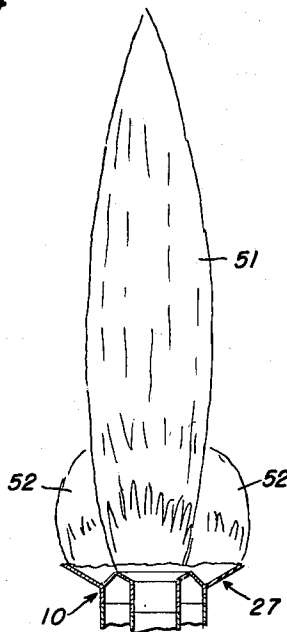


FIG. 5

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GAS BURNER HEADS

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2 Claims. (Cl. 158—116)

The present invention relates to burners for the combustion of gaseous fuel and more specifically pertains to the structural characteristics of the tip and to the disposition of the discharge ports for varying the shape of the flame and means in association with the head to promote and maintain stable burning of the gaseous fuel issuing from the discharge ports.

An object of the invention is to provide shield means in association with angularly disposed discharge ports for the gaseous fuel so as to permit some but to avoid unlimited quantities of air to be drawn into the presence of high velocity jets of gaseous fuel issuing from the discharge ports to thereby provide a burner which is stable in operation.

A more detailed object is to provide generally conical shaped shield means integral with the burner head so as to be supported thereby including a frusto-conical solid portion in an annular area around the discharge end of the burner head with circumferentially spaced finger portions extending outwardly from the solid portion of the shield means to provide open areas between the finger portions to permit limited quantities of air to move into the lower pressure area developed by the high velocity gas jets issuing from the discharge ports.

A still further object of the invention is to provide one annular surface on the burner head which slopes in relation to the axis of the burner structure for accommodating discharge ports which may be arranged at different angles and at the same time provide for stable burning of gaseous fuel issuing therefrom at relatively high velocity from a gas supply under pressure of from one to fifty pounds.

Other objects and features of the invention will be appreciated and become apparent to those skilled in the combustion art as the present disclosure proceeds and upon consideration of the following detailed description and the accompanying drawings wherein several embodiments of the invention are disclosed.

In the drawings:

Fig. 1 is an axial sectional view of a burner structure exhibiting the invention.

Fig. 2 is a front elevational view on a larger scale.

Fig. 3 is an enlarged fragmentary sectional view illustrating ranges of angular disposition of the discharge ports.

Fig. 4 is a fragmentary sectional axial view of a modified burner tip.

Fig. 5 is a diagrammatic view illustrating the flame shape developed when a major portion of the gaseous fuel escapes through the ports having low included angles with respect to the center line or axis of the burner.

Fig. 6 is a diagrammatic view illustrating the shape of the flame when the major portion of the fuel escapes through ports disposed at a high included angle with reference to the axis of the burner.

The invention is directed to a burner structure having an annular surface which slopes with reference to the center line of the burner and which accommodates at

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least two rows of discharge ports which may be disposed at different angles with reference to the axis of the burner and which may vary in size and number to control or vary the shape of the flame. The dual rows of discharge ports serve the further purpose of providing for stable ignition of the fuel even when it issues at high velocity through the discharge ports as is the case when the gaseous fuel under pressure of one to fifty pounds issues through the discharge ports. The invention includes shield means in association with such a burner head so as to provide for the access of a limited quantity of air to the presence of the burning fuel in the vicinity of the discharge orifices.

Referring to the drawings there is shown at 10 a burner head embodying the invention and it includes a centrally located tube 11 of cylindrical shape. A frusto-conical shaped annular wall 12 flares outwardly in proceeding from the downstream end of the tube 11. A second frusto-conical wall 14 is carried by the peripheral edge of the annular wall 12 and flares outwardly therefrom. In one embodiment the wall 14 is arranged at an angle of about one hundred and five degrees with reference to the plane of the annular wall 12. The outer edge of the frusto-conical wall 14 joins a cylindrical tubular member 16 having its axis concentric with the tube 11 and providing an annular space 17 between the tubular member 16 and the tube 11.

The rear or upstream end of the tube 11 is connected to a pipe 18 in any suitable manner so as to provide an impervious connection therebetween. A conduit 19 having a diameter equal to that of the tubular member 16 is connected thereto in any suitable manner as shown in Fig. 1. An end wall 21 closes the rear end of the conduit 19 and this end wall is sealed at 22 about the periphery of the pipe 18. A supply pipe for gaseous fuel is shown at 23 for guiding gas under pressure for movement in the direction of the arrows shown in Fig. 1 into the annular space 17. The gaseous fuel without primary air being mixed therewith is used for supplying fuel to the burner head but the burner is capable of operation when primary air is mixed with the gaseous fuel supplied to the annular space 17. The pipe 18 is open along its axis for the insertion of an auxiliary burner head shown at 24 which may be arranged within the tube 11 and supplied with liquid fuel through a supply pipe 26.

The burner structure includes shield means shown generally at 27 which has an overall frusto-conical shape and is preferably formed integral with the burner head 10 at the juncture of the tubular member 16 with the frusto-conical wall 14. The inner annular portion of the frusto-conical shield means is in the form of an unapertured flange 28 which in one embodiment is arranged at an angle of about eighty degrees with reference to the central axis of the burner structure. The shield means includes a plurality of circumferentially spaced plate like fingers 29 which extend outwardly from the periphery of the continuous flange 28. The fingers 29 are arranged in the same plane as the inner unapertured annular portion 28. The fingers provide open areas 31 therebetween. Any number of the fingers 29 may be employed and the circumferential dimensions thereof may be altered to thereby vary the number and dimensions of the open areas 31. The radial dimensions of the fingers 29 may be varied in relation to the radius of the unapertured ring portion 28. In the embodiment illustrated the radius of the annular portion 28 is approximately one-third of the radial dimensions of each of the fingers 29.

The burner head 10 is provided with two rows of discharge ports. One row is shown at 32 and the other row is represented at 33. The angular disposition of the discharge ports in each row and the size and number in each row may be varied and serve to provide novel re-

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sults in the operation of the burner. The size and angular disposition of the discharge ports are such that they not only control the shape of the flame produced by the burner head but serve the further purpose of maintaining ignition of the burning fuel. If substantially all of the fuel in the annular space 17 was discharged through the row of ports 32 each of which has its axis disposed at an angle between fifty and eighty degrees with respect to the axis or center line of the burner there would be no difficulty in maintaining ignition. The discharge of substantially all of the gaseous fuel through such angularly disposed ports produces a flame shape somewhat as shown at 40 in Fig. 6.

It is often desirable and necessary in order to satisfy heating requirements to produce an elongated flame of greater length downstream from the burner head than that shown in Fig. 6 and of less diameter. In order to produce such a flame as much as eighty percent of the gaseous fuel is discharged through the annular row of discharge ports 33. When such a quantity of the gaseous fuel escapes through the ports 33 a flame somewhat of the shape as shown at 51 in Fig. 5 is provided when the axes of these ports are disposed at an angle between ten and thirty-five degrees with respect to the axis of the burner. An angular disposition of the ports to provide such a flame shape presents difficulties in the maintenance of ignition. In order to maintain stable ignition of a flame somewhat as shown at 51 in Fig. 5 the row of ports 32 are of such size and number as to permit approximately twenty percent of the total fuel to escape through the high included angle ports 32 while the remaining eighty percent escapes through the low included angle ports 33. The small volume of fuel discharged through the ports 32 is shielded immediately upon escape from the downstream end of these ports by solid or unapertured portion 28 of the shield means 27. This stable burning fuel is drawn into the gas discharged through the row of ports 33 to provide ample heat for kindling and rekindling the fuel escaping through the low included angle port and stable burning results. Thus the burner structure provides for a rekindling of the fuel to maintain combustion of an elongated flame shown in 51 at Fig. 5 while the flame portion indicated at 52 is developed from the fuel issuing through the high included angle ports 32 is drawn into the main flame to maintain rekindling. The stability of the flame is in part maintained by the shield means 27 deflecting the air from the zone immediately downstream from the discharge ports to thereby avoid cooling of the flames below the kindling temperature as a result of the intruding air.

A modification of the burner head is shown in Fig. 4 wherein the central downstream end of the burner tip is closed. This burner head includes a short tubular member 36 which is adapted to be connected in any suitable manner to a supply conduit 37. An inwardly converging substantially frustro-conical wall 38 is carried by or formed integral with the forward end of the tubular member 36. This annular frustro-conical wall 38 may be arranged at approximately forty-five degrees with reference to the axis of the burner. A reversely disposed frustro-conical wall 39 merges in an arcuate manner with the downstream portion of the wall 38. The conical wall 39 has an arcuate apex portion 42 directed upstream of the burner. This structural arrangement closes the downstream end of the tubular member 36. The inner surface 42 of the conical wall 39 diverts the gas under pressure in the direction of the arrows shown in Fig. 4.

The burner of the modification shown in Fig. 4 includes shield means similar to that shown and described in connection with Figs. 1 to 3. The shield means includes an annular solid portion which is integral with the tubular member 36 at the juncture thereof with the frustro-conical wall 39 and circumferentially spaced fingers 29. The burner structure shown in Fig. 4 in-

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cludes two annular rows of discharge orifices 32 and 33 arranged in the frustro-conical wall 38 in a manner similar to the discharge ports described in connection with Figs. 1 to 3.

In cases where liquid fuel burner such as shown at 24 is employed in association with the gas burner of Figs. 1 to 3 the stabilizing action of the burning gaseous fuel is preserved and the shape of the liquid fuel flame may be of any desired pattern depending upon the design of the liquid burner tip. The central conical depression of the burner head provided by the wall 12 as shown in Fig. 1 provides a cavity within the boundary of the larger conical structure to stabilize the burning of the liquid fuel.

While the invention has been described with reference to specific structural characteristics and with regard to a burner designed primarily for the combustion of gas without primary air being mixed therewith it will be appreciated that changes may be made in the structure as well as the overall organization and that the gas burners will operate satisfactorily when the gaseous fuel supplied has air mixed therewith. Such changes and others may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim and desire to secure by Letters Patent is:

1. A gas burner comprising, a tubular member, a frustro-conical wall having its larger end coincident with said tubular member adjacent its downstream end and converging inwardly in proceeding from said downstream end, a second frustro-conical wall having its larger end coincident with the smaller end of the first frustro-conical wall, said second frustro-conical wall converging inwardly in proceeding upstream of the burner, said first frustro-conical wall having a first circumferential row of discharge ports and a second circumferential row of discharge ports between the first row and said tubular member with the axis of each discharge port diverging from the axis of the burner in proceeding downstream thereof, means for supplying a gaseous fuel to the upstream sides of said frustro-conical walls, the axis of each of the discharge ports of said first row being at an angle between ten and thirty-five degrees with respect to the axis of the burner and the axis of each of the discharge ports of said row being at an angle between fifty and eighty degrees with respect to the axis of the burner, said first row of discharge ports being of such number and size in relation to the number and size of the ports of the second row that a major portion of said gaseous fuel escapes therethrough to provide an elongated flame downstream of the burner, frustro-conical shield means carried by the burner adjacent the juncture of the first frustro-conical wall with said tubular member diverging in proceeding downstream of the burner, said shield means including an unapertured annular portion adjacent the first frustro-conical wall preventing air from sweeping over outlet ends of the ports forming said second row, and said shield means including circumferentially spaced fingers extending downstream beyond said unapertured annular portion.

2. A gas burner comprising, a tubular member, a frustro-conical wall having its larger end coincident with said tubular member adjacent its downstream end and converging inwardly in proceeding from said downstream end, a second frustro-conical wall having its larger end coincident with the smaller end of the first frustro-conical wall and converging inwardly in proceeding upstream of the burner, said first frustro-conical wall having a first circumferential row of discharge ports and a second circumferential row of discharge ports between the first row and said tubular member with the axis of each discharge port diverging from the axis of the burner at acute angles in proceeding downstream thereof, means for maintaining a supply of gaseous fuel under pressure at the upstream sides of said frustro-conical walls, the axis of each of the discharge ports of said first row being

at a lower included angle with respect to the axis of the burner than the axis of the discharge ports of said second row, said first row of discharge ports being of such number and size in relation to the number and size of the ports of the second row that a major portion of the gaseous fuel escapes therethrough to provide an elongated flame downstream of the burner, frustro-conical shield means carried by the burner adjacent the juncture of the first frustro-conical wall with said tubular member and diverging in proceeding downstream of the burner, said shield means being substantially parallel to the axes of the ports of said second row, said shield means including a continuous annular flange portion adjacent the

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periphery of said first frustro-conical wall for preventing air from sweeping over the outlet ends of the ports of said second row, and said shield means including circumferentially spaced substantially plate-shaped fingers extending downstream beyond said flange portion.

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