

[54] GAS OVEN

[72] Inventor: Richard L. Perl, 758 Betner Dr.,
Mansfield, Ohio 44107
[22] Filed: May 14, 1970
[21] Appl. No.: 37,257

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 638,108, May
12, 1967, abandoned.
[52] U.S. Cl.126/21 A
[51] Int. Cl.F24c 15/32
[58] Field of Search.....126/21, 21 A, 273

[56] References Cited

UNITED STATES PATENTS

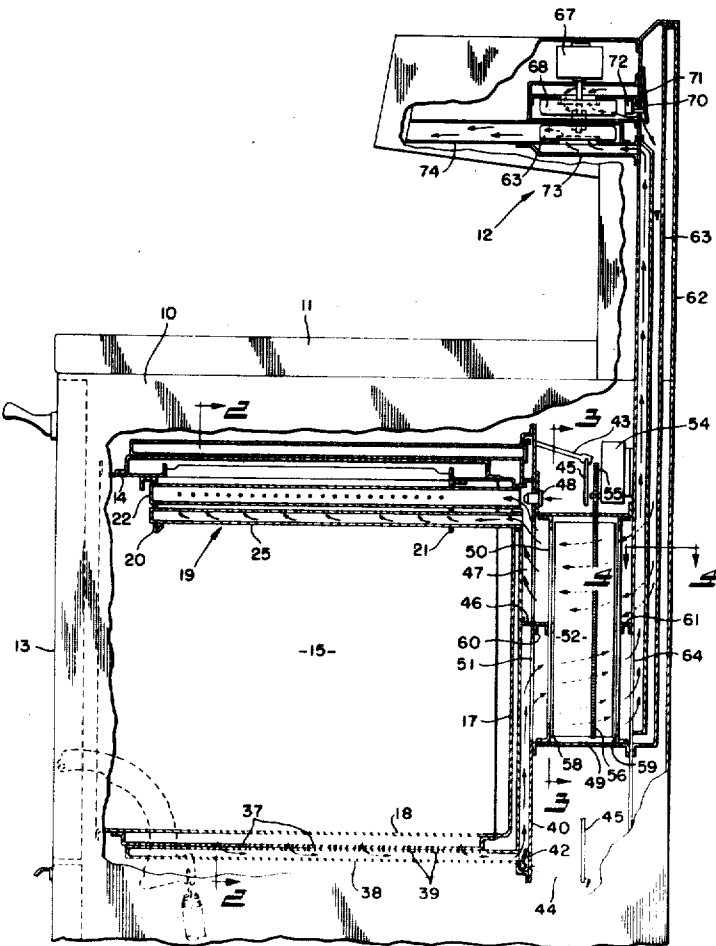
3,364,912 1/1968 Dills et al.....126/21 A
3,416,509 12/1968 Huebler et al.....126/21 A

Primary Examiner—Edward G. Favors
Attorney—Oberlin, Maky, Donnelly & Renner

[57] ABSTRACT

A gas cooking oven in which there is a single top burner assembly having a forced air supply for both primary and secondary combustion air, with the latter directed at the combustion zone or zones to minimize excess air requirement. The burner assembly includes baffling adjustable relative to the burner ports so that the flame issuing therefrom can be selectively exposed to or concealed from the interior of the oven cavity, with such concealment the condition for baking and the flame exposed for broiling and high temperature heat cleaning of the oven. The flue products are exhausted from the oven through a heat exchanger, such as a rotating regenerator drum, for preheating of the incoming air, either substantially directly from the top exterior region of the oven or from the bottom exterior or after such products flow through a wrapper spaced about the outer periphery of the oven liner to heat the walls thereof. The exhaust is from the top region during broiling and from such bottom region during baking and heat cleaning.

27 Claims, 8 Drawing Figures



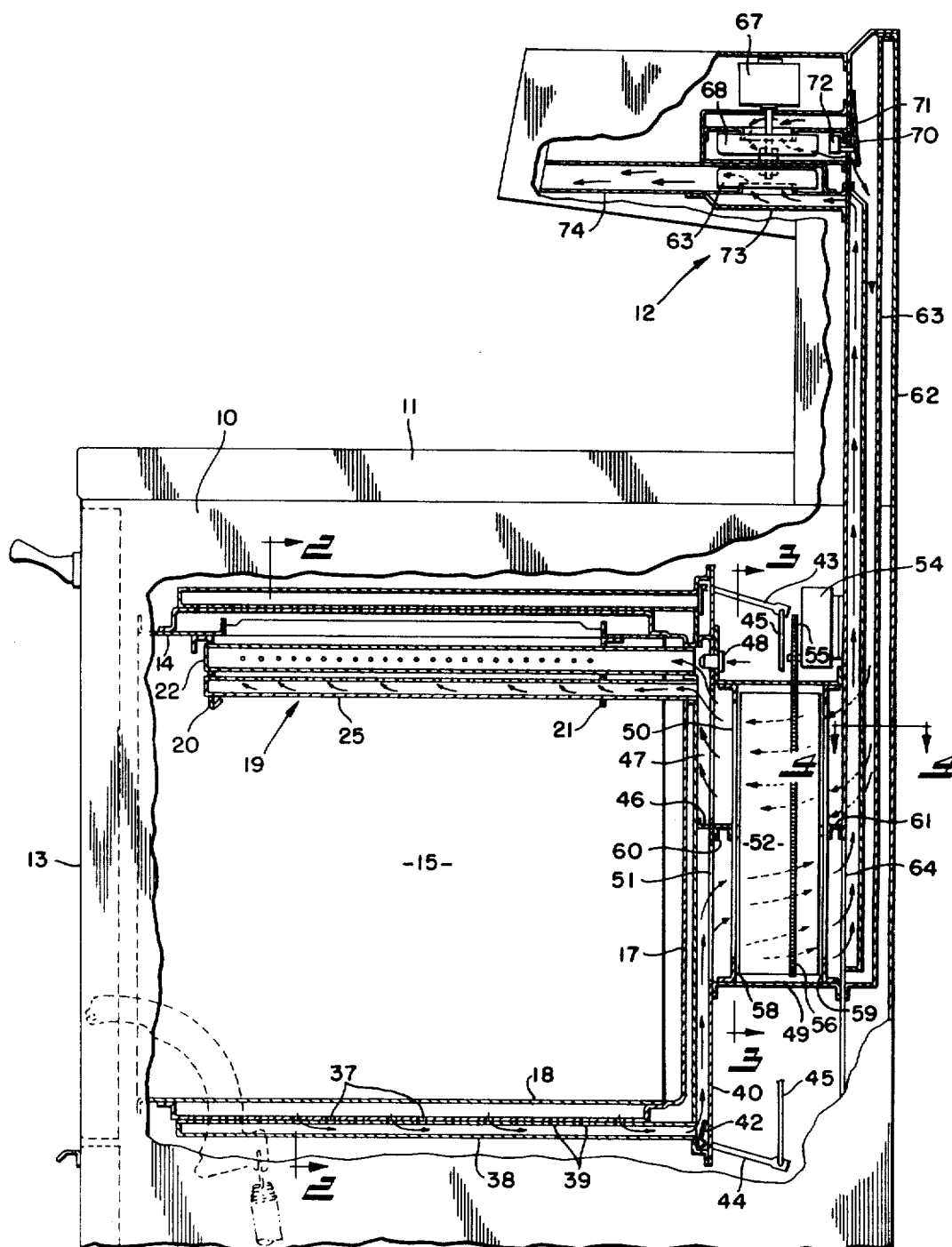


FIG. 1

INVENTOR.
RICHARD L. PERL

BY

Oberlin, Maky, Donnelly & Penner
ATTORNEYS

Fig. 2

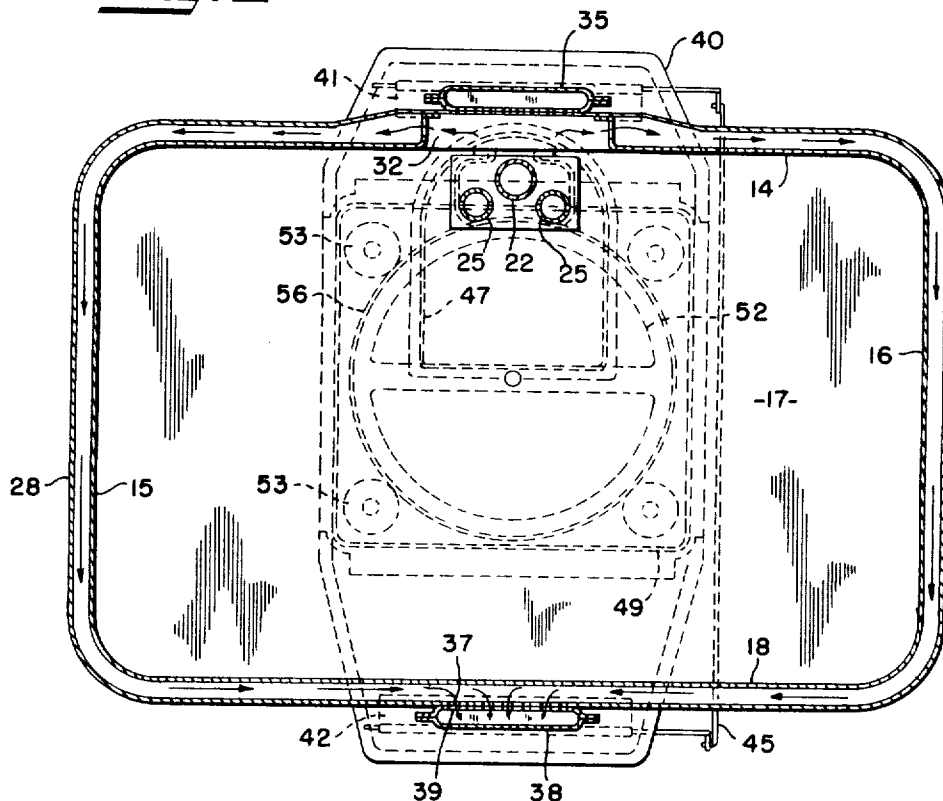


Fig. 3

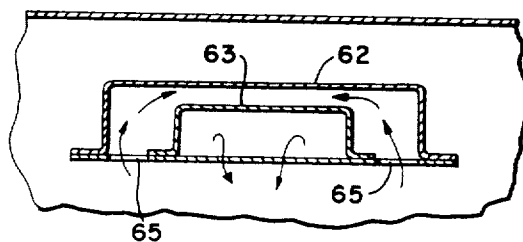
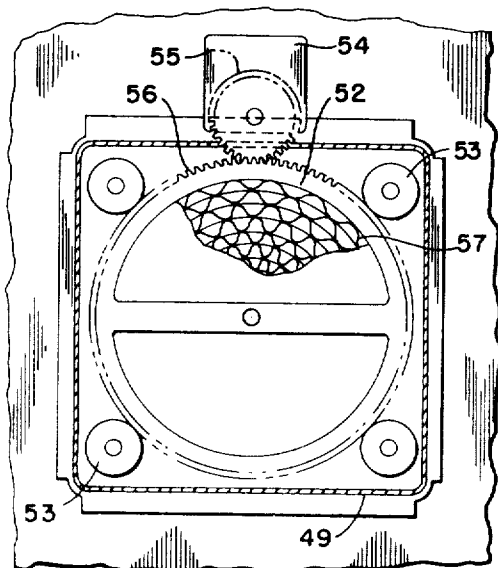


Fig. 4

INVENTOR
RICHARD L. PERL

BY
Oberlin, Maky, Donnelly & Renner
ATTORNEYS

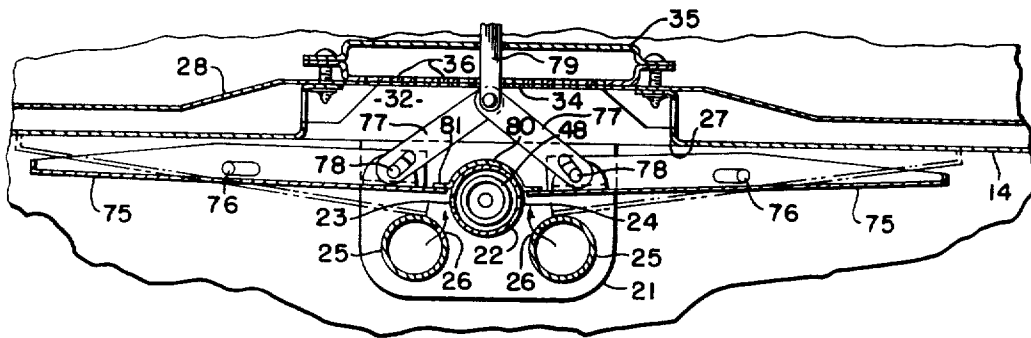


FIG. 5

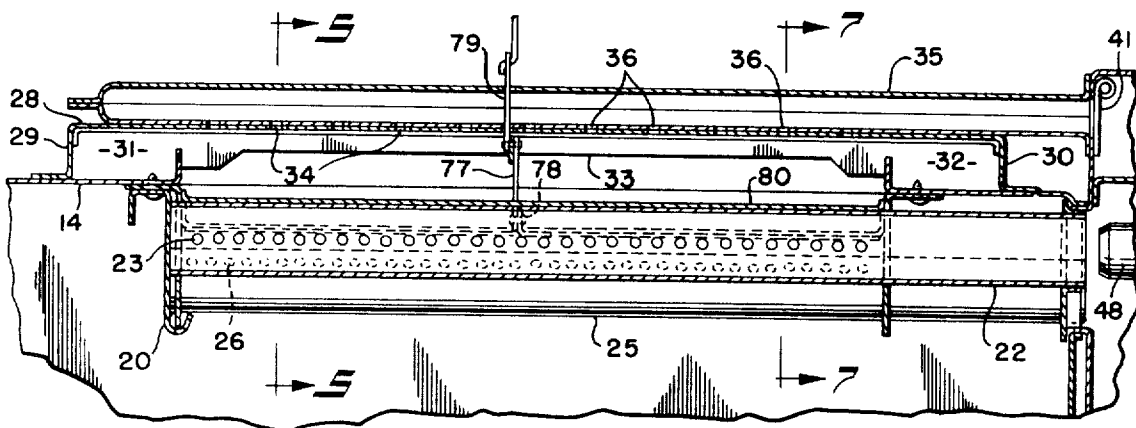


FIG. 6

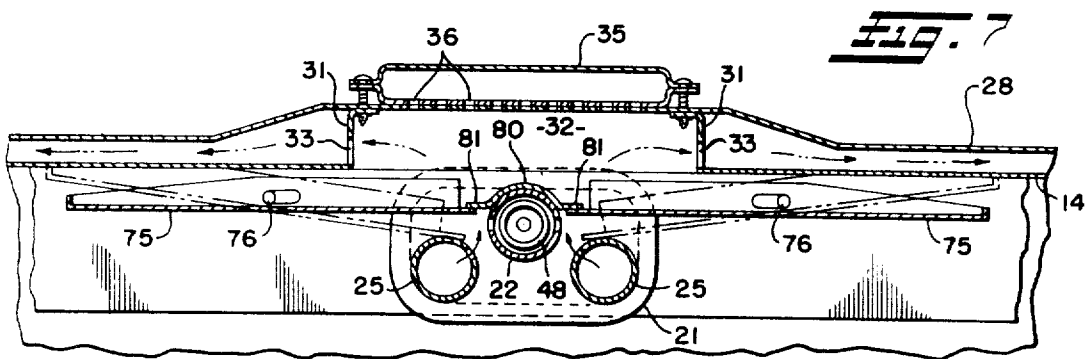


FIG. 7

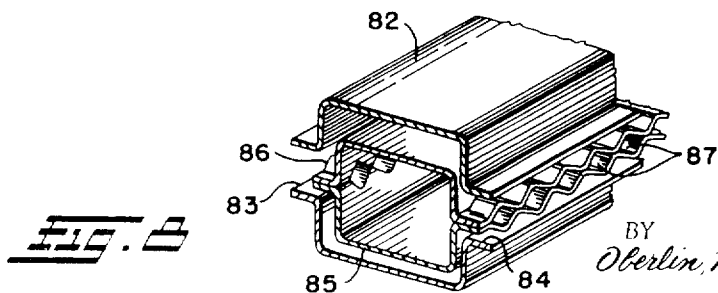


FIG. 8

INVENTOR
RICHARD L. PERL

BY
Oberlin, Maky, Donnelly & Renner
ATTORNEYS

GAS OVEN

This application is a continuation of copending U.S. application Ser. NO. 638,108, filed May 12, 1967, now abandoned.

The invention relates to gas-fired domestic cooking ovens and, more particularly, to an oven of this class in which automatic cleaning is accomplished by heating the oven to a temperature substantially above the range normally used for cooking.

It has been established by work carried out in electric ovens that the food soils which collect on the surfaces of the oven in usual cooking operations will decompose or degrade at a temperature of about 750°F to produce a variety of gaseous degradation products, but which may include carbon monoxide and free carbon having a tendency readily to coagulate to form soot and such products cannot be tolerated in an exhaust to the kitchen. However, catalytic oxidation units have been developed for incorporation in such ovens to treat the gaseous degradation products prior to discharge and particularly to convert free carbon and any carbon monoxide to carbon dioxide. With the further provision of a flow of ambient air through such an oven to carry the products as produced to the special oxidizing unit, thereby protecting against condensation of the vaporized products on the walls, electric household ovens have become available in which such heat cleaning can be carried out, with the operation of such ovens in this respect being described as taking place fundamentally by pyrolysis and without ignition or "burning" of products in the proper chemical sense of the term.

While a gas-fired oven is theoretically free of the problems which were thus encountered in such electric oven operation, namely, redeposition and incomplete oxidation of the food soil products generated during self-cleaning, conventional gas oven designs are basically unsuited for comparable high temperature heating. The principal problem in the gas oven of course is the very high temperature exhaust which results and to which venting to the exterior of the house is considered to be only a partial answer in view of the structural restriction on installation inherent in this approach. The true solution is a gas oven of such improved and more efficient design that a heat cleaning cycle can be carried out with safe and tolerable exhaust in the kitchen, and the provision of such an oven is a primary objective of the present improvements.

The gas oven design which has conventionally been used most widely is basically comprised of cabinet structure forming a lower broiler compartment and an upper baking oven cavity, both served by a single burner where the division occurs and each having a separate access and closure therefor. This configuration accordingly is a single-burner dual-cavity type and, more recently, special duplex or top burner devices have been developed and applied for broiling in the baking cavity. As compared to the first, this second design then is for a double-burner single-cavity type of gas oven.

In distinction from both such conventional designs, it is a further object of the present invention to provide a single-burner single-cavity gas cooking oven in which all normal baking and broiling operations can be performed and the oven additionally cleaned automatically by a high temperature cleaning cycle of operation as discussed above.

Another object is to provide a new gaseous fuel burner assembly having a substantially improved combustion characteristic, particularly in respect of the excess air which is required to ensure full combustion. The significant reduction in the secondary air required in this burner assembly lowers the amount of the hot exhaust and, in the heat cleaning operation particularly, materially assists in realizing the desired discharge to the room.

Such discharge is basically accomplished by heat exchange between the exhaust gases and inflowing ambient air for the combustion of the gaseous fuel, preferably through utilization of a heat regenerator device, and another object of the present invention is to provide means readily adaptable for incorporation in kitchen range structure to effect such heat exchange, that is, within normal range dimensioning and exterior configurations.

It is another object to provide a gas-fired kitchen oven in which there is a top burner assembly having two conditions of operative adjustment, with one providing optimum use of the burner for baking and the other for broiling and self cleaning operations.

An additional object of the invention is to provide a gas-fired kitchen oven having a top burner assembly to which ambient air is supplied under pressure, together with gaseous fuel to be combusted, and the hot combustion products are caused to flow over the oven shell or liner for heating of the oven for baking and self-cleaning cycles of operation.

A related object is to provide an alternate system for circulation of the hot combustion gases during broiling operations for discharge without such flow about the liner.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

FIG. 1 is a side elevation of a kitchen range, shown partially broken and sectioned, equipped with a gas oven according to the present improvements;

FIG. 2 is a vertical cross-sectional view the plane of which is indicated by the line 2—2 in FIG. 1 with only the oven proper shown however for convenience of illustration;

FIG. 3 is a further cross-sectional view taken on the plane of the line 3—3 in FIG. 1;

FIG. 4 is a fragmentary horizontal section of the backguard portion of the illustrated range at the line 4—4 in FIG. 1;

FIG. 5 is a transverse cross-sectional view on an enlarged scale of the top burner assembly of the oven, the plane of the section being indicated by the line 5—5 in FIG. 6;

FIG. 6 is a longitudinal sectional view of such burner assembly;

FIG. 7 is a further transverse sectional view of such burner assembly at the plane of the line 7—7 in FIG. 6; and

FIG. 8 is a fragmented perspective of a burner modification.

Referring now to the drawings in detail, the partially illustrated gas range is of conventional free-standing type apart from the oven and components associated therewith to be described in detail. Such other conventional structure is thus shown simply as comprising the usual cabinet 10 within which the new oven is suitably mounted, the range further having a top 11, a backguard assembly designated generally by reference numeral 12, and a bottom hinged front door 13, the oven being of course open at the front for access in the usual manner.

The oven itself is formed by a liner having as sections thereof a top wall 14, side walls 15, 16, rear wall 17, and bottom wall 18. The cavity defined by this liner is substantially cubical and of full kitchen size, that is, having the dimensions of either the only oven or the main oven for baking and roasting in a home kitchen. The oven proper will, moreover, be thermally insulated from the range structure, for example, by glass wool wrapping, not shown, in usual manner, with the particular insulation system used suited for the high temperature operation to be utilized for the desired self-cleaning action.

A gas burner assembly designated generally by reference numeral 19 is mounted within the oven liner and extends as illustrated centrally just beneath the top wall 14 from the rear wall to a point spaced a relatively short distance inwardly from the front of the liner. This assembly comprises a front hanger plate 20 and a rear hanger plate 21 attached to and depending from the top wall of the liner, and each plate has three circular holes in aligned triangular arrangement as shown. A burner tube 22, which is simply a length of tube of uniform diameter with two rows 23, 24 of ports or orifices 180° apart in the horizontal center plane, is supported in the two top openings of the front and rear hanger plates through which it extends. The tube is open at the rear, closed at the front end, and the length is such that it extends beyond the rear plate to and through an opening in the rear wall 17 of the liner.

The burner assembly further includes two air tubes 25 respectively supported in the lower corner holes of the front and rear hanger plates, with these air tubes also of uniform diameter, closed at their forward ends and extending at the rear through further openings in the rear liner wall 17. Each air tube has a single longitudinal row of ports 26 in the inner upper quadrant adjacent the burner tube 22. It is intended that air issuing from the ports of these air tubes, for a purpose to be more fully explained below, be directed generally toward the rows of the burner ports 23, 24 at the respective sides, and such air ports are shown approximately with their centers spaced 30° from the horizontal. The gaseous fuel and air supply to this assembly will also be more fully described in the following, but it should be here noted that the top wall of the oven liner is provided with a relatively large rectangular opening 27 above the ported length of the burner tube.

A wrapper 28 having front and rear flanges 29, 30 extends continuously about the top, side and bottom

walls of the oven liner with its front and rear flanges against the liner to define therewith a passageway or chamber through which air and gases can be circulated in contact with the enclosed portions of the liner walls.

The width of wrapper 28 is only slightly less than the depth of the liner, so that substantially the entire area about the periphery of the liner is thus enclosed.

At the longitudinal edges of the rectangular opening 27 in the top wall 14 of the oven liner, vertical partitions 31 are disposed to extend from the liner to the wrapper 28, which is at a relatively greater spacing from the liner in this area as shown most clearly in FIG. 2. These partitions also extend from the front to the rear flange of wrapper 28 and, together with the wrapper, define a top plenum chamber 32. Each partition 31 is provided with an elongated slot 33, and the section of the wrapper which forms the top of the chamber 32 is formed with a multiplicity of holes 34, so that air and gases can proceed from the chamber through the partition slots to the space surrounding the oven liner and also through the top chamber openings 34. Any flow through the latter enters and is confined by a shallow top collector duct 35 the bottom of which overlies the wrapper section in which the holes or perforations 34 are provided and has holes 36 in register therewith, this duct being open at the rear and otherwise closed. The bottom center section of the wrapper 28 is also provided with a series of holes 37 in a rectangular pattern, and a bottom collector duct 38 similar to the top one is disposed against this further wrapper section with registering holes 39 in its contacting wall, which is in this case the top of the duct. Such lower duct 38 is also open at its rear and otherwise closed except for the holes or perforations 39. The free space about the periphery of the oven liner thus has communication with both the top and bottom collector ducts.

A manifold 40 is arranged vertically behind the oven at a slight spacing from the rear wall 17 of the liner and is of a height to extend both above and below the rear ends of the top and bottom ducts 35, 38, while being of significantly reduced width relative to the oven as shown in FIG. 2. The front wall of this manifold is provided with openings at which communicating connections are made with such top and bottom collector ducts, and these communicating connections or openings are controlled by hinged dampers 41 and 42 having operating levers 43 and 44, respectively, and a common actuator rod or link 45. The arrangement of the dampers is such that they move simultaneously between adjusted positions in which one is open and the other closed and the reverse of this condition. The actuator link will have a connection, not shown, to a handle or lever accessible to the user of the range at some convenient exterior location and, preferably, to be operated in conjunction with the oven thermostat.

A continuous transverse partition 46 is disposed within the manifold 40 bridging between the front and rear walls of the latter to form an isolated chamber 47 within the central upper portion of the manifold. As again shown most clearly in FIG. 2, this inner chamber 47 has an upper vaulted portion behind the burner assembly 19, and the enclosed portion of the front manifold wall has openings in which the ends of the burner tube 22 and the two air tubes 25 are received. The rear wall of the manifold directly behind the end of

the burner tube has an opening in which a gas spud 48 is mounted to be supplied with gaseous fuel from the source to which the range is connected.

A square shaped housing section 49 having open outwardly flanged ends is positioned with one end against the rear wall of the manifold 40 to enclose an area of the latter which includes the section thereof forming the lower portion of the separate inner chamber 47. Such manifold wall section has an opening 50 to provide communication between the chamber 47 and the interior of the housing section 49 at the upper portion of the latter. A further opening 51 is provided in the rear manifold wall for providing separate communication between the interior of the manifold and the lower portion of the housing section 49.

A regenerator wheel or drum 52 is supported within the housing section 49 rotatably on rollers 53 and is driven by a small electric motor 54 through a gear 55 on the motor shaft in mesh with a toothed ring 56 about the periphery of the drum. The drum is intended to serve as a heat sink and preferably comprises a body 57 of honeycomb formation and thus having a multiplicity of small axial passages. Regenerator drums or wheels on this order are known and, as in a more specific example, the body can be formed of corrugated asbestos impregnated with sodium silicate or the equivalent for high heat capacity. The ends of the drum are unobstructed, but the space between the drum 52 and the enclosing square housing 49 is closed by square baffle plates 58, 59 having circular openings coincident with the drum ends to confine any flow through the section to the drum itself. Furthermore, the drum is effectively divided into upper and lower halves by horizontal diametric wipers 60, 61 made of a heat resistant material, such as glass fiber, respectively at its end faces.

The housing section 49 at the rear is connected to vertical ducting which, as shown most clearly in FIG. 4, comprises an outer duct 62 of generally rectangular section and an interior channel against one wall of the outer duct to form a second and separate inner duct 63. An opening 64 is provided in that portion of the forward wall of the outer duct 62 common to the lower end of the inner duct 63 below the rear drum wiper 61, so that this inner duct communicates with the passages in the lower half of the rotating drum. The forward wall of the outer duct 62 has openings 65 at the sides of the inner duct just above the rear wiper 61 and hence providing communication between the outer duct and the top half of the drum.

The vertical ductwork continues upwardly through the vertical part of the backward assembly 12 of the range to blower means housed within the upper section of this assembly. Such blower means comprises an electric motor 67 having two counterrotating fans 68, 69 on its drive shaft, with one above and sealed from the other. The upper fan 68 draws in ambient air and discharges it to the outer duct 62 through the opening 70, where there is a hinged gate 71 and microswitch 72 for a safety purpose to be described. The lower fan 69 rotates oppositely and serves to exhaust the inner duct 63 through a connecting passage 73 leading to the inlet of the fan and an outlet 74 to the kitchen.

As indicated earlier, the burner assembly 19 is intended to have two conditions of operative adjustment in relation to the type of operation to be performed

and, more particularly, such adjustment concerns exposure of the flame within the oven cavity. The top location of the burner tube 22 is of course suited for broiling and like operations in the normal use of the oven, but the flame must be "hidden" from foods to be baked or roasted. Such concealment is accomplished in the illustrative embodiment of the invention by means of two baffle plates 75 respectively at the sides of the burner tube 22 and mounted on pivots 76 at their ends for angular adjustment. As shown best in FIG. 5, the mounting of the baffle plates includes two links 77 of equal length pivotally connected to corresponding points 78 on the two baffle plates and having their other ends commonly connected pivotally to a third vertical link 79. The latter will also extend or have a connection to an operating handle, not shown, accessible at the exterior of the range, and it will be evident that vertical movement of the common link 79 causes both plates 75 to execute corresponding angular movement.

The limits of such adjustment of the baffle plates are established by a stop strip 80 on the burner tube and the two air tubes 25. The stop strip extends over the upper portion of the burner tube and provides outwardly directed stop flanges 81 respectively just above the two rows of burner ports 23, 24. The inner edge portions of the plates engage the undersides of such stop flanges in the first relatively elevated condition of adjustment shown by the full lines in FIG. 5, while the air tubes 25 are engaged by these edges to limit their downward movement as shown by the dashed outlined in this figure.

It will thus be seen that the flame at both sides of the burner tube 22 is beneath the baffle plates 75 in the elevated condition of the latter, but above the plates in the lowered condition and hence concealed. This last condition is of course the one used for the baking, and it is preferred that the flame be exposed in self-cleaning as well as broiling, since the radiant heating effect is also beneficial in this operation, particularly in view of the fact that the bottom of the oven usually accumulates most of the food soils.

It will be appreciated that all operations of this oven involve forced air supply to the burner assembly, and the circulation system will now be more particularly described. Ambient air is drawn from the kitchen by the fan 68 and is delivered through the hinged gate 71 to the outer or inlet duct 62 of the vertical ducting, such opening of the gate permitting closure of the microswitch 72 which can thus be suitably incorporated in the control circuit of the oven to ensure that operation of the latter cannot be initiated if the fans are not operating. The intake air proceeds downwardly through duct 62 and through the openings 65 to the outer end of the upper half of drum 52, which in operation will be rotating at a relatively slow speed. After passing through the multiple axial passages of the upper half of the drum, the supply air enters the chamber 47 and flows from the latter into the open ends of the burner tube 22 and air tubes 25. The spud 48 of course is in operation delivering gas at the usual pressure to the burner tube 22, with that portion of the supply air flowing with the fuel into the burner tube constituting the primary air for combustion and the rest of the supply entering the two air tubes for discharge

therefrom as secondary air. A suitable pilot and igniter, also not shown, will be provided to ignite the mixture of gas and air issuing from the burner ports 23, 24, and it will be evident that the secondary air is confined and closely directed at the flame. With this configuration, the amount of air can be at or close to stoichiometric, with a very substantial reduction in the amount of excess air provided as a result of the controlled direct delivery of the secondary air described. This reduction in the amount of excess air needed greatly lowers the heat output of the oven.

With the burner baffles 75 in the broil or elevated positions of adjustment, the flame is beneath such plates and the hot gases must flow outwardly over the plates respectively toward the sides of the oven. For this operation, the top collector duct 35 will be open, and the bottom duct 38 accordingly closed, so that the flue gases are drawn through the top liner opening 27 into the upper plenum chamber 32 and from the latter to top collector duct 35. It will of course be understood that the second fan 69 also operates in all conditions of operation of the oven to draw the flue gases which enter the rear manifold 40 through the bottom half of the rotating drum 52 and into the interior or outlet duct 63. The flue products thus not only transfer heat to the drum, and through the latter to the incoming air, there is a further heat exchange provided by the containment of the outlet duct 63 within the inlet duct 62.

As stated earlier, the burner baffle adjustment will preferably be the same for self-cleaning as for broiling, but the cleaning operation will be carried out with the top collector duct closed and the bottom collector open. Hot gases accordingly entering the upper plenum chamber 32 in this condition circulate within the wrapper 28 fully about the exterior periphery of the oven liner to the bottom collector duct 38. The liner wall portions are thus convectively heated from the exterior, with additional interior radiant heating by reason of the noted exposure of the burner flame. The oven temperature for the self-cleaning operation will be in excess of about 750° and perhaps as high as 1,000°F., and the efficiency of the burner assembly and the circulation system described are such that the temperature of the exhaust of the flue products to the kitchen can be less than 200°F. with the oven at a temperature of about 1,000°F. There will of course be comparable reduction in the heat of the exhaust in the broiling and baking operations as well, since the circulation occurs whenever the oven is operated.

The baking operation entails the previously noted adjustment of the baffle plates 75 to the lowered condition, whereby the burner flame is concealed, with bottom collector duct 38 open and the top duct 35 accordingly closed. The gases from the burner thus again flow from the top or upper plenum chamber 32 about the periphery of the liner for the heating of the oven to the desired baking temperature, and the exhaust is the same as described for the self-cleaning cycle. Baffle plates 75 in the illustrated embodiment are of such width and shape that their outer edges engage the top wall 14 of the liner outboard of the opening 27 therein when the plates are in the lowered or bake condition. Accordingly, the flow of products from the oven interior to the plenum chamber 32 in this condition must proceed substantially entirely through the relatively

small clearances between the burner tube 22 and air tubes 25, and hence closely through the burner flame, whereby oxidation of such products is facilitated.

The new oven thus uses a minimum amount of excess air for combustion of the gaseous fuel and, with forced air supply, heat exchange between the flue products and the incoming air. The regenerator wheel described is not considered critical in the sense that other heat exchange configurations cannot provide an equivalent transfer, and there will of course be the usual oven controls and safeties, such as a flame switch for the burner, and these need not be described or illustrated. As previously noted, the control should insure that the oven cannot be operated if the circulating system is inoperative, and it might also be desirable to provide a cooling period following a heat cleaning cycle during which the circulation system would continue with the burner off for accelerated extraction of the heat; the blower means could in such cooling be operated at a higher speed without rotation of the wheel.

The modified burner assembly shown in FIG. 8 uses the same principle of forced air supply as the one first described, but in a configuration which requires only a single secondary air tube 82. Such tube in this assembly is of relatively large generally rectangular section and has two outwardly flanged slots 83, 84 centrally at the respective sides. The burner 85 here is shown as also generally rectangular and formed by complementary channels having corrugated flanges which together provide side rows of burner ports 86, 87. Burner 85 is totally freely enclosed by air tube 82, with ports 86, 87 extending partially into the air tube slots 83, 84, also with appreciable clearance for free flow of the pressure secondary air from within tube 82 through such slots and therefore at the flame along the sides of the burner when operating. In this modified assembly, then, as well, the secondary air is forced and closely directed at the combustion zone or zones to again reduce the amount of excess air as compared to that which has to be provided in conventional range burners.

The use of two fans as disclosed permits the oven internal pressure to be adjusted in the sense that an imbalance can be created selectively for either negative or positive pressure within the oven, with a slight positive pressure found to be of some benefit in cleaning the door surface by the heat cleaning operation. It is, however, possible that a single fan or blower could be employed at the exhaust or supply side with suitable sealing of the system for the desired circulation. Since the oven pressure may be negative, it will be understood that the supply of the fuel gas and combustion air to the burner assembly need not be positive to be under pressure, the characteristic in both oven pressure conditions being that the oven or burner assembly is powered by a pressure differential in the exhaust direction.

The single-burner single-cavity design of the new oven has the obvious advantage of a smooth bottom, with also adds to the space available for storage and the like in the range beneath the oven. It will be further appreciated by workers in the art that the burner assemblies disclosed herein can be used in domestic ovens which are not specially equipped for heat exchange between the exhaust and incoming air, for example, in an economy model without full self-cleaning capability

or with cleaning ability at a somewhat higher heat output.

I claim:

1. A domestic oven comprising liner means having side, rear, top, and bottom walls forming a cooking cavity, gas-fired burner means in the upper portion of the oven for both broiling in said cavity and for baking therein, means for supplying fuel gas and combustion air, both under pressure, to said burner means, and blower-operated exhaust means for the oven having first and second conditions of operative adjustment, the exhaust means in such first condition causing the hot gases produced by the burner means to circulate about side and bottom walls of the liner means for baking operation of the oven and in the second condition withdrawing such gases substantially directly from the burner means for broiling.

2. A domestic oven as set forth in claim 1, which further comprises air supply duct means for conveying relatively cool ambient air to the burner means as the combustion air, and exhaust duct means in said exhaust means through which the hot gases from the oven are circulated, with said air supply and exhaust duct means being disposed in heat exchange relationship.

3. A domestic oven as set forth in claim 1, which further comprises baffle means in association with said burner means, and means for relatively adjusting the burner means and baffle means selectively to shield or expose the outlet section of the burner means with respect to the main interior of the cavity where the foods to be cooked are placed.

4. A domestic oven as set forth in claim 3, wherein the relative adjustment of the burner and baffle means is separate from the adjustment of the exhaust means, with the burner means normally shielded in the first condition of the exhaust means for baking and exposed in the second exhaust means condition for broiling in the oven.

5. A domestic oven as set forth in claim 4, which further comprises an inlet duct section through which relatively cool ambient air is conveyed to the burner means as the combustion air, and a hot gas outlet duct section in the exhaust means in heat exchange relationship with said inlet duct section.

6. A domestic oven as set forth in claim 5, wherein said outlet duct section is within said inlet duct section.

7. In a gas oven comprising a cooking cavity, burner means having an outlet section at an upper portion of said cavity, means for supplying fuel gas under pressure to said burner means, means for supplying air under pressure to the burner means to form a combustible mixture with the fuel gas, baffle means associated with the burner means, and means for relatively adjusting the burner and baffle means to provide respectively bake and broil conditions of adjustment thereof, the baffle means in such bake condition being close to and at least partially below the outlet section of the burner means for shielding food articles and the like placed therebeneath in the cavity from direct exposure to the output of the burner means, with the baffle means being relatively withdrawn in the broil condition to provide such exposure for broiling food articles supported below the same.

8. A gas oven as set forth in claim 7, wherein the baffle means is movable, and movement thereof effects the

relative adjustment between said bake and broil conditions.

9. A gas oven as set forth in claim 7, wherein said burner means is the only source of heat for the oven.

10. In combination with a gas oven having a cooking cavity, gas-fired burner means in the oven comprising a housing having an inlet and an outlet, means for supplying fuel gas under pressure to said housing through the inlet thereof, means for supplying primary air to said housing inlet for mixing with said fuel gas within said housing, blower means, and separate conduit means independent of said primary air supply means for confining secondary air delivered under pressure from the outlet of said blower means and discharging the same directly to the immediate region of the burner outlet and thus substantially directly to the combustion zone of the burner means.

11. The combination set forth in claim 10, wherein the outlet of the burner means is elongated, and the conduit means is constructed and arranged to deliver the pressurized secondary air substantially uniformly over the extent of said outlet.

12. A gas oven comprising an inner liner forming a single cooking cavity in which both baking and broiling operations are to be performed, outer wrapper means extending in spaced relation over a major portion of the periphery of the liner and forming therewith an exterior circulation chamber, gas burner means located in an upper portion of the cooking cavity, means providing communication between the interior of the liner above the burner means and the exterior circulation chamber, means for circulating hot gases produced by the burner means through said circulation chamber and thus over the enclosed peripheral portion of the liner to heat the same for baking in the oven, and means for alternatively withdrawing the hot gases substantially directly from the upper portion of the cavity for broiling without flow through the circulation chamber.

13. A gas oven as set forth in claim 12, which further comprises means for supplying gas under pressure to the burner means, and forced air supply means therefor.

14. A gas oven as set forth in claim 12, which further comprises baffle means associated with the burner means, and means for relatively adjusting the burner and baffle means selectively to shield food in the cavity from the burner output in baking and to expose the food thereto for broiling.

15. A gas oven as set forth in claim 12, which further comprises exhaust duct means to receive the hot gases from the circulation chamber or as alternatively withdrawn from the upper portion of the cavity, and inlet duct means through which combustion air is supplied to the burner means in heat exchange relationship with said exhaust duct means.

16. A gas oven as set forth in claim 12, which further comprises means for supplying fuel gas under pressure to the burner means, means for supplying pressurized primary air to the burner means, and air conduit means for delivering secondary air under pressure directly to the combustion zone of the burner means.

17. A gas oven comprising an inner liner forming a cooking cavity, outer wrapper means extending in spaced relation over a major portion of the periphery of the liner and forming therewith an exterior circulation

chamber, gas burner means in the upper portion of the oven for broiling in said cavity and for baking therein, means for circulating hot gases produced by the burner means through said circulation chamber and thus over the enclosed peripheral portion of the inner liner to heat the same for baking in the oven, and means for alternatively withdrawing the hot gases substantially directly from the burner means and exhausting the same from the oven for broiling without the flow through the exterior circulation chamber.

18. A partially aerated burner system, comprising a gas burner having a port section at which combustion occurs in operation of the burner, means for supplying gaseous fuel to the interior of the burner for issue at said port section, means for establishing a supply of air for the burner under pressure, means for directing a predetermined portion of the pressurized air from such supply to the interior of the burner for mixing therein and issue with the gaseous fuel as a combustible mixture to be burned at said port section, and conduit means independent of said directing means for confining the remaining pressurized air from such supply and discharging the same as secondary air immediately proximate to the port section of the burner.

19. A burner system as set forth in claim 18, wherein the port section of the burner is elongated and the discharge of the secondary air is coextensive therewith.

20. A burner system as set forth in claim 19, wherein the means for confining and discharging the secondary air includes a conduit spaced from the burner and having an outlet section adjacent the port section of the burner.

21. A burner system as set forth in claim 20, wherein the discharge of the secondary air from said conduit is at an angle relative to the direction of issue of the combustible mixture from the burner port section.

22. A burner system as set forth in claim 19, wherein the discharge of the secondary air is in the same general direction as the issue of the combustible mixture from the burner port section.

23. A burner system as set forth in claim 22, wherein the means for confining and discharging the secondary air includes enclosure means in spaced relation to the burner and forming a chamber therewith having an outlet contiguous to the burner port section.

24. A burner system as set forth in claim 23, wherein the enclosure means has top and bottom chamber defining portions spaced from the burner and outlets above and below the port section of the burner.

25. A self-cleaning gas oven comprising an outer supporting cabinet structure enclosing a box-like oven liner and a front-opening access door which define an oven cooking cavity, an outer wrapper surrounding the oven liner and spaced outwardly therefrom to form heating channels, gas burner means for generating flue gases which pass through the heating channels and

raise the temperature of the walls of the oven liner for both cooking of food placed therein and the pyrolytic cleaning of the food soils from the inner surfaces of the walls forming the oven cooking cavity, a counterflow heat exchanger mounted behind the back wall of the outer wrapper with a flue gas inlet at the bottom thereof and a cooling air inlet at the top thereof, the heat exchanger also having a flue gas outlet at the top thereof for exhausting to the atmosphere, and a cooling air outlet to the burner thereof in communication with the gas burner means as a source of heated combustion air.

26. A self-cleaning gas oven comprising an outer supporting cabinet enclosing a box-like oven liner and a front-opening access door which define an oven cooking cavity, an outer wrapper surrounding the oven liner and spaced outwardly therefrom to form heating channels therebetween, gas burner means for generating flue gases which pass through the heating channels and raise the temperature of the walls forming the oven cooking cavity for both the cooking of food placed therein and for the pyrolytic cleaning of the food soils from the inner surfaces of the oven cavity, vertically arranged stationary heat exchange means located outside the outer wrapper and having a flue gas inlet at the bottom thereof and an ambient air inlet at the top thereof, the flue gas and ambient air flowing in opposite directions to each other, there being a flue gas exhaust at the top of the heat exchange means and an ambient air exhaust at the bottom of the heat exchange means, the flue gas exhaust having an outlet to the atmosphere, and conduit means providing communication between the burner means and the ambient air exhaust, whereby the ambient air becomes heated in the heat exchange means and passes through the conduit means to the gas burner means as pre-heated combustion air.

27. A self-cleaning gas cooking oven comprising an oven body supporting a box-like oven liner and a front-opening access door which define an oven cooking cavity, a gas burner, heating channels extending about opposite side walls of the oven liner and communicating with the burner so that flue gases from the burner may pass through the channels thereby heating the walls forming the oven cooking cavity, a vertically arranged stationary heat exchanger, a flue gas inlet at the bottom of the heat exchanger, a flue gas outlet at the top of the heat exchanger, an ambient air inlet at the top of the heat exchanger and an ambient air outlet at the bottom of the heat exchanger said ambient air outlet supplying heated air to the burner as pre-heated combustion air, whereby the flue gases flowing through the heat exchanger give up much of their heat to the ambient air and thereby exhaust to the atmosphere at a temperature in the order of magnitude of less than one-half of the temperature of the flue gases entering the flue gas inlet of the heat exchanger.

* * * * *