

April 11, 1939.

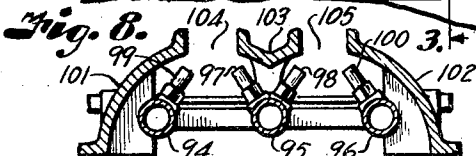
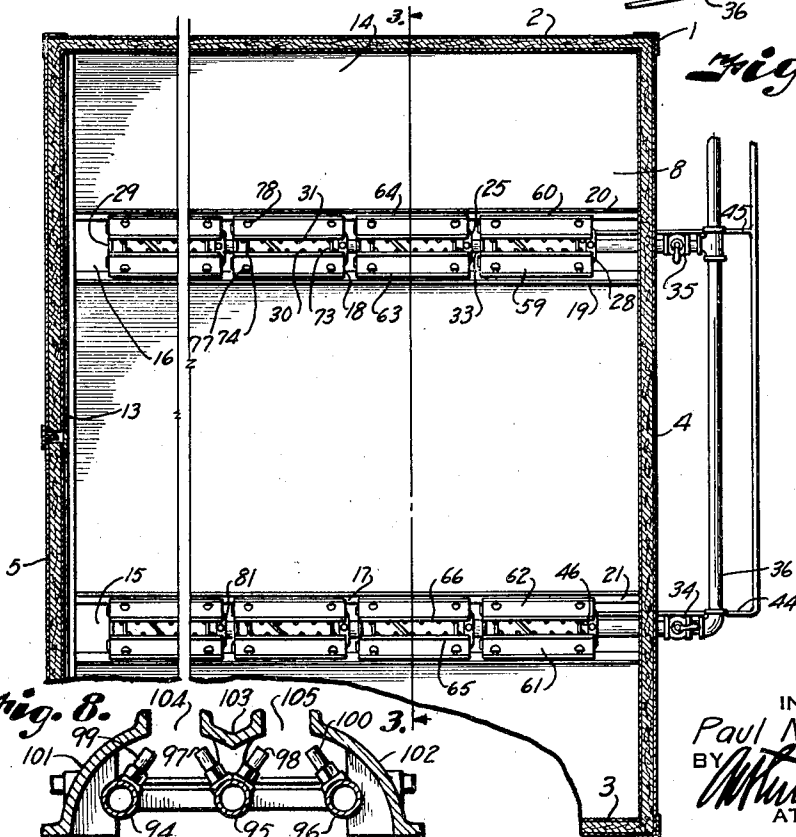
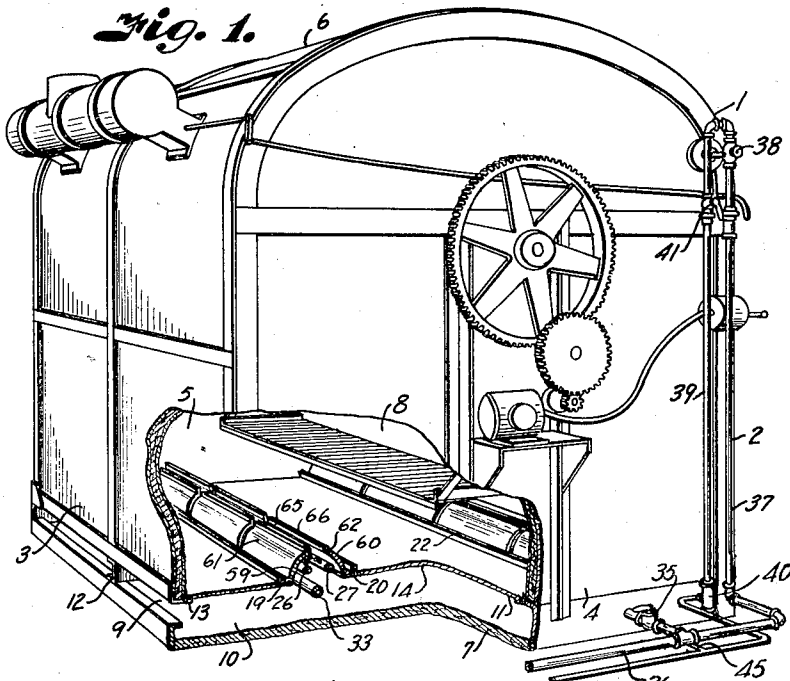
P. N. REED

2,153,938

GAS BURNER

Filed April 1, 1936

2 Sheets-Sheet 1



INVENTOR
Paul N. Reed.
BY *Wm. E. Brown*
ATTORNEY

April 11, 1939.

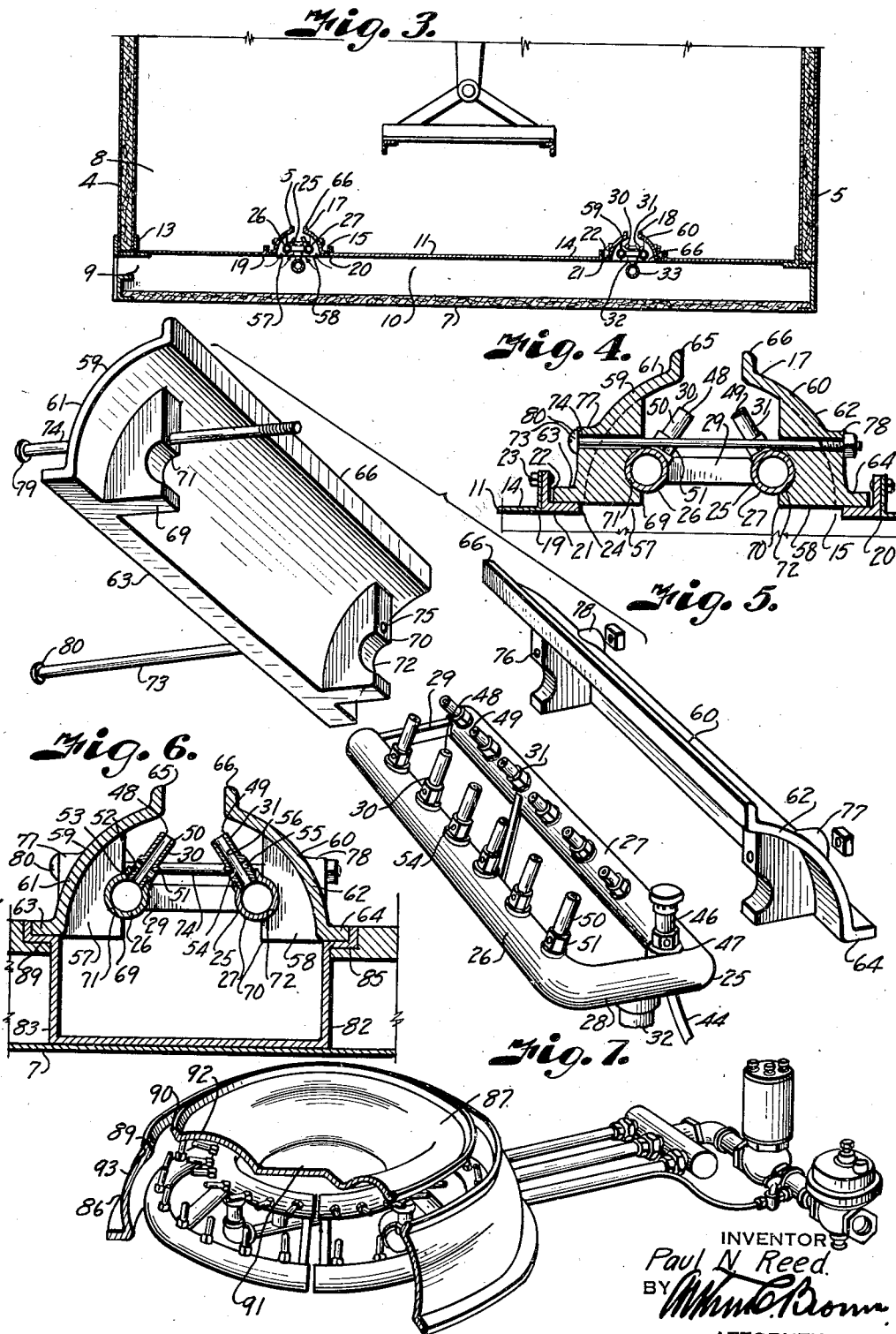
P. N. REED

2,153,938

GAS BURNER

Filed April 1, 1936

2 Sheets-Sheet 2



INVENTOR
Paul N. Reed.
BY *Wm. C. Brown*
ATTORNEY

UNITED STATES PATENT OFFICE

2,153,938

GAS BURNER

Paul N. Reed, Kansas City, Mo., assignor, by
mesne assignments, of one-half to said Paul N.
Reed and one-half to Phil B. Pursell, both of
Kansas City, Mo.

Application April 1, 1936, Serial No. 72,087

3 Claims. (Cl. 158—104)

This invention relates to gas burners, particularly to those of the jet type, and has for its principal object to adapt this type of burner to heating ovens and other apparatus wherein an extremely high combustion efficiency is required.

Burners of this character, and particularly those employing impinging jets, are efficient for the reason that the secondary combustion supporting air is introduced above the gas orifices in the jet tubes by the vacuum created incidental to the velocity and impingement of the fuel jets. However, I find that by increasing the volume of air supplied to the jets, the efficiency of this type burner is much greater, and I, therefore, provide a burner of this character with means for creating a Venturi action about the jets so as to increase the volume of both the secondary and primary air supply. Also by such arrangement the air is more uniformly distributed to all of the jets throughout the length of the burner and I am enabled to maintain a more uniform heat.

It is also an important object of the invention to provide a burner of the jet type with air directing means which serves to protect the burner jets from clogging caused by drippings from articles being heated in the oven.

In accomplishing these and other objects of the invention, as hereinafter pointed out, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of an oven equipped with burner units embodying the features of the present invention, a portion of the oven wall being broken away to better illustrate installation of the burners. A part of one of the burner units is also removed to better illustrate the construction thereof.

Fig. 2 is a horizontal section through the oven showing the burner units in plan.

Fig. 3 is a vertical section through the lower portion of the oven on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged cross-section through one of the burner units.

Fig. 5 is a large, perspective view of one of the burner units showing the parts thereof in disassembled, spaced relation.

Fig. 6 is a cross-section through a modified form of burner unit.

Fig. 7 is a perspective view, partly in section, of a further modified form of burner unit.

Fig. 8 is a section through a modified form of the invention showing a double jet burner arrangement.

Referring more in detail to the drawings:

While my invention is adaptable to various types of heating equipment, I have particularly illustrated it in association with a baker's oven 1, which is of reel type, including front and rear walls 2—3 and end walls 4—5 connected by a top wall 6 and a bottom wall 7 to form an enclosed oven chamber 8.

One of the walls, for example, the rear wall 3, is provided along its lower edge with an opening 9, coextensive with the length thereof for admitting combustion supporting air to a plenum chamber 10. The plenum chamber is formed by a partition 11 supported above the bottom 7 on a suitable framework including horizontal channels 12 and angles 13 fixed to the inner walls of the oven, as best shown in Figs. 1 and 3. The partition 11 is formed by a plurality of plates 14 spaced apart to provide openings 15 and 16 in which are mounted the burner units 17 and 18 embodying the features of the present invention. The plates 14 along the side edges of the burner opening are flanged upwardly, as at 19 and 20, and connected thereto are angles 21 having their vertical flanges 22 fixed to the flanges of the jets by fastening devices 23, and their horizontal flanges 24 turned inwardly to mount the burner units, as now to be described.

The burner units are composed of a plurality of tandem arranged sections 25 including substantially U-shaped conduits having spaced, parallel leg portions 26 and 27 connected at one of their ends by a conduit portion 28 and at their opposite ends by a tie 29. The ends of the legs opposite the connecting portion 28 are closed to provide a substantially U-shaped chamber for distributing gas to a plurality of nozzle tips 30 and 31 that are carried by the respective legs of the burner sections.

The portions 28 of the burner sections are provided with pipe connections 32 whereby the individual sections are connected to a manifold pipe 33 extending longitudinally of the respective openings 15 and 16, and which have their outer ends extending through the front wall of the oven and provided with valves 34 and 35 for stopping flow of gas thereto from a supply pipe 36 which extends across an end of the oven and terminates in an upwardly extending riser 37 which is provided at its upper end with a valve 38 actuated by a thermostat mounted in the oven chamber. The valve 38 is connected by a pipe 39 that extends downwardly in parallel relation with the riser 37 and terminates in a T 40 that is adapted to be connected to a suitable source of gas supply, as in conventional practice. The pipe 39 may

also be provided with a shut-off valve 41 whereby flow of gas can be shut off independently of the thermostatic valve 38 or the valves 34 and 35.

The T 40 also connects a branch line 43 that extends in parallel relation to the gas line 36 and leads to pilot lines 44 and 45 extending into the oven and provided with pilots 46, the pilots being carried by the burner sections nearest the end wall 4 of the oven in a web 47 connecting the portion 28 of that burner with the adjacent leg 27 thereof, as clearly illustrated in Fig. 5. The pilots may be of any approved construction and specifically form no part of the present invention.

The jet tubes on the respective legs of the burner sections are arranged in staggered relation and in pairs so directed that the first jet tube on one leg and the corresponding tube on the other leg converge toward each other in such a manner that the gas issuing therefrom impinges above the orifices 48 and 49 thereof to create a vacuum between the flames of the impinging jets for drawing air from the plenum chamber through the openings 15 and 16. The jet tubes are shown as including nipples 50 having hexagonal base portions 51 terminating in threaded shanks 52 that are threadedly mounted in internally threaded openings 53 formed in the legs of the burner sections. The heads are provided with laterally opening ports 54 and 55 communicating with the flow channels 56 in the nozzles to supply the primary combustion supporting air to the gas, the air being drawn through the openings by action of the gas moving through the channels to the outlet orifices 48 and 49.

In order to increase the air supply to the jets, I provide means for controlling flow of air over the outer sides of the respective jet tips and for producing a Venturi action of the air drawn about the jet tubes, as now to be described.

The openings 15 and 16 are wider than the spacing of the legs 26 and 27 of the burner sections to provide passageways 57 and 58 between the legs of the burner sections and the flanges 24 of the respective angles 21 and 22, and the air admitted through the passageways is guided by means of air directing members 59 and 60. The members 59 and 60 preferably conform to the length of the burner sections and comprise substantially arcuate plates 61 and 62 having base flanges 63 and 64 extending along the lower edges to seat upon the horizontal flanges 24.

The opposite edges of the arcuate plates terminate substantially over the orifices of the respective burner tips and have lip flanges 65 and 66 spaced apart to provide a constricted passageway for the flames and auxiliary air drawn through the openings from the plenum chamber. The arcuate shaped portions of the plate thus direct the air from the passageways through the constricted spacing of the lip flanges and in close relation to the outer surfaces of the impinging flames, in the manner of a venturi which effects movement of larger quantities of air at a higher pressure adjacent the primary ports than at the nozzle tips, thereby affording more perfect combustion by assuring an adequate supply of primary air to the inlet ports of the gas jets.

In order to retain the air directing members in operative relation with the burner sections, and at the same time support the burner sections in proper position over the openings 15 and 16, the inner faces of the arcuate plates are provided with lugs 69 and 70, as best shown in Fig. 5, which

terminate in substantially the axis of the burner legs and are provided with notches 71 and 72 to accommodate the leg portions of the burner, as best shown in Fig. 4. The lugs are clamped in engagement with the burner sections by tie bolts 73 and 74 projected through aligning openings 75 and 76 extending through the respective plates, through the lugs, and through bosses 77 and 78 that are formed on the outer sides of the plate to be engaged by the heads 79 and nuts 80 of the tie bolts, as clearly shown in Fig. 4. The air directing members are thus clamped to and form a rigid part of the respective burner sections, and since they are of approximately the same length as the burner sections they provide substantially continuous deflectors extending along the length of the openings 15 and 16.

In order that all of the burner sections in the respective units may be lighted from the pilot light, the connecting portions 28 thereof are provided with flame spreaders 81, as in conventional jet burner construction.

In the form of the invention illustrated in Fig. 6, supplementary air is supplied to the respective burner sections through individual ducts 82 that are formed by channels 83 laid along the floor of the oven, and which have laterally directed flanges 84 and 85 forming seats for the base flanges of the respective air directing chambers as shown. In this instance, the partition floor is formed of thicker material and has the side edges thereof adjacent the openings provided with rabbeted grooves to seat the lateral flanges of the channel members. Otherwise the construction is substantially the same as that illustrated in the previously described forms of the invention.

In Fig. 7 the burner unit is shown as of ring shape and the air directing members 86 and 87 conform thereto, the outer member 86 being of ring shape and having a base flange corresponding to the base flange previously described, and upwardly extending lips 89 cooperating with similar lips 90 on the other directing member 87, which is in the form of a disk 91 having an arcuate shaped portion 92 cooperating with an arcuate shaped portion 93 of the other member to direct supplementary air over the outer surfaces of the impinging jets, in the same manner as described in the other form of the invention. This form of the invention is particularly adapted for furnaces and other heating devices employing a circular fire-box.

In Fig. 8 the burner is shown as having three conduits 94, 95 and 96, with the center duct 95 provided with a double row of burner tips 97 and 98 cooperating respectively with the burner tips 99 and 100 on the outer conduits. The air directing members 101 and 102 correspond to the air directing members 59 and 60 and co-act with a central member 103 to form Venturi shaped outlets 104 and 105 over the cooperating rows of burner tips similar to the preferred form of the invention.

In operation, gas is supplied to the respective burner units upon opening the valves 34 and 35 so that jets of gas may issue through the orifices of the respective burner tips, which jets of gas are ignited from the pilot light through the respective flame spreading members. Upon lighting of the gas jets, the impinging action of the flames will cause air to be drawn from the plenum chamber upwardly between the legs of the burner sections and into the flames so as to provide substantially perfect combustion with the impinging

portion of the jets. Simultaneously air is drawn through the passageways formed between the leg portions of the burner sections and the air directing or control members into close contact with the outer surfaces of the flames to provide supplementary air thereto and to hold the flames in close contact with the air that is drawn therebetween.

Because of the reduced capacity of the outlet as afforded by the spacing of the lip flanges of the air directing members, the air is distributed substantially uniformly along the length of the burner section so that all of the flames will burn at substantially the same degree of efficiency, and, therefore, the head will be the same across the depth of the oven.

From the foregoing, it is obvious that I have provided for increased efficiency of this type of burner and a more even distribution of heat within the oven.

While I have particularly illustrated the invention as applied to a baker's oven, it is obvious that it may be associated with other heating equipment without departing from the spirit of the invention, and I, therefore, do not wish to be limited to the specific application of the invention shown and described.

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

1. A gas burner including an air duct having an opening in the top thereof provided with seats extending along opposite side edges of the opening and having an air inlet, spaced gas conduits substantially coextensive with said seats, jet tubes carried by said conduits and having axial outlet openings and laterally opening primary air inlet ports, means supplying gas to said conduits, and air directing members having sides supported on said seats and curving upwardly and inwardly over the primary air inlet ports of the jet tubes to form a Venturi-like passageway in covering relation with said jet tubes whereby air drawn through said duct and through the passageway supplies primary air to the inlet ports and secondary air above said jet tubes incidental to the burning action of the gas emitted from said jet tubes.

2. A gas burner including an air duct having an opening in the top thereof provided with seats extending along opposite side edges of the opening and having an air inlet, spaced gas conduits substantially coextensive with said seats, jet tubes carried by said conduits having laterally opening primary air inlet ports and arranged in inclined relation to each other whereby gas jets issuing from said tubes impinge against each other to effect drawing of primary air from said duct to the primary air inlet ports and secondary air into the flames issuing from said jets when the burner is in operation, and air directing members supported on said seats and having curved portions extending in spaced relation over the jet tubes to form a Venturi-like passageway in covering relation therewith whereby air drawn through the passageway incidental to impinging action of the gas jets supplies primary air to the inlet ports at higher pressure than the secondary air supplied above said jets.

3. A gas burner including an air supply duct having an elongated opening and seats extending along the sides of said opening, gas conduits arranged in inwardly spaced parallel relation with said seats, spaced jets carried by said gas conduits and provided with laterally opening primary air inlet ports, said jets being arranged in inclined relation to each other whereby gas issuing from said jets impinge against each other to effect drawing of primary air into the inlet ports and secondary air into the flames issuing from the jets when the burner is in operation, air directing members supported on said seats and curving upwardly and inwardly of said jets for confining air issuing from said duct for positive travel in the direction of the primary air ports and secondary air into said impinging flames, lugs on the air directing members having seats for engaging said conduits, and tie members extending through the air directing members to secure said air directing members and conduits in assembly on said air duct.

PAUL N. REED.