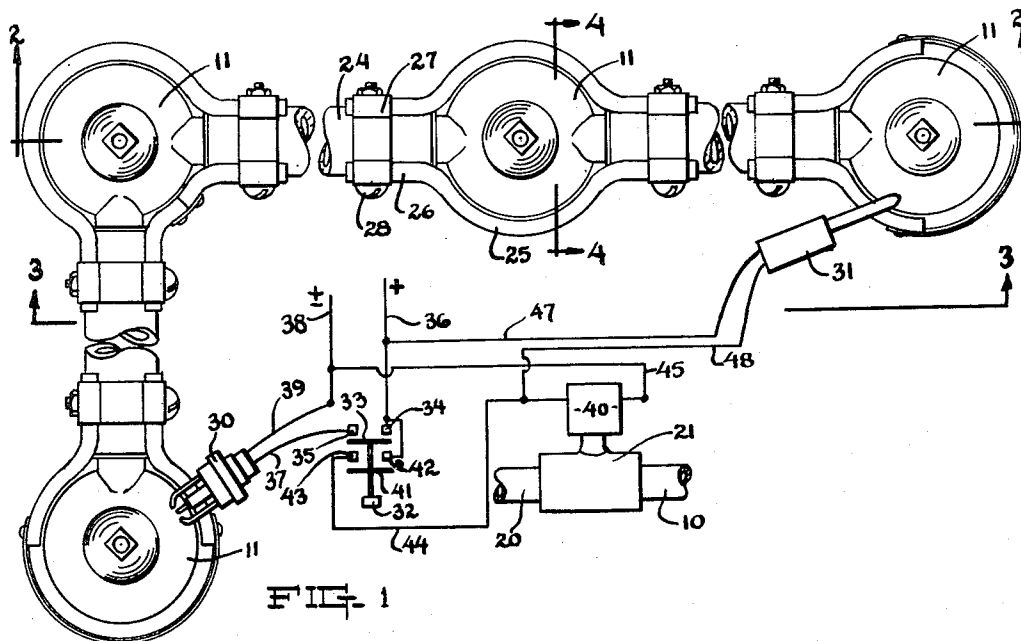
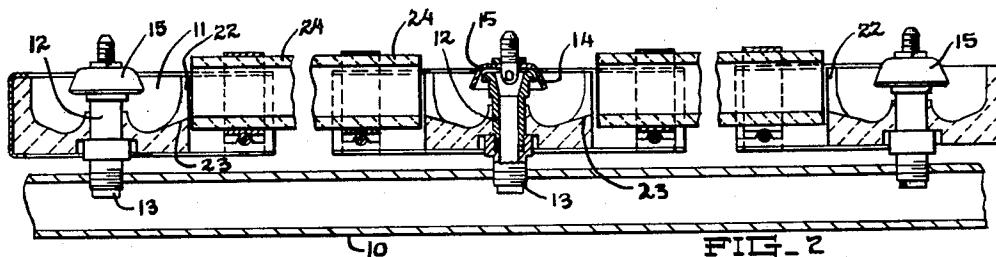
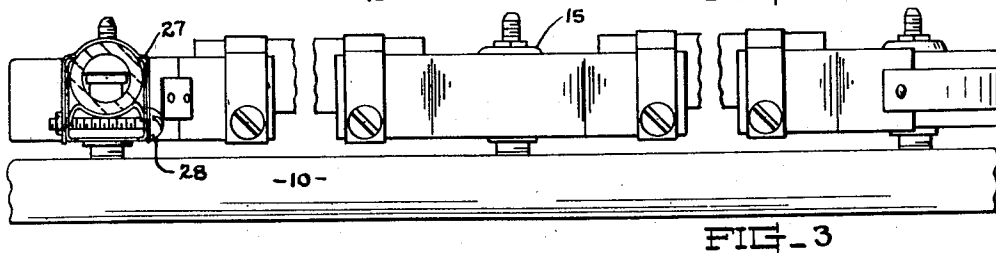
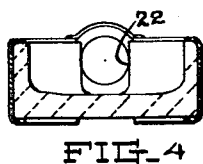


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INTERNALLY FIRED GAS BURNERS WITH INTERCONNECTING
FLASH TUBES AND SAFETY CUT OFF
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INTERNALLY FIRED GAS BURNER WITH
INTERCONNECTING FLASH TUBES AND
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This invention relates to combustion apparatus of the type employing a combustible gaseous fuel, such as a mixture of hydrocarbon gas and air, the apparatus consisting of a series of individual burners arranged in a combustion chamber. Often the combustion chamber is of considerable size extending several feet in length as, for example, in ovens for drying coatings applied to automobile bodies and the like. Such arrangements present a difficult situation in respect to lighting or igniting the burners. It is essential that all of the burners be quickly ignited, and if any of the burners fail to ignite, it is important that the supply of combustible be shut off. Otherwise, the unburned gas and air mixture accumulating in the combustion chamber will result in an explosion of considerable magnitude.

This invention has as an object a combustion apparatus wherein the individual burners are successively ignited, this ignition taking place rapidly and the apparatus includes means whereby, in the event any burner in the series fails to ignite, the supply of combustible will be shut off.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a top plan view of a combustion apparatus embodying my invention.

Figure 2 is a sectional view taken on line 2—2, Figure 1.

Figure 3 is a view taken on line 3—3, Figure 1.

Figure 4 is a sectional view taken on line 4—4, Figure 1.

This apparatus consists of a gas supply manifold 10 on which there is mounted a series of individual burners. These burners each consist of a cup shaped body formed of refractory material with an annular concave burning surface 11. The bodies are provided with a central aperture to receive a hollow stem 12 threaded into a shouldered sleeve 13 which, in turn, is threaded into the manifold 10. The upper end of the stems 12 is formed with a head portion 14 cooperable with an adjustable baffle 15 to direct the combustible mixture downwardly and across the curved or concave burner surface 11. These burners are of the type disclosed in the Burdett Patent No. 1,959,456. The manifold 10 is connected to a supply pipe 20 through a solenoid operated valve 21. This valve is normally closed and is opened during the time it is energized. The confronting side

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walls of the burner bodies are formed with openings 22.

In the burner structure illustrated, these openings are in the form of notches formed in the side walls of the bodies, with the bottom wall 23 of the openings arranged tangential to the bottom curvature of the concave surface 11, or forming a continuation thereof. An ignition tube 24, preferably formed of refractory material, is arranged intermediate the burners with the ends of the tubes arranged in registration with the openings 22. The tubes 24 have an internal diameter at least equal to the depth of the openings 22. The tubes are supported and maintained in place by a yoke formed of sheet metal members having a portion 25 encircling the burner body, and end portions 26 arranged on opposite sides of the tubes 24 and contracted against the tubes by clevis members 27 and bolts 28.

With this construction, the burners may be arranged at any convenient spacing along the supply manifold 10, and the tubes 24 cut to the desired length so that the ends of the tubes will be arranged in juxtaposition to the sides of the burner bodies. The arrangement for lighting the burners is shown diagrammatically in Figure 1 and includes an igniter 30 arranged in juxtaposition to a burner at one end of the series. A thermostat 31 is arranged in heat exchanging relation to the burner at the opposite end of the series. The igniter 30 is operable, when energized, to ignite combustible gas in the burner employing an electric spark for this purpose, as will be well understood. The igniter is energized by a manually operable switch 32 which, when actuated to the on position, completes a circuit from the supply line to the igniter. This is brought about by the movable contact 33 bridging contacts 34, 35, completing a circuit from the hot side 36 of the supply line to the igniter through wire 37. The igniter is connected to the common side 38 of the supply through wire 39.

Actuation of the switch 32 also effects energization of solenoid 40 associated with the supply valve 21. This is brought about by the movable contact 41 bridging the contacts 42, 43, connecting the hot side 36 of the line to the solenoid 40 through wire 44. The opposite side of the solenoid is connected to the common return 38 through wire 45. Accordingly, the valve 21 is open to supply the combustible gas fuel to the burners through the manifold 10 and simultaneously, the igniter 30 is energized, lighting the first burner of the series. As soon as the manifold 10 is connected to the supply pipe 20, gas

is supplied to all of the burners and is directed in both ends of each of the ignition tubes 24, whereupon these tubes are quickly filled with gas and the burners become successively ignited, as will be well understood. This ignition of all the burners takes place almost instantly, whereupon the switch 32 is released. The contacts of the thermostat 31 become closed as the last burner of the series is ignited and establish an operating circuit to the solenoid 40, the thermostat being connected to the supply 36, through wire 47, and to the solenoid through wire 48.

With this arrangement, if any of the burners in the series do not ignite, the remaining burners of the series will not ignite, and the contacts in the thermostat 31 will not close. Accordingly, upon release of the manually operable switch 32, the solenoid will be deenergized and the supply to all the burners will be shut off. The operator is thus informed of the existence of a defect in the combustion apparatus, and can proceed to remedy the trouble. This prevents a portion of the series of burners being operated and accordingly, the excess accumulation of unburned gas from the burners that have not been ignited.

I am aware of the fact that gaseous fuel burners have heretofore been ignited through the use of an ignition tube, or flash tube. However, in my apparatus, I arrange the burners in a series arrangement, whereby gas is supplied to the ignition tubes at both ends thereof. This, coupled with the fact that the tubes are of large diameter, results in the tubes being quickly and completely filled with gas, and in prompt ignition through the tubes from one burner to the next.

What I claim is:

1. A combustion apparatus comprising a gas supply manifold, a plurality of gas burners mounted in spaced relation on said manifold, each of said burners comprising an annular wall structure forming an upwardly concave combustion surface and a gas conducting passage communicating with said manifold and having an upwardly directed discharge outlet through the center of said combustion surface, a baffle arranged in juxtaposition to said discharge outlet and operable to direct gas outwardly from said outlet across said concave surface, the confronting sides of each of said annular wall structures being formed with an opening, the bottom portion of which is arranged tangential to the bottom of said concave surface, a tubular flame conducting member extending from one burner to the next, with the ends of the tubes arranged in register with said openings.

2. A combustion apparatus comprising a gas supply manifold, a series of gas burners mounted in spaced relation along said manifold, each of said burners including a cylindrical body having an annular wall structure forming an upwardly concave combustion burner surface, a gas conducting passage communicating with said manifold and having an upwardly directed discharge outlet through the center of said concave surface, a baffle member arranged in juxtaposition to said discharge outlet and being operable to direct gas outwardly from said outlet across said concave combustion surface, the confronting sides of each of said annular wall structures being formed with openings, a flame conducting

tube extending from one burner to the next, and means cooperable with said tubes to position the ends thereof in registration with said openings.

3. A combustion apparatus comprising a gas supply manifold, a series of gas burners mounted in spaced relation along the manifold, each of said burners including a body comprising an annular wall structure forming an upwardly concave combustion surface, a gas conducting passage arranged in the center of said surface and communicating with said manifold and having an upwardly directed discharge outlet through the center of said surface, a baffle carried by the body in juxtaposition to said passage and being cooperable to direct gas from said passage outwardly across said concave combustion surface, the confronting sides of each of said annular wall structures being formed with openings, the bottom wall of said openings being tangential to the curvature of the bottom of said concave burner surface, a flame conducting tube extending from one burner to the next, said flame conducting tubes being of a diameter at least equal to the depth of the concave burner surface, and means for detachably mounting said tubes and maintaining the ends thereof in registration with said openings.

4. A combustion apparatus comprising a gas supply manifold, a solenoid valve operable when energized to connect said manifold to a source of combustible gas, a series of gas burners mounted in spaced relation along said manifold, each of said burners including a body comprising an annular wall structure forming an upwardly concave combustion burner surface, and a gas conducting passage communicating with said manifold and having an upwardly directed discharge outlet through the center of said concave combustion surface, a baffle arranged in juxtaposition to said discharge outlet and cooperable to direct gas outwardly from said outlet across said concave surface, the confronting sides of each of said annular wall structures being formed with openings, a tubular flame conducting member extending from one burner to the next, with the ends of said tubes being arranged in register with said openings, igniter means arranged in proximity to a burner at one end of said series and being operable when energized to ignite the combustible gas in said burner, a thermostat arranged in proximity to the last burner at the opposite end of said series, a manually actuated switch means operable while actuated to closed position to energize said igniter and solenoid valve, and said thermostat including means to maintain energization of said valve upon ignition of the said last burner.

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