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C. H. WRIGHT

SHEET GLASS DRAWING APPARATUS

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Fig. 1.

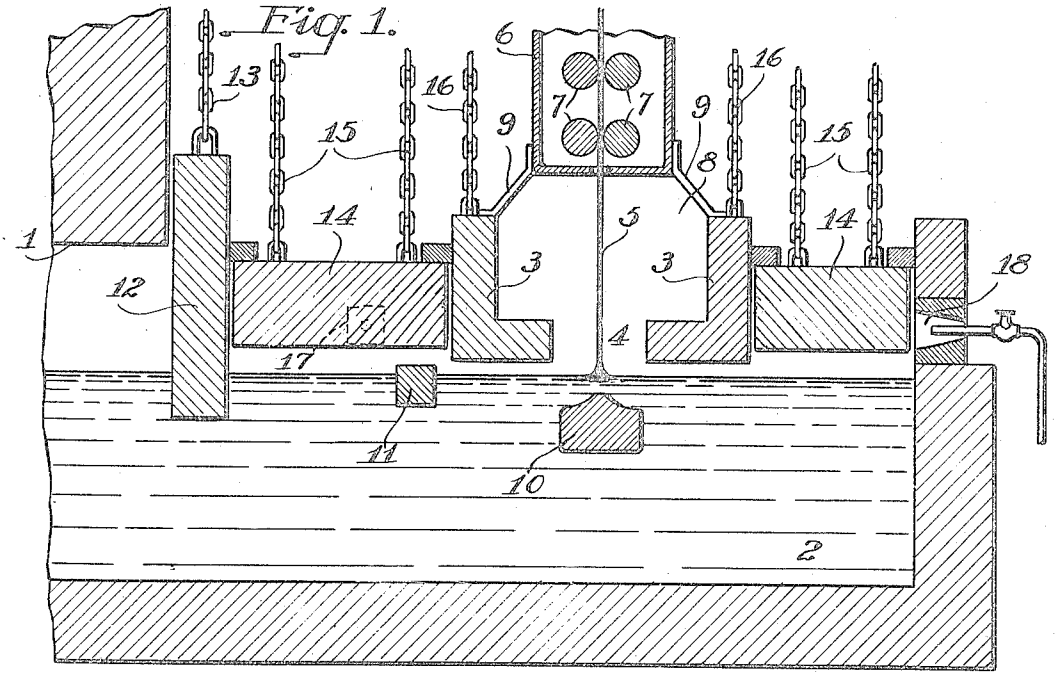
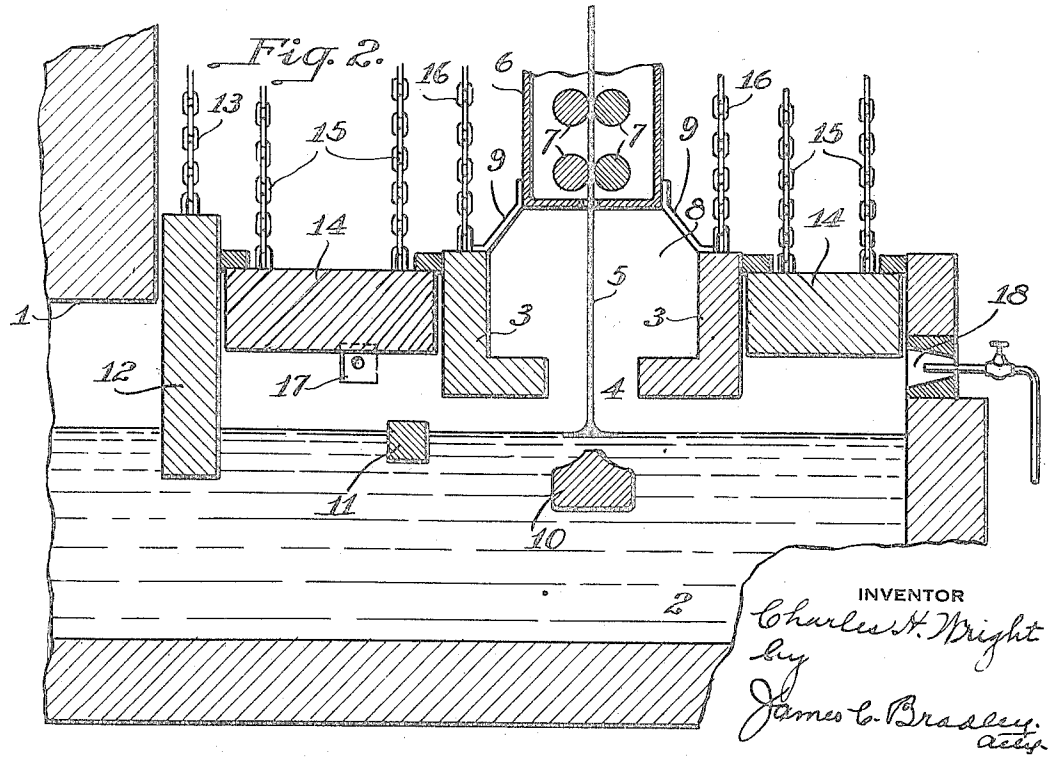


Fig. 2.



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SHEET-GLASS-DRAWING APPARATUS.

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The invention relates to an apparatus for drawing sheet glass and particularly to the forehearth or drawing tank construction. It has for its principal objects the provision of improved means for regulating the temperature of the glass and for increasing the economy of operation of the apparatus. Heretofore it has been the practice to apply heat by means of gas burners to the spaces between the arch or top of the tank and the glass on both sides of the line of generation of the sheet throughout the drawing operation. The temperature of the glass on the two sides of the sheet under these conditions was controlled by regulating the flow of gas to the burners. This method of control has not given the uniformity of temperature desired and the present invention is designed to improve the temperature control and at the same time dispense with the use of the gas burners during the drawing operation, such burners being employed only at those intervals when the drawing operation is discontinued and it is desired to recondition the bath by bringing the body of glass in the tank and particularly the surface portion to a temperature considerably above the normal drawing temperature. One embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical longitudinal section through the apparatus, with the parts in position of use. And Fig. 2 is a similar view, but with the parts in a different position, the position of the parts being that occupied when the drawing operation is discontinued and the bath is being reconditioned preliminary to starting another draw.

Referring to the drawings, 1 is the end of a melting tank, preferably of the regenerator type, and 2 is a forehearth or drawing tank, preferably of the same depth as the melting tank, so that a relatively large, deep body of glass is provided from which the sheet is drawn. Extending transversely of the forehearth from one side to the other is a pair of blocks 3, 3, preferably L-shaped section, and spaced apart so as to provide a drawing opening 4. The glass ribbon or sheet 5 may be drawn upward by any desired form of apparatus, although the one shown is preferably employed. This drawing device comprises a casing 6 having pairs of opposing rolls 7, 7 for gripping the opposite sides of the sheet and drawing it upward. This casing extends upward a distance of 15 to 20 feet and is divided into compartments of gradually decreasing temperature so that the sheet is annealed and cooled as it travels therethrough being cut off at the top in sections as it emerges. This is a well-known type of drawing apparatus requiring no further description. The space 8 above the bath through which the sheet is drawn is preferably closed off from the atmosphere by means of the inclined plates 9, 9 and by other plates located at the ends of the space 8.

A draw bar 10 is preferably employed in the glass bath beneath the line of generation of the sheet in order to fix the position of the line of generation. A bar 11 is also preferably employed a little to the rear of the transverse block 3, which bar extends transversely of the furnace and acts as a skimming device to prevent impurities at the surface of the glass from being carried along and drawn into the sheet. A cut off between the melting tank 1 and the forehearth is provided in the form of the gate 12 supported above for vertical movement by means of chains 13. This cut off extends down into the glass and serves to shut off the space above the glass in the forehearth from the space above the glass in the melting tank, thus assisting in maintaining more uniform conditions in the forehearth than would otherwise be the case. Lying to the rear of the L-blocks 3, 3 are the top or roof plates 14, 14 supported from above by means of the chains 15, 15. These chains are connected at their upper ends to suitable elevating devices so that the plates 14, 14 may be adjusted to any desired height with respect to the level of the glass in the forehearth. The L-blocks 3, 3 are also similarly supported for vertical adjustment by means of the chains 16, 16. Burner holes 17, 18 are provided through the sides walls of the forehearth so that when the parts are in the position shown in Fig. 2, the forehearth may be heated by means of gas burners directed through the openings.

When the glass sheet or ribbon 5 is being drawn, the parts occupy the position illustrated in Fig. 1, with the plates 14, 14 lowered so that they are relatively close to the surface of the glass, thus blanking the burner openings 17, 18. With this ar-

rangement, very uniform temperature conditions may be maintained in the forehearth on both sides of the sheet without the application of any outside heat thereto. The outer end of the forehearth has a tendency to drop below the temperature of the other end which is next to the melting tank, but this condition may be compensated for by lowering the top plate 14 at the outer end of the tank so that it is closer to the bath than the other top plate lying at the inner end of the tank. By regulating the relative vertical position of these two top plates, a uniform temperature condition may be maintained in the glass upon the two sides of the sheet being drawn. This range of control is increased by having both of the plates 14 adjustable, although a similar result may be obtained, but of less range, by having only the outer plate adjustable, so that the invention is not limited to making both of these plates adjustable. The heat losses are also reduced by carrying the plates 14, 14 at a position relatively close to the surface of the glass, but out of contact therewith. Under these conditions the body of the glass in the forehearth is heated entirely from the melting tank and any fluctuations in this temperature are necessarily slow and extend over a long period of time. This condition tends to reduce breakage in the glass being drawn and to give a uniform product.

When it becomes necessary to discontinue the drawing operation and recondition the bath, the parts are shifted to the position shown in Fig. 2, the plates 14, 14 being raised as well as the L-blocks 3, 3. At this time the gate 12 may also be raised so as to allow a greater amount of heat to pass from the forehearth into the melting tank. Additional heat is supplied at this time to the forehearth by means of the gas burners projecting into the openings 17 and 18. Under these conditions, the temperature of the glass in the forehearth is raised a very substantial amount, so that the glass is reconditioned and any cold glass at the surface of the bath, such as that found opposite the drawing opening 4 is remelted and brought to a temperature suitable for a new drawing operation. The parts are then returned again to the position of Fig. 1 and the drawing proceeded in the usual way, a bait being employed, as is common in the art, to start the drawing operation and carry a new sheet of glass up between the rolls 7, 7.

What I claim is:

1. The combination with a melting tank with a forehearth or drawing tank leading from one side thereof, of a pair of opposing blocks extending across the forehearth above the glass and spaced apart to provide a drawing opening, apparatus above said opening for drawing a sheet of glass continuously upward, and a top or roof plate to the rear of each of said blocks, also spaced above the surface of the glass, the one of such plates adjacent the outer end of the forehearth being mounted for vertical adjustment.

2. The combination with a melting tank with a forehearth or drawing tank leading from one side thereof, of a pair of opposing blocks extending across the forehearth above the glass and spaced apart to provide a drawing opening, apparatus above said opening for drawing a sheet of glass continuously upward, and a top or roof plate to the rear of each of said blocks, also spaced above the surface of the glass, said plates being mounted for vertical adjustment independent of each other.

3. The combination with a melting tank with a forehearth or drawing tank leading from one side thereof, of a pair of opposing blocks extending across the forehearth above the glass and spaced apart to provide a drawing opening, apparatus above said opening for drawing a sheet of glass continuously upward, and a top or roof plate to the rear of each of said blocks, also spaced above the surface of the glass, said blocks and plates all being mounted for independent vertical adjustment.

4. The combination with a melting tank with a forehearth or drawing tank leading from one side thereof, of a pair of opposing blocks, L-shape in cross section, extending transversely of the forehearth above the glass and spaced apart to provide a drawing opening, apparatus above said opening for drawing a sheet of glass continuously upward, and a top or roof plate to the rear of each of said blocks, also spaced above the surface of the glass, the one of such plates adjacent the outer end of the forehearth being mounted for vertical adjustment.

5. The combination with a melting tank with a forehearth or drawing tank leading from one side thereof, of a pair of opposing blocks extending across the forehearth above the glass and spaced apart to provide a drawing opening, apparatus above said opening for drawing a sheet of glass continuously upward, a cut off member extending down into the glass at the inner end of the forehearth positioned so as to shut off the area in the forehearth above the glass from the space above the glass in the melting tank, and a top or roof plate to the rear of each of said blocks and spaced above the surface of the glass, the one of such plates adjacent the outer end of the forehearth being mounted for vertical adjustment.

6. The combination with a melting tank with a forehearth or drawing tank leading from one side thereof, and having gas bur-

ner openings through the walls above the surface of the glass bath therein, of a pair of opposing blocks extending across the forehearth above the glass and spaced apart to provide a drawing opening, apparatus above said opening for drawing a sheet of glass continuously upward, and a top or roof plate to the rear of each of said blocks also spaced above the surface of the glass, the one of such plates adjacent the outer end of the forehearth being mounted for vertical adjustment.

In testimony whereof, I have hereunto subscribed my name this 4 day of May, 1926.

CHARLES H. WRIGHT.