Feb. 17, 1948. W. F. SKLENAR 2,436,124

REVERBERATORY FURNACE

Filed Aug. 29, 1946 4 Sheets-Sheet 1

Fig. 1

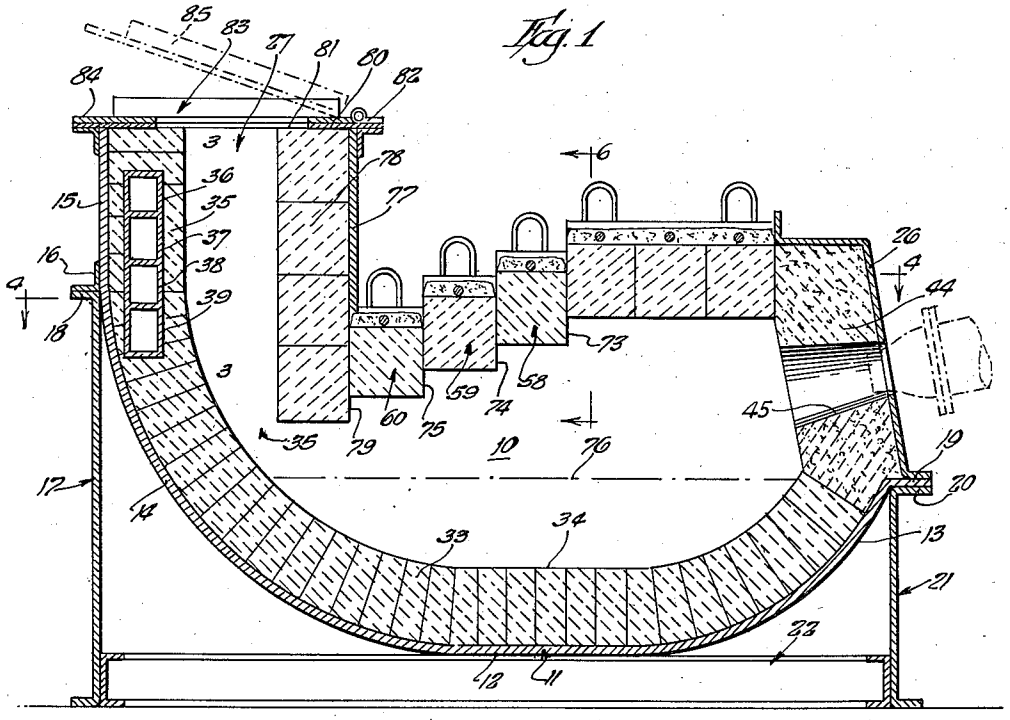
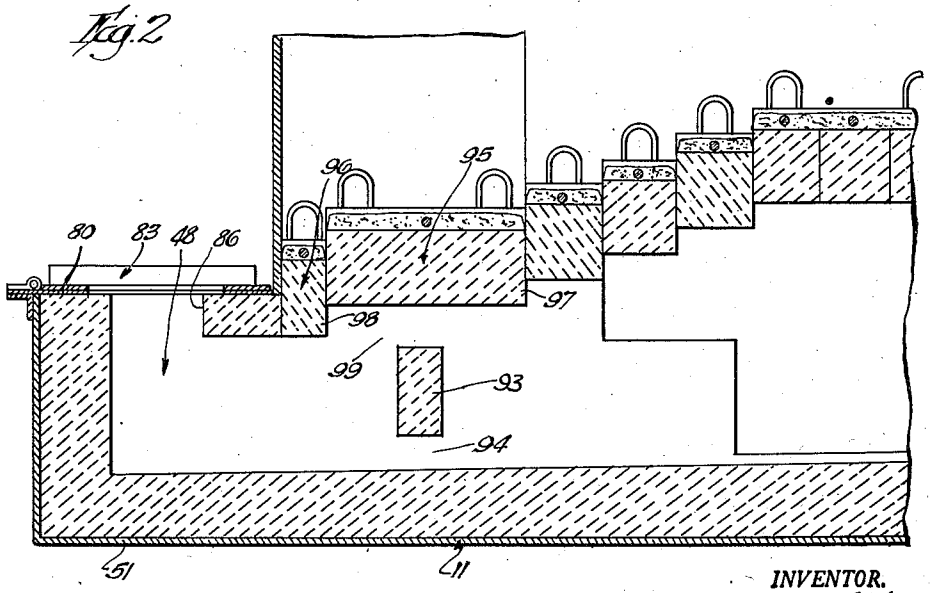


Fig. 2



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Filed Aug. 29, 1946 4 Sheets-Sheet 2

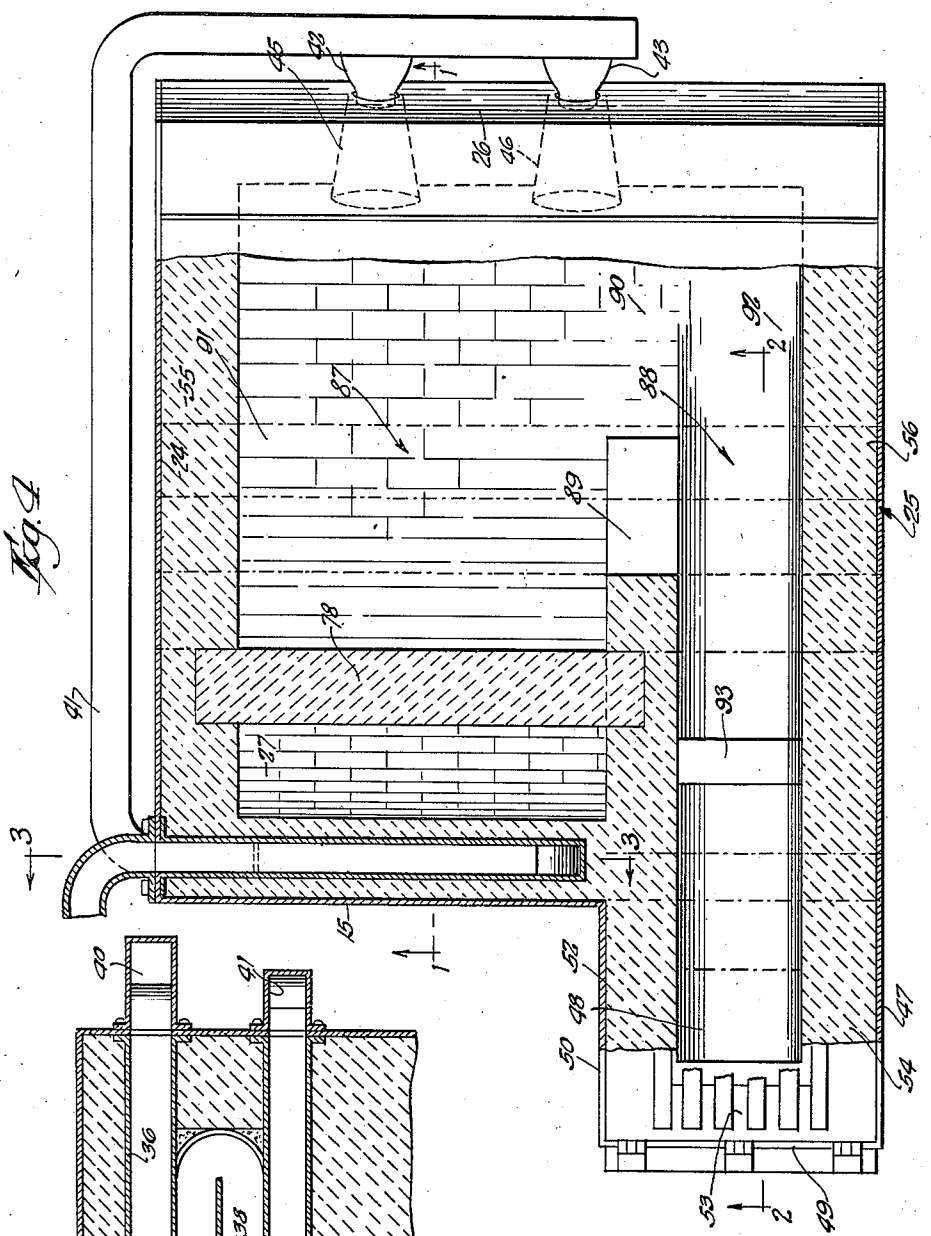


Fig. 4

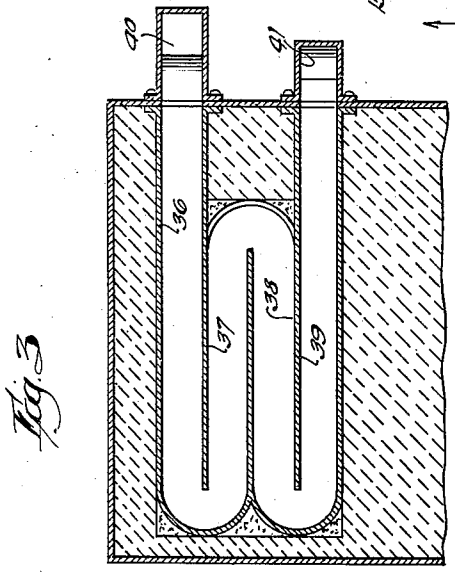


Fig. 3

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REVERBERATORY FURNACE

Filed Aug. 29, 1946 4 Sheets-Sheet 3

Fig. 5

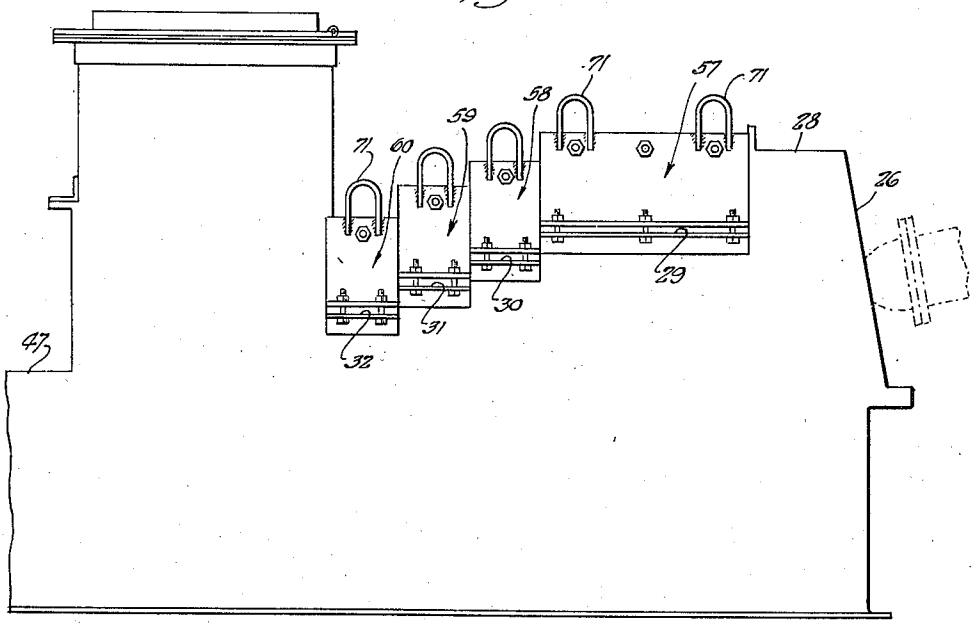
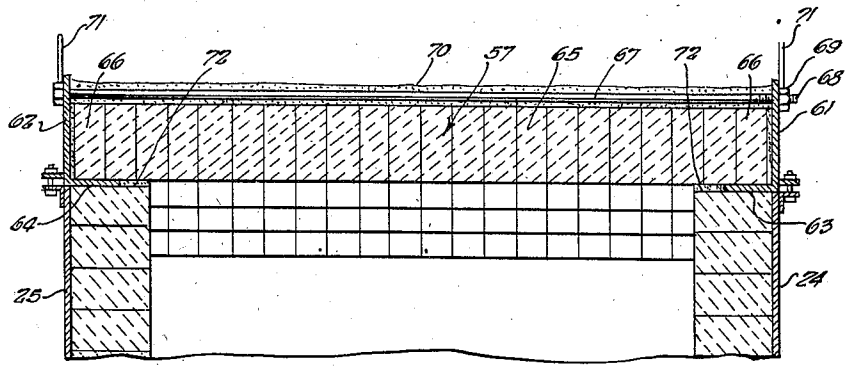


Fig. 6



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REVERBERATORY FURNACE

Filed Aug. 29, 1946 4 Sheets-Sheet 4

Fig. 7

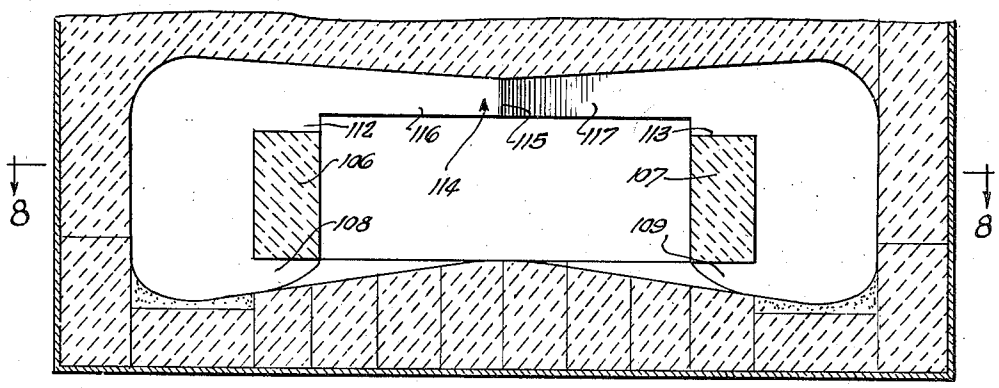
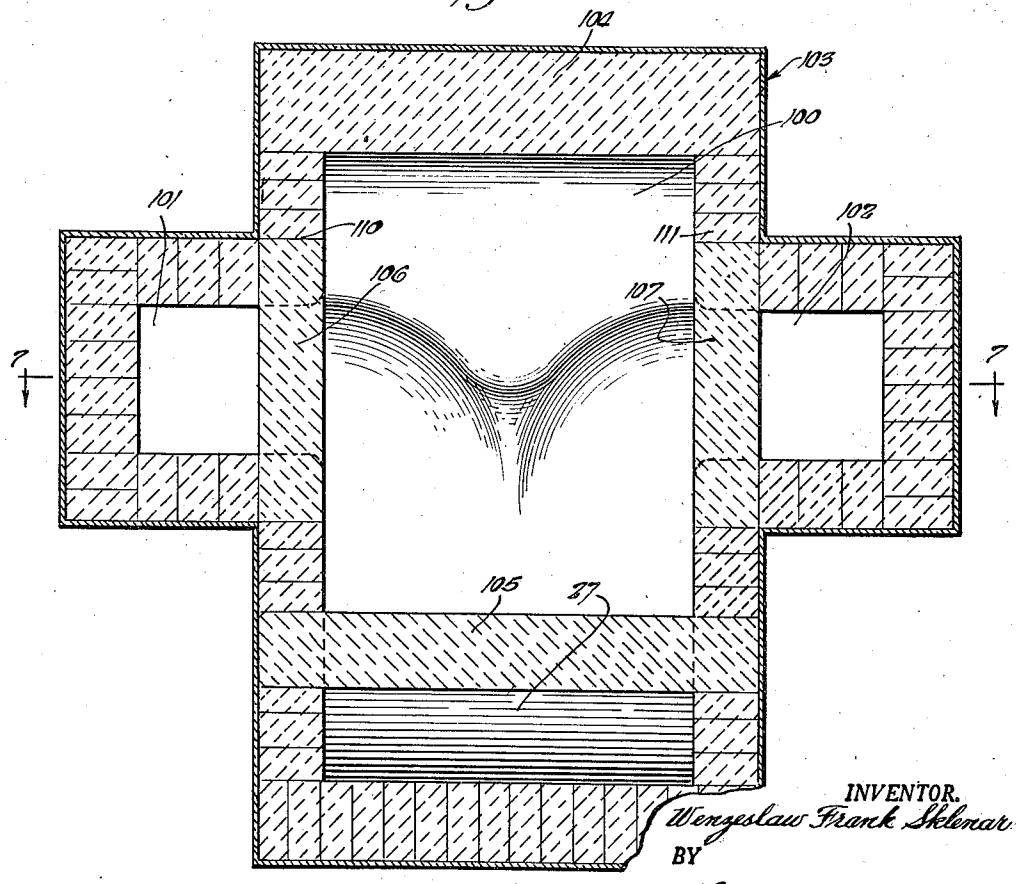


Fig. 8



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UNITED STATES PATENT OFFICE

2,436,124

REVERBERATORY FURNACE

Wenzeslaw Frank Sklenar, Chicago, Ill., assignor of one-fourth to John H. Ehardt, Chicago, Ill.

Application August 29, 1946, Serial No. 693,688

12 Claims. (Cl. 75—43)

1

The present invention relates to reverberatory furnaces, and is particularly concerned with the provision of an improved reverberatory furnace of the type disclosed in my prior application, Ser. No. 664,865, filed April 25, 1946, now Patent 2,409,810, which is particularly adapted to be used in melting low point metals, such as aluminum.

One of the objects of the invention is the provision of an improved reverberatory furnace for melting metals, which is adapted to produce a higher quality of molten metal, accomplish the melting in a much shorter time, with a considerable reduction in the use of fuel, a marked elimination of waste, and a saving in labor hours required.

Another object of the invention is the provision of an improved melting process and an improved process for the generation of maximum heat and its application to metal to be molten, by means of which metal may be melted more quickly, more cleanly, with less fuel and less labor than any of the devices of the prior art.

Another object of the invention is the provision of an improved furnace which is particularly adapted to be used in melting aluminum and light alloys for die casting, by means of which the separate furnace usually employed in connection with another furnace, called the holding or maintaining service furnace, may be eliminated and replaced by a single furnace, from which the metal may be ladled out, as required for die casting.

When two of the furnaces mentioned are employed according to the prior art methods, they are usually fired with oil fuel or by gas to maintain the casting temperature, and the metal which is melted in the separate furnace is carried in pots or ladles to the holding furnace.

By providing my improved furnace, performing both of these functions, half of the fuel previously required is saved, as well as the time which was formerly wasted in carrying the metal to and fro; and the unnecessary spilling, splashing, and disturbing of the molten metal, which causes undue oxidation, is eliminated.

Another disadvantage of the prior art furnaces used for this purpose lies in the fact that the pots were made of cast iron, and after used for some time, or prolonged and continuous heating, the molten aluminum is liable to be contaminated by the pots, which results in defective castings.

Another object of the invention is the provision of an improved reverberatory furnace structure which is provided with a plurality of removable and adjustable arch units adapted to be so located in the roof of the reverberatory furnace that their effect in reflecting and radiating heat toward the bath of metal is a maximum, and they are also adapted to deflect, at a multiplicity of different points, the hot combustion gases to the surface of the metal, thereby causing such a turbulence of the gases that a maximum engagement of the gases and the metal is accomplished, while still passing the gases through the furnace in large volume and at high velocity, and concentrating the hottest gases at the melting zone of the chamber to effect a quick melting.

2

Another object of the invention is the provision of an improved reverberatory furnace structure which has its bed and side walls so constructed that they may be used for many more heats than the furnaces of the prior art, and having its roof composed of a multiplicity of removable and adjustable arch units, which may be lifted from their supports on the side walls so that the arch units may be repaired between melts and so that the rest of the furnace lining is also available for repair whenever necessary, which is required only at relatively long intervals.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the drawings, of which there are four sheets,

Fig. 1 is a vertical longitudinal section taken through a central portion of a furnace embodying my invention, on the plane of the line 1—1 of Fig. 4;

Fig. 2 is a similar fragmentary longitudinal section, taken on the plane of the line 2—2 of Fig. 4;

Fig. 3 is a fragmentary sectional view, taken on the plane of the line 3—3 of Fig. 1, looking in the direction of the arrows;

Fig. 4 is a horizontal sectional view, taken on the plane of the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary side elevational view of the furnace;

Fig. 6 is a fragmentary sectional view, taken on the plane of the line 6—6 of Fig. 1, looking in the direction of the arrows;

Fig. 7 is a fragmentary sectional view, taken on the plane of the line 7—7 of Fig. 8;

Fig. 8 is a horizontal sectional view of a modification which is provided with two wells, from which the molten metal may be dipped.

The present furnace may be embodied either

in a stationary furnace or a tilting furnace, but the stationary type is selected for illustration in Fig. 1. In such case the furnace, which is indicated in its entirety by the numeral 10, is provided with a bottom shell 11 of metal, which is curved longitudinally of the furnace, as indicated, and curved laterally to form a bottom wall 12, a curved part of the front wall 13, an upwardly curved rear wall 14, and the chimney wall 15.

When embodied in a stationary furnace, the rear wall 15 may be provided with an angle iron 16 welded to it and mounted upon a supporting frame member 17, having a horizontal flange 18 under the angle iron 16, to which it may be welded. At the front of the furnace, that is, the right in Fig. 1, the bottom shell 11 may have a horizontal flange 19, which rests upon the horizontal flange 20 of a front frame member 21.

The front and rear frame members 17 and 21 may be joined at the bottom by suitable longitudinally extending channelled members 17 and 21 at each corner to form a rigid frame and base.

When embodied in a tilting furnace of the type shown in my prior application, the bottom shell 11 is also curved laterally and provided with tracks and rollers and a suitable hydraulic tilting mechanism, as described in that application; but when constructed in the stationary type, as illustrated in Figs. 1 to 8, the bottom shell 11 may be straight in a lateral direction, as shown at the bottom of Fig. 7; and its lining may be so contoured as to cause the molten metal to drain into the wells, from which it is to be dipped.

The side walls of the shell are shown in Fig. 4, and they may comprise metal plates 24, 25. The side wall 24 covers the right side of the furnace, and is joined at the back to the rear plate 15 and at the front to a front plate 26. The shape of the side plate 24 is shown in Fig. 5. Its bottom outline is straight, and its rear outline is straight, forming part of the shell for the chimney and charging opening 27, which projects upwardly above the body of the furnace.

At the roof of the furnace the two side plates 24, 25 may reach its maximum height at the top edge 28, near the front wall 26, and may thereafter be stepped downward, terminating at the lines 29, 30, 31, and 32, which indicate the top wall of each side of the furnace at these points, formed in successively lower steps.

The bottom shell 11 may be lined with suitably shaped firebrick 33 (Fig. 1), which are suitably curved to form a curved recess 34 on the bottom, inside of the furnace, toward which the molten metal runs from the throat 35 of the chimney 27 as it is melted, and the firebrick 33 may extend upwardly along the back of the chimney on the shell parts 14, 15 and forwardly on the shell part 13.

At the rear insulating wall 35 of the chimney 37 the firebricks are suitably shaped to house a plurality of firebrick tiles 36—39, or metal pipes, and closed and protected by the firebrick and forming an air preheating passage, the shape of which is shown in Fig. 3.

Here 40 indicates the outlet of a centrifugal blower, which blows air into the conduit 36, the end of which is joined at the left to the conduit 37, which carries the air toward the right. There conduit 37 is joined with conduit 38, extending toward the left, where it is joined with conduit 39, carrying the air toward the right to a suitable pipe 41, which leads forwardly of the furnace and communicates with the burners 42, 43 to supply them through suitable valves with preheated air. The front wall of the furnace is insulated with a suitable block or a plurality of blocks of firebrick insulation 44, which are formed with the outwardly tapered burner openings 45, 46, into which the burners 42, 43 project.

In the smaller embodiments of the furnace a single burner may suffice for both the melting and the maintenance of the metal in the molten condition, in which case it would be located like the burner 43, but in the larger furnaces any number of burners may be employed, such as two, three, four, or more.

The left metal side wall 25 at the bottom of Fig. 4 is elongated beyond that of the other side 24 sufficiently to form at the rear bottom a rectangular extension 47 (Fig. 5), which forms the side wall of a metal well 48, into which the ladles may be dipped, and in which a suitable supply of molten metal can be kept at all times.

In addition to the shell portion 47, the well 48 has a rear wall shell 49 and a right side wall shell 50; and the bottom shell 11 has a rectangular extension 51 (Fig. 2) extending under the well 48. The well 48 is lined, adjacent the shell portion 50, with an insulating wall 52, and at its rear wall with an insulating wall 53, and on its side, adjacent the shell portion 47, with an insulating wall 54.

Both of the side walls 24, 25 of the shell are lined with insulating walls 55 and 56, respectively, which, like the side walls 24, 25, are stepped downwardly toward the rear, as indicated in Fig. 5, from 28 to 32. Thus both the side walls 24, 25 and side insulation 55, 56 step backwardly in such manner as to support a plurality of arch units, indicated at 57, 58, 59, and 60 (Fig. 3) and located successively below each other toward the rear of the furnace.

Such an arch unit is illustrated in Fig. 6, and each arch unit may consist of a pair of end plates 61, 62, each of which comprises an angle having a lower supporting flange 63, 64. The length of these angles 61, 62 depends upon the front-to-back width of the arch, and arches may be made of any desired width; for example, the arch 57 comprises a three-brick arch, while the arches 58—60 are each made of one layer of firebrick.

The arches in narrow furnaces may be curved as shown in my prior application, above-mentioned; but in relatively wide furnaces are preferably made straight, as shown in Fig. 6; and they include a plurality of firebricks 65, preferably of the type having tongue and groove formations of one brick engaging those of another brick.

The end bricks 66 engage the end flanges 61, 62 and rest upon the lower flanges 63, 64 of these angle plates. A plurality of steel tie rods 67 extend through the plates 61, 62 and clamp the end plates 61, 62 against the bricks 65, 66 by means of a threaded portion 68 and a nut 69. Thus the arches are adapted to be handled as a unit; and the space between the plates 61, 62 above the firebrick 65, 66 and surrounding the tie rods 67 may be filled with initially plastic insulation 70.

The flanges 63, 64 of each arch unit rest on top of the wall; in this case at the top wall surface 29, but in other cases at the top surfaces 30—32. The arch units are preferably provided with means for attachment to a hoist to facilitate their handling, which in the case of narrow arch units 58—60 may consist of a pair of U-shaped steel rods 71 (Fig. 6), these U-shaped rods having their

lower legs overlapping the end plates 61, 62 and welded to them.

In the case of the larger arch units 57, a pair of these lifting members 71 may be provided at each end. The supporting flanges 63, 64, which rest on the top of the side walls of the furnace, may be protected against heat at their inner edges by initially plastic insulation 72, and the height of these arches 57—60 may be adjusted for any individual furnace by inserting or removing bricks from the side wall so as to secure an adjustment that is suitable for melting the particular type of metal that is being used.

As the arch units step downward toward the back, each successive downwardly stepped arch unit 58, 59, 60 presents a forward shoulder 73, 74, 75, which engages the flame and deflects it downwardly toward the free surface 76 of the metal in the recess 34.

The front side of the chimney 27 is formed by means of a suitable metal wall 77 and lined by firebrick 78, and may have its lowermost brick also disposed below the arch 60 to form a forwardly facing shoulder 79 and to form a restriction at the throat 35 of the chimney 27.

The top of the chimney may be faced by a rectangular facing plate 80, having a rectangular opening 81 and supporting, by means of a plurality of hinges 82, a grating 83. The grating 83 is mounted upon a frame 84 and may consist of a plurality of spaced angles 85, having openings between them, which permit the discharge of combustion gases with some restriction, the restriction being practically equivalent to that which would be provided by a pile of metal fragments located in the chimney 27 and falling down to the throat 35.

A similar facing plate 80 and grating 83 is provided in the top opening 86 of the metal well 48, from which the metal is to be dipped by means of ladles. In the case of the chimney opening 27, the grating 83 may be opened, while the furnace is being charged, and kept open as long as the unmolten charge restricts the flow of gases from the chimney; but the grating 83 over chimney 27 should be closed when all of the metal has been molten, to prevent the combustion gases from passing out of the chimney too freely.

The grating 83 over the well 48 will be kept closed to restrict the flow of gases whenever metal is not being dipped from the well.

As seen in Fig. 4, the furnace comprises, besides the chimney 27 and well 48, a pair of chambers, such as the melting chamber 87 and the melt maintenance chamber 88, partially separated by a stepped wall 89 and joined at a forward opening 90.

The burner 42 and its opening 45 are so arranged as to be used exclusively for the melting in the melting chamber 87, while the burner 43 and its opening 46 are arranged so that the flame is spread between the melting chamber 87 and the melt maintenance chamber 88 by the wall 89.

The bottom of the furnace is covered with a firebrick lining which curves downwardly and backwardly from the throat 35 toward the recess 34 and curves downwardly from the front of the furnace toward the recess 44. The bottom lining of chamber 87 is raised at the side 91, along the wall 55; and is so shaped as to drain toward the opening 90 between the two chambers, toward a lower portion 92 of the floor, at the right end of melt maintainance chamber 88.

From the point 92 the floor drains downwardly toward the left in Fig. 4 at a regular slope, terminating with its lowermost portion in the bottom of the well 48.

The forward part of the melt maintenance chamber is separated from the well 48 by an intermediate skimming wall 93, which is open above sufficiently to permit the flame to project over the wall 93 into the well 48 and open below sufficiently to let the molten metal flow through the opening 94 into the well 48.

As shown in Fig. 2, the narrow portion of the melt maintenance chamber 88, opposite chimney 27, is provided with a pair of additional arch units 95, 96, each of which presents a forwardly facing surface 97, 98. The latter shoulder 98 forms a throat at 99, with the top edge of the wall 93, and tends to deflect the flame downwardly toward the free surface of the molten metal in the well 48.

Due to the slope of the furnace floor from the point 91 through opening 90 to point 92, and thence downwardly to well 48, the level of the free surface of metal in the well 48 will be relatively high so that metal may be readily dipped out of the well 48, as required.

Referring now to Figs. 7 and 8, these are fragmentary views of a modification in which the main melting chamber 100 of the furnace is substantially rectangular in shape, but is provided with a pair of rectangular lateral extensions 101, 102, providing a pair of melting wells, one at each side.

The metal shell 103 of the furnace is of corresponding shape, and each well 101, 102 is provided with a similar grating 83; and in this case the furnace may be fired by means of one or more burners in the front wall 104, which are directed toward the charge at the rear wall 105.

The wells 101, 102 are again separated from the main chamber 100 by partial partitions 106, 107, having openings 108, 109 below for drainage of the molten metal. The partial partitions 106, 107 terminate below the edge of the side walls 110, 111, which form the upper part of the furnace, leaving an opening 112, 113 above each partial partition 106, 107.

One or more of the foremost arch units 114 in this embodiment may have its forwardly facing shoulder provided with a vertical ridge 115 and a pair of lateral and diagonal surfaces 116, 117, which not only deflect the gases downwardly toward the free surface of the metal, but also deflect the flame from one burner laterally into both of the wells 101, 102 through the openings 112, 113.

Thus a single burner is adapted to maintain the heat in the pair of wells, and may also be used for effecting the melting of the metal in the main chamber 100 of the furnace.

The operation of the furnace is as follows: A suitable charge of metal to be melted is placed in the hopper of the furnace, after the furnace has been preheated, the solid metal being deposited in small increments, such as shovelfuls. The size of the restriction at the lower end of the uptake is such that the metal to be molten piles up and presents a porous mass through which the hot gases of combustion pass, preheating the solid metal, the melting taking place at the forward end of this pile or mass of metal, and the molten metal running down into the concavity at the bottom of the furnace.

Any kind of fuel may be employed, such as powdered fuel, gas, or liquid fuel.

The burner nozzle is supplied with one of the fuels mentioned, such as gas, in a suitable

amount, as regulated by the valve, and with air in suitable amount, as regulated by the valve, the air having been preheated by being passed through the conduits located around the uptake of the furnace, after the furnace itself has first been subjected to a period of preheating by means of the burner, with the uptake grille closed.

The flame from the burner is directed downwardly and rearwardly in the reverberatory furnace toward a medial point toward the bottom and the restriction at the uptake, this being the hottest part of the furnace; but there is a considerable amount of spread of the flame, and some of the flame is immediately directed from the burner downwardly toward the molten metal in the furnace, while the upper part of the flame impinges upon the abrupt forward edge 73 of the first arch unit.

The hot gases which are deflected downwardly toward the metal surface 76 are again reflected upwardly into engagement with the abrupt shoulder 74 of the arch unit 59, where they are again deflected downwardly by the abrupt surface 75.

The free surface of the metal again reflects the flames upwardly, where they engage the abrupt surface 79, to be deflected downwardly again toward the charge, which is located in the throat 35 and below it. As the charge at this point is melted, it runs downwardly into the recess 34 of the furnace, and thence laterally from the chamber 87 into the chamber 88, and down toward the well 48.

The burner 43 divides its flame between the melting chamber 87 and the melt maintenance chamber 88, and sufficient of the flame and combustion gases pass down through the chamber 88 and out of the grating over the well 48 to maintain the molten metal in proper molten condition and at a suitable temperature.

Instead of requiring two separate furnaces, and instead of requiring the dipping and carrying of metal from the melting furnace to the holding or maintaining furnace, a supply of molten metal is provided at all times by the well 48 for casting operations.

The amount of fuel required is greatly reduced, the cost of the installation is reduced, and the unnecessary spilling, splashing, and disturbing of the molten metal, which causes undue oxidation, are substantially eliminated.

In the embodiment of Figs. 7 and 8 two wells are provided so that this melting furnace provides a ready supply of metal on each of its sides for serving two batteries of casting or die casting machines.

The present furnace is adapted to melt the metal required in a fraction of the time required for other furnaces, and it produces a molten metal which has far superior physical characteristics, equivalent to that produced by an electric furnace, which requires a much longer time for melting.

The present furnace may be constructed at a much lower cost than electric furnaces, and is adapted to replace two or three of the furnaces of the prior art, and to reduce the amount of labor required to one-half or one-third of that required for the prior art furnaces. The amount of fuel is also greatly reduced, to one-half or one-third of the fuel which is required by the crucible or barrel type furnaces of the prior art of the same size.

The advantages of the present melting and holding furnace may be summarized briefly as follows:

1. This furnace replaces a melting furnace and a holding furnace, and reduces the cost of the installation.
2. Greater flexibility with perfect control.
3. Fifty percent lower fuel consumption.
4. Seventy-five percent savings in labor cost.
5. Faster melting in a fraction of time required by other furnaces, resulting in greater output with less equipment.
6. Superior metal, both chemically and physically.
7. Elimination of costly crucibles and costly and difficult furnace repairs.
8. Lower metal losses.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The method of preparing metal for casting operations which comprises feeding the metal continuously over a predetermined period of time into a hopper, comprising the uptake outlet of a reverberatory furnace to provide a batch of metal of predetermined amount, the solid metal accumulating on the floor of the furnace at a restriction at the lower end of said uptake to be preheated by the passage of hot combustion gases out of the uptake, and projecting into said furnace from the opposite end an intense flame supplied with fluid fuel, and preheated air in predetermined mixture under predetermined pressure and velocity, the said flame being directed downwardly and rearwardly toward the accumulation of solid metal at said restriction and spreading to engage the roof of the furnace and the bed of metal in a concavity in the floor of the furnace and in a reservoir chamber disposed laterally of the flame to receive a portion of the flame, the upper combustion gases of the flame being projected against a plurality of abrupt shoulders and deflected downwardly a plurality of times toward the metal on the floor, causing the molten metal to drain by gravity from the point of melting to said reservoir, and restricting the flow of gases from an upper opening in said reservoir to provide sufficient passage of hot combustion gases through the reservoir for maintaining the molten metal in constant condition for casting operations.

2. The method of preparing metal for casting operations which comprises feeding the metal continuously over a predetermined period of time into a hopper, comprising the uptake outlet of a reverberatory furnace to provide a batch of metal of predetermined amount, the solid metal accumulating on the floor of the furnace at a restriction at the lower end of said uptake to be preheated by the passage of hot combustion gases out of the uptake, and projecting into said furnace from the opposite end and an intense flame supplied with fluid fuel, and preheated air in predetermined mixture under predetermined pressure and velocity, the said flame being directed downwardly and rearwardly toward the accumulation of solid metal at said restriction and spreading to engage the roof of the furnace and the bed of metal in a concavity in the floor of the furnace and in a reservoir chamber disposed laterally of the flame to receive a portion

of the flame, the upper combustion gases of the flame being projected against a plurality of abrupt shoulders and deflected downwardly a plurality of times toward the metal on the floor, causing the molten metal to drain by gravity from the point of melting to said reservoir, and restricting the flow of gases from an upper opening in said reservoir to provide sufficient passage of hot combustion gases through the reservoir for maintaining the molten metal in constant condition for casting operations, and interposing a barrier to the flow of metal at the free surface between the point of melt and said reservoir to cause the metal to flow under the barrier and to effect an automatic skimming and retention of floating impurities in the furnace apart from the reservoir.

3. A reverberatory furnace for melting relatively low melting point metals for die casting operations and the like, comprising a metal shell curved downwardly from the back and the front to form a central cavity for receiving molten metal, said shell being provided with end walls and side walls and being lined on its bottom, ends, and sides with rigid insulating material, said shell also including at one side an elongated melt maintenance chamber, and the floor of said cavity draining toward said melt maintenance chamber, which is provided at a predetermined point with a dipping well located at the lowest point of the furnace, said furnace being provided with an uptake at one end and burner means at the other end, and said burner means being located to project its flame toward the bottom of the uptake which serves as a hopper for metal to be melted, and also toward said dipping well through said melt maintenance chamber.

4. A reverberatory furnace for melting relatively low melting point metals for die casting operations and the like, comprising a metal shell curved downwardly from the back and the front to form a central cavity for receiving molten metal, said shell being provided with end walls and side walls and being lined on its bottom, ends, and sides with rigid insulating material, said shell also including at one side an elongated melt maintenance chamber, and the floor of said cavity draining toward said melt maintenance chamber, which is provided at a predetermined point with a dipping well located at the lowest point of the furnace, said furnace being provided with an uptake at one end and burner means at the other end, and said burner means being located to project its flame toward the bottom of the uptake which serves as a hopper for metal to be melted, and also toward said dipping well through said melt maintenance chamber, said uptake and dipping well being both provided with a suitable covering member and having ports for passage of combustion gases, the ports being small enough to restrict the flow of gases and to intensify the heat from the furnace.

5. A reverberatory furnace for melting relatively low melting point metals for die casting operations and the like, comprising a metal shell curved downwardly from the back and the front to form a central cavity for receiving molten metal, said shell being provided with end walls and side walls and being lined on its bottom, ends, and sides with rigid insulating material, said shell also including at one side an elongated melt maintenance chamber, and the floor of said cavity draining toward said melt maintenance chamber, which is provided at a predetermined point with a dipping well located at the lowest point of the

furnace, said furnace being provided with an uptake at one end and burner means at the other end, and said burner means being located to project its flame toward the bottom of the uptake which serves as a hopper for metal to be melted, and also toward said dipping well through said melt maintenance chamber, the said furnace having its roof provided with a plurality of separate, removable arch units adapted to be hoisted from the supporting walls to gain access to the interior of the furnace for repair or replacement of its parts.

6. A reverberatory furnace for melting relatively low melting point metals for die casting operations and the like, comprising a metal shell curved downwardly from the back and the front to form a central cavity for receiving molten metal, said shell being provided with end walls and side walls and being lined on its bottom, ends, and sides with rigid insulating material, said shell also including at one side an elongated melt maintenance chamber, and the floor of said cavity draining toward said melt maintenance chamber, which is provided at a predetermined point with a dipping well located at the lowest point of the furnace, said furnace being provided with an uptake at one end and burner means at the other end, and said burner means being located to project its flame toward the bottom of the uptake which serves as a hopper for metal to be melted, and also toward said dipping well through said melt maintenance chamber, the said melt maintenance chamber being provided with a transverse insulating barrier located with its upper edge above the free surface of the metal, but permitting the passage of flame above said upper surface, having an aperture below the free surface of the metal for the passage of molten metal along the floor into the well.

7. A reverberatory furnace for melting relatively low melting point metals for die casting operations and the like, comprising a metal shell curved downwardly from the back and the front to form a central cavity for receiving molten metal, said shell being provided with end walls and side walls and being lined on its bottom, ends, and sides with rigid insulating material, said shell also including at one side an elongated melt maintenance chamber, and the floor of said cavity draining toward said melt maintenance chamber, which is provided at a predetermined point with a dipping well located at the lowest point of the furnace, said furnace being provided with an uptake at one end and burner means at the other end, and said burner means being located to project its flame toward the bottom of the uptake which serves as a hopper for metal to be melted, and also toward said dipping well through said melt maintenance chamber, the said uptake having one of its walls provided with a labyrinth of communicating air passages and means for propelling air through the passages through the burner means to provide a highly preheated source of air for the burner means.

8. In a reverberatory furnace, the combination of a metal shell provided with a main melting chamber and with a pair of dipping well chambers, said main melting chamber and dipping well chambers having their bottoms and side walls lined with heat-resistive, rigid insulation, and said main chamber having its floor sloped downwardly from the front and downwardly from the back to a central cavity which drains laterally to each of said wells, a roof for said furnace resting on the side walls, and an uptake located at the

rear end of said furnace, said uptake having its lower end in communication with the main chamber through a restricted opening and serving as a hopper for the supply of metal to be melted at said restricted opening, and burner means in the forward end of said furnace and projecting a flame toward said charge, a part of said flame being deflected into each of said dipping well chambers.

9. In a reverberatory furnace, the combination of a metal shell provided with a main melting chamber and with a pair of dipping well chambers, said main melting chamber and dipping well chambers having their bottoms and side walls lined with heat-resistive, rigid insulation, and said main chamber having its floor sloped downwardly from the front and downwardly from the back to a central cavity which drains laterally to each of said wells, a roof for said furnace resting on the side walls, and an uptake located at the rear end of said furnace, said uptake having its lower end in communication with the main chamber through a restricted opening and serving as a hopper for the supply of metal to be melted at said restricted opening, and burner means in the forward end of said furnace and projecting a flame toward said charge, a part of said flame being deflected into each of said dipping well chambers, the said roof being provided with a plurality of separate arch units, certain of said arch units being stepped downwardly with respect to the arch unit immediately in front of it, exposing a plurality of forwardly directed faces of the arch units as shoulders to engage the flame and gases and deflect them toward the bed of metal a plurality of times.

10. In a reverberatory furnace, the combination of a metal shell provided with a main melting chamber and with a pair of dipping well chambers, said main melting chamber and dipping well chambers having their bottoms and side walls lined with heat-resistive, rigid insulation, and said main chamber having its floor sloped downwardly from the front and downwardly from the back to a central cavity which drains laterally to each of said wells, a roof for said furnace resting on the side walls, and an uptake located at the rear end of said furnace, said uptake having its lower end in communication with the main chamber through a restricted opening and serving as a hopper for the supply of metal to be melted at said restricted opening, and burner means in the forward end of said furnace and projecting a flame toward said charge, a part of said flame being deflected into each of said dipping well chambers, the roof of said furnace being provided with means for deflecting a portion of the flame and gases into the upper part of the dipping wells for maintenance of the melt and metal temperature therein.

11. In a reverberatory furnace, the combination of a metal shell provided with a main melting chamber and with a pair of dipping well chambers, said main melting chamber and dipping well chambers having their bottoms and side walls lined with heat-resistive, rigid insulation, and said main chamber having its floor sloped downwardly from the front and downwardly from the back to a central cavity which drains laterally to each of said wells, a roof for said furnace resting on the side walls, and an uptake located at the rear end of said furnace, said uptake having its lower end in communication with the main chamber through a restricted opening and serving as a hopper for the supply of metal to be melted at said restricted opening, and burner means in the forward end of said furnace and projecting a flame toward said charge, a part of said flame being deflected into each of said dipping well chambers, the said dipping wells being each provided with a grating for restricting the flow of gases from them when the grating is closed, to intensify the action of heat therein.

12. In a reverberatory furnace, the combination of a metal shell provided with a main melting chamber and with a pair of dipping well chambers, said main melting chamber and dipping well chambers having their bottoms and side walls lined with heat-resistive, rigid insulation, and said main chamber having its floor sloped downwardly from the front and downwardly from the back to a central cavity which drains laterally to each of said wells, a roof for said furnace resting on the side walls, and an uptake located at the rear end of said furnace, said uptake having its lower end in communication with the main chamber through a restricted opening and serving as a hopper for the supply of metal to be melted at said restricted opening, and burner means in the forward end of said furnace and projecting a flame toward said charge, a part of said flame being deflected into each of said dipping well chambers, the said wells being separated from the main chamber by a transverse baffle spaced from the floor to permit metal to flow into the wells, and spaced from the upper part of the well to permit flame to be deflected into the well above the molten metal therein.

WENZESLAW FRANK SKLENAR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,264,740	Brown	Dec. 2, 1941

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370,636	Great Britain	Apr. 14, 1932

Certificate of Correction

Patent No. 2,436,124. February 17, 1948.

WENZESLAW FRANK SKLENAR

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 1, lines 5 and 6, strike out the words and comma "now Patent 2,409,810,"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of April, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.