

June 20, 1933.

J. H. FICHTER

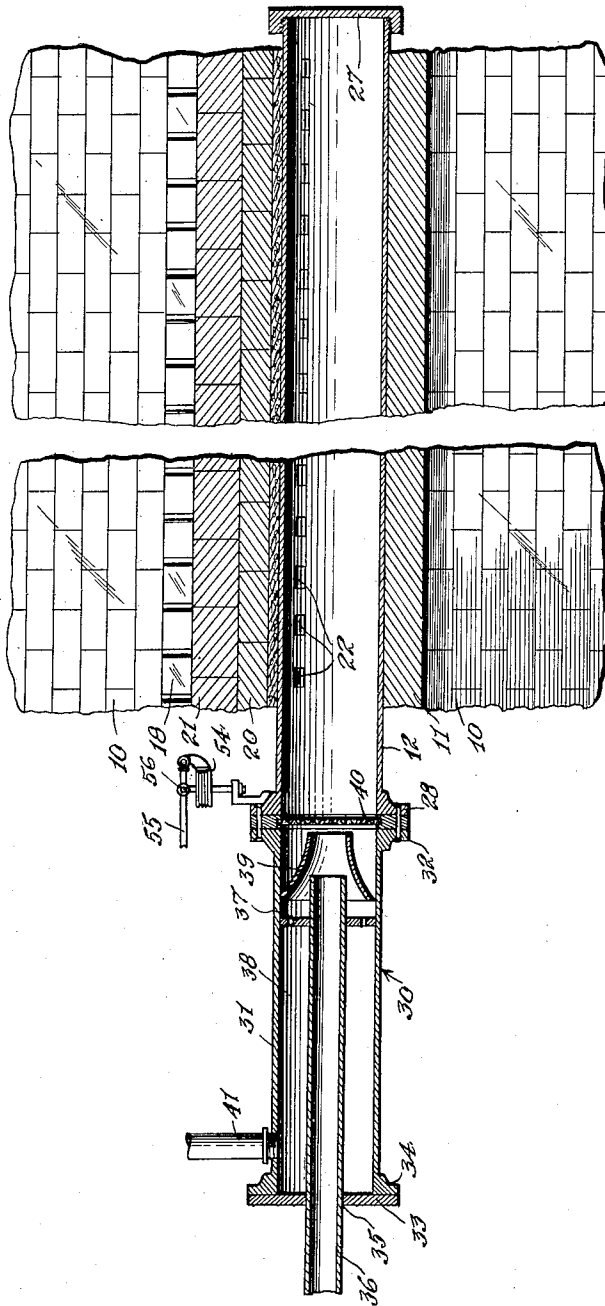
1,915,056

FURNACE CONSTRUCTION

Filed Nov. 19, 1929

4 Sheets-Sheet 1

Fig. 1



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Fig. 2

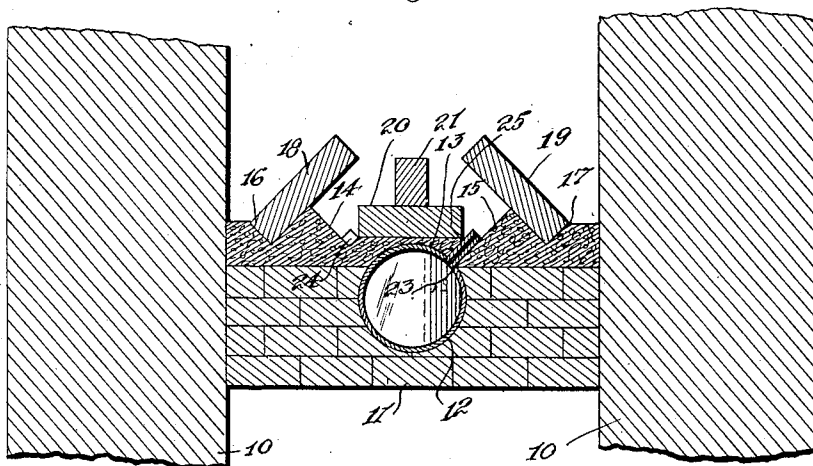
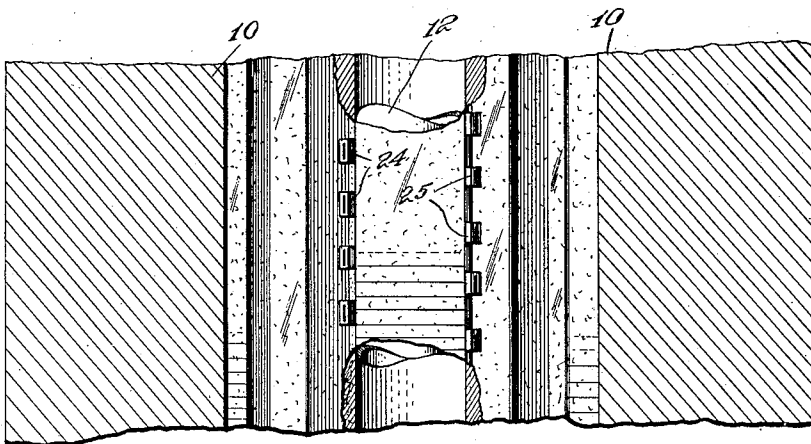


Fig. 4



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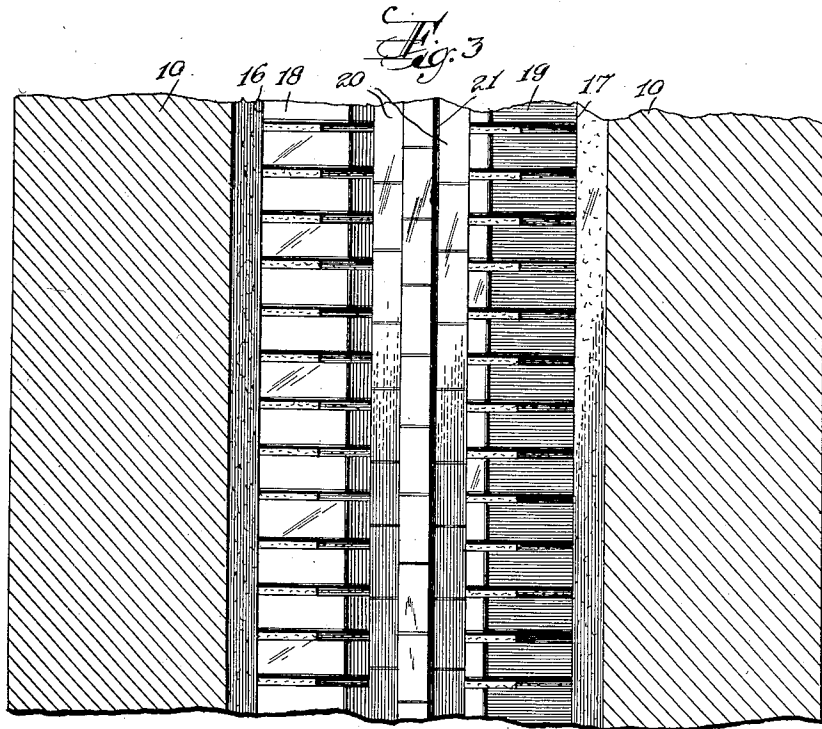


Fig. 7

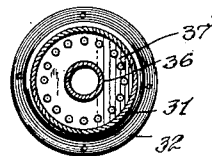


Fig. 10

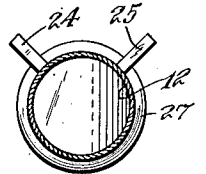


Fig. 8

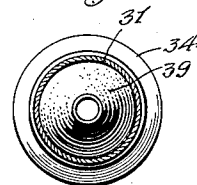
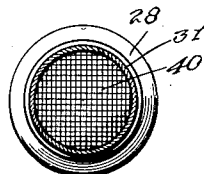


Fig. 9



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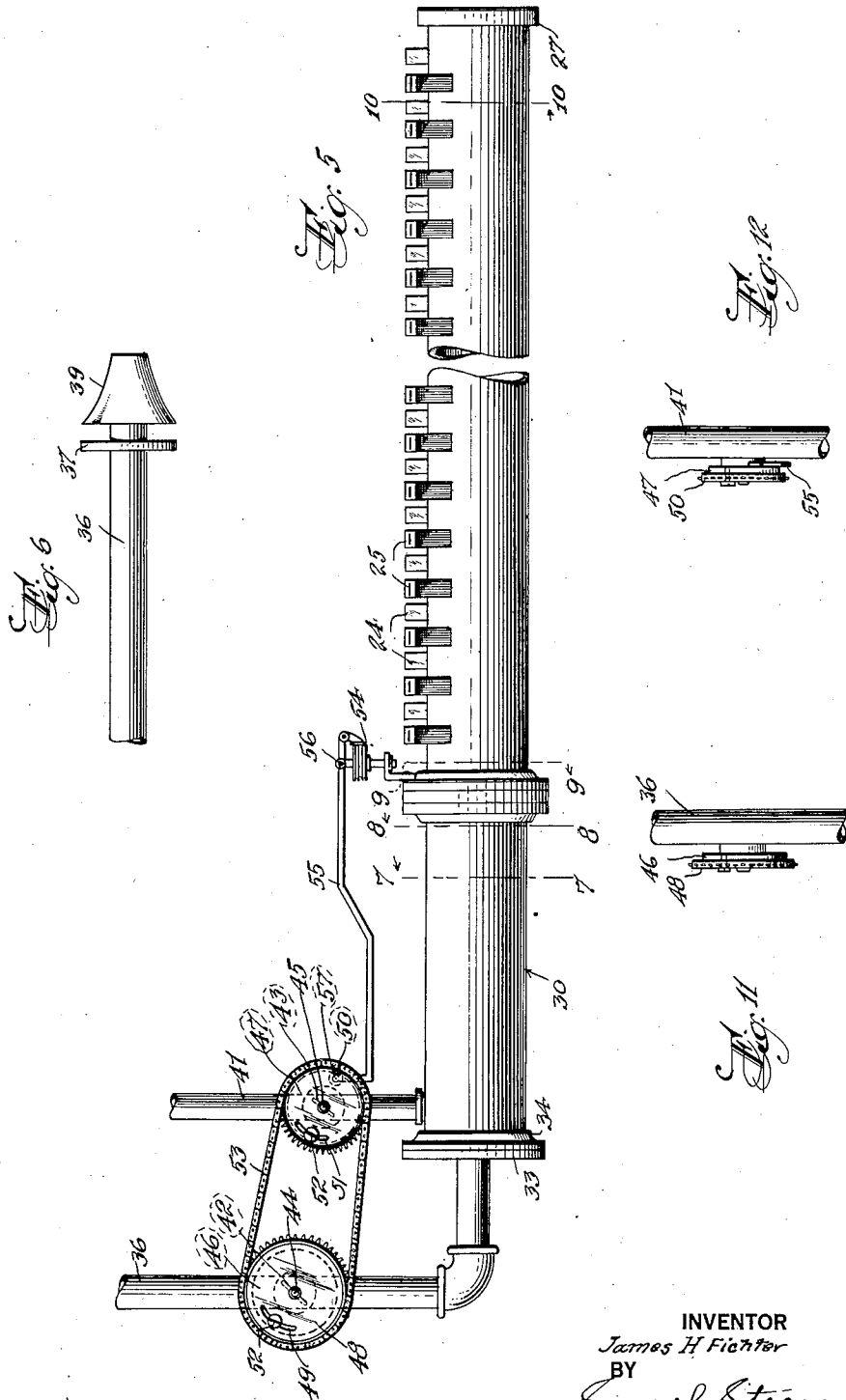
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FURNACE CONSTRUCTION

Filed Nov. 19, 1929

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

JAMES H. FICHTER, OF CINCINNATI, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
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FURNACE CONSTRUCTION

Application filed November 19, 1929. Serial No. 408,284.

This invention relates to an improved fur-
nace construction in association with an im-
proved form of burner therefor and is de-
signed particularly for the heating of vari-
ous substances that are required to be heated
to relatively high temperatures in various in-
dustrial heating operations. The arrange-
ment as provided by my invention finds one
particular adaptation in the heating of vis-
cous materials such as asphalt, tar, pitches
and the like to high temperatures, as for ex-
ample, heating asphalt of 100 to 200° F.
melting point to temperatures of 600 to
700° F.

One object of my invention is to provide
a furnace construction and gas burner design
so arranged as to eliminate the occurrence
of air and gas stratification whereby to se-
cure more perfect and uniform combustion
and consequently more efficient heating.

Another object of the invention is to pro-
vide an arrangement of the character de-
scribed wherein the explosive combustible
fuel mixture is confined to a zone of the fur-
nace under conditions which will avoid in-
terference with combustion by the cooling
influence of the object or vessel containing
the material to be heated, such for example,
as the shell of a boiler, or tank of asphalt.

Another object of the invention resides in
the provision of refractory baffling members
within the furnace or combustion chamber
arranged so as to protect the nozzles of the
burner against distortion or destruction by
the intense heat generated within the com-
bustion chamber.

Still another object of the invention is to
provide a burner design having associated
therewith a carbureting device of simple
construction and efficient operation for en-
suring exact adjustment in the ratio of the
volume of gas to the volume of air forming
the combustible mixture.

Still a further object of the invention re-
sides in the provision of means in associa-
tion with the carbureting device of the burn-
er, responsive to the temperature or other
conditions in the furnace, for maintaining
the desired predetermined temperatures
within the combustion chamber.

The foregoing and other objects of the in-
vention, as well as numerous advantages
thereof, will more clearly appear from the
more detailed description to follow and from
the accompanying drawings, wherein

Figure 1 is a view partly in section and
partly in elevation showing the burner con-
structed according to my invention and its
disposition in the furnace.

Figure 2 is a transverse cross-section
through the furnace.

Figure 3 is a view in plan thereof.

Figure 4 is a similar view with certain of
the parts removed.

Figure 5 illustrates the burner and the
carburetor, in side elevation.

Figure 6 is a detail of one of the parts of
the carbureting device.

Figures 7, 8, 9 and 10 are transverse sec-
tions through Figure 5 taken along the lines
indicated by corresponding numerals.

Figures 11 and 12 are details of the ar-
rangement for adjusting the relative flow of
gas and air to the burner.

Referring more in detail to the drawings,
the numeral 10 indicates the side walls of
the furnace, and the numeral 11 indicates the
horizontal span of brick work which supports
the burner 12, the latter being embeded in
this brick work as shown, intermediate the
walls 10. The burner is preferably in the
form of a cylindrical pipe extending sub-
stantially the full length of the furnace, with
a portion of the upper periphery of the
burner projecting above the uppermost row
of bricks in the horizontal span 11.

One of the important features of the con-
struction provided by my invention resides in
the arrangement of the refractive material
upon the floor or support 11. For this pur-
pose, refractory material is built up over the
upper peripheral surface of the burner 12 in
a layer of substantial thickness as shown at
13 extending laterally of the burner for a
slight distance, and having the upper surface
thereof horizontal. The refractory mate-
rial at both sides of the intermediate portion
13 is inclined upwardly to form the inclined
walls 14 and 15, these walls extending up-
wardly for a substantial distance above the

top of the intermediate layer 13, and terminating with right angular depressions 16 and 17 respectively. The right angular depressions 16 and 17 thus formed in the refractory material to either side of the burner, constitute supporting surfaces for refractory baffle members or bricks 18 and 19 respectively, these baffles being inclined upwardly toward each other and extending over and beyond the respective inclined walls 14 and 15 of the supporting refractory material. The upper horizontal surface of the intermediate portion 13 supports a row of horizontally disposed refractory bricks 20 upon which are laid a row of similar bricks 21 which are set thereon edgewise along the center of the horizontal row 20.

The upper peripheral surface of the burner 12 is provided with two longitudinal rows of spaced openings 22, 23 through which project the nozzles 24, 25 respectively, the arrangement being such that these nozzles extend in upwardly inclined directions through the intermediate portion of refractory material 13, and substantially parallel to the walls 14 and 15 when the burner is in place in the furnace. The nozzles form part of the burner. By the aforescribed relative arrangement of the burner nozzles and the refractory baffles, there is provided a more or less restrained course for the combustion gases, as well as a barrier between the two rows of nozzles functioning to protect these nozzles against distortion or destruction by the heat generated in the combustion zone. Furthermore, this arrangement of the refractory baffles provides an ignition medium and contributes to the maintenance of a uniform temperature throughout the length of the retort.

One end of the burner 12 is closed as by means of a screw cap 27 while the opposite end thereof, exteriorly of the furnace, is connected as by means of a flange 28 to a carbureting device indicated generally by the numeral 30. The carburetor mechanism preferably consists of a cylindrical pipe or chamber 31 having a flange 32 at one end for connection with flange 28 of the burner, the opposite end being closed by a plate 33 secured to a flange 34. The plate 33 is provided with a central opening 35 through which extends an air supply line 36, this supply line projecting into the chamber 31 and terminating slightly inwardly of the flange 32. The air supply pipe 36, near its forward open end, has fixed thereon a perforated disc 37, the outer periphery of which fits closely against the inner walls of the chamber 31 to define a gas reservoir 38 in the annular space between the wall of the chamber and the feed pipe 36. A cone-shaped baffle 39 is mounted within the chamber 31 near the forward end thereof with the enlarged end of the baffle encircling the forward open end of the pipe

36. For the purpose of preventing premature ignition of the explosive fuel mixture in the carburetor or gas reservoir 38, a screen 40 is mounted in front of the baffle 39 and preferably between the flanges 28 and 32. A suitable gaseous fuel is delivered to the carburetor through a feed pipe 41 simultaneously with the feed of air under high pressure through the feed pipe 36, the air combining with the gas flowing from the reservoir 38 through the perforations in the disc 37 and the mixture being driven under considerable force into the main body of the burner 12 from where it is fed through nozzles 24—25 into the combustion (or ignition) zone.

Provision is made for adjusting the relative volume of gas and air fed to the carburetor, and likewise for regulating the flow of the fuel mixture in accordance with furnace conditions. For this purpose, the air feed line 36 is provided with a valve or damper 42 and the gas feed line 41 is provided with a similar valve or damper 43, these valves or dampers 42, 43 being fixed upon shafts 44, 45 respectively, which extend outwardly of the respective feed pipes. Fixed to the shaft 44 is a disc 46 and a similar smaller disc 47 is fixed upon the shaft 45. A sprocket wheel 48 provided with an arcuate slot 49 is loosely mounted upon shaft 44 and a similar smaller sprocket 50 provided with an arcuate slot 51 is loosely mounted upon the shaft 45. The ratio of the volume of air to the volume of gas fed to the carburetor may thus be readily varied by changing the relative positions of the sprockets upon the damper shafts and fixing this adjustment by means of set screws 52 passing through the arcuate slots in the sprockets and into the respective discs 46 and 47, which are fixed to the respective damper shafts. Having thus adjusted the ratio of the volume of air and gas to provide as lean or as rich a mixture as desired, the variations in the furnace conditions can be compensated for without changing the ratio as previously adjusted. For this purpose, I provide a sprocket chain 53, passing around the sprockets 48 and 49 so that when the latter have been set to desired position and secured to the discs, both discs and consequently both of the valves or dampers move in unison in one direction or the other. Actuation of the damper shafts in response to the furnace conditions may be accomplished in any convenient way, and in the drawings I have shown conventionally an air motor or other similar device 54 responsive to the temperature or other conditions in the furnace to actuate in one direction or another, a lever 55 fulcrumed as at 56 and connected as at 57 with the disc 47, whereby to cause the dampers to move in unison in response to the variations

of the temperature or other conditions in the furnace.

It will be understood of course that the vessel or other object to be heated will be mounted and suitably supported within the furnace above the refractory baffles, in a well known manner.

It will be further understood that the installation may include a plurality of independent units as above described, each connected with its own carburetor, or all connected to a common carburetor.

Having thus described an embodiment of my invention, it will be obvious that numerous changes or modifications may be made therein without departing from the scope of the invention as defined in the appended claims.

I claim as my invention:

1. In a furnace, a burner comprising a chamber having spaced rows of nozzles projecting upwardly therefrom into the combustion zone, and refractory material above the burner serving to shield one of said rows of nozzles from the other row.

2. In a furnace, a burner comprising a chamber having spaced rows of nozzles projecting upwardly therefrom into the combustion zone, refractory material disposed above the burner, said refractory material comprising an intermediate portion shielding one of said rows of nozzles from the other row, and lateral portions extending outwardly of said rows of nozzles and above the intermediate portion.

3. In a furnace, a burner comprising a chamber having spaced rows of nozzles projecting in opposite upwardly inclined directions therefrom into the combustion zone, refractory material disposed above the burner, said refractory material comprising an intermediate portion shielding one of said rows of nozzles from the other row, and lateral portions extending outwardly of said rows of nozzles and above the intermediate portion of refractory material, said lateral portions being formed with the inner walls thereof inclined upwardly in substantial parallelism to the respective rows of nozzles.

4. In a furnace, a burner comprising a chamber having spaced rows of nozzles projecting in opposite upwardly inclined directions therefrom into the combustion zone, a body of refractory substance disposed above the burner, said refractory substance comprising an intermediate portion shielding one of said rows of nozzles from the other row, and lateral portions extending outwardly of said rows of nozzles and above the intermediate portion of refractory substance, said lateral portions being formed with the inner walls thereof inclined upwardly in substantial parallelism to the respective rows of nozzles, refractory baffle members supported on said intermediate

portion, and refractory baffle members supported on said lateral portions in upwardly inclined directions with the inner ends thereof projecting beyond said inclined walls.

5. A gas burner comprising an elongated conduit having spaced rows of nozzles projecting outwardly thereof, a carburetor associated therewith, said carburetor comprising a chamber, a perforated partition within said chamber, an air feed pipe extending into said chamber and beyond said partition and providing a passageway around the pipe, and a gas supply pipe connected to said passageway.

6. A gas burner comprising an elongated conduit having spaced rows of nozzles projecting outwardly thereof, a carburetor associated therewith, said carburetor comprising a chamber, a perforated partition within said chamber, an air feed pipe extending into said chamber and beyond said partition and providing an annular passageway around the pipe, a gas supply pipe connected to said passageway, and a baffle for mixing air from said feed pipe and gas delivered by said passageway through the perforations in said partition.

7. A gas burner comprising an elongated conduit having spaced rows of nozzles projecting outwardly thereof, a carburetor associated therewith, said carburetor comprising a chamber, a perforated partition within said chamber, an air feed pipe extending into said chamber and beyond said partition and providing a passageway around the pipe, a gas feed pipe connected to said passageway, dampers for said air and gas feed pipes, and means permitting independent adjustment of said dampers to vary the composition of the fuel mixture.

8. A gas burner comprising an elongated conduit having spaced rows of nozzles projecting outwardly thereof, a carburetor associated therewith, said carburetor comprising a chamber, a perforated partition within said chamber, an air feed pipe extending into said chamber and beyond said partition and providing a passageway between the pipe and chamber, a gas feed pipe connected to said passageway, dampers for said air and gas feed pipes, means permitting independent adjustment of said dampers to vary the composition of the fuel mixture, and means responsive to furnace conditions for actuating said dampers to maintain predetermined furnace conditions, said means being adapted to actuate said dampers in unison.

9. In a furnace, a burner having spaced rows of nozzles projecting upwardly into the combustion zone, refractory material disposed above the burner, said refractory material comprising an intermediate portion shielding one of said rows of nozzles from the other row, and portions extending laterally of said rows of nozzles, and extending above

the intermediate portion, a carburetor connected with said burner, air and gas feed lines leading to said carburetor, dampers for said air and gas feed lines, and means permitting independent adjustment of said dampers to vary the composition of the fuel mixture.

10. In a furnace, a burner having spaced rows of nozzles projecting upwardly into the combustion zone, refractory material disposed above the burner, said refractory material comprising an intermediate portion shielding one of said rows of nozzles from the other row, and portions extending laterally of said rows of nozzles, and extending above the intermediate portion, a carburetor connected with said burner, air and gas feed lines leading to said carburetor, and means responsive to the furnace conditions for actuating said dampers in unison.

11. In a furnace, a burner having spaced rows of nozzles projecting upwardly and outwardly into the combustion zone, refractory material overlying the burner, said refractory material comprising an intermediate portion shielding one row of nozzles from the other row and lateral portions extending outwardly and above said rows of nozzles, said lateral portions having inclined upwardly and outwardly extending inner walls, substantially parallel to the respective rows of nozzles.

12. A heating unit comprising an elongated chamber provided with a plurality of nozzles, a carburetor connected to one end of said chamber, said carburetor comprising a chamber, a perforated partition in said chamber, a screen between said first mentioned and said second mentioned chambers, an air feed pipe in said carburetor chamber and spaced from the inner walls thereof, a gas feed pipe connected to said carburetor chamber, and a baffle between said partition and said screen adapted to mix the air and the gas.

Signed at Cincinnati, in the county of Hamilton and State of Ohio this 8th day of November A. D. 1929.

JAMES H. FICHTER.