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H. H. CLARK

FURNACE OPERATION

Filed Aug. 12, 1920

Fig. 1

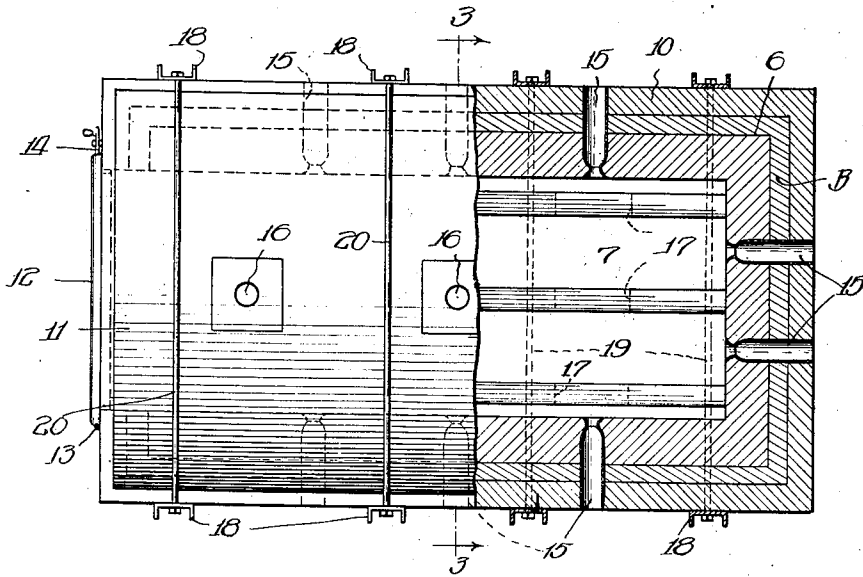
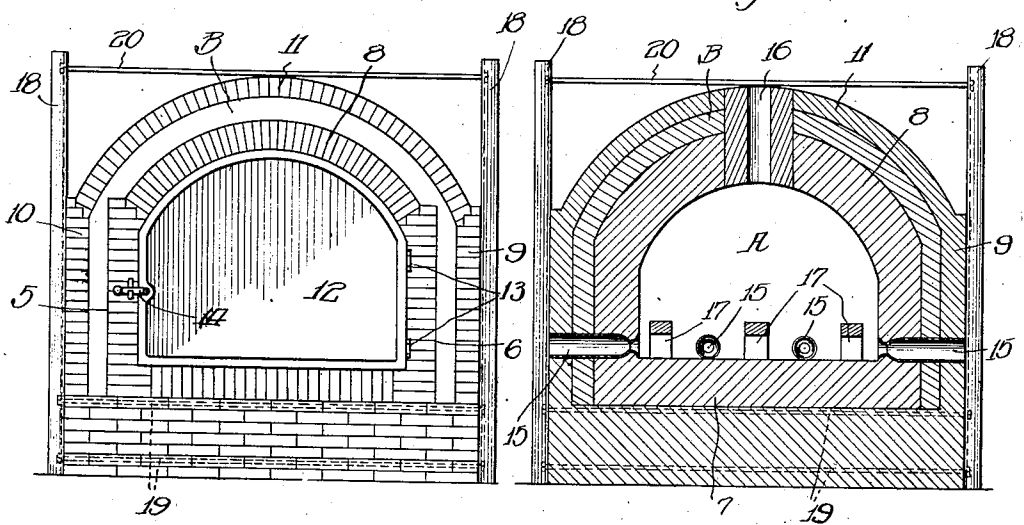


Fig. 2

Fig. 3



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# UNITED STATES PATENT OFFICE.

HORACE H. CLARK, OF CHICAGO, ILLINOIS.

## FURNACE OPERATION.

Application filed August 12, 1920. Serial No. 403,001.

*To all whom it may concern:*

Be it known that I, HORACE H. CLARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnace Operation, of which the following is a specification.

My invention relates to a method of furnace operation and is particularly adapted for use in enameling articles of various kinds.

In carrying out my invention as applied to enameling, a furnace is employed, having a furnace chamber suitably insulated against loss of heat, which is heated by the application of fuel directly to the furnace chamber. After a predetermined length of time, the fuel supply is interrupted and the goods to be enameled are placed in the furnace chamber to absorb a portion of the heat therein. My method makes possible the carrying out of enameling, or other similar operations under perfectly quiet conditions without the impinging of the heating flame against the goods in the furnace. It also results, automatically, in scavenging the furnace by the inrush of cold air and displacement of products of combustion upon opening the door to introduce the goods.

An object of my invention is to provide a method of operation in which there is no direct action of the furnace heating flame against the articles being treated.

Another object of my invention is to provide a method of treating articles to be enameled by directly heating a furnace chamber, interrupting the fuel supply, placing the articles to be treated in the chamber, leaving the same therein until the desired treatment has taken place, removing the articles, reheating the chamber, and again going through the same cycle of operations for other groups of articles.

A further object of my invention is to provide a method of treatment which consists in directly heating the furnace by means of gas or other suitable fuel, interrupting the supply of fuel, and subjecting the articles to be heated to the heat of the furnace only during the period that the fuel supply is cut off.

A still further object is to improve the process of enameling and the like for successful, economical, commercial use.

In carrying out my invention, I provided a furnace having an open chamber therein,

which is spaced from the walls of the furnace proper, and which space may be filled with some heat insulating medium to prevent too rapid heat losses within the furnace chamber. Fuel is supplied to the furnace chamber directly and burned therein and I prefer to employ gas or oil as fuel. The gas or oil is supplied to suitable burners, and means are provided for regulating the supply of fuel. The bottom of the chamber may be provided with supports, on which the articles to be subjected to the heat are supported, to permit the heat to engage as great a portion of the surface of the articles as may be found desirable.

My invention contemplates a furnace wherein the muffle partition is eliminated, and in which the fuel for heating furnaces is introduced directly into the chamber in which the articles to be treated are placed.

My invention will be more fully understood by reference to the accompanying drawings wherein—

Figure 1 is a top plan view partially in section, showing a furnace constructed in accordance with the preferred embodiment of my invention.

Figure 2 is a front elevation of the furnace of Figure 1; and,

Figure 3 is a vertical section taken in the plane of line 3—3 of Figure 1.

Referring to the drawings, the furnace of my invention includes a furnace chamber designated by reference character A, and which is defined by side walls 5 and 6, bottom 7, and arched roof 8. Surrounding the chamber A, and spaced therefrom is an enclosing structure comprising walls 9 and 10, and arched roof 11, the relation of the parts being such as to define a space B between the furnace chamber A and the surrounding structure. If desirable, suitable heat insulating material may be inserted in the space B. The front end of the chamber A has a door 12 hinged at 13 to one of the side walls, the drawings showing the hinges as being on wall 6. A latch 14, or other suitable fastening device is fixed to the door to permit the same to be opened and closed.

The size of the door relative to the internal vertical and transverse dimensions of the chamber A is such that after combustion has been interrupted and the door is opened to introduce the goods, products of combustion will escape freely from the chamber through the upper portion thereof

as relatively cold air enters the lower portion and displaces the same.

Fuel burners 15 extend through the side walls 5 and 6 and the back walls of the chamber A and the corresponding walls 9 and 10 of the enclosing structure and are arranged to burn the fuel within the chamber A. These burners are adapted for connection to a source of fuel supply by means not shown, but which may be of any well known form. The fuel I prefer to employ is of a liquid or gaseous form. The inner ends of the burners are arranged so that the discharge therefrom may be within the chamber A near the bottom 7 thereof. It is not, however, essential that the burners be arranged near the bottom. Extending upwardly from the top of the chamber through the arched tops 8 and 11 are outlets 16 for the escape of the products of combustion, and these outlets may be closed by suitable dampers or valves if desired. On the bottom 7 of the chamber, at suitable intervals, are provided supports or standards 17, on which the articles to be heated are placed.

The enclosing structure may be tied together by suitable upright supports 18, which in the drawings are shown as channels, and which are connected at the top and bottom by bolts 19 and 20.

The operation of my invention is as follows:

Fuel is introduced through the burners 15 and ignited within the chamber A. It is understood that a sufficient amount of air or other gas is introduced through the burners to perfect combustion. When my method is used for enameling, the chamber A is supplied with the fuel a length of time sufficient to heat the same to a temperature sufficiently high for enameling purposes, and which temperature is approximately 1800° F. When the desired temperature has been reached which may be ascertained by any well known means, the fuel supply is interrupted or cut off, whereupon the door is opened to receive the articles to be baked which are placed in the chamber A on the supports 17. The opening of the door for the relatively brief period required for introducing the goods results in an inflow of cold air into the lower portion of the chamber, accompanied by displacement of products of combustion through the upper portion of the doorway, thereby effectually scavenging the chamber. The articles under treatment are permitted to remain in the chamber until the treatment is completed. Whereupon the articles are withdrawn from the chamber and the fuel supply started to reestablish the temperature previously attained, in order that other goods may be subjected to the same heat treatment. After the proper temperature has been reached, the fuel supply is again interrupted and an-

other lot of articles to be treated are placed in the chamber, and the cycle continued as long as desired.

An advantage of my invention is that the fuel consumption is cut down enormously and the cost greatly reduced. Another advantage is that the furnace necessary in carrying out my invention consists of nothing but a chamber with a surrounding wall, whereas a muffled furnace is much more complicated and requires frequent and expensive repairs.

A still further advantage is that the articles being treated are very evenly heated in a quiet atmosphere, out of contact with any impinging flame. Still another advantage arises from the fact that the chamber is largely evacuated or scavenged of the products of combustion so that if fuel contains ingredients which, or the oxidation of which, results in ingredients that are injurious to the enameling substance, such ingredients of the furnace atmosphere will be eliminated.

For ascertaining the temperature within chamber A, any instrument may be used. I have found that a pyrometer may be successfully employed, as by such an instrument the temperature within the chamber may be readily observed at all times.

It may be evident to those skilled in the art, that many changes could be made in the detailed construction of the parts, which are described without departing from the spirit and scope of my invention.

I claim:

1. A method of enameling, which consists in heating a furnace chamber until a desired temperature is obtained, stopping the source of heat, placing the articles to be enameled in the chamber, withdrawing the articles from the chamber, and again applying heat to said chamber to restore former temperature thereof for the reception of another lot of articles to be enameled.

2. The improvement in the process of enameling which consists in subjecting an article to be enameled to high temperature effects in inert and immobile environment by first burning fuel in a furnace chamber until the walls thereof acquire a temperature approximately that to which the article is to be subjected, then discontinuing the supply of fuel to the chamber, introducing thereinto the article to be treated, tightly closing the chamber, and leaving the material to the action of radiant heat from the walls of the chamber.

3. The process of subjecting to high temperature effects in inert and immobile environment an article to be enameled which consists in burning fuel in a furnace chamber until the walls thereof acquire a temperature approximately that to which the article is to be subjected, then discontinuing

the supply of fuel to the chamber, introducing thereinto the article to be treated, tightly closing the chamber, and leaving the article to the action of radiant heat from the walls of the chamber; the combustion of fuel in the furnace chamber being renewed after completion of the treatment of the article and its removal from said chamber, before introducing a successive charge of material, thereby maintaining the required temperature during the continued proceeding without impairing the inert and immobile condition of the chamber during the heat treatment.

4. The method of furnace operation for fusing enamel upon articles to be enameled, which consists in heating a furnace chamber into which the articles to be treated are to

be placed by the combustion of fuel delivered thereto and continued until a predetermined temperature is attained, stopping the source of heat, immediately placing an article bearing an enameling substance within said chamber and after suitable time withdrawing said articles, again applying heat to said chamber to restore the former temperature thereof for the reception of another lot of articles to be treated and controlling the temperature of the chamber so that at the time the fuel supply is cut off the temperature is never in excess of that desirable for treatment of the particular articles to be treated.

Signed at Chicago, Illinois, this 10th day of August, 1920.

HORACE H. CLARK.