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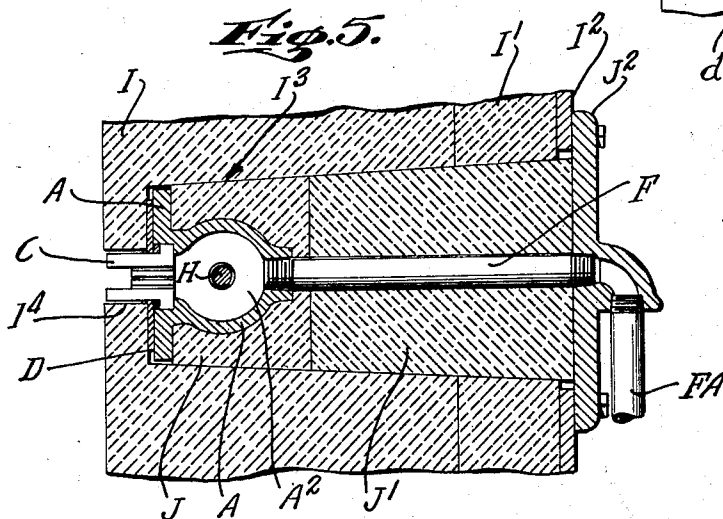
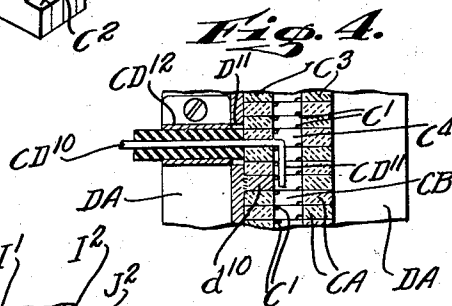
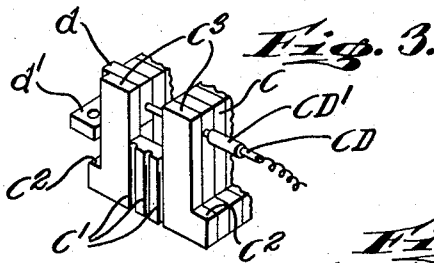
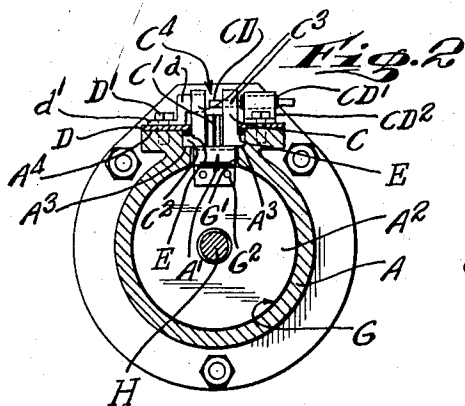
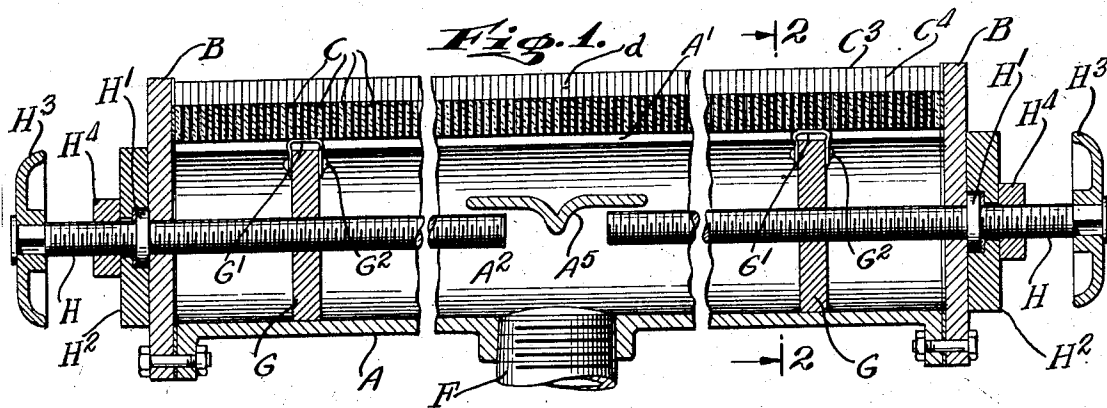
F. O. HESS

2,228,114

GAS BURNER

Filed Feb. 21, 1940

2 Sheets-Sheet 1



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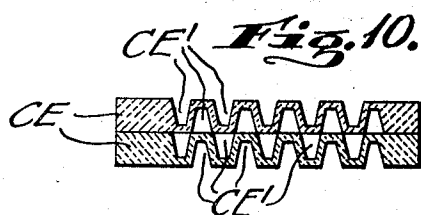
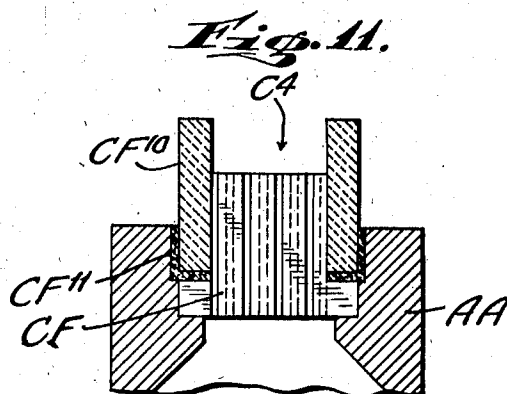
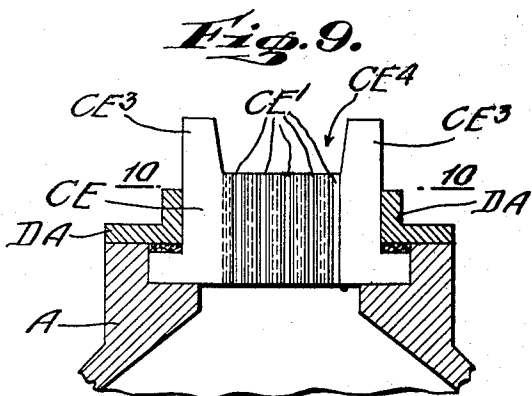
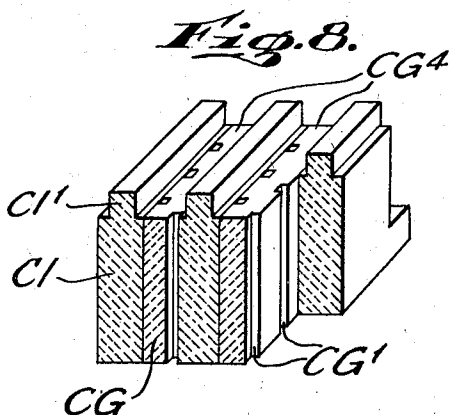
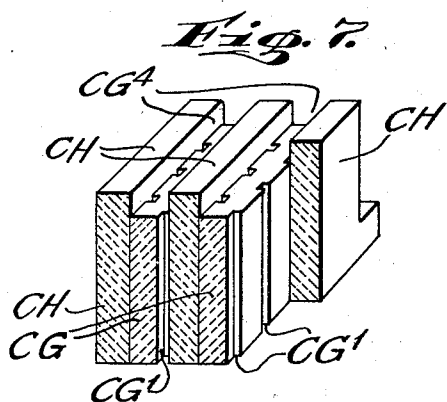
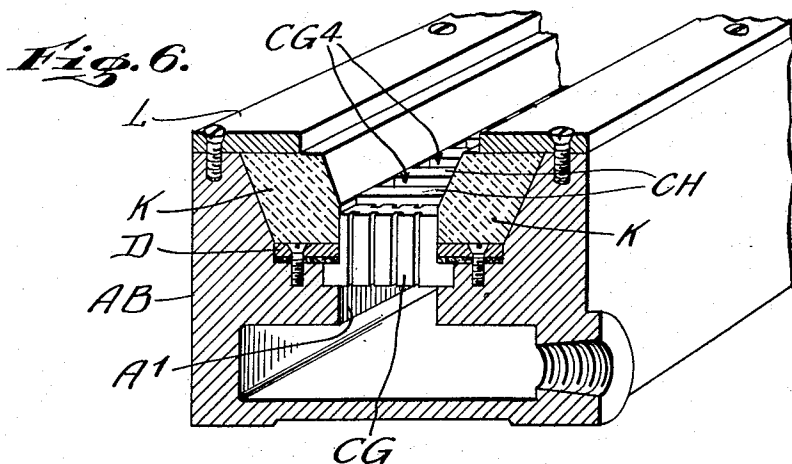
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GAS BURNER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,228,114

GAS BURNER

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Application February 21, 1940, Serial No. 320,189

15 Claims. (Cl. 158—99)

The general object of the present invention is to provide improved gas burners of a type heretofore devised by me in which the burner fuel supply and combustion spaces are separated by a wall formed by relatively thin plates of ceramic material arranged side by side and in close contact with one another and in which grooves formed in the side surfaces of said plates constitute the burner orifices extending through the wall.

The first burners of the type manufactured for commercial use, were elongated or ribbon burners, in which I shaped the burner orifice wall formed by the ceramic plates, to have a substantially smooth, flat outer, or combustion side surface, which was laterally extended relative to the discharge ends of the orifice grooves in the wall, so that all of said ends were within a portion of said surface displaced inwardly away from the marginal edge of the surface. In use, such burners were found to have more heat storage capacity than was desirable, and the burner bodies tended to attain undesirably high temperatures, and the burners exhibited an undue tendency to flame extinction, or blowoff, and a major specific object of the present invention is to provide an improved burner of the above mentioned type, in which the above noted objectionable tendencies are eliminated, or substantially minimized.

In accordance with the present invention, I avoid flame blowoff under conditions in which it would occur with the earlier burners mentioned above, by shaping or arranging the wall formed by or including the ceramic plates, so as to provide, in the combustion side of the wall, one or more grooves or recesses into which the burner orifices open. Each such groove or recess thus forms a combustion space or portion thereof, having side walls of refractory material, which in the normal use of the burner are customarily heated to incandescence and thereby tend to maintain the ignition of jets of the fuel gas, or of the preferably used combustible mixture of air and gas, discharged by adjacent burner orifices. In preferred forms of my improved burner, some, at least, of the burner orifices have their discharge ends closely adjacent the intersection of the side and bottom walls of the groove or recess formed in the combustion side of the wall formed by the ceramic plates, so that each of the burning jets discharged from said orifices, may have its side in contact with a side wall of the groove or recess.

In accordance with the present invention, I eliminate, or substantially reduce, unduly large

burner heat storage capacity and undesirably high burner temperatures, by providing walls of ceramic material, transverse to and extending outwardly away from the portion of the refractory orifice wall at which the discharge ends of the burner orifices open, so that heat from the portion of the combustion space between said transverse walls can be transferred to metallic portions of the burner only by conduction through ceramic material.

In the preferred form of the present invention, each of the wall forming ceramic plates includes an integral, outwardly extending, projection at each end of its combustion space edge, so that the said projections of the different plates assembled to form a burner orifice wall, unite to form the side walls of a single elongated groove or recess in the combustion side of the wall, and thus serve, as explained above, to reduce the heat storage tendency of the burner, and the maximum burner temperatures attained in normal operation, and to reduce the tendency of the burning jets discharged by the burner orifices, to blow off, or become extinguished.

A further specific object of the invention is to provide a burner of the above mentioned type with simple and effective ignition means.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages, and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of the invention.

Of the drawings:

Fig. 1 is an elevation in section of a portion of a burner;

Fig. 2 is a transverse section on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the ceramic plates employed in the burner shown in Figs. 1 and 2;

Fig. 4 is a sectional plan of a portion of a burner including ceramic plates having a special orifice groove, and also including ignition electrodes;

Fig. 5 is a sectional elevation of a portion of a furnace wall incorporating a burner of the form shown in Figs. 1 and 2;

Fig. 6 is a perspective view, partly in section, of a portion of a gas burner of modified form;

Fig. 7 is a perspective view on a larger scale

than Fig. 6, of a portion of the refractory orifice wall of the burner shown in Fig. 6;

Fig. 8 is a perspective view taken similarly to Fig. 7 and illustrating a modified form of the refractory orifice wall;

Fig. 9 is a side elevation of a wall forming ceramic plate differing from those shown in Figs. 1-5;

Fig. 10 is a section on the line 10-10 of Fig. 9; and

Fig. 11 is a partial transverse section of a burner differing from those shown in Figs. 1-5, 9 and 10, in respect to the form of its ceramic portion.

The elongated, or ribbon, burner illustrated by way of example in Figs. 1 and 2, comprises an elongated metallic burner body or manifold A of tubular form, having its ends closed by removable end heads B, and formed at one side with a slot-like outlet A' from the burner fuel space A². The slot A' extends longitudinally of the burner body, for the full length of the latter. As shown, the portions of the burner body A adjacent the sides of the slot A' are thickened and shaped to provide a seat or corner recess A³ at each side of the slot, to receive a corresponding corner portion of each of a multiplicity of relatively thin ceramic plates C, which extend across the slot A'. The plates C are shown as all similar in form, and are arranged side by side in close contact with one another, and each is formed with grooves C' in one of its sides, so that the plates collectively form a transversely laminated ceramic wall with burner orifices, formed by the grooves C' and which serve as leading away from the slot A'.

As shown, the portion of each plate C adjacent the slot A' is of a greater width than the portion of the plate more remote from the slot A', so that each plate is thus provided at each of its opposing sides with a projection C³ which may be overlapped by a corresponding clamping plate D secured as by bolts D' against clamping faces A⁴, formed on the thickened portions of the member A at opposite sides of the slot A', and of the recesses A³. A gasket E of asbestos or other refractory gasket material, is shown as inserted between each set of plates extensions C² and the corresponding clamping plate D.

In accordance with the present invention, each of the plates C is formed at each end of its edge remote from the burner body with an integral outwardly extending projection or extension C³, so that the wall collectively formed by the ceramic plates C, is provided at its side remote from the burner body A, with a longitudinal groove C⁴, into which the different channels C' open. The groove C⁴ thus constitutes a combustion space having refractory side walls formed by the extensions C³, and having a refractory bottom wall formed by the edges of the plates C at which the outer ends of the channels C' open.

The provision of the combustion space C⁴ with its refractory side walls increases the burner capacity by reducing the tendency to flame extinction when the burner is operated at high rates. This matter of the maximum rate of burner operation which can be maintained without objectionable risk of flame blow-off, is of much practical importance in many cases. In some cases, it may permit the use of a single commercially available burner for a given heating duty, which, but for the high rate of burner operation permitted, could be served only by the

use of two commercially available burner units.

Stated differently, the provisions of the refractory walls formed by the projection C³ at the sides of the space C⁴ in which combustion is initiated, permits of operation of a given burner, without serious risk of flame blowoff, when the rate of combustion is high enough to give rise to a serious blowoff risk in the operation of a burner differing from said given burner only by its non-inclusion of the projection C³. The 10 walls formed by the projection C³ reduces the tendency to flame extinction because of their jet heating capacity, the adjacent surfaces of the two walls formed in the projection C³ being heated to incandescence in normal operation. 15

The tendency to flame maintenance due to the jet heating action of the projection C³ is greatly augmented by the action of the walls in frictionally retarding the velocity of each of the jets discharged by such of the orifices as have their discharge ends so located, that one side of the jet is in contact with a wall formed by the projection C³. The retardation of the velocity of a jet directly reduces the risk of blowing off or extinction of the flame formed by that jet, and the flames formed by the jets having the velocities retarded as described, serve as pilot flames to maintain the combustion of the more rapidly moving fluid jets discharged by the orifice grooves which have their discharge ends intermediate, and laterally displaced from each of the two combustion space walls formed by the projection C³. 20 25 30

The walls formed by the projection C³ also serve as heat screens which largely prevent radiation from the space C⁴ except in a direction outwardly and away from the bottom wall of that space and thus minimize the transfer of heat to the metallic burner body thereby reducing the effective heat storage capacity of the burner, as well as the maximum temperatures attained by the burner. 35 40

The reduction in the heat storage capacity of the burner, as a result of the heat insulating effect of the plate projections C³, is of substantial practical importance in certain cases. For example, in the use of the burner for drying ink or for singeing a travelling web of cloth, the burner has a tendency to set fire to the web on an interruption in the web feed as a result of the heat storage capacity of the burner, even when the supply of fuel to the burner be interrupted instantly on the interruption in the web feed. That tendency has led me to devise ink drying provisions of printing presses comprising an earlier form of the ceramic plate type burners having greater inherent heat storage capacity than the burners disclosed herein, and comprising means for turning the burners away from the web on an interruption of the web feed, and at the same time subjecting the burners and the web to the cooling effect of an air stream. In the printing press, ink drying use of the burners disclosed herein, I have found that the interruption of the fuel supply coupled with the use of the cooling air stream sufficiently reduces the risk of setting the web on fire, so that no provisions need be made for turning the burners away from the web on the interruption of the web feed. 45 50 55 60 65 70

The particular burner shown in Figs. 1 and 2 comprises means, sometimes desirable, for varying the effective length of the burner. As shown, a combustible mixture of air and gas is supplied to the burner body by a pipe F, shown

as connected to the fuel chamber A² in the burner body A at a point midway between the ends of the latter. The pipe F extends transversely away from the burner body, and a baffle A⁵ in the burner body prevents the jet discharged by the pipe F from impinging directly against the inner edges of the adjacent plate C. To vary the effective length of the burner a piston or barrier part G is located in, and is adjustable longitudinally of, the burner fuel chamber A², between its center and each end of the burner body.

Each piston G extends across, and substantially fills the fuel chamber of the burner, and has an extension G' which extends into, and prevents flow through the slot A' from one side of the piston to the other. As shown, the extension G' is a loop shaped piece of spring metal, which has its ends connected to the piston G by rivets G², and is adapted to bear resiliently against the edges of the adjacent plates C. The extension G' also serves as a spline key preventing rotation of the piston G about its own axis in the burner body A.

Each piston G may be adjusted axially of the length of the burner body by the rotation of a corresponding threaded spindle H. The latter is rotatably mounted in the corresponding end head B, and is provided with a collar H', received in a recess provided for the purpose in an auxiliary head member H², secured to the head B. Each spindle H passes axially through a threaded opening in the corresponding piston G, so that when the spindle H is rotated in one direction or the other, the piston G will be adjusted toward or away from the corresponding end of the burner. At its outer end, each spindle H is provided with a handwheel H³ and a locknut H⁴ on the spindle is provided to clamp the latter to the part H², and thus prevent accidental or unauthorized rotation of the spindle. When adjustment of the effective length of the burner is not desired or can be obtained with a single piston, both or one of the pistons G may be dispensed with.

For some uses under conditions in which the risk of flame blow-off is especially high, or in which an occasional extinction of the burner flame might result in a serious explosion risk or other specially objectionable result, a burner of the type disclosed herein may be employed with continuously operating electrical ignition means, whereby the burner flame if extinguished, is immediately reestablished. The special form of the ceramic plates C, with their projections C³, facilitates a simple and effective application of electric ignition means to the burner.

For example, as shown in Figs. 1, 2 and 3, an ignition electrode CD may extend into the space C⁴ through a groove formed for the purpose in one projection C³ and a cooperating electrode d may extend to the space C⁴ through a similar groove formed in the second projection C³ of one of the plates C. The electrode d may be grounded by clamping an extension d¹⁰ of the electrode against the adjacent clamping plate D, as shown in Fig. 2. The conductor CD is shown in Fig. 2 as extending through an insulation bushing CD' supported by a supporting clip CD² secured against the adjacent clamping plate D.

As will be apparent, one or more of the plate projections C³ may readily be grooved or cut away to accommodate other ignition electrode arrangements, which may be desirably employed in particular cases. For example, as shown in Fig. 4, in a burner having angle bar clamping members

DA of the kind shown in cross section in Fig. 9, one of those bars may have welded to it a projection d¹⁰, adapted to replace the upper portion of the projection C³ of one of the ceramic plates CB. The same clamping member DA may also be formed with a notch D'', displaced a short distance from the projection d¹⁰, and receiving the insulated body portion of an electrode CD¹⁰. The latter has a bared end portion which extends into the space C⁴ through the space provided by removing the projection C³ of a suitably located plate CB, and which has a portion CD'' within the space C⁴, transversely bent to extend alongside of the projection d¹⁰. As shown, the conductor CD¹⁰ is secured to the base flange of the adjacent clamping bar DA by a clip or bracket part CD¹².

By connecting the electrode CD or CD¹⁰ to one terminal of a suitable source of voltage having its other terminal grounded or connected to the burner body, ignition arcing between that electrode and the corresponding grounded electrode d or d¹⁰ may be effected whenever necessary to start the burner in operation, or continuously when flame blow-off is apt to occur, or would be especially detrimental if it did occur. The mounting of the electrodes in the manner described is especially advantageous, because no special insulation problem is presented, and because the electrodes may have relatively long lives, since the temperature within the space C⁴ is relatively low, the maximum flame temperatures in the type of burner shown, developing with normally large combustion rates, at points outside of and at some distance away from the outer edge of the space C⁴.

My improved burners are adapted for a wide range of uses. In some cases they are advantageously incorporated in the wall of a furnace to heat the latter. One such arrangement is shown by way of example in Fig. 5, wherein the furnace wall is shown as comprising a main refractory portion I, an outer portion I' of heat insulating material and a metallic casing I². As shown in Fig. 5, a burner A which may be of the form shown in Figs. 1 and 2, is incorporated in the furnace wall, the burner assembly being received in a tapered slot I³, in the refractory portion of the wall. As shown, the slot I³ opens to the furnace or heating chamber at the innerside of the wall through a slot I⁴ of a width adapted to singly receive the portions of the plates C extending inwardly beyond the clamping plates D. As shown, the burner assembly comprises refractory material J surrounding the burner body, an outer body of refractory material J' and a metal plate J² detachably secured to the wall casing I², and closing an opening therein in register with the slot I³. The part J is connected to the burner body A by the supply pipe section F, and the latter is connected to a combustible mixture supply source through a pipe section FA threaded into an elbow passage formed in the metal wall part J².

The number and disposition of the orifice grooves formed in the ceramic orifice wall plates, may vary widely as conditions make desirable. Thus, each of the plates C shown in Figs. 1, 2, 3, and 5, is formed with three orifice grooves all at one side of the plate, one opening midway between the two plate projections C³, and the others opening one adjacent one, and the other adjacent the second of the two projections C³. Each of the burner plates CA shown in Fig. 4 has a single orifice groove C¹ at each side, one of the two

grooves in each plate being adjacent one and the other adjacent the second of the two projections C^3 of the plate. The ceramic plate CE shown in Figs. 9 and 10, has five grooves at each side, and plates with still more orifice grooves may be employed when conditions make it desirable to increase the capacity of individual burners by increasing the number of orifices at each side of each plate.

- 10 Major advantages obtainable with the burner constructions collectively illustrated in Figs. 1-5, may be obtained with quite different constructions, some of which are illustrated in Figs. 6-11. In the construction shown in Figs. 9 and 10, each of the ceramic plates CE, forming the laminated orifice wall of the burner, has grooves CE' in one of its sides in staggered relation with the similar grooves, in its opposite sides. The grooves CE' are so deep and so closely spaced that each groove at one side of the plate is separated from each adjacent groove at the opposite side of the plate, by a wall of a thickness which is substantially less than the distance between the opposite side surfaces of the plate. As shown, the grooved portion of each plate CE including grooves CE' is in the form of a corrugated strip of material with a strip thickness smaller than the depths of the corrugation grooves. While the dimensions may be varied, I note that in one practical burner construction including such corrugated plates as are shown in Figs. 9 and 10, the distance between the opposing sides of each plate, i. e., the thickness of its end portions including the projections CE^3 , is $\frac{1}{4}$ of an inch, and the thickness of the wall between adjacent grooves in the opposite sides of the plate is $\frac{1}{8}$ of an inch.

The thinness of the walls between the grooves in the corrugated portion of the plate E has the practical advantage of reducing the heat conductivity of those walls, and of thereby reducing the rate at which heat flows into the walls from the burner combustion space, relative to the rate at which heat is taken out of those walls by the fuel mixture flowing through the orifice grooves CE'. In consequence, other things being equal, the orifice wall and burner body temperatures will be significantly lower in a burner having the orifice wall plate form shown in Figs. 9 and 10, than in a burner having the orifice wall plate construction shown in Figs. 1-5.

Another special feature of the burner construction shown in Figs. 9 and 10, is the flaring away from one another of the side walls of the combustion space CE^4 formed by the plate projections CE^3 . This feature is of advantage from the flame extinction standpoint in some cases, particularly when the fuel mixture is relatively slow burning, as it provides space for the diametral expansion of the burning jets issuing from the orifices CE' adjacent the projections CE^3 , so that those jets are not crowded toward the center of the space CE^4 with the result of snuffing out jets discharged through the intermediate orifices, as sometimes occurs with slow burning fuel mixtures in a burner as shown in Fig. 2 in which the sides of the space C^4 are parallel. The divergence of the two projections CE^3 of each plate CE is a feature not restricted to use in a burner in which the intermediate portions of the plate are corrugated as shown in Figs. 9 and 10.

With burners of standard form, I ordinarily consider it preferable to employ orifice plates having combustion space side wall portions in the form of projections integral with the plate

bodies, as are the projections C^3 of the plates C, and the projections CE^3 of the plates CE. It is occasionally advantageous, however, especially in making up specially shaped or proportioned burners, to form the side walls of a burner combustion space like the space C^4 , of barlike bodies of ceramic material CF^{10} , as shown in Fig. 11, and to shape the orifice plate members CF so that the plates CF and ceramic bars CF^{10} may collectively form a ceramic orifice wall including a combustion space groove, generally like the orifice wall shown in Fig. 2 or like that shown in Fig. 9. With the construction shown in Fig. 11, the bars CF^{10} are secured by cement CF^{11} to the burner body AA, which may be formed of metal or of ceramic material.

Figs. 6 and 7 illustrate a burner construction having a laminated ceramic orifice wall formed of grooved ceramic plates CG and ungrooved ceramic plates CH alternating with the plates CG. The plates CG, as shown, are generally similar in form to the plates CF. The ungrooved plates CH extend at the combustion side of the wall beyond the corresponding end of the grooved plate CG, thereby providing a plurality of combustion spaces or grooves CG^4 in the combustion side of the wall, which extend transversely to the length of the burner and into which the combustion orifices CG' open. With the arrangement shown in Figs. 6 and 7, each of the burning jets discharged by the burner orifices CG', has its tendency to flame extinction minimized by its proximity to the portion of the adjacent plate CH forming the side wall of the corresponding combustion groove CH^4 .

In the burner shown in Fig. 6, the plates CG and CH are seated and secured in the burner body AB, generally as the plates C are seated and secured in the burner body A of Figs. 1 and 2. As shown in Fig. 6, however, the combustion space grooves CG^4 open into a larger combustion space of trough-like shape which has its sides formed by refractory blocks or bars K. The blocks K are secured in place by clamping bars L screw connected to corresponding uprising side portions of the metallic burner body AB. With the protection against flame extinction obtained when the orifice grooves discharge into combustion space grooves CG^4 , as described, it is ordinarily not essential that any of the flame jets should be close enough to either bar K to contact with, and having its velocity retarded by the latter.

The ceramic orifice wall construction shown in Fig. 8, differs from that shown in Figs. 6 and 7 in that in Fig. 8 the grooved plates CG alternate with ungrooved plates CI having portions CI' projecting beyond the edges of the plates CG at the combustion side of the wall, which are of less thickness than their body portions. In consequence, the combustion space grooves CG^4 are relatively wider in the wall shown in Fig. 7 than in the wall shown in Fig. 8. The velocity retarding effects of the plate portions CI' of Fig. 8 on the jets discharged by the orifice grooves CG', is thus less pronounced than the jet velocity retarding effects of the corresponding portions of the plates CH of Figs. 6 and 7.

The use of ceramic screen walls, such as those formed by the projections C^3 and parts CF^{10} , interposed between the initial combustion space and the metallic burner parts, gives the practically important advantages of substantially increasing the maximum temperature of the products of combustion. As I have demonstrated by use of

burners of both forms, a burner constructed in accordance with the present invention is adapted to operate continuously and satisfactorily with a combustion rate and temperature high enough to destroy a burner differing therefrom only in that the side walls of its combustion space are formed of metal, through the corrosion and the actual melting, of the combustion space side wall metal, within a period of a day or two, or less.

10 This application is a continuation in part of my prior application, Serial No. 713,433, filed March 1, 1934, and is a continuation in part of my prior application Serial No. 195,950, filed March 15, 1938.

15 While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

25 Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A gas burner orifice wall of ceramic material having in its combustion space side a recess space in the form of one or more grooves, and comprising laminae of refractory material extending from the combustion space side to the opposite side of the wall and formed with orifice grooves in their sides which extend through the wall and open at their discharge ends into said recess space.

2. A gas burner orifice wall of ceramic material having in its combustion space side a recess space in the form of one or more grooves, and comprising laminae of refractory material extending from the combustion space side to the opposite side of the wall and formed with orifice grooves in their sides which extend through the wall and open at their discharge ends into said recess space, and some at least of which open to said recess space adjacent a side wall thereof.

3. A laminated gas burner wall composed of laminae of refractory ceramic material with grooves in the sides of said laminae forming burner orifices extending through said wall between its opposing sides, the edge portions of said laminae at one side of said wall being shaped to form slots in said wall, into which said orifices open.

4. A laminated gas burner wall consisting of laminae with grooves in their sides alternating with laminae having ungrooved sides and having their edges at one side of said wall extending beyond the corresponding edges of the grooved laminae, said grooves forming burner orifices extending through said wall, and each opening at one end into the space between adjacent projecting edges of ungrooved laminae.

5. In a gas burner, a burner body formed with a gas chamber and with a slot in one wall of said chamber with seats at the outer edges of said slot and side by side plate-like parts of ceramic refractory material extending across said slot and having end portions engaging said seats, and clamping means detachably securing said parts in place, said parts having grooves in their sides which form burner orifices leading from said chamber to the opposite side of the laminated wall formed by said side by side parts.

6. In a gas burner, the combination with a

burner body formed with a fuel chamber and with a slot in the wall thereof, of a multiplicity of thin ceramic plates, arranged side by side and each extending across said slot and being seated on said body at the opposite sides of said slot and each formed with integral projections at its side remote from said slot, extending away from the latter and spaced apart from one another so that the said projections of the different plates form the sides of a trough-shaped space in the body of ceramic material collectively formed by said plates, said plates being formed with orifice grooves in their side leading from said slot to said space.

7. In a burner, the combination with a burner body formed with a fuel chamber and with a slot in the wall thereof of a multiplicity of thin ceramic plates, arranged side by side and each extending across said slot and seated on said body at the opposite sides of said slot and each formed with integral projections at its side remote from said slot, extending away from the latter and spaced apart from one another so that the said projections of the different plates form the side walls of a trough-shaped space in the body of ceramic material collectively formed by said plates, said plates being formed with orifice grooves in their sides leading from said slot to said space, and means for securing said plates to said burner body comprising a metallic clamping member located at one side of said body and including a portion alongside and reinforcing the plate projections forming the adjacent side wall of said space.

8. In a ribbon burner, the combination with a burner body formed with an elongated fuel chamber and with a slot in the wall thereof extending longitudinally of the chamber, of a multiplicity of thin ceramic plates, arranged side by side and each extending across said slot and seated on said body at the opposite sides of said slot and each formed with integral projections at its side remote from said slot, extending away from the latter and spaced apart from one another so that the said projections of the different plates form the side walls of a trough-shaped space in the body of ceramic material collectively formed by said plates, each plate being formed with one or more orifice grooves in its side, leading away from said slot to said space, and being formed with projections extending away from the two edges of the plate which extend away from the burner body at the opposite sides of the slot, and means for securing said plates to said burner body comprising a metal clamping part of angle bar cross section at each side of said body of ceramic material, each of said parts having one flange alongside and reinforcing the first mentioned plate projections, and having a second flange extending over and engaging the second mentioned plate projections.

9. A gas burner combination as specified in claim 6 in which some of the orifice grooves in the plates have wall portions substantially in contact with the plane of one side of said trough-shaped space.

10. A gas burner combination as specified in claim 6 in which some of the orifice grooves in the plates have wall portions substantially in contact with the plane of one side, and other grooves have wall portions substantially in the plane of the other side of said trough-shaped space.

11. A gas burner combination as specified in claim 6, in which one of said ceramic plate pro-

jections is cut away to provide a side wall opening to said trough-shaped space, and in which an ignition electrode is received in said opening.

- 5 12. A gas burner combination as specified in claim 6, in which one of said ceramic plate projections is cut away to provide a side wall opening to said trough-shaped space and in which an ignition electrode extends into said space through said opening.
- 10 13. A gas burner combination as specified in claim 7, in which the plate reinforcing portion of the metallic clamping member has an ignition electrode extension at its side adjacent the ceramic plates, and in which a projection from
- 15 the plate immediately adjacent said extension is cut away to provide an extension receiving opening in the side wall of the trough-shaped space of said extension.

- 20 14. In a gas burner, a burner body formed with the gas chamber and with a slot in one

wall of said chamber with seats at the outer edges of said slot and side by side plate-like parts of ceramic refractory material extending across said slot and having end portions engaging said seats and clamping means detachably securing said parts in place, said parts having grooves in their sides which form burner orifices leading from said chamber to the opposite side of the laminated wall formed by said side by side parts, and ceramic material extending away from said laminated wall at the opposite sides of a trough-shaped combustion space having its bottom formed by said laminated wall.

- 15 15. A gas burner orifice wall as specified in claim 1, in which said recess space has opposing side walls each inclined away from the other, and in which some of said orifices open into said space adjacent said side walls.

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