J. O. ERSKINE.

ELECTRIC GLASS FURNACE.

APPLICATION FILED NOV. 21, 1917.

1,267,317. Patented May 21, 1918.

Fig. 1.

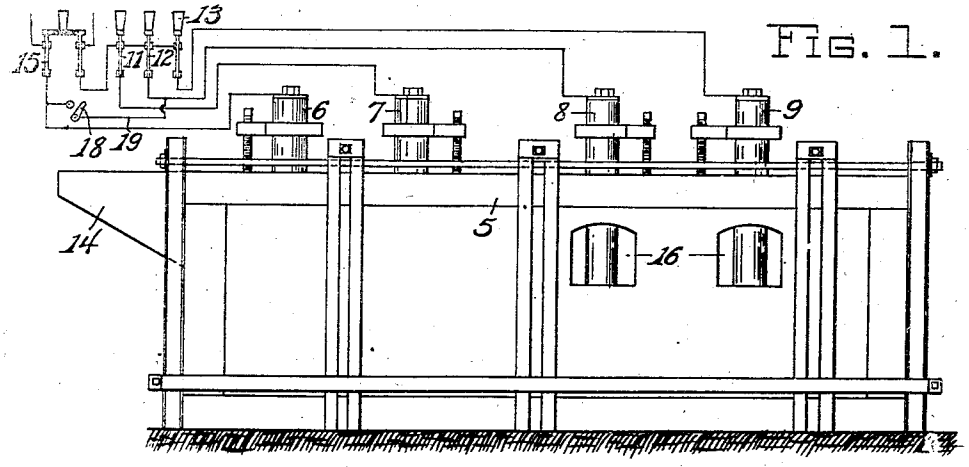


Fig. 2.

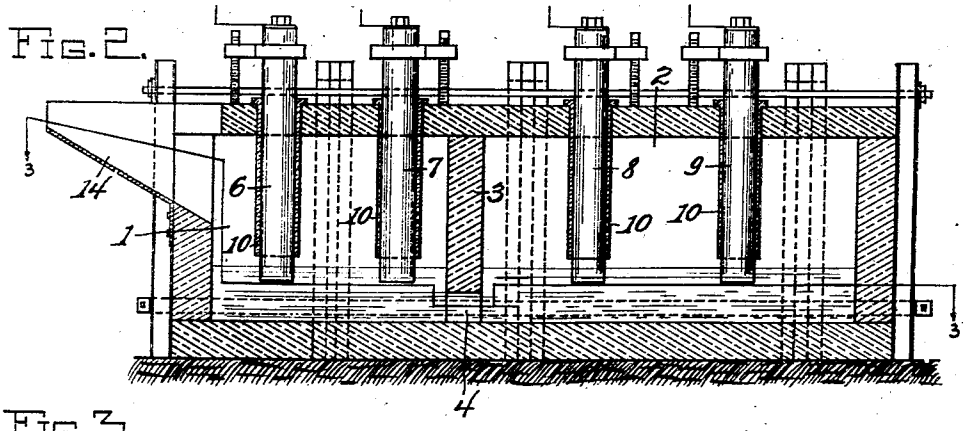
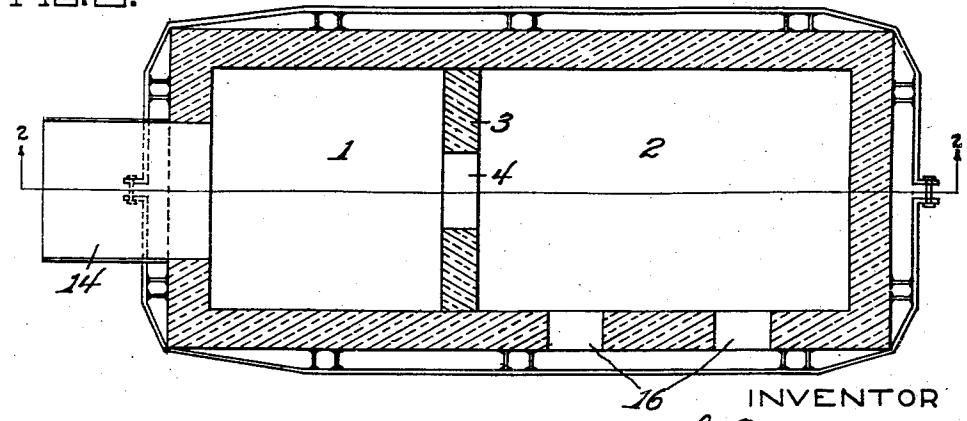


Fig. 3.



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ELECTRIC GLASS-FURNACE.

1,267,317. Specification of Letters Patent. Patented May 21, 1918.

Application filed November 21, 1917. Serial No. 203,116.

To all whom it may concern:

Be it known that I, JOHN O. ERSKINE, a citizen of the United States of America, and resident of Steubenville, county of Jefferson, and State of Ohio, have invented certain new and useful Improvements in Electric Glass-Furnaces, of which the following is a specification.

This invention relates broadly to electric furnaces, and it has for its object to provide a glass melting furnace or tank wherein the heat employed for melting the glass materials, or batch, and for maintaining the plastic condition of the glass when melted, is produced by the conversion of electrical energy.

A further object is to provide an electrically heated glass furnace in which the melting heat is generated by the relatively great resistance to the current offered by the glass material, and in which, furthermore, the use of a lining of carbon, common to electric furnaces, is dispensed with.

A still further and very important object of the invention is to provide a self-contained glass furnace or tank which may be worked continuously and which is adapted to be made in such relatively small sizes that a plurality thereof may be located in out-of-the-way corners or otherwise unutilized areas of the glass plant.

With these and other objects in view, the invention resides in the features of construction, arrangement of parts and combination of elements which will hereinafter be exemplified, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a glass furnace embodying my invention;

Fig. 2 is a central longitudinal section of the same; and—

Fig. 3 is a section on line 3—3, Fig. 2.

Referring to said drawings in which like designating characters distinguish like parts throughout the several views—

1 indicates the melting chamber and 2 the working chamber of my furnace, the walls, floor and top of which are composed of suitable tile or other refractory material. As herein shown for illustrative purposes, the furnace is rectangular in shape, but it may be of any other appropriate or preferred form. Said chambers 1 and 2 are separated by a division wall 3 in the lower part of which is provided a port 4 through which molten glass from the melting chamber may flow to the working chamber.

Projected into the furnace, preferably through the top 5, is a plurality of suitable electrodes, preferably composed of carbon, which may be located with respect to each other in any suitable arrangement. In the present preferred embodiment, two electrodes 6 and 7 are located in the melting chamber 1 and two electrodes 8 and 9 in the working chamber 2. Said electrodes are adjustably mounted so that their positions with respect to the contents of the furnace may be adjusted as desired; and, in order to shield the bodies thereof against deterioration due to heat generated in the furnace, each is embraced by a sleeve-like shield 10 of refractory material which depends within the furnace to a point slightly above the normal maximum level of said contents, leaving unshielded only a relatively short length of the end of each electrode, as shown. Instead of the separate shield 10 a coating of a heat-resisting cement may be applied as a protecting sheath to the body of the electrode.

Said electrodes are wired in series with the electrode 6 located in the melting chamber constituting, in the normal circuit, a positive pole and any desired one of the electrodes 7, 8 or 9, the negative pole, switches 11, 12 and 13 being located respectively, in the lines leading to the last-mentioned electrodes so that any one of the latter may be employed in the electric circuit with the electrode 6.

In practice, the glass material or batch to be melted is introduced, as through a hopper 14, into the melting chamber 1 and the electrodes 6 and 7 in said chamber are adjusted to positions wherein their ends

engage or sink into said material. The electric current is then switched on by closing a main switch 15 and the secondary switch 11 for closing a circuit which includes said electrodes 6 and 7, the secondary switches 12 and 13 remaining open. The circuit through said carbon poles or electrodes 6 and 7 includes the intermediate glass material which offers such great resistance to the passage of the current that a high degree of heat is generated for effecting the melting of said material.

The melted glass flows through the port 4 to the working chamber 2 from which it may be gathered in the usual manner, as through ports 16 in the side walls or other suitably located openings in the tank.

When melting has once proceeded to the point where a considerable, or working, quantity of molten glass is contained by the working chamber, a sufficiently high temperature to accomplish the melting of added material introduced in the melting chamber may be maintained by diverting the current from the electrode 7 to one of the electrodes 8 or 9 in the working end, this being accomplished by opening the switch 11 and closing either switch 12 or 13, according as it is desired to include the electrode 8 or 9 in the circuit. As is obvious, the molten condition of the glass in the working chamber is maintained when the current is directed through one of the last-mentioned electrodes. Further, the temperature may to some extent be controlled, it being apparent that a lower temperature will result when the circuit includes electrode 9, which is more remote than electrode 8 from the electrode 6, and vice versa.

When it is desired that heat be generated in the working chamber alone, a switch 18 located in a line 19 may be closed for diverting the current into a circuit which includes only the electrodes 8 and 9. In such case the secondary switches 11 and 12 are permitted to remain open while the main switch 15 and the secondary switch 13 are closed.

It will be noted that the furnace is extremely simple and inexpensive in construction. Instead of the arched silica crown which is commonly employed in glass melting furnaces, a plain flat top composed of blocks or slabs of a moderately heat-resisting character may be used in the improved furnace described, as said top is subjected to relatively low temperatures as compared with those furnaces in which gaseous fuels are employed. Indeed, the top may be wholly omitted from the melting chamber 1 without material disadvantage, due to the fact that melting of the material is accomplished by heat directly generated in the latter rather than by heat generated in juxtaposition and requiring confinement in close proximity thereto.

What is claimed is—

1. The method of producing molten glass, which consists in melting constituent glass-producing materials in an electric furnace by passing a current of electricity between electrodes in contact with a bed of said materials, said bed affording the sole resistance for generating the heat by which its melting is accomplished.

2. The method of producing molten glass, which consists in melting constituent glass-producing materials in an electric furnace by passing an electric current through said materials between two electrodes which have their ends submerged in said materials, the constituent materials intermediate said electrodes constituting the sole circuit-completing conductor for the passage of said current between said electrodes and affording the sole resistance for generating melting heat.

3. A continuous glass melting method which consists in passing an electric current between two electrodes having their ends submerged in molten glass in an electric furnace, so that the resistance of said glass to the passage of said current generates a melting heat, and supplying raw glass-producing materials to said furnace as molten glass is withdrawn from the latter.

4. A continuous method of melting glass in an electric furnace having melting and working ends, which consists in introducing raw glass-materials to be treated into the melting end in contact with molten glass contained therein, and passing an electric current through said molten glass between electrodes having their ends submerged in said molten glass for heating the latter through resistance offered thereby to a temperature sufficient for melting said raw materials.

5. In an electric glass furnace, a melting chamber and a working chamber, a division wall separating said chambers and having a port therein for the passage of melted glass from the melting chamber to the working chamber, a pair of electrodes located in the melting chamber, an electrode located in the working chamber, and means for diverting an electric circuit from one of the first-mentioned electrodes through the last-mentioned electrode, said first-mentioned electrodes being partially submerged in the material to be melted whereby said material constitutes a resistance element and the last-mentioned electrode being adapted to be partially submerged in the molten glass in the working chamber.

6. In an electric glass furnace, a melting

chamber and a working chamber, a division wall separating said chambers and having a port therein for the passage of melted glass from the melting chamber to the working chamber, a pair of electrodes located in the melting chamber, an electrode located in the working chamber and wired in series with one of the electrodes in the melting chamber, and means for diverting the circuit from one to the other of said series-wired electrodes, said electrodes being adapted to contact directly with the glass material which constitutes the heating resistance element.

In testimony whereof, I affix my signature in presence of two subscribing witnesses.

JOHN O. ERSKINE.

Witnesses:
H. E. DUNLAP,
W. F. KEEFER.