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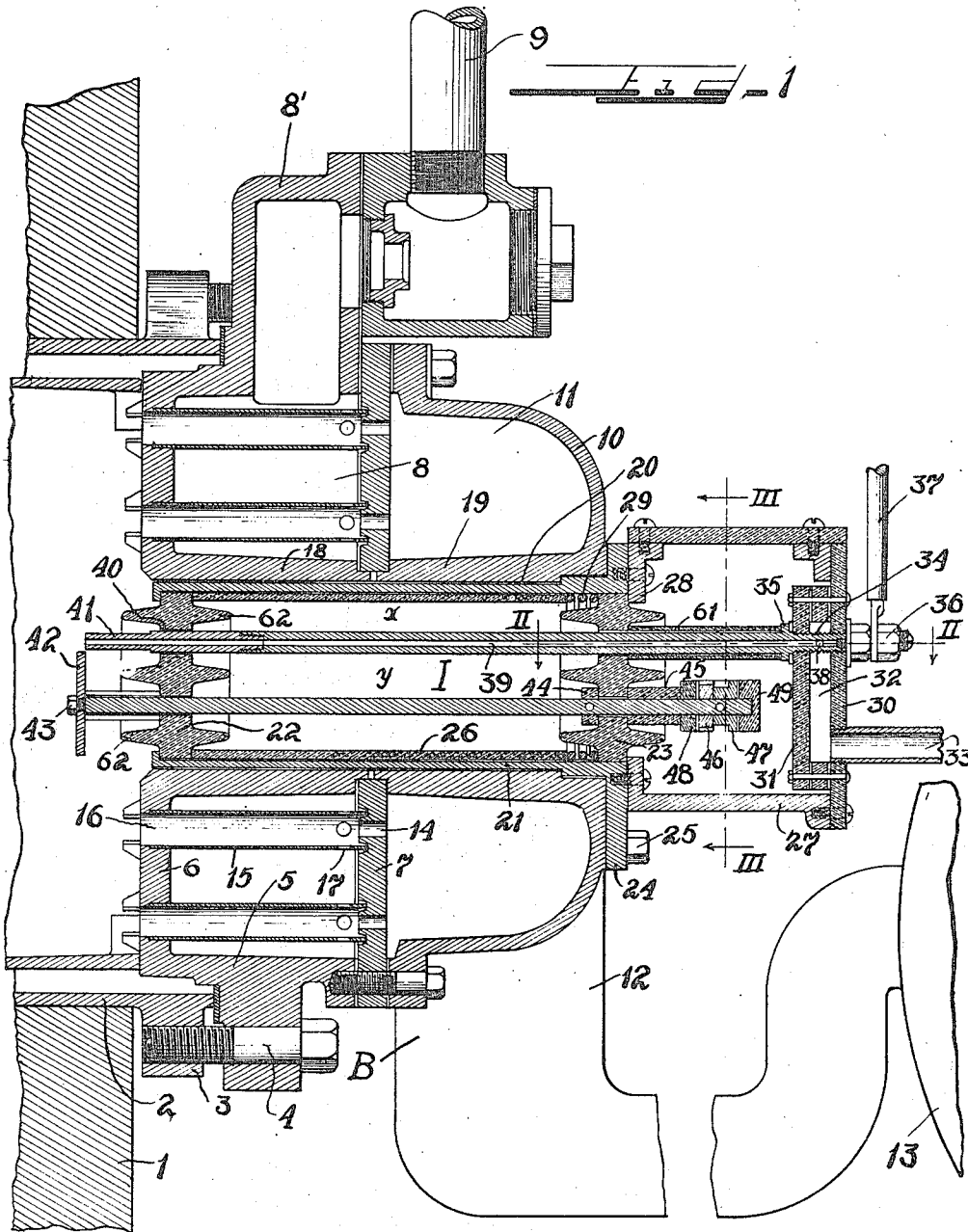
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GAS IGNITION APPARATUS

Filed Aug. 8, 1929

2 Sheets-Sheet 1



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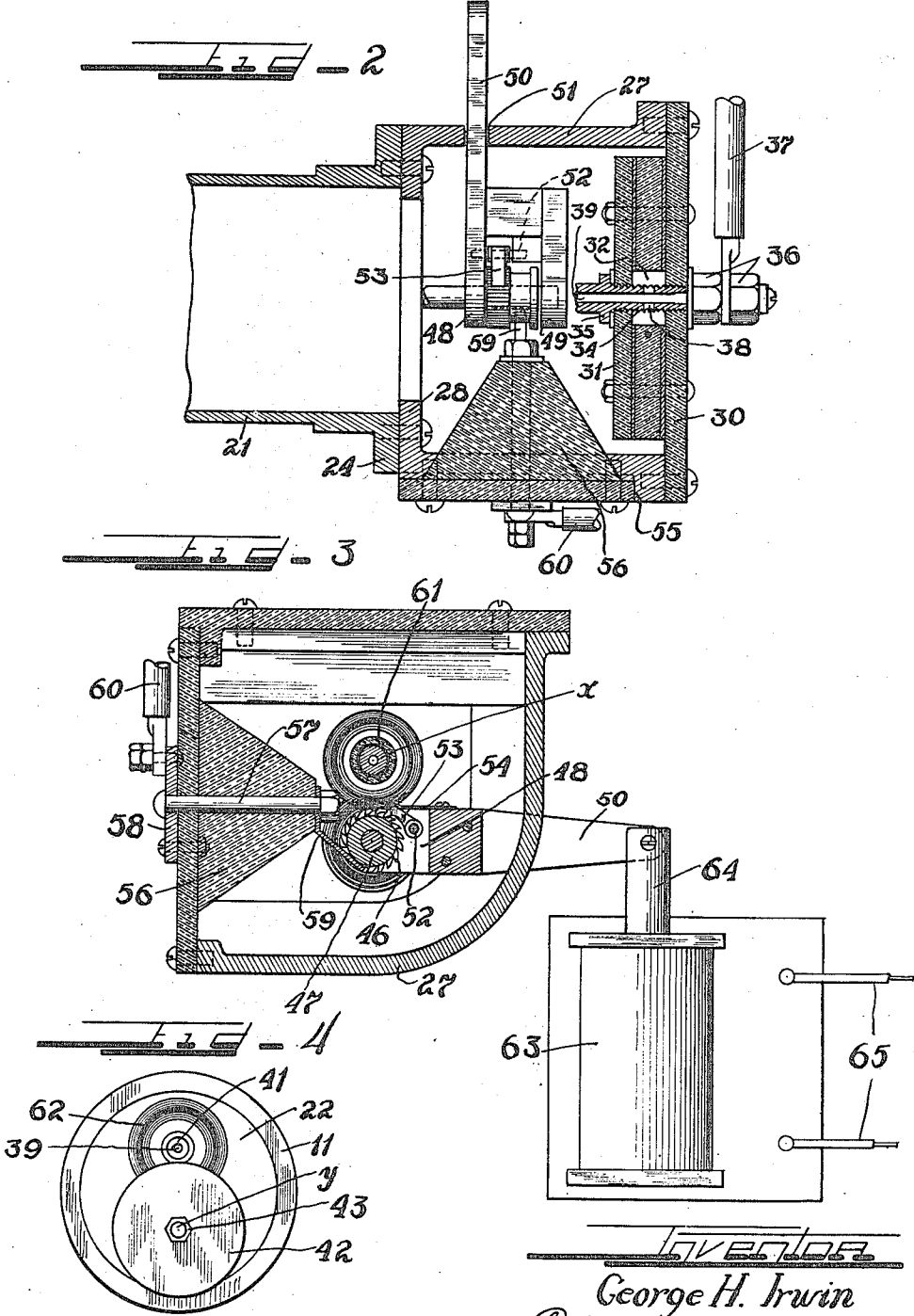
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GAS IGNITION APPARATUS

George H. Irwin, Chicago, Ill.

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6 Claims. (Cl. 175-115)

My invention relates to gas ignition apparatus for igniting gas or combustion mixtures in heat or power producing devices.

The general object is to produce safe, certain and efficient means for igniting the gas or combustion mixture used in industrial or domestic heating or power devices such as hot air or hot water furnaces, or steam boilers.

An important object of the invention is to provide an electrical ignition device having a hollow, preferably tubular electrode, through which gas for a pilot flame is delivered to be ignited at the spark points of the electrodes.

Another important object is to provide in a device of this class relatively either continuously or intermittently shiftable or movable ignition points so that any obstructions or foreign matters accumulated between the points may be expelled and the points present clean efficient sparking surfaces at all times.

A further object is to provide for either manually or automatically controlling the cleaning adjustment of the electrodes.

Another important object is to so relatively locate the electrode points in a furnace that the pilot flame issuing from the hollow electrode will not contact with the other electrode thereby preventing the deposit of soot, dust or other foreign matter on such other electrode.

A further important object is to produce an ignition device having the general shape of a plug which can be readily applied to gas burners to control the ignition thereof.

A still further object is to provide readily accessible terminals for the ignition device away from the heat of the furnace and to provide adequate insulation for preventing short circuiting of the high tension current or creeping thereof along insulating surface, and also to prevent premature ignition of the gas delivered through part of the device to the hollow pilot flame electrode.

The above and other features of construction and operation are incorporated in the structure illustrated on the drawings in which:

Figure 1 is a diametral vertical section of my improved ignition device applied to a burner feeding to a furnace,

Figure 2 is an enlarged sectional view on plane II-II of Figure 1,

Figure 3 is an enlarged section on plane III-III of Figure 1, and

Figure 4 is an inner end view of the ignition device.

I have shown part of the front wall of a furnace 1 having the gas inlet frame 2 provided with

a flange 3 at its outer end. An annular burner structure B projects into the frame 2 and is secured to the flange 3 by screw 4. The burner has the cylindrical wall 5 and the inner and outer walls 6 and 7 forming an annular gas chamber 8 which receives gas from the inlet 8' to which it is conducted by a pipe 9 from a suitable source.

A cap frame 10 is secured against the outer wall 7 and forms the annular air chamber 11 receiving air from the inlet 12 delivered thereto preferably by an electrically driven blower represented by 13. Air inlet ports 14 in the wall 7 communicate with combustion mixture tubes 15 which terminate in the combustion mixture outlet ports 16 in the wall 6, and adjacent to the wall 7 these tubes have the gas inlet ports 17 so that as air is blown through the tubes it will draw gas into the tubes and will mix therewith to produce a combustion mixture to be delivered to the ports 16 in axial direction relative to the burner.

The gas chamber 8 and the air chamber 11 are closed respectively by inner walls 18 and 19 which together form the axial passageway or pocket 20 for receiving my improved ignition device designated as a hole I. The body of this device comprises the cylindrical shell 21 preferably of metal and the end walls 22 and 23 which are of ceramic or other good electrical and heat insulating material. The shell 21 fits through and into the burner passageway 20 and at its outer end has a flange 24 abutting against and secured to the outer side of the air chamber wall 10 as by means of detachable screws 25. The walls 22 and 23 support the electrodes x and y which extend in axial direction through the shell 21. For further insulating the electrodes from the shell 21, a bushing 26 is inserted in the shell between the insulating end walls thereof.

An enclosure frame 27 is secured by its flanges 28 to the outer end of the shell 21, the flanges overhanging the end of the shell a distance to provide a seating shoulder for the end wall 23. Owing to unequal expansion and contraction between the metal shell 21 and its insulating bushing 26, I preferably insert a compression spring 29 between the wall 23 and the adjacent end of the shell and this spring will hold the bushing longitudinally against displacement.

The enclosure frame 27 has an outer wall 30 of insulating material to which is secured against its inner side a wall 31 also of insulating material and these walls form a passageway 32 for receiving gas from a pipe 33 which in practice will be connected with the gas supply source.

The electrode x is shown in the form of a metal

tube and is extended through the enclosure frame 27 with its threaded end 34 extending through the walls 30 and 31. The electrode has the shoulder 35 abutting the wall 31 and outside of the wall 30 the threaded end of the tube receives the terminal nut 36 for securing to the tube an electrical conductor 37 connected in practice with a device for producing high tension ignition current. Between the walls 30 and 31 a port 38 connects the passage 32 with the gas passage or bore 39 through the electrode and to thoroughly insulate the gas inlet pipe 33 from the electrode tube it is placed a sufficient distance away therefrom on the wall 30.

The electrode x is securely held by the pressure of the terminal nut 36 and also the threaded engagement of its end 34 with the walls 30 and 31, and at its inner end projects through the opening 40 through the insulating end wall 22. The tube may be constructed entirely of some high resistance metal such as nickel chromium alloy or only the end section 41, which projects through the wall 22 may be formed of such metal. The member x thus, besides functioning as a current conductor and electrode, serves also as a conduit for gas flow for forming a pilot flame for igniting the combustion mixture discharged from the orifices 16 of the burner.

The other electrode y is in the form of a rod of suitable metal and is journaled in the end walls 22 and 23 to be rotatable. Secured to the inner end of the rod is a cylindrical disk 42 by means of a screw 43 and this disk is of nickel chromium alloy or other suitable heat resisting material. The periphery of the disk is adjacent to the end of the outlet 41 of the electrode x to leave a gap for the passage of ignition current. As the electrodes are parallel and the disk 42 is concentric with the electrode y the length of the spark gap will remain constant during turning of the electrode y . It will be noted that the plane of the disk 42 is a distance inwardly of the end of the outlet 41 of the electrode x and the purpose of this arrangement and rotational movement of the disk is to prevent the accumulation of any foreign substances which might clog the sparking gap and interfere with the formation of a proper current flow and sparking. The gas blown out through the electrode x will sweep across the cylindrical face of the disk and will tend to dislodge any matter which may settle on the disk, and by rotating the disk any matter which may have lodged in the gap will be broken up and a clean surface will be presented by the disk to the electrode x . The gas flow through the electrode x will keep its end comparatively cool but the disk will become highly heated by the combustion in the furnace but this will serve to keep the disk clean by burning off any accumulation of foreign matter and maintaining a clean metallic surface. I also preferably place the electrode x above electrode y so that the pilot flame which may at times become yellow and sooty will be deflected upwardly away from the disk by the force of the draft in the furnace or boiler to which the ignition device is applied.

The electrode y extends into the enclosure 27 and is held against longitudinal displacement by collars 44 and 45 thereon at opposite sides of the wall 23. The electrode y may be rotated continuously, or intermittently when the ignition device is used with thermostatically or pressure controlled gas furnaces or boilers, and the rotation may be either manually or automatically accomplished.

In the adjusting arrangement shown I secure a ratchet wheel 46 to the electrode rod y and adjacent thereto a commutator or current disk 47. Arms 48 and 49, preferably of insulating material, extend from a lever 50 projecting into the enclosure 27 through an opening 51 and these arms receive the electrode rod to rotate relative thereto and receiving between them the ratchet wheel and the commutator. One of the arms has a pin 52 for pivoting a pawl 53 which engages the ratchet wheel so that when the lever 50 is reciprocated the pawl will cooperate with and rotate the ratchet wheel and therewith the electrode y . A spring 54 holds the pawl in proper association with the ratchet wheel.

Seated in an opening 55 in the side wall of the enclosure frame 27 is a supporting block 56 of insulating material through which extends a conductor screw 57. At its outer end this screw secures a terminal plate 58 to the enclosure wall and at its inner end the screw holds a brush 59 which extends into contact engagement with the current collecting disk or commutator 47. The terminal plate 58 is connected by a conductor 60 with the source of high tension current supply and the electrode y and its disk 42 are thus connected in the ignition circuit.

In addition to the insulating bushing 45 and the insulating arms 48 and 49 of the lever 50, the electrode y is insulated from the electrode x by a sleeve 61 of insulating material extending between the wall 23 and the shoulder 35 of electrode x . Also to prevent creepage of current along walls 22 and 23, I provide annular fins 62 on each side of the walls surrounding the respective electrodes.

It is evident that the ratchet lever 50 could be operated manually to control adjustment of the electrode y , or the lever could be operated automatically. I have shown electromagnetic means comprising a solenoid 63 whose armature 64 is connected with the end of the lever. The electric circuit 65 for the solenoid could be controlled from a distance by the operation of a push button or other switching device, or could be automatically controlled in conjunction with some other electrical circuit. For example, the solenoid circuit could be automatically controlled in conjunction with the circuit for the electric motor driving the blower 13 and the motor circuit could be automatically controlled in accordance with the temperature or pressure of the gas fired device. The electrode y could then be rotated by the operation of the solenoid when the motor circuit is closed to shift the electrode disk 42 to present a new clean surface before combustion mixture is delivered by the burner. The solenoid circuit could also be controlled in conjunction with the circuit for the thermostat device controlling the starting and stopping of the motor. Adjustment of the electrode y could also be pneumatically controlled.

It will be noted that the terminal contacts for the electrodes are at the outer end of the ignition structure away from the heat of the burner, and the entire ignition structure can be readily withdrawn from the burner by withdrawing the screws 25.

In operating the structure the supply pipe 33 for the pilot electrode could be connected directly with the main gas supply source so that the pilot flame would be continuous, or the supply pipe 33 could be connected with the supply pipe 9 for the burner so that the pilot tube would receive gas only when the burner is being connected for

gas supply. Owing to the comparatively small bore through the electrode *x* the gas would be expelled therefrom under some pressure and as before explained the gas will blow across the adjacent edge of the electrode disk 42 and assist in keeping it clean. Furthermore, such pressure will insure a blue flame adjacent to the electrode points and will keep the combustion zone of the pilot flame away from the points, thus keeping the points clear of the soot and carbon which might be formed in the pilot flame. The upward draft on the pilot flame will also keep it deflected upwardly and will tend to prevent soot or foreign matter from lodging on or between the sparking surfaces. The high heat to which the electrode disk is subjected will burn it clean of any deposits thereon and tend to keep its surface clean for the passage of current.

By turning the electrode and disk continuously, periodically or intermittently a fresh surface will always be presented to the electrode *x* and consequently certain and efficient and continuous ignition sparking will result so long as the electrodes are connected in the supply circuit.

It is evident that changes and modifications can be made without departing from the scope of my invention, therefore, I do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as follows:

1. A gas ignition device comprising a tubular shell having insulating end walls, electrodes extending through said shell and supported by and insulated from each other by said end walls, said electrodes being opposed at one end to form a gap for the passage of ignition current, and means for axially rotating one of said electrodes.

2. An electrical ignition device for the purpose described comprising a tubular shell having insulating end walls, electrode rods extending through said shell and being supported by and insulated from each other by said end walls, said electrode rods being opposed at one end to form a gap for the passage of ignition current, means for axially rotating one of said rods, said other rod having a passageway therethrough for the conduction past said gap of gas to be ignited.

3. In gas ignition apparatus, a tubular shell having end walls of insulating material, electrodes extending through said shell and supported and insulated from each other by said end walls, said electrodes at their outer ends being opposed to form a gap for the passage of ignition current, one of said electrodes being axially

rotatable, pawl and ratchet mechanism associated with the inner end of said rotatable electrode, means for operating said pawl and ratchet mechanism to cause rotation of said rotatable electrode, means at the outer end of said rotatable electrode for connecting it with an electrical supply circuit, and means at the outer end of the other electrode for connecting it with a current supply circuit.

4. In gas ignition apparatus for the purpose described, the combination of a tubular shell having walls in its ends formed of insulating material, an enclosure head on said shell, an electrode extending through said shell and head and supported by said end walls, said head having an end wall of insulating material receiving the end of said electrode, means for connecting said electrode with a current supply circuit, a rotatable electrode opposed at its end to the end of said other electrode to form a gap for the passage of ignition current, and means within said head for rotating said rotatable electrode.

5. In gas ignition apparatus for the purpose described, the combination of a tubular shell, end walls closing said shell and composed of insulating material, an enclosure head on said shell having an end wall of insulating material, a hollow electrode extending through said end walls of said shell and through the end wall of said enclosure head, a gas passage in said head communicating with said hollow electrode, a pipe for conducting gas to said gas passage, said hollow electrode being adapted outside of said head for connection with an ignition current supply circuit, a rotatable electrode opposed at its one end to the adjacent end of said hollow electrode to form a gap for the passage of ignition current, means within said head and operable from the outside thereof for rotating said rotatable electrode, and means extending into said head for conducting current to said rotatable electrode from an ignition current supply circuit.

6. An ignition device comprising a tubular shell having end walls of insulating material, electrodes supported in and insulated from each other by said end walls, said electrodes being opposed at one end to form a gap for the passage of ignition current and at their other ends being adapted for connection with an ignition current supply circuit, and extensions on said insulating end walls forming annular fins surrounding said electrodes to prevent creeping of current.

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