To all whom it may concern:

Be it known that I, CHARLES H. LAND, a citizen of the United States, and a resident of Detroit, in the county of Wayne and State of Michigan, have made certain new and useful Improvements in Burners for Dental Furnaces, of which the following is a specification.

My invention relates to improvements in furnaces, particularly those furnaces which are used in dental, metallurgical, and other similar operations requiring a high heat, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a furnace in which extremely high temperatures may be had by the use of ordinary illuminating gas, producer gas, etc., which are ordinarily not considered capable of being used successfully owing to the fact that it is extremely difficult to prevent the ignition of the charge in the mixing chamber, thereby causing an explosion.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming part of this application in which similar reference characters indicate like parts in the several views and in which—

Figure 1 is a vertical section through the furnace.

Fig. 2 is a face view of a portion of the removable auxiliary air conduit, certain parts being shown in section,

Fig. 3 is a view of the under side of a modified form of the auxiliary air conduit,

Fig. 4 is a section at right angles to Fig. 1 along the line 4—4 of Fig. 1,

Fig. 5 is a plan view of the lower portion of the furnace, the top portion having been removed.

In carrying out my invention I provide a base portion 1 of highly refractory material. In the drawings I have illustrated this base portion as being of a substantially cylindrical shape, but it is obvious that it might be of other shapes without departing from the spirit of the invention. Around the sides and bottom of the base portion 1 is a metal casing 2, while legs 3 are secured to the bottom of the casing in the manner shown. As will be seen from Fig. 1 the top part of the base portion 1 slopes slightly toward the center and is provided with a rounded portion 1. Beneath the base portion is disposed the mixing chamber 4 which is of substantially conical shape and which is provided with an integral extension 5 at its lower end, the upper end being secured to the bottom of the casing 2 in any suitable manner.

Communicating with the extension 5 is a pipe 6 which is provided with a valve 7. This pipe is designed to supply gaseous fuel, while at the bottom of the extension 5 is a pipe 8 communicating with a flexible tube 9, this tube being designed to supply air to the gaseous fuel.

As will be seen from Fig. 1 the base 1 is provided with a central recess 1'. Disposed within the recess 1' is a removable refractory block 10 whose lower end rests on the inclined walls of the mixing chamber 4 and whose upper end is disposed normally below the upper surface of the base 1. This block forms one of the main features of the invention, although, as pointed out above, it does not form the only feature. It consists preferably of a body portion of carborundum having longitudinal passages 11 extending therethrough, these passages being preferably disposed in parallel relation. As will be seen from Figs. 1 and 5 the passages are relatively small so as to provide a large number of passages in a block of relatively small size. While the manner in which the block is perforated with these passages forms no part of the present invention, at the same time the dimensions of the block and of the passages as well as the fact that I have been able to make the block of carborundum, which is one of the most refractory materials known, does have a direct bearing on the successful operation of the device.

The upper part of the furnace consists of a body portion 12 of refractory material hollowed out to provide a combustion chamber. The body portion 12 is inclosed in a metal casing 13 which is preferably provided at its bottom with an annular flange 14 secured to the casing by screws or in any other suitable manner, this flange 14 having a shoulder 15 arranged to rest against a shoulder 20 formed on the lower casing 2, the arrangement being such that a lap joint 21
is provided, as shown. The top part of the body portion is reduced and is provided with a cap 15.

Communicating with the combustion chamber is a laterally extending opening 16 which is arranged to receive a muffle 17. The latter is supported by cross members 18 of highly refractory material such as carborundum. A frame 19 bearing a shelf 20 is secured to the outer casing 18. The purpose of the shelf 20 is to temporarily support materials to be heated. After the muffle is inserted the opening 16 around the muffle is closed by means of a lute 16°. The mouth of the opening is beveled as shown at 16°.

From the foregoing description of the various parts of the device the operation thereof may be readily understood.

It will be noted that the extension 5 is provided with air inlets 21 which may be covered by pivoted closures 22 to exclude the air when it is so desired. I have found that with certain gases, as for instance illuminating gas, it is better to keep the closures 22 over the openings 21 when the device is first started up and then to open them afterward. The gas passing through the pipe 5 into the mixing chamber 4 is mixed with the air coming through the pipe 8 and forms an efficient mixture for obtaining perfect combustion. The mixture passes up through the passages 11 and is ignited, and the flames play upon the muffle 17.

In order to produce the greatest heating effect and to render the device able to retain heat for a long time I fill the space above the muffle with refractory particles or balls such as those shown at 23 in Fig. 4. I have found that these provide sufficient draft for the products of combustion, but they become highly heated and thus present a heat retaining member immediately adjacent to the muffle. The heat which may be attained by this device is very great. It is sufficient to melt platinum. The air coming through the tube 9 is preferably under pressure.

The perforations in the refractory block 10 break up the streams of gas and air in such a manner as to insure a thorough mixing of the latter and the most perfect combustion. The great trouble in furnaces of this kind has been that the screens or gratings which have been used did not prevent the ignition of the charge in the mixing chamber, thereby resulting in an explosion which would render the device useless. The high temperature attained in the combustion chamber would eventually raise the gases in the mixing chamber to the kindling temperature. I have succeeded in preventing the striking back or the explosion of the charge in the mixing chamber by the use of the perforated block described.

It will be noted that there are three main factors among others which lead to the successful use of this furnace.

First: The block 10 being made of carborundum is absolutely refractory for any temperature at which this furnace is designed to work;

Second: The passages are small enough to prevent a flame from falling back into the mixing chamber; and

Third: Although equally important, the block is of such a length that the refractory material which is a very poor conductor of heat cannot conduct enough heat from the top of the block to the bottom thereof to ever raise the kindling temperature of the gases inside the mixing chamber to their ignition point, for it will be observed that the cool gases striking the bottom of the refractory block 10 tend to cool the block whose upper end, of course, is subject to intense heat. A perforated screen or grating of metal will not answer the purpose of the refractory block, since no matter how long the metal grating may be evidently enough heat is conducted by the metal to raise the kindling temperature of the gases in the mixing chamber to their ignition temperature, thereby causing an explosion. Furthermore, a metal grating or block would fuse far below the temperature which is required for such operations as forming artificial teeth or for melting platinum. Moreover, a block of refractory material having small passages will not prevent explosions in the mixing chamber if the block is not of sufficient length so that it will prevent the conduction of heat from the upper end which is adjacent to the combustion chamber to the lower end which is receiving the gases. I have tried refractory blocks of such thickness or length that they would stand a high temperature and not fuse, but it was only after considerable experiment that I was able to determine that a refractory block could be made of sufficient length to absolutely prevent any such explosion.

Another feature to which I desire to call particular attention is the means by which I prevent any disastrous effects from the cracking of the muffle or even upon articles such as artificial teeth which are being baked therein. It is a well-known fact that the carbon monoxid constituent of the gas is the agent which destroys the color in teeth if the muffle should crack and permit the gas to enter the interior thereof. To prevent this I provide a conduit which consists preferably of a slab 24 of refractory material such as carborundum having therein passages 25. This slab is placed on the floor of the muffle and a passage 25 is connected by means of a flexible tube 26 with a branch pipe 27 leading from the air pipe and provided with a valve 28. Any of the passages...
25 may be connected with the tube 26 so as to deliver the air at approximately the point desired.

In the ordinary operation of baking teeth the plastic matter which is to form the tooth is molded to the shape and is then placed on a refractory tray 39 in Fig. 1. The tooth to be baked is shown at 30. During the firing operation air is admitted through the tube 26 and through the passage 25 and passes to the rear end of the muffle where it emerges at an exceedingly high temperature.

If by chance during the firing operation the muffle should crack and admit carbon monoxid the oxygen of the highly heated air would immediately unite with the carbon monoxid to form carbon dioxide which is not injurious to the teeth being baked.

By this expedient I overcome any danger of discoloration of the product, owing to the action of the carbon monoxid gas.

It may be that at times it will be desirable to pass into the fuel pipe hydrocarbons of particular composition in order to accomplish particular results. Thus in certain metallurgical operations it may be advisable to introduce hydrocarbons or other suitable fuels through a branch pipe 32 leading directly into the pipe 6, as shown in Fig. 1.

In Fig. 3 I have shown a modified form of the slab 24. In this figure the slab 24' is shown as having a recess 33 in its bottom which is arranged for the reception of the end of the pipe or other suitable conduit. Radially extending grooves 34 carry the gases to various portions of the interior of the muffle. It will be understood that Fig. 3 shows a bottom view of the slab so that when it is turned over the bottom of the muffle will form one of the walls of the conducting passage.

Another feature to which I desire to call particular attention is the fact that varying temperatures may be secured by the use of the same kind of gas and the same air pressure by a proper distribution of the burners. I have found that a burner of given area will maintain a temperature of 3290° F. in a combustion chamber of certain size.

This is sufficient to melt platinum. With a combustion chamber of larger size a temperature of 2600° may be maintained, while with one of still larger size a temperature of 1800° may be had, and in each of these cases the burners is working at its maximum efficiency. By constructing the furnace in accordance with the work to be done the operations may be carried out at a given temperature with the maximum efficiency and with a minimum loss of heat units.

I claim:

1. In a furnace, a mixing chamber, a combustion chamber, and means for conducting gaseous fuel from said mixing chamber into said combustion chamber and for preventing the ignition of the charge in the mixing chamber by the heat from the combustion chamber, said means comprising a block of highly refractory material having a plurality of passages extending therethrough, the length of the block being such that the temperature of the end of the block adjacent the mixing chamber is never above the kindling point of the gases within the mixing chamber.

2. In a furnace, a combustion chamber, a mixing chamber, a highly refractory block disposed between said mixing chamber and said combustion chamber, said block being provided with a plurality of passages for establishing communication between the mixing chamber and the combustion chamber, each of said passages being relatively small in diameter, and said block being comparatively long so as to prevent conduction of heat from said combustion chamber to said mixing chamber, means for introducing gas into said mixing chamber, an air pipe for introducing air into said mixing chamber, said air pipe being provided with a lateral opening communicating with the atmosphere, and means for covering said lateral opening at will.

3. In a furnace, a mixing chamber, a combustion chamber, and means for conducting gaseous fuel from said mixing chamber into said combustion chamber and for preventing the ignition of the charge in the mixing chamber by heat from the combustion chamber, said means comprising a block of carborundum having a plurality of passages extending therethrough of relatively small diameter, the length of the block being such that the temperature of the end of the block adjacent to the mixing chamber is never above the kindling point of the gases within the mixing chamber.

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Witnesses:
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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."