Dec. 29, 1959 J. B. PLUMER 2,918,754

METHOD OF AND APPARATUS FOR DISCHARGING CONTINUOUS SMELTERS

Filed June 14, 1954 2 Sheets-Sheet 1

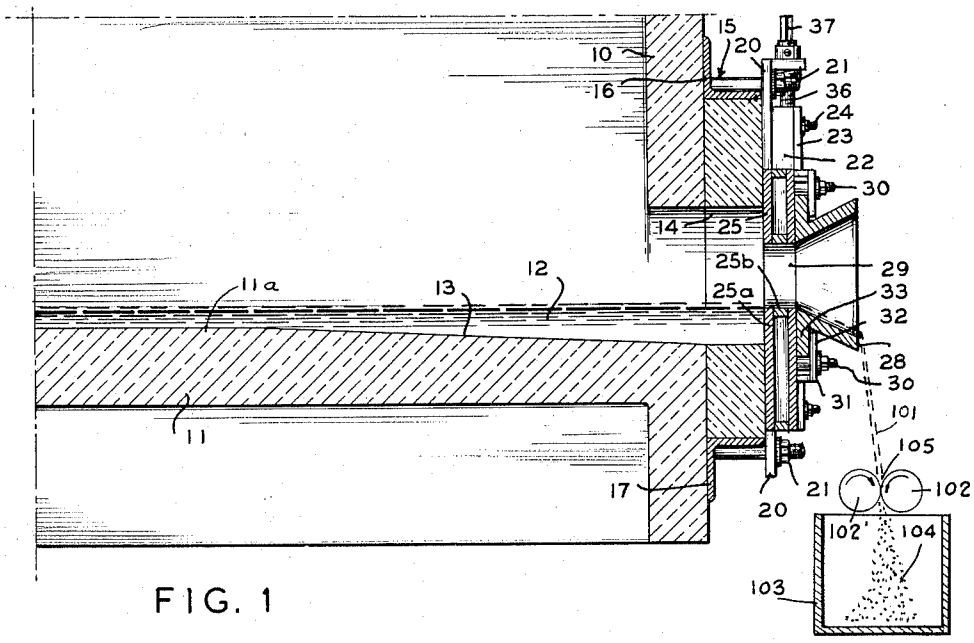


FIG. 1

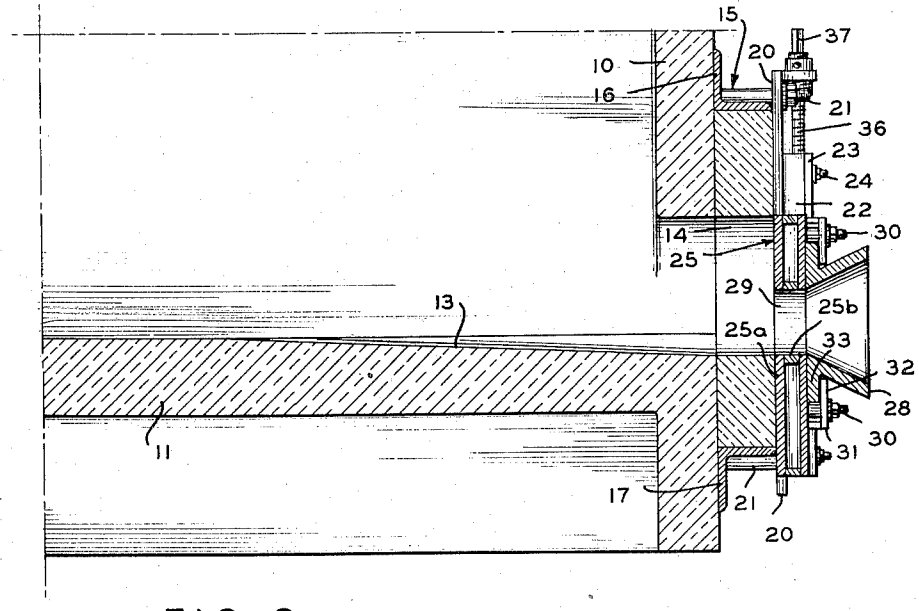


FIG. 2

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METHOD OF AND APPARATUS FOR DISCHARGING CONTINUOUS SMELTERS

Filed June 14, 1954 2 Sheets-Sheet 2

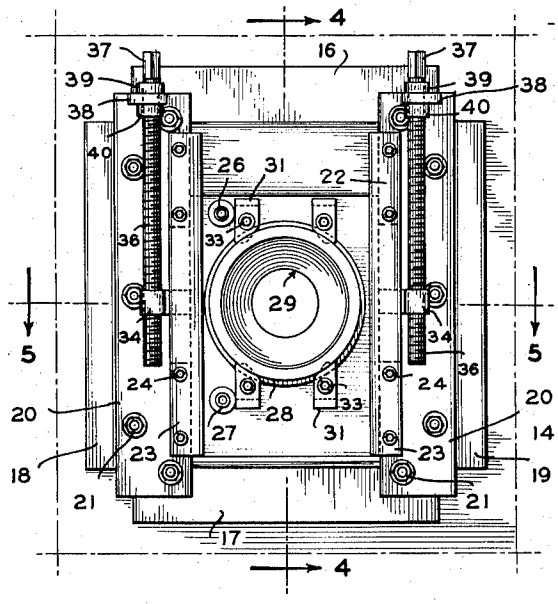


FIG. 3

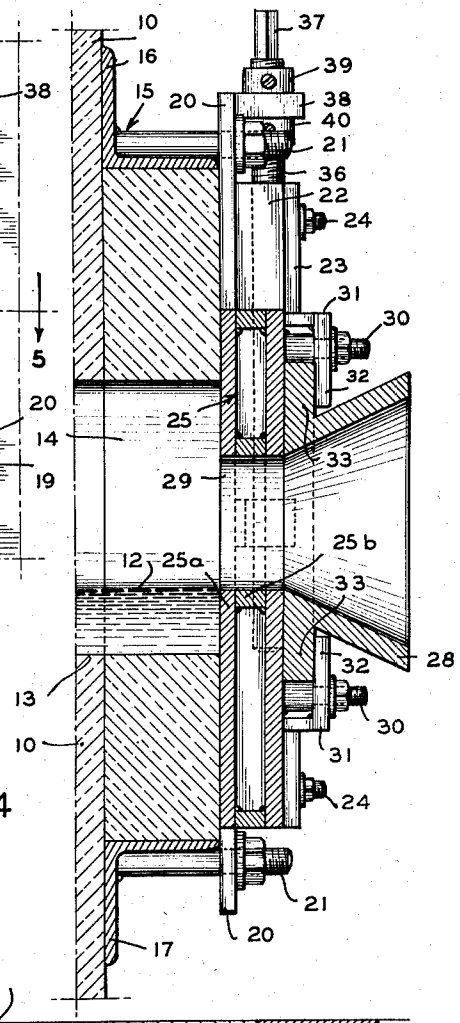


FIG. 4

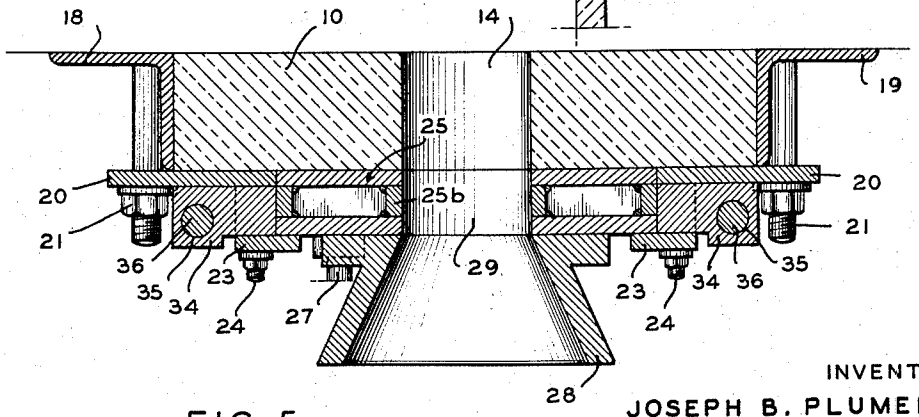


FIG. 5

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2,918,754

METHOD OF AND APPARATUS FOR DISCHARGING CONTINUOUS SMELTERS

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Application June 14, 1954, Serial No. 436,300

9 Claims. (Cl. 49—55)

This invention relates to a smelter or furnace, and more particularly to a method of and apparatus for discharging continuous smelters.

The object of the invention is to provide a method of and apparatus for discharging smelters that are used for handling vitreous material such as porcelain enamels, ceramic glazes and the like.

Another object of the invention is to provide a means for controlling the depth of the pool in a pool-type smelter to simplify drainage of the pool when the smelting operation is completed.

Another object of the invention is to provide a smelter which will insure that a more uniform product is produced since a pool arrangement is utilized to allow a mixing action and to prevent channeling of the molten glass or other material on the smelter hearth.

A still further object of the invention is to provide an adjustable water-cooled lip or discharge spout for a smelter which is not readily subject to wear and erosion due to the flowing enamel and wherein the lip may be made of a suitable alloy that is not effected by high temperatures, the lip being vertically adjustable but wherein lateral or horizontal shifting of the lip is prevented, and wherein with the present invention pool-type smelting with any desired pool depth can be accomplished and, also by continuously lowering the lip to maintain a constant flow from the smelter, the difficulties and dangers encountered in the previous methods of tapping are eliminated and the smelter can be used with any type of quenching apparatus without any difficulty or danger.

Another object of the invention is to provide a smelter which includes a pool that can be discharged from the upper surface rather than from the bottom so that the possibility of oversmelting material is materially diminished or eliminated so that there is practically no loss of final material and wherein both undersmelting and oversmelting will be prevented.

Another object of the invention is to provide a smelter for vitreous enamel which includes a pool which can be discharged from the upper surface thereof during smelting and during draining of the pool, said smelter discharging the molten enamel to chilling rolls at substantially the center line thereof.

Another object of the invention is to provide a method of smelting vitreous enamel including the formation of a pool of molten enamel and draining said pool by successively removing and discharging the molten enamel from only the upper surface portion of the pool.

Another object of the invention is to provide a method of smelting vitreous enamel including the formation of a pool of molten enamel and draining said pool by successively removing and discharging the molten enamel from only the upper surface portion of the pool and flowing the discharge to chilling rolls at substantially the center line thereof.

Another object of the invention is to provide a method of smelting vitreous enamel wherein the molten enamel is continuously removed from the upper surface of a pool

of molten enamel while maintaining a constant depth of pool and draining said pool by successively removing and discharging the molten enamel from only the upper surface of the pool.

Another object of the invention is to provide a method of producing fined porcelain enamel which is of substantially uniform quality in a furnace having a hearth provided with a smelting zone or section and a fining zone or sector, said surface being provided with a vertically movable discharge member having a discharge lip at the hearth discharge end, said method comprising positioning the discharge lip of the discharge member at a predetermined distance above the hearth, the latter sloping towards the discharge end and having thereon a pool of molten vitreous or porcelain enamel, discharging the molten vitreous material through the so-positioned discharge lip until the flow of the molten fined vitreous material diminishes, and preventing over smelting of the residual fined vitreous material or porcelain enamel by gradually lowering the discharge lip until the latter is substantially flush with the upper surface of the hearth and each successive upper layer of the residual molten vitreous enamel of the pool is successively discharged from the upper surface of the molten pool.

Another object of the present invention is to carry out said method while simultaneously cooling the discharge member to prevent the latter from being attacked, that is warped and/or eroded by said molten vitreous enamel.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are used to designate like parts through the same:

Figure 1 is a fragmentary sectional view illustrating somewhat diagrammatically a portion of a continuous smelter furnace with the novel water-cooled gate or spout of the present invention attached thereto.

Figure 2 is a fragmentary sectional view similar to Figure 1 and illustrating the spout or gate in its lowermost position to effect complete drainage from the smelter.

Figure 3 is a front elevational view of the water-cooled gate illustrated in Figure 1.

Figure 4 is a vertical sectional view on an enlarged scale taken on the line 4—4 of Figure 3 looking in the direction of the arrows, and

Figure 5 is a horizontal sectional view also on an enlarged scale taken on the line 5—5 of Figure 3 looking in the direction of the arrows.

Referring in detail to the drawings, the numeral **10** designates a portion of a continuous smelter which is adapted to be used for handling materials such as vitreous materials which may include porcelain enamel, ceramic glazes and the like. The smelter **10** includes a hearth **11**, Figure 1, and comprises a smelting section **11***a* and a recessed or inclined fining section **13**, the latter defining a pool for a purpose to be later described. The smelter **10** further includes a discharge opening **14** through which the material being discharged can flow.

Arranged on the outside of the smelter **10** and secured thereto in any suitable manner is a frame **15** which includes a pair of spaced parallel horizontally disposed beams **16** and **17**, and the frame **15** further includes spaced parallel vertically disposed beams **18** and **19**, Figure 5. These beams surround the discharge opening **14** and the frame **15** is stationary or immobile.

There is provided a pair of spaced parallel vertically disposed plates **20** which are secured to the beams of the frame **15** in any suitable manner, as for example by means of bolt and nut assemblies **21**, Figure 3. Formed integral with each of the plates **20** or secured thereto, is a pair of spaced apart blocks **22**, the blocks **22** extending

outwardly from the plates 20. A pair of spaced parallel vertically disposed guide strips 23 are arranged on opposite sides of the discharge opening 14, and the guide strips 23 are secured to the blocks 22 in any suitable manner, as for example by means of bolt and nut assemblies 24. These guide strips 23 coact with the plates 20 to define vertical channels for a purpose to be later described.

Slidably mounted in the channels defined between the guide strips 23 and the plates 20 is a vertically shiftable body member 25 which forms part of a movable discharge spout assembly, Figure 5. The body member 25 is rectangular and is adapted to be made of a suitable alloy that is not affected by high temperatures. The hollow body member 25 is provided with openings 26 and 27, Figure 3, whereby a suitable cooling medium such as water can be passed through the hollow body member 25 to maintain the discharge spout in a cooled state.

The hollow body member 25 is provided with a central opening or spout 29 which is adapted to be moved into and out of registry with the discharge opening 14 in the smelter as the discharge spout is shifted vertically. The discharge spout has extending therefrom and secured thereto a flaring mouth or discharge lip 28 which coincides with the opening 29 in the body member 25. For securing the lip 28 to the body member 25, a plurality of clamps 31 are provided, and each clamp 31 includes a finger 32 that engages a portion of a flange 33 which is secured to the lip 28 in any suitable manner as by welding. The fingers 32 are secured to the body member 25 in any suitable manner, as for example by means of bolt and nut assemblies 30. Thus, as the body member 25 moves up and down the lip 28 will move therewith.

A means is provided for vertically shifting the discharge spout assembly, and this means comprises a pair of vertically disposed spaced parallel screw members 36, which are arranged in threaded engagement with apertures 35 that are formed in a pair of lugs 34. The pair of lugs 34 are secured as by welding to the sides of the body member 25. A head 37 is arranged on the upper end of each of the screw members 36, and the head 37 is adapted to be engaged by a suitable tool such as a wrench so as facilitate rotation of the screw members in order to adjust the position of the discharge spout assembly and the lip 28. The screw members 36 extend downwardly through apertured ears 38 which project outwardly from the tops of the plates 20, and the ears 38 may be secured in place by welding. Collars 39 and 40 are arranged on opposite sides of each ear 38 for guiding and maintaining the screw members in their proper aligned position. Thus, since the lugs 34 are secured to the body member 25, it will be seen that by rotating the screw members 36, the discharge spout can be shifted vertically so that the discharge of material from the smelter or from the pool 12 through the openings 14, and 29 can be readily controlled.

Heretofore raw materials have been permitted to melt in the smelter and run over the hearth to the discharge point or lip of the smelter to thus form a comparatively shallow bath which was normally never allowed to be more than one-half inch to one inch in depth but it has been determined that with certain materials a more uniform product can be obtained by using a pool construction such as the pool 12 at the discharge end of the smelter. That is, instead of building the lip of the smelter and earth at the same level, the hearth is constructed so that at the discharge point the hearth is lower than the discharge lip and in the present invention the discharge lip is adjustable. By providing this pool or recess 12, a better mixing action of the material being handled or treated is provided, and also there will be prevented channeling of the molten glass on the lining section of the hearth. By channeling is meant the physical process wherein the glass has a tendency to flow in channels directly to the outlet rather than smoothly over the smelter hearth.

Heretofore smelters embodying this construction were found not to be satisfactory because of the following reasons. First, assuming that a pool of molten porcelain enamel consisting of 1500 to 3000 pounds of melted material was formed on the hearth of the smelter and it became necessary or desirable to change the material, it was necessary to tap this pool thus necessitating the use of two discharge openings in the smelter. One of these discharge openings had to be closed during normal operations and opened to drain the pool and this process is dangerous, costly and difficult to perform. Also, in order to drain pools of earlier smelters, it was necessary to have the bottom outlet or tap hole level with the floor of the smelter and thereby discharge the pool from the bottom but since this required some time, a good deal of the material drained from the pool was not usable. Also, considerable time and a great deal of skill were necessary to discharge the pool without damaging the equipment used to remove the quenched frit from the smelter pit without injuring personnel.

Where so-called "roll" quenching (that is, the chilling of the molten glass by permitting it to pass between water-cooled rolls rather than quenching in water) was used, again the pool could not be used since in positioning the discharge spout of a smelter utilizing this method of quenching frit, the adjustment must be very precise in relation to the center line between the rolls and this is not feasible in a smelter which is being discharged by hand. In a pool type smelter with bottom discharge, it is necessary to open the tap hole and control the rate of flow with a refractory plug and this of course disturbs the rate of flow of the glass and makes for a non-uniform discharge. As a result, pool type smelters have in the past not proved satisfactory particularly when the smelter was used in combination with roll quench apparatus due to the higher material losses, greater cost of operation, and difficulty of controlling the discharge of the enamel glass in the pool.

The discharge lip of the present invention is made of cast alloy and is therefore advantageous over a lip made of refractory material since it is not as subject to wear and erosion by the flowing enamel as is the refractory lip. Also, heat from an exterior source such as a gas flame may be directed into the cone portion 28 of the lip to maintain the enamel at the proper temperature and at the proper fluidity and the metal cone 28 will transmit heat much better than the refractory block-type of lip.

The adjustable water-cooled lip of the present invention eliminates all of the previous disadvantages encountered with so-called pool smelters and the lip is made of cast alloy and includes a water-cooled cell member or body member 25 that may be made of a nickel copper alloy such as Inconel. The body member 25 is mounted on the discharge end of the smelter and can be adjusted vertically but not horizontally. The body member 25 may be constructed by welding or otherwise securing together plates onto the faces of an open square frame which can also be constructed of Inconel strip and there is provided the flange 33 whereby the lip 28 can be clamped to the body member 25. The opening 26 is adapted to serve as a water outlet, while the opening 27 provides a means for introducing cooling water into the body member 25. The ears 38 serve as guides for the screw members 36 and the screw members engage the threaded lugs 34 which are secured to the sides of the body member 25.

In operation the smelter operators determine the depth of the pool that is desired, and then the cast alloy lip is positioned so that the distance between the floor of the smelter and the bottom of the opening 29 corresponds to the depth desired in the bath or pool. Then the smelter is operated in a normal manner and at the same time water is permitted to flow into the cooling cell 25 and the cell or body member 25 serves to channel or guide the flow of molten enamel glass into the lip 28 to thus

help protect the metal from erosion and warping. After the run has been completed and it is desired to completely discharge the molten enamel from the smelter so that for example another type of material may be smelted, charging of the smelter is stopped. When the flow of material from the smelter diminishes, the discharge spout including the lip **28** and body member **25** are lowered by rotating the screws **36** so that the actual flow of the material from the smelter continues in a uniform quantity and this operation is continued until the inner surface or bottom of the opening **29** coincides with the bottom of the pool **12** as shown in Figure 2.

Thus, with the present invention pool-type smelting with pool depths can be utilized and also pool depths can be varied for different materials so that the depth of the pool can be predetermined in order to secure the best results for the particular material. Also, by using the adjusting screws **36** and continuously lowering the lip to maintain a constant flow from the smelter, the difficulties and dangers encountered in the previous methods of tapping are eliminated and the smelter can be utilized with any type of quenching apparatus without any difficulty or danger. Also, since the pool is discharged from the upper surface instead of the bottom, the possibility of oversmelting materials is materially diminished so that there will be a minimum of loss of material for commercial sale. There will be no jamming of parts and the sizes of the various parts can be varied as desired.

It is to be understood that the present invention is not concerned with the details of the smelter and the height of the raw material pile on the surface where the melting takes place. The temperature of the smelting area, the temperature of the fining area, the temperature of the vitreous enamel, and the rate of discharge of the fused vitreous enamel can be varied as desired depending upon the material being smelted.

As an example of a specific material that can be smelted, titanium-opacified enamel may be set forth. In the manufacture of such a porcelain enamel frit, the component raw materials are carefully weighed and thoroughly mixed and then they may be introduced into the smelter **10** by means of a conveyor. Previously the smelter is brought up to the proper temperature which may be in the neighborhood of 2280° F. so that the enamel can be smelted and as the charging of the raw material continues, a pile of material is built up against the back wall of the smelter in what is known as the "smelting zone." Charging is continued at an accelerated rate until the raw material melting pile reaches a predetermined size and during this time and thereafter the smelting zone of the furnace may be maintained, for example, at a temperature between 2260° and 2280° F., the burner flames being projected into the smelting area in such a manner that the raw material in the pile fuses on the surface of the pile and runs down in a thin stream onto the smelting section **11***a* of the hearth **11**. The molten material spreads over the hearth in a thin layer and flows along the hearth **11** towards the inclined lining section **13** and then to the discharge outlet **14**.

There is thereby formed at the inclined forehearth of the smelter, or stated differently, in the fining zone or section, a pool **12** of fused vitreous or porcelain enamel, the depth of the pool of smelted enamel on the fining section being greater than the depth of the smelted enamel on the smelting section. The hollow body member **25** having openings **26** and **27**, is provided with an interior wall **25***a* and an annular wall **25***b*, the lower portion of the water-cooled wall **25***a* being in contact with the pool of the molten fused vitreous enamel during the fining thereof as shown in Figure 1. As the height of the pool begins to diminish, the interior wall **25***a*, the annular wall **25***b*, the discharge opening, and the lip **28** is lowered by means of adjusting screws **36** so that the flow of the fined enamel from the discharge lip is essentially uniform, and the position of the discharging vitreous enamel is properly maintained relative to the quenching apparatus.

As can be seen from Fig. 1, the stream **101** of molten fined enamel flows from the discharge lip **28** to the center line or nip **105** between counter-directional rotating water-cooled chilling rolls **102, 102'** and the chilled shattered enamel **104** is discharged from the rolls into a container **103**. When the discharge lip or cone reaches its lowermost position as shown in Figure 2, it then becomes possible to rake the smelter and thereby remove any remaining material from the smelter hearth. Since the fused vitreous enamel in the pool is continuously removed from the pool surface by continuously, if necessary, lowering the discharge cone, there is substantially little tendency to over-smet the fused enamel so that the amount of unsalable material produced at the end of the smelter run is substantially diminished.

It is desired to point out that as the molten stream of vitreous enamel approaches the discharge end of the continuous smelter, the hearth is constricted horizontally to channel the flow of the material into the discharge lip from which it flows in a continuous stream. This continuous stream of molten vitreous enamel is then cooled either by quenching in cold water or it may be quenched by means of counter-directional, rotating water-cooled rolls. The molten vitreous enamel is discharged at a relatively high temperature as for example around 2200° F. The volume discharge may be maintained for example at about 1400 pounds per hour, the raw material being continuously charged into the smelter in an amount sufficient to provide this poundage of molten vitreous enamel. It may be pointed out that modern porcelain enamel compositions are carefully designed to meet certain end-use physical, chemical, and appearance characteristic requirements. The enamels are designed to have specific color, gloss, and reflectance characteristics. These enamels also must be compounded to have certain fusibility and expansion characteristics. Further, the vitreous enamels are designed to have very specific chemical resistance characteristics—that is, these enamels are designed to withstand acids, alkalis, boiling solvents, and the like. If the enamels are under-smelted, that is, do not remain on the smelter hearth for long periods of time, or if the composition of the end product be slightly non-uniform due to segregation either in the melting or fining operations, the resultant appearance characteristics especially reflectance, color, and color stability will be affected. Likewise, the chemical resistance characteristics may be decreased and other physical properties impaired. As a result, it is desirable that materials emerging from the smelter be not only uniform throughout the smelt, but that they be uniform as regards the basic characteristics of the material. For example, if the titanium-opacified enamel be under-smelted, the fusibility will be affected, the acid resistance properties will be diminished, and the color and especially the color stability, that is the ability of the enamel to be matured on steel at various temperatures without changing color, will be materially affected. If the vitreous enamel be over-smelted, these properties will again be affected although in a somewhat different manner.

The present invention is applicable to the smelting of low melting glasses such as flux glasses, aluminum enamels, or glass decorating enamels which may be smelted at temperatures below 1700° F. More refractory materials such as some types of pottery frits and special flux glasses smelted at temperatures as high as 2400° and 2500° F. may be smelted in accordance with the present invention.

The present invention made possible the use of pool smelting. While attempts have been made to utilize pool-type smelters, as far as known these attempts have not been crowned with success because there always remained in the pool on the fore-hearth of the smelter 2000 to 3000 pounds of molten porcelain enamel which

could not be removed in the normal manner since the discharge lip of the smelter was well above the surface of the pool. The common practice was, therefore, to provide an auxiliary discharge port in the furnace wall through which the pooled material could be tapped. During the operation of the furnace for the tapping of the pool, this auxiliary port was carefully sealed with a clay plug. Following the composition of the smelting run, it was necessary to open the seal and allow the molten glass to flow from the pool. It is obvious that molten glass held at a temperature of the order of 2200° F. in the quantity involved cannot be allowed to flow freely. Therefore, it became necessary to manually control the flow of vitreous enamel by means of a refractory plug. Since the pool was discharged from the bottom rather than from the surface during this operation, the surface areas of the pool material become over-smelted and therefore the larger part of the material remaining in the pool is lost as salable material.

In view of the above, it is clear that the present invention solves a real problem.

Utilizing the present invention, it is possible to predetermine the depth of a molten pool to secure best results with a particular material. In the previous pool smelters, this was not possible.

In current practice, the molten pool at and adjacent to the discharge cone may have a depth between about 4 inches and 6 inches. These figures are set forth by way of illustration and not by way of limitation.

It is to be noted that in the commercial use of a smelter, many different material compositions must be smelted in the course of a period of time so that the composition of the material being smelted in a single smelter may be changed many times, and before each change of composition it is necessary to completely drain the smelter and free the hearth from glass of the previous composition before the smelter can be recharged with the next material desired. Before the present invention such material changes in pool-type continuous smelters were, as has been pointed out, difficult and wasteful. With the present invention when the smelting operation is complete, the charging is shut-off and the raw material pile melted down and as the level of the pool in the area 12 begins to diminish, the position of the discharging cone is lowered by means of the adjusting screws so that the flow from the discharge lip is uniform. Also since the molten enamel of the pool is removed from the surface, the tendency to over-smelt is eliminated, and the danger to men and equipment incident to manual tapping operations is eliminated.

As will be obvious to those skilled in the art, the present invention is equally advantageous when used in connection with a continuous smelter or with a so-called "box-type" periodic smelter; that is, a smelter in which individual batches of material are smelted and completely removed from the smelter before the next batch is charged.

I claim:

1. In a method of producing vitreous enamel by smelting in a furnace provided with a hearth having a smelting section and a fining section, forming on said fining section a pool of molten vitreous enamel, maintaining said pool free of disturbances which normally cause different portions of said pool to be fined unevenly, and diminishing the tendency of the pool of molten vitreous enamel while on said fining section to be over-fined during the period of pool discharge by successively removing and discharging from only the upper surface portion of the pool of molten enamel successive layers of fined enamel until substantially all of the pool of molten enamel is discharged.

2. The method defined in claim 1 in which the vitreous enamel is smelted on the smelting section and the molten vitreous enamel in the pool has a depth greater than the depth of the smelted enamel on the smelting hearth section.

3. In a method of producing vitreous enamel by smelting in a furnace provided with a hearth having a smelting section and a fining section, forming on said fining section a pool of molten vitreous enamel, maintaining said pool free of disturbances which normally cause different portions of said pool to be fined unevenly, and diminishing the tendency of the pool of molten vitreous enamel while on said fining section to be over-fined during the period of pool discharge by successively removing and discharging from only the upper surface portion of the pool of molten enamel successive layers of fined enamel until substantially all of the pool of molten enamel is discharged, and chilling the discharged molten fined vitreous enamel by flowing it to and over chilling rolls at substantially the center line thereof.

4. In a method of producing vitreous enamel by smelting in a furnace provided with a hearth having a smelting section and a fining section, the steps of continuously smelting a run of the enamel on the smelting section, continuously flowing the smelted enamel onto the fining section, forming on said fining section a pool of molten vitreous enamel and there fining the enamel, continuously removing and discharging fined enamel from the upper surface portions of the pool while maintaining a constant depth of the pool, and on completion of the smelter run terminating the process and removing substantially the entire pool from the fining section by successively removing and discharging only from the exposed upper surface portions of the pool of molten enamel successive layers of fined enamel until substantially all of the pool of molten enamel is discharged.

5. In a smelter, a hearth including a recessed portion at its discharge end defining a pool, there being a discharge opening communicating with said pool, a frame including horizontally disposed and vertically disposed beams secured to the outer surface of said smelter and positioned around said discharge opening, a pair of vertically disposed spaced parallel plates secured to said frame and positioned on opposite sides of the discharge opening, a pair of spaced apart blocks extending outwardly from each of said plates and secured thereto, a pair of vertically disposed spaced parallel guide strips arranged on opposite sides of said discharge opening and secured to said blocks, said guide strips cooperating with said plates to define opposed channels, a discharge spout assembly including a hollow rectangular body member slidably positioned in the channels between said plates and guide strips, there being a central opening in said body member constituting a spout for the passage therethrough of material from the smelter, a flaring lip extending from said body member and registering with the spout, said flaring lip being provided with a flange, clamps arranged contiguous to the outer surface of the body member and secured thereto, said clamps engaging the flange of the flaring lip, and means for adjusting said spout assembly.

6. In a smelter, a hearth including a recessed portion at its discharge end defining a pool, there being a discharge opening communicating with said pool, a frame including horizontally disposed and vertically disposed beams secured to the outer surface of said smelter and positioned around said discharge opening, a pair of vertically disposed spaced parallel plates secured to said frame and positioned on opposite sides of the discharge opening, a pair of spaced apart blocks extending outwardly from each of said plates and secured thereto, a pair of vertically disposed spaced parallel guide strips arranged on opposite sides of said discharge opening and secured to said blocks, said guide strips cooperating with said plates to define opposed channels, a discharge spout assembly including a hollow rectangular body member slidably positioned in the channels between said plates and guide strips, there being a central opening in said body

member constituting a spout for the passage therethrough of material from the smelter, a flaring lip extending from said body member and registering with the spout, said flaring lip being provided with a flange, clamps arranged contiguous to the outer surface of the body member and secured thereto, said clamps engaging the flange of the flaring lip, and means for adjusting said spout assembly, said means comprising a lug extending laterally from each side of said body member and provided with a central threaded aperture, apertured ears extending outwardly from the top of said plates, and screw members extending through said ears and lugs.

7. The smelter as defined in claim 5, wherein said body member is provided with openings for the passage therethrough of a cooling medium.

8. In a smelter, a hearth including a recessed portion at its discharge end defining a pool, there being a discharge opening communicating with said pool, a frame including beams secured to said smelter and positioned around said discharge opening, a pair of plates secured to said frame and positioned on opposite sides of the discharge opening, a pair of blocks extending outwardly from each of said plates and secured thereto, a pair of guide strips arranged on opposite sides of said discharge opening and secured to said blocks, said guide strips cooperating with said plates to define opposed channels, a discharge spout assembly including a body member slidably positioned in the channels between said plates and guide strips, there being a central opening in said body member constituting a spout for the passage therethrough of material from the smelter, a flaring lip extending from said body member and registering with the spout, means for securing said flaring lip to said body member, and means for adjusting said spout assembly.

9. In a smelter, a hearth including a recessed portion at its discharge end defining a pool, there being a discharge opening communicating with said pool, a frame including beams secured to said smelter and positioned around said discharge opening, a pair of plates secured to said frame and positioned on opposite sides of the discharge opening, a pair of blocks extending outwardly from each of said plates and secured thereto, a pair of guide strips arranged on opposite sides of said discharge opening and secured to said blocks, said guide strips cooperating with said plates to define opposed channels, a discharge spout assembly including a body member slidably positioned in the channels between said plates and guide strips, there being a central opening in said body member constituting a spout for the passage therethrough of material from the smelter, a flaring lip extending from said body member and registering with the spout, said flaring lip being provided with a flange, clamps arranged contiguous to the outer surface of the body member and secured thereto, said clamps engaging the flange of the flaring lip, and means for adjusting said spout assembly, said body member being provided with openings for the passage therethrough of a cooling medium.

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