July 25, 1961 J. R. GREINER ET AL 2,993,534

GAS BURNER IGNITER

Filed Nov. 3, 1958 2 Sheets-Sheet 1

Fig. 2

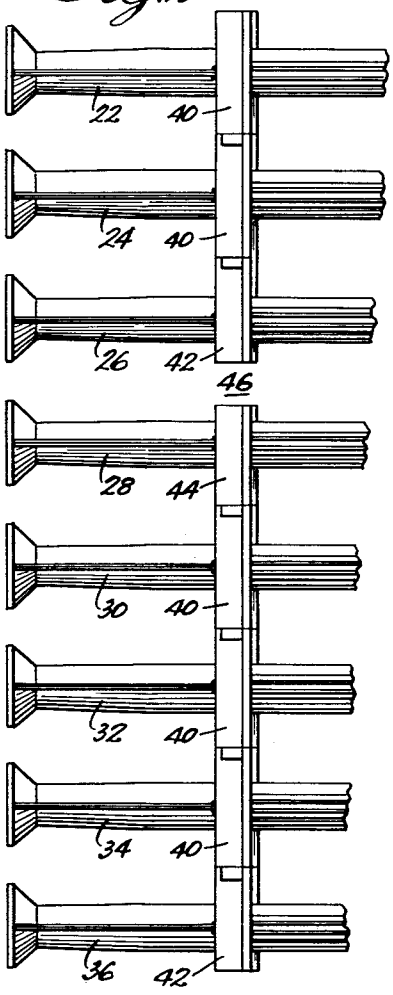


Fig. 1

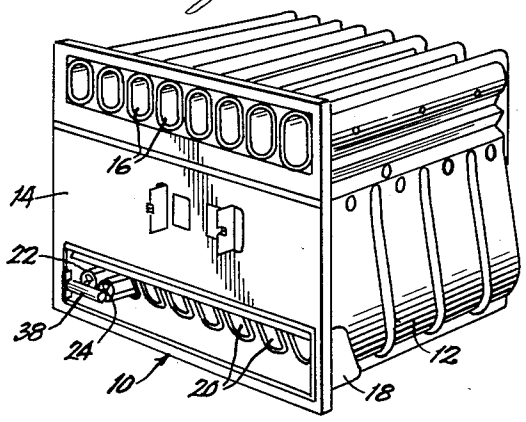
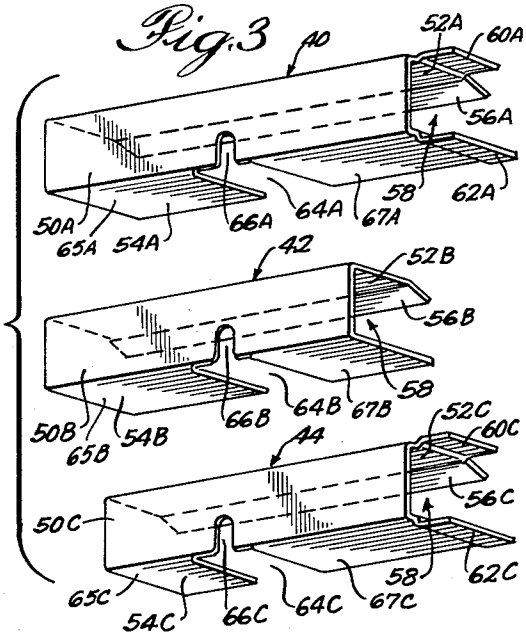


Fig. 3

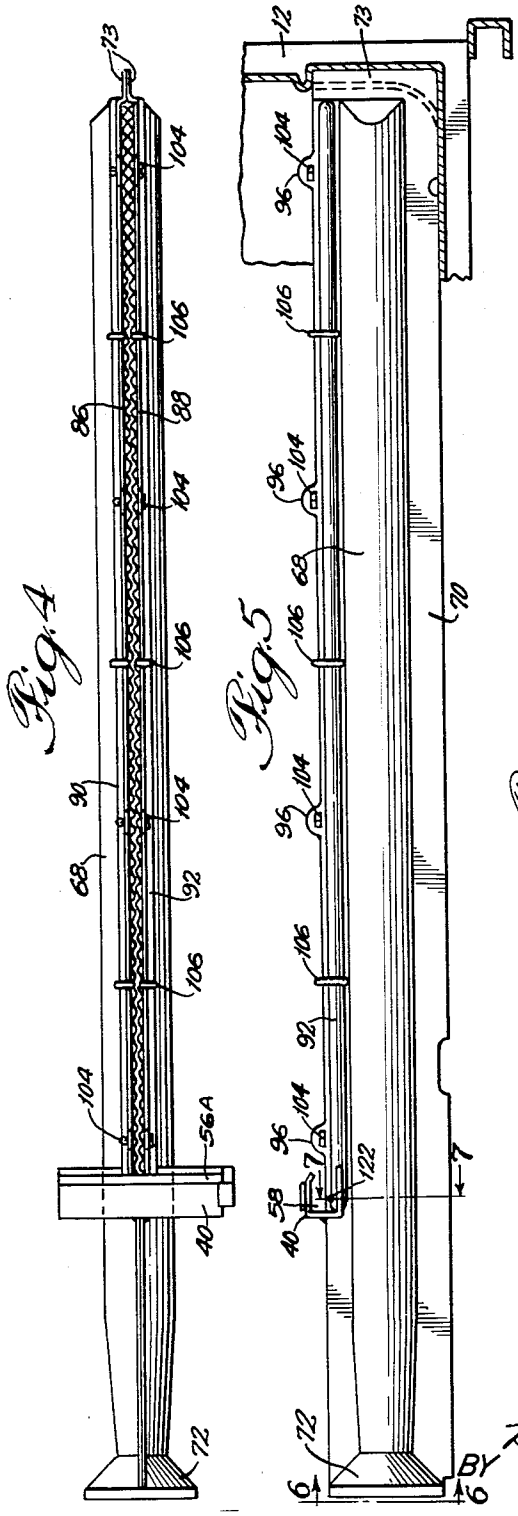


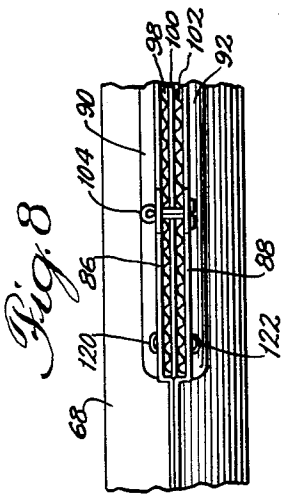
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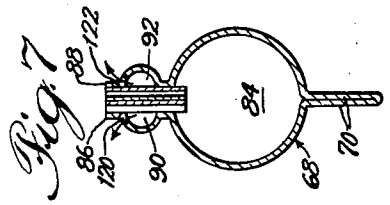
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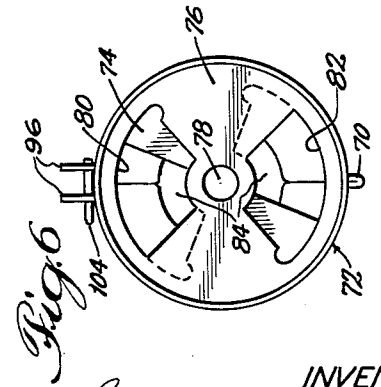
GAS BURNER IGNITER

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2,993,534
GAS BURNER IGNITER

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5 Claims. (Cl. 158—115)

This invention relates generally to improvements in the construction of elongated tubular gas burners, and more particularly to a novel "cross-over" ignition structure for multiple banks thereof.

In achieving gas furnace structures of extremely compact size with substantial heat output, it is of great importance to provide burner tubes capable of achieving a constant yet short flame height, and characterized by a uniformity of gas flow to produce instantaneous ignition, quiet burning and even heat transmission to the cooperating heat exchanger surfaces.

In multiple arrangements of burner tubes, and particularly where a substantial number of such tubes are disposed in immediately adjacent parallel relation, as is necessary for compact furnace structures of high heat output, substantially instantaneous yet quiet and non-hazardous ignition has not heretofore been achieved with compact and simple structures.

It is the primary object of this invention, therefore, to provide a combination of elongated gas burner tubes having a unitary lateral or "cross-over" igniter trough extending completely across all of the burner tubes for instantly spreading a pilot flame from a single pilot nozzle to each individual burner, whereby to achieve substantially instantaneous and quiet ignition in an extremely compact structural arrangement.

Further objects and advantages of this invention will become apparent as the following description proceeds, and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

A preferred embodiment of the invention is shown in the accompanying drawing, in which:

FIGURE 1 is a perspective view of a gas furnace construction of the type to which the principles and features of the present invention may be applied;

FIGURE 2 is a fragmentary top view of a bank of multiple burners employing the novel cross-over igniter trough of the present invention, and adapted to be inserted within the clam-shell heat exchangers of the unit of FIGURE 1, and within the vestibule panel pouch and burner inlet structure thereof;

FIGURE 3 is a perspective view of the three types of channel members which cooperate to define the cross-over igniter trough of FIGURE 2;

FIGURE 4 is a top plan view of a complete burner table constructed in accordance with the present invention;

FIGURE 5 is a side elevational view of the burner tube of FIGURE 4, showing its mounted relation within the cooperating heat exchanger structure of a furnace unit in fragmentary cross section at one end thereof;

FIGURE 6 is an end view taken in the direction as indicated by the line 6—6 of FIGURE 5;

FIGURE 7 is a vertical cross-sectional view taken substantially as indicated by the line 7—7 of FIGURE 5; and

FIGURE 8 is a fragmentary top view, on an enlarged scale, of the structure of FIGURE 4 with the cross-over channel member removed.

Referring now more particularly to FIGURE 1 of the drawing, we have illustrated a gas-fired furnace **10** of a type which has been designed for substantial heat output in an extremely compact structural "package." The

furnace **10** is primarily intended for mounting within a modular unit cabinet of fixed cross sectional size and low vertical height, particularly adapted for interchangeable vertical stacking arrangements of the type shown and described in detail in the co-pending application of John W. Norris, Serial No. 755,785, filed August 18, 1958, and having a common assignee with the present invention. The furnace **10** comprises a plurality of clam-shell heat exchangers **12** arranged in immediately adjacent side-by-side arrangement. Eight such heat exchangers have been illustrated, although it will be understood that smaller or larger numbers may be desired for particular design configurations. The heat exchangers **12** each communicate at their upper ends through flue outlets **16** of an interconnecting mounting plate or vestibule panel **14**. A pouch wrapper **18** cooperates with the heat exchangers **12** to provide an access chamber for a corresponding plurality of burner tube inlets **20** for each of the heat exchangers **12**.

In FIGURE 2 we have shown a bank of eight gas burner tubes **22** through **36** adapted to be inserted into the clam-shell heat exchangers **12** through the pouch wrapper **18** and the corresponding burner tube inlets **20**. It will be understood that the gas inlet ends of the burner tubes **22** through **36** will be disposed in cooperative relation with a gas supply manifold **38** (see FIGURE 1) which may be of any suitable type, such as that shown and described in our co-pending application Serial No. 764,576, filed October 1, 1958, and having a common assignee with the present invention.

In order to provide substantially instantaneous yet quiet and safe ignition of each of the multiple bank of burner tubes **22** through **36**, we have provided a novel "cross-over" igniter burner. Essentially, the igniter burner comprises a lateral gas transmitting trough communicating with all of the burners in opposite transverse directions from a single pilot nozzle. This trough is formed by means of three types of contiguously interconnected channel members fixedly secured to corresponding adjacent burner tubes. The three types of cross-over channel members are indicated in FIGURES 2 and 3 at **40**, **42** and **44**, respectively.

The first type, **40**, is of symmetrically balanced length extending equal distances at each side of the burner tube. The channel member **40** is employed on the tubes **22**, **24**, **30**, **32** and **34** of FIGURE 2, for reasons which will hereinafter become apparent. The second type of channel members, **42**, is similar to the type **40**, but is shortened at its right-hand side so as to terminate substantially closer to the burner tube than at its left-hand side. Similarly, the third type, **44**, is shortened at its left-hand side only. It is contemplated that the channel members **42** and **44** will cooperate to define a suitable pilot access space **46** between adjacent burners, such as **26** and **28** in FIGURE 2.

In FIGURE 3 of the drawing, identical or closely similar structural elements of each of the cross-over channel members **40**, **42** and **44** have been designated with the same reference numerals with added letter designations A, B and C for the respective channel members. The balanced channel member **40** will be referred to as type A, the shortened-right channel member **42** will be referred to as type B and the shortened-left channel member **44** will be referred to as type C. Each of the channel member types A, B and C provides a back wall **50**, a top wall **52**, and a bottom wall **54**, thereby defining a forwardly open-sided trough. The top walls **52** define a visor flange or shroud **56** which extends forwardly at a downward inclination. The enclosed space within the walls of the channel members defines a lateral gas igniter trough **58**, as seen in FIGURE 5 of the drawing. Channel members **40** and **44** are formed with top and bottom

coupling ears **60** and **62** so that adjacent channel members may be telescopically coupled together for aligned continuity of the trough **58** defined thereby. Each channel member is formed with a mounting slot **64** and a welding notch **66** so as to straddle and seat upon the top portions of the gas burners. The slot **64** is formed in the bottom wall **54** and between two sections **65** and **67** thereof.

When a plurality of burner tubes with the appropriate types of cross-over channels secured thereto are arranged and coupled in side-by-side parallel relation, as shown in FIGURE 2, gas and air admitted from the interior of each burner tube upwardly into its cross-over channel member will be laterally transmitted to the cross-over channels of the adjacent burner tubes. The trough **58**, therefore, serves as an "igniter burner" when supplied with gas and air so as to instantly spread a pilot flame from the access space **46** to each of the individual burners **22** through **36**, thereby enabling substantially instantaneous burner ignition without risk of substantial gas leakage between burners or non-uniformity of distribution therebetween for ignition purposes.

Each of the gas burners **22** through **36** is formed of a generally clam-shell type body **68** (see FIGURES 4 to 8) having integral lower opposed flanges defining a bottom web **70**, which extends from a gas and air inlet end **72** of enlarged or "bell" shape to a closed forward end formed by opposed edge flanges defining a sealed end web **73**. As best seen in FIGURE 6, the bell end **72** provides a pair of relatively rotatable and overlapping shutters **74** and **76** having a central gas inlet opening **78** extending therethrough for the introduction of a gas supply from the manifold **38** into the interior of the clam-shell body **68**. Registering cut-out portions of the respective shutters **74** and **76** serve to cooperatingly define variable apertures **80** and **82** for the admission of air to the interior of the clam-shell body **68**. A gas and air mixing and conducting chamber **84** is defined along the full length of each burner tube by its clam-shell body **68**.

Top edge flanges or lips **86** and **88** of the clam-shell body **68** are in engaged, sealed relation adjacent the inlet or bell end **72** of the clam-shell body **68**, as seen in FIGURE 7, and are widely spaced apart along the major length portion of the clam-shell body **68**. In this way, the spaced lips define an air and gas discharge slot into which the burner port-defining ribbon elements are adapted to be disposed, as best seen in FIGURES 7 and 8. Arcuately outwardly enlarged conduit portions **90** and **92** are defined by the spaced lips **86** and **88**, as best seen in FIGURE 7.

A port-forming assembly of two elongated ribbons of "ripple" or corrugated form **98** and **102**, and an intermediate flat strip **100**, are adapted to be disposed as a "sandwich" assembly within and between the spaced body lips **86** and **88**, as best seen in FIGURE 8. A plurality of cotter pins **104** are extended through the ears **96** to assist in maintaining the spaced lip portions **86** and **88** in tightly engaged relation against the port-forming ribbon assembly. The cotter pins **104** extend across the upper edges of the ribbon assembly so as to define an uppermost limiting position thereof within the spaced body lips **86** and **88**. A plurality of clip members **106** serve to provide resilient gripping means for supporting the port-forming ribbon assembly thereon in a fixed and predetermined lower position within the clam-shell body **68**. In this way, a multiplicity of gas-air flow outlets are provided for discharge from the gas chamber **84** and combustion.

A pair of igniter orifices **120** and **122** provide restricted gas flow from the arcuate conduit portions **90** and **92** of the spaced body lips **86** and **88** into the cross-over channel member thereabove, as best seen in FIGURES 5, 7 and 8 of the drawing. In this way gas and air are transmitted to the igniter burner or trough **58** both from the ribbon ports therein and the supplementary

orifices **120** and **122**. The ribbon assembly **98** to **102** is fixedly positioned by the cotter pins **104** and the clips **106** entirely below the spaced lips **86** and **88** and at a substantial depth within the clam-shell body **68** so as to extend downwardly into the gas chamber **84**. This substantial height of the ribbon assembly relative to the height of the gas chamber **84** and its discharge space defined by the spaced lips **86** and **88** serves to increase the over-all tube pressure back-up to a higher level than has heretofore existed in ribbon type burners, thereby insuring a uniform and relatively high pressure along the full length of the gas chamber **84**. In this way, a substantial gas flow is assured upwardly through the ribbon ports within the cross-over channel members and through the supplemental orifices **120** and **122**, thereby enabling a rapid uniform lateral transmission of gas across the full extent of the trough **58** for substantially instantaneous but quiet combustion initiation. In addition, the particular mounting of the port-forming ribbon assembly **98** to **102** insures a tightly engaged "sandwich" with the spaced body lips **86** and **88**, and eliminates gaps or irregularities which create risks of leakage and possible flash back.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and, therefore, it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a gas furnace of the type including a plurality of elongated hollow burner tubes arranged in closely adjacent and longitudinally parallel relation, each tube defining an elongated chamber having an inlet adapted to receive a combustible gas and air mixture and having a multiplicity of longitudinally aligned outlet ports for discharge upwardly therefrom, the improvement in combination with said burner tubes comprising a unitary cross-over igniter trough transversely interconnecting said burner tubes, said trough comprising a plurality of elongated channel members each mounted transversely on a separate burner tube, said channel members including means for detachably coupling them together in longitudinally aligned continuity at the adjacent ends thereof, and each including enclosing walls overlying all of the plurality of outlet ports thereunder of the corresponding burner tube, and a bottom wall including two wall sections each extending transversely from one side of the corresponding burner tube below the outlet port openings and adapted with a bottom wall section of the adjacent channel member to provide a bottom trough wall extending from said corresponding burner tube to the adjacent burner tube, said bottom wall having a mounting slot between said wall sections receiving the corresponding burner tube therein, said trough serving to receive from each burner tube the full discharge of said combustible mixture entirely upwardly from the outlet ports therein and effect a lateral intercommunication of the burner tubes, whereby an ignition flame introduced at a single point along the length of said trough will be substantially instantaneously transmitted to effect substantially simultaneous and quiet ignition of all of said burner tubes.

2. Apparatus as defined in claim 1 wherein said channel member coupling means comprise longitudinally extending coupling ears on one channel member adapted for telescopically receiving the adjacent channel member.

3. Apparatus as defined in claim 1 wherein said enclosing walls include a top wall terminating in a visor flange inclined downwardly toward said outlet ports.

4. Apparatus as defined in claim 1 wherein said outlet ports extend downwardly into said chamber for a substantial distance relative to the chamber, thereby providing a back pressure in said tubes for maintaining

a substantial discharge flow of said combustible mixture through said outlet ports.

5. In a gas furnace of the type including a plurality of elongated hollow burner tubes arranged in closely adjacent and longitudinally parallel relation, each tube defining an elongated chamber having an inlet adapted to receive a combustible gas and air mixture and having a multiplicity of longitudinally aligned outlet ports for discharge upwardly therefrom, the improvement in combination with said burner tubes comprising a unitary cross-over igniter trough transversely interconnecting said burner tubes, said trough comprising a plurality of elongated channel members each mounted transversely on a separate burner tube, said channel members including means for detachably coupling them together in longitudinally aligned continuity at the adjacent ends thereof, and each including enclosing walls overlying all of the plurality of outlet ports thereunder of the corresponding burner tube, and a bottom wall including two wall sections each extending transversely from one side of the corresponding burner tube below the outlet port openings and adapted with a bottom wall section of the adjacent channel member to provide a bottom trough wall

extending from said corresponding burner tube to the adjacent burner tube, said bottom wall having a mounting slot between said wall sections receiving the corresponding burner tube therein; and additional outlet ports provided in said burner tubes on each side of said first-named outlet ports and within said trough for supplemental discharge of said combustible mixture thereinto; said trough serving to receive from each burner tube the full discharge of said combustible mixture entirely upwardly from the outlet ports therein and effect a lateral intercommunication of the burner tubes, whereby an ignition flame introduced at a single point along the length of said trough will be substantially instantaneously transmitted to effect substantially simultaneous and quiet ignition of all of said burner tubes.

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