July 12, 1966 R. J. ZOSCHAK ETAL 3,260,301

IGNITER

Filed Feb. 20, 1964

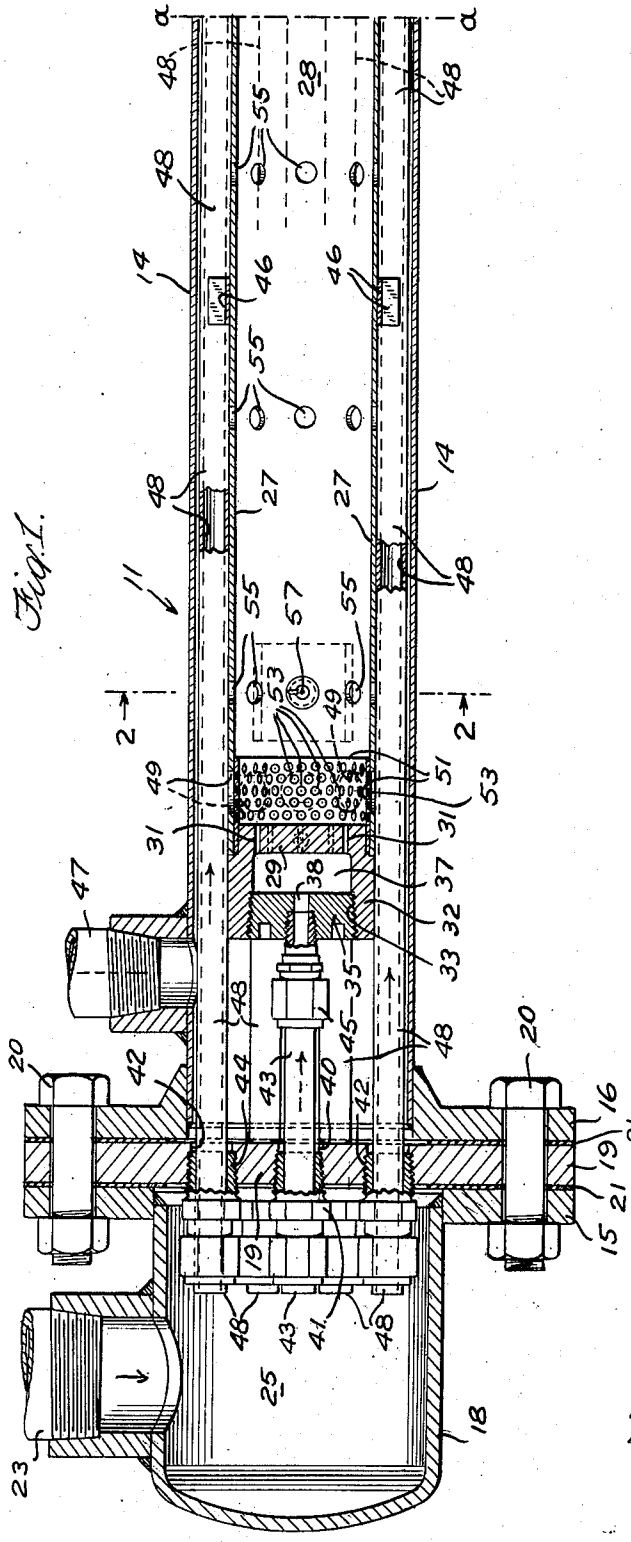

Fig. 1.

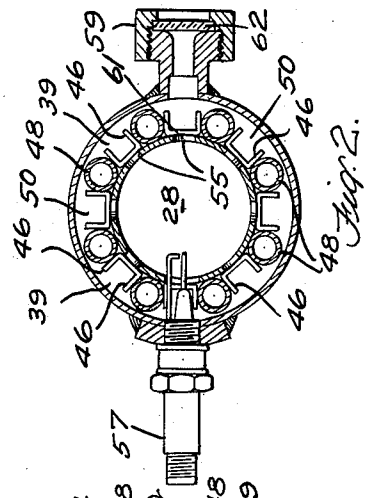

Fig. 2.

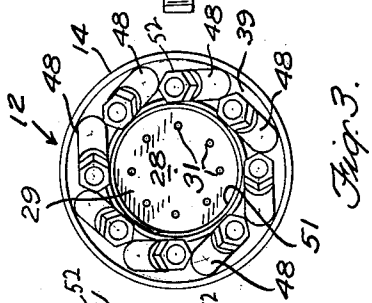

Fig. 3.

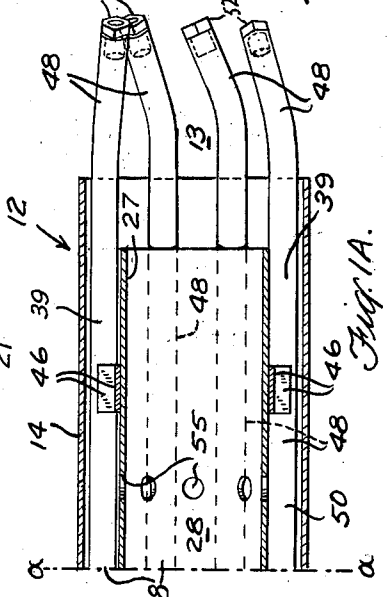

Fig. 1A.

INVENTORS
ROBERT J. ZOSCHAK
ROBERT E. SOMMERLAD
BY John Maier, III
ATTORNEY

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IGNITER

Robert J. Zoschak, Rutherford, and Robert E. Sommerlad, Cranford, N.J., assignors to Foster Wheeler Corporation, New York, N.Y., a corporation of New York

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This invention relates to igniters and more particularly to igniters using a gaseous fuel.

In the construction of gas-burning igniters, it is very important to achieve stability of combustion. According to this invention in order to obtain the desired stability, a pilot chamber is annularly disposed within an outer partition. In the space between the outer shield and the pilot chamber, a passageway is formed for supplying air to the flame port and for locating a series of individual conduits which delivered combustible gas to the flame port. Apertures in the pilot chamber permit a limited quantity of air from the passageway to enter the pilot chamber. An orifice plate at the outboard end of the pilot chamber permits only a limited quantity of combustible gas to enter the pilot chamber.

Also important in the construction of igniters is to provide for long life for preventing the heat of the burner being ignited from deteriorating such heat destructible parts of the igniter as the pilot ignition system. In accordance with this invention, this is achieved by locating such parts as remotely as possible from the burner heat. Such remotely located parts also provide for easier maintenance of the igniter.

An object of this invention is to provide an improved igniter.

Another object of this invention is to provide an igniter with stability of combustion.

Still another object of this invention is to provide an igniter which avoids deterioration from burner heat.

Still a further object is to provide an igniter which is readily maintainable.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a longitudinal section of the outboard end of the apparatus embodying the invention.

FIGURE 1A is a longitudinal section of the inboard end of the apparatus embodying the invention joined on the lines *a*—*a* of FIGURE 1.

FIGURE 2 is a transverse section taken on line 2—2 of FIGURE 1.

FIGURE 3 is an inboard end view of the apparatus embodying the invention.

Referring now to the drawings and particularly to FIGURE 1, the igniter has an outboard portion, generally designated by the numeral **11**, which is located outside a furnace or other burner enclosure (not shown). The igniter's inboard portion, generally designated by the numeral **12** and shown in FIGURE 1A, is located inside a furnace. The inboard portion **12** has a flame port **13** located at its extreme inboard end. The igniter passes through a wall (not shown) of the furnace and is so placed that the flame port **13** is adjacent the burner of the furnace. In this way the apparatus serves to ignite combustible fuel when it is emitted from the burner.

An outer partition **14** forms the outside surface of both the outboard portion **11** and the inboard portion **12** of the igniter. A shell **18** encloses the extreme outboard end of the outboard portion **11**. A flange **15** is connected to the shell **18**. A similar flange **16** is connected to the outer partition **14**. A plate **19** fits between the flange **15** and the flange **16**. The flanges **15**, **16** are pressed against the plate **19** by means of bolts **20**. Seals **21** are used

between the plate **19** and the flanges **15**, **16** to prevent leakage. A gas inlet **23** opens into the shell **18** which defines a gas-collection compartment **25**.

Within the outer partition **14** is a inner partition **27** which, as shown in FIGURE 1A, is withdrawn slightly within the outer partition **14** at the flame port **13**. The space encompassed by the inner partition **27** defines a pilot chamber **28** which is open at the flame port **13**. The opposite end of the inner partition **27** has an orifice plate **29** secured to it. Orifices **31** provide multiple small passageways through the orifice plate **29**. The total cross-sectional area of the orifices **31** is controlled by the amount of combustible fuel desired within the pilot chamber **28** formed by the inner partition **27**. A cyclindrical lip **32** protrudes from the orifice plate **29** thereby defining a threaded cavity **33**. A plug **35** is screwed part-way into the threaded cavity **33** to leave a space **37** between the plug **35** and the orifice plate **29**. A threaded opening **38** is located through the center point of the plug **35**.

Located approximately at the center point of the end plate **19** is a threaded opening **40**. Threaded into the opening **40** is a bushing **41** which secures a pilot gas-supply tube **43** to the plate **19**. The opposite end of the pilot gas-supply tube **43** is screwed by means of a fitting **45** to the threaded opening **38** in the plug **35**. The pilot gas-supply tube **43** thereby defines a passageway communicating between the gas-collection compartment **25** and the space **37** between the plug **35** and the orifice plate **29**.

An annular space **39** is located between the inner partition **27** and the outer partition **14**. A series of tubes or conduits **48** pass through the space **39** and extend beyond the outer partition **14** as shown in FIGURE 1A. At the flame port **13** the conduits **48** are bent, and the flame orifices **52** are attached. The opposite ends of the conduits **48** pass through threaded openings **42** in the end plate **19**. Bushings **44** are screwed into the openings **42** to seal the connection between conduits **48** and the end plate **19**. U-members **46** are circumferentially placed in a spaced relation to assure separation between the conduits **48**. As gas is supplied into the compartment **25** through the gas inlet **23**, a major portion of the gas flow passes through the conduits **48** and a minor portion of the flow passes through the tube **43** to the pilot chamber **28**. The bend at the inboard end and the orientation of the conduits **48** causes the combustible gas being discharged from the conduits **48** at the flame port **13** to swirl inwardly.

An air inlet **47** is provided through the outer partition **14**. Large apertures **49** are provided in the inner partition **27** to permit a minor portion of the air flow to enter the pilot chamber. A major portion of the air stream flows through a number of passageways **50** which are formed from the portion of the annular space **39** not occupied by the conduits **48**. An adjustable sleeve **51** may be provided having perforations **53** therein to regulate the cross-sectional area available for the flow of air through the large apertures **49**. Use of a sleeve **51** as well as the number and sizing of the apertures is, of course, a matter of choice. Small apertures **55** are provided in spaced locations about the circumference of the inner partition **27** to provide additional air to a flame in the pilot chamber **28** as the flame approaches the flame port **13**.

A spark plug **57** is provided which extends into the pilot chamber **28** to provide a spark therein for ignition of a pilot flame. A sight port **59** is located in line with an aperture **61** which is one of the group of small apertures **55** to permit viewing into the pilot chamber **28** through a transparent sheet **62**.

In operation, combustible gas is supplied through gas inlet **23** into compartment **25**. A major portion of the

gas flow passes into conduits **48** which deliver the gas directly to the flame port **13**. The bent ends and orientation of the conduits **48** swirl the gas streams inwardly. A minor portion of the gas passes through tube **43**. Air is supplied through air inlet **47**. A major portion of the air flows through passageways **50** between the conduits **48** to flame port **13**. A minor portion enters the pilot chamber **28** through the apertures **49**, **55**. When the spark plug **57** is electrically charged, a spark fires the gas and air mixture in the pilot chamber **28** and the flame in the pilot chamber **28** burns continuously through the full length of the inner partition **27**. As the flame progresses toward the flame port **13**, additional air continues combustion. This additional air which enters through the various apertures **55** is necessary to completely burn all the gas entering the pilot chamber **28** since the amount of air entering through the apertures **49** is inadequate for full burning of the gas being supplied through the orifices **31**. The pilot flame emerges from the pilot chamber **28** igniting the gas and air being discharged at the flame port **13**. As soon as the spark begins burning in the pilot chamber **28**, the spark plug **57** need no longer be electrically charged. The flame thus burning at the flame port **13** serves to ignite a burner located nearby.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An igniter for fuel burners comprising:
an outer partition defining a flame port at one end,
an inner partition with apertures therein located within said outer partition so that an annular space is formed between said inner partition and said outer partition and a pilot chamber is formed within said inner partition,
conduits occupying a portion of said annular space,
means for introducing combustible gas to said conduits and to said pilot chamber,
means for limiting the portion of combustible gas flowing into said pilot chamber so that a major portion of said combustible gas flows through said conduits to said flame port and a minor portion of said combustible gas flows into said pilot chamber,
an air inlet for introducing air, said air flowing through said annular space around said conduits, a major portion of said air being discharged from said annular space at said flame port and a minor portion entering said pilot chamber through said apertures, and
a sparker in said pilot chamber to cause a pilot flame to burn in said pilot chamber, said pilot flame causing the combustible gas flowing from said conduits to burn at said flame port.

2. An igniter according to claim **1** wherein:
said conduits extend beyond said outer and inner partition and are arcuately shaped at the flame port so as to swirl the combustible gas as it is discharged therefrom.

3. An igniter according to claim **1** wherein:
said outer partition extends slightly beyond said inner partition at said flame port, and
said conduits extend beyond said outer partition, the extending portions being arcuately shaped.

4. An igniter for fuel burners comprising:
an outer partition having an inboard end and an outboard end, said inboard end defining a flame port,
an inner partition with apertures therein located within said outer partition so that an annular space is formed between said inner partition and said outer partition and a pilot chamber is formed within said inner partition, said inner partition having an inboard end and an outboard end,
a shell forming a compartment at the outboard end of said outer partition,
an inlet for introducing combustible gas into said shell,
conduits extending from said compartment through said annular space to said flame port to provide a passageway for said combustible gas,
an orifice plate between said compartment and said pilot chamber for limiting the portion of combustible gas flowing into said pilot chamber so that a major portion of said combustible gas flows through said conduits to said flame port and a minor portion of said combustible gas flows into said pilot chamber,
an air inlet for introducing air, said air flowing through said annular space and around said conduits, a major portion of said air being discharged from said annular space at said flame port and a minor portion entering said pilot chamber through said apertures, and
a sparker in said pilot chamber to cause a pilot flame to burn in said pilot chamber, said pilot flame causing the combustible gas flowing from said conduits to burn at said flame port.

5. An igniter according to claim **4** wherein the outer partition and inner partition are concentric cylinders.

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FREDERICK L. MATTESON, JR, *Primary Examiner.*