R. MARX.

FURNACE.

APPLICATION FILED OCT. 4, 1919.

1,357,790.

Patented Nov. 2, 1920.

2 SHEETS—SHEET 1.

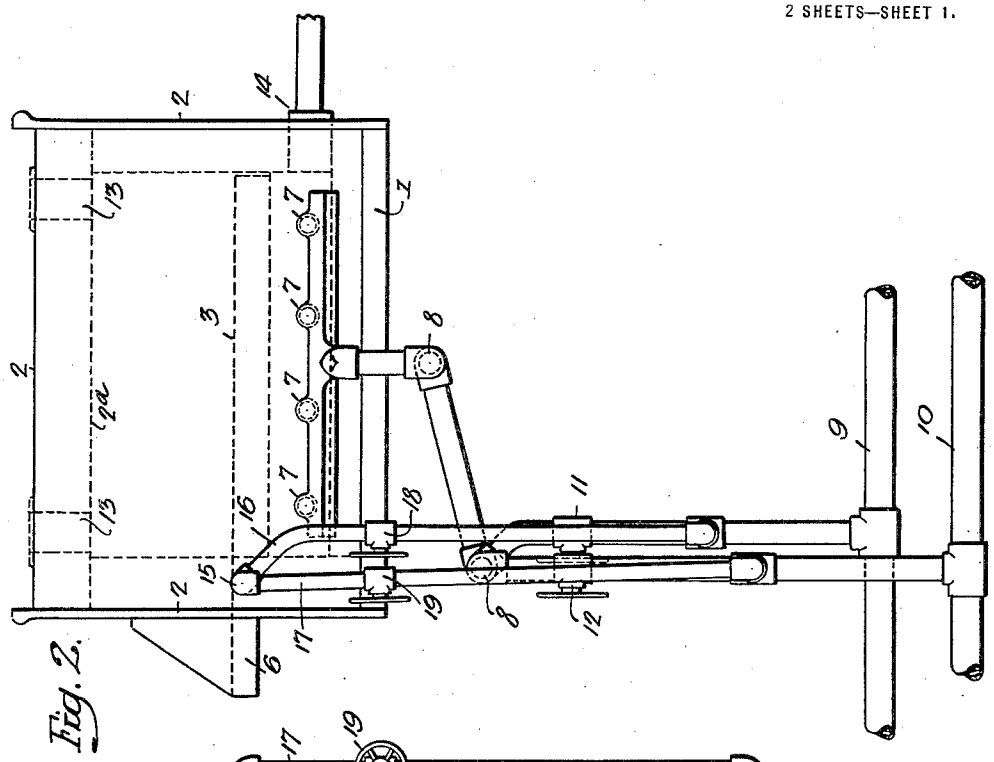


Fig. 2.

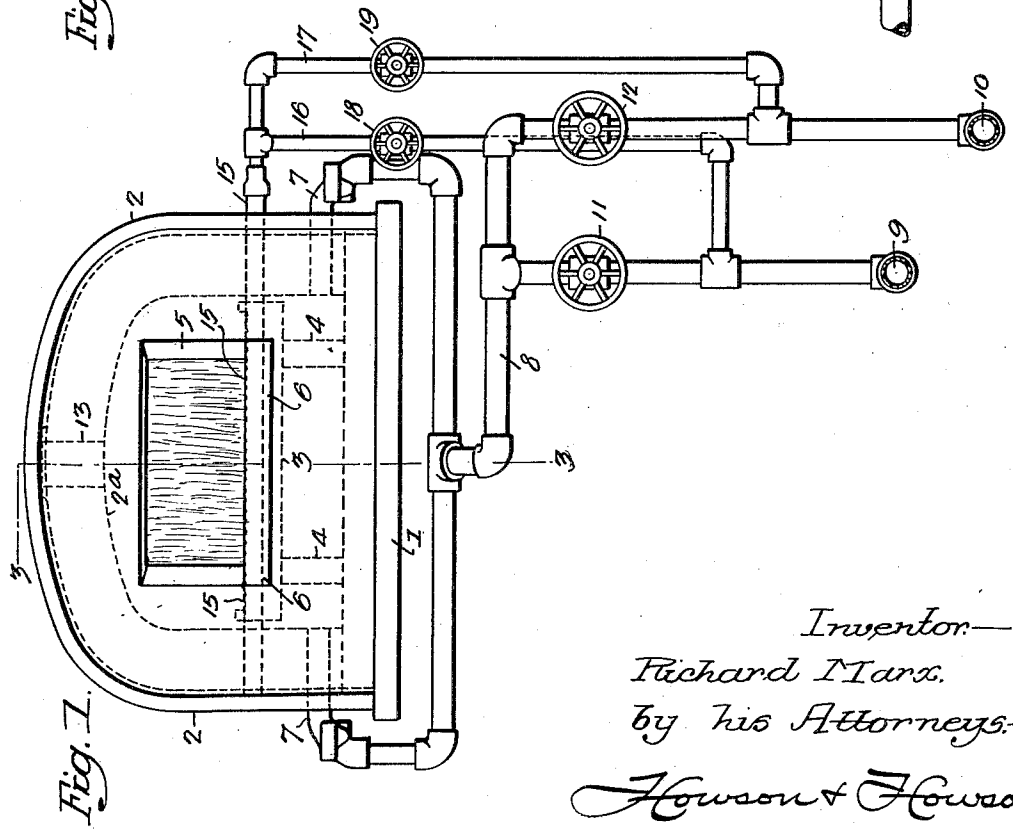


Fig. 1.

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by his Attorneys—
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Fig. 3

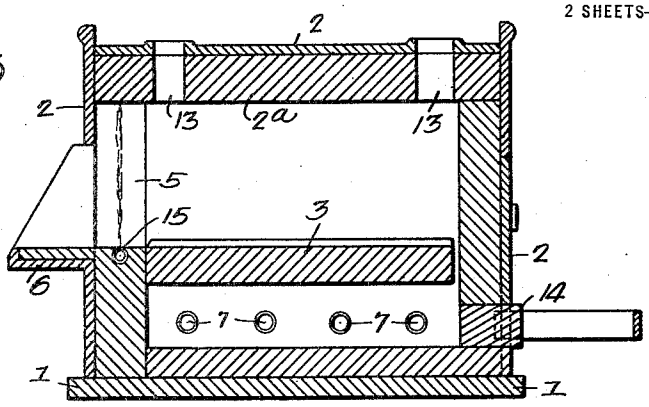


Fig. 5.

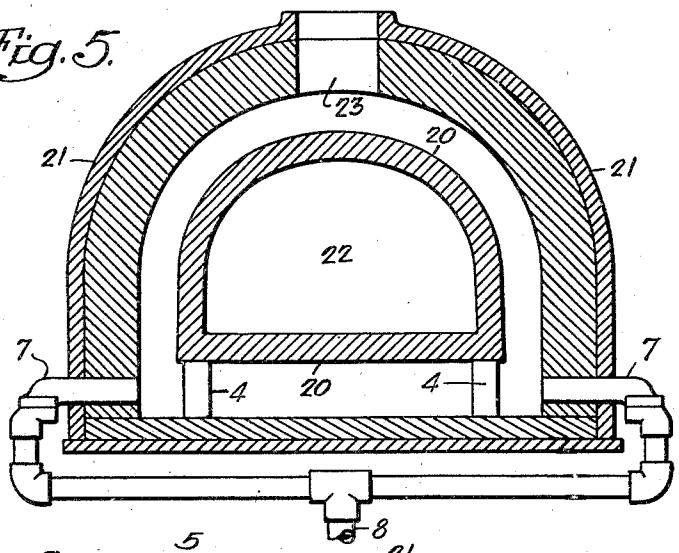
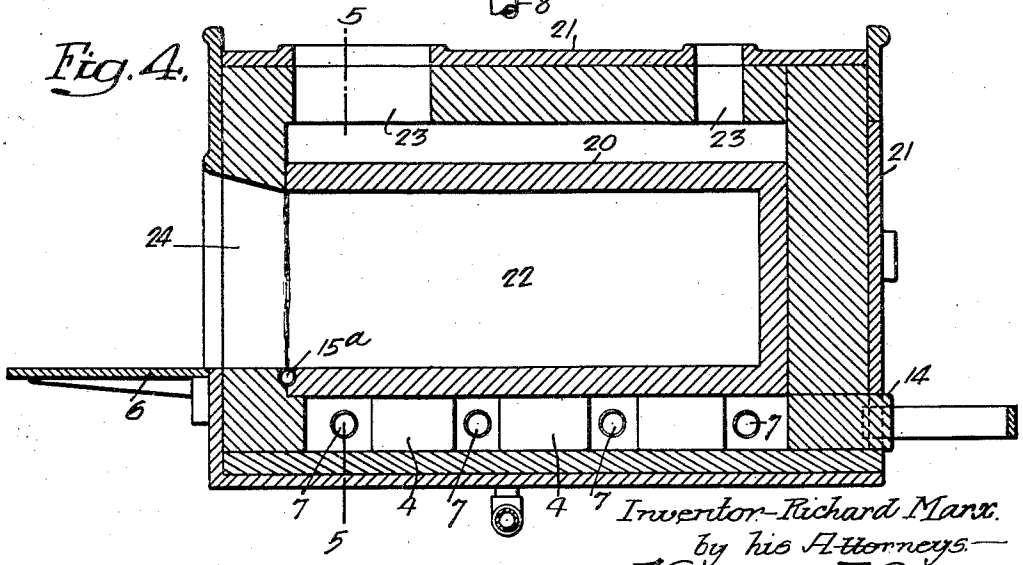


Fig. 4.



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UNITED STATES PATENT OFFICE.

RICHARD MARX, OF PHILADELPHIA, PENNSYLVANIA.

FURNACE.

1,357,790. Specification of Letters Patent. Patented Nov. 2, 1920.

Application filed October 4, 1919. Serial No. 328,442.

To all whom it may concern:

Be it known that I, RICHARD MARX, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented Improvements in Furnaces, of which the following is a specification.

In heating furnaces and more particularly in muffle furnaces, oxidation of the article under treatment occurs and not only is the uniformity of the heating disturbed but there is wasteful and injurious cooling of the furnace whenever the door is opened.

One object of my invention therefore is to provide a furnace with novel means whereby its contents may be at all times open to view but which shall none the less prevent the entrance of air into the furnace and thus avoid burning or scaling of the articles under treatment as well as cooling of the furnace.

It is further desired to provide a heating furnace with novel means whereby its operation may be made more uniform than has hitherto been possible and the material under treatment be effectually prevented from oxidation, or if desired, exposed to a reducing action at will; the invention more particularly contemplating the provision of a gas curtain which shall serve as means of preventing the access of air to the interior of that part of the furnace in which are placed the articles being heated.

These objects and other advantageous ends I attain as hereinafter set forth, reference being had to the accompanying drawings, in which,

Figures 1 and 2 are respectively a front and a side elevation of a furnace constructed in accordance with my invention;

Fig. 3 is a transverse vertical section on the line 3—3, Fig. 1; and

Figs. 4 and 5 are respectively a central longitudinal vertical section and a transverse vertical section on the line 5—5, Fig. 4, illustrating my invention as applied to a muffle furnace.

In Figs. 1 to 3 of the above drawings 1 represents a supporting base on which is mounted a casing 2 having a refractory lining 2^a, forming a chamber within which a refractory slab 3 is mounted upon blocks 4 so as to be spaced some distance above the furnace floor or bottom and in the horizontal plane including the bottom of the doorway 5.

In the front of the furnace the front or face of the furnace casing has fixed to or supported upon it a forwardly projecting shelf 6 flush with the bottom of the doorway and with the slab 3 and the sides of the latter as well as its rear edge are spaced away from the furnace lining to permit of the circulation of the products of combustion.

The furnace is heated by fuel delivered from a number of burners 7 discharging into its lower portion from opposite sides and these burners are connected to any suitable source which in the present instance consists of a supply pipe 8 connected to air and gas mains 9 and 10 through branch pipes containing stop valves 11 and 12. Openings 13 are formed in the top of the furnace for the escape of the products of combustion and a suitable opening into the back of the furnace is provided to permit of the lighting and inspection of the burners;—this being normally closed by a refractory block 14.

In accordance with my invention I provide means whereby a transparent curtain and closure of gaseous material is formed across the doorway of the furnace and for this purpose I mount in the refractory lining at the threshold of the doorway 5, a conduit 15 with its top surface substantially tangent with the flat bottom of said doorway forming in it a line of openings through which jets of fuel may be discharged vertically upward across said doorway. This burner is connected to a suitable source of fuel (in the present instance the gas and air mains 9 and 10) through branch pipes 16 and 17 which include stop valves 18 and 19 and are independent of the valves 11 and 12 for the supply of the main burners.

Under operating conditions when the furnace has been brought to the proper heat by the operation of the burners 7, the valves 18 and 19 are opened and the fuel discharged from the burner 15 is ignited, with the result that it is delivered in a continuous curtain across the doorway of the furnace, forming a gaseous closure which is transparent and effectually prevents the entrance

of air. The articles to be treated may be introduced through this curtain and placed upon the slab 3 so that they are at all times visible from the outside of the furnace and it is possible to accurately note their temperature and condition without the necessity of allowing entrance of cold air into the furnace as is ordinarily the case when the door is opened. Moreover when the desired heat treatment is complete, the articles may be removed by the introduction of tongs or the like through the curtain of burning fuel, without in any way cooling or otherwise affecting the interior of the furnace or the other articles therein.

If it be desired to subject the articles to an annealing treatment after they have been brought to the desired temperature, the main burners may be extinguished, the openings 13 may be closed by any suitable means and the operation of the burner 15 continued with the result that the furnace and its contents cools with the greatest evenness and at a relatively slow rate.

If desired my invention may be advantageously applied to a muffle furnace such as that shown in Figs. 4 and 5 in which a muffle 20 is mounted within a lined furnace casing 21 so that the fuel delivered from the burners 7 to the interior of said casing surrounds said muffle without allowing the products of combustion to enter its interior chamber 22. The casing is provided with openings 23 at its top for the escape of the products of combustion and has a front opening or doorway 24 at whose threshold is mounted a transversely extending burner 15^a.

As before, this burner is preferably embedded in or mounted with its top surface substantially flush with the bottom of the muffle 20 so as to be practically protected thereby and its openings are so placed and spaced that it will discharge the fuel in jets, which when ignited form a burning gaseous curtain completely closing the interior of the muffle.

In this form of my invention the oxygen of any air in the muffle is quickly removed both by the chemical action of the burning gas as well as by the suction action of the burner 15^a so that pressure in said muffle is less than that of the atmosphere;—this condition being maintained even though there should be some leakage of air or gas through the walls of the muffle. As a consequence, articles may be treated in the muffle without possibility of their scaling or becoming oxidized and their condition and temperature may at any time be readily observed through the transparent curtain of burning fuel across the doorway, as described in connection with Figs. 1 to 3 inclusive.

After the furnace has been brought to a desired temperature, fuel may be cut off from the main burners, and the openings 23 closed while the burner 15^a is continued in operation, with the result that the muffle 22 with its contents will remain for a prolonged period in a highly heated condition which it is noted becomes perfectly uniform after the extinguishing of the main burners. It is thus possible to allow the objects under treatment to cool at any desired rate which may be regulated by varying the number of the main burners in operation or regulating the supply of gas to the same or even by varying the amount of gas supplied to the burner 15^a. In any case the condition of the articles under treatment may be observed without cooling them or the furnace and the heating and cooling takes place in an atmosphere from which oxygen is excluded and from which it is totally abstracted.

Obviously with my invention, the fuel mixture supplied may be regulated so that under operating conditions it has either an oxidizing or a reducing action on the articles under treatment. Any suitable fuel may be used for heating the furnace as well as for forming the curtain or closure therefor.

I claim:

1. The combination of a furnace having a doorway; with means for forming a gaseous curtain of burning fuel across said doorway.

2. The combination of a furnace having a doorway; with a device for supplying fuel in the form of a relatively thin sheet across said doorway to provide a gaseous closure therefor.

3. The combination of a furnace having a doorway; and a burner formed to supply fuel in a series of jets across the doorway.

4. The combination of a furnace having a doorway; with a burner mounted to project fuel upwardly across said doorway to form a curtain of burning material.

5. The combination of a furnace having a doorway; with a burner tube mounted in the threshold of said doorway and having a line of closely spaced openings placed to deliver jets of fuel across the same substantially within the same plane.

6. The combination of a furnace having a refractory lining and provided with a doorway; a perforated tube mounted in said lining extending across the bottom of the doorway in position to deliver upwardly flowing jets of fuel across the same; and means for supplying fuel to said tube.

7. The combination of a furnace having main heating means and provided with a doorway; with an auxiliary burner positioned to maintain a curtain of burning fuel across the doorway.

8. The combination of a furnace having main fuel burners and provided with a doorway; with an auxiliary burner positioned to maintain a curtain of burning fuel across the doorway.

9. The combination of a furnace including a casing; a muffle mounted in the casing and having a doorway cut off from the interior of the furnace; means for heating the body of the muffle; and means for delivering a curtain of burning fuel across the doorway of the muffle.

10. The combination of a furnace; heating means therefor; a muffle in the furnace; and means for forming a transparent curtain of burning fuel across the opening into the muffle to prevent the entrance of air thereto.

In witness whereof I affix my signature.

RICHARD MARX.