

GAS BURNER.

Patented Oct. 24, 1916.

2 SHEETS--SHEET 1.

1,202,736.

FIG.4

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GAS BURNER.
APPLICATION FILED JUNE 19, 1916.

1,202,736.

Patented Oct. 24, 1916.
2 SHEETS--SHEET 2.

FIG. 2

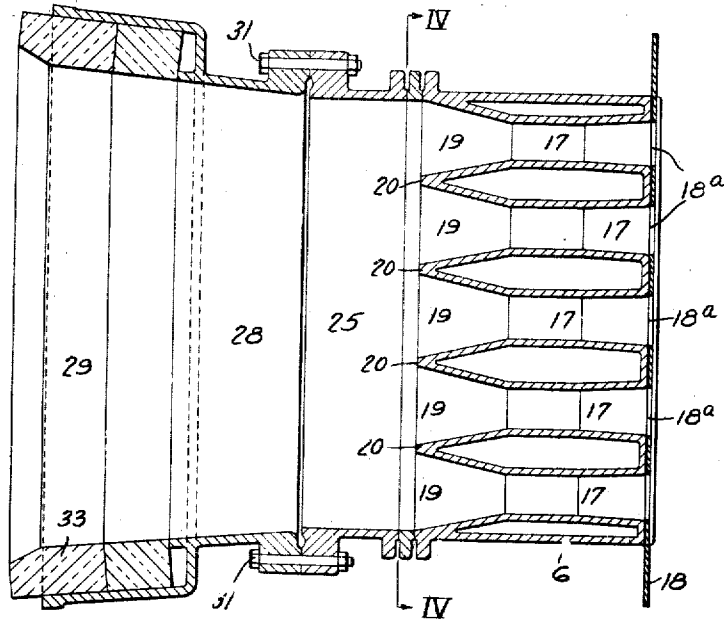
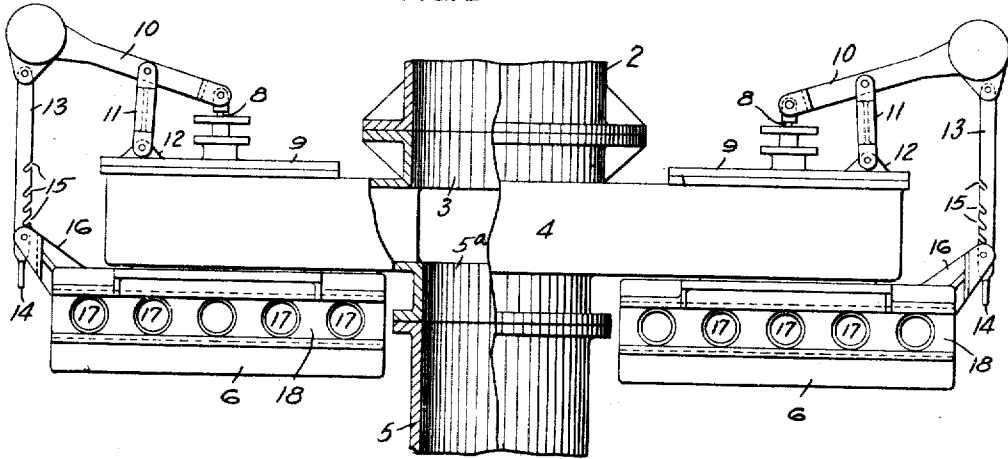


FIG. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

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GAS-BURNER.

1,202,736.

Specification of Letters Patent.

Patented Oct. 24, 1916.

Application filed June 19, 1916. Serial No. 104,540.

To all whom it may concern:

Be it known that we, FRED E. KLING and LUTHER B. WEIDLEIN, both citizens of the United States, and residents of Youngstown, in the county of Mahoning and State of Ohio, have invented certain new and useful Improvements in Gas-Burners, of which the following is a specification.

Our invention relates to the construction of gas burners and more particularly gas burners for steam boiler furnaces employed in burning blast furnace gases.

One object of the invention is the provision of a gas burner of improved construction having novel means whereby the combustible gases and air are caused to intimately mix and whereby the mixture of gas and air is uniformly distributed over the width of the combustion chamber of the steam boiler furnace.

Another object of our invention is to provide a gas burner having novel means whereby the combustible gases and air are stratified and caused to enter the gas burner mixing chamber in a series of thin, wide layers or streams, uniformly distributed over the width of the furnace combustion chamber.

A further object of the invention is to provide a gas burner having improved means whereby the quantity of air supplied to the burner and mixed with the combustible gases is regulated and controlled with changes in the pressure of the gases.

Still further objects of our invention consist in the provision of the novel constructions, combinations and arrangements of parts shown in the drawings, more fully described hereinafter, and particularly specified in the appended claims.

Referring now to the drawings forming part of this specification, Figure 1 is a sectional side elevation showing the front end of the combustion chamber of a steam boiler furnace having a gas burner constructed and arranged and applied for use therewith in accordance with our invention. Fig. 2 is an end elevation of the gas burner shown in Fig. 1. Fig. 3 is a sectional plan, the section being taken on the line III—III of Fig. 1, showing details in the construction of the air and gas passages in the distributing chamber forming part of our improved gas burner. Fig. 4 is a sectional end elevation, the section being taken on the line IV—IV of Fig. 3, showing the partitions in the primary nozzle for delivering the gases and

air in stratified layers into the secondary nozzle of our improved gas burner.

In the accompanying drawings, the numeral 2 designates a vertical gas flue leading downwardly from a horizontal overhead gas main (not shown) to the gas inlet 3 of a gas box 4. A dust outlet 5^a on the lower side of the gas box opens into the upper end of a vertical dust collecting leg 5, the gas inlet 3 and dust outlet 5^a being in vertical alinement. The hollow dust leg 5 may conveniently be employed as a support for the gas box and for part of the weight of the horizontal overhead gas main located above the gas box. A cleaning door on the bottom of the hollow dust leg provides means for removing accumulations of dust therefrom.

The gas box 4 which is arranged to extend lengthwise in front of a steam boiler furnace has ends overhanging the dust leg 5 and suspended from the lower side or bottom of the gas box at each end thereof is a gas distributing chamber 6 forming part of our improved gas burner. The open upper ends of the distributing chambers connect into the interior of the gas box 4 and a disk valve 7 is employed to close the opening into the distributing chambers and to regulate and control the flow of gas into each gas distributing chamber 6. Each valve 7 has a vertical stem 8 which extends upwardly through a stuffing box and gland on the head 9 closing the opening in the upper face of the gas box 4, and the valve stem is pivotally connected to one end of a counterweighted swinging lever 10. The lever 10 is pivotally connected by a link 11 to an ear or lug 12 on the head 9 and the weighted end of the lever 10 is pivotally connected to the upper end of a depending arm 13 having a grip 14 at its swinging lower end. Notches 15 in one edge of the arm 13 coact with a pin in the bracket 16 on the ends of the gas distributing chambers 6 to hold the valve 7 in adjusted position.

The suspended gas distributing chambers 6 are wide and shallow and of relatively much greater length. Each chamber 6 is provided with a series of air tubes 17 which extend lengthwise across the width of the distributing chamber. The inlet ends of the air tubes 17 are circular in cross section and a slide 18 on one end of the gas chamber 6 has a series of circular holes 18^a therein arranged to register with the inlet openings to the air tubes 17. By adjusting the slide 18

on its ways, the size of the air inlets to the air tubes is lessened so as to regulate the volume of air entering the gas burner through the air tubes 17. The air tubes 17 are flattened at their discharge ends so as to lessen the height of and materially increase the width of the air outlets 19 at the discharge end of these tubes, so that in effect the outlets 19 form what is substantially a single discharge outlet. thin, vertical partition walls 20 being all that separate the outlets one from another, (see Fig. 3).

The horizontal walls 22, 22, which define the width of the outlets of the air tubes 17, and the adjacent walls 23, 23, of the gas distributing chamber 6, form two wide, shallow slots 24 through which the gas enters the primary nozzle 21 in two thin flat sheets, one above and one below the intermediate thin sheet of air emerging from the discharge end 19 of the air tubes 17. (See Figs. 1 and 3.) The outlets 19 discharge into the primary nozzle 21 which is fastened in place between the discharge side of the gas distributing chamber 6 and the inlet side of the adjacent secondary nozzle. The central stratum of air and top and bottom strata of gas will become mixed in passing through the secondary nozzle 25 which, with the primary nozzle 21, is fastened by bolts 26 to the outlet side of the gas distributing chamber 6 (see Figs. 3 and 4), the partitions 27, 27, preventing mixing of the air and gas streams within the primary nozzle 21.

The secondary nozzle 25 projects forwardly and its outlet end is in close proximity to the flaring inlet end 28^a of the mixing chamber 28 which is formed integral with the ignition chamber 29 and in which the stratified gas and air become thoroughly mixed. The outlet end of the secondary nozzle 25 and inlet end of the mixing chamber 28 co-act to form two secondary air inlets 30, 30, through which air is drawn from the atmosphere into the mixing chamber 28. The adjacent sides of the secondary nozzle 25 and the mixing chamber 28 are connected by bolts 31 to maintain these adjacent ends in spaced relation.

The ignition chamber 29 is built into an opening in the front end of the combustion chamber 32 of the steam boiler furnace to which our improved burner is shown applied, and a refractory lining 33 is provided in the ignition chamber 29 as well as in the refractory lined combustion chamber 32 of the boiler furnace. A removable cover 34 which is adapted to be placed in position manually, is provided to entirely shut off or close the inlet opening to the mixing chamber so as to prevent air being drawn into the boiler furnace by the stack draft when any one particular boiler furnace of a battery of boilers is not in use.

The operation of our improved gas burner

will be readily understood. The blast furnace gases from the gas box 4 is caused to pass through the primary nozzle 21 at high speed and in two thin flat streams, and causes air to be injected or drawn through the air tubes 17 into the nozzle 21 between the two streams of gas. The central sheet of air becomes mixed with the inner layers of the combustible gases in passing through the secondary nozzle 25 into the mixing chamber 28. The outer layers or streams of gas and intermediate layer or stream of air, in passing into the mixing chamber 28 causes air to be drawn into the mixing chamber through the top and bottom openings 30, 30, formed by the inlet end 28^a of the mixing chamber and adjacent outlet end of the secondary nozzle 25 so that in entering the mixing chamber 28 there are two thin flat streams of gas sandwiched between a central and two outside streams of air. The strata of air and gas entering the mixing chamber 28 are thoroughly commingled and as the primary nozzle is machined the mixture of gas and air is uniformly distributed over the entire width of the gas burner in a thin wide stream, and owing to the uniform mixture of gas and air entering the mixing chamber, the amount of excess air required is low and results in a high temperature of combustion, while the thin layers of gas are so thoroughly mixed with the air as to completely burn in the combustion chamber of the boiler furnace.

The advantages of our invention will be apparent to those skilled in the art. The apparatus is simple, is easily and cheaply constructed and will not require frequent and correspondingly expensive repairs.

Modifications in the construction and arrangement of the parts may be made without departing from our invention as defined in the appended claims.

We claim:—

1. In a gas burner, the combination with a combustion chamber, an ignition chamber opening into the combustion chamber, and a mixing chamber opening into the ignition chamber, of a secondary nozzle arranged to discharge air and combustible gases into said mixing chamber in thin flat stratified layers, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into the mixing chamber from the atmosphere and arranged to deliver a flat thin stream of air to the mixing chamber above and below the stratified streams of combustible gases from the secondary nozzle, a primary nozzle opening into said secondary nozzle and arranged to deliver a plurality of thin flat stratified streams of combustible gases and an intermediate layer of air into the secondary nozzle, a gas distributing chamber for supplying gases to the primary nozzle, a series of air tubes in said

distributing chamber opening into the atmosphere and having flattened ends arranged to deliver an intermediate layer of air to the primary nozzle, and a gas box for supplying combustible gases to said distributing chamber.

2. In a gas burner, the combination with a combustion chamber, an ignition chamber opening into the combustion chamber, and a mixing chamber opening into the ignition chamber, of a secondary nozzle to discharge air and combustible gases into said mixing chamber in thin flat stratified layers, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into the mixing chamber from the atmosphere and arranged to deliver a flat thin stream of air to the mixing chamber above and below the stratified streams of combustible gases from the secondary nozzle, a primary nozzle opening into said secondary nozzle and arranged to deliver a plurality of thin flat streams of combustible gases and an intermediate layer of air into the secondary nozzle, a gas distributing chamber for supplying gases to the primary nozzle, a series of air tubes in said distributing chamber opening into the atmosphere and having flattened ends arranged to deliver an intermediate layer of the air to the primary nozzle, a gas box for supplying combustible gases to said distributing chamber, and means for regulating the supply of air and gases to said distributing chamber.

3. In a gas burner, the combination with a combustion chamber, an ignition chamber opening into the combustion chamber, and a mixing chamber opening into the ignition chamber, of a secondary nozzle arranged to discharge thin flat stratified layers of air and combustible gases into said mixing chamber, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into the mixing chamber from the atmosphere and arranged to deliver flat thin streams of air to the mixing chamber above and below the stratified streams of combustible gases from the secondary nozzle, a primary nozzle opening into said secondary nozzle and arranged to deliver a plurality of thin flat streams of combustible gases and an intermediate layer of air into the secondary nozzle, a gas distributing chamber for supplying gases to the primary nozzle, said distributing chamber having a series of air tubes opening into the atmosphere and having flattened ends arranged to deliver an intermediate layer of air to the primary nozzle, a gas box for supplying combustible gases to said distributing chamber, and means for controlling the air supply to said air tubes.

4. In a gas burner, the combination with a combustion chamber, an ignition chamber opening into the combustion chamber, and

a mixing chamber opening into the ignition chamber, of a secondary nozzle to discharge thin stratified layers of air and combustible gases into said mixing chamber, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into the mixing chamber from the atmosphere and arranged to deliver flat thin streams of air to the mixing chamber above and below the stratified layers of combustible gases from the secondary nozzle, a primary nozzle opening into said secondary nozzle and arranged to deliver a plurality of thin flat streams of combustible gases and an intermediate layer of air into the secondary nozzle, a gas distributing chamber for supplying gases to the primary nozzle, a series of air tubes in said distributing chamber opening into the atmosphere and having flattened ends arranged to deliver an intermediate layer of air to the primary nozzle, a gas box for supplying combustible gases to said distributing chamber, and means for controlling the supply of gases to said distributing chamber.

5. In a gas burner, the combination with a combustion chamber, an ignition chamber opening into the combustion chamber, and a mixing chamber opening into the ignition chamber, of a secondary nozzle to discharge thin stratified layers of air and combustible gases into said mixing chamber, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into the mixing chamber from the atmosphere and arranged to deliver thin streams of air to the mixing chamber above and below the stratified layers of combustible gases from the secondary nozzle, a primary nozzle opening into said secondary nozzle and arranged to deliver a plurality of thin flat streams of combustible gases and an intermediate layer of air into the secondary nozzle, a gas distributing chamber for supplying gases to the primary nozzle, a series of air tubes in said distributing chamber opening into the atmosphere and having flattened ends arranged to deliver an intermediate layer of air to the primary nozzle, a gas box having a distributing chamber suspended from each end thereof, and means connecting the gas box with a source of combustible gases.

6. In a gas burner, the combination with a combustion chamber, an inwardly flaring ignition chamber opening into said combustion chamber, and a mixing chamber opening into said ignition chamber, of a burner nozzle discharging air and combustible gases into said mixing chamber, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into said mixing chamber from the atmosphere, a distributing chamber connected to the entrance end of the said nozzle and arranged to deliver the combustible gases in

a plurality of stratified layers into said mixing chamber, a series of air tubes in said distributing chamber arranged to deliver air centrally into said mixing chamber, said tubes having flaring ends opening into the distributing chamber and having rear ends connecting into the atmosphere, means for supplying combustible gases to the distributing chamber, and means for regulating the air supply to said air tubes.

7. In a gas burner, the combination with a combustion chamber, an inwardly flaring ignition chamber opening into said combustion chamber, and a mixing chamber opening into said ignition chamber, of a burner nozzle discharging air and combustible gases into said mixing chamber, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into said mixing chamber from the atmosphere, a distributing chamber connected to the entrance end of the said nozzle and arranged to deliver the combustible gases in a plurality of stratified layers into said mixing chamber, a series of air tubes in said distributing chamber arranged to deliver air centrally into said mixing chamber, said tubes having flaring ends opening into the distributing chamber and having rear ends connecting into the atmosphere, means for controlling the supply of combustible gases to said distributing chamber, means for supplying

combustible gases to the distributing chamber, and means for regulating the air supply to said air tubes.

8. In a gas burner, the combination with a combustion chamber, an inwardly flaring ignition chamber opening into said combustion chamber, and a mixing chamber opening into said ignition chamber, of a burner nozzle discharging air and combustible gases into said mixing chamber, the adjacent ends of said mixing chamber and nozzle forming secondary air inlets opening into said mixing chamber from the atmosphere, a distributing chamber connected to the entrance end of the said nozzle and arranged to deliver the combustible gases in a plurality of stratified layers into said mixing chamber, a series of air tubes in said distributing chamber arranged to deliver air centrally into said mixing chamber, said tubes having flaring ends opening into the distributing chamber and having rear ends connecting into the atmosphere, means for supplying combustible gases to the distributing chamber, and means for regulating the supply of gases and air to the gas burner.

In testimony whereof we have hereunto set our hands.

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