July 10, 1951 A. E. MARTOIS 2,559,979

MULTIPLE GAS BURNER

Filed Feb. 23, 1945 2 Sheets-Sheet 1

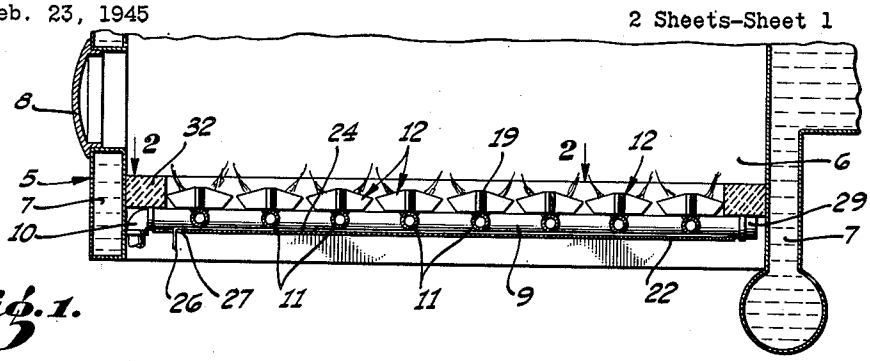


Fig. 1.

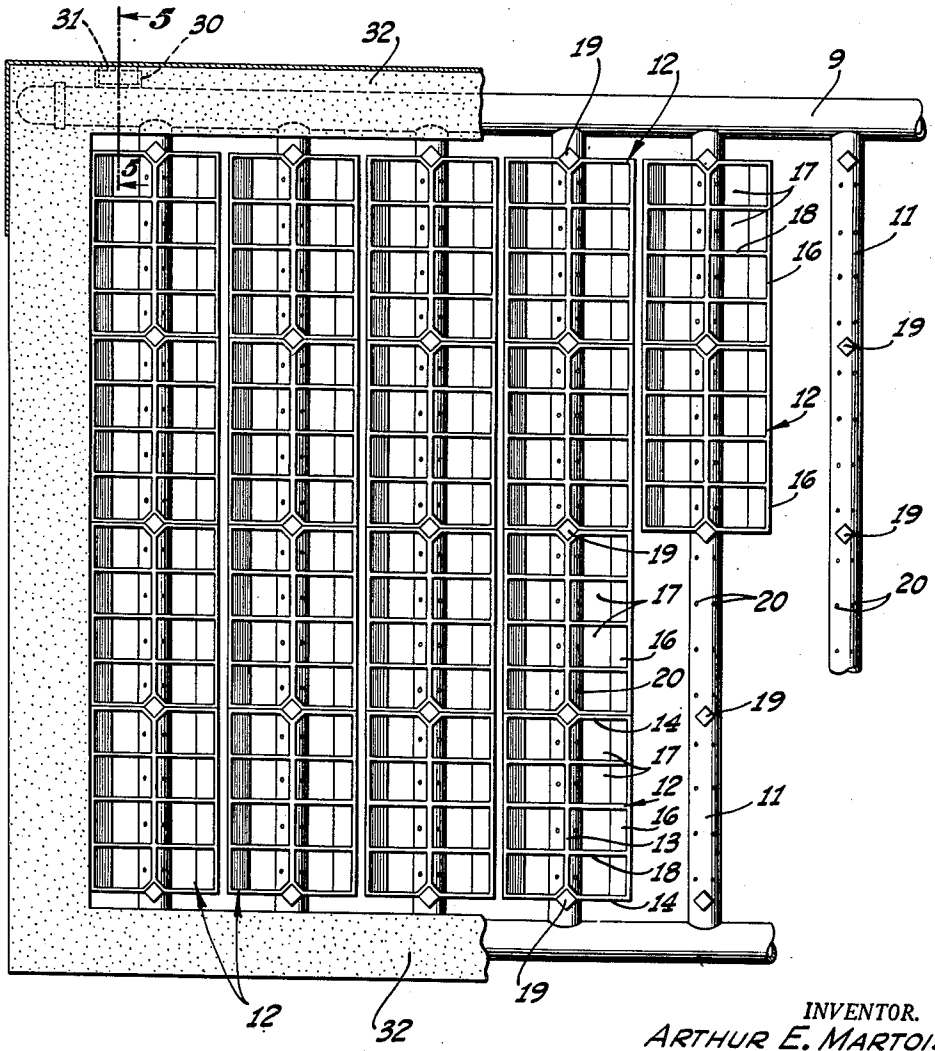


Fig. 2.

INVENTOR.
ARTHUR E. MARTOIS,
BY
Westall & Westall
ATTORNEY.

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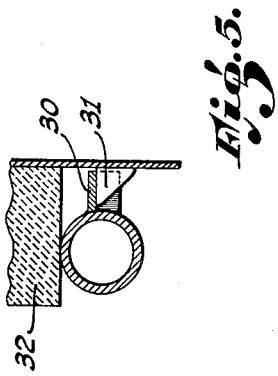


Fig. 5.

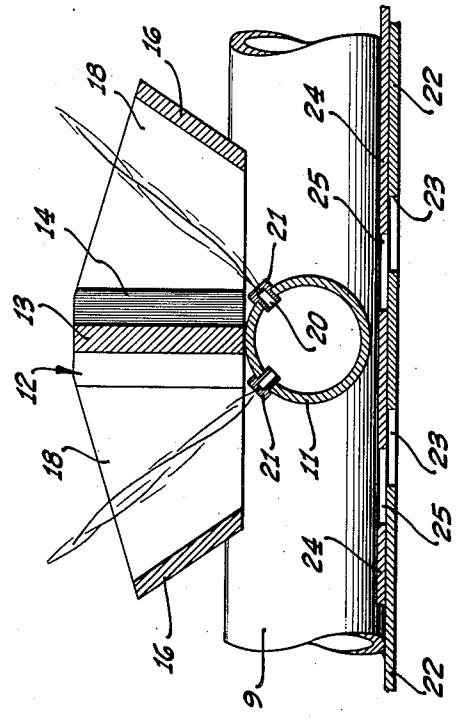


Fig. 4.

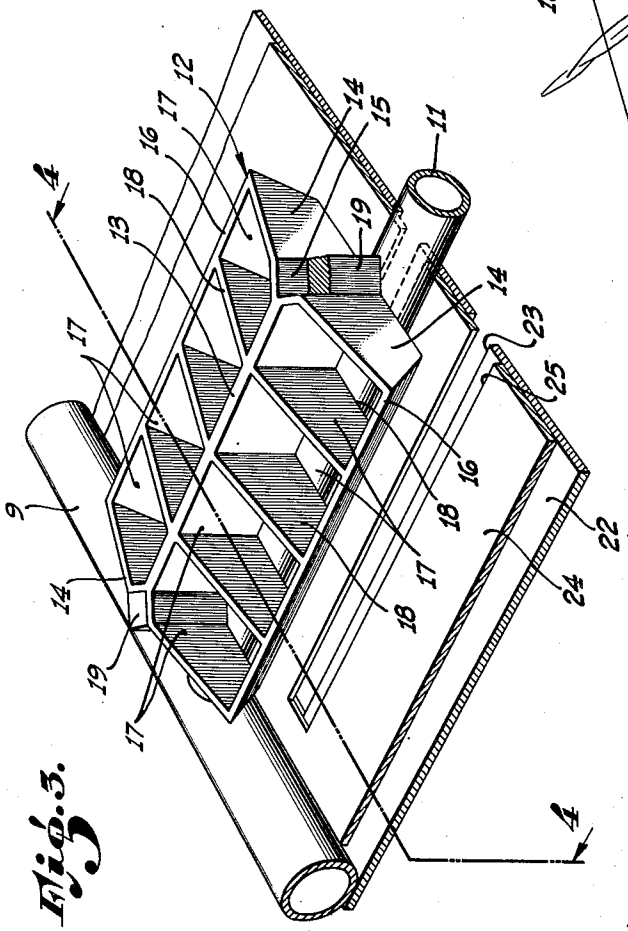


Fig. 3.

INVENTOR.
ARTHUR E. MARTOIS,
BY
Westall & Westall
ATTORNEY.

Patented July 10, 1951

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MULTIPLE GAS BURNER

Arthur E. Martois, Torrance, Calif.

Application February 23, 1945, Serial No. 579,357

5 Claims. (Cl. 158—106)

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This invention relates to gas burners of the general character commonly employed in combustion chambers of boilers, kilns, furnaces and the like to provide fuel for heating purposes by effecting the admixture of gas and air in proper variable proportions, depending upon gas pressure, and has particular application to portable locomotive-type firebox boilers utilized in many oil fields. The invention contemplates improvements in the burners described and claimed in my patents, No. 2,231,391, dated February 11, 1941, and No. 2,296,475, dated September 22, 1942.

The conventional fire-tube boiler employed in oil fields is usually provided with a large firebox, surrounded by a water jacket. Tubes, leading from the firebox, carry the heat through the main water chamber to the stack. A principal problem encountered in the art prior to my invention has been to provide a heating unit, commensurate with the size of the firebox, having a plurality of burners, each of maximum efficiency, in sufficient number and arranged to assure an even distribution of the heat produced, so as to obviate the formation of relatively hot and cold areas within the firebox, and insure maximum capacity on low gas pressure.

A principal object of the present invention is to provide a compact, flat burner assembly designed to effect a reduction in the vertical dimension of the area normally occupied by prior art burners in the firebox of boilers, and thereby afford a larger combustion zone above the burners, as well as to avoid the direction of flame against the crown sheet and inner walls of the firebox.

Another object is to provide a sectional manifold to supply gas to each of a series of mixing chambers of each of a plurality of separable mixing units arranged and supported in adjacent rows on the manifold in any number desired, depending solely upon the size of the firebox in which the assembly is to be accommodated, the mixing chambers of units arranged in adjacent rows being formed and disposed to direct the volumes of fuel mixed therein obliquely upward to the vertex of their angle of direction where they impinge and commingle, reducing flame length and causing the redirection of their components laterally in a secondary mixing zone immediately above the space between the rows of mixing units, through which space additional air may be drawn to effect a more uniform mixture of air and gas in proper proportions.

Another and highly important object hereof is the provision of a burner assembly utilizing a large number of gas jets whereby substantially

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the entire cross-sectional area of the boiler firebox is converted into a plurality of individual mixing chambers with the area immediately thereabove affording a secondary mixing zone to effect a more uniform distribution of the fuel produced in the individual chambers so as to assure maximum utility of the area of the firebox available for fuel consumption and correspondingly greater efficiency, especially when the gas pressure is extremely low.

Still another object is to provide a novel device for releasably and individually securing each mixing unit in proper postiion on the manifold with respect to the gas jets by which it is fed, to facilitate assembly of a composite burner of any desired width or length.

Other objects and corresponding advantages are economy of manufacture incident to a reduction in number of parts, resulting in a saving in both labor cost and in critical materials required, simplicity of adjustment of the mixture effected in each mixing chamber, low weight, facilitating transportation without disassembly, and durability.

Referring to the drawings:

Fig. 1 is a fragmentary section of a boiler of one type to which my invention is particularly well adapted, illustrating the novel burner assembly operatively disposed in the firebox.

Fig. 2 is an enlarged plan view of the inside of the firebox shown in Fig. 1, depicting the arrangement of the headers and gas distributing tubes with the sectional mixing units releasably supported by the latter;

Fig. 3 is a perspective view, partially broken away, illustrating the means by which the mixing units are secured on the manifold, and further illustrates the valvular means by which the proportions of air to gas may be controlled;

Figs. 4 and 5 are sectional views taken on correspondingly numbered lines of Figs. 3 and 2, respectively.

Referring to the drawings in detail, the numerals of which indicate similar parts throughout the several views, 5 designates generally a conventional locomotive type boiler of the character commonly employed in oil fields. Surrounding the firebox 6 of boiler 5, the walls are hollow to form water chambers 7, which are in communication with the main water chamber of the boiler (not shown). The usual door, through which the firebox may be inspected, is indicated at 8. A header or pipe 9 extends along each of the two opposed side walls of the firebox and is equipped with an L-fitting 10 at its for-

ward end for connection to a gas main or other source of supply. The opposite end of each of the header pipes 9 are capped as at 29, the caps being removable to facilitate cleaning of the pipes by air pressure, when necessary. A channel section 30 is welded or otherwise secured in inverted position to the side of each pipe adjacent each of its ends for support on lugs 31 mounted on the walls of the firebox. It will be noted that the channels 30 are of sufficient width with respect to the thickness of the lugs 31 to permit longitudinal adjustment of the header and mechanism associated therewith hereinafter described, so as to facilitate placement of the unit in the firebox. Extending between and in communication with opposed headers 9, are a plurality of tubes 11 arranged in equi-spaced parallel relation and transverse to the longitudinal axis of the unit. The number of the distributing tubes 11 and the distance between adjacent tubes will depend, respectively, upon the size of firebox 6 for which the burner is constructed, and the width of the mixing units 12, about to be described, as will appear.

The mixing units of the preferred form of my invention illustrated and herein described preferably consist of castings composed of a high grade heat-resisting burner metal (though they may be composed of any refractory material), and are each generally rectangular in form as illustrated most clearly in Fig. 2. Each mixer 12 is formed with a central partition 13, from the ends of which end walls 14 diverge at substantially a 45° angle for a short distance to provide a right angular recess 15 for a purpose hereinafter described, and then extend in parallel relation to the point of joinder with the side walls 16 which lie in oblique planes having a vertex below the partition, as indicated in Figs. 3 and 4. While the lower edges of partition 13, side walls 15 and end walls 14 lie in a common plane, the upper edges of the end walls diverge downwardly on either side of partition 13, joining with the upper edges of respective side walls 16 which are accordingly narrower than the partition. Each mixing unit 12 is divided into eight mixing chambers 17 of equal size by three transverse partitions 18, having upper and lower edges parallel with corresponding edges of the end walls at respective sides of partition 13.

The mixing units 12, when operatively assembled, are supported by the manifold tubes 11 and, in a boiler of standard size of the character hereinabove referred to and illustrated in Fig. 1, four mixing units are carried in alignment, with their ends in contiguous relation, on each transverse distributing tube 11 of the manifold. A plurality of pins 19, square in cross-section, are welded in upright position on tubes 11 in spaced relation to engage the ends of respective mixing units 12 to maintain the described relationship of the units on the manifold. In the embodiment depicted in the drawings, five pins 19 are mounted on each tube 11 and are spaced apart distances equal to the lengths of the mixing units 12, and are each arranged with the diagonal of the square of their cross-section parallel with the axis of the tube 11 to which they are secured, so as to engage snugly in the right angular recesses 15 in the end walls of the units. As will be observed from Fig. 2, pins 19 intermediate the ends of tubes 11 are adapted to engage adjoining ends of two abutting mixing units 12, while the end pins 19 on each tube 11 reinforce the position of the adjacent end of the outermost mixing units, respectively. Thus, the pairs of pins 19, engaging opposite ends of each mixing unit 12, hold the unit firmly against tilting, lateral or longitudinal motion while permitting facile removal and replacement, when necessary, by lifting it from between the pins 19.

Each distributing tube 11 is formed with a plurality of orifices 20, equal in number to the total number of mixing chambers 17 of the units 12 supported thereby, through which orifices 20 gas may be supplied to each chamber 17. The orifices 20 are arranged in pairs in the upper arc of each tube 11 on radii of the latter, passing through approximately the middle of each pair of mixing chambers 17 disposed at opposite sides of the partition 13 of each mixing unit, respectively. Each orifice 20 may be of sufficient size to receive, in threaded engagement, a jet 21 of conventional construction as indicated in Fig. 4.

Gas discharged from orifices 20 into the mixing chambers 17 is effective to draw air from below and on either side of each distributing tube 11. In order to control the volume of air admitted into each mixing chamber 17, and to permit an adjustment of the mixture of air and gas, I provide a valvular structure below the distributing tubes comprising a stationary plate 22 having its edges welded on opposite sides to the underside of the headers 9, respectively. Plate 22 is formed with a plurality of slots 23 disposed parallel to distributing tubes 11 and arranged directly under respective rows of mixing chambers 17 of the units carried by the tubes of the manifold. Each slot 23 is of a length substantially equal to the lengths of the distributing tubes, so as to provide a uniform flow of air for each of mixing chambers 17 which it is adapted to accommodate. A valve plate 24 is superimposed upon plate 22, and is slidable thereon between opposed headers 9 in a direction transverse to the slots 23 in plate 22. Valve plate 24 is formed with a plurality of slots 25 arranged to coincide with, and of the same size as, slots 23 of the stationary plate 22, but being slidable on plate 22, may, by such adjustment, vary the degree of registry or effect the complete misalignment of slots 23 and 25 of the respective plates 22 and 24, and thereby limit and control the flow of air through the slots into the mixing chambers 17. The valve plate 24 is manipulated manually by means of a handle 26, secured to the forward edge of plate 24 and projecting downwardly through a slot 27 in the stationary plate 22 adjacent the front wall of the firebox 6, as is indicated in Fig. 1. After installation of the unit in a firebox, the space between the walls of the firebox and the mixing chambers may be substantially filled with firebrick, as indicated at 32 (Figs. 1 and 2) or a metal plate, if desired.

It will thus be observed that I have provided a compact sectional burner of uniform application and simple construction, comprising a plurality of identical mixing units, which facilitates assembly of a composite structure of any size necessary to meet specific requirements, each mixer being removable from the unit to permit cleaning of the gas jets 21 or orifices or replacement of any of the mixers. An important feature of the invention will be seen to reside in the arrangement and construction of

the various individual components whereby the mixers are supported directly by the gas feeder pipes, so as to assure minimum burner height and a complementary larger combustion chamber, which is utilized most effectively incident to the close relationship of the mixers and the oblique arrangement of the mixing chambers 17 of each unit, and gas jets therefor, whereby the combustible mixture emanating from each chamber is directed laterally as well as upwardly. Thus, the blast or flow of air and gas, effecting a primary mixture within each mixing chamber, impinges upon and intermingles with a flow of the mixture emanating from the opposed chamber 17 of an adjacent unit at the opposite side of the passage formed between the rows of mixing units. As the commingling of the mixtures from adjoining rows of mixing units occurs directly above the passage just referred to, in which zone combustion is initiated, a volume of secondary air is drawn upwardly through each passage to facilitate complete combustion and the disbursal of the mixtures and flame throughout the firebox, assuring maximum efficiency even at very low gas pressures.

While I have shown and described but one preferred embodiment of my invention, it will be understood that numerous changes in size, design, shape, proportion and number of the various parts may be made; that other means well known in the art may be utilized to effect the releasable connection between the mixing units and their supporting pipes, or that the recesses 15 may be of different contour with corresponding changes in the shape of the pins; that each unit may be equipped with more or fewer mixing chambers; that the precise angle of ejection of the gas from the feeder pipes is not critical, but may be varied, with corresponding changes in arrangement of the mixing chambers, to meet specific requirements; that conventional apparatus for mechanically controlling the air admitted into the firebox may be incorporated; and that the gas jets 21 as illustrated may be omitted if desired—all without departing from the spirit of my invention as defined in the appended claims.

What I claim and desire to secure by Letters Patent is:

1. In a burner assembly, a plurality of gas distributing pipes arranged in parallel relation, a plurality of mixing units supported on said pipes, each of said mixing units comprising a plurality of mixing chambers overhanging opposite sides of the pipes on which said mixing units are supported, respectively, said pipes having orifice means therein to direct gas obliquely upward into said mixing chambers, respectively, said pipes and the respective mixing units carried thereby being adjacent one another, whereby gas emanating from the orifices in adjacent pairs of pipes is directed through the mixing chambers of the units supported thereon into a common secondary mixing zone above and in vertical alignment with the area between said mixing units supported on said pairs of pipes, respectively, a stationary plate disposed below and parallel to said pipes substantially closing the area therebelow and having a slot therein beneath each series of said mixing chambers overhanging each side of each pipe, and a valve plate in contiguous relation with and slidable relative to said stationary plate having slots therein adapted to be moved into and out of registry with the slots in said stationary plate to control the flow of air into said mixing chambers and into said secondary mixing zone.

2. In a burner assembly, a gas distributing pipe, a pair of mixing units supported upon said pipe in serial contiguous relationship with one another, each of said mixing units having mixing chambers therein, means secured in rigid relationship with said pipe to resist movement of said mixing units longitudinally of said pipe, adjoining contiguous portions of said respective mixing units having registering recesses therein, means mounted upon said pipe engageable in both of said recesses to resist lateral motion of adjoining ends of said mixing units with respect to said pipe, said pipe having orifices therein to direct gas into said mixing chambers of each of said mixing units.

3. In a burner assembly, a gas distributing pipe, a pair of mixing units, each comprising a pair of parallel end walls, a plurality of intermediate walls parallel with said end walls, and a medial partition forming two parallel rows of equi-spaced mixing chambers, means to support said mixing units upon said pipe in adjoining relationship with nearest adjacent end walls of said units, respectively, in contiguous parallel relationship, the rows of said mixing chambers at corresponding sides of the partitions of said units being aligned with one another and overhanging corresponding lateral arcs of said pipe, the mixing chambers comprising the aligned rows being disposed in substantially equi-spaced relationship from said pipe, said pipe having orifice means therein to direct gas radially from said pipe obliquely upward into said mixing chambers, respectively.

4. In a burner assembly, a pair of spaced parallel gas distributing pipes, a mixing unit supported upon and in contiguous relationship with each of said pipes, each of said mixing units comprising flat side walls, a plurality of transverse walls extending between said side walls, and a medial partition forming two parallel rows of mixing chambers at opposite sides, respectively, of said partition and means carried by said pipes, respectively, to maintain said mixing units in adjacent spaced relationship with one another with the upper edges of nearest adjacent side walls of said units in spaced, parallel relationship, said pipes having orifice means therein to direct gas obliquely upward on radii of said pipes through said mixing chambers, respectively, and into the zone above the space between said adjacent side walls of said respective units.

5. In a burner assembly, a pair of spaced, parallel gas distributing pipes, a pair of mixing units supported upon and in contiguous relationship with each of said pipes, each of said mixing units comprising side walls having straight upper edges, parallel end walls, a plurality of transverse walls extending between said side walls, and a medial partition, forming two parallel rows of mixing chambers at opposite sides, respectively, of said partition, and means carried by said pipes to maintain end walls of the mixing units supported upon each pipe in contiguous relationship, and the upper edge of a side wall of each of said mixing units carried by each of said pipes disposed in spaced, parallel relationship with an upper edge of a side wall of a mixing unit supported upon the other of said pipes, said pipes having orifice means therein to direct gas obliquely upward on radii of said pipes, respectively, through said mixing chambers of the mix-

ing units supported on said pipes, respectively, and into the zone above the space between said adjacent side walls of the mixing units carried by the respective pipes.

ARTHUR E. MARTOIS.

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