

G. W. McKEE.

GAS FURNACE.

APPLICATION FILED DEC. 18, 1917.

1,334,309.

Patented Mar. 23, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

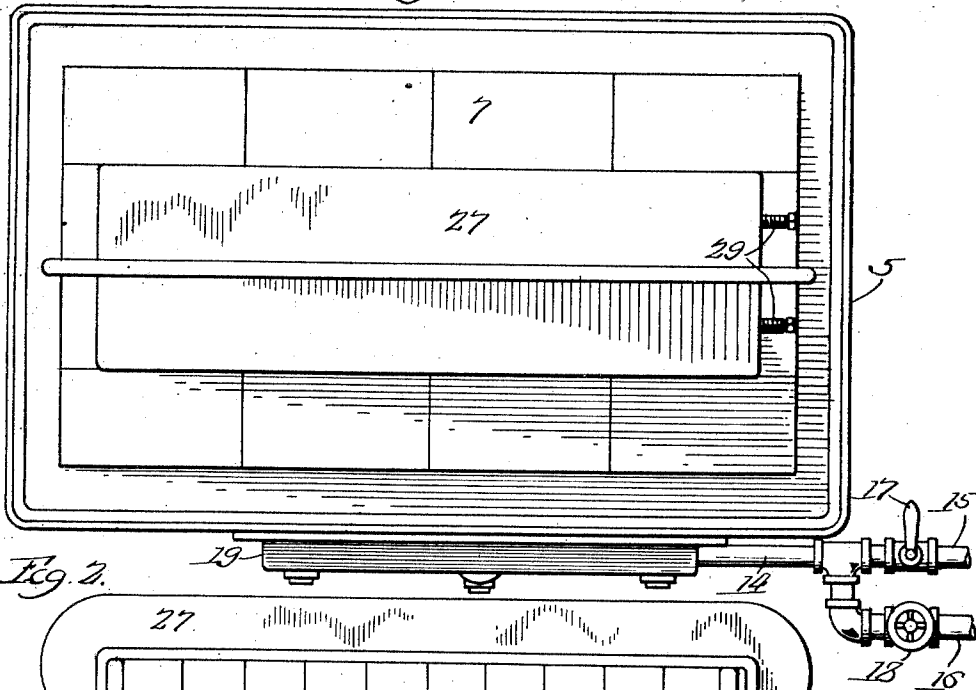
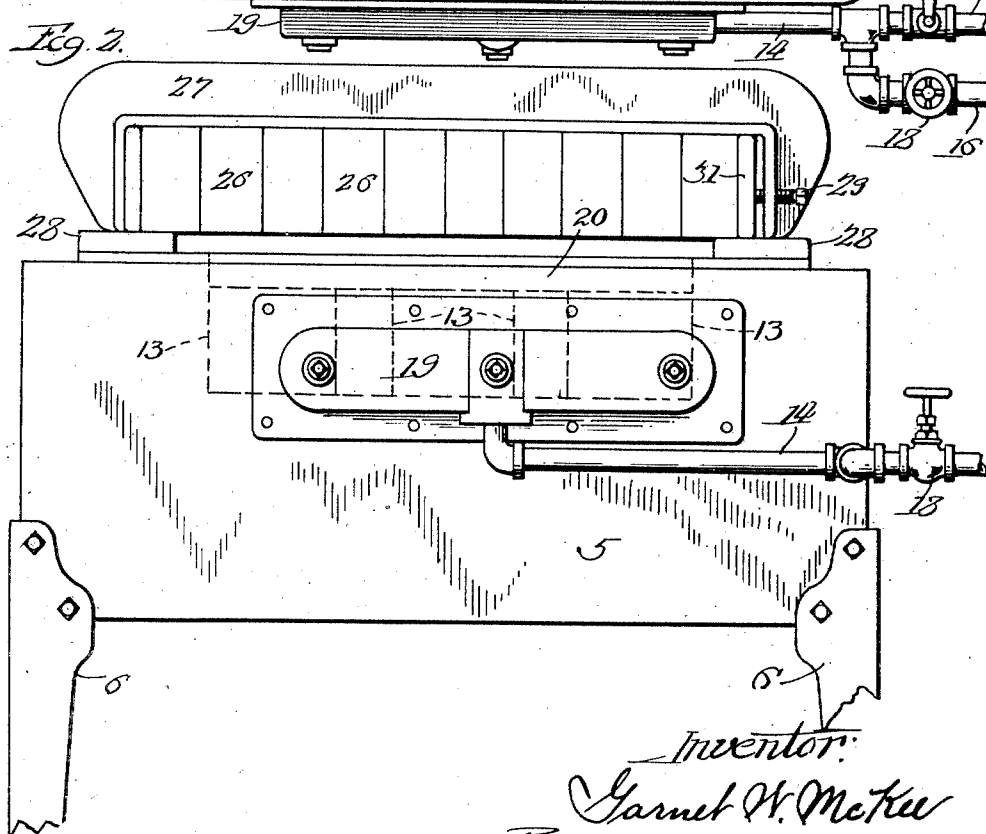


Fig. 2.



Inventor:

Garnet W. McKee

By Ira J. Wilson

Att'y

G. W. McKEE.
GAS FURNACE.

APPLICATION FILED DEC. 18, 1917.

1,334,309.

Patented Mar. 23, 1920.
2 SHEETS—SHEET 2.

Fig. 3.

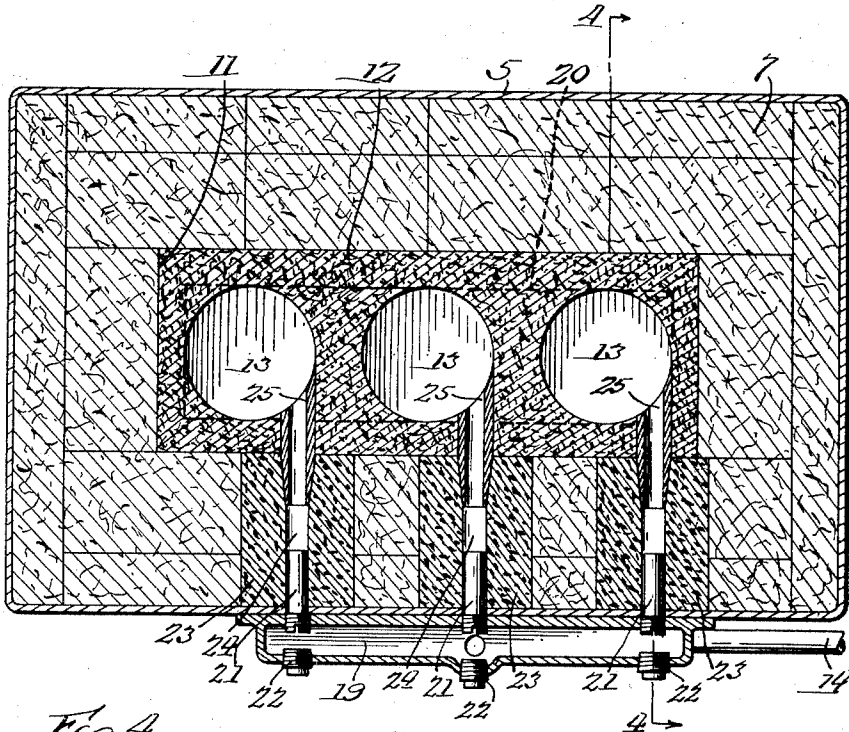
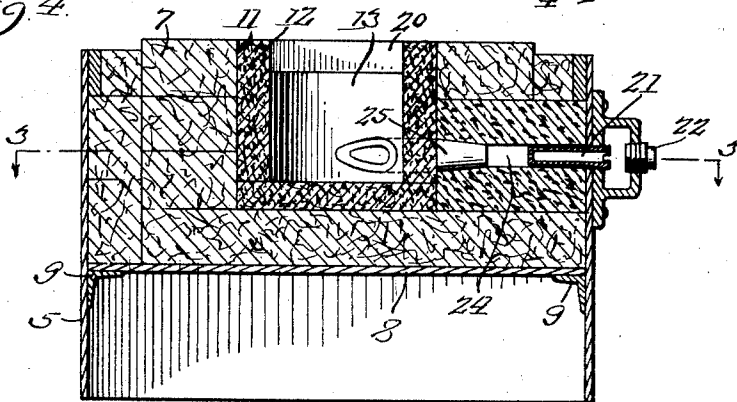


Fig. 4.



Inventor:
Garnet W. McKee
By *Irving Wilson*
Atty.

UNITED STATES PATENT OFFICE.

GARNET W. McKEE, OF ROCKFORD, ILLINOIS.

GAS-FURNACE.

1,334,309.

Specification of Letters Patent. Patented Mar. 23, 1920.

Application filed December 18, 1917. Serial No. 207,705.

To all whom it may concern:

Be it known that I, GARNET W. McKEE, a citizen of the Dominion of Canada, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Gas-Furnaces, of which the following is a specification.

This invention relates to high temperature furnaces designed for heating rods, bars and other metal parts to high temperatures, in order that the heated portions of the parts may be worked or shaped as may be required. In other words, these furnaces perform for the modern manufacturer the functions performed for the country blacksmith by his familiar and well known forge.

The use of illuminating gas mixed with the proper porportion of air and delivered to the combustion chamber of a furnace of the general character indicated is becoming very prevalent in manufacturing establishments where it is desirable to attain at a minimum cost high and uniform furnace temperatures which may be increased or diminished at will, depending upon the character of the work being heated.

One of the primary objects of my present invention is to provide a gas furnace in which maximum effective temperatures may be obtained from the use of a minimum quantity of fuel. The attainment of this object necessarily requires a substantially perfect combustion of all of the fuel delivered to the furnace and this result is secured in my present invention by the shape of the combustion chamber and the manner of delivery of the fuel thereto.

In addition to securing substantially perfect fuel combustion my invention also contemplates increasing the effective heat of combustion ordinarily transmitted to the work by convection, by securing and utilizing the maximum amount of radiant heat which is derived from the walls of the combustion chamber and results from burning the gaseous fuel upon the inner surfaces of the walls the advantages of which will be recognized by those skilled in the art.

Another feature of my invention resides in the production of a heating area above the combustion chamber which will receive substantially equal heat units throughout its entire area, thus much more quickly and efficiently heating the work disposed in this area than has heretofore been possible with

the use of furnaces which deliver maximum heat units at a certain point with respect to the heating flame and a gradually diminishing number of units at points more remote from the flame.

Still another feature of my furnace is the division of the area usually occupied by a single combustion chamber into a series of chambers each of which will deliver, both by convection and radiation, a maximum number of heat units, and since the number of smaller combustion chambers is immaterial so far as the principles of my invention is concerned, the size of the furnace may be increased indefinitely without detracting from its efficiency, which result was incapable of accomplishment by furnaces of the type now in use for the reason that as the size of the combustion chamber was increased its efficiency was correspondingly decreased.

Many other advantages of my invention will be readily appreciated by those skilled in the art as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings.

Referring to the drawings,—

Figure 1 is a plan view of a furnace embodying my invention;

Fig. 2 is a side elevation thereof;

Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 4; and

Fig. 4 is a vertical sectional view on the line 4—4 of Fig. 3.

By reference to the drawings it will be observed that the furnace body comprises a casing or frame 5 preferably of rectangular form and of any desired dimensions, supported at a suitable height upon legs 6. Within the frame the body proper is built up of fire bricks or blocks 7, carried by a bottom 8, which in turn is supported upon angle brackets 9 within the frame 5. The bricks or blocks 7 are disposed and arranged so as to provide an elongated rectangular compartment 11 which corresponds substantially in size and shape to the combustion chamber ordinarily provided in furnaces of this general character. It might be stated at this point, that in the ordinary furnaces now in use this elongated combustion chamber is equipped with a plurality of fuel delivery nozzles which project into the chamber and deliver the combustive fuel thereto where it is consumed rather inefficiently, due

to imperfect combustion, and furthermore, the heat produced is of maximum intensity at certain distances from the nozzles, while other points in the chamber receive less heat; the result being that the heat throughout the chamber is of varying intensity.

Referring again to my present invention, this compartment 11 has disposed therein a quantity of refractory material 12, which is put in in plastic condition and is molded to provide a plurality of circular cylindrical combustion chambers 13, the side walls and bottoms being formed by the refractory material and the tops being open, as shown. Around the tops however the material is molded to form an enlarged rectangular chamber 20 which connects the various circular chambers and affords an enlarged heating area.

The fuel is supplied to the furnace from a supply pipe 14, which receives air and gas in the proper proportions either from a mixer or from two separate pipes 15 and 16, one of which supplies the gas and the other the air, the air and gas being under the requisite pressures and each pipe being equipped with a regulating valve, 17 and 18 respectively. It should be understood that the manner of mixing the air and gas to provide a combustive mixture of the proper proportions is immaterial, so far as my present invention is concerned. The mixture is delivered by the pipe 14 into a header 19 mounted at one side of the furnace, as shown, this header being provided on its inner wall with a series of tapped openings corresponding in number and position to the combustion chambers, and on its outer wall with alined openings of larger size than those on the inner wall. Into each of these openings in the inner wall there is threaded a delivery nozzle 21 and into each of the outer openings there is threaded a plug 22. When access is desired to the nozzles 21 for purposes of removal or for other reasons the corresponding plug 22 is removed from the outer wall of the header, thus permitting access by a spanner wrench to the outer end of the alined nozzle, which may thereupon be unthreaded and withdrawn through the outer opening. By this construction access may readily be had to the nozzles without dismantling the furnace.

The nozzles project inwardly a limited distance into the bricks or blocks 23 comprising part of the furnace body but being preferably of more highly refractive material than the body blocks 7, each block 23 being equipped with a bore 24 into which a nozzle 21 projects.

When the furnace body has been assembled and before the refractory combustion chamber-forming material 12 has been disposed in the compartment 11 each block 23 has inserted in the inner end of its bore a

hollow wooden twyer 25, the inner end of which is preferably shaped on an arc coincident with the circumference of the combustion chamber when molded. These twyers provide temporary cores around which the refractory material 12 is molded, and when the furnace is first put in operation they serve to deliver the fuel into the chambers but after the furnace has been heated to a high temperature these wooden twyers burn out and leave delivery passages of the requisite size and shape formed by the refractory material 12 itself. It should be manifest that the metal nozzles 21 are disposed a considerable distance from the combustion chambers so that they are not subjected to the intense heat created in the chambers, and that the fuel is delivered into the chambers beyond the nozzles by the bores provided in the highly refractory bricks or blocks 23 and the still more highly refractory material 12. Thus the nozzles are protected from the intense heat of the furnace and are not subject to injury.

Since the fuel is delivered into the combustion chambers in a tangential direction at high pressure, it will be obvious that it will follow the walls of the combustion chambers in a circular path and will burn on the surfaces of the walls which become heated to a very high temperature, under which they become white-hot. The burning fuel being disposed entirely around the combustion chambers produces uniform heat within the entire perimeter of the chamber, and the heating area above each chamber is consequently subjected to uniform convectional heat. Furthermore, since the chamber walls become white-hot an extremely large amount of radiant heat is projected from these walls directly and by reflection, upwardly into the heating area above the chamber, so that the heat delivered to this area by convection is greatly increased by the radiant heat while the swirling action to the burning gases results in absolute uniformity in the delivery of heat units both by convection and radiation to the heating area. The swirling action of the flame and gases also keeps the side walls of the combustion chambers free from slag and iron oxid which have a tendency to adhere to the walls and pit and otherwise injure them.

In order to confine the heat and still further increase the efficiency of the furnace I have provided a cover which is disposed over the combustion chambers and spaced therefrom a distance sufficient to permit the insertion between the cover and the top of the combustion chambers the work to be heated. This cover, as best shown in Fig. 2, consists of a series of blocks or bricks 26 of refractory material which are held in a metal holder 27 shaped as shown in Figs. 1 and 2, and adapted to rest at its ends upon blocks

28 which may be of varying thicknesses, depending upon the thickness of the work to be inserted beneath the cover. The blocks 26 are firmly clamped in the holder 27 by means of a plurality of setscrews 29 acting against a clamp plate 31, the result being that a flat arch is produced which is a uniform distance from the tops of the combustion chambers throughout its length, thus producing a flat bottomed cover which is more efficient because of the uniformity in its distance from the combustion chambers than a curved arch, such as has been customarily employed with furnaces of this character, could be.

If bars or members are to be heated intermediate their ends they are simply shoved under the arch above the combustion chambers until the portion to be heated is disposed within the heating area, the ends of the bars projecting a greater or less distance beyond each side of the furnace.

It is believed that the construction, operation and inherent advantages of my invention will be understood from the foregoing without further description, and it should be manifest that the shape of my combustion chambers in conjunction with the appurtenant features of my invention result in a furnace of extremely high efficiency, but it should also be understood that while I have shown and described a preferred embodiment of my invention, material differences in the size, shape, proportion and arrangement of the various parts may be resorted to without sacrificing any of its material advantages or departing from the essence of the invention as defined in the following claims.

I claim:

1. In a gas furnace, the combination of a row of cylindrical open top combustion chambers, means for delivering fuel tangentially into said chambers, and an unobstructed chamber above said cylindrical chambers providing a heating zone heated jointly by said row of combustion chambers.

2. In a gas furnace, the combination of a row of cylindrical open top combustion chambers, means for delivering fuel tangentially into said chambers, an unobstructed chamber above said cylindrical chambers providing a heating zone heated jointly by said row of combustion chambers, and means overlying said heating zone preventing dissipation of the heat but permitting access

to said zone for the insertion and removal of articles to be heated.

3. In a gas furnace, the combination of a row of laterally spaced open top combustion chambers, a jet for each chamber arranged to deliver fuel tangentially thereto, and a horizontal heating zone above the combustion chambers and in such proximity thereto as to be intersected substantially throughout its length by the reflection of heat rays from the internal walls of said chambers.

4. In a furnace of the character described, the combination of an open top heating chamber of greater length than width, a plurality of cylindrical combustion chambers at the bottom of said heating chamber, communicating directly therewith and spaced longitudinally thereof, means for delivering fuel to said combustion chambers, and means overlying the open top of the heating chamber but permitting insertion through one or more sides thereof of articles to be heated therein.

5. In a furnace of the character described, the combination of a horizontal unobstructed heating zone having a closed top and an open side through the latter of which articles may be inserted into said zone, and means for heating said zone, uniformly throughout, comprising a plurality of laterally spaced open top cylindrical combustion chambers beneath said zone.

6. In a furnace of the character described, the combination of a horizontal unobstructed heating zone having a closed top and an open side through the latter of which articles may be inserted into said zone, and means for heating said zone uniformly throughout, comprising a plurality of laterally spaced open top cylindrical combustion chambers beneath said zone, said chambers being of such diameter and such distance beneath said zone that reflection of heat from the chambers intersects said heating zone throughout substantially the length thereof.

7. In a gas furnace the combination of a plurality of open top cylindrical combustion chambers, and an elongated chamber overlying and communicating directly with said cylindrical chambers and providing an unobstructed horizontal heating zone, and means for delivering fuel into each of the cylindrical chambers.

GARNET W. McKEE.