Oct. 30, 1923. 1,472,401

F. G. ROBERTS

METHOD OF AND APPARATUS FOR OPERATING MUFFLE FURNACES

Filed July 13, 1922

Fig. 1.

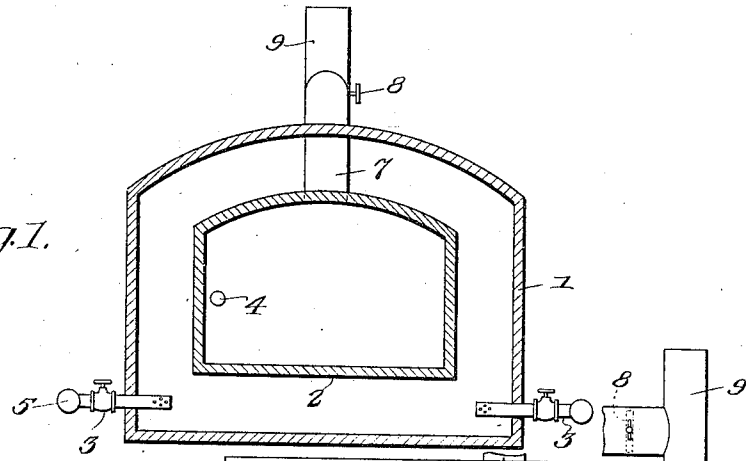
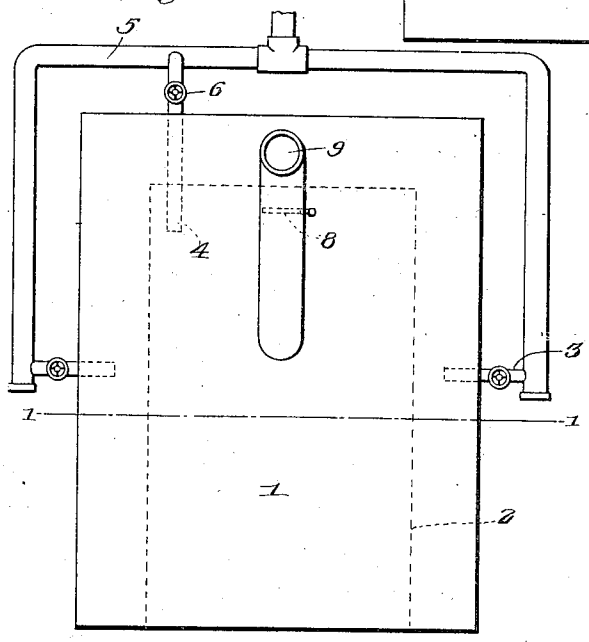


Fig. 2.



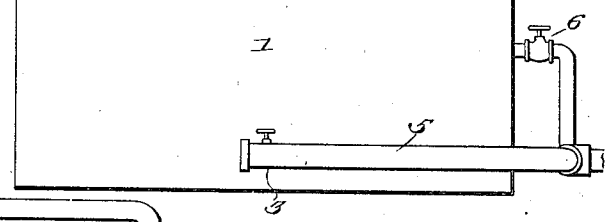


Fig. 3.

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UNITED STATES PATENT OFFICE.

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METHOD OF AND APPARATUS FOR OPERATING MUFFLE FURNACES.

Application filed July 13, 1922. Serial No. 574,730.

To all whom it may concern:

Be it known that I, FRANK GROTHAUS ROBERTS, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Methods of and Apparatus for Operating Muffle Furnaces, of which the following is a specification.

This invention relates to a method of operating muffle furnaces and to apparatus for practicing the same.

In the manufacture of enamel ware, it is customary to fire the ware either in a muffle furnace fired indirectly or in a furnace heated directly by the fuel. Furnaces of the latter type, have the disadvantage of allowing the products of combustion, to come in direct contact with the work undergoing treatment. The products of combustion carry deleterious ingredients which are more or less harmful and react on the enamel producing an inferior product. All fuels carry a certain amount of sulphur compounds and these on combustion form sulphur dioxide which is an undesirable ingredient. The direct method of firing, however, has the advantage of being very economical in the use of fuel. The indirect method of firing has not the disadvantage of the direct method of firing above referred to but is not very economical in the use of fuel.

The primary object of this invention is to provide a method of operating muffle furnaces and apparatus therefor admitting of the economical use of fuel. More specifically, the object is to provide a muffle furnace which combines the direct and indirect method of heating.

For a clear understanding of the invention reference is directed to accompanying drawing where one form of the apparatus for carrying out the invention is more or less conventionally and diagrammatically shown in which:

Fig. 1, is a transverse section of the furnace taken on line 1—1 of Figure 2.

Fig. 2 is a plan view.

Fig. 3, is a side view.

The furnace comprises an outer casing 1 containing a muffle 2 adapted to contain the article to be enameled, outside fuel burners 3 for heating the muffle when the work is present therein and auxiliary fuel burners 4. The fuel conduit 5 supplies the fuel to both the burners 3 and 4. The fuel supply to the burners 4 may be regulated by the valve 6. The muffle 1 is provided with a flue 7 carrying a valve 8 connecting with the main flue 9. When the auxiliary burners 4 are in use the valve 8 is open so the products of combustion may escape.

By the use of the apparatus set forth, muffle furnaces may be operated with an increased efficiency, as compared with the straight indirect method and without the work being exposed to the products of combustion as in the direct method. The method of operation is as follows: In starting the enamel-heat the main burners 3 are utilized to bring the muffle to the required temperature. When this temperature is attained the articles to be fired carrying the enamel are inserted in the muffle. When the firing operation is completed the articles are withdrawn and immediately thereafter the auxiliary burners 4 are brought into operation and the muffle is kept at the required temperature. When another set of articles are to be fired the auxiliary burners 4, are shut off and the main burners 3 started. According to the method of operation set forth, indirect heating is utilized when the work is in the muffle and direct heating to keep the muffle chamber at the required temperature when the work is out of the muffle. This results in substantial economy of fuel. The above preferred method of operation may be modified so that the inside and outside burners may be used simultaneously in combination.

The number and position of the burners may be varied according to conditions of application. A single primary burner may in some cases be sufficient. The main burners may be located in the back or front of the furnace instead of on the sides as shown and the position of the auxiliary burners may also be changed as desired. Gas, oil or other liquid fuel may be used.

I claim:

1. The method of operating muffled furnaces to continuously keep the same to a working heat comprising simultaneously heating the exterior and interior of the muffle.

2. The method of operating muffle furnaces to continuously keep the same at working heat comprising indirectly heating when the work is in the muffle and directly heating the interior of the muffle in the

presence of a combustion supporting substance when the work is absent from the muffle.

3. The method of operating muffle furnaces to continuously keep the same at working heat comprising indirectly heating with fluid fuel when the work is in the muffle, whereby the work is protected from the action of the products of combustion, and directly heating the interior of the muffle by fluid fuel in the presence of a combustion supporting substance when the work is absent from the muffle.

4. In combination, a furnace chamber, a muffle therein, primary means for supplying heating gases around the exterior of the muffle when the work is present therein, and auxiliary combustion means for continuously supplying heating gases to the interior of the muffle during the period the work is absent from the muffle to keep the latter at a working heat, and means for removing the cooled heating gases.

5. In combination, a furnace chamber, a muffle therein, primary means for supplying heating gases around the exterior of the muffle and auxiliary combustion means for continuously supplying heating gases to the interior of the muffle and means for removing the cooled heating gases.

6. In combination, a furnace chamber, a muffle therein, primary means for supplying heating gases around the exterior of the muffle and auxiliary combustion means within the muffle, for continuously supplying heating gases to the interior of the muffle and means for removing the cooled heating gases.

7. The method of operating muffle furnaces adapted for the enameling of articles to continuously keep the furnace at a working heat comprising indirectly heating the muffle when the articles are present therein, thereby preventing the heating gases from coming in contact with the articles during the process of enameling and directly heating in the presence of a combustion supporting substance, the interior of the muffle to prevent the cooling of the same in the absence of the work.

In testimony whereof I hereunto affix my signature.

FRANK GROTHAUS ROBERTS.