

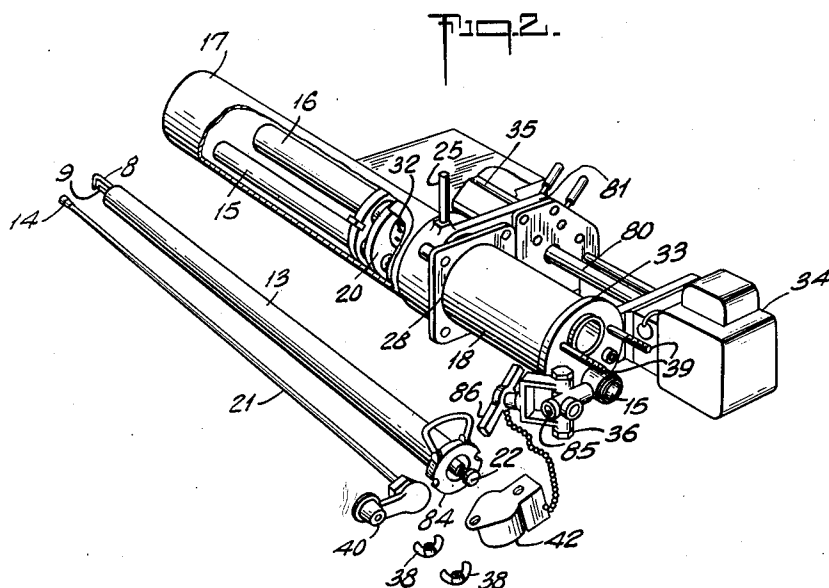
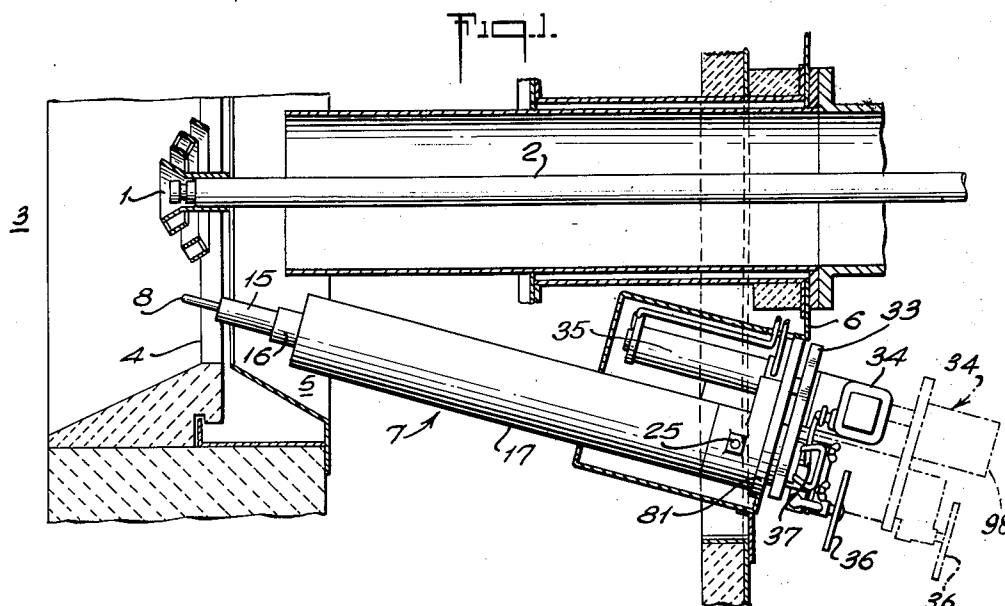
Sept. 17, 1957

A. J. POOLE ET AL
IGNITER FOR FUEL BURNERS

2,806,518

Filed Nov. 23, 1953

3 Sheets-Sheet 1



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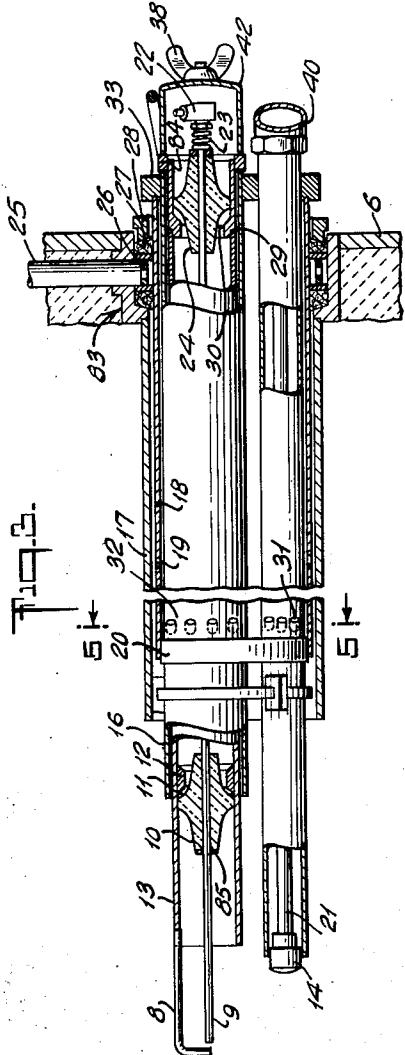
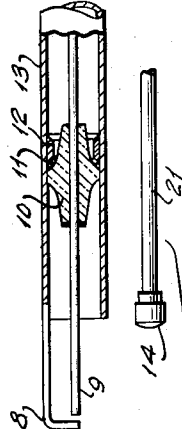
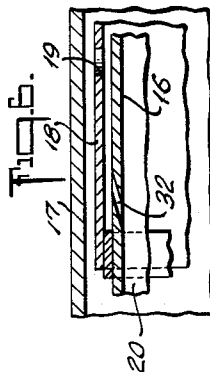
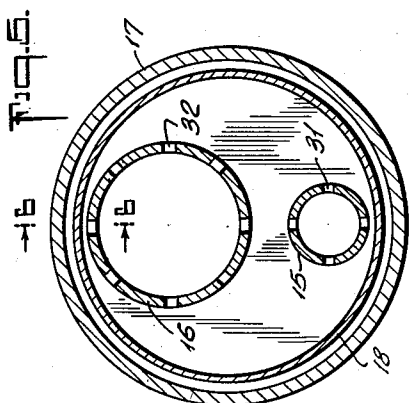
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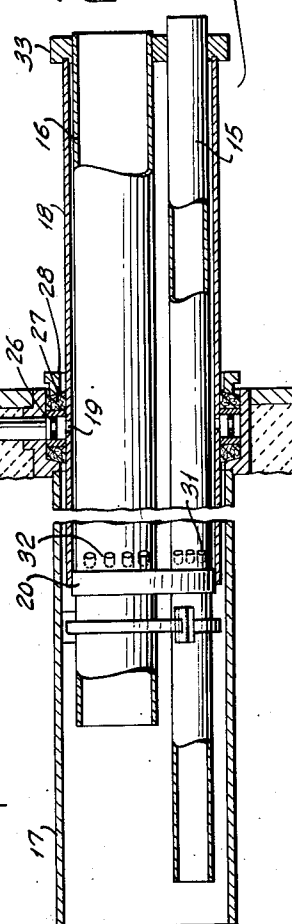
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SEALING AIR

ASPIRATING AIR

Fig. 4



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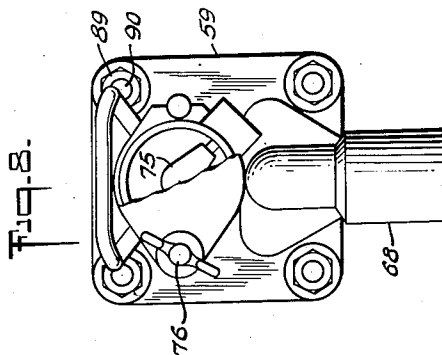
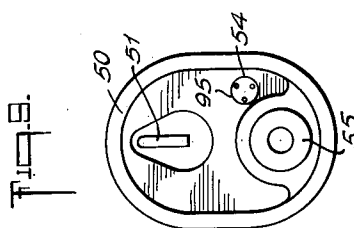
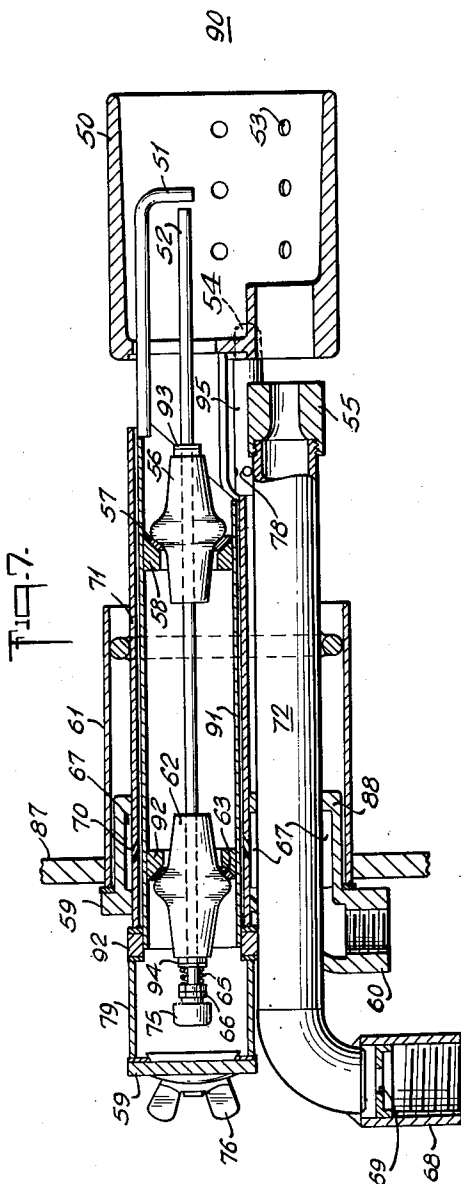
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3 Sheets-Sheet 3



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IGNITER FOR FUEL BURNERS

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11 Claims. (Cl. 158—28)

This invention relates to igniters for fuel burners and more particularly to a reliable and easily serviced igniter which is particularly adapted for igniting fuel burners where combustion takes place under superatmospheric pressure.

In the burning of fluidized fuels such as pulverized coal, a mixture of air and pulverized coal is delivered to the furnace where it is admixed with secondary air for complete combustion. The mixture of the fuel and air has a slow burning characteristic and must be ignited immediately upon entering the furnace chamber, otherwise poor combustion will result. In furnaces which are hot when the fuel and air mixture is delivered thereto, there is a danger of delayed ignition which could result in furnace explosion and it is this characteristic which makes it imperative that the fuel be ignited immediately upon its entrance into the furnace. In other fuels such as oil and gas, they too are mixed with a sufficient quantity of air to support and maintain combustion just as they enter a furnace. These fuels also have the same propensity to explode in a hot furnace as has been discussed above relative to pulverized fuel.

This invention provides reliable means for insuring immediate ignition and maintaining of ignition of the fuel and air immediately after introduction into the furnace. Such immediate ignition is of particular importance for the mixture of pulverized fuel and air when the fuel has a relatively high moisture content, as it is then particularly difficult to maintain ignition up to the time when the furnace is heated to a relatively high operating temperature.

The igniter of this invention has several advantageous characteristics. It is reliable in its ignition function so that there is an assurance of an ignited flame each time the igniter is turned on. This operating characteristic depends primarily upon a reliable electric sparking means. In addition, the pertinent igniter is capable of extended periods of operation, in order to assure ignition of the main fuel burners during periods of unstable combustion in the main furnace. Such unstable combustion of the main burners could be caused by operation at low loads or in the case of pulverized fuel, when burning high moisture content coal. The igniter is placed adjacent the combustion area of the main burners and as such is subjected to the gases of the main furnace which usually contain particles of suspended materials such as slag. During the extended operation of the igniter, its sparking device is maintained free and clear of deposit of this suspended matter. Similarly, the igniter is so constructed that it can be easily maintained and serviced. These characteristics are particularly advantageous in pressurized furnace operation, in vapor generating units. The igniter unit when installed becomes a part of the pressure sealing system of the vapor generator but the operating parts are easily removable for servicing, during which time there is provided additional means for sealing the pressurized furnace gases.

The igniter because of its contact with the furnace

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gases operates advantageously at elevated temperatures. Igniters of the pertinent type are started by a spark across the air gap of ignition electrodes which have their sparking ends adjacent the zone of mixture of fuel and air. In order to obtain the sparking, it is necessary that high electrical potential be applied to the electrodes and this requires heavy electrical insulation. The high operating temperatures of the igniter precludes the use of insulation of conventional type. However, attempts to utilize high temperature materials for this service have resulted in electrode assemblies which were difficult to remove, inspect and/or repair.

The present invention is an igniter which provides for facile inspection and maintenance of the vital parts of the igniter. To this end the electrode assembly is made removable in its entirety. The assembly is preferably in the form of a cartridge which, in operative position is arranged in parallel spaced relation with the igniter fuel supply and having the arcing ends of the electrodes offset radially from the central axis of the fuel conduit. The high potential electrode is preferably installed in the cartridge by the use of ceramic insulators and is so constructed and arranged that it will stay securely in position when exposed to differential thermal expansion caused by high temperature operating conditions.

A distinctive characteristic of the igniter unit is that when the electrode assembly cartridge is removed from the igniter housing, there is provided a series of high velocity fluid jets which discharge through the walls of the access tube, or cartridge housing, thereby sealing the high pressure furnace against gas leakage.

An additional characteristic of the invention is that the igniter has high velocity fluid jet means directed against the spark ends of the electrodes to keep them cool and clean, and another high velocity fluid jet means for maintaining the electrode insulator free of soot and slag accumulations.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described preferred embodiments of the invention.

In the drawings:

Fig. 1 is a plan section of an oil fired retractable igniter unit embodying the invention as mounted in a furnace adjacent a main fuel burner and in the extended or operative position.

Fig. 2 is an isometric and partially cutaway view of the igniter unit and parts of the retractable oil fired igniter.

Fig. 3 is a vertical longitudinal section of the oil fired lighter showing the relationship and details of the invention.

Fig. 4 is another vertical section of the oil fired lighter in the retracted position with the electrode assembly and burner barrel removed.

Fig. 5 is an end view cross-section taken on the line 5—5 of Fig. 3.

Fig. 6 is a longitudinal partial cross-section on the section line 6—6 of Fig. 5.

Fig. 7 is a longitudinal vertical cross-section of a gas igniter showing the relationship and details of the various parts.

Fig. 8 is an end elevation of the gas igniter.

Fig. 9 is an end elevation of the burner end of the igniter.

Referring first to Fig. 1, an igniter unit 7 including a fuel atomizer and sparking ignition means is arranged to be projected into operative position and retracted therefrom by suitable means such as a double acting

cylinder 35. When the lighter has been so projected, a spark between a pair of electrodes 8, 9 ignites a mixture discharged from the igniter fuel atomizer.

In Fig. 1 the igniter unit 7 is shown suitably mounted in an aperture of the burner wall 6 adjacent a main burner 1. The main burner 1 is supplied fuel through a main tube 2 and combustion air is supplied by conduit 5. The main burner fuel is discharged through aperture 4 into the main furnace 3. The igniter unit 7 is shown with its forward end in operative position adjacent the main burner 1 and the dotted lines 98 shows its retracted position. The unit is placed into operating position by the air cylinder motor 35, disposed adjacent and suitably connected to the main cylinder 18 in such a way that the latter is extended forward or retracted as desired by suitable controls (not shown). The connection between the air cylinder 35 and the main cylinder 18 is a driving flange 33. Attached to this flange is an air cylinder driving rod 80 (Fig. 2) and on the opposite side of the flange there is connected a high voltage transformer 34. The igniter housing consists of the igniter housing tube 17 and an attachment plate 81 where the igniter is attached to the furnace casing 6. The igniter support tube or main cylinder 13 slides internally of the igniter housing tube 17 and is sealed against pressurized furnace gas leakage by the packing joint 83. The electrode assembly cartridge 13 and the burner barrel 21 are supported inside of the igniter support tube 18. The igniter housing tube 17 forms an opening in communication with the furnace 3. The igniter support tube 18 fits coaxially through the housing tube 17 and is sealed at the outer end of said tube by the packing joint 83. The packing joint 83 is composed of packing rings 27, a lantern ring 26 spaced between the packing rings and a packing retainer ring 28. A high pressure fluid inlet tube 25 is fitted so as to deliver high pressure fluid to the packing joint 83. The lantern ring 26 is an annular ring which is H-shaped in cross-section and it has perforations in the center web which allow fluid distribution in the annular packing gland 83.

The igniter support tube 18 has at its inner end a support flange 20 and at the outer end it is connected to the main support flange 33. The two flanges 20 and 33 are formed with two off center circular holes as shown in Fig. 5. Through these holes there are placed the electrode access tube 16 and the burner support tube 15 which are rigidly attached to the inner flange 20 and are welded or otherwise attached to the main flange 33. In the periphery of the electrode access tube 16 there is drilled or otherwise formed a number of fluid aspirating holes 32 through the wall at an angle which positions center lines of the holes 32 so that they converge on the central axis of the access tube 16. Likewise in the burner support tube 15 there are formed similar aspirating holes 31 through the support tube wall, the center lines of these holes converging on the longitudinal axis of the support tube in a direction towards the furnace. In the wall of the support tube 18 there is formed a number of radial holes 19 spaced around the periphery in a plane which is so positioned relative to the main flange 33 that when the support tube 18 is fully retracted, the center lines of the holes 19 are aligned with the center of the lantern ring 26 of the packing gland 83. The alignment is shown in Fig. 4 where the igniter support tube 18 is in a fully retracted position. Fig. 6 shows the relationship of the aspirating holes 32 of the access tube to the holes 19 of the igniter housing tube.

The electrode is carried in the cartridge type electrode support tube 13. At the outer end of said tube there is welded or securely attached a flange 84, so constructed and formed as to fit over the outer end of the access tube 16 and has holes in it which receive the studs

39. Internally of the support tube 13 there are placed two annular insulator retainer rings 12, 29 which are adjacent but spaced from the ends of the support tube 13. At the furnace end of the support tube 13 there is attached an L shaped electrode 8. Internally of said electrode support tube 13, there is a high voltage electrode 9 which is a substantially rectilinear rod having its end adjacent but in spaced relation to electrode 8. The electrode 9 is mounted in a pair of insulators 10 and 24 which fit into and are retained by the internal retainer rings 12 and 29. The inner end of insulator 10 is retained by a washer 85 secured to the electrode 9. Because the electrodes have a frusto conical shape which matches the faces of the retainer rings, they tend to be self-centering. To avoid insulator breakage which could occur because of contact with the metal ring 12 there is placed a small amount of asbestos or similar high temperature packing material 11 between the insulator and retainer ring. The construction at the outer end of the insulator is as described above with the insulator 24 being kept from direct contact with the metal retainer ring 29 by the pliable packing 30. The electrode assembly is made tight by the bearing of the washer 85 against the face of the insulator 10 with the electrode bar 9 being placed in tension by a spring 23 bearing against the outer face of the insulator 24 which in turn is pressed against the retainer ring 29 and packing 30. Disposed on the outer end of the electrode 9 is an electrical terminal 22 which provides for a connection to the high voltage transformer 34. To assure safety of the operators of the igniter a shield 42 is placed over the high voltage connection 22. The retaining studs 39 along with the wing nuts 38 jointly secure the shield 42 and the outer flange 84 to the igniter unit.

Spaced below the electrode access tube 16 is the burner support tube 15. A burner barrel 21 having a spray nozzle 14 on one end and a fuel connection 40 on the other end is placed coaxially within the support tube 15. The outer end of the support tube 15 is sealed at the fuel connection 40 by a conventional oil burner fuel quick disconnect 36. Liquid fuel is provided to the oil burner assembly through the disconnect 36 at the pipe connection 85 in a conventional manner. The handle 86 of the disconnect 36 operates to secure the fuel connection of the burner barrel to the burner assembly.

The furnace gas sealing operation of the unit would be as follows:

High pressure fluid enters through the connection 25 to the packing joint 83 and flows through the lantern ring 26, then through the ports 19 and into the chamber within the igniter support tube 18. The fluid chamber is composed of the inner surface of the igniter support tube 18, the outer surface of the burner support tube 15 and the electrode access tube 16, and the inner surface of the flange 20 and the main support flange 33. The high pressure fluid then flows through the aspirating holes 32 of the access tube 16 and concurrently through the aspirating holes 31 of the burner support tube 15. Thus, there is formed two series of high velocity jets which converge along the longitudinal axes of the two tubes and create a high pressure zone which seals the tubes against leakage of the high pressure furnace gases to atmosphere.

When the cartridge type electrode assembly and the burner means are in place, they seal the igniter against furnace gas leakage. Further, when the igniter housing tube 18 is in its fully extended or igniting position, the fluid ports 19 are not aligned with the packing joint 83 and the packing rings 27 then seal the entire unit against leakage of the furnace gases. The seal is made further effective by constantly maintaining fluid pressure in the joint 83.

The special features of the invention in the embodiment shown in Figs. 1 through 6 are the removable electrode assembly and the jet means which seals against leakage

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of the furnace gases when the electrode assembly and the burner means are removed for repair and/or servicing.

The advent in recent years of superatmospheric pressure combustion systems has caused a great deal of difficulty to the operators. When it was required to service the igniters in some types of installations, it was necessary to install multiple igniters so that when one or two of the igniter units are inoperative there would remain at least one in operating condition. At other times operators have been forced to stop the combustion process and reduce the furnace pressure before making repairs.

The above described embodiment provides a simple, highly reliable and removable electrode assembly, which with the minimum number of operations, may be completely disassembled, repaired and serviced. There also is provided a means for removing the electrode assembly from the igniter when the furnace is under superatmospheric pressure and operating without leakage of high temperature furnace gases. Further there is provided a means for sealing against furnace gas leakage when the burner is removed from the igniter unit. The result is an igniter of maximum effectiveness.

In Figs. 7 through 9 there is shown another illustrative embodiment of the invention when applied to a gas igniter. A circular opening is made to a pressure operated furnace by the aperture tube 61 which is securely attached to furnace casing 87. The relationship of the igniter to the main burner of a pressure combustion system is not shown but would be substantially similar to the arrangement for the oil igniter shown in Fig. 1. An igniter housing 88 is adapted to securely fit the aperture tube 61 and has a flange 59 which seals the aperture tube 61 by a compression fitting secured by studs 90 and nuts 89. Into the igniter housing 88 and through the flange 59 there is fitted an electrode access tube 71. Also fitted through flange 59 and spaced from the access tube is a gas conduit 72 having its vertical axis identical with that of the access tube 71. The access tube 71 and the gas conduit 72 are longitudinally adjustable to meet the conditions of different installations. The relation of the gas discharge nozzle 55 to the electrodes 51 and 52 is fixed. Attached to flange 59 is a high pressure fluid inlet 60. This inlet leads to a high pressure fluid chamber 67 around the electrode access tube 71. There is formed through the access tube a number of apertures 70, communicating with the high pressure fluid chamber 67 of the housing 88. These apertures are so arranged as to have their axes converge along the central axis of the access tube 71 in the direction of the furnace 90. Attached to the furnace end of the access tube there is an ignition chamber 50 in a semi-cylindrical form and having a number of small diameter apertures 53 through its wall. The gas burner is composed of an outlet nozzle 55, gas conduit 72, gas connection 68 and restricting orifice 69 secured in the igniter housing 88.

The cartridge electrode assembly includes a tubular support member 91 having its outer end fitted in and securely attached to a flange 92 and disengageably secured in fluid tight relation to access tube 71 by the wing nuts and studs 76. Between the flange 92 and the flange 59, there is an electrode shield 79. The air tight relationship is obtained by turning the wing nuts 76 against the flange 59 thereby pressing the shield 79 against the flange 92. On the furnace end of the assembly support tube 91, there is attached an L shaped electrode 51. Internally of said support tube 91 there are arranged two insulator retainer rings 92 and 58, rigidly attached to tube 91 and individually positioned adjacent but spaced from the ends of said tube. The retainer rings 92 and 58 are so formed that they present converging concave surfaces. Coaxially of the tube 91 there is a high voltage electrode 52 substantially rectilinear and having its inner end in adjacent but spaced relation to electrode 51. Electrode 52 is mounted in two semi-conical ceramic insulators 62 and 56 which are supported in the retainer rings 92 and 58.

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Between the retainer rings and the insulators there are packings 63 and 57 disposed around the insulators. The inner insulator 56 is secured in position by washer 93 which is fastened to the electrode 52 and which bears against the surface of the insulator 56. The electrode at its outer end is designed to receive a spring 65, a washer 94 and a nut 66. When the nut 66 is turned inwardly the spring 65 presses the washer 94 against the insulator 62; simultaneously, the washer 93 presses the electrode 56 against the retainer ring 58. The construction of the retainer ring and the shape of the electrodes combined with the spring compression maintains the electrodes centered securely in operative position.

When the cartridge type electrode assembly is in position both the inner insulator 56 and the electrodes 51 and 52 are exposed to furnace gases. Adjacent but spaced from the insulator 56 and electrodes 51 and 52 there is positioned a dust blowing tube 95 which is in communication with the fluid chamber 67. At the inner extreme end of the dust blowing tube 95 there is positioned a series of apertures 54 which direct fluid jets toward the spark gap between electrodes 51 and 52. Adjacent the insulator 56 there is formed a number of apertures 78 in the wall of tube 95 which direct fluid jets against the insulator 56.

To remove the cartridge type electrode assembly, the single nut 76 is removed, the flange 59 and the shield 79 are next removed leaving the cartridge type assembly tube 91 free to be withdrawn from the access tube 71. The interior of the access tube 71 is then in direct communication with the furnace gases.

The operation of the igniter units is as follows:

The gas enters at the inlet 68 and is reduced in pressure and metered by the orifice 69. It then flows through the conduit 72 and discharges through the high velocity nozzle 55 into the ignition chamber where it becomes mixed with air from the furnace. A high potential is applied through a terminal connection 75 from a suitable transformer (not shown) and creates a spark across the air gap at the electrodes 51 and 52. High pressure fluid introduced into the fluid inlet 60, flows in the chamber 67, and through the dust blower tube 95. Then simultaneously from the apertures 78 and 54 a high velocity stream of fluid issues which cools and cleans the insulator 56 and the electrodes 51 and 52 respectively.

When it is required that the electrode assembly be serviced or repaired, the gas is turned off, the high potential disconnected, the cartridge type electrode assembly removed, and the flow of high pressure fluid to the inlet 60 increased. The fluid flows through the aspirating jets 70 and converges along the central axis of the access tube forming a high pressure barrier to seal the furnace gases against leakage to atmosphere.

The gas igniter described features a simple highly reliable removable electrode assembly, jet means for maintaining the electrode and insulator clean and cool during operation and jet means for sealing the electrode access tube when the electrode assembly is removed. The electrode assembly because of its arrangement may thermally expand independently of the igniter housing while maintaining its proper relationship to the burner and without the hazard of shorting due to soot and slag accumulations at the insulator. Also the electrodes are maintained clean and relatively cool by the dust blowing jet means. In addition, the electrode assembly may be removed for repairs without removing the entire igniter and there would be no need to interrupt the pressurized furnace operation.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be embodied in other arrangements without departing from such principles.

What is claimed is:

1. A pressurized furnace having a fuel burner creat-

ing hot gases under pressure, an igniter arranged to ignite said burner, said igniter having an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge-type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, a source of fluid at a pressure above the pressure of the furnace gases, duct means including fluid jet means in communication with said fluid source and arranged to direct said fluid at high velocity into said access tube in a direction opposing the flow of furnace gases outwardly to create a high pressure fluid barrier preventing the escape of the pressurized furnace gases when said closely fitting electrode assembly is removed from said access tube, and fluid control means in the duct means operable to introduce said fluid to said jet means.

2. A pressurized furnace having a fuel burner creating hot gases under pressure, an igniter arranged to ignite said burner, said igniter having an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge-type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with said fluid source and arranged to direct gaseous fluid through the wall of the access tube in a series of high velocity jets converging along the central axis of the access tube in a direction opposing the flow of furnace gas outwardly when said closely fitting electrode assembly is removed from the access tube, and fluid control means in the duct means operable to introduce said fluid to said jet means.

3. A pressurized furnace having a fuel burner creating hot gases under pressure, an igniter arranged to ignite said burner, said igniter having an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge-type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, said assembly consisting of a tubular cartridge-type electrode support, an electrode attached to the support, and an electrode insulated from the support constructed and arranged to stay securely in position under conditions of varying thermal expansions of the electrode and support, a source of fluid at a pressure above the pressure of furnace gases, duct means including fluid jet means in communication with said fluid source and arranged to direct said fluid at high velocity into said access tube in a direction opposing the flow of furnace gases outwardly to create a high pressure fluid barrier preventing the escape of the pressurized furnace gases when said closely fitting electrode assembly is removed from said access tube, and fluid control means in the duct means operable to introduce said fluid to said jet means.

4. A pressurized furnace having a fuel burner creating hot gases under pressure, a fluid fuel burning igniter arranged to ignite said burner, said igniter having an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge-type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, said assembly consisting of a tubular cartridge-type electrode support, an electrode attached to the support, and an electrode insulated from the support constructed and arranged to stay securely in position under conditions

port, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with fluid source and arranged to direct high pressure fluid through the wall of the access tube in a series of high velocity jets converging along the central axis of the access tube in a direction opposing the flow of furnace gas outwardly when said closely fitting electrode assembly is removed from the access tube, and fluid control means in the duct means operable to introduce said fluid to said jet means.

5. A pressurized furnace having a fuel burner creating hot gases under pressure, a fluid fuel burning igniter arranged to ignite said burner, said igniter having an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge-type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, said assembly consisting of a tubular cartridge type electrode support, an electrode attached to the support, and an electrode mounted in insulators in the support constructed and arranged to stay securely in position under conditions of varying thermal expansions of the electrode and support, a fluid fuel burner support tube in said igniter having its interior in communication with the furnace gases, a removable fluid fuel burner barrel disposed in said support tube and arranged to seal said tube, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with said source and arranged to direct high pressure fluid through the wall of said support tube in a series of high velocity jets converging along the central axis of the support tube in a direction opposing the flow of furnace gas outwardly when the burner barrel is removed, and fluid control means operable in the duct means to introduce said fluid to said jet means.

6. A pressurized furnace having a fuel burner creating hot gases under pressure, a fluid fuel burning retractable igniter for said burner, said igniter having means for projecting it into operative relationship with the burner and retracting it therefrom during periods of inaction, said igniter including an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with said fluid source and arranged to direct high pressure fluid through the wall of the access tube in a series of high velocity jets converging along the central axis of the access tube in a direction opposing the flow of furnace gas outwardly when said closely fitting electrode assembly is removed from the access tube, and fluid control means in the duct means operable to introduce said fluid to said jet means upon retraction of said igniter during periods of inaction.

7. A pressurized furnace having a fuel burner creating hot gases under pressure, a fluid fuel burning retractable igniter for said burner, said igniter having means for projecting it into operative relationship with the burner and retracting it therefrom during periods of inaction, said igniter including an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, said assembly comprising a tubular electrode support having two internal annular insulator retainer rings positioned adjacent but spaced inwardly from the opposite ends of said support, a high voltage electrode extending coaxially through the support and having two insulators which bear respectively on each

of the retainer rings, a compression means disposed on the outer end of said high voltage electrode to maintain the insulators pressed firmly against the retainer rings, an electrode attached to the support, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with said fluid source and arranged to direct high pressure fluid through the wall of the access tube in a series of high velocity jets converging along the central axis of the access tube in a direction opposing the flow of furnace gas outwardly when said closely fitting electrode assembly is removed from the access tube, and fluid control means in the duct means operable to introduce said fluid to said jet means upon retraction of said igniter during periods of inaction.

8. A pressurized furnace having a fuel burner creating hot gases under pressure, a fluid fuel burning retractable igniter for said burner, said igniter having means for projecting it into operative relationship with the burner and retracting it therefrom during periods of inaction, said igniter including an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, a fuel burner support tube in said igniter having its interior in communication with the furnace gases, a removable fluid fuel burner barrel disposed in said support tube and arranged to seal said tube, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with said fluid source and arranged to direct high pressure fluid through the wall of said support tube in a series of high velocity jets converging along the central axis of the support tube in a direction opposing the flow of furnace gas outwardly when the burner barrel is removed, and fluid control means in the duct means operable to introduce said fluid to said jet means upon retraction of said igniter during periods of inaction.

9. A pressurized furnace having a fuel burner creating hot gases under pressure, a fluid fuel burning retractable igniter for said burner, said igniter having means for projecting it into operative relationship with the burner and retracting it therefrom periods of inaction, said igniter including an electrode access tube extending through a wall of said furnace in communication with the pressurized furnace gases, a removable cartridge type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, said assembly comprising a tubular electrode support having two internal annular insulator retainer rings positioned adjacent but spaced inwardly from the opposite ends of said support, a high voltage electrode extending coaxially through the support and having two insulators which bear respectively on each of the retainer rings, a compression means disposed on the outer end of said electrode to maintain the insulators pressed firmly against the retainer rings, a low voltage electrode attached to the tubular support at the forward end thereof and forming with the forward end of said high voltage electrode a spark gap, a source of fluid at a pressure above the pressure of the furnace gases, duct means including jet means in communication with said fluid source and arranged to direct high pressure fluid through the wall of the access tube in a series of high velocity jets converging along the central axis of the access tube in a direction opposing the flow of furnace gas outwardly when said closely fitting electrode assembly is removed from the access tube upon retraction of said igniter during

periods of inaction, fluid control means in the duct means operable to introduce said fluid to said jet means, a fluid fuel burner support tube in said igniter having its interior in communication with the furnace gases, a removable fluid fuel burner barrel disposed in said support tube and arranged to seal said tube, duct means including jet means in communication with said fluid source and arranged to direct high pressure fluid through the wall of said support tube in a series of high velocity jets converging along the central axis of the support tube in a direction opposing the flow of furnace gas outwardly when the burner barrel is removed, and fluid control means in the duct means operable to introduce said fluid to said jet means upon retraction of said igniter during periods of inaction.

10. A furnace having a fuel burner, a fluid fuel burning igniter arranged to ignite said burner, said igniter having an electrode access tube extending through a wall of said furnace in communication with the furnace gases, a readily removable cartridge-type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, means for detachably clamping said cartridge assembly in operative position in said access tube, said assembly comprising a tubular electrode support having two internal annular insulator retainer rings positioned adjacent but spaced inwardly from the opposite ends of said support, a high voltage electrode extending coaxially through the support and having two insulators which resiliently bear respectively on each of the retainer rings, a yieldable compression means disposed on the outer end of said high voltage electrode to maintain the insulators pressed firmly against the retainer rings, and a low voltage electrode attached to the tubular support at the forward end thereof and forming with the forward end of said high voltage electrode a spark gap.

11. A furnace having a fuel burner, a fluid fuel burning retractable igniter for said furnace, said igniter having means for projecting it into operative relationship with the burner and retracting it therefrom during periods of inaction, said igniter having an electrode access tube extending through a wall of said furnace in communication with the furnace gases, a readily removable cartridge type electrode assembly, said assembly being tubular shaped of a diameter and length to closely fit throughout the length of and having a flange on the outer end arranged to seal one end of said access tube, means for detachably clamping said cartridge assembly in operative position in said access tube, said assembly comprising a tubular electrode support having two internal annular insulator retainer rings positioned adjacent but spaced inwardly from the opposite ends of said support, a high voltage electrode extending coaxially through the support and having two insulators which resiliently bear respectively on each of the retainer rings, a yieldable compression means disposed on the outer end of said high voltage electrode to maintain the insulators pressed firmly against the retainer rings, and a low voltage electrode attached to the tubular support at the forward end thereof and forming with the forward end of said high voltage electrode a spark gap.

References Cited in the file of this patent

UNITED STATES PATENTS

1,288,898	Hunter	Dec. 24, 1918
2,194,081	Bock	Mar. 19, 1940
2,545,945	Ensign et al.	Mar. 20, 1951
2,596,944	Schellenberger et al.	May 13, 1952
2,604,510	Berkey	July 22, 1952
2,622,549	Fletcher et al.	Dec. 23, 1952
2,689,000	Musat et al.	Sept. 14, 1954