April 24, 1934. H. F. HITNER 1,956,171

APPARATUS FOR MELTING VITREOUS MATERIALS

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Fig. 2.

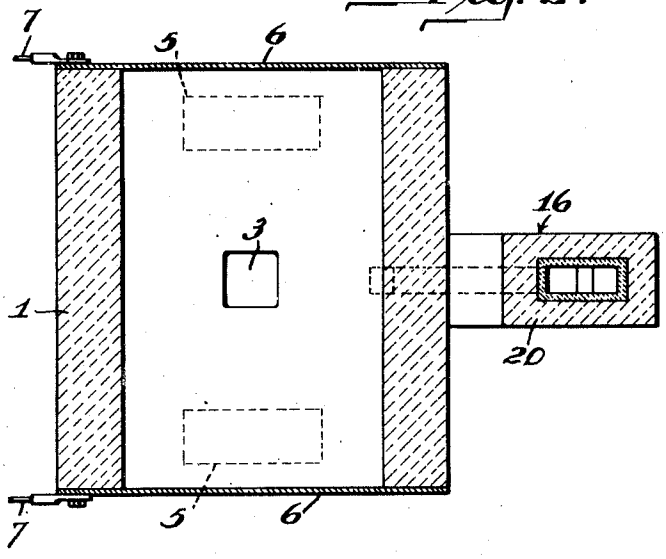
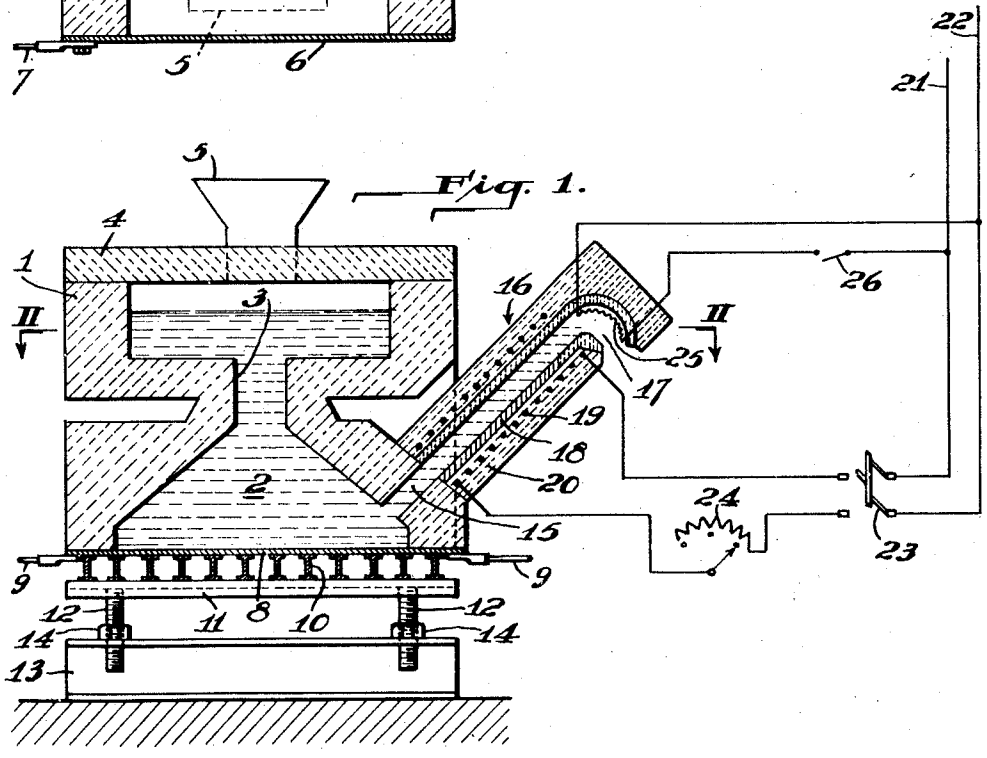


Fig. 1.



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APPARATUS FOR MELTING VITREOUS MATERIALS

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5 Claims. (Cl. 13—6)

The invention relates to apparatus for melting materials in the formation of vitreous products, such as glass, silicate of soda, and enamels, by the passage of electric current therethrough. In such operations, considerable difficulty is involved in controlling the outflow of the melted product so that such outflow may be maintained at a uniform rate and the level of the molten bath may be kept constant. The maintenance of these conditions has a large bearing upon the proper operation of the apparatus and particularly so in the case of apparatus of the type illustrated, in which the batch is melted in a vertical well having a restricted neck through which the current passes vertically, and wherein the batch to be melted is supplied to the upper end of the well and the finished product removed from the bottom. One embodiment of the invention is illustrated in the accompanying drawing, wherein:

Figure 1 is a rough, diagrammatic showing, partly in vertical cross section. And Fig. 2 is a section on the line II—II of Fig. 1.

The electric furnace shown is of the type disclosed in my Patent No. 1,827,471, dated October 13, 1931, which comprises a chamber or tank having the refractory walls 1 and a vertical well 2 with a reduced neck 3. The chamber is provided with a cover 4 and batch is fed into the upper end of the furnace by means of the hoppers 5, 5 whose ends lead through the cover 4, the location of the hoppers being indicated by the dotted line rectangles in Fig. 2. At the upper end of the tank are a pair of metal electrodes 6, 6, to which current is supplied from the leads 7, 7, the lower edges of such electrodes lying at approximately the level of the upper end of the neck 3. A third electrode 8 of metal constitutes the bottom wall of the tank and is supplied with current through the leads 9, 9. The metal electrodes are made of any suitable refractory metal or composition, preferably an alloy of iron and chromium containing about 25 per cent of chromium. The electrode 8 is supported by a plurality of I-beams 10 carried upon a platform 11 and this platform may be leveled and tilted by means of the screws 12, 12, having their lower ends extending through the base member 13. These screws may be moved up and down by means of the nuts 14, 14.

An outlet 15 is provided at the lower end of the furnace and in opposition to this outlet is mounted the spout 16. This spout extends upwardly and outwardly, as shown in Fig. 1 and has its outer end 17 turned downwardly so as to discharge into any suitable receptacle or mold depending upon the character of the molten material and the use to which it is to be put. The spout preferably comprises a clay cylinder 18 around which is wound a resistance wire 19. A body of suitable insulating material 20 surrounds the clay cylinder and resistance member. Current is supplied to the resistance wire from the leads 21, 22, the circuit being provided with a suitable switch 23 and resistance 24. In order to still further control the temperature and flow of the material at the outlet end of the spout, the resistance coil 25 is provided, such coil being supplied from the circuit 21, 22, with a suitable switch 26 interposed in the circuit. The spout provides a convenient and effective means for controlling the flow from the melting chamber or furnace, since the speed of flow is regulated by the viscosity of the molten material, and this is readily controlled by means of the resistance coils 19 and 25. By the use of these heating devices, the flow may be increased or decreased and may be brought to a point where the level of the bath in the melting chamber is maintained at substantially a constant level. This promotes a uniform melting operation in the heating chamber, which in turn insures uniformity in the condition of the melted product, the advantages incident to these conditions being well known to those skilled in the art. The spout 16 is supported and made readily removable by the use of any suitable means, not shown.

As an additional means for regulating the flow from the spout, the regulating screws 12, 12 may be employed in order to tilt the furnace slightly and thus raise and lower the outlet end of the spout.

What I claim is:

1. In combination in an electric apparatus for producing vitreous products, a furnace chamber of refractory material, means for securing a flow of electric current through the body of material in the tank to melt it, an outlet spout of refractory material leading obliquely laterally and upwardly from the lower portion of the chamber and lying outside the wall of the chamber, and means for heating the spout.

2. In combination in an electric apparatus for producing vitreous products, a furnace chamber of refractory material, means for securing a flow of electric current through the body of material in the tank to melt it, an outlet spout of refractory material leading obliquely laterally and upwardly from the lower portion of the chamber with its walls spaced away from the wall of the chamber, and having a discharge end turned downwardly so as to direct the molten material

downwardly, means for heating the spout, and other means for heating the molten material at the discharge end of the spout.

3. In combination in an electric apparatus for producing vitreous products, a furnace chamber of refractory material, means for securing a flow of electric current through the body of material in the tank to melt it, an outlet spout of refractory material leading obliquely laterally and upwardly from the lower portion of the chamber, and having a discharge end recurved downwardly, means for heating the spout, and an electric heating element in such discharge end of the spout for regulating the temperature of the molten material at the point of discharge.

4. In combination in an electric apparatus for producing vitreous products, a furnace chamber of refractory material, means for securing a flow of electric current through the body of material in the tank to melt it, an outlet spout of refractory material leading obliquely laterally and upwardly from the lower portion of the chamber, and having a discharge end recurved downwardly, electric resistance means embedded in the material of the spout for heating it, and a separate electrical resistance element mounted in the end of the spout above the molten material.

5. In combination in an electric apparatus for producing vitreous products, a furnace chamber of refractory material, means for securing a flow of electric current through the body of material in the tank to melt it, an outlet spout of refractory material extending obliquely laterally and upwardly from the lower portion of the chamber and having its wall spaced away from the wall of the chamber to a point adjacent the level at which it is desired to maintain the level of the molten bath in the chamber, means for heating the body of the spout and an electrically heated member in opposition to the surface of the molten material at the outlet end of the spout.

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