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ELECTRIC IGNITER

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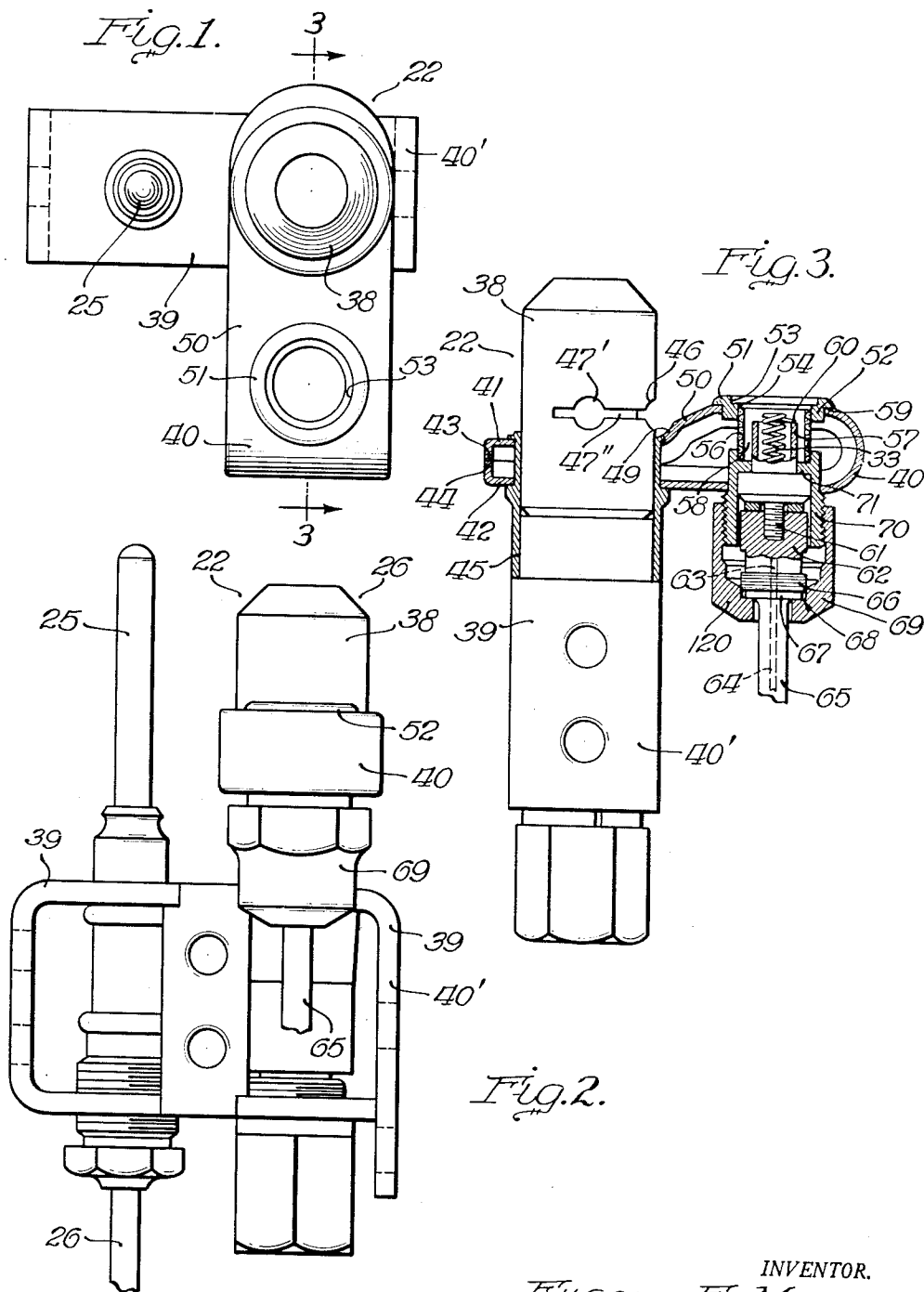


Fig. 2.

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2,751,973

ELECTRIC IGNITER

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11 Claims. (Cl. 158—115)

This invention relates, in general, to ignition devices, and has particular relation to an improved electric igniter for gaseous fuel burners.

While the present igniter is particularly well suited and is shown and described herein in connection with a burner control system employing thermoelectric safety shut-off means for shutting off the supply of fuel, for example, to both a main burner and a pilot burner when the pilot burner flame is extinguished, it is to be understood that the invention in its broader aspects is not limited to this particular type of system but may be employed in other types of systems as suitable or desired.

Efforts have been made for many years to provide for electric ignition of ignitable gases by means, for example, of an electrically heated incandescent wire or like ignition element brought to the ignition temperature of the gaseous fuel. Difficulties have, however, been encountered in these prior efforts due to variations in pressure of the gaseous fuel and to varying B. t. u. values of the fuel; also due to fluctuations or variations in the line voltage of commercial current and the resulting changes in the current supplied to the ignition device.

It has been found, for example, that it is practically impossible to ignite natural gas, with the pressure variations to which it is subject, by means of an ignition element and a separate flash gas tube, as previously attempted, without having the flow of gas either cool the ignition element so that it will not ignite the gaseous fuel or result in burning up or deleteriously affecting the ignition element after ignition of the gaseous fuel with the current still on.

One of the main objects of the present invention is to provide an improved electric igniter in which the problems previously presented are overcome.

Another object of the invention is to provide an improved electric igniter which will ignite the gaseous fuel—for example, the gaseous fuel which issues from a pilot burner—under wide variations of pressure and B. t. u. values of the gaseous fuel.

Another object of the invention is to provide an electric igniter which will operate effectively to ignite all of the commonly used gaseous fuels, such as manufactured gas, natural gas, and methane and propane gases having various B. t. u. values.

Another object of the invention is to provide an improved form of electric igniter wherein a replaceable glow plug may be used, which plug is compact and readily accessible.

Another object of the invention is to provide an igniter with the advantageous characteristics set forth for igniting a pilot burner arranged to ignite a main burner and to heat a thermoelectric generator for controlling, for example, a safety shut-off device.

Another object of the invention is to provide an improved electric igniter of the character set forth, which eliminates the need for a gas valve, burner tip, gas line and installation, such as required where flash gas is used for ignition.

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Another object of the invention is to provide an electric igniter having various features of novelty and advantages, and which is characterized by its simplicity in construction, its economy in manufacture, and its compactness and effectiveness in use with the new and beneficial results which will hereinafter appear.

Further objects and advantages of the invention will appear from the following detailed description taken in connection with the accompanying drawings which show the construction and operation of an illustrative embodiment of the invention.

In the drawings:

Figure 1 is a plan view of the pilot burner, thermoelectric generator and igniter assembly;

Figure 2 is a front elevational view of the pilot burner, thermoelectric generator and igniter assembly shown in Figure 1; and

Figure 3 is a sectional view through the igniter assembly taken in a vertical plane on the line 3—3 of Figure 1.

Referring to Figures 1 to 3, a pilot burner 22 is provided with means (not shown) for supplying fuel thereto. To cause ignition of the pilot burner 22 when flow of gas is established thereto, an electric igniter is provided. This igniter comprises, in general, a glow coil 33 in the form of a coiled wire or other suitable ignition element. Low voltage electric energy for energizing the ignition element 33 may be supplied by a step-down or current limiting transformer (not shown).

As shown in detail in Figures 1, 2 and 3, the pilot burner body 38, which is of generally tubular form, is mounted in a bracket 39 provided with a flange 40' by means of which the bracket may be bolted or otherwise secured to the main burner 12 or other support in suitable position relative to the main burner. The bracket 39 also supports the thermoelectric generator 25, which, while shown in the form of a coaxial element thermocouple, in general, of the type shown and described in Oscar J. Leins Patent No. 2,126,564, issued August 9, 1938, may be in the form of a thermopile or other thermoelectric generator. The construction and mounting of the thermocouple and pilot burner in the bracket 39 may be of the form shown and described in the copending application of Charles E. Hajny, Serial No. 39,339, filed July 1, 1948, which has been assigned to the assignee of the present invention, and is now abandoned, or of other suitable form.

The igniter structure mounting the coil or igniter element 33 is carried in a hairpin formed type supporting stamping 40 which is folded upon itself in a manner best shown in Figure 4. The support 40 comprises a pair of return bent legs 41 and 42 which may, if desired, abut at their ends 43 and 44. The ends 43 and 44 may be held together by a sleeve 45 slipped telescopically over the pilot burner body 38 into the position shown in Figure 3. In this position the lower end of the sleeve 45 may abut the support bracket 39. With this construction the igniter mechanism may be positioned suitably adjacent to a pilot burner port 46 in the body of the pilot burner which has a port 47 for directing an igniter flame in igniting relation to the main burner 12, and a port 47' for directing a flame for heating the hot junction of thermocouple 25. Ports 46, 47, and 47' are shown connected by slit 47''.

The upper leg 41 of the support 40 is carefully formed and contoured to provide an initial dispersal surface 49 for deflecting and diffusing the gas-air mixture as it issues from the port 46 over an inclined surface 50. In practice it has been found that excellent results are obtained where the surface 50 is at an angle of approximately 22° away from the horizontal where the device is mounted in the position shown in the drawings. It is understood,

of course, that the device may be mounted in other positions and that the surface 50 may be at other angles as long as the desired results are obtained.

If the surface 50 were not inclined about as shown and described, low pressure, low density gases would move away from the surface rapidly. However, where the gases are of higher pressure, higher density, the necessity for as sharp an angle of the surface 50 is not so essential. Hence the angularity of the surface 50 may vary within the scope of the present invention. It is important that the dispersal surface 49 and angularity of the surface 50 be retained to insure that low pressure, low velocity, and low density gases will be constrained to traverse the inclined surface 50, and that high pressure, high velocity gases will be diffused with air by impingement on the surface 49 so as to set up by a Bernoulli effect a somewhat similar traversal of gases over the inclined surface 50.

After the gas has traversed and diffused over the surface 50, it encounters a lip 51 which is formed, for example, as a part of a sleeve 52. The sleeve 52 has a shoulder 53 formed, for example, by a counterbore or hole in the sleeve 52. For more satisfactory use over a wide range of pressures and electric energy, a pair of relatively sharp shoulders 53 and 54 are preferably provided. The second relatively sharp annular shoulder 54 may be formed by a bore or opening in the sleeve 52, and, as already stated, the first relatively sharp annular shoulder 53 may be formed by a counterbore or opening.

As the gas which issues from port 46 flows over the lip 51, a gentle turbulence occurs at the crater or depression formed by the shoulders 53 and 54, and due to the relatively sharp break in the surface an intimate gas-air mixture is obtained at this point at a very low mixture velocity. Complete and thorough mixtures of gas and air at the crater or depression as thus obtained are ignited more readily by the resistance element 33. This element is formed of platinum wire as contemplated within the scope of the present invention. Thus, within the interior of the sleeve 52, a quiescent zone of gas-air mixture is created even though the velocity of the gas at the port 46 may vary within very wide limits such as those produced in the neighborhood of one inch of water pressure, for example, and those produced by approximately 15 inches of water pressure. The contour of the surfaces 49 and 50, as well as lip 51 and shoulders 53 and 54, each contribute in part to providing the relatively quiescent, thoroughly mixed gas-air mixture within the depression in the sleeve 52, and to maintaining a relatively similar or stable condition of the gas-air mixture at the ignition zone notwithstanding relatively wide variations in the pressure of the gaseous fuel.

The sleeve 52 has a shoulder 59 which rests upon leg 40 adjacent to the opening therein into which sleeve 52 is pressed. The sleeve 52 also carries a sleeve 56 shown in the form of a tubular screen which affords the aforementioned depression in the sleeve 52 an air inlet opening offset from the mouth of said depression defined by the shoulder 53. Within the sleeve 56 and separated slightly therefrom to provide an annular space 58 therebetween is an internal sleeve 57. The sleeve 57 carries and thus mounts the ignition element 33 which is preferably in the form of a coil of platinum wire having from about 1½ to 2½ turns extending above the outer or uppermost end of the sleeve 57. Other forms of ignition element are contemplated within the scope of the broader aspects of the present invention.

The annular space 58 between the outer sleeve 56 and inner sleeve 57 provides a chimney effect as ignition occurs in the gas-air mixture. This causes a pulling away, to a predetermined extent, of the flame from the ignition element 33 to thus prevent its burning out upon the occurrence of ignition and the presence of the flame at the top of the coil or ignition element. Once ignition occurs even at high gas pressures, the flame pulls away from the coil 33 and burns outwardly and upwardly from the port

46 as the device is viewed in the drawings. This substantially reduces the tendency of coil burn-out, particularly where there are high ambient temperatures adjacent to the coil 33. The sleeve arrangement also supplies hot secondary air when the coil 33 is energized, which in turn produces a lean, hot gas mixture in the ignition zone adjacent to the ignition element 33. This lean, hot gas mixture is ignited with less heat and time; in fact, the hot secondary air may, of itself, ignite some, or all, gas-air mixtures.

The coil 33 has one end 60 secured to the upper part of the sleeve 57, and the internal end of the coil is insulated from the sleeve 57 and electrically and mechanically connected to a screw stem 61. This entire structure, including the sleeve 57, coil 33, and the insulated stem, may be of conventional type, and provides a replaceable unit which is compact and readily accessible. An internal connector nut 62 has screw connection with the screw stem 61, and, internally, is connected to one of the lead conductors leading from a source of electrical energy (not shown) to the igniter, for example, at 63 to the internal lead wire 64 within the outer tubular conductor 65 of a coaxial conductor. An insulating washer 66 spaces and insulates the connector nut 62 from the outer tubular conductor 65 which is flanged at 67 to abut a shoulder 68 in a compression nut 69 which screws to a connector sleeve 70 secured to the bottom leg 42 of the support 40 and in electrical connection at 71 to a shoulder which contacts sleeve 57 to complete the electric circuit through the coil 33.

The embodiments of the invention shown in the drawings are for illustrative purposes only, and it is to be expressly understood that said drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. In a gas burner igniter, a burner comprising a burner body having an outlet port opening from the side thereof for discharging gaseous fuel laterally from said burner body, means defining an upwardly opening depression spaced laterally from said burner body, a member providing a surface leading from said port to the top of said depression over which the gaseous fuel flows from said port to said depression, a first deflector at the end of said surface toward said port and effective to reduce the velocity of said gaseous fuel and to cause same to hug said surface in its movement to said depression, a second deflector at the end of said surface toward said depression and effective further to reduce the velocity of said gaseous fuel in its movement to said depression, said surface extending at an upward inclination from said first deflector to said second deflector, said depression defining means having a relatively sharp shoulder affording a sharp drop-off of the gaseous fuel from said surface beyond said second deflector into said depression and a ledge deflector within said depression and below said drop-off, electric ignition means within said depression with its upper end below the top of said depression, an inner sleeve surrounding said ignition means, and an outer sleeve for admission of air disposed in surrounding spaced relation to said inner sleeve and providing a downward extension of said depression.

2. In a gas burner igniter, a burner comprising a burner body having an outlet port opening from the side thereof for discharging gaseous fuel laterally from said burner body, means defining an upwardly opening depression spaced laterally from said burner body, a member providing a surface leading from said port to the top of said depression over which the gaseous fuel flows from said port to said depression, a first deflector at the end of said surface toward said port and effective to reduce the velocity of said gaseous fuel and to cause same to hug said surface in its movement to said depression, a second deflector at the end of said surface toward said depression and effective further to reduce the velocity

of said gaseous fuel in its movement to said depression, said depression defining means having a relatively sharp shoulder affording a sharp drop-off of the gaseous fuel from said surface beyond said second deflector into said depression and a ledge deflector within said depression and below said drop-off, electric ignition means within said depression with its upper end below the top of said depression, an inner sleeve surrounding said ignition means and an outer sleeve for admission of air disposed in surrounding spaced relation to said inner sleeve and providing a downward extension of said depression.

3. In a gas burner igniter, a burner comprising a burner body having an outlet port opening from the side thereof for discharging gaseous fuel laterally from said burner body, means defining an upwardly opening depression spaced laterally from said burner body, a member providing a surface leading from said port to the top of said depression over which the gaseous fuel flows from said port to said depression, a first deflector at the end of said surface toward said port and effective to reduce the velocity of said gaseous fuel and to cause same to hug said surface in its movement to said depression, a second deflector at the end of said surface toward said depression and effective further to reduce the velocity of said gaseous fuel in its movement to said depression, said depression defining means having a relatively sharp shoulder affording a sharp drop-off of the gaseous fuel from said surface beyond said second deflector into said depression and a ledge deflector within said depression and below said drop-off, and electric ignition means within said depression with its upper end below the top of said depression.

4. In a gas burner igniter, a burner comprising a burner body having an outlet port opening from the side thereof for discharging gaseous fuel laterally from said burner body, means defining an upwardly opening depression spaced laterally from said burner body, a member providing a surface leading from said port to the top of said depression over which the gaseous fuel flows from said port to said depression, a first deflector at the end of said surface toward said port and effective to reduce the velocity of said gaseous fuel and to cause same to hug said surface in its movement to said depression, a second deflector at the end of said surface toward said depression and effective further to reduce the velocity of said gaseous fuel in its movement to said depression, said depression defining means having a relatively sharp shoulder affording a sharp drop-off of the gaseous fuel from said surface beyond said second deflector into said depression, and electric ignition means within said depression with its upper end below the top of said depression.

5. In a gas burner igniter, a burner comprising a burner body having an outlet port opening from the side thereof for discharging gaseous fuel laterally from said burner body, a generally hairpin shaped support having upper and lower legs attached to said burner body below said port and a looped portion extending laterally from said burner body, a ring-shaped member carried by said upper leg and defining an upwardly opening depression spaced laterally from said burner body, said upper leg providing a surface leading from said port to the top of said depression over which the gaseous fuel flows from said port to said depression, a first deflector at the end of said surface toward said port and effective to reduce the velocity of said gaseous fuel and to cause same to hug said surface in its movement to said depression, a second deflector at the end of said surface toward said depression and effective further to reduce the velocity of said gaseous fuel in its movement to said depression, said surface extending at an upward inclination from said first deflector to said second deflector, said ring-shaped member having a relatively sharp shoulder affording a sharp drop-off of the gaseous fuel from said surface beyond said second deflector into said depression and a ledge deflector within said depression and below said

drop-off, electric ignition means within said depression with its upper end below the top of said depression, an inner sleeve carried by said second leg and surrounding said ignition means, and an outer sleeve carried by said ring-shaped member in surrounding spaced relation to said inner sleeve for admission of air and providing a downward extension of said depression.

6. In combination with a gaseous fuel burner having a burner body provided with an outlet port for discharging gaseous fuel therefrom, means defining a depression spaced from said burner in the direction of discharge of said fuel, said depression having a mouth opening in a direction substantially normal to the direction of said fuel discharge, a member providing a surface leading from adjacent said port to adjacent the margin of said depression mouth and positioned in the path of at least a portion of the discharged gas and inclined with respect to the direction of said gas discharge to deflect said discharged gas in the direction toward which said depression opens and cause the gaseous fuel to flow along said surface toward said depression, a deflector at the end of said surface adjacent said depression positioned to further deflect a substantial portion of the discharged gas away from the depression mouth and affording eddies of said discharged gas flowing into said depression, and electric ignition means within said depression for igniting said gas within said depression.

7. In combination was a gaseous fuel burner having a burner body provided with an outlet port for discharging gaseous fuel therefrom, means defining a depression spaced from said burner in the direction of discharge of said fuel, said depression having a mouth opening in a direction substantially normal to the direction of said fuel discharge, a member providing a surface leading from adjacent said port to adjacent the margin of said depression mouth and positioned in the path of at least a portion of the discharged gas and inclined with respect to the direction of said gas discharge to deflect said discharged gas in the direction toward which said depression opens and cause the gaseous fuel to flow along said surface toward said depression, said means defining said depression also affording at least one air inlet opening into said depression offset from said depression mouth, and electric ignition means within said depression for igniting said fuel within said depression.

8. In combination with a gaseous fuel burner having a burner body provided with an outlet port for discharging gaseous fuel therefrom, means defining a depression spaced from said burner in the direction of discharge of said fuel, said depression having a mouth opening in a direction substantially normal to the direction of said fuel discharge, a member providing a surface leading from adjacent said port to adjacent the margin of said depression mouth and positioned in the path of at least a portion of the discharged gas and inclined with respect to the direction of said gas discharge to deflect said discharged gas in the direction toward which said depression opens and cause the gaseous fuel to flow along said surface toward said depression, a deflector at the end of said surface adjacent said depression positioned to further deflect a substantial portion of the discharged gas away from the depression mouth, said means defining said depression having a relatively sharp shoulder at the margin of said depression mouth, said deflector and shoulder affording eddies of the discharged gas flowing into said depression, and electric ignition means within said depression for igniting said fuel within said depression.

9. In combination with a gaseous fuel burner having a burner body provided with an outlet port for discharging gaseous fuel therefrom, means defining a depression spaced from said burner in the direction of discharge of said fuel, said depression having a mouth opening in a direction substantially normal to the direction of said fuel discharge, a member providing a surface leading from adjacent said port to adjacent the margin of

said depression mouth and positioned in the path of at least a portion of the discharged gas and inclined with respect to the direction of said gas discharge to deflect said discharged gas in the direction toward which said depression opens and cause the gaseous fuel to flow along said surface toward said depression, a deflector at the end of said surface adjacent said depression positioned to further deflect a substantial portion of the discharged gas away from the depression mouth, said means defining said depression having a relatively sharp shoulder at the margin of said depression mouth, said deflector and shoulder affording eddies of the discharged gas flowing into said depression, said means defining the depression also affording at least one air inlet opening into said depression offset from said depression mouth, and electric ignition means within said depression for igniting said fuel within said depression.

10. In combination with a gaseous fuel burner having a burner body provided with an outlet port opening from a side thereof for discharging gaseous fuel laterally from said burner body, means defining a depression spaced laterally from said burner in the direction of discharge of said fuel, said depression having a mouth opening upwardly in a direction substantially normal to the direction of said fuel discharge, a member providing a surface leading from adjacent said port to adjacent the margin of said depression mouth and positioned in the path of at least a portion of the discharged gas and upwardly inclined to deflect said discharged gas upwardly and cause the gas to flow along said surface toward said depression, a deflector at the upper end of said surface adjacent said depression positioned to further deflect a substantial portion of the discharged gas away from the depression mouth and affording eddies of the discharged gas flowing into said depression, and electric ignition means within said depression for igniting said gas within said depression.

11. In combination with a gaseous fuel burner having a burner body provided with an outlet port opening from a side thereof for discharging gaseous fuel laterally from said burner body, means defining a depression spaced laterally from said burner in the direction of discharge of said fuel, said depression having a mouth opening upwardly in a direction substantially normal to the direction of said fuel discharge, a member providing a surface leading from adjacent said port to adjacent the margin of said depression mouth and positioned in the path of at least a portion of the discharged gas and upwardly inclined to deflect said discharged gas upwardly and cause the gas to flow along said surface toward said depression, said means defining said depression affording at least one air inlet opening into said depression offset from said depression mouth, and electric ignition means within said depression and below the top thereof for igniting said gas within said depression.

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