Nov. 25, 1941. A. H. JUNG 2,263,880

APPARATUS FOR MELTING METALS

Filed Dec. 10, 1940 4 Sheets-Sheet 1

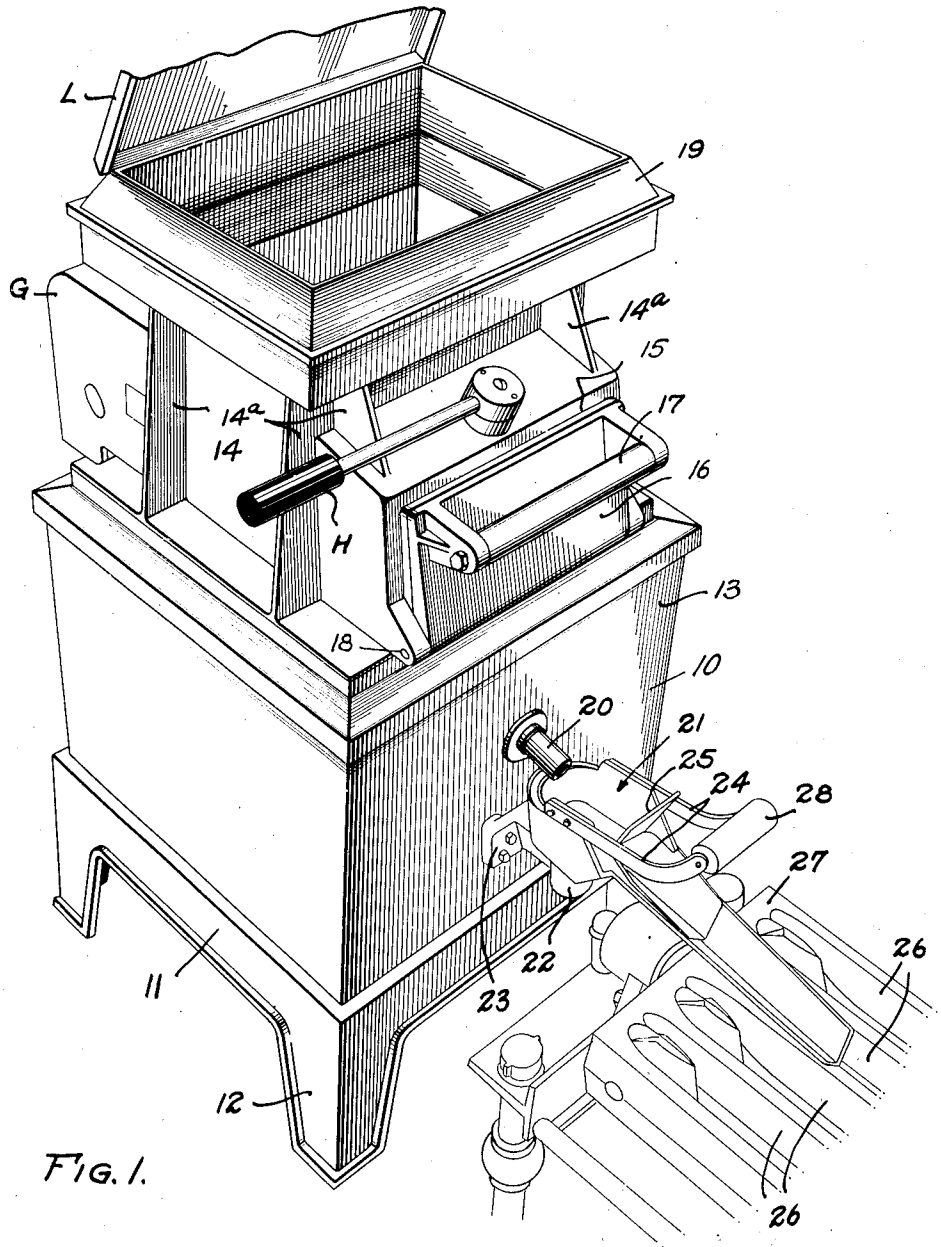


FIG. 1.

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Filed Dec. 10, 1940 4 Sheets-Sheet 2

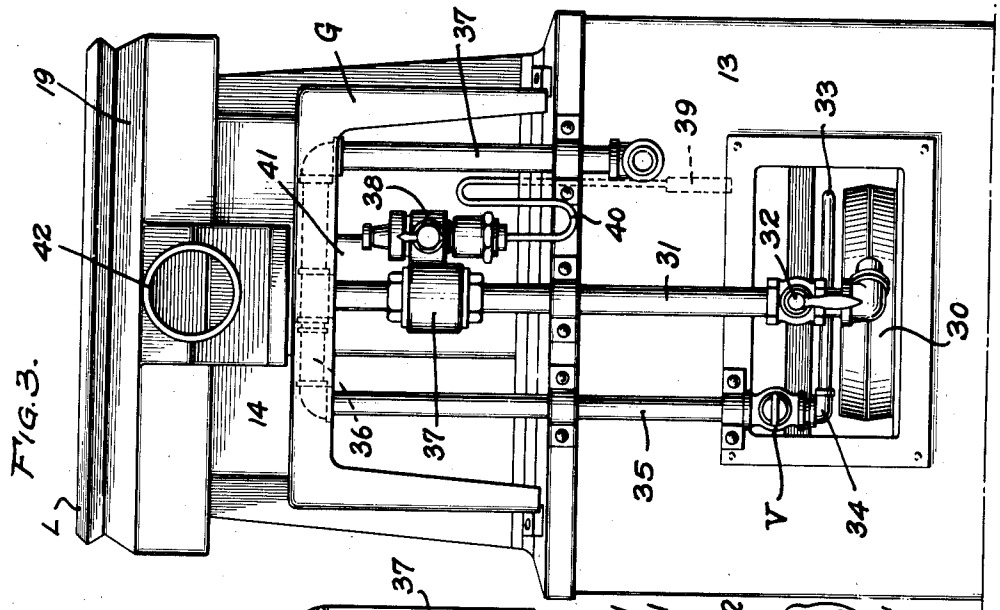


FIG. 3.

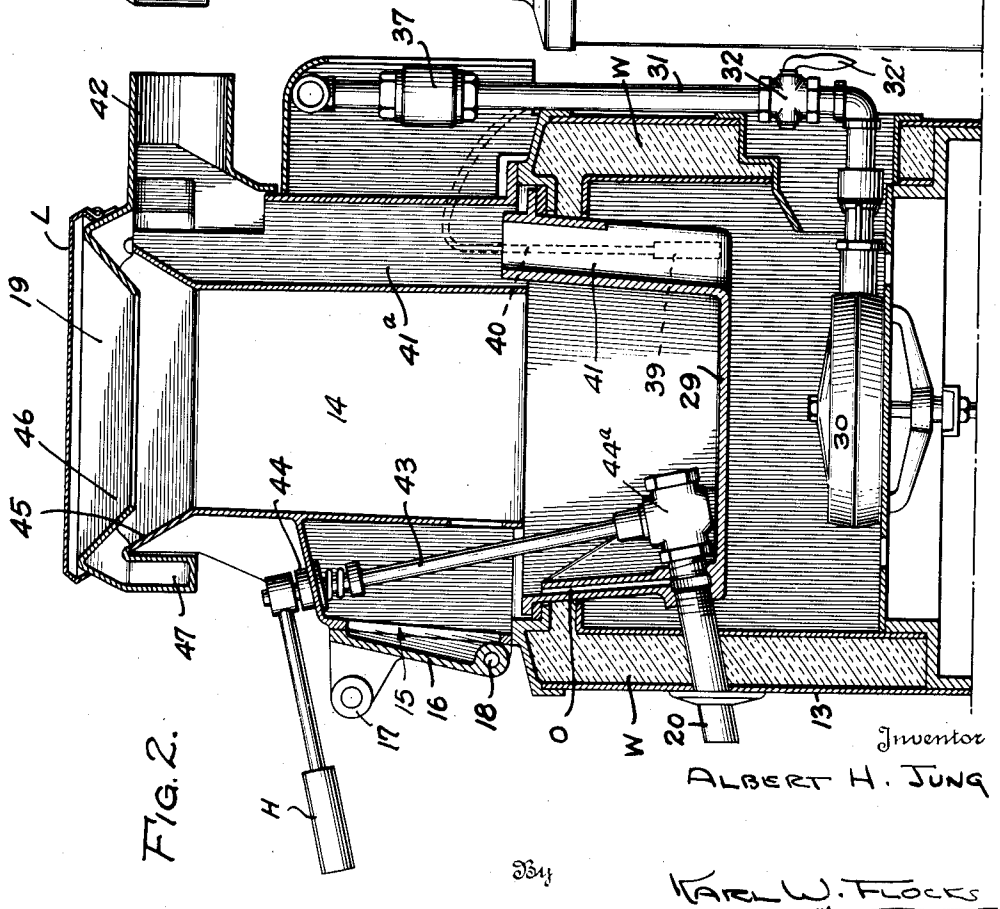


FIG. 2.

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Filed Dec. 10, 1940 4 Sheets-Sheet 3

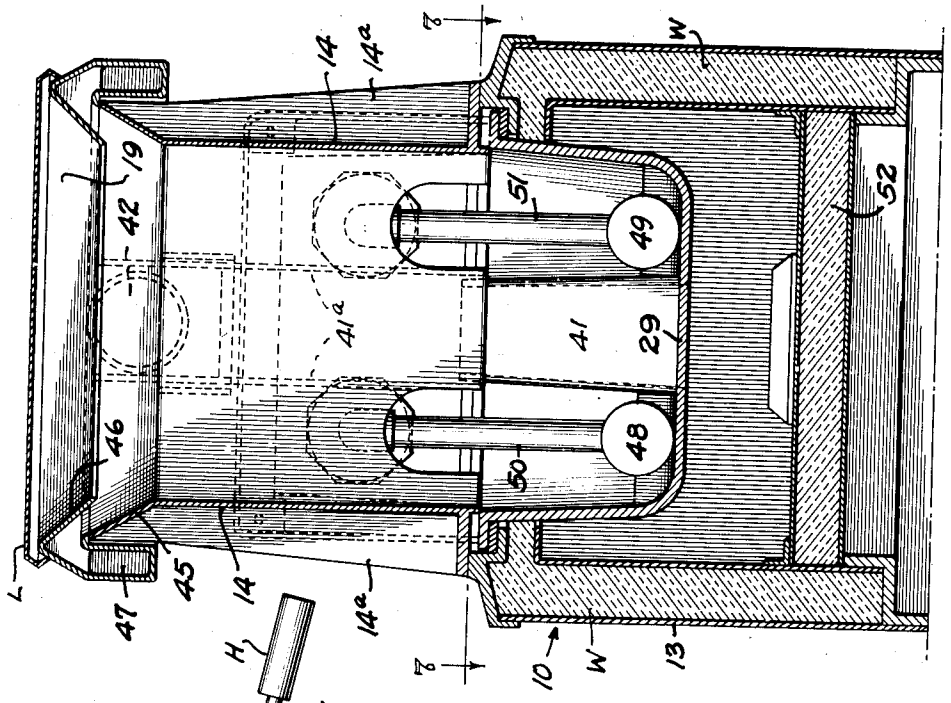


FIG. 5.

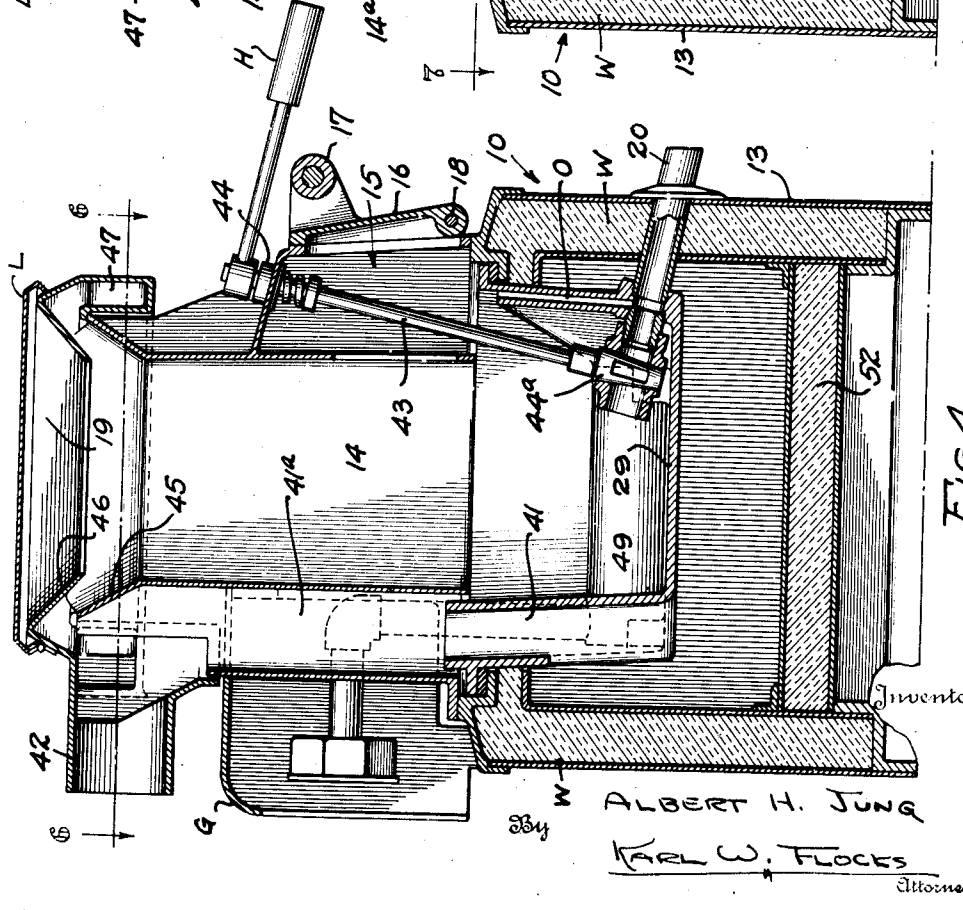


FIG. 4.

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APPARATUS FOR MELTING METALS

Filed Dec. 10, 1940 4 Sheets-Sheet 4

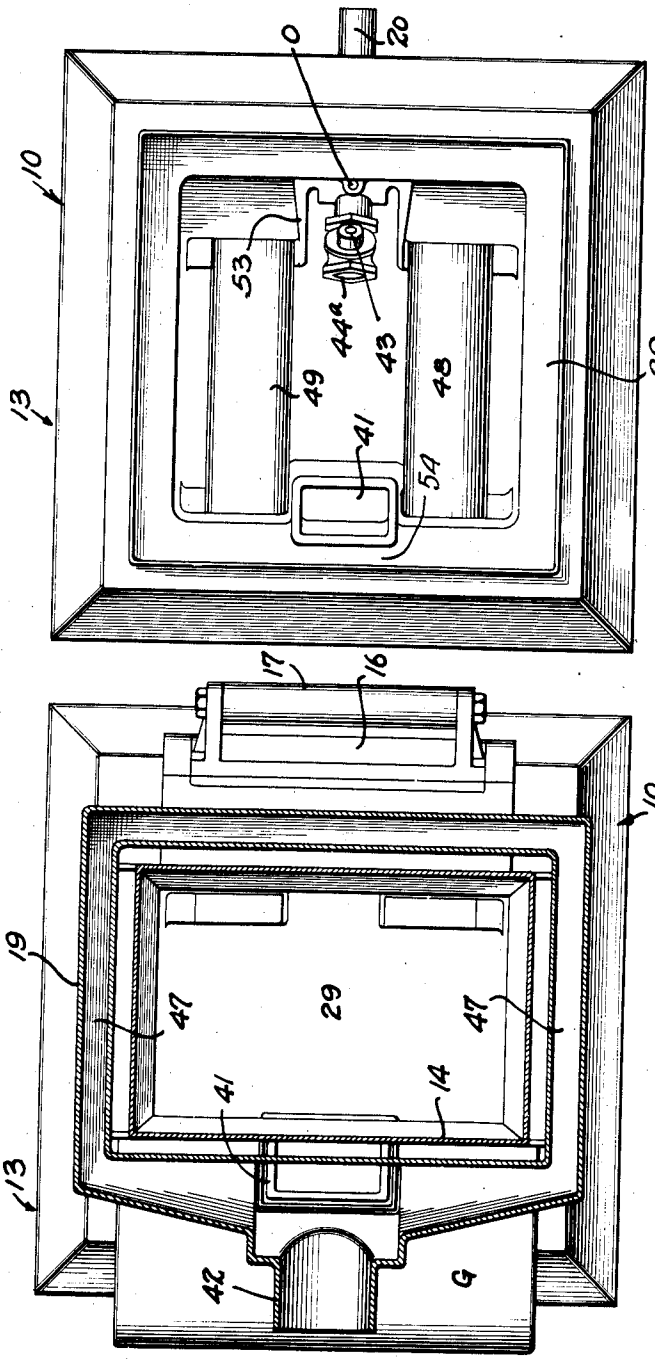


FIG. 7.

FIG. 6.

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UNITED STATES PATENT OFFICE

2,263,880

APPARATUS FOR MELTING METALS

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Application December 10, 1940, Serial No. 369,484

12 Claims. (Cl. 263—14)

This invention relates to the art of melting metal, and more particularly to the continuous remelting of type metal or other metal slugs.

In printing plants wherein a series of "Linotype" machines or other line casting machines are in use and where such machines are adapted to continuously be fed with metal ingots of a specific shape adapted to be assoicated with a specific metal feeder and melted in a particular melting pot connected to the "Linotype" or other line casting machines, there is a constant need for cast metal ingots of a specific shape and accordingly such printing plants must carry on hand a very large supply of such specifically formed ingots.

After all the ingots in the plant have been fed to the "Linotype" or line casting machine, melted down and formed into cast line slugs which are used in the printing process, it becomes necessary to remelt the slugs into the specially shaped ingots which may be of the "Margach" type.

In accordance with the prior art, these printing plants are equipped with a relatively large melting furnace containing a melting pot of a size sufficient to remelt all the metal used in the line casting machines during a predetermined period of time, such as for example one day or two days or longer. In other words when the metal ingot supply has run low, all the used metal slugs are collected and fed into the furnace to be remelted. The remelting process may take approximately two hours or somewhat longer, and all the metal is remelted and poured into molds to form the ingots of proper shape for use in the line casting machine feeders.

The furnaces of prior constructions have accordingly been relatively large, expensive, and generally relatively unsatisfactory in operation due to their intermittent use, the great amount of space they occupy, and the fact that the remelting operation is put off until the last moment because of the expense involved in operating it to the great inconvenience of the line casting machine operators who may need ingots during the period of operation of the furnace.

It is an object of the instant invention to provide a relatively simple inexpensive remelting furnace adapted to be used continuously for the remelting of slugs into type metal ingots or the like.

It is another object of the instant invention to teach a novel continuous method of remelting slugs into ingots of the "Margach" type.

It is a further object of the instant invention to provide for the remelting of metal slugs in a novel manner, including a novel hopper arrangement to effect a more or less continuous remelting process.

Other objects and the nature and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a view in perspective of a furnace in accordance with the invention, depicting the molten metal chute, its control, and the "Margach" type molds;

Figure 2 is a vertical section of a remelting furnace in accordance with the invention;

Figure 3 is an elevational view of the rear of the furnace showing the fuel pipe connections;

Figure 4 is a view similar to Figure 2 but of a modified form;

Figure 5 is a sectional view taken at right angles to the section shown in Figure 4;

Figure 6 is a horizontal sectional view taken along line 6—6 of Figure 4 and looking in the direction of the arrows; and

Figure 7 is a top plan view taken along line 7—7 of Figure 5 and looking in the direction of the arrows.

Referring to Figure 1, the furnace 10 comprises a base 11 having legs 12 on which is supported the body portion 13 which houses the melting pot, to be described later. Supported directly on the body portion is the hopper structure 14 provided with a feed passageway 15 at its front and a door 16 therefor adapted to be operated by the handle 17. The door 16 is pivoted at 18 in such a manner that the center of gravity thereof is on the hopper side of the hinge, whereby the feed door 16 will tend to remain in closed position unless the operator pulls the handle 17 and locates the center of gravity of the door 16 on the outside of the hinge 18. Supported on the top of the hopper 14 is a gas take-off arrangement 19 which will be described later. A lid L hinged at the rear of the gas take-off arrangement 19 normally covers the top opening to the hopper 14 when the same is not being fed with metal slugs.

Leading from the body portion 13 is the molten metal discharge spout 20 controlled by a valve within the pot, to be described later, by the handle H. The molten metal discharged from the spout 20 passes into the horizontally swingable distributor chute 21 which is pivoted on a vertical axis within the bearing 22 supported on the body portion 13 by the bracket 23. Mounted within the chute 21 and secured to the arms 24 is the gate 25 which in the position shown serves

to cut off the flow of metal down the chute 21 into the cavities 26 of the mold 27. When the handle 28 is raised, the gate 25 is correspondingly raised from its closed position and molten metal discharged from the spout 20 may pass along the chute 21 into the mold cavities 26. The handle 28 is also used to swing the chute from one cavity 26 when it is filled to an adjacent unfilled cavity whereby it may be filled. Accordingly the handle 28 may be operated with one hand to both cut off or initiate the flow of molten metal and swing the distribution chute from over one mold cavity to over an adjacent mold cavity.

Referring to Figures 2 and 3, the melting pot 29 is adapted to be heated by the burner 30 which receives its fuel, which may be gas or oil, from the conduit 31, which may be controlled by the valve 32. A swingable pilot 33 controlled by valve V and having a swivel joint connection 34 may be utilized to light the burner 30. The pilot 33 receives its fuel from the conduit 35 which is connected to the manifold 36 which also feeds the conduit 31. Within the conduit 31 is the thermostatic control valve 37 having an adjustment 38 connected to the thermostat 39 by the thermostatic lead conduit 40. The thermostat 39 is located within the melting pot, as better shown in Figure 2. The manifold 36 is fed from a source of fuel supply through the conduit 37.

The body portion 13 comprises insulated walls W which serve to guide the hot gases from the burner 30 about the melting pot 29 including a portion of the discharge spout 20 and upwardly through the flue 41 built into the rear portion of the pot, into the flue continuation 41*a* which is built into the rear portion of the hopper 14, then the flue gases pass into the rear portion 42 of the gas take-off arrangement 19 and out of the furnace.

At the front of the furnace 10, the handle H is connected to the shaft 43 which is mounted within the bearing 44 so that the swinging of the handle H through a generally horizontal arc will effect the turning of the shaft 43 on its axis and the turning of the gate valve 44*a* which is connected to the shaft 43 and controls the flow of hot molten metal from within the pot 29 through the spout 20.

Hot gas, above the melting pot 29, when the furnace 10 is in operation, may pass upwardly through the loosely and heterogeneously arranged type metal slugs within the hopper 14 and then pass between the angularly disposed walls 45 and 46 to within the angular chamber 47 which is connected to the rear portion 42 of the gas take-off arrangement 19, whereby the hot gases from above the melting pot may be passed from the furnace together with the hot gases from above the burner 30.

Referring to Figures 4 and 5, not only may a fluid fuel fired burner be utilized to heat the pot 29 but the melting pot 29 may be heated by the electrical units 48 and 49 which are disposed directly within the melting pot 29. The electrical wires leading to these units pass through the conduits 50 and 51 disposed on each side of the flue 41 and on each side of the flue continuation 41*a* so as to effect a compact and space saving structure. Two electrical heater units are utilized so that in case one fails and the metal is frozen within the pot, the second unit may be utilized to melt the metal within the pot in order to facilitate its withdrawal so that the first unit may be readily serviced. When the electrical units are utilized for heating the metal within the melting pot 29, the wall 52 below the pot 29 may also be insulated. A thermostatic control may be associated in the heater circuits and may involve the location of a thermostatic bulb adjacent the melting pot and a rheostat controlled by the bulb. The gas take-off arrangement 19 in this embodiment of the invention simply serves to remove the hot gases from above the melting pot.

Referring to Figure 6, the gas flow from the top of the melting pot 29 is indicated by the arrows which lead to the outlet 24 or rear portion of the gas take-off arrangement 19. When the furnace is gas or oil fired, the hot gases passing up the flue 41 and flue continuation 41*a* also pass out through the outlet 42.

Referring to Figure 7, the construction of the pot 29 is more clearly illustrated. At the central portion 53 of the melting pot 29 a protrusion is arranged to house the valve 44*a* and its operating rod 43. At the central rear portion 54 of the melting pot 29, the flue 41 is built thereinto whereby the hot gases from the burner 30 may pass upwardly about the rear of the pot 29 and from the furnace as better shown by the arrows in Figure 6.

The hopper 14 may be of integral construction and comprise the reinforcing ribs 14*a* located at the sides and front thereof. At the rear of the hopper and about the flue continuation 41*a*, the guard G is arranged to afford protection for the thermostatic control 39 and associated conduits when the furnace is fired by gas or oil, and for the conduits 50 and 51, which house the electrical wires for the heaters 48 and 49, when the furnace is heated by electricity.

In operation, the valve V is opened and the pilot valve ignited and swung over the burner 30. The valve 32 is then opened and the main burner 30 placed in operation. When the furnace is electrically heated, the main switch to the heaters 48 and 49 is closed. The furnace 10 is now ready for continuous operation.

As type metal slugs are used and ready for remelting, they are continuously thrown into the hopper 14 over the inclined wall 46 of the gas take-off arrangement 19 after raising the lid L. This is the normal method of feeding the remelting furnace 10. This feeding of the hopper 14 through the top thereof is maintained continuously as long as the printing plant is in operation and the line casting machines are being utilized. In other words, in operating the remelting furnace, one does not wait until all the metal has been cast into slugs and is ready to be remelted, but the slugs are fed to the hopper as soon as each individual slug is ready for remelting, thereby insuring a continuous process. The hopper 14 is relatively large, having about three times the volumetric capacity of the melting pot and adapted to hold approximately the same amount of metal in heterogeneously arranged slugs as the pot can hold in molten metal. With this arrangement, when the hopper 14 becomes full, the handle H may be operated to permit the metal to flow through the discharge spout 20 into the chute 21 and the operator with a single hand may effect the operation of the handle 28 to successively fill the mold cavities 26 in the mold 27 to cast ingots adapted to be associated with feeders of the "Margach" type, which ingots are in turn fed into relatively small melting pots operatively

associated with line casting mechanisms which form the slugs to be eventually remelted.

Should the level of molten metal within pot **29** reach an abnormally high level due to excessive feeding of slugs to the hopper **14**, a proper high level will be maintained by the overflow by-pass O which serves to convey excess molten metal past valve **44***a*, when the same is closed, through discharge spout **20** and into the mold cavity therebelow. Feeding of slugs may then be temporarily discontinued until a series of mold cavities are filled with metal from the pot by operation of valve **44***a*.

The door **16** is only utilized when it is desired to feed the remelter from the side of the furnace instead of from the top, or when service, such as cleaning, is to be effected within the hopper or the melting pot.

A suction fan not shown may be associated within a flue or conduit connected with the outlet **42** in order to facilitate removal of hot gases passing up the flue **41** and flue continuation **41***a*.

In order to facilitate the continuous operation of the device a thermostatic control device for the heater has been incorporated within the furnace, which control may be manually adjusted to effect the conditions desired.

In furnaces of the prior art incorporating a melting pot of a size merely large enough to accommodate the molten metal for the molds, the operator would have to stand by until sufficient slugs were melted before room could be had for additional slugs. In accordance with the instant invention this waste of time is avoided by providing the hopper arrangement shown in the drawings so that continuous charging of the pot may be effected. Should the pot become overcharged, the overflow arrangement O will act as a signal.

It will be obvious to those skilled in the art that various changes may be made in this device without departing from the spirit of the invention and therefore the invention is not limited to what is shown in the drawings and described in the specification but only as indicated in the appended claims.

What is claimed is:

1. A furnace comprising a melting pot, a heater therefor, a gas take-off arrangement arranged thereabove, said take-off arrangement comprising a pair of inclined walls angularly disposed inwardly and downwardly and extending around the melting pot, an annular gas collecting chamber connected to said walls, and a gas discharge outlet connected to said annular chamber.

2. A furnace comprising a relatively small melting pot, a heating arrangement associated therewith, a hopper located above said melting pot, said melting pot having a volumetric capacity corresponding to more than twice the volumetric capacity of said melting pot, a discharge conduit leading from said melting pot, a valve associated with said discharge conduit, a by-pass connecting said pot and said discharge conduit independently of said valve, one portion of said by-pass being associated with an upper portion of said melting pot whereby excess molten metal may be discharged from said pot when the same is over fed.

3. A remelting apparatus comprising a slug fed hopper, a melting pot, and means for applying heat to said melting pot, said hopper being approximately three times the volumetric size of the melting pot, the sides of said hopper being substantially vertical, the horizontal cross-sectional configuration of said hopper corresponding to the horizontal cross-sectional configuration of the upper portion of said pot, whereby slugs may be continuously fed to said hopper and when it is full the volumetric capacity of the melting pot will generally correspond to the solid volume of metal in the hopper, said melting pot having a relatively narrow flue built into and extending up one side thereof, a pair of conduits extending along each side of said flue and carrying electrical conduits, a pair of electric heaters within said pot, said conduits being connected to said heaters.

4. A remelting apparatus comprising a slug fed hopper, a melting pot, and means for applying heat to said melting pot, said hopper being approximately three times the volumetric size of the melting pot, the sides of said hopper being substantially vertical, the horizontal cross-sectional configuration of said hopper corresponding to the horizontal cross-sectional configuration of the upper portion of said pot, whereby slugs may be continuously fed to said hopper and when it is full the volumetric capacity of the melting pot will generally correspond to the solid volume of metal in the hopper, conduit means for supplying energy to said heating means, a guard for said conduit means mounted on the rear of said hopper.

5. A remelting apparatus comprising a slug fed hopper, a melting pot, and means for applying heat to said melting pot, said hopper being approximately three times the volumetric size of the melting pot, the sides of said hopper being substantially vertical, the horizontal cross-sectional configuration of said hopper corresponding to the horizontal cross-sectional configuration of the upper portion of said pot, whereby slugs may be continuously fed to said hopper and when it is full the volumetric capacity of the melting pot will generally correspond to the solid volume of metal in the hopper, a discharge spout leading from said melting pot, a rotary valve in said discharge spout, a handle for operating said discharge spout, a distribution chute having a vertical turning axis located below said spout, and means operable by a single hand for controlling the flow through said chute and for swinging said chute from one mold cavity to an adjacent mold cavity.

6. A metal remelting apparatus comprising a slug feeding hopper, a melting pot directly therebelow, means forming insulation about the walls of said melting pot, said hopper comprising generally upright sides which are substantially vertical, the horizontal cross sectional configuration of said hopper corresponding to the horizontal cross sectional configuration of the upper portion of said melting pot, means for heating the exterior of the bottom of said melting pot, said heating means comprising a gas flame, means associated with one wall of said hopper for preventing the flow of flue gases produced by said heating means about said hopper, whereby the slugs within said hopper will be fed without sticking or jamming from said hopper into said melting pot and said flue gases will be conducted away from said melting pot after heat exchange therewith has taken place.

7. The structure recited in claim 6, an annular duct-like chamber extending about the upper portion of said hopper and in a plane outside of the substantially vertical walls thereof, and walls

forming a gas discharge outlet from said annular chamber.

8. A metal remelting apparatus comprising a hopper having substantially vertical walls, a melting pot associated therewith and located directly therebelow, means for applying heat to said melting pot to melt the metal therewithin and fed thereto by said hopper, said pot being formed on one side with a generally tubular passageway, said hopper being formed on a corresponding side with a generally tubular passageway, said tubular passageways being substantially in alinement.

9. The structure recited in claim 8, an annular duct-like chamber extending about the upper portion of said hopper and in a plane outside of the substantially vertical walls thereof, and walls forming a gas discharge outlet from said annular chamber.

10. The structure recited in claim 8, a gas take-off arrangement located directly thereabove, said take-off arrangement comprising inclined walls angularly disposed inwardly and downwardly and extending around said hopper, an annular gas collecting chamber connected to said walls, and a gas discharge outlet connected to said annular chamber.

11. The structure recited in claim 8, a gas take-off arrangement located directly thereabove, said take-off arrangement comprising inclined walls angularly disposed inwardly and downwardly and extending around said hopper, an annular gas collecting chamber connected to said walls, and a gas discharge outlet connected to said annular chamber, a lid hinged at the top of said inclined walls and forming a cover for said hopper, said lid cooperating with the structure recited for directing the gases emanating from said melting pot into said annular gas collecting chamber.

12. A metal remelting apparatus comprising a slug feeding hopper having a feed opening in its top and having substantially vertical side walls, a melting pot located immediately therebelow, heating means for said melting pot, insulation means for said melting pot forming a space about the melting pot, said last mentioned means comprising walls extending from adjacent the top of said melting pot downwardly along the sides of said melting pot and substantially separating the space about said melting pot from the space about said hopper, said heating means operating to effect the flow of hot gases about the exterior of said melting pot, and means for collecting said hot gases after they have passed about said melting pot and for preventing said hot gases from passing about the major area of the walls of said feeding hopper.

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