Sept. 14, 1937. S. H. HOBSON 2,092,744

GAS BURNER

Filed Aug. 16, 1934 4 Sheets-Sheet 1

Fig. 1

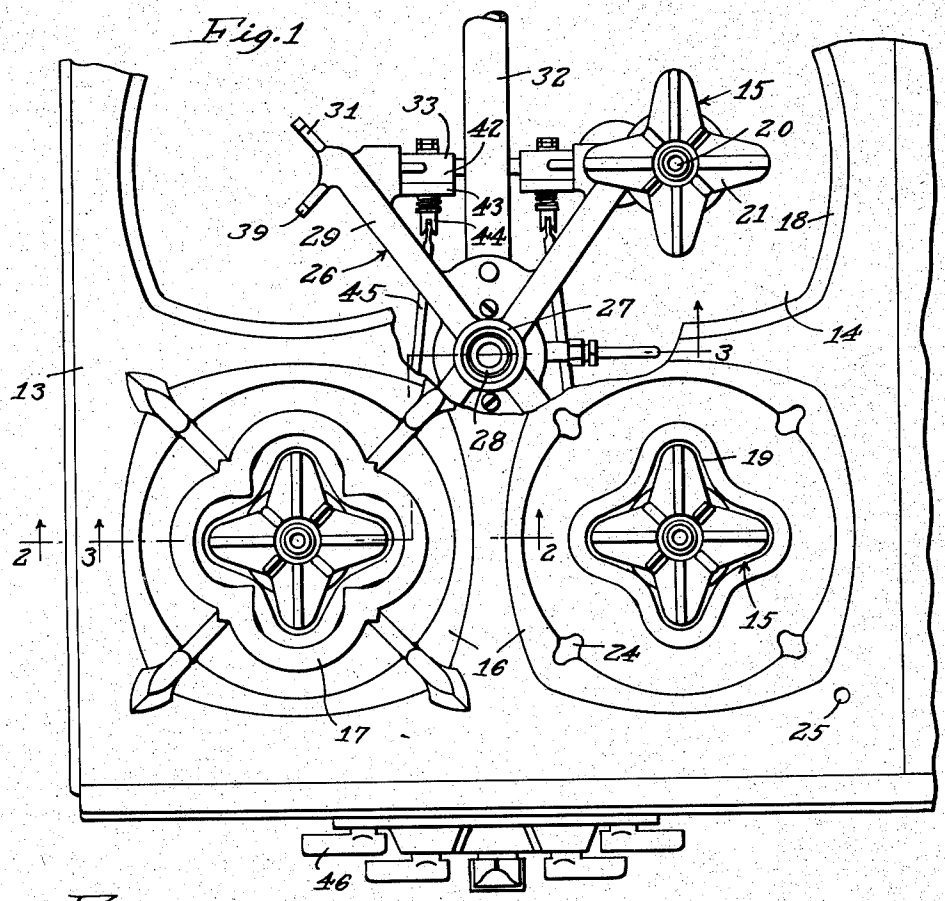
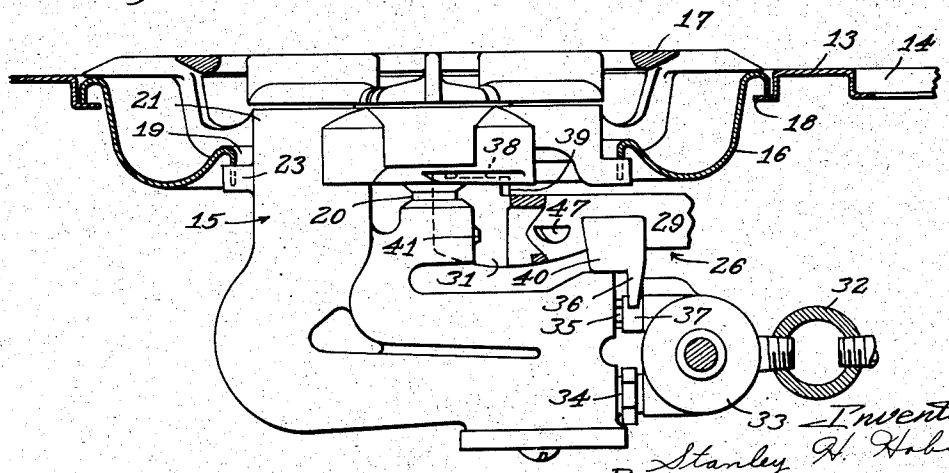


Fig. 2



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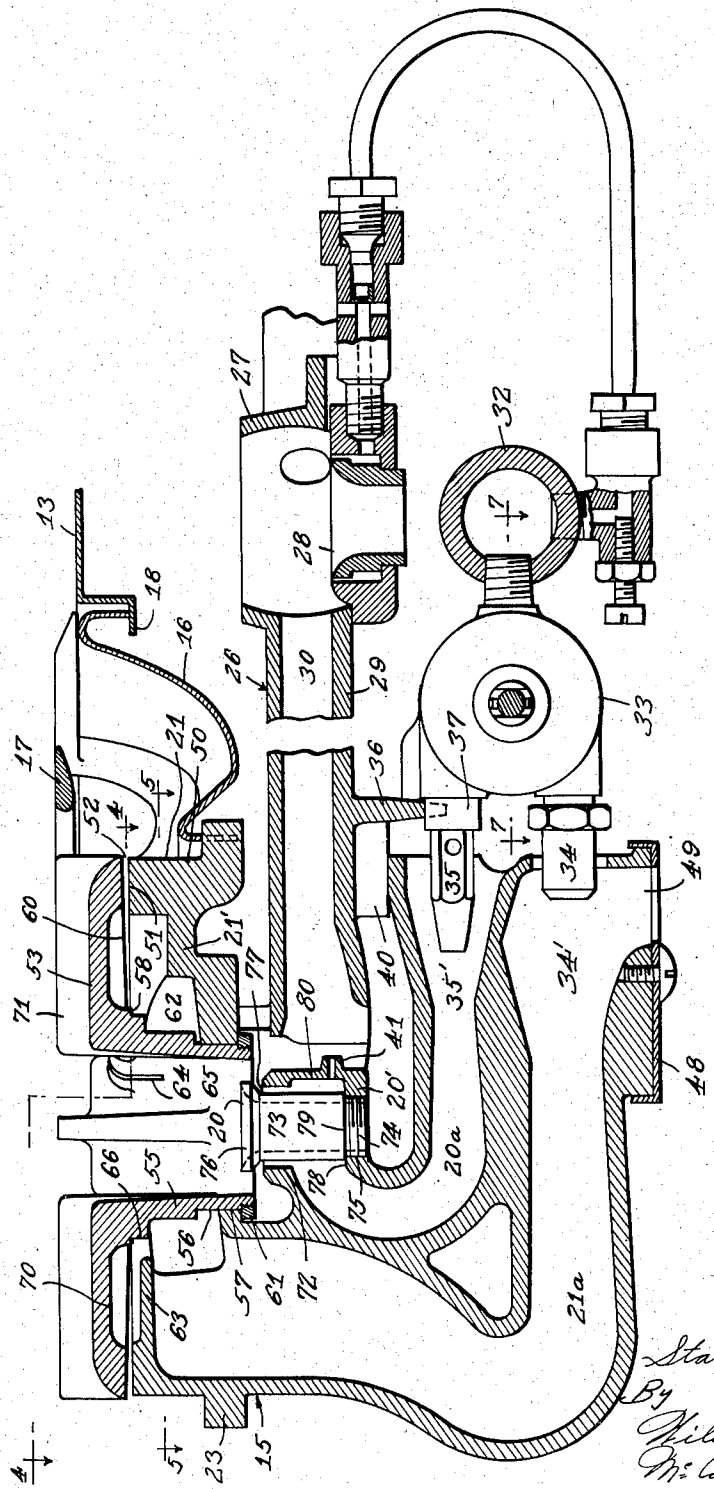


Fig. 3

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GAS BURNER

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Fig. 4

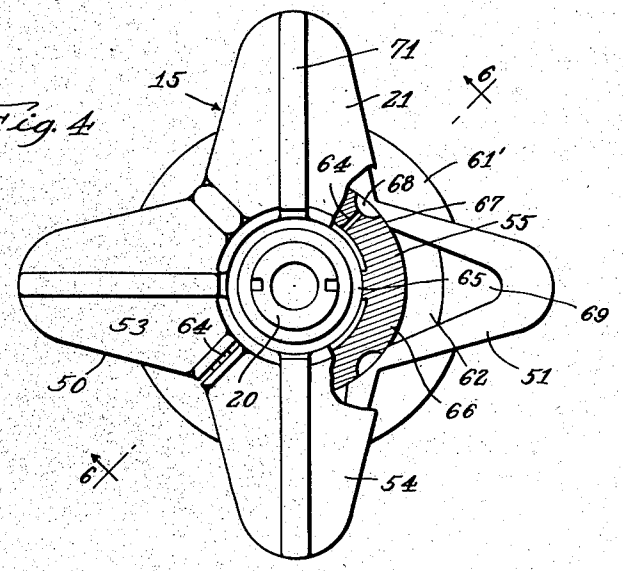


Fig. 5

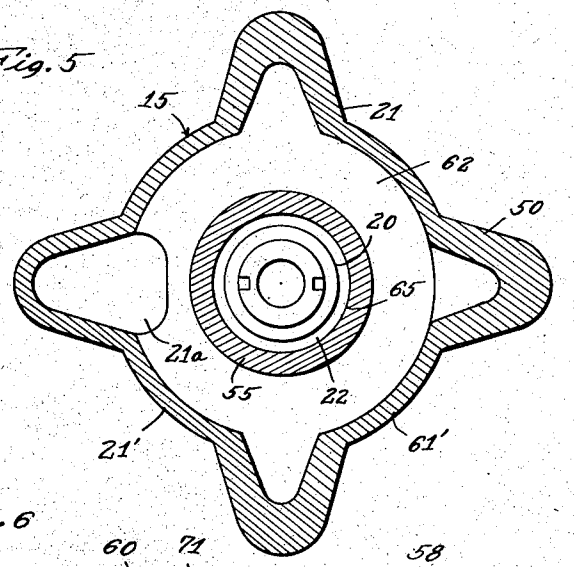
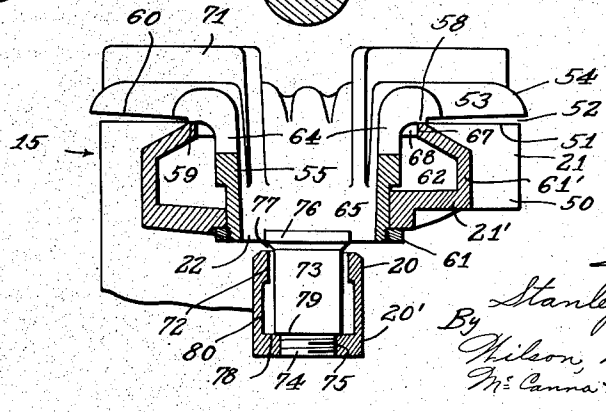


Fig. 6



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GAS BURNER

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Fig. 7

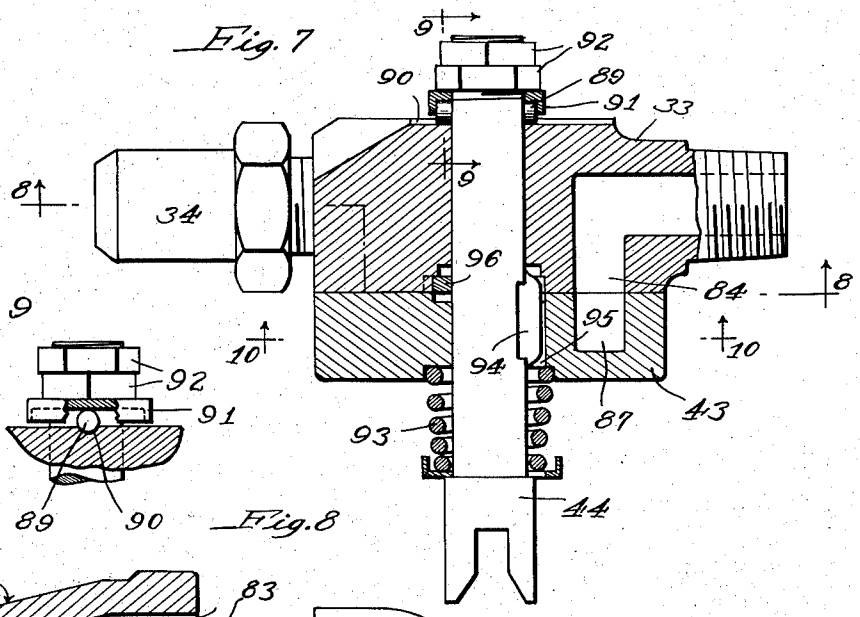


Fig. 9

Fig. 8

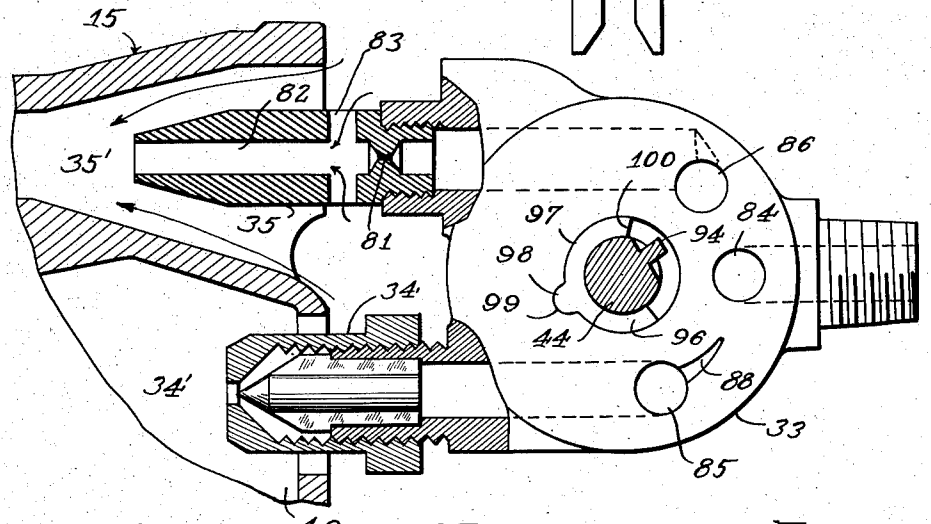
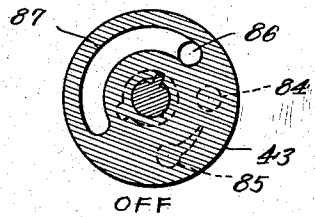
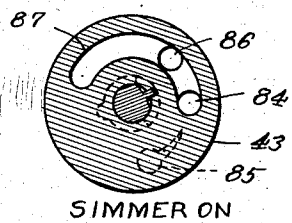


Fig. 11



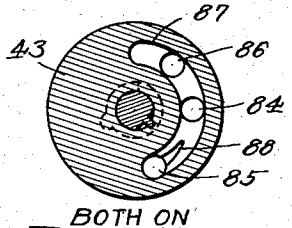
OFF

Fig. 10



SIMMER ON

Fig. 12



BOTH ON

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Patented Sept. 14, 1937

2,092,744

UNITED STATES PATENT OFFICE

2,092,744

GAS BURNER

Stanley H. Hobson, Rockford, Ill., assignor, by mesne assignments, to Reconstruction Finance Corporation, Chicago, Ill., a corporation of United States

Application August 16, 1934, Serial No. 740,040

8 Claims. (Cl. 158—105)

This invention relates to gas burners.

The principal object of my invention is to provide a star-shaped burner constructed to operate with a sheet flame and designed so as to have an increased width of flame at the outer ends of the fingers, whereby to provide for substantially uniform heating in the area occupied by the burner.

Another object is to provide a double burner operating with a sheet flame on both the main star-shaped burner and the smaller circular simmer burner which is centrally located in the main burner at a lower elevation and serves as the lighter for the main burner.

Still another object is to provide a sheet flame burner of two-piece construction, namely, a main body and a top removable therefrom, in which the top is mounted in the body so as to be accurately located and provide the same desired width of flame slot between the top and body on all fingers of the star or clover leaf shaped burner.

This burner is disclosed in my copending applications Serial Nos. 721,101 and 729,409.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the cooking top of a gas range having burners made in accordance with my invention;

Fig. 2 is a side view of a burner on a larger scale, taken on the line 2—2 of Fig. 1;

Fig. 3 is a central vertical section through the same burner on a still larger scale, taken on the broken line 3—3 of Fig. 1;

Fig. 4 is a plan view of the burner partly in horizontal section on the line 4—4 of Fig. 3;

Fig. 5 is a horizontal section of the burner on the line 5—5 of Fig. 3;

Fig. 6 is a vertical section on the line 6—6 of Fig. 4;

Fig. 7 is an enlarged horizontal section through the gas valve on the line 7—7 of Fig. 3;

Fig. 8 is a view taken on the broken line 8—8 of Fig. 7, but showing adjacent portions of the burner;

Fig. 9 is a detail on the line 9—9 of Fig. 7, and Figs. 10 to 12 are sections of the valve on a smaller scale showing the disk in different positions, Fig. 10 being taken on the line 10—10 of Fig. 7.

The same reference numerals are applied to corresponding parts throughout the views.

Figs. 1 to 3 show a cooking top 13 having openings 14 therein for the burners 15. Each burner has a bowl 16 surrounding it and mounting therein a utensil support 17. The ledges 18 support the bowls, and these have openings 19 of four leaf clover or star shape conforming to the burners 15 which project therethrough. The burners 15 are all double burners each having a small simmer burner 20 centrally of a main burner 21. Secondary air will flow upwardly through the annular space 22 to support combustion at the simmer burner, and air will also flow upwardly through the opening 19 to support combustion at the main burner 21. Projections 23 on the burners enter slots in the bowls 16 to locate the latter, and the utensil supports 17 fit in recesses 24 in the bowls for location, as described in my application Serial No. 729,409.

The lighter 26, as described in my application Serial No. 721,101, is also a burner support. It consists of a hollow casing 27 for the pilot burner 28 and arms 29 integral with casing 27 and having flash-back passages 30 therein. Claws 31 support the burners 15 on the ends of the arms 29. The gas supply manifold 32 has valves 33 extending from opposite sides thereof each having two jets 34 and 35 for delivering gas to a main burner 21 and simmer burner 20, respectively. The lighter rests on these valves 33, as indicated at 36—37 (Fig. 3). Each burner is recessed, as at 38 (Fig. 2), to receive projections 39 on the claws 31 and fulcrums on the points 39 for engagement with the lighter 26 at 40. A lateral jet 41 on the side of the simmer burner 20 is thus accurately located with respect to the adjacent end of the arm 29 for lighting purposes, and the mixers 34' and 35' are likewise accurately located with respect to the jets 34 and 35.

The jets 34 and 35 are on the stator part 42 of the valves 33 and the rotary disk 43 turns with the stem 44 to control the delivery of gas from the manifold 32 to these jets. Rods 45 make detachable connections with these stems and are operated by related handles 46 on the front of the stove.

In operation, when the valve 33 for a burner is opened by turning the disk 43 thereof, gas is first discharged through the jet 35 into mixer 35' for the simmer burner 20. Gas issuing from jet 41 is conducted through the flash-back passage 30 to the housing 27 for ignition by the pilot burner 28. This produces a flash-back which lights the simmer burner 20 and its jet 41. The vent 47 (Fig. 2) at the bend in the outer end of the passage relieves the pressure so that the flame will not be snuffed out at 41. The simmer burner 20 can be left burning alone if simmer action is desired, but if the main burner 21 is to be lighted, the disk 43 of valve 33 is turned farther to cause discharge of gas through jet 34 into

mixer 34', whereupon gas issuing from the main burner 21 is immediately lighted by the simmer burner by flame propagation, as hereinafter described. The lighting of the simmer burner is instantaneous, so that the operator can operate the valve 33 in one movement when he wants to light the main burner, but a detent is incorporated in each valve, as hereinafter described, so that the operator can tell by "feel" when he has turned on the simmer burner alone.

The present invention is particularly concerned with the burner 15. This burner is best illustrated in Figs. 3–6. It comprises a one-piece casting for the body portions of the two burners, having the hollow head portion 20' of the simmer burner 20 concentric with the hollow head portion 21' of the main burner 21 but at a lower elevation, and having the mixer 35' of the simmer burner in the same vertical plane with the mixer 34' of the main burner and directly above the same. The mixing tube 20a for the simmer burner is entirely in the same vertical plane with the mixing tube 21a of the main burner, both being substantially C-shaped, with the tube 20a within the confines of tube 21a, as shown. The two mixers are venturi shaped as shown and disposed substantially coaxial with jets 34 and 35, the mixer 34' being elbowed downwardly so as to enable provision of an adjustable rotary shutter 48 to vary the amount of air taken in at 49.. The head portion 21' of the main burner is substantially cross-shaped, as indicated in Figs. 4 and 5, or what may be described as a four leaf clover shape or 4-pointed star shape, there being four fingers 50 90° apart. The mixing tube 21a communicates with the head 21' through the bottom of one of these fingers 50, as shown in Figs. 3 and 5. Two diametrically opposed fingers are in the same vertical plane with the mixing tubes 20a and 21a and the other two diametrically opposed fingers are in a vertical plane at right angles, and inasmuch as the fingers are tapered toward their outer ends, it is apparent that the casting of the burner in one piece is facilitated. The top of the hollow head portion 21' is milled off flat in a horizontal plane, as indicated at 51, to form the bottom of the continuous peripheral sheet flame slot 52 provided between the head portion 21' and the separate top piece 53 that is assembled on the head portion to complete the main burner. The top piece 53 has four fingers 54 of similar form to the fingers 50 and arranged in register therewith, with the outer edges of the fingers 54 slightly overhanging the edges of the fingers 50, as indicated in Figs. 3, 4 and 6. A central tubular portion 55 on the top piece 53 has an accurately machined lower pilot end 56 fitting in a center hole 57 in the bottom wall of the head portion 21' so as to accurately center the top piece with respect to the head portion. An annular shoulder 58 on the top piece is arranged to engage an annular seat 59 on the top of the head portion 21' to accurately locate the top piece at the proper elevation with respect to the head portion and thus secure a slot 52 of a predetermined depth, the shoulder 58 being spaced a predetermined distance from the bottom face 60 of the top piece. The face 60 is machined in outwardly diverging relation to the top face 51 of the head portion 21' so that the slot 52 is of greater width at the outer ends of the fingers than toward the center of the burner. A nut 61 threads on the lower pilot end 56 of the tubular portion 55 of the top piece and jams against the bottom of the head portion 21' to hold the top piece in place and makes the burner gas tight at that point. In the tightening of this nut, care is taken to see to it that the fingers 54 register accurately with the fingers 50. The head portion 21' has a hollow annular body 61' formed thereon concentric with the tubular portion 55 of the top piece 53 so as to provide an annular space 62 within the head portion to establish good communication between the fingers and thus insure adequate gas supply to all fingers. A horizontal wall 63 is formed in the top of the head portion 21' in that finger with which the mixing tube 21a communicates, in order to direct the incoming gas to the annular space 62 and avoid the condition of too much gas supply to the one finger directly communicating with the mixing tube. Vertical slots 64 are milled in diametrically opposite sides of the top piece 53 between the fingers and extend downwardly far enough to establish good communication with the annular space 62 in the head portion 21'. These slots provide for flame propagation from the open center 65 of the main burner to the outer peripheral slot 52, as required in the lighting of the main burner from the simmer burner. The fact that the top piece 53 has an annular enlarged portion 66 above the lower pilot end 56 to form an upper pilot arranged to fit snugly in the bore 67 formed in the top of body 61' to further insure good centering of the top piece with respect to the head portion, makes it advisable to provide external vertical grooves 68 on the upper end of the tubular portion 55 of the top piece to provide good communication between the slots 64 and the annular channel 62 so that the slots will not be starved so far as gas supply thereto is concerned and there will be quick lighting across from the inside to the outside of the main burner. Of course, once the gas issuing from the continuous peripheral slot 52 is ignited at the two diametrically opposed points of the burner, the flame propagation from those two points results in the practically instantaneous lighting of the whole burner. The head portion 21' is cored out within the fingers 50, as at 69, and the top piece 53 is similarly cored out, as at 70, within the fingers 54 to provide for different radial depth of slot and thus different length of travel of the gas through the continuous slot 52 at different points on the burner, there being shorter travel at the narrower portions of the slot 52 and longer travel at the wider portions of the slot as must be apparent from comparison of Fig. 4 with Fig. 6. This prevents flash-back of flame from the outside to the inside of the burner. Upwardly projecting ribs 71 are provided on the tops of the fingers 54 extending radially along the middle of the fingers. These ribs reenforce the fingers and minimize danger of breakage and serve also to prevent a utensil bottom from getting too close to the flame of the burner.

The simmer burner 20 also is constructed to burn with a sheet flame, its flame being, however, circular to conform to the shape of the open center 65 of the main burner. The opening at 65 is made large enough so that the simmer burner flame will not be fouled by direct contact with the inside of the tubular portion 55 of the top piece 53 of the main burner. Obviously, any gas issuing from slots 64 will be ignited readily by such a circular flame. The head portion 20' of the simmer burner has a circular opening 72 in the top wall thereof truly concentric with the main burner to form one wall of the circular slot for the circular sheet flame of the simmer burner. A central tubular member 73 fitting in the head

portion 20' and having a reduced threaded lower end 74 threaded in a hole 75 in the bottom wall of the head portion coaxial with the hole 72 has an enlarged upper end 76 which forms the other wall of the circular slot 77. An accurately machined seat 78 inside the head portion 20' is engaged by the annular shoulder 79 on the member 73 so as to locate the latter accurately and insure not only a predetermined width of slot but also a slot of uniform width at 77. The head portion 20' is cored out annularly with respect to the member 73, as at 80, to insure good supply of gas to all portions of the slot 77 and also insure good supply of gas to the lateral jet 41.

In the operation of the burner of my invention, the burner is, first of all, supported accurately with respect to the cooking top 13 to insure a spacing of one-half inch to $\frac{5}{16}$ of an inch between the slot 52 and the bottom of the utensil to be heated. This is important because too close proximity results in fouling and too much spacing means inefficient heating. The fact that the flame issues horizontally enables such close spacing between the burner and utensil as I have just mentioned without fouling upon turn-up. Most other burners had to make allowance in the elevation thereof for turn-up and, as a result, there would be efficient heating only with a certain sized flame. The clover leaf shape of the burner, moreover, gives greater flame spread and consequently makes for more efficient heating of a utensil. Out of regard for the fact that the simmer burner operates simultaneously with the main burner and there is consequently a circular flame within the clover leaf flame of the main burner, the slot 52 was purposely made so as to be wider at the ends of the fingers than toward the center of the main burner, in order to provide more flame at the outer ends of the fingers farthest away from the simmer flame and less flame in the vicinity of the simmer flame at the inner ends of the fingers. The proportioning of the flame was arrived at experimentally so as to result in uniform heating of the bottom of a utensil. The simmer burner is well below the elevation of the main burner for several reasons. First of all, it is desired to have the lighter 26 well below the cooking top so that it is concealed and its pilot burner 28 will not transmit appreciable heat to the cooking top. This dictated the placing of the simmer burner at that lower elevation since the simmer burner is the one which is ignited by the lighter and, in turn, lights the main burner. Now, the lower elevation of the simmer burner was also necessitated because of its high flame, which required sufficient spacing from the utensil to give even heat and avoid fouling. A high flame for the simmer burner is considered desirable because there must be adequate gas supply to this burner if there is to be assurance of safe and positive lighting. In other words, if too small an amount of gas were supplied to the simmer burner the jet 41 thereof would not deliver sufficient gas to the lighter to make the automatic lighting of the simmer burner as positive as desired. As later described, the supply of gas to the simmer burner is constant throughout the adjustment of valve 33 in the graduating of the flame of the main burner and, of course, the constant supply to the simmer burner is of sufficient volume for positive lighting with the automatic lighter 26. In operation, therefore, as soon as the valve 33 is opened, there is a sufficient delivery of gas to the simmer burner 20 for the charging of the flash-back passage 30 by the lateral jet 41, in order to secure automatic lighting of the simmer burner by flash-back in the lighter. The simmer burner and its lateral jet burn with a constant flame, the burner and jet being supplied with adequate secondary air past the end of the lighter and up through the central opening 65 of the main burner. The simmer burner can be used alone for simmer purposes, or for lighting the main burner. Just as soon as the valve 33 is turned further to deliver gas to the main burner 21, gas issuing from the slots 64 is ignited by the flame of the simmer burner and instantly lights the gas issuing from the continuous peripheral slot 52 by flame propagation outwardly from the open center 65 of the main burner, as previously indicated. The main burner may be turned on or regulated to what ever sized flame is desired, and the turning of the valve 33 for such regulation of the main burner does not affect the simmer burner in any way. There is, therefore, a full sized pilot flame in the center of the main burner at all times to take care of ignition of the main burner and hence there is no likelihood of unburned gas being allowed to escape from the main burner in the event the gas is turned down low. The danger of asphyxiation is accordingly entirely eliminated.

The present burner it will also appear will not clog by reason of drippage, boiling over, or spilling onto the burner from a cooking vessel. The reason is that the slot 52 opens only to the side of the burner and the same is true of the slot of the simmer burner. Furthermore, the overhang of the top 53 with respect to the lower portion of the head of the burner reduces to a minimum what little chance there might be for anything to enter the slot by flowing down the sides of the burner. Such overhang is also provided in the simmer burner as shown in the drawings.

The stove illustrated is what may be called a semi-closed top stove because while the cooking top 13 is closed, the bowl 16 and utensil support 17 cooperating with each burner 15 form a heat concentrating unit for efficiently heating a utensil placed over the burner while allowing final escape of the products of combustion to the atmosphere, instead of having the products conducted under the cooking top to a discharge flue. In view of such operation, the burner is supported so that there is an elevation of approximately $\frac{5}{32}$ of an inch for the tops of the ribs 71 and the top of the utensil support 17 with respect to the cooking top, whereby to insure free escape of products of combustion between a utensil and the cooking top. It will, of course, be understood that while the present burner is illustrated in connection with a stove of this type, the burner may be used in gas ranges of the open or closed types.

The amount of gas delivered to the simmer burner is, of course, small in relation to the amount of gas delivered to the main burner. It was, therefore, a problem to secure sufficient injector action with the relatively small gas flow to produce a good combustible mixture both from the standpoint of good burning of the simmer burner and positive lighting through the operation of the lateral jet 41. The jet 35 used in connection with the mixer 35' of the simmer burner as shown in Fig. 8 provides for double air injection and hence double mixing of gas and air. This jet 35 has a small orifice 81 discharging into the longitudinal bore 82 of the jet past air intake openings 83 whereby to entrain an initial amount of air with the gas directly in the jet itself, as indicated by the small arrows, and partially mix the air and gas. The mixture discharged from

the jet into the mixer 35' causes a further injection of air, as indicated by the longer arrows, so that the mixture formed in and passing through the tube 20a to the simmer burner has the right amount of air in proportion to the gas both for good combustion and quick lighting.

The valves 33 are specially constructed, as shown in Figs. 7–12, to permit graduating the main burner without affecting the simmer burner. As best appears in Fig. 8, the stator or body of the valve has a gas supply port 84 between ports 85 and 86 that communicate with the jets 34 and 35, respectively. When the disk or rotor 43 is in the "off" position shown in Fig. 11, the supply port 84 is closed and the arcuate groove 87 provided in the rotor communicates only with the port 86 for the simmer burner. A slight turn of the disk 43, however, brings it to the "simmer on" position of Fig. 10 in which the port 84 has full communication with port 86. The simmer burner is, therefore, turned on fully and is automatically ignited by the lighter 26. Further turning of the disk 43 results in establishing communication between the port 84 and port 85 along with 86 whereby to operate the main burner. A narrow arcuate tapered groove 88 is provided in the body or stator of the valve extending from the port 85 toward the port 84. This permits throttling the main burner to whatever extent desired by turning the disk 43 so as to have different degrees of registration of the port 85 and groove 88 with the groove 87. Obviously, the throttling of the main burner has no effect whatever upon the functioning of the simmer burner; its port 86 always has the same communication with port 84.

The valves 33 are provided with detents which enable the operator to turn the disk 43 to the simmer position of Fig. 10 without allowing a small amount of gas to flow to the main burner. This detent consists of a cross-pin 89 on the rear end of the stem 44 arranged to enter a groove 90 in the back of the stator or body of the valve when the disk 43 is turned to the "simmer on" position shown in Fig. 10. The pin 89 is held in place by a thimble 91 which in turn is secured on the stem by nuts 92 threaded on the end of the stem. A coiled compression spring 93 encircling the front end of the stem acts between the stem and the disk 43 to hold the disk seated and also urge the stem forwardly to cause the detent 89 to enter the recess 90 and releasably hold the disk 43 in the "simmer on" position. A key projection 94 on the stem 44 fits in a keyway 95 in the disk to provide a driving connection between the stem and disk. A washer 96 entered in a counter-bore 97 in the stator or body of the valve has a lug 98 fitting in a radial recess 99 so as to hold the washer against turning. The washer is cut away, as at 100, to provide two stops for engagement by the key 94 at the limits of turning of the stem 44, see Figs. 11 and 12. The key 94, therefore, serves the double purpose of providing a driving connection between the stem and disk 43 and limiting the turning of the stem and disk. When the operator turns the disk 43 from the "off" position of Fig. 11, the detent pin 89 drops into the recess 90 the moment the disk arrives at the "simmer on" position of Fig. 10. The operator can easily feel this in the turning of the handle 46 on the front of the stove; in fact, it takes some slight additional pressure on the handle 46 to turn the disk 43 past the "simmer on" position, due to the spring 93 urging the detent pin 89 into the recess 90.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn with a view to covering all legitimate modifications and adaptations.

I claim:

1. A star shaped gas burner comprising a head portion and a top portion both star shaped and defining therebetween a continuous peripheral flame slot for projecting flame laterally from the sides of the fingers of the star when gas issuing from the slot is burned, the slot of each finger being of greater width at the outer end of the finger than at the inner end, whereby to widen the flame at said outer ends and provide for substantially uniform heating in the area occupied by the burner.

2. A star shaped gas burner comprising a head portion and a top portion both star shaped and defining therebetween a continuous peripheral flame slot for projecting flame laterally from the sides of the fingers of the star when gas issuing from the slot is burned, the slot of each finger being of greater width at the outer end of the finger than at the inner end, whereby to widen the flame at said outer ends and provide for substantially uniform heating in the area occupied by the burner, said head and top portions being internally recessed to define marginal portions on the head and top defining the slot therebetween, said recesses being formed so as to increase the width of the marginal portions at the outer ends of the fingers substantially proportionately with increase in slot width.

3. In a duplex burner, a star shaped main burner open at the center and comprising a head portion and top portion both star shaped and defining therebetween a continuous peripheral flame slot for projecting flame laterally from the sides of the fingers of the star when gas issuing from the slot is burned, and a secondary burner in the open center of the main burner discharging gas substantially vertically, the slot of each finger being of greater width at the outer end of the finger than at the inner end, whereby to provide a narrower flame at the inner ends of the fingers which taken together with the flame of the center burner will give substantially the same heat as that of the wider flame at the outer ends of the fingers, for uniform heating in the area occupied by the duplex burner.

4. In a gas burner, a hollow star-shaped body open at top and having a bottom and side walls, said body having the top of the side walls thereof flat in a horizontal plane to form the bottom of a continuous peripheral flame slot, and a star-shaped top member having a top wall overlying and spaced from the top of the side walls to form the top of said slot, the body having a circular opening provided in the center of the bottom wall thereof and a coaxial circular bearing in the top thereof at the inner ends of the fingers forming the star, and a tubular downwardly projecting portion on said top member having lower and upper concentric cylindrical bearing portions fitting in the aforesaid opening and bearing respectively to accurately center said top member relative to said body, said top member also having a downwardly projecting annular shoulder thereon for engagement with the top of said body adjacent said pilot bearing, whereby to provide a flame slot of predetermined width between the body and top member.

5. A burner as set forth in claim 4 wherein said body has a hollow annular enlarged por-

tion between the top bearing and bottom opening, interconnecting and communicating with the fingers forming the star, whereby to establish free communication between all portions of the burner annularly with respect to said tubular portion of said top member.

6. A gas burner comprising a hollow star-shaped body each of the fingers of which has a continuous peripheral flame slot provided therein for projecting flame laterally from the sides thereof when gas issuing from the slot is burned, the slot of each finger being of greater width at the outer end of the finger than at the inner end, whereby to widen the flame at said outer ends and provide for substantially uniform heating in the area occupied by the burner.

7. A gas burner comprising a hollow star-shaped body each of the fingers of which has a continuous peripheral flame slot provided therein for projecting flame laterally from the sides thereof when gas issuing from the slot is burned, the slot of each finger being of greater width at the outer end of the finger than at the inner end, whereby to widen the flame at said outer ends and provide for substantially uniform heating in the area occupied by the burner, said body being formed internally to make the walls defining the slots of increased thickness at the outer ends of the fingers, substantially proportionately with increase in slot width.

8. A gas burner comprising a main hollow star-shaped body each of the fingers of which has a continuous peripheral flame slot provided therein for projecting flame laterally from the sides thereof when gas issuing from the slot is burned, the center of said main burner being open, and a secondary burner in the open center of the main burner discharging gas substantially vertically, the slot of each finger of the main burner being of greater width at the outer end of the finger than at the inner end, whereby to provide a narrower flame at the inner ends of the fingers which taken together with the flame of the center burner will give substantially the same heat as that of the wider flame at the outer ends of the fingers, for uniform heating in the area occupied by the duplex burner.

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