J. M. ROTH.

MOLD HEATING FURNACE.

APPLICATION FILED MAY 14, 1917.

1,296,122.

Patented Mar. 4, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

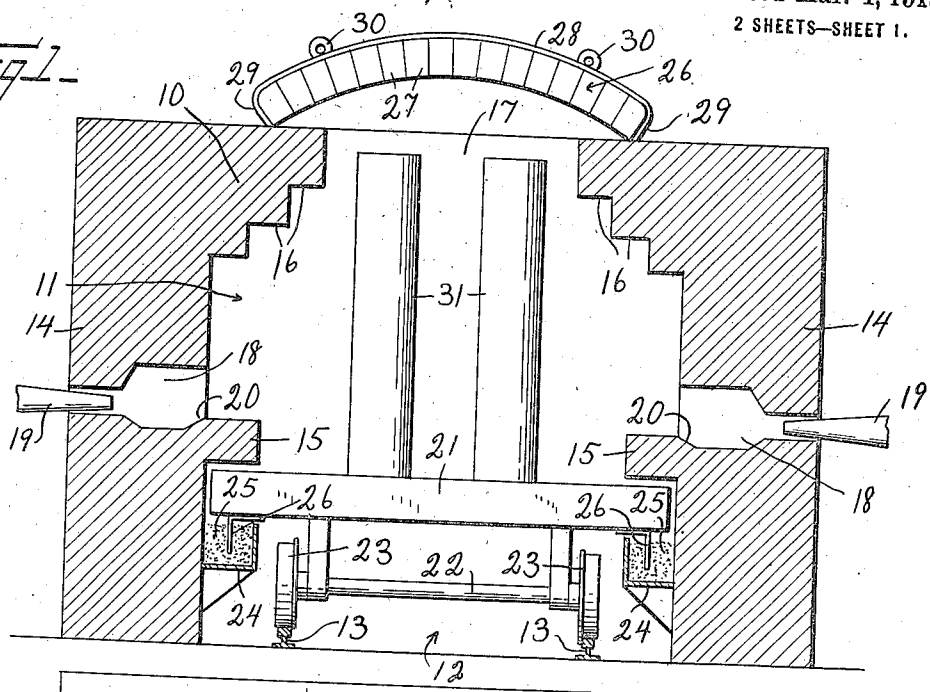
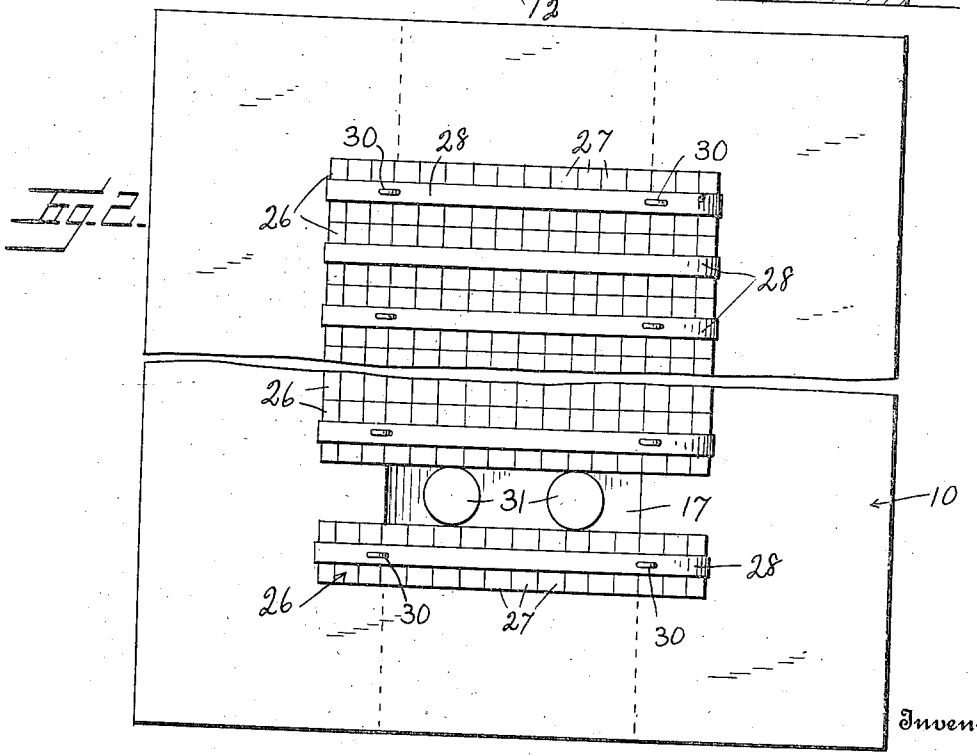


Fig. 2.



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Fig. 3

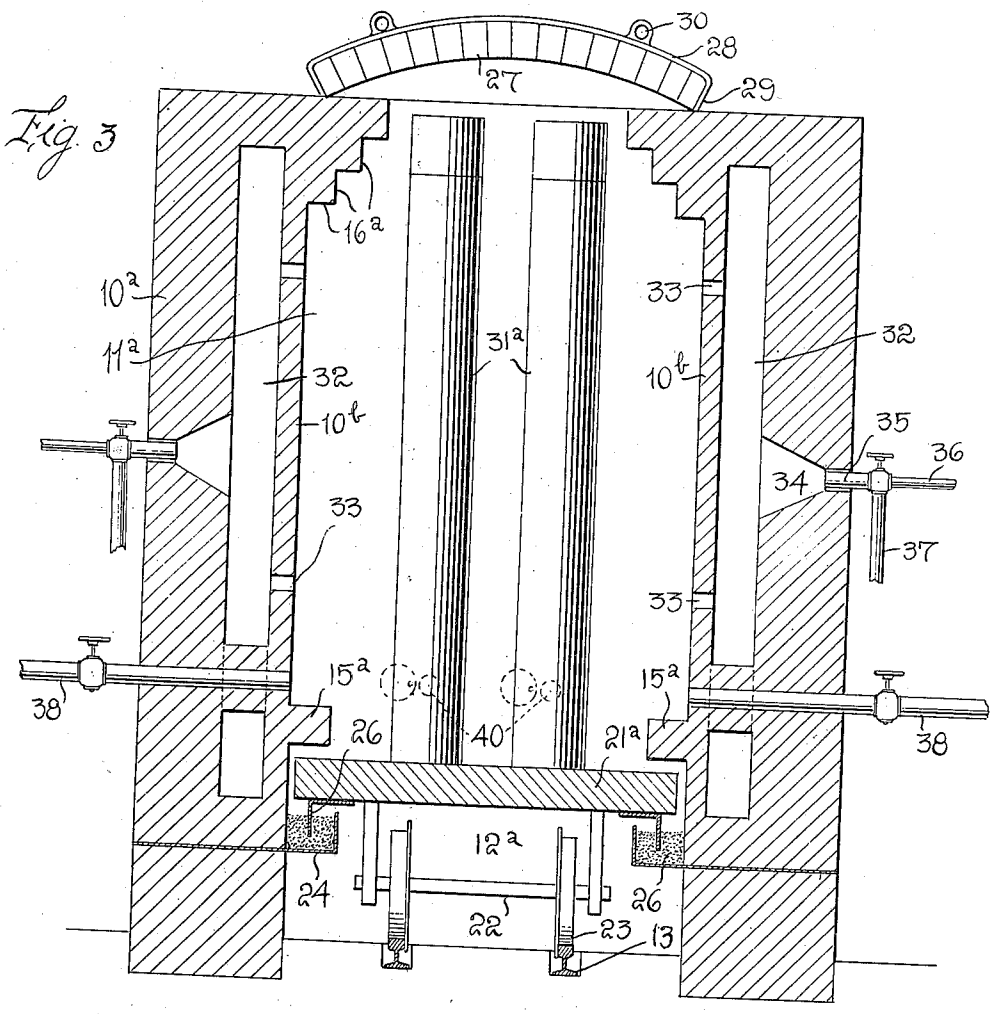
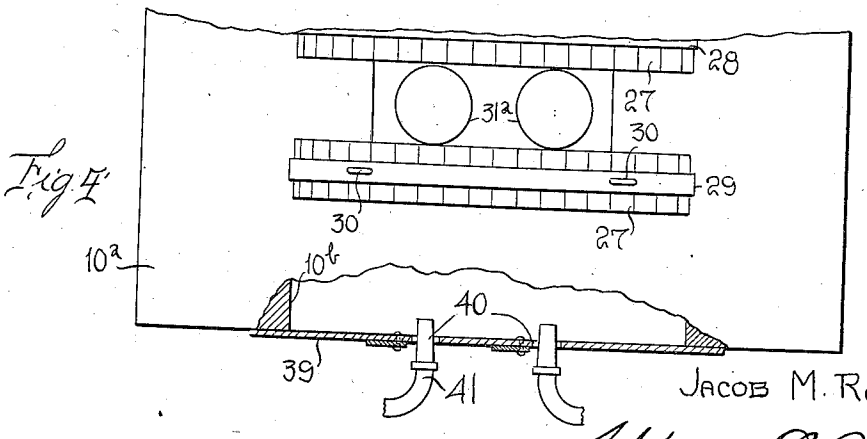


Fig. 4



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UNITED STATES PATENT OFFICE.

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MOLD-HEATING FURNACE.

1,296,122. Specification of Letters Patent. Patented Mar. 4, 1919.

Application filed May 14, 1917. Serial No. 168,465.

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 patent granted December 21, 1915, No. 1,165,025.

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

In the operation of heating the mold, in order to properly weld the core, and the outer coating or lining of copper to each other, it is necessary that the heat should be concentrated at the upper portion of the mold, rather than at the lower portion, so that the metal in the lower portion of the mold may begin to harden or congeal before that in the upper portion may do so. Thus any air or other gases contained in the molten metal in the lower portion of the mold may rise upward through the lower molten metal thus omitting the formation of air holes or blow bubbles.

One object of the invention is to provide a furnace so constructed that the heat at the upper portion of the mold or the upper portion of the furnace will have a greater intensity than at the lower portion of the furnace, that is, that portion of the furnace surrounding the base of the mold or molds.

A further object of the invention is to provide improved means for preventing the heat from escaping around the buggy or carriage upon which the molds, billets or other articles being treated are disposed.

A further object in this connection is to provide baffle walls extending over the lateral edges of the buggy, to construct this buggy of brick or other refractory material, and to provide sealing troughs mounted upon the walls of the furnace into which sealing flanges on the buggy extend.

A further object of the invention is to provide improved means for closing the longitudinally extending opening at the top of the furnace and in this connection to provide a closure for this opening comprising a series of abutting sections, there being a section for each mold or pair of molds or for each article or pair of articles disposed on the buggy, so that access may be had to the furnace for the removal of the mold or molds, or the placing in position of said molds, without any undue waste or loss of heat.

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

My invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a transverse section of a furnace constructed in accordance with my invention.

Fig. 2 is a top plan view of the furnace illustrated in Fig. 1.

Fig. 3 is a vertical sectional view of a preferable form of furnace; and

Fig. 4 is a fragmentary top plan view partly in section to show one end wall of the furnace and the corresponding door.

It will be seen that the furnace 10 is, generally speaking, of a common type, that is the furnace is longitudinally elongated, so as to provide a longitudinally extending mold chamber 11, open at its opposite ends or only temporarily closed at these ends or at one end. This mold chamber 11 opens at the top of the furnace, and at its bottom the mold chamber 11 opens into the longitudinally extending chamber 12, within which the buggy operates, as will be later described, the floor of this chamber being provided with rails 13 upon which the wheels of the buggy run. The side walls 14 of the furnace are formed just above the buggy chamber 12 with inwardly extending baffle walls 15, these baffle walls, of course, extending longitudinally the entire length of the furnace. These baffle walls are formed of refractory material and may be of the same material as the furnace. The inside faces of the furnace walls 14 extend vertically upward from the baffle walls 15 and at a suitable height, the side walls are inwardly and upwardly extended in a series of stepped

faces 16, the upper ends of these inwardly extending portions of the side walls defining the longitudinally extending top opening 17 of the furnace. This top opening of the furnace will be, in actual practice, about 36″ wide and, of course, approximately the full length of the furnace.

Disposed immediately above the inwardly extending baffle walls 15 are the laterally extending burner passages 18, into which project the nozzles of the usual blast burners 19. These may be of any usual or suitable construction. Preferably, though not necessarily, the bottom of each chamber or passage 18 is formed with an upwardly and inwardly extending deflecting face 20.

The base 21 of the buggy or carriage has a width nearly equal to the width of the furnace between the inner faces of the walls 14, so as to extend beneath the baffle walls 15 and considerably beyond the inner edges of these walls. This base 21 is mounted upon axles 22 having wheels 23 running upon the rails 13.

For the purpose of sealing the space between the base 21 and the walls of the buggy chamber 12, I provide metallic troughs 24 mounted upon the lateral walls of the chamber 12, these troughs extending outward beneath the lateral margins of the base 21 and being filled with sand 25. Mounted upon the base 21 on the under side thereof inward of the lateral edges thereof are the downwardly extending sealing flanges 26, which may be of metal and which dip into the sand 25 or other sealing medium disposed within the troughs 24. The troughs 24 extend upward as near as possible to the under face of the base 21 so that only a minimum amount of the metal of the flanges 26 will be left unprotected by the sand 25.

In the ordinary construction of sealing means for buggies used in furnaces of this character, the buggy carries laterally extending troughs filled with sand and the furnace walls are provided with downwardly extending flanges extending into the sand in the troughs. This construction, however, is open to objection for the reason that the flames of the blast may be deflected downward and these flames or other heated products come in direct contact with the sealing flange, thus burning out this flange. Furthermore the metal of the parts is usually carried across the lower face of the buggy and this metal becomes very highly heated and thus renders the bottom of the buggy very hot and making it difficult to handle the buggy. With my construction, however, the baffle walls 15 act to prevent the downward discharge of flame against the base of the buggy or between the base of the buggy and the walls of the chamber 12 and even if the flame does pass down between the baffle walls 15 and the base 21, this flame will be directed downward against the sand 25 and only a very small portion of the flame at the most can possibly strike the flange 26 and none of the flame will strike the middle of the trough 24. Inasmuch as these flanges 26 are spaced from each other and are mounted upon the base 21, which is of refractory and non-conductive material, it is obvious that the buggy or carriage will not become too hot to handle, nor will there be burnt out sealing flanges and burnt out troughs, as is the case where the old construction is used.

The opening 17 of the furnace is closed by a plurality of transversely extending closure sections 26, each comprising a plurality of refractory bricks or blocks 27 arranged in the form of a slightly curved arch, with a tie 28 of metal, the extremities of each tie being bent over the end clips of the arch as at 29. Preferably these bricks will be about 9″ wide and the metallic tie 28 will be about one-third of the width of the bricks and will be provided with rings 30 or other means whereby the closure sections may be lifted from the furnace or lowered thereonto. The advantages of this construction reside in the fact that any one of the sectional closures may be lifted up without disturbing the other closure sections and thus access may be had to the molds or other objects immediately beneath the removed closure section, with only a minimum loss of heat. It will be seen that the metal tie member 28 does not come in direct contact with the heat and, therefore, remains relatively cool so that the closure section may be readily handled.

The advantages of this invention as illustrated in Fig. 1 will be obvious from what has gone before. The flames from the blast burners enter the mold chamber and are deflected upward and inward so that the greatest heat is at the top of the mold. The stepped surfaces 16 also act to radiate the heat and as these stepped surfaces come nearer to the mold as they extend upward, it is obvious that the uppermost portion of the mold will be the hottest and the heat will gradually decrease in intensity toward the lower portion of the mold or molds. Furthermore it will be seen that the baffle walls 15 prevent the flames from being sucked downward against the sealing troughs and flanges and that if any flames are so deflected downward, they will have to pass through a relatively circuitous course in order to attack the flanges 26 and only a very small portion of these flanges is exposed to the action of the flames, thus saving expense and, furthermore, conserving the heat, as none will escape through the seals.

While I have illustrated a construction which I believe to be particularly effective for the purpose intended, it is obvious that

many modifications might be made therein, without departing from the spirit of the invention. Furthermore, while I have referred to this furnace as being used for heating molds used in the process referred to in my prior patent, it is obvious that the furnace may be used for heating blooms and for various other purposes. The use of the sectional closure members is particularly valuable, however, in connection with the preliminary heating of the molds 31, as the molds may be first heated or preheated to the requisite temperature and then the sections 26 may be removed, one after the other, and the molds beneath each section filled with the molten copper and then the section replaced and the next section reopened.

In Fig. 3, I show another and preferable form of my invention, in which the same means are used for sealing the buggy, but in which the means for heating the furnace is differently arranged and in which the details of construction are somewhat different. Referring to these drawings, 10^a designates the lateral furnace walls having vertical inner faces and formed with the inwardly projecting flanges 15^a, corresponding to the flanges 15 in Fig. 1. The walls 10^a are formed with longitudinally extending vertically disposed combustion chambers 32, the inner wall of each combustion chamber being formed with openings 33 whereby combustion products may escape into the mold heating chamber. These combustion chambers extend down to a level somewhat below the level of the buggy 21^a, and at any desired intervals, the wall 10^a is formed with an inwardly extending somewhat conical recess 34, into the small end of which projects a nozzle 35 connected to a gas pipe 36 and to an air blast pipe 37. The flaring walls of the openings 34 act to distribute the flame within the combustion chamber. At any desired intervals, air blast pipes 38 extend through the walls 10^a, these air blast pipes opening into the mold chamber 11^a just above the baffle wall 15^a. These air blast pipes are provided with suitable valves and are connected to means for causing the blast of cold air at a relatively high pressure.

The upper ends of the side walls 10^a are formed with the inwardly extending stepped surfaces 16^a, corresponding to the stepped surfaces 16 in Fig. 1, but these stepped surfaces are located adjacent the upper ends of the molds 31^a. The wall which divides the combustion chamber from the mold heating chamber 17^a may be made either solid, with the openings 33 or as checker walls, or in any other suitable manner to provide openings leading from the combustion chambers into the interior of the furnace.

As before stated, the means for sealing the space between the base 21^a of the buggy and the walls of the buggy chamber 12^a is precisely the same as that previously described, and, therefore, the same reference numerals are used as in Fig. 1 for these parts of the construction. The opening at the top of the mold chamber is closed by a plurality of closure sections in the same manner as previously described and hence I have used the same reference numerals for the closing means illustrated.

In the practical use of this form of my invention, ignited gas is discharged through the nozzles 35 into the combustion chambers 32 and heats the inner walls 10^b of these combustion chambers to a high heat, thus indirectly heating the molds, but without the flames actually coming in contact or being projected against the molds. The stepped surfaces 16^a extending as they do closer and closer to the tops of the molds and, furthermore, confining the heat in the upper portion of the furnace closely adjacent to the molds, causes the upper portion of the molds to be more highly heated than the lower portion, when the blast of mixed gas and air entering through the nozzle 35 is cut off. As soon as the predetermined temperature has been reached, the gas is cut off and the air blast pipes 38 are opened, and cold air enters the lower portion of the mold chamber, thus cooling the lower portion of the molds. The stepped surfaces 16^a, being successively nearer to the upper portion of the mold, cause the upper portion of the mold to be more highly heated than the lower portion of the mold. This is because these surfaces 16^a are nearer to the mold than the inner surface of the wall 10^b. Thus congelation advances progressively upward thus preventing air bubbles from being formed within the metal containing molds, for the reason that as congelation proceeds, these air bubbles will rise through the molten metal to the upper portion of the mold and will break and discharge.

The ends of the furnace are normally closed while the furnace is in operation by means of the ordinary sliding doors 39, which are formed with normally closed openings 40 through which portable air blast nozzles 41 may be inserted so that a cold air blast may be forced into the interior of the mold space from the ends of the furnace, as well as through the side walls thereof. It will, of course, be understood that these doors are opened to permit the buggies to be slid in or out.

The combustion chambers 32 extend practically the full height of the furnace and extend practically the whole length of the furnace. It will be understood that the purpose of these combustion chambers is to diffuse the heat so that the interior of the

furnace will be submitted to a practically equalized heat throughout its entire extent, and further the inner walls of the combustion chambers prevent the blast of flame from the burners from striking or being in any way directed toward the molds or other objects being heated. At the present time the cost of these molds is very great and unless the blast pipes are directed into a combustion chamber, they will discharge more or less directly against certain portions of the molds and the molds will not last as long as they should.

By, however, directing the blast into the combustion chambers, the inner walls of these chambers provide baffles which completely prevent the heat from being directed against or toward the molds and, as before stated, provide for an equitable diffusion of the heat throughout the mold chamber.

Having thus described my invention, what I claim is:—

1. A furnace of the character described having oppositely disposed side walls and having inwardly extending burner passages, each of said walls below the burner passages being formed with a baffle wall extending inward from the inner face of the corresponding side walls and defining below the baffle walls a buggy chamber, a buggy shiftable longitudinally through the buggy chamber and having a body formed of refractory material, the body having a width greater than the distance between the adjacent ends of the baffle walls and extending transverse between the inner ends of the baffle walls and in contiguity therewith, troughs mounted upon the side walls of the buggy chamber and extending inward therefrom below and parallel to the baffle walls and filled with granular refractory material, and downwardly extending metallic sealing flanges attached to the under face of the buggy body and inward of the lateral edges of the buggy body and extending downward into said troughs.

2. A furnace for heating objects having a heating chamber for containing a body to be heated and having oppositely disposed heat radiating walls extending gradually upward and inward toward the top of the chamber whereby to increase the intensity of the heat in the upper portion of the chamber and bring the radiating surface of the wall nearer to the surface of the object, cold blast nozzle passages extending through said furnace walls below said upwardly and inwardly extending portions of the walls, and means for heating the side walls of the furnace.

3. A furnace for heating objects having a heating chamber for containing a body to be heated, the chamber having oppositely disposed heat radiating walls extending vertically upward and then upward and inward toward the top of the chamber, whereby to increase the intensity of the heat in the upper portion of the chamber and bring the radiating surfaces of the walls nearer to the surface of the object being heated, said side walls being formed with combustion chambers, and means for directing a heating blast into said combustion chambers directly and against the heat radiating walls.

4. A furnace for heating objects having a heating chamber for containing the body to be heated, the chamber having oppositely disposed heat radiating walls extending vertically upward and then upward and inward toward the top of the chamber, whereby to increase the intensity of the heat in the upper portion of the chamber and bring the radiating surfaces of the walls nearer to the surface of the object being heated, said side walls being formed with combustion chambers, means for directing a heating blast into said combustion chambers at right angles to the plane of the inner walls and against said inner walls, the inner walls of the combustion chambers being provided with openings leading into the interior of the furnace and disposed in staggered relation to the blast.

5. A furnace for heating objects having a heating chamber for containing a body to be heated, the chamber having oppositely disposed heat radiating walls, each of said walls being formed with a combustion chamber, means for discharging a heating blast into the combustion chambers, and means for discharging cold air into the lower portion of the heating chamber.

6. A furnace for heating objects having a heating chamber for containing a body to be heated, the chamber being defined by oppositely disposed heat radiating walls extending vertically upward and then extending upward and inward in a series of stepped heat radiating surfaces, whereby to increase the intensity of the heat in the upper portion of the chamber and bring the radiating surfaces of the walls nearer to the surface of the object, means for discharging the heating blast into the interior of the combustion chambers, and blast pipes connected to a source of cold air under pressure and discharging into the heating chamber adjacent the lower end thereof.

7. A furnace for heating objects having a heating chamber for containing a body to be heated and having oppositely disposed heat radiating walls, side walls extending vertically for a predetermined height and then extending inward and upward in a series of stepped heat radiating surfaces, whereby to increase the intensity of the heat in the upper portion of the heat radiating chamber and bring the radiating surfaces of the wall nearer to the object, each of said walls being formed with a combustion chamber extend-

ing the full height of the heating chamber and the length of said heating chamber, the outer walls of the combustion chambers being formed with inwardly flaring recesses, blast pipes entering the outer ends of said recesses and connected to a source of gas and a source of air, and cold air blast pipes passing through the furnace walls and discharging adjacent the lower end of the heating chamber.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JACOB M. ROTH.

Witnesses:

FREDERIC B. WRIGHT,

M. R. WILSON.