July 22, 1969 B. WITHORN 3,456,606

COMBUSTION APPARATUS

Filed July 10, 1967 2 Sheets-Sheet 1

Fig 1.

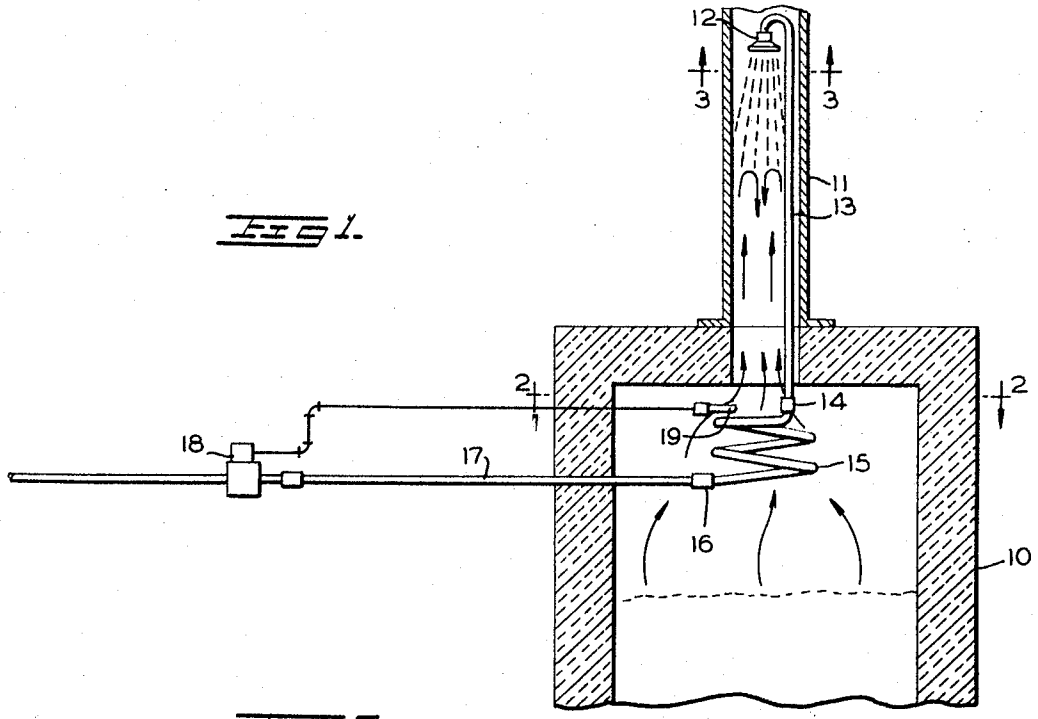


Fig 2.

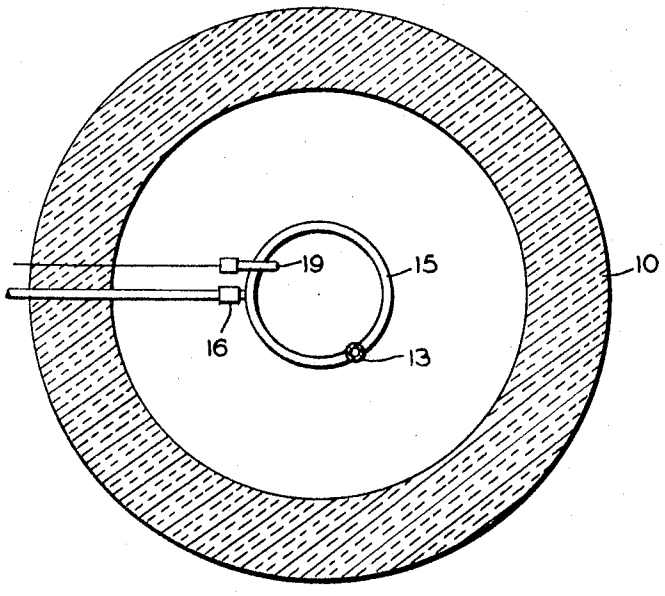
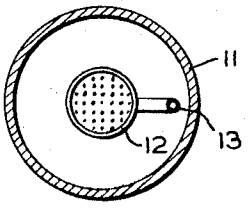


Fig 3.



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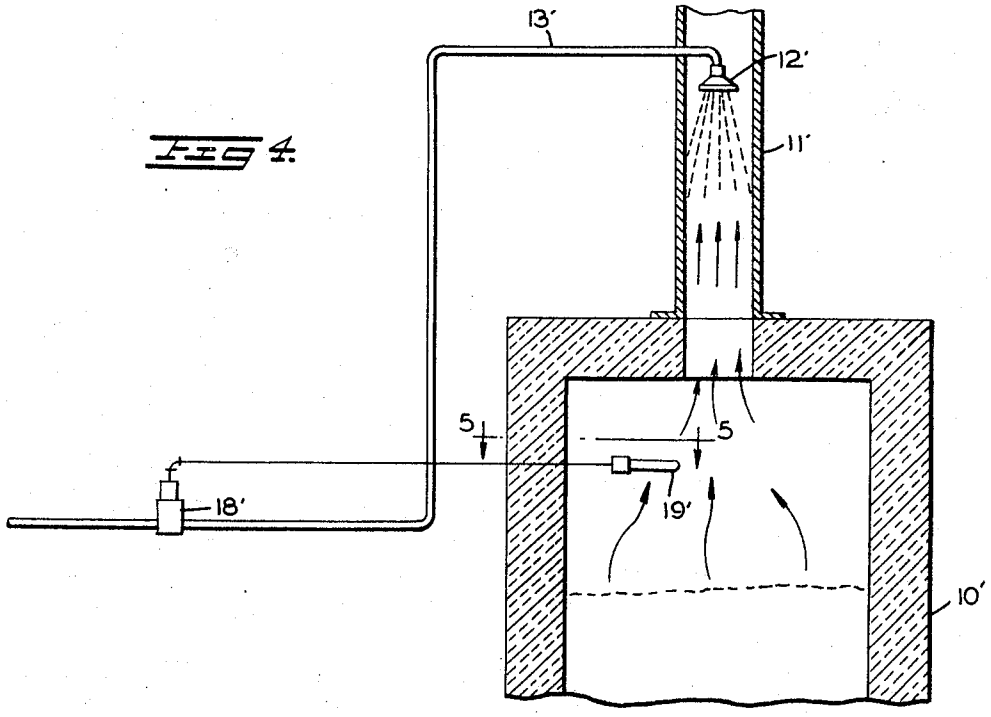
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COMBUSTION APPARATUS

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Fig 4.



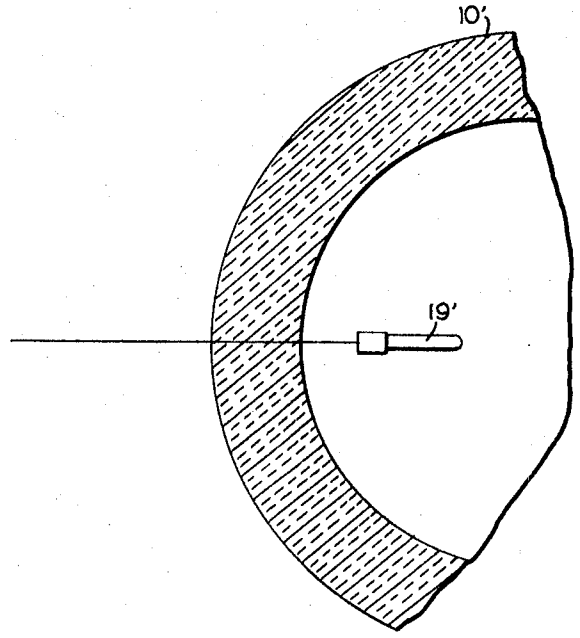


Fig 5.

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3,456,606

COMBUSTION APPARATUS

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Int. Cl. F23j 15/00; F23g 3/04
U.S. Cl. 110—119 1 Claim

ABSTRACT OF THE DISCLOSURE

The patent specification and drawings disclose an arrangement of parts which can easily be installed in an existing smoke stack or stack flue and is adapted to sprinkle either a steam or a fine mist of water against the uprising flue gases so as to mingle with the same and to cause the soot particles to become heavier by the addition thereto of the steam or water mist thus causing rapid precipitation of the same, within the stack thereby preventing their escape into the surrounding atmosphere.

Also, the addition of steam to the uprising combustion gases changes the color of the uprising gases from one which is usually darkish in color to one which assumes a white or a grayish white color.

Background of the invention

The present invention relates to an arrangement of parts which may effectively be employed in the elimination of undesirable smoke and soot particles rising upwardly from the smoke stacks of establishments such as incinerators, office buildings, apartment houses, etc., where for reason of economy a low grade fuel is employed in the furnaces commonly installed in such establishments.

It is a well known fact that when the furnaces in establishments of the aforementioned type are fired, a dense black smoke issues from the flue stacks and this black smoke is most objectionable inasmuch as it consists of innumerable minute particles of soot which will ultimately settle on the ground or surrounding buildings in the area. Also, such smoke is objectionable from a health standpoint as it will pollute the air in the area surrounding the buildings employing such low grade fuel burning furnaces.

Since air pollution has recently entered into a major problem and due to the large number of establishments employing low grade fuels in their furnaces, the structure of the present invention will eliminate the air pollution caused by these establishments and the structure of the present invention is one which may easily be installed in existing flue stacks with relative ease and without necessitating major changes in the flue stacks.

Summary of the invention

The present invention provides for an efficient and compact arrangement of parts which may be easily installed in pre-existing flue stacks or installed in stacks as they are being erected which will direct a fine mist of water or steam downwardly against uprising flue gases so as to precipitate the soot particles therein and to simultaneously wash the uprising smoke and to change the color thereof from a darkish color to one which is substantially white, thus eliminating the pollution of the air in the area surrounding the establishments employing low grade fuel burning furnaces.

Brief description of the drawings

FIGURE 1 is an elevational view, partly in section of one form of the present invention.

FIGURE 2 is a section taken on line 2—2 of FIGURE 1 looking in the direction of the arrows.

FIGURE 3 is a section taken on line 3—3 of FIGURE 1 looking in the direction of the arrows.

FIGURE 4 is an elevational view, partly in section of a modified form of the invention, and,

FIGURE 5 is a section taken on line 5—5 of FIGURE 4 looking in the direction of the arrows.

Description of the preferred embodiments

Referring to the darwings there is shown at FIGURE 1 thereof a combustion chamber **10** of conventional construction and made of a suitable refractory material. Secured to the combustion chamber **10** in any suitable manner is a smoke stack **11** which extends upwardly therefrom and leads to the atmosphere.

Mounted interiorly of the smoke stack is a sprinkler head **12** which is directed downwardly and is adapted to project a steam spray against the uprising flue gases. The sprinkler head **12** is secured in any suitable manner to a conduit **13** which extends downwardly within the stack **11** and is coupled as by a coupling **14** to a coil **15**. Coil **15** is secured by still another coupling **16** which connects the coil **15** to a water line **17** which extends through a wall of the combustion chamber **10** and thence to a source of water supply as a main water line or the like.

Located in water line **17** is a solenoid valve **18** which is adapted to be responsive to a temperature sensing element such as a thermocouple **19**. Thermocouple **19** is mounted in any manner within the combustion chamber **10**, preferably in the upper portion thereof and is adapted to be in line connection with the solenoid valve **18**, aforesaid, so as to regulate the admission of water within the coil **15** for a purpose to be more fully described hereinafter. As shown in FIGURE 1 of the drawings, the thermocouple **19** is preferably in close proximity to the coil **15** so as to enable the same to sense the heat temperature in the area surrounding the coil **15**.

The structure shown in FIGURES 1, 2 and 3 of the drawings is designed to operate in the following manner. The furnace is fired in the usual manner and the type of fuel employed for firing the same can be anywhere from coal, coke, oil, etc. Following the firing of the furnace, the heat created thereby is sensed by the thermocouple, aforesaid, and when the heat generated in the combustion chamber reaches a calculated minimum degree heat, the solenoid valve **18** in the water line **17** is actuated to open the valve therein thereby admitting water into the coil **15** where due to the heat generated within the combustion chamber, the water in the coil is converted into steam and the thus generated steam rises upwardly in conduit **13** and out through the downwardly directed spray head **12** against the uprising flue gases. Thus it will be appreciated by the reason of the aforesaid valve and thermocouple only so much water is admitted within the coil as will readily be converted into steam thus insuring always a constant source of steam being directed against the upwardly rising flue gases.

As can be appreciated, little if any modification is to be required to an existing combustion chamber and stack rising therefrom so as to adapt the unit described herein to such existing heating structures. To adapt the unit of the present invention to a pre-existing structure one need only form an opening in one wall of the combustion chamber and extend the water line therethrough, thence, the coil and its associated parts are secured as by the aforesaid couplings to the water line and the uprising conduit which mounts at the upper end thereof the sprinkler head. If desired, suitable bracing members may be employed for steadying the unit within the combustion chamber and flue stack although it has been found that such bracings or supports are not necessarily required.

Referring now to the modification shown in FIGURES 4 and 5 of the drawings, a combustion chamber

10' is shown therein which is provided with the customary smoke stack 11' rising upwardly therefrom. A sprinkler head 12' is mounted in any suitable manner to a conduit 13' which extends from within the stack 11' and connects with a suitable source of water such as a water main, not shown. A valve such as a solenoid valve 18' is interposed in the conduit 13' and a line connection leads from said valve 18' to a thermocouple 19' which is mounted in any suitable manner in the upper portion of the combustion chamber as clearly shown in FIGURE 4 of the drawings. Unlike the structure shown in FIGURES 1 through 3 of the drawings, the unit shown in FIGURES 4 and 5 of the drawings is adapted to force a spray of cold water downwardly against the uprising flow of gases. The amount of water admitted from the main water line is regulated by the thermocouple 19' in a manner to be more fully described hereinafter.

The thermocouple 19' is set to be responsive to an ascertained minimum degree heat and once the furnace has been set into operation and the heat generated therein reaches the minimum degree heat, the thermocouple through its line connection with the solenoid valve 18' causes the same to admit water from an outside source to the conduit 13' and thence through sprinkler head 12' whereupon a fine mist or spray is directed outwardly therefrom and against the upwardly rising flue gases.

It will be apparent that the structure shown in FIGURES 4 and 5 of the drawings can easily be adapted for use with an existing furnace structure and the only modification necessary to adapt the same to such an existing installation is to support the thermocouple in the upper portion of the combustion chamber in any suitable manner and to extend a spray head inwardly of the smoke stack and to support the same therein by means of the conduit associated therewith extends through a suitable opening formed in the stack.

Thus it will be seen that I have herein provided a simple and efficient unit which can readily be installed in preexisting heating installation, incinerators, and the like, and the same employed for eliminating the discharge of soot and other undesirable constituents from a smoke stack thus contributing greatly to maintaining the atmosphere surrounding these installations free of such undesirables.

As can be appreciated, both modifications of the invention are adapted to be responsive to a thermocouple or like heat sensing element thus insuring the operation of the units only at such times as the furnace is in operation. In the alternative, the valve mechanism can be made to operate in conjunction with the conventional electrical equipment commonly employed to fire the furnace responsive to temperature means associated with the boiler or the like. For that matter, the operation of the units can be considered to be more or less automatic since the directing of either steam or water spray to the uprising flue gases is controlled by the heat sensing element and valve means associated therewith.

While I have herein shown and described what I consider the preferred manner of carrying out the invention, the same is merely illustrative, and I contemplate all changes and modifications which come within the scope of the claim appended hereto.

I claim:

1. In combination with a combustion apparatus, a flue for the passage of gases of combustion outwardly from said combustion apparatus, a spray head mounted in said flue and facing downwardly for directly spraying a fluid medium against the counterflow of the uprising combustion gases, a conduit for delivering said fluid medium to said spray head having a portion within the combustion apparatus and another portion extending from the combustion apparatus to the spray head upwardly into the flue, a valve in said conduit for regulating the amount of flow of said fluid medium to said spray head, and a heat sensing element mounted within said combustion apparatus in proximity and above that portion of the conduit within the combustion apparatus and being responsive to the heat generated therein for admitting said fluid medium to said spray head when a minimum degree is reached.

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JAMES W. WESTHAVER, Primary Examiner

U.S. Cl. X.R.

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