June 25, 1963 H. E. McCRAY ETAL 3,094,978

UNITARY AIR CLEANER AND FLAME ARRESTER

Filed Sept. 15, 1960 2 Sheets-Sheet 1

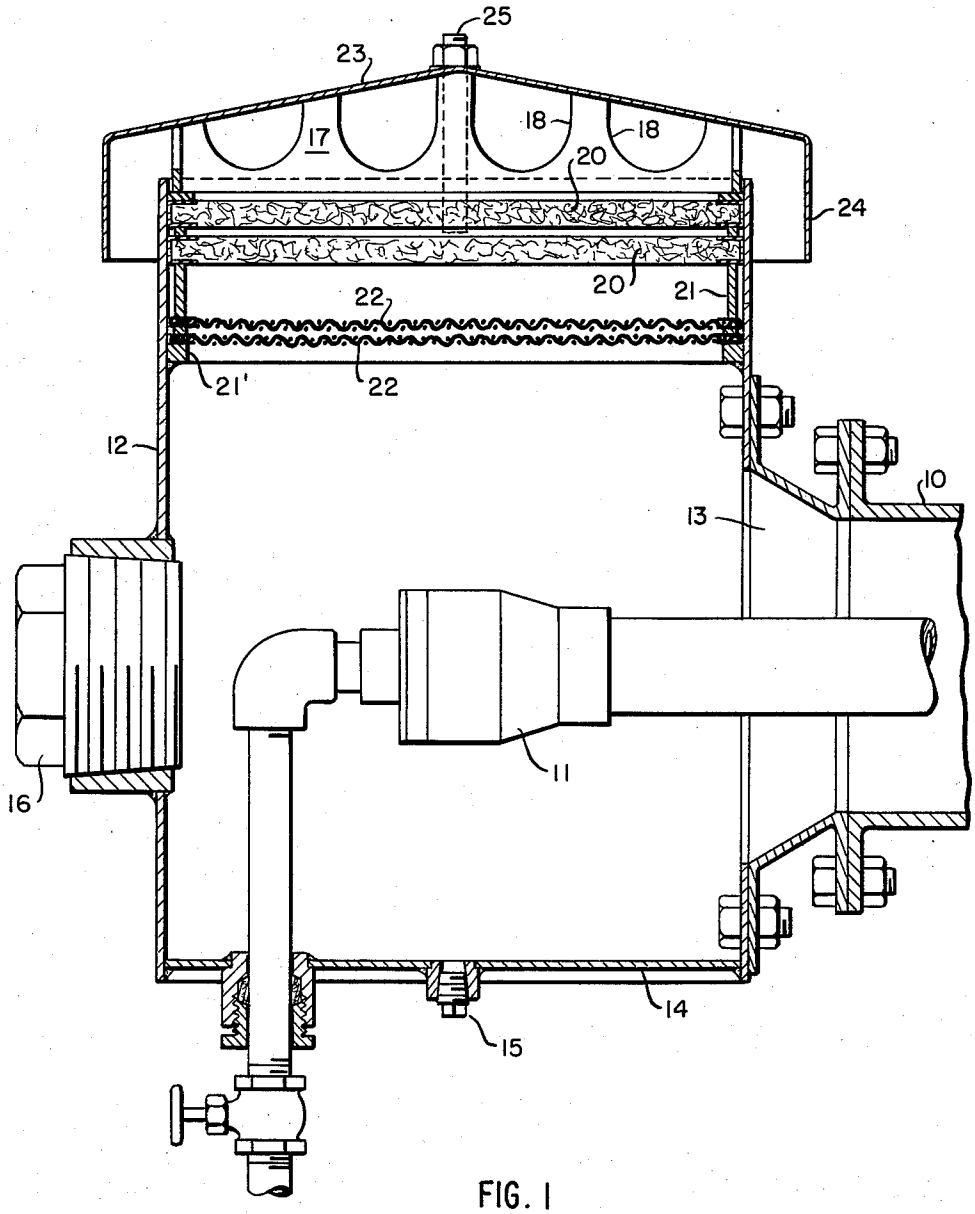


FIG. 1

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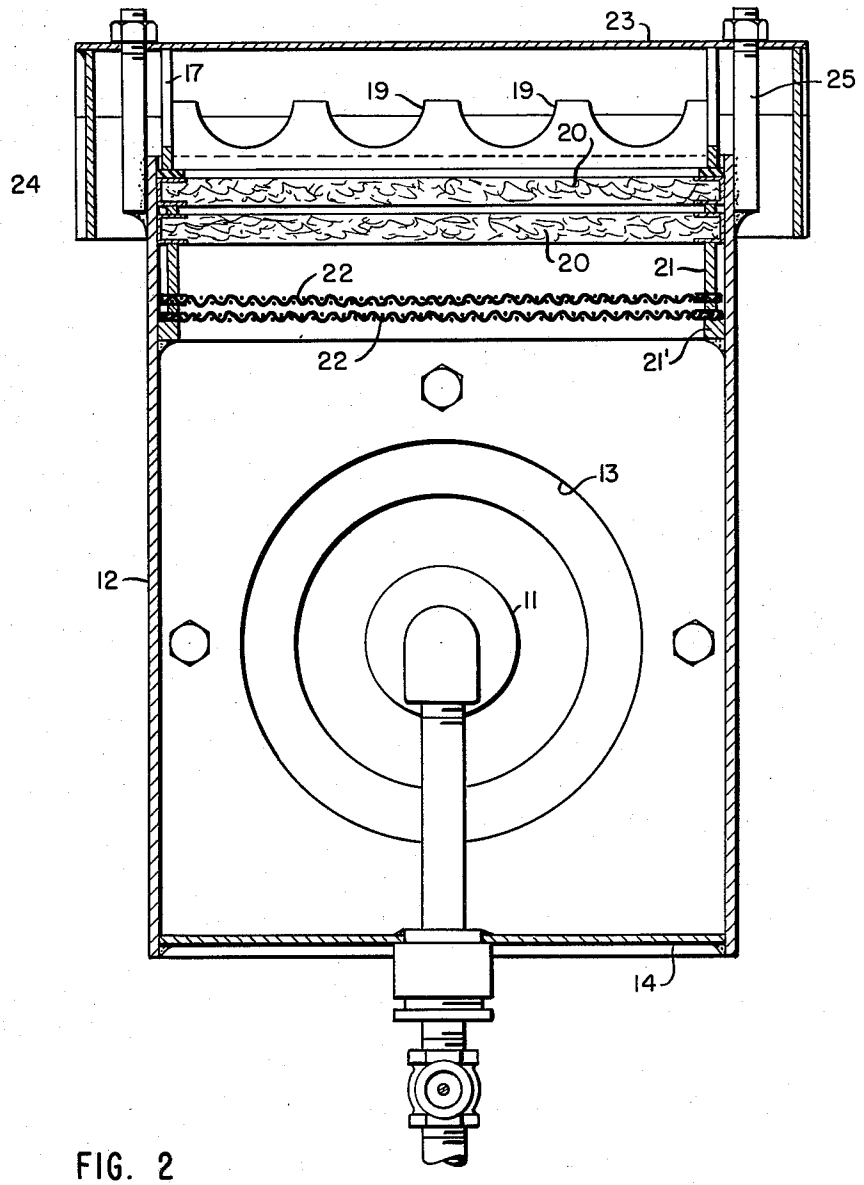


FIG. 2

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UNITARY AIR CLEANER AND FLAME ARRESTER

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1 Claim. (Cl. 126—85)

This invention comprises a unitary air cleaner and flame arrester for use in connection with heaters or furnaces employed in the oil and gas industry, particularly on pipe lines and meter houses where the heater must operate reliably without attention between long periods of inspection and without danger of either fire or of being blown out.

The device of our invention meets these exactly demands and successfully performs certain additional functions. In the first place, it controls and cleanses the air required for combustion. By reason of its construction, no direct blast of air is permitted to reach the burner. The path of the inlet air is made circuitous, and the air is divided in volume in reaching a tranquilizing zone from which it then passes, uniformly distributed, to the cleaning elements of the device. Under these conditions the cleaning elements operate with maximum efficiency. Dust, pollen and all other contaminants are removed from the admitted air which then flows peacefully on to the burner without turbulence.

In the second place, the device of our invention is organized to include one or more flame arresting elements in the shape of wire mesh screens spaced from and lying below the cleaning elements. There is always the possibility that leakage of petroleum and its more volatile fractions, or of natural gas, may form an ignitable or explosive mixture that will be touched off by a flash back from the burner. In the device of my invention, the danger of flash back is obviated without obstructing or restricting the non-turbulent flow of cleaned air to the burner.

The desired objectives are secured in accordance with the present invention in a unitary device comprising an upright casing having a side outlet to the furnace and an open top inlet protected by an effective rain shield. Within the upper end of the casing, and above the side outlet, air-cleaning pads and wire mesh flame arresters are sealed to the inner walls of the casing. Air flow passages are provided for dividing and distributing the incoming air so that it reaches the internal components of the casings in a uniform non-turbulent manner.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings in which:

FIG. 1 is a view of the unit in longitudinal section, and

FIG. 2 is a similar sectional view taken at right angles to that of FIG. 1.

The unitary air-cleaner and flame arrester herein shown is constructed and arranged to be attached to any oil or gas burning furnace of commercial construction as indicated by reference character **10** in FIG. 1 and shown as fired by a gas burner **11**. The unit comprises an upright casing **12** of sheet metal herein shown, but not necessarily, as being substantially square in cross section and as having a circular outlet opening **13** in one of its

side walls. The outlet opening is surrounded by an external throat or collar that is bolted to the furnace **10**.

The bottom **14** of the casing is provided with a drain plug **15** and a stuffing box for the fuel gas pipe which serves the burner. The side wall opposite the outlet opening **13** is provided with a threaded fitting for a large plug **16** that may be removed for purposes of lighting the burner, inspection or otherwise.

A square extension sleeve **17** of sheet metal is fitted within the casing **12** and extends upwardly above its upper or inlet end forming an unobstructed air tranquilizing chamber or zone. Two opposite top edges of the sleeve **17** are upwardly convex and each is provided with a row of spaced air apertures **18** of approximately semi-circular shape as shown in FIG. 1. The other two top edges are flat or straight and provided with spaced semi-circular air apertures **19** all opening traversely into the air tranquilizing chamber.

The air cleaning components of the unit comprise a pair of spaced pads **20** having a frame which is sealed to the inner surface of the casing **12** or the extension sleeve **17** and a filling of aluminum foil or ribbons. The number and spacing of these pads is of secondary importance and may be varied in accordance with local conditions encountered in practice.

The flame-arresting components of the unit as herein shown comprise a pair of wire mesh screens **22** sealed in the casing below the pads **20** between a spacer **21** and a peripheral shoulder **21'** that may be welded to the inner walls of the casing **12**. Here again, the number and spacing of the wire mesh screens is of only secondary importance, but their employment in cooperation with the pads **20** is an important and novel feature of the invention.

Surmounting the casing **12** is a dome-shaped rain shield or cover **23** which is pitched in opposite directions as seen in FIG. 1 to fit the convex edges of the sleeve **17**. The cover **23** has downwardly extending edge flanges or walls **24** that are spaced from the outer walls of the casing **12** so as to provide a peripheral air passage extending about all four sides of the casing and leading to the air apertures **18** and **19** in the upper edges of the sleeve **17**. The cover is detachably held in place by a pair of bolts **25** welded at their lower ends to the outer walls of the casing. By turning down the nuts of these bolts, the pads **20** and screens **22** may be clamped in place against the underlying shoulder **21'**.

In operation, the air required for combustion is drawn upwardly through the peripheral air passage, and inwardly through the apertures **18** and **19**, whence it spreads into the tranquilizing zone formed by the sleeve **17** between the cover **23** and the uppermost pad **20**. It then passes downwardly through the cleaning pads **20** and the wire mesh screens **22**, arriving in non-turbulent flow at the combustion zone of the furnace.

Having thus disclosed our invention and described in detail an illustrative embodiment thereof, we claim as new and desire to secure by Letters Patent:

A unitary air cleaner and flame arrester for use with heaters employed in the oil and gas industry, comprising an upright casing of rectangular cross section having an outlet adapted to lead to the heater in one side wall and an open top inlet, a rectangular sleeve having walls extending from within the casing upwardly above its open top, forming an open unobstructed tranquilizing chamber

and having a series of spaced air inlet apertures in its walls above said casing, a rectangular air-cleaning pad extending across the casing and serving as the bottom of the tranquilizing chamber, a wire mesh flame arrester of substantially the same area as the air-cleaning pad disposed in parallel relation thereto and sealed at its edges within the casing, and a dome surrounding the upper portion of the sleeve, with clearance thus providing an upwardly extending peripheral air passage leading to the air inlet apertures in said sleeve.

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