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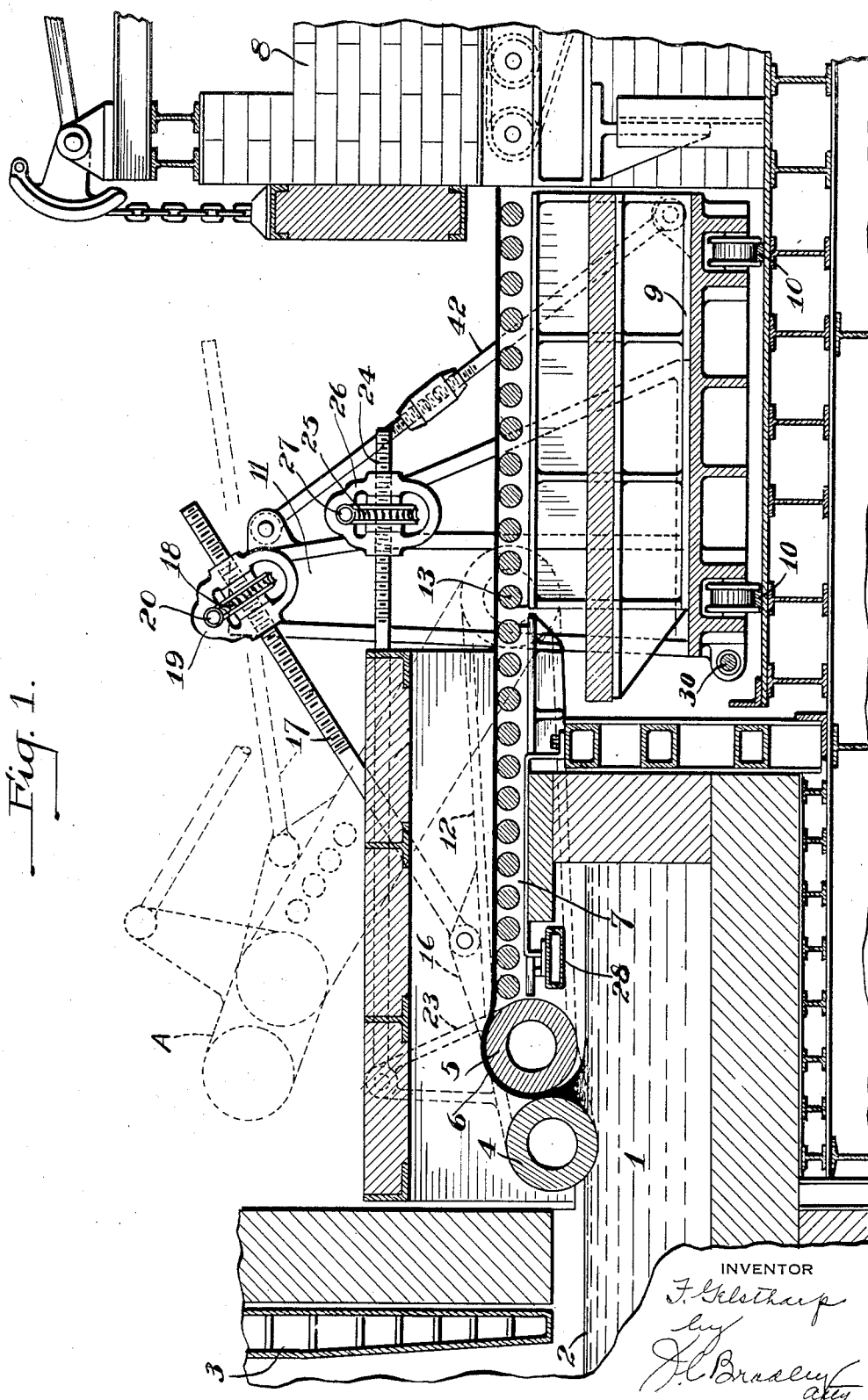
F. GELSTHARP

1,775,125

APPARATUS FOR MAKING PLATE GLASS

Filed Nov. 25, 1927

3 Sheets-Sheet 1



INVENTOR

F. Gilstrap
by
J. L. Bracey
Atty

Sept. 9, 1930.

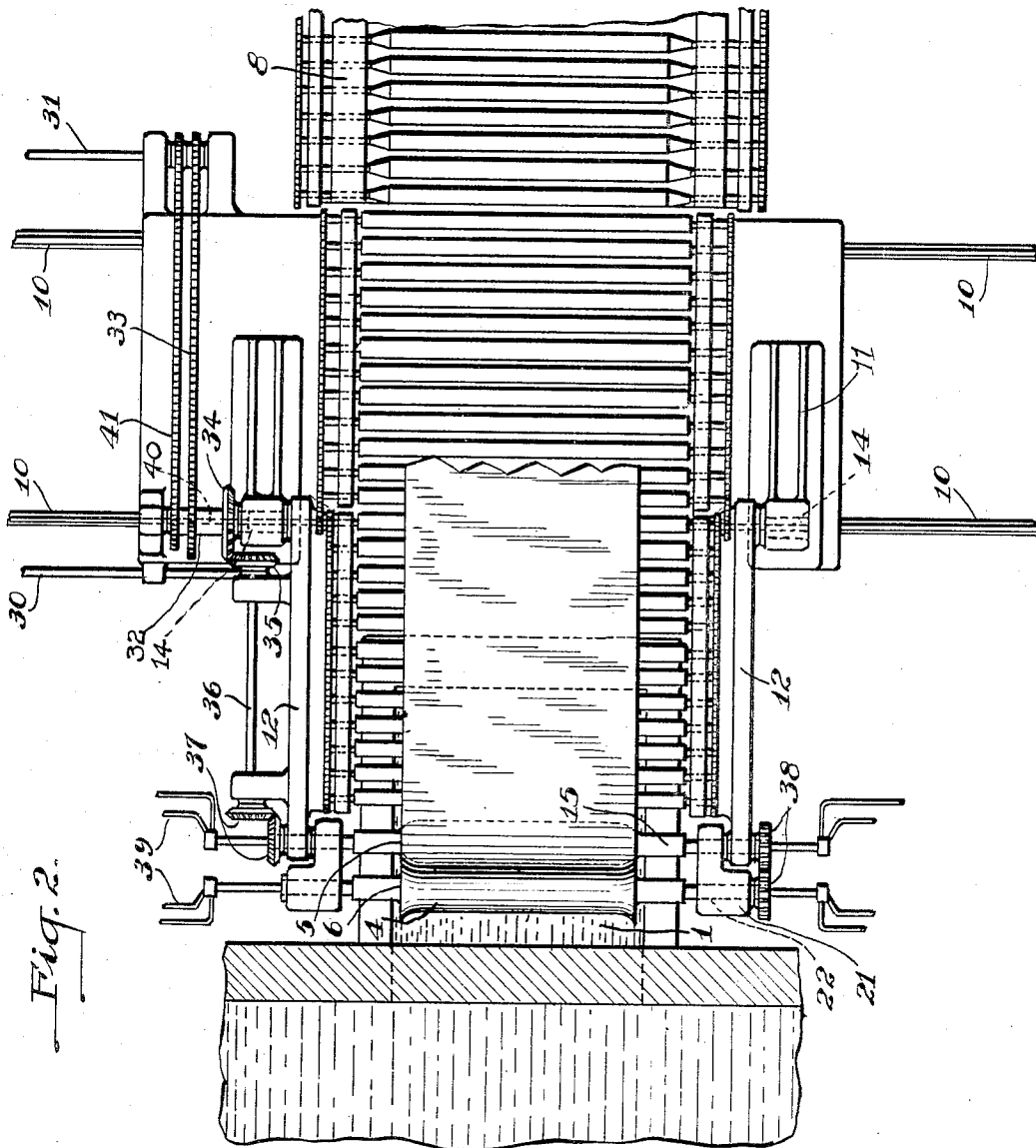
F. GELSTHARP

1,775,125

APPARATUS FOR MAKING PLATE GLASS

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3 Sheets-Sheet 2



INVENTOR

Frederick Gelstharp
by
James C. Bradley
att'y

Sept. 9, 1930.

F. GELSTHARP

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3 Sheets-Sheet 3

Fig. 4.

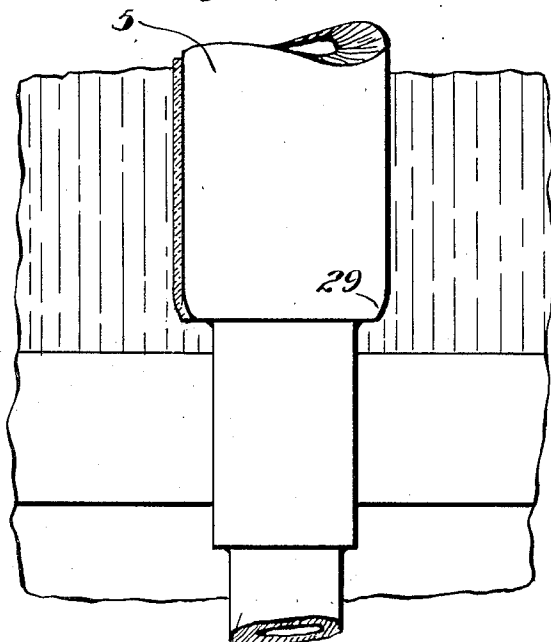
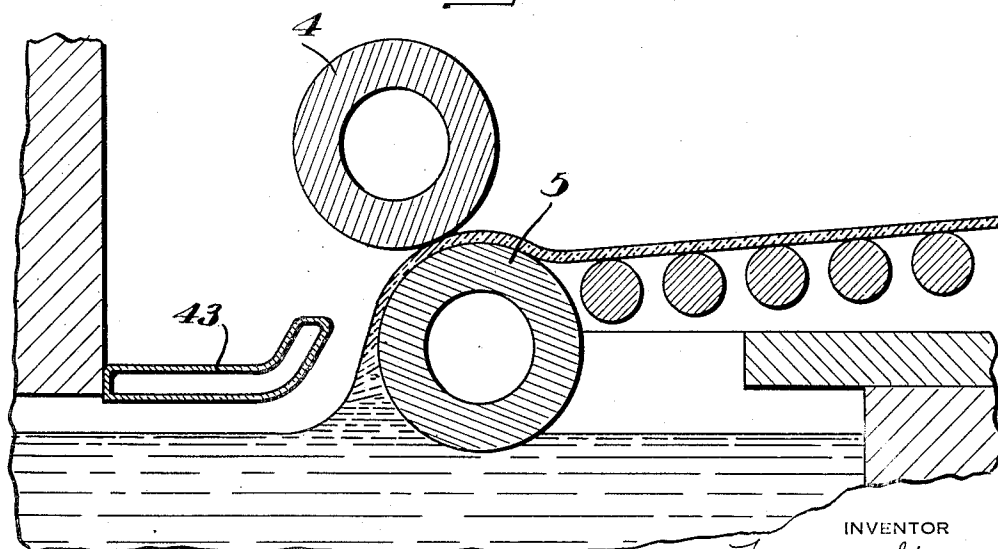


Fig. 3.



INVENTOR

Frederick Gelstharp
by
James C. Bradley
att'y

UNITED STATES PATENT OFFICE

FREDERICK GELSTHARP, OF TARENTUM, PENNSYLVANIA, ASSIGNOR TO PITTSBURGH
PLATE GLASS COMPANY, A CORPORATION OF PENNSYLVANIA

APPARATUS FOR MAKING PLATE GLASS

Application filed November 25, 1927. Serial No. 235,459.

The invention relates to apparatus for producing glass in a continuous sheet or ribbon and involves further developments of the constructions shown in my Patents Nos. 1,615,834 and 1,580,130. The invention has for its primary objects, the provision of improving means for accomplishing the function above set forth; for securing the adjustment of the rolls relative to each other and to the glass bath for securing uniformity in temperature conditions on the two sides of the sheet or ribbon; and for preventing the sheet from narrowing as the operation progresses, and one of the rolls is adjusted to a position above and out of contact with the glass bath. Certain embodiments of the invention are illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical section through one form of the apparatus. Fig. 2 is a plan view of the apparatus of Fig. 1 on a reduced scale. Fig. 3 shows a modification. And Fig. 4 is a partial plan view of one of the rolls as used in the Fig. 1 construction.

Referring to Figs. 1 and 2, 1 is a forehearth or drawing tank communicating with a melting tank 2, preferably of the regenerator type, and 3 is a water cooled gate which may be used for cutting off the flow of glass to the forehearth or for regulating the temperature of such glass. The forehearth 1 opens upwardly and above the bath are mounted a pair of fluid cooled driven sizing rolls 4 and 5 between which the glass sheet 6 is formed and sized, such sheet after its formation moving laterally over a runway or bed 7 which leads into the leer 8.

The runway and sizing rolls are carried upon a truck 9 mounted upon the track 10 so that these parts may be moved laterally from position in front of the tank when it is desired to repair the parts or in order to give access to the front end of the tank. The truck comprises a rigid framework having a pair of upwardly extending side posts or standards 11 and a pair of arms 12 mounted for swinging movement about the center line of the roller 13. These arms are carried upon a pair of pivots 14 (Fig. 2) supported in the posts 11 and carry at their outer ends the shaft 15 of the sizing roll 5. The arms 12 are provided with lugs 16 to which are pivoted the adjusting rods 17, threaded at their upper ends through nuts in the worm wheels 18. These worm wheels are mounted for rotation in the members 19 swiveled upon the upper ends of the posts 11 and driven by a transverse shaft 20 provided with worms which engage the worm wheels. The arms 12 carry the rollers of the runway 7 to the left of the roller 13, so that the adjusting means, as above described, serves to regulate the position of the roll 5 and runway with respect to the glass bath and to raise these parts to a position, so that they will clear the sides of the tank when it is desired to run the truck laterally in order to remove the rolling apparatus from a position above the drawing tank. This adjustment to upper position is shown in dotted lines at A in Fig. 1.

The sizing roll is mounted for adjustment around the center line of the roll 5, this being accomplished by means of the arms 21 (Fig. 2) carrying at their outer ends the axle 22 of the roll 4 and pivoted at their inner ends upon the shaft 15 of the roll 5. The arms 22 have the upstanding lugs or standards 23 (Fig. 1) to which are pivotally connected the operating rods 24. These rods are threaded at their rear ends through the worm wheels 25. These worm wheels are mounted in members 26 swiveled to the side posts, the wheels being driven from the transverse shaft 27 by means of worms which engage the wheels. It will be seen that the adjusting rods 17 serve to adjust the runway and the sizing rolls, as a unit, to any desired position with respect to the bath, and that the rods 24 serve to adjust the roll 4 to any desired position with respect to the bath and the roll 5. These adjustments become desirable, depending upon the conditions encountered, and may vary at different periods of the rolling operations. Such rolling operation may be initiated with both of the rolls 4 and 5 in the glass and after such operation is under way, the rolls may be adjusted to the position shown. In order to give an additional chilling effect upon the glass adjacent the roll 5, the water cooled platen 28 may be

employed extending transversely of the bath thereabove and cooled by a circulation of water. In order to prevent the sheet from narrowing after leaving the bath, the end of the roll 5 may be tapered inward or beveled, as indicated at 29 in Fig. 4. When the edge of the sheet bends around this tapered portion of the roll, it partially hardens in such position and thus counteracts any tendency of the edge to work inward and thus narrow the sheet. This feature of construction also comes into service when the parts are adjusted to the position shown in Fig. 3. The driving means of the parts will be seen by reference to Fig. 2 in connection with Fig. 1. The truck or table 9 is preferably moved laterally by means of the shaft 30 extending through a nut carried by the framework of the truck and threaded so that the rotation of the shaft moves the car back and forth, depending upon the direction of the rotation of the shaft. This shaft is driven by any suitable means, not shown. The drive of the rolls 4 and 5 is accomplished from the main drive shaft 31, which drives a countershaft 32 through the intermediary of the chain 33 passing around suitable sprockets on the two shafts. This shaft is axially arranged with respect to the center line of the roll 13, about which the arms 12 pivot and carries at its end a bevel gear 34 which drives another bevel gear 35 carried upon a second countershaft 36. This second countershaft drives the axle 15 of the roll 5 through the intermediary of the bevel gears 37, one of which is carried upon the shaft 36 and the other of which is carried by the shaft 15. The roll 4 is driven from the roll 5 by means of the spur gears 38 carried by the shafts 15 and 22 of the rolls 5 and 4. The rolls 4 and 5 are cooled by means of the water pipes 39 connected to swiveled headers upon the ends of the roll shafts. The roller 13 is driven from a countershaft 40 (Fig. 2) which extends through the hollow countershaft 32, the shaft 40 being driven from the main drive shaft 31 through the intermediary of the sprocket chain 41 and sprockets upon the two shafts. The rollers in the bed to the right of the rollers 13 and also those in the bed to the left of such roller, are all driven from the roller 13 by means of sprocket chains which pass around sprockets on the ends of the roller shafts, this method of driving being roughly shown in Fig. 2, and require no detailed description since it is well-known in the art. The rollers in the roller leer are similarly driven by means of suitable sprocket chains passing around sprockets at the ends of the rolls. The side posts or standards 11 are made relatively stiff and rigid, and in addition, are braced by means of rods 42 arranged as indicated in Fig. 1.

The operation, as heretofore indicated,

may be started by first positioning the rolls 4 and 5 so that they both contact with the glass bath, whereupon the rotation of the rolls will pick up the glass without the use of a bed and carry it up over the roll 5 and onto the roller leer, the advance end of the sheet being turned by hand bars as it first emerges, so that it passes over the roll 5 instead of in the reverse direction, and after the sheet is once started, it will maintain itself in this position. After the operation is under way, the rods 17 and 24 are adjusted to bring the sizing rolls to the positions shown with the roll 5 spaced above the surface of the bath. This position of the roll 5 above the bath serves to equalize the cooling effect of the two rolls 4 and 5 upon the sheet, the arc of contact of the glass with the two rolls being substantially the same when the rolls are positioned, as indicated in Fig. 1. By shifting the rolls relatively to meet requirements, the cooling effect of the two rolls may be made uniform upon the two sides of the sheet, which is a desirable condition, as the strain introduced into the sheet in cooling is less if the temperature conditions upon the two sides thereof are the same when such cooling begins.

Fig. 3 illustrates another adjustment which it is possible to make with the rolls 4 and 5 by the use of the rods 17 and 24, the roll 4 being moved to a position above the glass, while the roll 5 is lowered into the glass. Under these conditions, an additional cooling effect upon the upper side of the sheet is provided for by the use of the water cooled platen 43 having its end upturned, as illustrated so as to give a maximum cooling effect upon the surface of the bath and also upon the base portion of the sheet which is being formed. The beveled roll construction shown in Fig. 4 is employed under these conditions in order to prevent the sheet from gradually narrowing as the rolling operation progresses, the opposing roll being preferably curved reversely at its ends to follow the curve of the roll 5 at its ends. For simplicity in illustrating, no showing is included of the devices at the ends of the rolls known as "guns" similar to the members 44 of my Patent No. 1,615,834, but it will be understood that such devices and other auxiliary devices commonly used with rolling mechanism are to be employed as required. The cooling devices 28 and 43, may or may not be used, depending upon conditions, and if desired, such devices may be used as heating means by the use of suitable gas supply and burner devices.

What I claim is:

1. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other

lies alongside such roll with its axis in a vertical plane, spaced in a horizontal direction to the side of the vertical plane in which the axis of the first roll is located, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, and means for supporting and carrying away the glass which is delivered upward from the rolls.

2. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, having a substantially vertical pass therebetween, one of which has its periphery immersed in the body of glass, while the other has its periphery spaced above such body, means for cooling the rolls so as to prevent the molten glass from adhering thereto, and means for supporting and carrying away the glass which is delivered upward between the rolls.

3. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other lies alongside such rolls with its axis in a vertical plane, spaced in a horizontal direction to the side of the vertical plane in which the axis of the first roll is located, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, and a glass receiving bed or runway extending laterally with respect to the rolls for carrying away the glass sheet formed therebetween.

4. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other lies alongside such roll with its axis in a vertical plane, spaced in a horizontal direction to the side of the vertical plane in which the axis of the first roll is located, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, means for supporting and carrying away the glass formed between the rolls, and a fluid cooled chilling device located above the surface of the bath next to the roll lying at the higher level.

5. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other lies alongside such roll with its axis in a vertical plane,

spaced in a horizontal direction to the side of the vertical plane in which the axis of the first roll is located, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, and a receiving bed or runway extending laterally from the roll which is at the higher level for carrying away the glass sheet which is formed.

6. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other lies alongside such roll, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, means whereby both rolls may be adjusted as a unit toward and from the molten body of glass, and means whereby one of the rolls may be adjusted about the center of the other roll as an axis.

7. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other lies alongside such roll, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, a glass receiving bed or runway extending laterally from the side of one of said rolls for carrying away the glass formed between the rolls, means whereby the two rolls may be adjusted vertically as a unit, and means whereby the roll on the side away from the bed or runway may be adjusted about the center of the other roll as an axis.

8. In combination, a glass tank containing a body of molten glass and open above a portion of the bath, a pair of horizontal driven sizing rolls above said portion of the bath, one of which has its periphery immersed in said body of glass, while the other lies alongside such roll, but at a higher level so that its periphery lies above the surface of said body of glass, means for cooling the rolls, so as to prevent the glass from sticking thereto, a glass receiving bed or runway extending laterally from the side of one of said rolls for carrying away the glass formed between the rolls, means whereby the two rolls and the runway may be adjusted as a unit so as to bring the rolls toward or away from the body of glass in the tank, and means whereby the roll on the side away from the bed or runway may be adjusted about the center of the other roll as an axis.

9. In combination, a glass tank containing a body of molten glass and open above a por-

tion of the bath, a pair of horizontal driven
sizing rolls above said portion of the bath,
one of which has its periphery immersed in
said body of glass, while the other lies at a
higher level so that it is out of contact with
the body of molten glass, the end of the roll
which lies in the glass having its ends tapered
inward to provide an edge holding means
for the sheet as it is formed and the other
roll having its ends tapered reversely, means
for cooling the rolls so as to prevent the glass
from sticking thereto, and means for support-
ing and carrying away the glass which is de-
livered by the rolls.

In testimony whereof, I have hereunto sub-
scribed my name this 18th day of November,
1927.

FREDERICK GELSTHARP.

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