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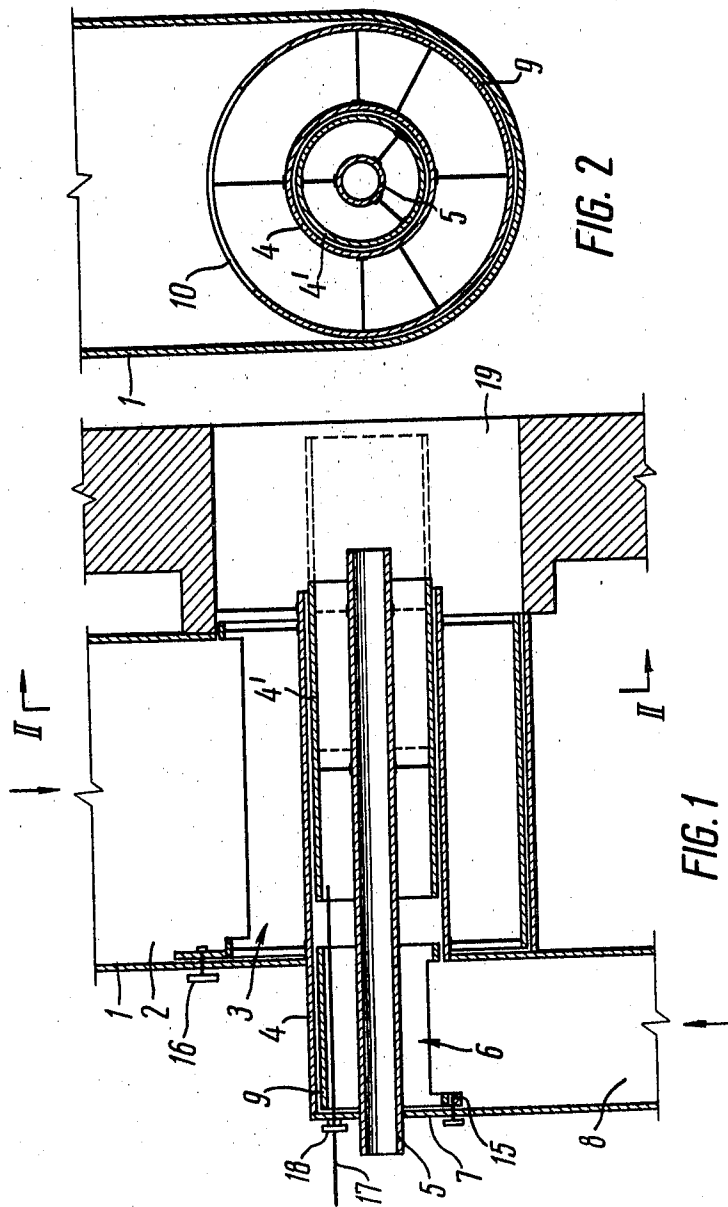
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BURNER DEVICE FOR COMBUSTION GASES

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2 Sheets-Sheet 1



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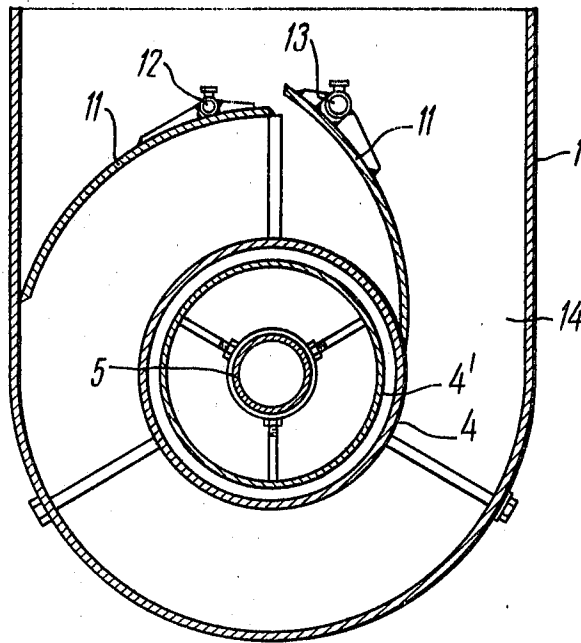


FIG. 3

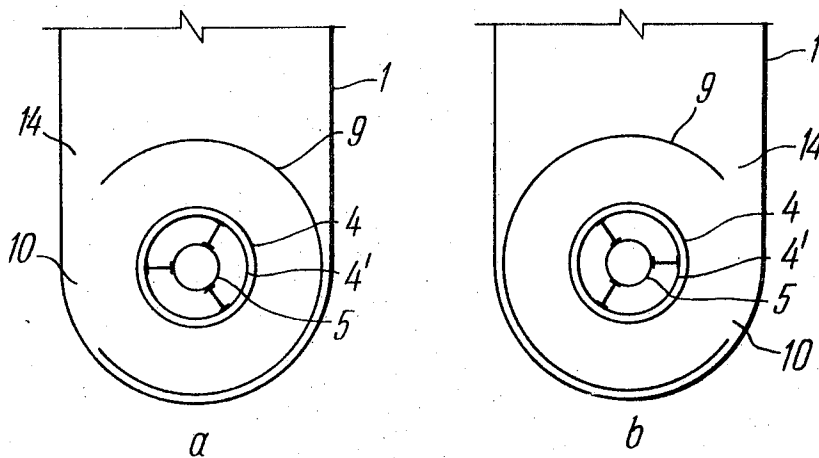


FIG. 4

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BURNER DEVICE FOR COMBUSTION GASES

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5 Claims

ABSTRACT OF THE DISCLOSURE

A burner device for combustion gases, for use in boiler units. In said burner device, there are whirlers for air and gas, which are shaped as rotary pieces permitting, variation of the place of admission of gas and air streams as well as of the cross-section of the channel at the place of admission, said rotary pieces being provided with the possibility of their mutual rotation in order to vary the direction of rotation of air and gas streams.

The present invention relates to burner devices for combustion gases, and more particularly to burner device which are used in boiler units.

At the present burner devices for combustion gases are known in the art. Some of these are of a type having a body which accommodates an air whirler and at least one gas-feeding pipe fitted with a whirler.

In the known devices, whirlers both for air and gas are made stationary. This does not allow controlling the whirling intensity of gas and air streams nor varying the direction of their mutual rotation. Furthermore, the gas-feeding pipe is designed so that it does not permit varying the length of flow path wherein the gas and air streams are mixed. Thus the known devices fail to insure the possibility of variations in the torch thermal characteristics (light and temperature characteristics as well) in the course of their operation.

At the same time, there is a great number of units whose thermal conditions vary depending upon load and operational requirements.

Also known are units operated on several types of fuel whose torch thermal characteristics differ sharply. Thus, for instance, two or three types of gas fuel (blast-furnace, coke oven, or natural gas) with markedly differing thermal characteristics are burned, daily, at a time in different proportions in power boiler units at plants in, for example, the ferrous industry. In such a case, transfer from one type of fuel to another, or variations in the proportion of fuel components, as well as the combustion of their mixture results in a sharply changed ratio of heat absorption by convection and by water-cooled heating surfaces. This sharply worsens the operating conditions of the metal of steam superheaters, increases the range of superheated steam temperature control and raises the temperature of the outgoing gases, which affects the dependability and increases the operational cost of boiler units.

It is an object of the present invention to eliminate the above-mentioned disadvantages.

It is another object of the present invention to provide a burner device for combustion gases, wherein the whirlers both for gas and air provide the possibility of varying the whirling intensity of gas and air streams as well as varying the direction of rotation and the length of their path of mixing.

According to this and other objects, in a burner device for combustion gases, whose body accommodates a

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whirler for air and at least one gas-feeding pipe fitted with a whirler, according to the invention, each of the burners is fashioned as a rotary piece enabling variation of the place of admission of gas and air streams, as well as the cross-section of the channel at the place of admission, said rotary pieces insuring the possibility of their mutual turning to vary the direction of rotation of the air and gas streams.

Such a technical solution of the problem permits controlling, within a wide range, the thermal characteristics of the torch by varying the whirling intensity of the gas and air flow and the place of their admission in the course of said whirlers turning to one side or the other. Provision of the whirlers with the possibility of their mutual turning makes it possible to vary the direction of turning of the air and gas streams by way of turning one whirler relative to another or effecting their mutual turning in one or the opposite direction.

It is advantageous that each of the rotary pieces be fashioned as a pair of blades rigidly fixed on rotary axles and accommodated inside the body.

Each rotary piece can be made as a cylinder inside the body, exposed to incoming streams, with a window along the longitudinal axis of the device for admission of air or gas streams, and coaxial to the body.

It is preferable that the window in the cross-section of the cylinder be not less than one quarter of its perimeter. In order to vary the length of the path of mixing gas with air, it is advantageous to make the gas-feeding pipe telescopic.

As a whole, the invention improves the operational characteristics and raises the heat efficiency of furnace units (e.g., in heating and other furnaces), improves the operating conditions of heating surfaces, reduces the range of control of the temperature of superheated steam and the temperature of outgoing gases and thus increases the efficiency and reliability of boiler units.

The proposed burner device will find an especially wide application in power boiler units operated on two or three types of gaseous fuel (blast-furnace, coke-oven, and natural gases). In this case, owing to the provision of optimal thermal characteristics of the torch depending upon a gas being burned up or upon the proportion of the components in their mixture, the proposed burner device permits reducing sharply the range of control of the superheated gas temperature, improving the operating conditions for the heating surfaces, reducing the temperature of outgoing gases, etc. In its turn, this enables the manufacture of superheater parts out of relatively inexpensive carbon steels instead of expensive alloys as is the case now and raises the boilers' efficiency and their reliability.

The burner device of the invention will be more readily understood from the following description of exemplary embodiments, reference being had to the appended drawings, wherein:

FIG. 1 is a cross-section of a burner device with a whirler shaped as a cylinder with a window, according to the invention, said device being fixed in a slot of the boiler unit shown partially;

FIG. 2 is a sectional view along line II-II of FIG. 1;

FIG. 3 is a cross sectional view of a burner device with a whirler fashioned as blades; and

FIGS. 4a and b are schematic diagrams of the positions of a whirler of the first type in the burner device, depending upon the direction of rotation of gas or air streams.

The burner device for combustion gases in accordance with the invention comprises a body 1 (FIG. 1) with a window 2 for feeding air into a whirler shaped as a rotary piece 3. Coaxial with the latter inside the body 1 are two coaxial pipes 4 and 5. The external pipe 4 of these

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is intended for the feeding of gas and is fitted with a whirler shaped as a rotary piece 6 similar to the rotary piece 3' and provided in the body 7 which serves as a part of the pipe 4. There is a hole 8 in the body 7, through which gases are fed.

Gaseous fuel of another type is fed through central pipe 5 without being whirled so that, in case a blast-furnace gas is fed through the pipe 4, a coke-oven or natural gas or a mixture of natural and coke-oven gases is fed through the pipe 5.

The pipe 5 can be used as a casing for a black oil burner or as a hole for observation of the burning process. In such case, another type of gaseous fuel can be supplied through an annular clearance between the pipe 4 and an additional pipe coaxial to it (not shown in the drawings).

Each of the rotary pieces 3 and 6 is fashioned as a cylinder 9 open in the direction of the stream motion (FIG. 2) with a window 10 along the longitudinal axis of the device. These cylinders 9 are set coaxially in the bodies 1 and 7 respectively. In their cross-section, the windows 10 of the cylinders 9 should not be less than one quarter of their perimeter, which insures the formation of shaped whirled streams of gas and air with a minimal whirling intensity.

The rotary pieces 3 and 6 (FIG. 1) classified as the whirlers can be shaped as a pair of blades 11 (FIG. 3) rigidly fixed on rotary axes 12 and 13 respectively.

The embodiment of the whirlers, as described hereinabove, permits variation of the place of admission of the gas and air streams, as well as the cross-section of a channel 14 at the place of their admission.

In case the pieces 3 and 6 are made as the cylinders 9 (FIG. 2), they are provided with the possibility of rotation by means of drives 15 and 16 (FIG. 1). In case said rotary pieces 3 and 6 are fashioned as a pair of blades 11 (FIG. 3), the turning of either of these is effected by an autonomous independent drive (not shown in the drawings).

The whirlers provided with the possibility of their mutual turning enable variations in the direction of gas and air streams.

The gas-feeding pipe 4 is made telescopic, which enables variation of the length of the path for mixing of the gas and air streams. The movement of a telescopic portion 41 of the pipe 4 is enabled by a rod 17 and by a screw drive 18.

The operation of the burner device of the invention is described as adapted to the whirlers of the first type.

The burner device is installed in a hole 19 of a furnace unit of the boiler or oven.

Through the window 8 in the body 7, gas is fed to the cylinder whirler 9 and then goes to the furnace hole 19 through the external pipe 4.

Through the window 2 in the body 1, air is fed to the cylinder whirler 3, the mixing of the air and gas streams taking place in a portion equal to a distance between the end of the pipe 4 and the mouth of the furnace hole.

Variations in the thermal characteristics of the torch in case of a changed mode of operation of, say, an oven or boiler unit, changed operating conditions in the oven unit, varied load, type of a gaseous fuel being burned, or components of gases in the mixture inside the boiler unit are possible by a turning of the cylinder chambers 9, with the aid of drives 15 or 16, to the right (FIG. 4b) or to the left (FIG. 4a). The angle to which the cylinders 9 are turned depends upon a required intensity of whirling of an air or gas stream, said intensity being dependent, in its turn, upon the cross-section of a channel 14 formed by the edge of the window 10 of the cylinder and the nearest wall of the body.

The position of the cylinder 9 shown in FIG. 2 insures the supply of an unwhirled stream of air or gas.

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In case the whirler is shaped as two rotary blades 11 (FIG. 3), the intensity of whirling is controlled by a turning of either of the blades. When both of the blades are turned toward each other at one time, an unwhirled gas or air stream is formed.

To change the direction of rotation of the gas and air streams, it is necessary to turn the whirlers, i.e., the mobile pieces 3 and 6, to one side or the other.

To change the length of the path wherein gas and air are mixed, it is necessary to move the telescopic portion 41 of the pipe 4 along the axis of the burner device.

In case the gas and air streams are not whirled and the telescopic portion 41 of the pipe 4 is pulled out to the furnace hole to the maximum, the torch is of maximum length.

In case the gas and air streams are whirled as much as possible to opposite sides and the telescopic portion 41 of the pipe 4 is not extended to the hole, the torch is of minimum length.

By varying the whirling intensity and the mutual direction of rotation of gas and air streams, as well as by varying the length of their path of mixing, it is possible to obtain a great variety of thermal characteristics of the torch.

What we claim is:

1. A burner device comprising a body, a whirler for air in said body, at least one gas-feeding first pipe connected to said body, a whirler in said pipe; the whirlers being shaped as cylindrical pieces provided with windows, means to rotate the said pieces to vary the places of admission of gas and air streams and the cross-section of the stream paths at the places of admission, a second pipe for the supply of fuel, said rotary pieces being concentric with the latter said pipe and opening axially in the same direction to mix air and gas with said fuel, and a third pipe extending from the second said whirler in coaxial relation between said second pipe and the first said whirler.

2. A burner device, as claimed in claim 1, wherein each said cylinder has its window along the longitudinal axis thereof.

3. A burner device as claimed in claim 2, wherein the window of each said cylinder is of a circumferential extent not less than one quarter of the perimeter of the said cylinder.

4. A burner device as claimed in claim 1, wherein each of the rotary pieces includes rotatable axes and a pair of blades fixed rigidly on said axes.

5. A burner device as claimed in claim 1, wherein the third pipe includes telescopic sections to vary the length of the path for mixing gas and air.

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