

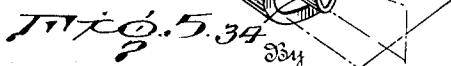
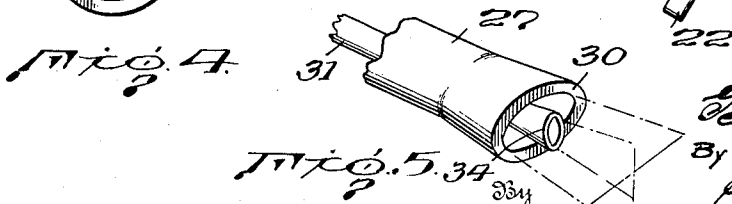
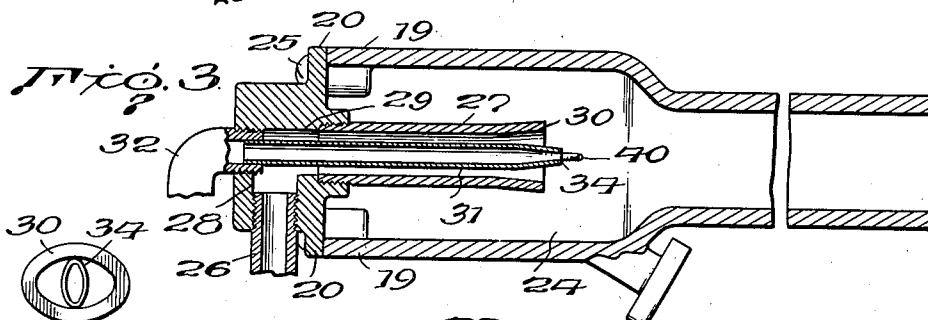
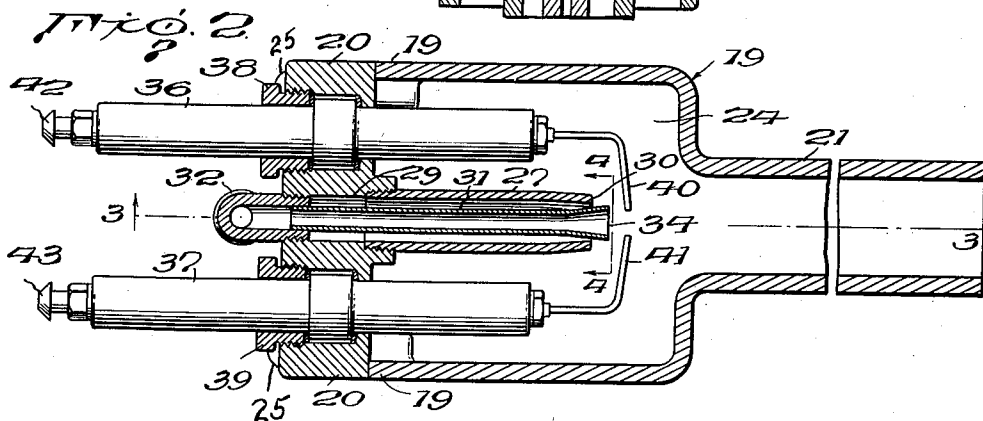
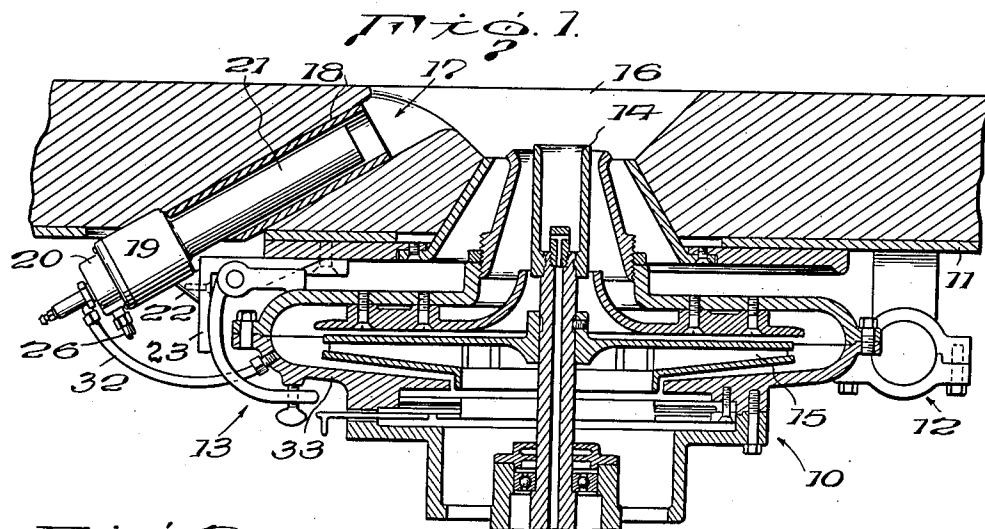
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IGNITION APPARATUS

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IGNITION APPARATUS

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9 Claims. (Cl. 158—28)

This invention relates to ignition apparatus for liquid, gaseous, or powdered fuel pressure burners, and more particularly to a gas-electric torch-type igniter especially suitable for horizontal rotary oil burners. Although the embodiment of the invention described herein is illustrated in connection with a particular form of oil burner, it is to be understood that the ignition apparatus is readily adaptable to cooperate with any form of pressure burner in any type of furnace construction.

It is an object of this invention to provide an igniter which is designed to direct a hot ignition flame against an atomized oil and air, or other combustible, mixture as the mixture is projected from burner apparatus into the combustion chamber of a furnace.

It is the further object of this invention to provide a torch-type igniter which is completely closed to the outside atmosphere, thereby preventing all possibility of a flare or puff-back through the igniter from the furnace combustion chamber to the outside of the furnace.

Another object of this invention is to provide an economical igniter of the gas-electric type for intermittent operation on manufactured, natural, bottled or any other gas supply, and which requires no continuously burning pilot light.

It is a further object of this invention to provide a torch-type igniter apparatus which will be continually purged by a current of fresh air during the operation of the main burner to prevent fouling and/or overheating of the igniter parts by the combustion gases prevailing in the furnace chamber.

It is a further object of the invention to provide an igniter construction which may be easily disassembled for inspection and adjustment, and which has a minimum number of parts and is economical to manufacture and install.

Still another object is to provide a gas-electric type of igniter which is of such construction as to be particularly efficient in igniting the igniter charge.

A still further object is to provide a gas-electric type of igniter with novel and efficient means for mixing air and gas to be ignited.

Another object is to provide a gas-electric type of igniter of such construction that the igniter electrode points are both cooled and shielded from the igniter flame by a jet of air.

Other objects and advantages of this invention will be apparent from the following description

of the embodiment of the invention illustrated in the accompanying drawing, in which:

Figure 1 is a top plan view, partly in horizontal cross-section, showing one method of installing an ignition apparatus embodying the present invention, the ignition apparatus being illustrated as installed in the front wall of a furnace; and adjacent a horizontal type rotary oil burner;

Figure 2 is a vertical section view of the igniter apparatus of Figure 1;

Figure 3 is a cross-sectional view taken on line 3—3 of Figure 2;

Figures 4 and 5 are end and perspective views respectively of the air and gas nozzle structure of Figures 2 and 3. Figure 4 is also a view taken on line 4—4 of Figure 2.

Referring to Figure 1 of the drawing, a horizontal rotary oil burner is indicated generally by the numeral 10. The burner is usually pivotally mounted on the front wall 11 of a furnace in a conventional manner by hinge 12 and clamp 13. The burner 10 is provided with a rotary oil cup 14 and a centrifugal fan 15 for projecting a combustible mixture of atomized oil and air into the entrance 16 of a furnace combustion chamber. The ignition apparatus is mounted partly within a passage 17 through or in the furnace wall 11, and a lining 18 may be provided for the walls of passage 17. The ignition apparatus comprises a housing 19 having a removable closure or end plate 20 out side of the furnace wall and adjacent the oil burner 10 and may include a tubular portion 21 extending into the passage 17. The housing 19 is conveniently supported by a bracket 22 secured to an angle plate 23 on the front wall of the furnace.

The ignition housing 19, shown in section in Figures 2 and 3, is provided with a tubular or nozzle-like portion 21 to be directed toward the entrance to the combustion chamber of the furnace. An appropriate relationship of ignition apparatus and burner is illustrated in Figure 1. The tubular portion 21 may extend into or to the combustion chamber, or it may terminate short of the combustion chamber entrance at any point in passage 17. Obviously, the nozzle portion 21, as well as the passage 17, may be of any desired cross-section, a circular cross-section being preferred. A somewhat enlarged chamber 24 is provided at the opposite or outer end of the housing 19, and is closed by the removable end plate 20 which is secured to the housing 19 by screws 25 or the like.

Gas is supplied by a pipe 26 to a gas nozzle or tube 27 within the chamber 24. The source of

this gas may be any available supply of manufactured, bottled, or natural gas and may be connected to the pipe 25 by conventional conduits and valves. The gas nozzle 27 is supported by the closure plate 20, the inlet end of the nozzle 27 having threaded engagement with the plate 20 as shown in Figures 2 and 3. The gas pipe 26 also has threaded engagement with the closure plate 20. A communicating passage between the pipe 26 and the gas nozzle 27 is provided by the bores 28 and 29 which are formed in the plate 20. The tip or discharge end 30 of the gas nozzle 27 is modified or partially flattened as shown in the drawing and for a purpose to be described.

A nozzle or tube 31 is supplied with air by a pipe 32 which may be connected to any suitable source of air under pressure, but preferably is connected to the main burner fan casing 33 for supplying air under pressure above atmospheric pressure. The pipe 32 may be connected in any suitable and convenient manner to the fan casing 33, so that during the entire operation of the fan 15 the pipe 32 will supply the nozzle 31 with air under pressure. The outlet end of pipe 32 has threaded engagement with the closure plate 20, and also has close interfitting connection with the inner end of the air nozzle 31. Thus the air nozzle 31 is supported by air pipe 32, and is maintained in operative position by reason of the threaded engagement of the pipe 32 with the closure plate 20. This nozzle 31 extends along the interior of the gas nozzle 27 and is also spaced from the inner walls of the gas nozzle 27. The tip 34 of the air nozzle 31 extends outwardly of and beyond the gas nozzle tip 30 and is modified or partially flattened similarly to the tip 30, but at a right angle thereto as will be seen from the drawing.

The end or closure plate 20 also carries the high tension insulating bushings 36, 37 which are held in place by nuts 38, 39. The bushings 36, 37 support spark gap electrodes 40, 41 adjacent the nozzle tips 30 and 34. The two bushings 36 and 37 are mounted at opposite sides of the bore 29 and have their electrodes 40, 41 extending toward each other. The tips or points of the electrodes 40, 41 are positioned in the path of air discharged by the air nozzle 31 and closely adjacent the air nozzle tip 34. The electrode tips or points preferably are spaced apart a distance on the order of three sixteenths of an inch and supplied with current to provide a 10,000 volt arc between the points. The electrodes 40, 41 are intended to be connected through terminals 42, 43 to a transformer or other suitable source of high potential electricity.

The end closure plate 20, the nozzles 27, 31, and the electrodes 40, 41 with their supports form a unit which is removable from the igniter housing 19 for inspection, adjustment or cleaning. This unit may be removed from the housing 19 by removing the screws 25 which secure the plate 20 to the housing 19.

Operation

When it is desired to operate the main burner 10, the burner motor is started either manually or thermostatically by conventional controls. Operation of the main burner fan 15 supplies air to the combustion chamber and also conveniently supplies air through the pipe 32 to the air nozzle 31. The igniter is also manually or automatically started by admitting gas through the pipe 26 to the gas nozzle 27 and supplying electric current to produce a spark or arc between the

points or outer ends of the electrodes 40 and 41. The gas issuing from the nozzle 27 is ignited by the electric spark or arc, and the flame is carried or blown to the combustion chamber end of the passage 17 by means of the air jet issuing from the air nozzle 31. The igniter produces a hot blow-torch flame at the combustion end of the passage 17. The main oil supply is then turned on and the combustible mixture of oil and air, or the like, projected by the burner into the combustion chamber is at once ignited by the hot intense flame supplied by the igniter. The supply of gas and electricity to the igniter may then be discontinued and the igniter thereby extinguished. However, a current of air under pressure is continuously supplied to and passes through the igniter housing during operation of the main burner.

The igniter provides a relatively long and strong electric spark which is adapted to ignite various types of gases ranging, for example, from bottled gas having a B. t. u. content of 2,500 units per cubic foot to a lower grade of manufactured gas having only 350 B. t. u. per cubic foot. The igniter requires no adjustment to adapt it to these various gases, although the gas flow to the igniter may be regulated by a throttling valve in the main supply pipe and in accordance with the particular type of gas being used. The electric arc is formed directly in front of the air nozzle tip 34 and directly across the air jet. The arc assumes a looped shape, and the moving air between the electrode tips tends to make the arc flutter. Thus a relatively wide band of igniter action is provided for the electric arc.

Due to the shape of the air nozzle tip 34, the air jet issuing therefrom spreads out in a fan shape and in a direction lengthwise of the electrode tips or points. As the electrode points project into this fan shaped air stream, they are kept cool by the flowing air. The air current also tends to keep the ignition flame stable and away from the electrode points. In this way, the air flow not only exerts a cooling effect on the electrode points but also shields them from the burner flame. The action of the air stream on the electrode tips or points is an important feature, since sulphur, which is usually present in the igniter gas, will cause excessive and objectionable corrosive action at the electrode tips if they are allowed to remain in the igniter combustion area. The air current also tends to blow away any carbon deposits which might form on the electrode tips and cause short circuits.

Since the air nozzle 31 is positioned within the gas nozzle 27, the gas jet issuing from the gas nozzle 27 is delivered as an envelope or blanket surrounding the air jet. As the gas nozzle tip 30 is partially flattened, the gas issuing therefrom also spreads out in a fan shape, the spreading action of the gas being in a direction (or plane) at right angles (normal) to the direction (or plane) in which the air jet spreads in a fan shape. Due to the relative arrangement and shape of the nozzle tips 30, 34, the gas and air jets are so discharged as to provide thorough intermixing of the gas and air and to promote and insure ignition of the gas, even though the air and gas are not introduced in the most suitable proportions for securing combustion.

Since the housing 19 including enlarged chamber 24 is closed by end plate 20, there is no possibility of puff-back or flare-back from the combustion chamber through the igniter housing

to the outside of the furnace. The continual current of fresh air passing through the igniter chamber and housing during operation of the main burner purges and cools the igniter and maintains it at all times in readiness for relighting. The air current also serves to prevent combustion gases from entering the igniter housing from the furnace combustion chamber, and thereby eliminates overheating, burning, or fouling of the igniter parts. Since gas is supplied to the igniter nozzle 27 only during the main burner starting operation, there is no continuously burning pilot flame, and hence gas consumption is minimized. In the event of failure of the main burner fan to operate when the burner is started, the igniter gas supply will be lighted, but it will burn with only a small flame at the tip of the gas nozzle 27, and hence not effective to cause ignition in the furnace combustion chamber until the main burner fan operates satisfactorily. A further advantage of the above-described igniter construction is the fact that the spark gap being in a closed chamber is adequately protected from mechanical injury as well as from heat and corrosion.

Other advantages of my improved apparatus will be readily apparent from the above description of an embodiment thereof. Obviously, variations in the nature and arrangement of the elements described will be evident to those skilled in this art, and this invention contemplates any equivalent structure within the scope of the following claims.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. Ignition apparatus for use with a furnace having a combustion zone, and a burner and fan for supplying a combustible mixture to said zone, said ignition apparatus being adapted for positioning adjacent said zone and adapted to blow an igniting flame against said combustible mixture, said ignition apparatus comprising a housing having a flame outlet for communicating with said combustion zone, said housing being closed to the atmosphere outside of said combustion zone, an air nozzle mounted within said housing to discharge a jet of air into said flame outlet, means for conducting air under pressure above atmospheric pressure supplied by said fan to said air nozzle, electrode means in said housing and positioned to provide the sparking end thereof closely adjacent said air nozzle and in the path of said air jet, and means for supplying said housing with gaseous fuel for ignition by the spark of said electrode means.

2. Ignition apparatus for use with a furnace having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus being adapted to blow an igniting flame against said combustible mixture, said ignition apparatus comprising: a housing having an ignition flame outlet for positioning at an opening in a wall of the furnace, a gaseous fuel nozzle within said housing and positioned to direct a gaseous fuel jet toward said ignition flame outlet, means disposed substantially centrally of the outlet of said fuel nozzle to discharge a stream of air into said gaseous fuel jet and toward said ignition flame outlet, means for supplying air under pressure above atmospheric pressure to said air discharge means, and spark electrodes within said housing and having the points thereof closely adjacent said air discharge means and in the path of said air jet.

3. Ignition apparatus for use with a furnace

having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus being adapted to be positioned at an opening in a wall of the furnace and to blow an igniting flame against said combustible mixture, said ignition apparatus comprising: a housing having a chamber and an elongated tubular portion extending from one end of said chamber; a plate forming a removable closure for the opposite end of said chamber; a gaseous fuel supply tube within said chamber, supported by said plate, and having the outlet thereof positioned to direct a jet of gas into said tubular portion; an air supply tube within and extending axially of said gaseous fuel tube to direct a jet of air into said tubular portion; insulating bushings carried by said plate at opposite sides of said gaseous fuel tube; and spark electrodes supported by said bushings and within said chamber, the points of said electrodes being arranged closely adjacent the discharge end of said air tube and in the path of said air jet.

4. A structure as recited in claim 3, wherein the discharge ends of the air and gas nozzles are shaped to provide air and gas jets of fan shape, said gas jet having its longer cross sectional dimension extending at an angle to the longer cross sectional dimension of said air jet to provide thorough intermixing thereof, the spread of said air jet into fan-shape being in the same plane as the electrode points.

5. Ignition apparatus for use with a furnace having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus being adapted to blow an igniting flame against said combustible mixture, said ignition apparatus comprising: a housing, a gaseous fuel supply tube within said housing, an air supply tube extending along the interior of said gaseous fuel supply tube and having the discharge end thereof extending outwardly of the discharge end of said gaseous fuel tube, spark electrode means within said housing and positioned to provide both the sparking end thereof adjacent said air tube discharge end and in the path of the air jet issuing from said air nozzle, and means for supplying air under pressure above atmospheric pressure to said air tube.

6. Ignition apparatus for use with a furnace having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus being adapted to be positioned at an opening in a wall of the furnace and to blow an igniting flame against said combustible mixture, said ignition apparatus comprising: a housing having a chamber and an elongated tubular portion extending from one end of said chamber; a plate forming a removable closure for the opposite end of said chamber; a gaseous fuel supply tube within said chamber, supported by said plate, and having the discharge end thereof positioned and shaped to direct a fan-shaped jet of gaseous fuel toward said tubular portion; an air supply tube positioned within and extending axially of said gaseous fuel supply tube, the discharge end of said air supply tube extending through and beyond the discharge end of said gaseous fuel tube and being positioned and shaped to direct a fan-shaped jet of air into said tubular portion; said fan-shaped gaseous fuel jet spreading in a plane substantially normal to the plane of spread of said air jet; and a set of spark electrodes carried by said plate, the points of said electrodes being arranged closely

adjacent said air tube discharge end and positioned in the path of said air jet.

7. Ignition apparatus for use with a furnace having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus being adapted to be positioned at an opening in a wall of the furnace and to blow an igniting flame against said combustible mixture, said ignition apparatus comprising: a housing having a chamber and an elongated tubular portion extending from one end of said chamber; a plate forming a removable closure for the opposite end of said chamber; a gaseous fuel supply tube within said chamber, supported by said plate, and having the discharge end thereof positioned and shaped to direct a fan-shaped jet of gaseous fuel toward said tubular portion; an air supply tube positioned within and extending axially of said gaseous fuel supply tube, the discharge end of said air supply tube extending through and beyond the discharge end of said gaseous fuel tube and being positioned and shaped to direct a fan-shaped jet of air into said tubular portion; and a set of spark electrodes carried by said plate, the points of said electrodes being arranged closely adjacent said air tube discharge end and positioned in the path of said air jet, said fan-shaped air jet spreading in a plane extending through said electrode points and substantially normal to the plane of spread of said gas jet.

8. Ignition apparatus for use with a furnace having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus comprising: a housing having a chamber and an elongated tubular portion extending from one end of said chamber, said tubular portion being adapted to be positioned at an opening in the wall of the furnace to direct an igniting flame against said combustible mixture; a plate forming a removable closure for the opposite end of said chamber; a gaseous fuel supply tube within said chamber, supported by said plate, and having the discharge end thereof positioned and shaped to direct a fan-shaped jet

of gaseous fuel toward said tubular portion; an air supply tube positioned within and extending axially of said gaseous fuel supply tube, the discharge end of said air supply tube extending through and beyond the discharge end of said gaseous fuel tube and being positioned and shaped to direct a fan-shaped jet of air into said tubular portion; a set of spark electrodes carried by said plate, the points of said electrodes being arranged closely adjacent said air tube discharge end and positioned in the path of said air jet; said fan-shaped air jet spreading in a plane extending through said electrode points and substantially normal to the plane of spread of said gas jet; and means for supplying air under pressure above atmospheric pressure to said air supply tube.

9. Ignition apparatus for use with a furnace having a combustion zone and a burner for supplying a combustible mixture to said zone, said ignition apparatus being adapted to be positioned at an opening in a wall of the furnace and to blow an igniting flame against said combustible mixture, said ignition apparatus comprising: a housing having a chamber and an elongated tubular portion extending from one end of said chamber; a gaseous fuel supply tube within said chamber and having the discharge end thereof positioned and shaped to direct a fan-shaped jet of gaseous fuel toward and into said tubular portion; an air supply tube positioned within and extending axially of said gaseous fuel supply tube, the discharge end of said air supply tube extending through and slightly beyond the discharge end of said gaseous fuel tube and being positioned and shaped to direct a fan-shaped jet of air into said tubular portion; said fan-shaped gaseous fuel jet spreading in a plane substantially normal to the plane of spread of said air jet; and a set of spark electrodes within said housing, the points of said electrodes being arranged closely adjacent said air tube discharge end and positioned in the path of said air jet to form an arc extending in the plane of said air jet.

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