

[54] **METHOD FOR CRACKING AND BURNING HYDROCARBONS**

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[58] Field of Search 23/259.5, 277; 239/422, 424, 561, 591; 431/2, 8, 187, 284, 354

[56] **References Cited**

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[57] **ABSTRACT**

Hydrocarbons are cracked and burned by forming a combustible mixture of a fuel gas and a combustion-supporting gas, establishing a central stream of hydrocarbons to be cracked and burned, surrounding said stream of hydrocarbons with said combustible mixture, directing an annular stream of gas richer in oxygen than air between said central stream and said combustible mixture, and combusting the combined streams. The luminosity of the flame is thereby increased and the quantity of carbon black which is produced is also increased.

8 Claims, 2 Drawing Figures

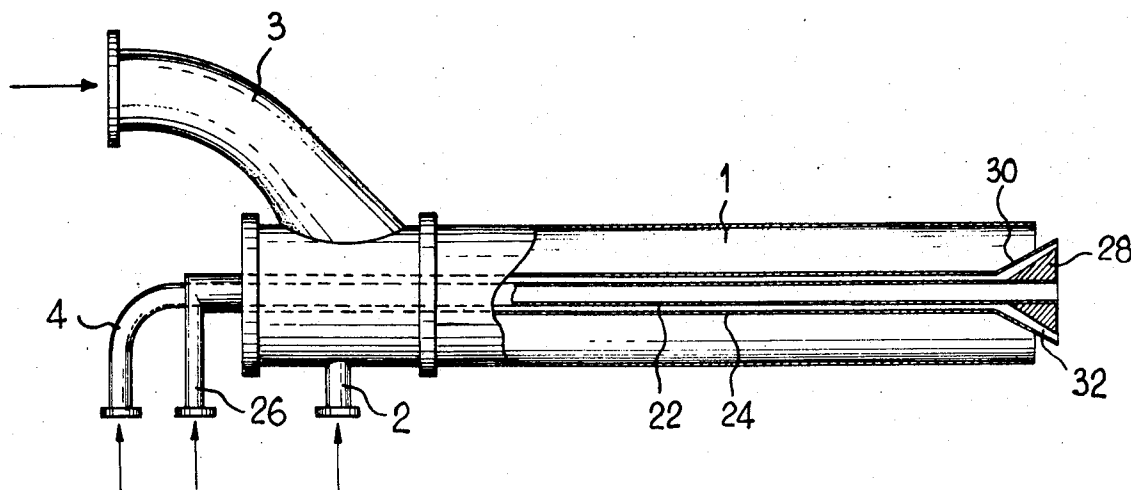


Fig.1

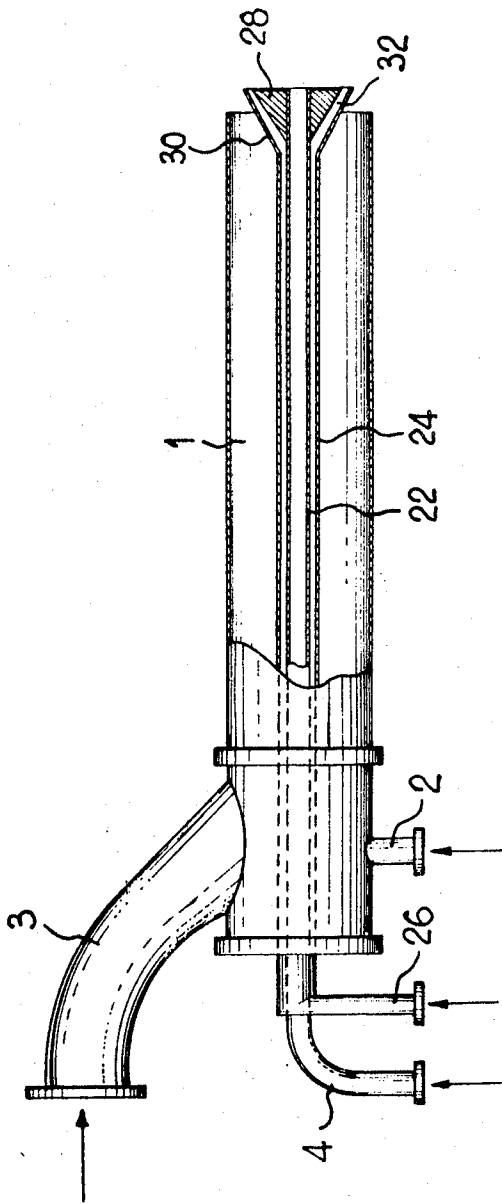
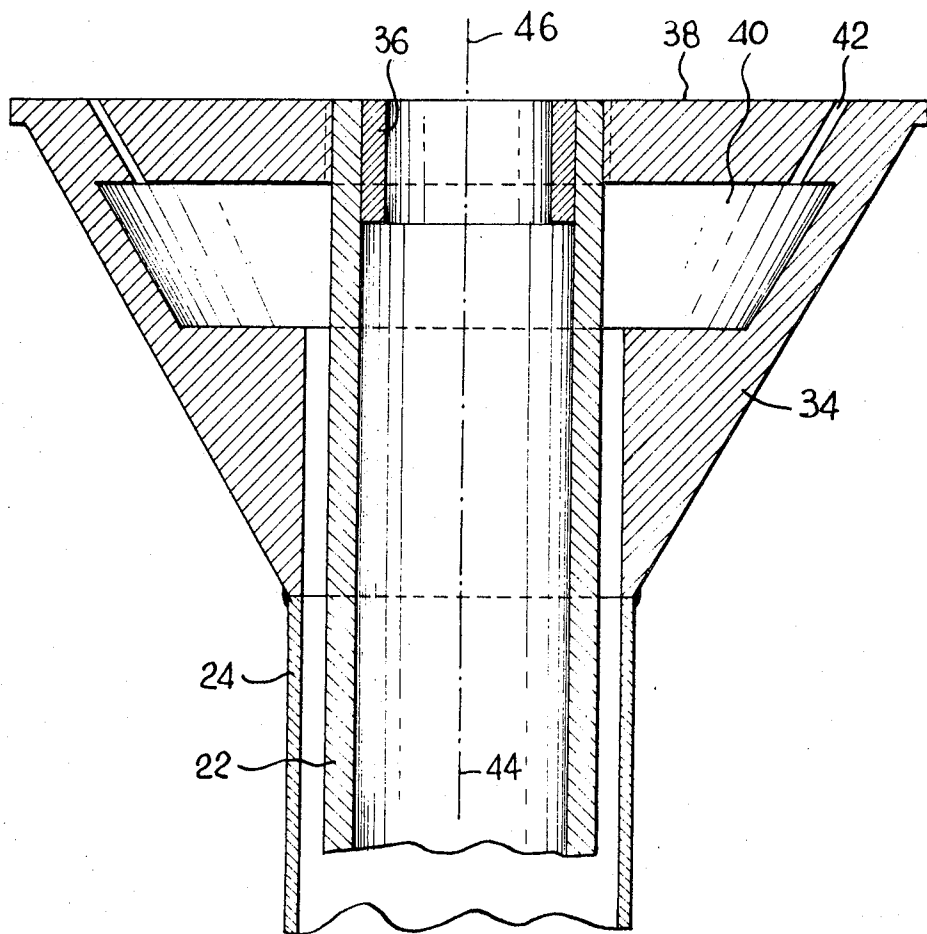


Fig. 2



METHOD FOR CRACKING AND BURNING HYDROCARBONS

This application is a division of copending application Ser. No. 42,259, filed June 1, 1970, and now U.S. Pat. No. 3,649,206.

The present invention relates to a method for cracking and burning hydrocarbons.

The invention has for its object to increase the quantity of carbon produced by cracking, which increases the luminosity of the flame and the quantity of carbon black which is produced.

It is a further object of the invention to increase the temperature up to which the hydrocarbons are brought.

These and other objects of the invention will become apparent from the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a longitudinal view, partly in section, of apparatus for practicing the method of the present invention; and

FIG. 2 is an enlarged fragmentary view in section of an alternative form of part of the device shown in FIG. 1.

The burner of FIG. 1 comprises a pre-mixing chamber 1 supplied with fuel gas through a pipe 2 and with combustion-supporting gas through a pipe 3. Along the axis of the chamber extend two concentric tubes 22 and 24. The tube 22 is supplied with secondary fuel through a pipe 4, while the space between these two tubes is supplied with combustion-supporting gas rich in oxygen, through a pipe 26. For example, natural gas passes in through the pipe 2, air through the pipe 3, natural gas or fuel oil through the pipe 4, and industrial oxygen or air enriched in oxygen through the pipe 26.

The tube 22 terminates in a thickened portion 28 forming a cone having an axial bore therethrough in which is disposed the end of the tube 22. The tube 24 terminates in a frusto-conical flared portion 30, the base of which is in the same plane as that of the cone 28 and is located outside the chamber 1. Between the elements 28 and 30 is located an annular slot 32 through which passes out the combustion-supporting gas rich in oxygen.

FIG. 2 shows an alternative form of the nose of the burner.

The tube 22 is screwed into a nose 34 which constitutes the baffle member; a nozzle 36 is screwed into the extremity of the tube 22. The tube 24 is welded at the extremity of the nose directed towards the chamber 1; on the opposite side, the nose has a substantially flat surface 38. The oxygen or other combustion-supporting gas rich in oxygen, passing into the space between the tubes and 24 expands into a chamber 40 which encloses the tube 22 and passes out through holes such as 42.

The axes of the holes 42 should not form too small an acute angle with the surface 38, in order to prevent the rich combustion-supporting gas which passes out from being mixed with the mixture which passes around the head. This axis forms for example an angle of 30° with the axis 44-46 of the head. The direction of the outlet of the rich combustion-supporting gas is the same as in the case shown in FIG. 1. By this means, the fraction of the mixture deflected by the baffle member returns the combustion-supporting gas towards the jet of hydrocarbons emerging from tube 22. It is probable that the rich combustion-supporting gas is only

mixed, over a certain length of the flame, with the outer layer of the jet of hydrocarbons, producing at that point a high temperature, which causes the cracking of the hydrocarbons which are not mixed with combustion-supporting gas.

The oxygen introduced by the pipe 26, of the order of 4% of the total volume of oxygen utilized, makes it possible for example, to increase the temperature of the flame by 200° C. at 120° cm. from the nose of the burner; in addition, the luminosity of the flame is substantially increased.

In the oxygen utilized, there must be included that which is supplied by the air circulating around the chamber 1. The device according to the invention may be mounted, for example, in the hearth of a furnace in which secondary air is intentionally introduced in order to complete the combustion.

The devices shown and described for practicing the process of the present invention may be modified without thereby departing from the scope of the invention. For example, the outlet of the rich combustion-supporting gas may be closer to the outlet of the hydrocarbons. The latter may have very different volatilities, as for example propane and fuel oil.

A burner has been constructed with a nose as shown in FIG. 2, in which the internal diameter of the nozzle 36 was 30 mm. and the diameter of the face 38 was 159 mm. It comprised 48 holes 42 of 2 mm. in diameter, opening into the face 38 along a circle having a diameter of 132 mm. The face 38 projected from the extremity of the chamber 1 by about 15 centimeters.

To this burner, there were supplied:

through the pipe 2: 160 cu.m./hr. of Groningen gas;
through the pipe 3: 1,300 cu.m./hr. of air;
through the pipe 4: 490 cu.m./hr. of Groningen gas;
through the pipe 26: 40 cu.m./hr. of industrial oxygen of 99.5% purity.

As compared with a similar burner, but without the addition of oxygen, it was found that:

the white portion of the flame is slightly shorter, but much more luminous;
the content of carbon black is 3.5 times higher at 120 mm. from the nose, and 1.9 times higher at 220 mm.

From a consideration of the foregoing disclosure, therefore, it will be evident that the initially recited objects of the present invention have been achieved.

Although the present invention has been described and illustrated in connection with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit of the invention, as those skilled in the art will readily understand. Such modifications and variations are considered to be within the purview and scope of the present invention as defined by the appended claims.

Having described my invention, I claim:

1. A method of cracking and burning hydrocarbons, comprising forming a combustible mixture of a fuel gas and a combustion-supporting gas, establishing a central stream of hydrocarbons to be cracked and burned, surrounding said stream of hydrocarbons with said combustible mixture, directing an annular stream of gas richer in oxygen than air between said central stream and said combustible mixture, and combusting the combined streams.

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2. A method as claimed in claim 1, and deflecting said annular stream radially outwardly of said central stream.

3. A method as claimed in claim 2, and imparting to said stream of gas richer in oxygen an outwardly conical path immediately prior to said combustion.

4. A method as claimed in claim 3, in which said outwardly conical path is imparted along an outwardly conical solid surface.

5. A method as claimed in claim 1, said gas richer in

oxygen being air enriched in oxygen.

6. A method as claimed in claim 1, in which said combustion-supporting gas is air.

7. A method as claimed in claim 6, in which said gas richer in oxygen than air contains about 4% of the total volume of oxygen utilized.

8. A method as claimed in claim 1, in which said gas richer in oxygen than air contains about 4% of the total volume of oxygen utilized.

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