Feb. 2, 1965 R. J. ZOSCHAK 3,168,133

GAS FIRED IGNITER

Filed July 3, 1962

FIG. I.

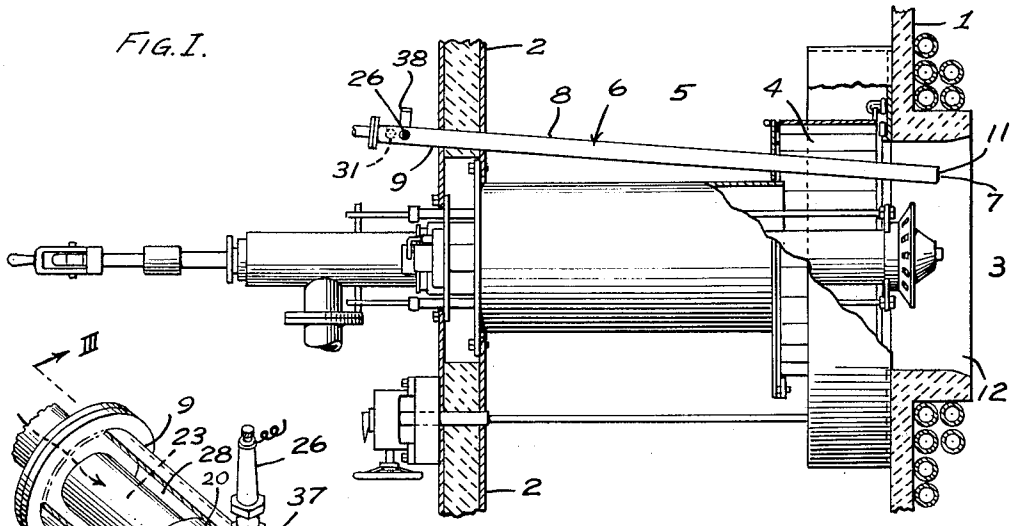


FIG. II.

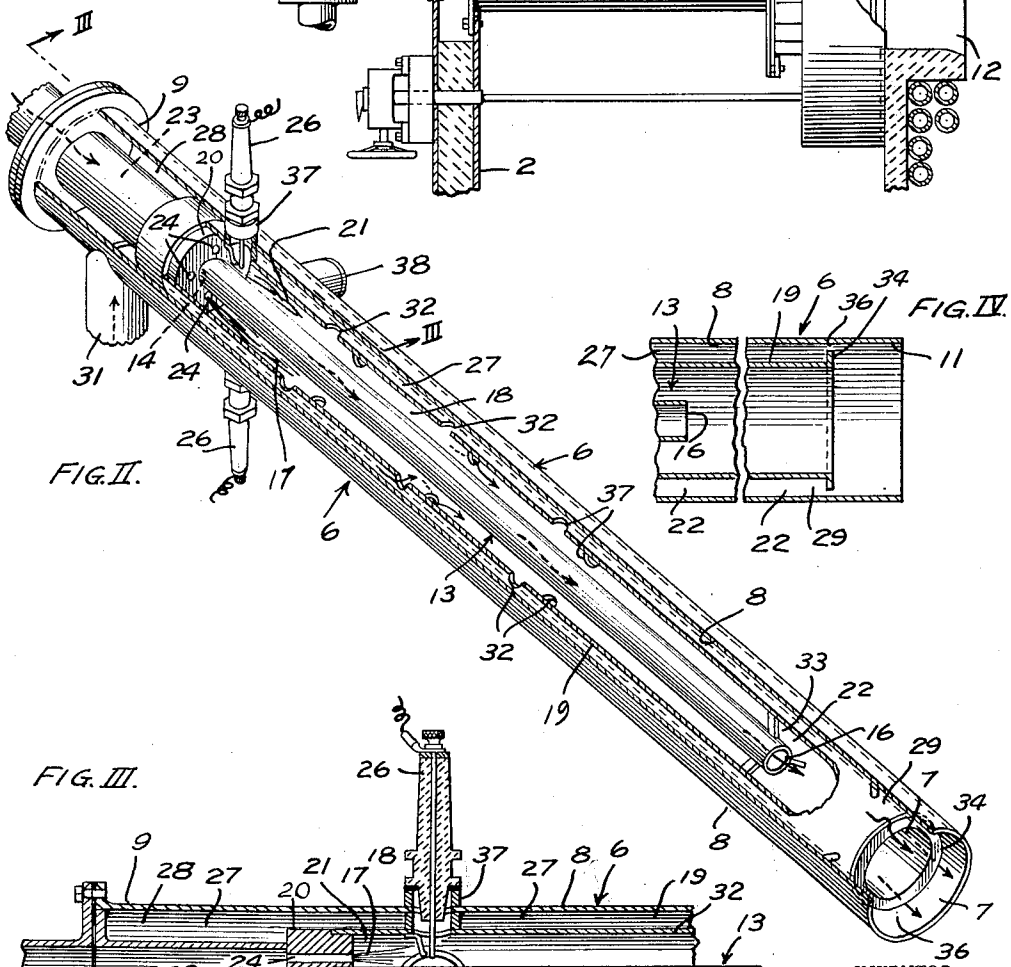


FIG. IV.

FIG. III.

INVENTOR.

ROBERT J. ZOSCHAK

BY

ATTORNEY

United States Patent Office

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GAS FIRED IGNITER

Robert J. Zoschak, Rutherford, N.J., assignor to Foster Wheeler Corporation, New York, N.Y., a corporation of New York

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5 Claims. (Cl. 158—115)

This invention relates to gas fired igniters. The invention contemplates an igniter having a fuel chamber and a pilot chamber disposed in annular relationship to each other.

Basically the arrangement of a pilot flame in a shielded chamber offers stability of combustion.

Disposing an air delivery chamber along the pilot chamber affords cooling for igniter parts with consequent improvement in operating strengths.

This teaching also permits the location of spark plugs and sight ports outside the setting where they are away from extreme temperature and dirt conditions.

The foregoing and other advantages will appear more fully from the accompanying drawings wherein:

FIGURE I is a partly fragmented sectional plan view of a burner penetrating a furnace setting with a gas fired igniter disposed in the burner opening.

FIGURE II is an isometric view of the igniter with a portion of the shell and partition removed.

FIGURE III is an enlarged sectional view taken along line III—III of FIGURE II.

FIGURE IV is a fragmented sectional view depicting the flame port.

Referring to the drawings in greater detail and more particularly to FIGURE I, furnace 1 has a setting 2 which defines combustion zone 3 therein. Burner means shown as intervane burner 4 penetrates setting 2 to inject fuel and air into combustion zone 3. Setting 2 also defines plenum chamber 5. An oil burner is here shown but the igniter of the present invention is equally useful with burners for pulverized or gaseous fuels.

An igniter generally designated 6 lights the fuel. Toward this objective, igniter 6 penetrates setting 2 for operative association of flame port 7 with fuel and air injected into combustion zone 3. Igniters are generally operated during start-up or periods of low load when there is jeopardly of flame out. In some installations igniters are removably inserted into the setting.

As best seen in FIGURE II, igniter 6 includes a hollow outer body or shell 8 preferably cylindrical in shape with outboard end 9 outside setting 2 and inboard end 11 projecting via burner throat opening 12 into combustion zone 3. Inboard end 11 of shell 8 defines flame port 7 from whence the igniter flame issues.

A gas fuel such as natural gas or propane is generally used in this type of igniter because a clean flame is desired. However, other clean burning fuels are feasible. Gas conduit 13 has outboard opening 14 and inboard opening 16. Flame port 7 at inboard end 11 of shell 8 projects beyond inboard opening 16 of gas conduit 13 so that gas issuing from inboard opening 16 of the gas conduit is shielded by shell 8.

Stable maintenance of a pilot flame is the crux of this invention. Pilot flame 17 is shielded in pilot chamber 18. The fuel chamber and the pilot chamber are annularly disposed relative each other. As shown in FIGURE II, partition 19 surrounds the gas conduit 13 defining on elongated pilot chamber 18 thereabout. Pilot chamber 18 has an outboard end 21 and an inboard end 22.

A suitable fuel is communicated to pilot chamber 18 at the outboard end 21. Gaseous fuel is here used. A divider 20 in the form of an orifice plate is provided for separating the gas input stream into a major portion and a minor portion. To introduce combustible gas, a fuel inlet 23 delivers fuel to the divider 20. The major portion of the gas input stream enters outboard opening 14 of the gas conduit 13 which conveys the major portion through flame port 7. A minor portion of the gas input stream (in the order of five percent) enters the pilot chamber 18 through the orifices 24 in the divider 20 for passage therethrough to the flame port 7.

An air input stream is required for operation of pilot chamber 18. In this regard some other combustion supporting gas such as oxygen or an oxygen rich waste gas should be regarded as the equivalent of air. Shell 8 defines elongated air delivery chamber 27 about partition 19. Air delivery chamber 27 has outboard end 28 and inboard end 29. Air pipe or inlet 31 communicates with outboard end 28. Pilot air ports or apertures 32 are located in partition 19 to deliver air from the air chamber 27 to the pilot chamber 18. Pilot air ports 32 are disposed along the length of pilot chamber 18 to support a stable pilot flame therealong.

Spark plug 26 is insertable in access port 37 outward of setting 2 and extends into the outboard end 21 of pilot chamber 18 to spark the fuel and air mixture therein into a pilot flame 17 which fires the major portion of the gas as it issues from gas conduit 13 out flame port 7. Partition 19 and gas conduit 13 define pilot outlet 33 therebetween which communicates with flame port 7 so that pilot flame 17 engages the major portion of the gas input stream issuing from gas conduit 13.

It is desirable to pass substantially more air through air delivery chamber 27 than is necessary for combustion of the gas in pilot chamber 18. The excess air joins with air for burner 4 in supporting combustion of the major portion of the gas input stream at flame port 7. Maintenance of a flow gradient across pilot air ports 32 from air delivery chamber 27 to pilot chamber 18 is important. As is best seen from FIGURE IV, flow barrier 34 disrupts flow through air outlet port 36 to build up pressure in air delivery chamber 27.

Shell 8 and partition 19 define sight port 38 communicating with pilot chamber 18. A sight port 38 with a transculent member 39 permits viewing into the pilot chamber while preventing the escape of gases. Monitoring means such as a lead sulfide cell (not shown) are commercially available to detect flame.

It is apparent that wide changes may be made in the shown embodiment without departing from the spirit of invention defined by the following claims.

What is claimed is:

1. An ignitor for fuel burners comprising:

a hollow cylindrical container having an inboard end and an outboard end, said inboard end being open and forming a flame port,

a hollow cylindrical body concentrically located in closely spaced relationship within said container with apertures spaced along its surface and having an inboard end and an outboard end, said inboard end being open and adjacent said flame port whereby an air-delivery chamber is formed between said container and said body and a pilot chamber is formed within said body, said apertures having a total cross-sectional area which is comparatively smaller than said air-delivery chamber,

an air inlet located adjacent said outboard end of said cylindrical container adapted to introduce a stream of air to said air-delivery chamber, a major portion of said air stream being conveyed through said air-delivery chamber with larger cross-sectional area to said flame port and a minor portion of said air stream passing from said air-delivery chamber through said spaced apertures with smaller cross-

sectional area located on said body into said pilot chamber,

a separate gas conducting means within said hollow container having an inboard end and an outboard end, said inboard end being open and adjacent said flame port,

a gas flow divider means positioned across the outboard end of said pilot chamber and said gas conducting means, said divider means having a passageway therein to said pilot chamber and a passageway therein to said gas conducting means, said passageway to said pilot chamber being comparatively smaller in cross-sectional area than said passageway to said gas conducting means,

a gas inlet means including a pipe connected to said gas flow divider means and adapted to introduce a gas stream to said divider, a major portion of said stream entering the outboard end of said gas conducting means through said larger cross-sectional area in said divider and a minor portion entering the outboard end of said pilot chamber through said smaller cross-sectional area in said divider, and

a spark means in said pilot chamber located adjacent said outboard end, said spark means causing a pilot flame to burn in said pilot chamber, said pilot flame causing the gas stream issuing from the gas chamber to burn at said flame port.

2. An ignitor for fuel burners comprising:

a hollow cylindrical container having an inboard end and an outboard end, said inboard end being open and forming a flame port,

a hollow cylindrical body concentrically located within said container in closely spaced relationship to said container and having apertures spaced along the surface and having an inboard end and an outboard end, said inboard end being open and adjacent said flame port whereby an air-delivery chamber is formed within said body, said apertures having a total cross-sectional area which is comparatively smaller than said air-delivery chamber,

an air inlet located adjacent said outboard end of said cylindrical container adapted to introduce a stream of air to said air-delivery chamber, a major portion of said air stream being conveyed through said air-delivery chamber with larger cross-sectional area to said flame port and a minor portion of said air stream passing from said air-delivery chamber through said spaced apertures with smaller cross-sectional area located on said body into said pilot chamber,

a cylindrical gas conduit concentrically located within said pilot chamber having an inboard end and an outboard end, said inboard end being open and adjacent the flame port to deliver gas to said flame port,

a gas-flow divider means positioned across the outboard end of said pilot chamber and said gas conduit, said divider having a passageway therein to said pilot chamber and a passageway therein to said gas conducting means, said passageway to said pilot chamber being comparatively smaller in cross-sectional area than said passageway to said gas conducting means,

a gas inlet means including a pipe connected to said gas-flow divider means and adapted to introduce a gas stream to said divider, a major portion of said stream entering the outboard end of said gas conduit through said larger cross-sectional area in said divider and a minor portion entering said smaller cross-sectional area in said pilot chamber through said divider, and

a spark means in said pilot chamber located adjacent said outboard end, said spark means causing a pilot flame to burn in said pilot chamber, said pilot flame causing the gas stream issuing from the gas chamber to burn at said flame port.

3. An ignitor for fuel burners comprising:

a hollow cylindrical container having an inboard end and an outboard end, said inboard end being open and defining a flame port,

a cylindrical partition concentrically located within said container in closely spaced relationship to said container with spaced apertures along the surface and having an inboard end and an outboard end whereby an air-delivery chamber is defined between said container and said partition, said inboard end of said container extending further in an inboard direction than said inboard end of said partition, said inboard end of said partition being open, said apertures having a total cross-sectional area which is comparatively smaller than said air-delivery chamber,

a cylindrical conduit with an inboard end and an outboard end concentrically located within said partition, said inboard end being open, whereby a pilot chamber is defined between said partition and said conduit and a gas delivery chamber within said conduit, said inboard end of said partition extending further in the inboard direction than said inboard end of said conduit,

an air inlet located adjacent said outboard end of said cylindrical container adapted to introduce a stream of air to said air-delivery chamber, a major portion of said air stream being conveyed through said air-delivery chamber with larger cross-sectional area to said flame port and a minor portion of said air stream passing from said air-delivery chamber through said spaced apertures with smaller total cross-sectional area into said pilot chamber,

a gas-flow divider means positioned across the outboard ends of said pilot chamber and said gas conduit, said divider having a passageway therein to said pilot chamber and passageway therein to said cylindrical conduit, said passageway to said pilot chamber being comparatively smaller in cross-sectional area than said passageway to said cylindrical conduit,

a gas inlet means including a pipe connected to said flow divider means and adapted to introduce a gas stream into said divider, a major portion of said stream entering the outboard end of said gas conduit through said larger cross-sectional area in said divider and a minor portion entering said pilot chamber through said smaller cross-sectional area in said divider, and

a spark means in said pilot chamber located adjacent said outboard end, said spark means causing a pilot flame to burn in said pilot chamber, said pilot flame causing the gas stream issuing from the gas chamber to burn at said flame port.

4. An ignitor for fuel burners comprising:

an outer hollow cylinder having an inboard end and an outboard end, said inboard end being open and defining a flame port,

an intermediate hollow cylinder having an inboard end and an outboard end whereby an air-delivery chamber is defined between said outer cylinder and said intermediate cylinder, said intermediate cylinder being concentrically located within said outer cylinder and having spaced apertures therein, said inboard end of said outer hollow cylinder extending further in an inboard direction than said inboard end of said intermediate hollow cylinder, said inboard end of said intermediate hollow cylinder being open, said apertures having a total cross-sectional area which is comparatively smaller than said air-delivery chamber,

an inner hollow cylinder concentrically located within said intermediate hollow cylinder having an inboard end and an outboard end, said inboard end being open whereby a pilot chamber is defined between said intermediate cylinder and said inner cylinder and a gas delivery chamber is defined within said inner cylinder, said inboard end of said intermediate hol-

low cylinder extending beyond said inboard end of said inner hollow cylinder in an inboard direction,

an air inlet adapted to introduce a stream of air to said air-delivery chamber, a major portion of said air stream being conveyed through said air-delivery chamber with a larger cross-sectional area to said flame port and a minor portion of said air stream passing from said air-delivery chamber through said spaced apertures with a smaller cross-sectional area located in said intermediate cylinder into said pilot chamber,

a plate having orifices therein positioned across the outboard ends of said pilot chamber and said inner hollow cylinder, the orifice area adjacent said inner hollow cylinder being comparatively larger than the orifice area adjacent said pilot chamber,

a gas inlet means including a pipe connected to said plate adapted to introduce a gas stream to said plate, a major portion of said stream entering the outboard end of said inner hollow cylinder through said larger orifice area and a minor portion of said stream entering said pilot chamber through said smaller orifice area, and

a spark means in said pilot chamber to cause a pilot flame to burn, said pilot flame causing the gas stream

issuing from said gas chamber to burn at said flame port.

5. An ignitor according to claim 4 which includes:

a flow barrier located at the inboard end of said intermediate hollow cylinder, said flow barrier partially obstructing the air stream leaving said air-delivery chamber at said flame port whereby pressure is built up within said air-delivery chamber, and

wherein said spark means includes a spark plug.

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JAMES W. WESTHAVER, *Primary Examiner.*

PERCY L. PATRICK, *Examiner.*