

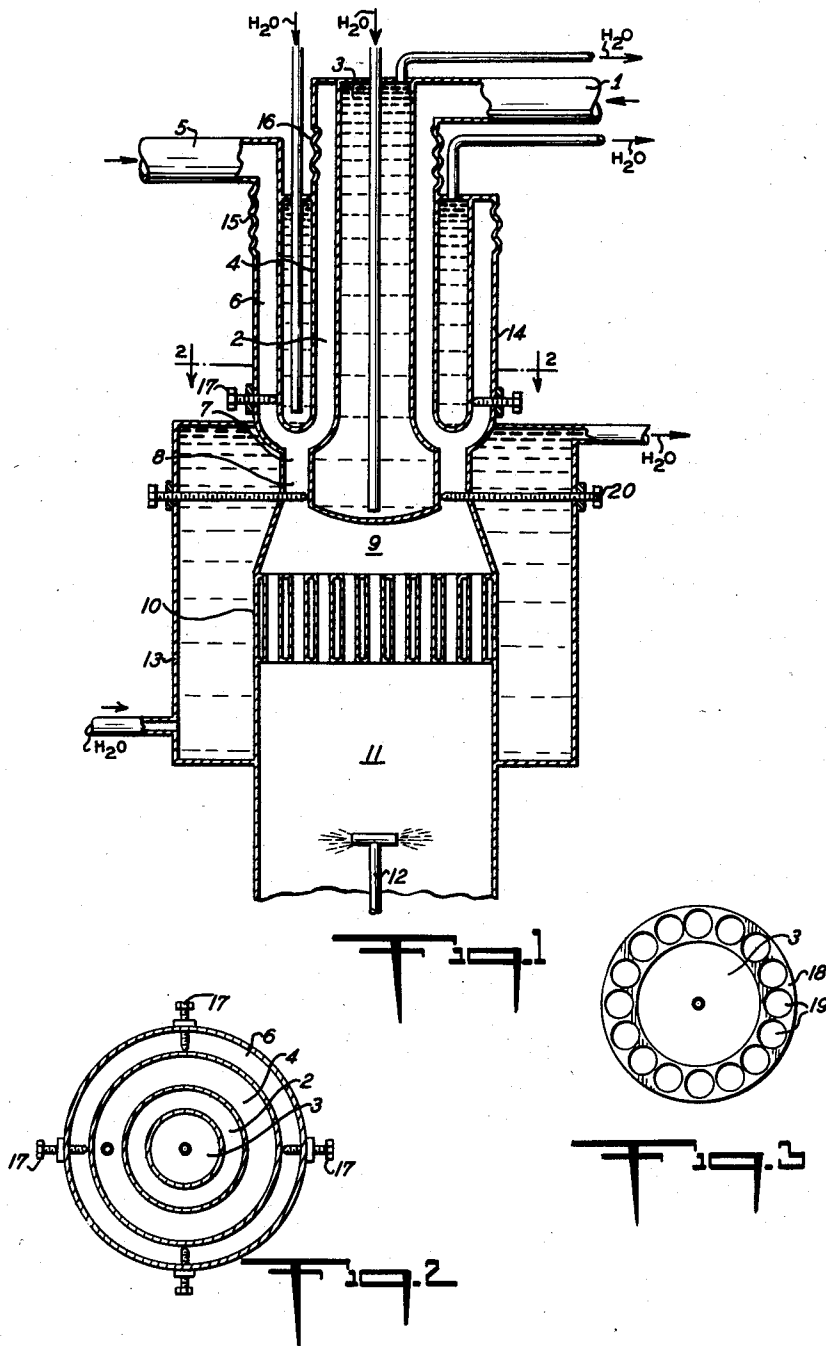
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GAS BURNER

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GAS BURNER

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This invention relates to devices for regulating the uniformity of the composition and dynamic pressure of fuel and comburent gas mixtures for burners used in the combustion of hydrocarbons, and particularly for burners or furnaces for the industrial manufacture of acetylene by means of the partial combustion of gaseous, gasified or finely dispersed hydrocarbons. (Note that "comburent" is used here in its sense of "combustion-supporting".)

More particularly, the invention relates to mixing and distributing devices of the annular type in which the fuel and comburent gases are separately conducted through two coaxial, annular and cylindrical spaces to a circular groove forming the joining line of the two annular spaces where the two gases are mixed and whence the mixture, by previously passing through an intermediate distributing space, is forced through the ducts of a gas distributor into a combustion chamber.

In the practical working of such furnaces, it has been noted that, for a maximum efficiency (that is to say with maximum production of acetylene while getting a minimum of undesirable by-products such as soot, homologous acetylenes, cyclic hydrocarbons, tars, etc., reduction to a minimum of the consumption of the gases reacting together, reduction of the risks of back-fires from the combustion-chamber to the intermediate distributing space, improvement of adjustment of the combustion operation, etc.), it is important that, before entering into the burner distributor, the gases be perfectly mixed. More specifically, at every point in the intermediate distributing space, the composition of the fuel and comburent mixture must be constant and the dynamic pressure of the gaseous mixture at the entrance of each nozzle of the distributor must be uniform.

In ordinary furnaces or burners, the different parts of which are rigidly assembled, this condition is not sufficiently realized. Important variations are frequently noted in the oxygen content of the gaseous mixture and in the dynamic pressures at different points before the distributor.

These differences are due to differences of dynamic pressures in at least one of the gaseous currents at points across the confluence of these currents, i.e., where they are united, such differences of dynamic pressure are largely caused by a practically unavoidable asymmetry of the feeding devices or ducts for the fuel and comburent gases.

An object of the present invention is accordingly to remedy the lack of homogeneity of the gaseous mixture, before it is passed into the combustion chamber, by means of a special arrangement of the mixing and distributing device for the gases feeding such burners.

This special arrangement consists essentially of making flexible the connection of the different parts which form the gas mixing and distributing device and the burner, and of allowing adjustment, by simple mechanical means, of the positions of these parts relative to one another, so that the prejudicial effects of differences of dynamic pressures are eliminated and a homogeneous gas

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mixture is realized in the intermediate distributing space.

The nature of the invention will be more fully understood by the description of a burner as schematically represented in the accompanying drawing, in which:

Fig. 1 is an axial section in a vertical plane through the upper part of a burner according to the invention,

Fig. 2 is a horizontal cross-section on line 2—2 of Fig. 1, and

Fig. 3 is a modification of Fig. 1.

In the burner, one of the two gases, either the fuel gas or the comburent gas, comes through a pipe 1 to an annular space or passage 2 surrounding a central part or core member 3. This core member 3, being preferably hollow, may be advantageously provided with a system for liquid circulation in order to make possible, if necessary, the cooling of the base of the part, e.g. in case of pre-ignition of the gaseous mixture caused by a back-fire.

The annular space 2 is surrounded by an annular partition or coaxial part 4, which, is preferably hollow and which in the same manner as part 3, can also be provided with a system of coolant liquid circulation.

The other gas, either the comburent gas or the fuel gas, comes through a pipe 5 to an annular passage or space 6, which concentrically surrounds annular partition 4. While they join at the base of the annular passages 2 and 6, along a circle 7, the two gas currents are mixed by passing through the annular space 8 and through the intermediate distributing space 9, whence, through a distributor 10, the mixture is injected into the combustion or reaction chamber 11 where it is ignited and then quenched, after combustion, by means of a known device such as, for example, a cold water spray 12. Combustion chamber 11, distributor 10 and annular space 8 are surrounded with a water-jacket 13 for protecting them against the heat of the flame.

In a burner of the type which has a rigid construction, the oxygen content of the gaseous mixture in the intermediate distributing space 9 is generally very variable from one point to another; this fact being very detrimental to the efficacious working of the device.

It is an object of the present invention to remove this disadvantage by means of a special arrangement of the different parts of the mixing and distributing device by making them movable and relatively independent from each other as well as from the parts forming the burner. Thus it is made possible to eliminate, by adjusting the position of the parts, the disturbing effect of the differences of dynamic pressures of the gas currents at different points in their confluence 7 adjacent the annular space 8.

For the aforementioned purpose, the wall 14 of the burner and the central part 3 and annular part 4 (which also form the walls of the annular spaces conducting the gases) are connected at their upper ends by means of flexible bellows-shaped corrugated sleeves or annuli 15 and 16. This arrangement permits a certain shifting, transverse to the axis of the vertical burner, of the lower end of part 4, with regard to the outer wall 14 and to the central part 3 and consequently a modification of the passage section, at different points, of the lower ends of the ducts 2 and 6. By means of screws 17 which are pressed against part 4 and which can be rotated within threaded parts fixed on the circumference of the outer wall 14, it is possible to adjust and to keep part 4 in a determined position.

This position is adjusted in such a manner as to get in the distributing space 9, a uniform oxygen content of the gas mixture by analyzing samples of the gas at different points of space 9 and by changing the adjustment of the screws until the oxygen content is equal at all points. The screws 17, at least three in number, are

symmetrically distributed around part 4, as indicated in Fig. 2 in which four such screws are shown.

However, by making the construction more supple, its vertical stability and that of the central part 3 is somewhat reduced. This is undesirable in consideration of the fact that, in order to adjust the passage section of pipes 2 and 6 with precision, it is important to keep central part 3 fixed with regard to the movable part 4.

In order to avoid this deficiency, the position of central part 3 may be fixed by joining its base to wall 14 by means of cross-pieces 20.

As regards the assembling of the parts and the construction of the device, it is however more advantageous to immobilize part 3 by joining it to the outer wall 14 by means of a ring 18 inserted and fixed between the two said parts, this ring being provided, on its whole periphery, with vertical perforations 19 for the passage of the gas mixture as indicated in Fig. 3, representing a horizontal section of such a ring.

According to a further embodiment, instead of immobilizing part 3 with a ring 18, its position may be fixed, according to the same principle as for corresponding part 4, that is to say by adjusting and keeping it in the desired position by means of at least three screws 20, whereby a complementary means is obtained for eliminating the detrimental effect of differences of dynamic pressures on the uniform flow of the gaseous mixture just in front of each nozzle of distributor 10.

The annular device for the mixing and distributing of gases feeding burners for incomplete combustion of hydrocarbons, may be advantageously applied to different known types of such burners, amongst which, those where the flame is surrounded by a liquid screen, e.g. water (U.S.A. patent application, Ser. No. 432,216 filed May 25, 1954 and assigned to the assignee of this application) in order to avoid carbon deposits on the walls of the combustion chamber, and those, where, as much as the mixing device, the combustion chamber is also of annular type (Belgian Patent 520,578). When realizing, by means of the described devices, a perfect uniformity of the oxygen content at every place of the mixing chamber 9, as well as an equalization of the dynamic pressure and consequently of the throughput in each nozzle of the distributor 10, a better yield in acetylene (that is to say a better ratio of acetylene product to total input of combined carbon) is obtained. It is, in particular, possible to greatly reduce the formation of free carbon (soot etc.), homologous acetylenes and cyclic compounds. Back-fires from combustion-chamber 11 to mixing-space 9 are also avoided.

It will now be obvious to those skilled in the art that many modifications and variations are feasible utilizing the principles set forth and realizing many or all of the objects and advantages of the apparatus described but which do not depart essentially from the spirit of the invention.

What is claimed is:

1. In apparatus for supplying a mixture of hydrocarbon gas and comburent gas to a reaction chamber for partial combustion and pyrolysis of the hydrocarbon in said reaction chamber and having a mixing chamber upstream of said reaction chamber and separate feed inlet conduits for supplying respectively said hydrocarbon gas and said comburent gas to said apparatus, the combination which comprises an outer tubular wall defining an enclosure leading from said inlet conduits to said mixing chamber, a central core member extending axially within said tubular wall and substantially coaxially there-

with and inwardly spaced therefrom, an annular partition extending coaxially within said outer tubular wall and spaced from both said wall and said core member defining an annular passage between said partition and said core member in flow communication with one of said inlet conduits and an outer annular passage between said partition and said tubular wall in flow communication with the other of said inlet conduits, a bellows-like corrugated flexible connection between said annular partition and said outer tubular wall providing for transverse movement of said partition with respect to said outer wall and said core member, another bellows-like corrugated flexible connection between said core member and said annular partition providing for transverse movement of said core member with respect to both said annular partition and said outer tubular wall, both said flexible connections being adjacent the inlet end of said apparatus and said points of flow communication of said inlet conduits with said inner and outer annular passages and axially spaced from said mixing chamber, adjustable means for transversely shifting and positioning said core member with respect to both said outer wall and said annular partition upon movement of said core member about said flexible connection thereto, additional adjustable means for transversely shifting and positioning said annular partition with respect to said outer tubular wall and said core member upon movement of said annular partition about said flexible connection thereto, said adjustable shifting and positioning effecting selective and independent adjustable variation of said inner and outer annular passages defined by said core member and said partition at least at the ends thereof adjacent said mixing chamber.

2. Apparatus as in claim 1 in which said core member includes means for the cooling thereof by the passage therethrough of a coolant.

3. Apparatus as in claim 1 in which said annular partition includes means for the cooling thereof by the passage therethrough of a coolant.

4. Apparatus as in claim 1 in which said flexible connection between said annular partition and said outer wall comprises transverse corrugations in said outer wall.

5. Apparatus as in claim 1 in which said flexible connection between said core member and said annular partition comprises transverse corrugations in the surface of said annular partition adjacent said core member.

6. Apparatus as in claim 1 in which said core member extends axially within said outer tubular wall downstream beyond said annular partition and is adapted to define with said outer wall an annular inlet into said mixing chamber thus being adapted to effect at least partial pre-mixing of said hydrocarbon gas and said comburent gas from said inner and outer passages upstream of said mixing chamber.

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