J. M. ROTH.

MOLD HEATING FURNACE.

APPLICATION FILED NOV. 24, 1915.

1,247,015. Patented Nov. 20, 1917.

Fig. 1

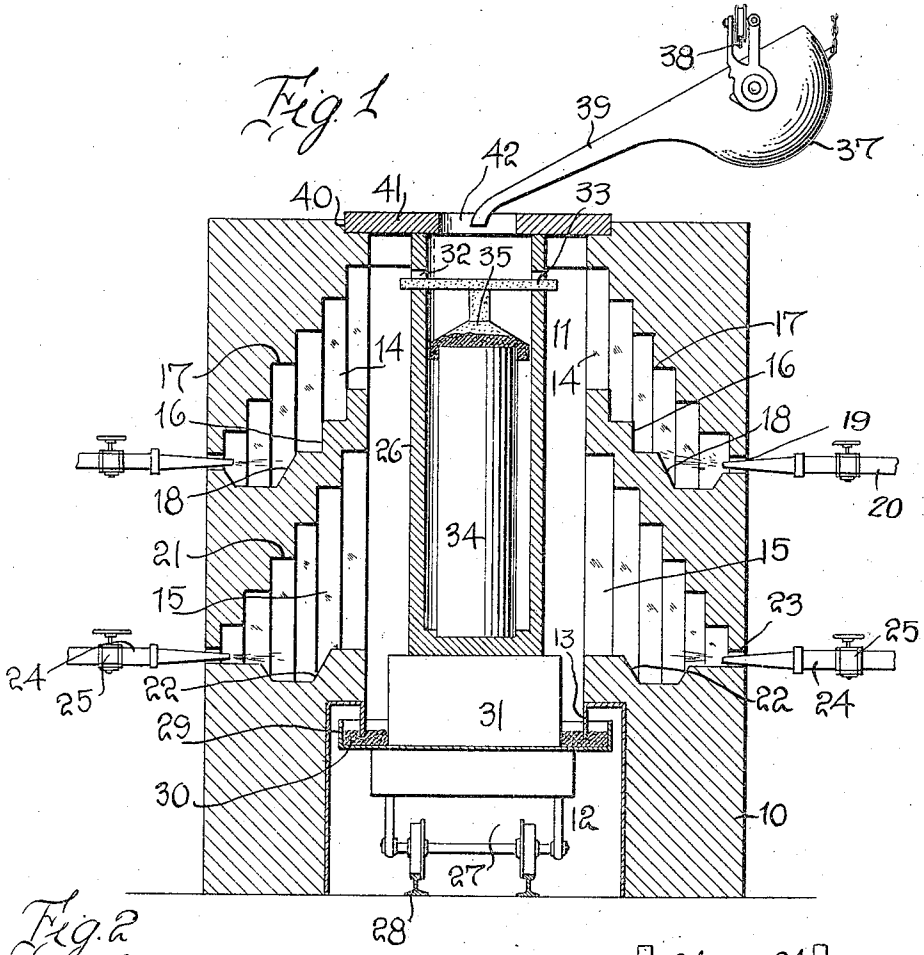
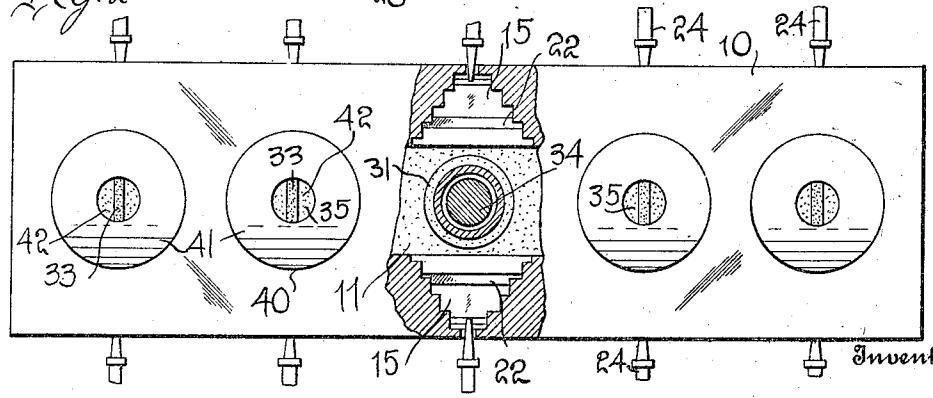


Fig. 2



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MOLD-HEATING FURNACE.

1,247,015. Specification of Letters Patent. Patented Nov. 20, 1917.

Application filed November 24, 1915. Serial No. 63,172.

To all whom it may concern:

Be it known that I, JACOB M. ROTH, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Mold-Heating Furnaces, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to furnaces, and particularly to furnaces for use in welding metallic linings upon metallic cores in the manner described in my pending application for patent filed March 27, 1915, Serial No. 17,486.

In the carrying out of the method described in said application, a cylindrical mold is used having disposed therein a core of steel or similar ferrous metal and after the core is disposed therein molten copper or like non-ferrous metal is poured into the mold so as to surround the core and when solidified the billet so formed is composite in character having a center core of steel or like ferrous metal and an outer layer, coating or lining of copper or like non-ferrous metal.

In the operation of heating the mold in order to properly weld the core and the lining to each other, it is necessary that the mold and billet should be first uniformly heated to a predetermined degree and that then after the molten copper has been poured into the mold to surround the core the heat at the lower end of the mold should be reduced, the heat at the upper end of the mold remaining practically the same so that the metal in the lower portion of the mold may begin to harden or congeal before the metal in the upper portion of the mold so that thereby any air or other gases contained within the molten metal in the lower portion of the mold may rise upward through the less molten metal and so escape, thus avoiding the formation of blow-holes or air bubbles.

The object of my present invention is to provide a furnace so constructed that the heat will be applied uniformly to the mold and not so applied as to cause the extreme heating of the mold at any one point, and further to so construct the furnace that the heat may be reduced or cut off at the lower portion of the mold and retained for a predetermined time at any desired temperature around the upper portion of the mold.

A further object of my invention is to so form the furnace that the burning gases with which the furnace is heated shall not be directed against the wall of the mold but shall be directed against a wall of the furnace itself and then reflected against the mold, thus preventing the jets of burning gas from playing directly upon the mold wall and thereby burning the mold wall through at one or more points. This materially increases the life of the mold and also secures a more uniform heating thereof.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical section through a furnace constructed in accordance with my invention;

Fig. 2 is a top plan view of the furnace partly broken away to show the interior construction.

Referring to these drawings, 10 designates a furnace which is built of any suitable refractory material such as ordinarily used in the construction of furnaces, and which as illustrated is elongated in form to provide a longitudinally extending mold chamber 11 open at its opposite ends or only temporarily closed at these ends, this mold chamber 11 opening at the top of the furnace and at its bottom opening into a longitudinally extending chamber 12 which is greater in width than the chamber 11. The confronting walls of the chamber 11 at the lower ends of the walls are provided with the downwardly extending flanges 13.

The lateral walls of the furnace are formed with a plurality of chambers 14 and 15 which may extend either entirely along the furnace but which preferably are closed at their ends, there being as many sets of chambers 14 and 15 as there are molds to be heated. I have illustrated a pair of these chambers 14 and 15 in each lateral wall of the furnace and opposite each mold space. The chambers 14 open into the upper end of the mold chamber 11, while the chambers 15 open into the lower end of the chamber 11. The chambers 14 are alike in form and each chamber has a stepped lower wall 16 and a stepped upper wall 17. The upper wall 17 is stepped uniformly upward and inward but the lower wall 16 is formed to provide an inclined face 18. Opposite this face 18 the furnace wall is formed with an opening

19 through which a burner 20 is projected so as to direct the jet of flame issuing from the burner against the inclined wall 18. The chambers 15 are alike, each chamber having an upwardly and inwardly stepped upper wall 21 and the lower wall of the chamber being formed with an inclined face 22 opposite to a burner opening 23 through which the burner 24 is inserted so that the jet of flame issuing from the burner will be directed against this inclined wall and deflected upward. Each of the burners 20 and 24 is provided with any suitable valve 25 whereby the jet of burning gas may be controlled or cut off entirely.

The molds, designated 26, are supported within the furnace by means of a truck, designated generally 27, or "buggy." This truck runs upon the rails 28 and is formed with lateral flanges 29 having upturned margins which are disposed outwardly over the flanges 13 and project up above these flanges so that a seal of sand 30 or like material may be disposed upon the upper face of the buggy into which the flanges 13 will extend. The mold 26 is preferably mounted upon a block of graphite 31 or like material. The mold may be of any suitable construction and of any suitable material, such as carborundum, alundum, cast iron, steel, etc. As illustrated, the mold has the form of the mold forming the subject-matter of my application for patent Serial No. 63,171, filed on the 24th day of November, 1916, that is, the mold is cylindrical in form and adjacent its upper end is provided with the vertically extending slots 32 and 33. The core 34, which for illustration is assumed to be of steel properly prepared, is disposed within the mold and rests upon the base thereof, and after the core is in place a clay head piece 35 is disposed within the mold, this head piece resting upon the upper end of the core and having sliding engagement at its ends with the mold and acting to center the core. This head piece has an upward extension upon which rests a graphite bar 36 which is disposed in the slots 33. The graphite bar 36 and the head piece 35 act by their weight to hold the core down against upward movement due to the difference in the specific gravity of the molten copper and the steel core, but the slots permit the core to expand.

For the purpose of filling the several molds after they have been disposed in the furnace, I provide the ladle 37 which is mounted to travel upon a track 38 and which ladle has a spout 39 which may be disposed over any one of the molds and discharge the molten metal thereinto. The top of the furnace is formed with a series of openings 40 disposed over each mold, and these openings, after the mold is put in place, are partially closed by means of a cover 41 of refractory material having a central opening 42 through which the spout of the ladle may be inserted to discharge the contents of the ladle into the mold.

It will be seen that the peculiar form of the chambers 14 and 15 is such that the blasts of gas coming from the burners are not discharged directly against the wall of the mold but that each jet or blast of burning gas strikes the inclined face of the wall opposite the burner and is then reflected upward to the top of the chamber and is again deflected downward to one of the steps of the lower wall of the chamber and is again deflected upward, and so on, and that therefore the gas does not directly strike the mold itself but that the mold is heated by heat reflected from the stepped faces of the upper walls of the chambers 14 and 15. Some of this heat is reflected downward through the space between the mold and the wall of the mold chamber and some of the heat is reflected directly toward the mold chamber. Thus the mold is uniformly heated throughout its entire extent by a heat which is diffused and which is not directed against any one or more relatively circumscribed areas of the mold. Inasmuch as the burners 20 and 24 are provided with valves, the heat from the lower burners may be reduced after the mold has been filled with molten copper and then gradually cut off, the heat of the upper burners being kept constant and thus the molten metal in the lower portion of the mold will gradually congeal while that in the upper portion will be kept hot for any desired length of time so that any air or other gases which may be trapped in the lower portion of the molten metal may rise upward through the more fluid metal and thus escape, thus preventing the formation of blow-holes or bubbles which would be liable to occur if the upper and lower portions of the molten metal were allowed to cool at the same rate or uniformly. Of course after the supply of gas to the lower burners 24 has been cut off the supply of gas to the upper burners may be gradually reduced and eventually cut off so that the metal in the upper portion of the mold will solidify.

While I have illustrated a furnace of this character having a series of upper chambers 14 and a series of lower chambers 15, I wish it understood that I do not wish to be limited to the use of only two chambers on each side of the mold as it is obvious that more chambers might be used, if desired, so as to even more gradually regulate the heat applied to the lower, middle and upper portions of the mold. Nor do I wish to be limited to the details of construction illustrated nor the exact form of the lower chambers

as shown as these may be modified in many ways without departing from the principle of my invention.

Having described my invention, what I claim is:

1. A furnace for heating molds, having a mold space and a heating chamber formed in the wall of the furnace and opening at its inner end into said mold space, the bottom wall of the heating chamber extending substantially horizontally inward and then upward to a level with the base of the mold supported within the furnace and forming a deflecting surface, the upper wall of the heating chamber extending inward and upward to a plane inward of the deflecting surface in a series of stepped heat radiating surfaces, whereby to bring the radiating surfaces gradually nearer to the upper portion of the object, and a blast nozzle entering the furnace wall and discharging against the upwardly extending portion of the bottom wall of the heating chamber, whereby the blast may be deflected upward against said heat radiating surfaces.

2. A furnace for heating molds having a vertically extending mold chamber, and upper and lower heating chambers disposed in each side wall of the furnace and opening at their inner ends into the mold chamber, each of said heating chambers having its upper wall extending upward and inward in a series of stepped heat radiating surfaces, the bottom wall of each heating chamber being formed with an upwardly extending baffle and the uppermost heat radiating surface of the upper wall being disposed inward of the plane of said baffle, and nozzles entering each heating chamber and separately controllable, said nozzles discharging against the said baffle walls to thereby cause the heat from said nozzles to be deflected upward against the heat radiating surface.

In testimony whereof I hereunto affix my signature.

JACOB M. ROTH.

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