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FLAME PRODUCTION AND CONTROL

Filed March 15, 1941

Fig. 1

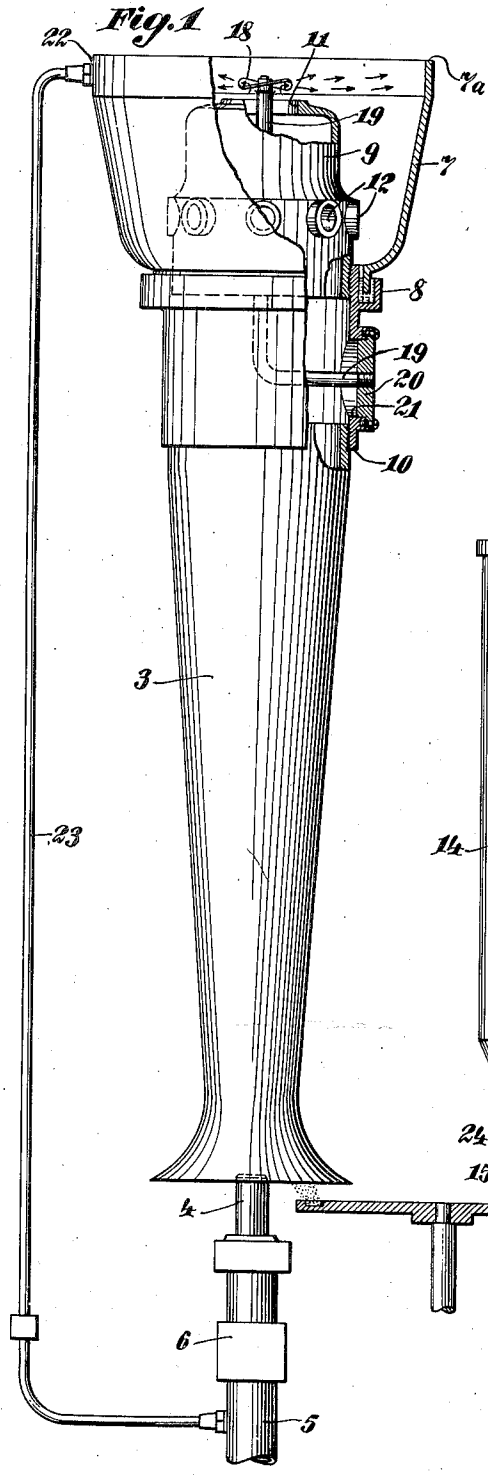
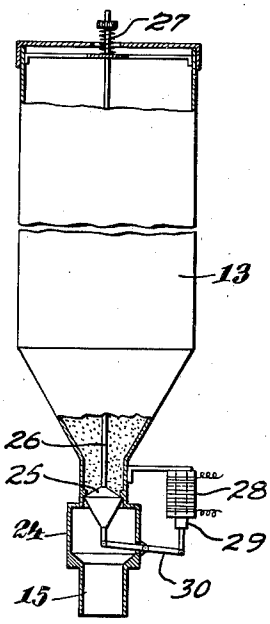


Fig. 2



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FLAME PRODUCTION AND CONTROL

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6 Claims. (Cl. 67—1)

The invention here disclosed relates to the creation and control of flames for producing color effects and for other purposes and is a partial continuation of patent application Ser. No. 258,817 filed February 27, 1939.

Special objects of the invention are to provide practical means for feeding color producing or other materials into a flame creating burner structure and for controlling the mechanism to gain the desired color effects and results.

Other desirable objects and the novel features by which the purposes of the invention are attained will appear or are set forth in the course of the following specification.

The drawing accompanying and forming part of the specification illustrates one practical commercial embodiment of the invention. Actual structure however may be modified and changed as regards this particular disclosure, all within the true intent of the invention as will be apparent from the following specification and broad scope of the claims.

Fig. 1 is a broken part sectional side elevation of one embodiment of the invention.

Fig. 2 is a broken detail view of one form of control valve for the powder feed mechanism.

The burner structure illustrated comprises a Venturi air-gas mixer 3, into the open end of which a nozzle 4, discharges, said nozzle heing connected with a high pressure gas line 5. This gas line is shown equipped with a remotely controlled motor operated valve 6, which may be of conventional design and details of which are not shown.

A flame collecting and spreading head 7, is shown set in a water seal trough 8, on the upper end of the venturi, said head being in the form of an inverted truncated conical bowl having a substantially cylindrical deflector and confining wall or flange 8, at the upper larger open end of the same.

The burner tip is shown as a hollow head 9, screwed into the upper end of the collar portion 10, of the water seal and having a central vertical port 11, in the upper end of the same and a number of side ports 12, discharging horizontally into the upwardly divergent walls of the spreader bowl.

The flame coloring or other material is supplied to the burner through the injector action of the air mixer.

In the illustration, flame coloring material in the form of powder is supplied from one or more hoppers 13, 14, etc., through a spout or spouts such as indicated at 15, into a groove or channel 16, in a rotating turntable 17, which carries the material into the range of suction at the mouth of the venturi.

Usually, it is sufficient for the purpose, to simply have the grooved rim of the turntable rotate under the flared entrance to the venturi, at one side of the gas nozzle, substantially as indicated in Fig. 1.

In this relation of the parts, the powdered material carried by the turntable is entrained with the air drawn into the mixer and then carried by the air-gas mixture into the combustion zone at the burner head.

A propeller 18, journalled on a support 19, over the central vertical burner port 11, homogenizes the mixture and spreads and throws the color producing material outward across the bowl and against the confining rim 8, which thus may serve more or less as a baffle.

The upwardly angled propeller supporting arm 19, is shown as carried by a cover plate 20, removably secured over a handhole opening 21, in the side of the collar 10 and the propeller is shown as of a size to pass freely downward through the central burner port and out through opening 21, thus to enable ready removal and replacement of this distributing structure.

Ignition of the primary flame is effected in the illustration by a pilot indicated at 22, in the rim of the flame collector and which may be of the remote control of the electrically ignited type supplied with gas through a line 23, from the main gas supply line 5.

For colored flame effects, the mixture usually may be adjusted to produce a Bunsen type flame, practically colorless and more or less invisible.

The main or primary flame is under immediate control of the motor actuated valve 6, which may be remotely controlled for starting, stopping or regulating the size of such flame. The flow of the air-gas mixture through the central burner port 11, keeps the distributing propeller 18, in rotation.

The turntable 17, may be rotated by hand or by motor and be continuously, intermittently or arbitrarily operated.

Similarly, the flame coloring chemicals may be supplied in any desired relation, amount or timing as by means of valves 24, in the delivery spouts 15, operated electrically, for instance, from some remote control point.

The structure of the feed control valves 24, may vary quite widely. Thus as shown in Fig. 2, they may consist each simply of a valve element 25, carried by a rod 26, acted on by spring 27, to

hold the valve closed upward against its seat, the opening of the valve being effected by an electro-magnet **28**, having a movable core **29**, connected with the valve by a lever **30**.

For producing a succession of colors, the materials required for different colors may be arranged in layers in a hopper as indicated at **31**, Fig. 1. By using hoppers of different color producing materials and control valves for each, the materials may be selected in any order to produce any color effects desired.

As the gas flame supplies the necessary heat for volatilization of the metallic salts, it is not necessary or desirable to include with the solid color materials any fuel elements, oxidizing agents or stabilizers, such as required for color production with the solids used in firework displays. The invention contemplates use of any free flowing, preferably crystalline metallic salt or various mixtures of such salts.

For reasons, of economy, it is usually desirable to dilute these metallic salts with some free flowing combustible material, which in addition to reducing total cost, gives increased bulk, aiding in better distribution By way of example, the pure metallic salts may be diluted with small wood chips, spent coffee grounds, shredded corn or other dust free light weight combustible substance.

With dry sodium chloride, a bright yellow flame can be created Yellowish green colors can be obtained with dry granulated copper sulphate. Deep red is obtainable with stronium carbonate applied as a coating to balsa wood chips. Shredded corn or coffee grounds treated with lithium fluoride will produce bright crimson.

Sawdust may be used as the bulk material saturated with chemicals to give the desired color effects. In such cases, it is preferable to treat the material with a water-proofing medium, such as ordinary dewaxed or wax free alcoholic solution of shellac. This water-proofing prevents materials which may be hygroscopic from absorbing moisture, which would make the powder sticky and possibly impractical to use in the manner disclosed.

While the turntable forms illustrated provide a desirable form of conveyor for transferring flame coloring materials from a point of storage to a point within the suction zone of the air mixer, it is contemplated that other forms of conveyors may be provided, such as those of the endless belt type, or ribbons carrying pellets or particles of the color producing materials and the like.

While disclosed particularly for colored flame production, it will be appreciated that the invention may be applied to other purposes, for example, calcining or dehydrating chemicals which may be introduced in the powdered form in the same manner as the flame coloring materials. The groove or trough in the turntable may be continuous or discontinuous, in the latter event, it being in the nature of a series of separate receptacles for the material to be injected. The size of the turntable may vary to suit different circumstances and so may be quite large to carry a considerable amount of material, or be relatively small. If desired, the turntable may be enclosed more or less, particularly to prevent escape of light powders.

What is claimed is:

1. Apparatus of the character disclosed, comprising a gas-air mixer of the injector type, a conveyor having a range of travel from a point removed from the field of suction into the field of suction at the inlet end of said gas-air mixer and means for supplying material of a character adapted to be removed by the injector suction, to said conveyor at a point removed from the influence of suction of said gas-air mixer.

2. Apparatus of the character disclosed, comprising a gas-air mixer of the injector type, a conveyor having a range of travel from a point removed from the field of suction into the field of suction at the inlet end of said gas-air mixer and one or more supply reservoirs having valved discharges controllable to deposit material on said conveyor at a point removed from the field of suction.

3. In apparatus of the character disclosed, an upright gas-air mixer of the injector type, a substantially horizontally disposed turntable mounted to rotate into the range of suction created by said mixer and means for depositing materials to be combined with the gas-air mixer onto said turntable.

4. In apparatus of the character disclosed, an upright gas-air mixer of the injector type, a substantially horizontally disposed turntable mounted to rotate into the range of suction created by said mixer, means for depositing materials to be combined with the gas-air mixer onto said turntable and including one or more material holding hoppers located above and positioned to discharge onto said turntable.

5. In apparatus of the character disclosed, an upright gas-air mixer of the injector type, a substantially horizontally disposed turntable mounted to rotate into the range of suction created by said mixer, means for depositing materials to be combined with the gas-air mixer onto said turntable, said turntable having a material receiving and confining groove.

6. In apparatus of the character disclosed, the combination of an upright Venturi tube, a gas nozzle discharging into the lower end of the same, a burner head at the upper end of the same having central and side discharge ports, a flame confining bowl about said burner head, means for supplying dry powder material to the lower end of the Venturi tube and a rotary distributor at the central burner port.

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