

June 3, 1930.

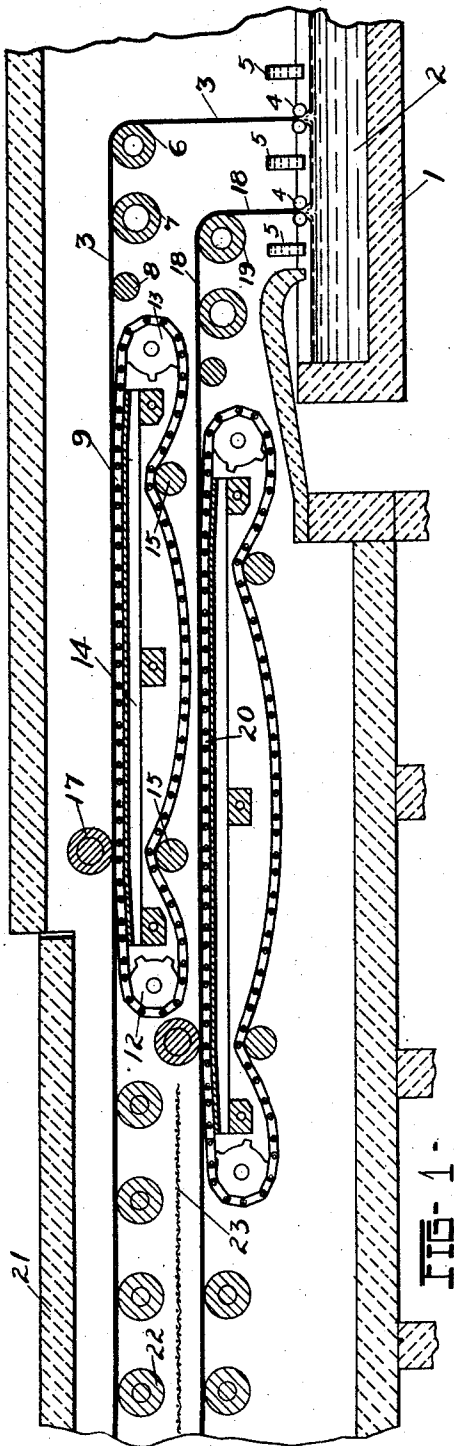
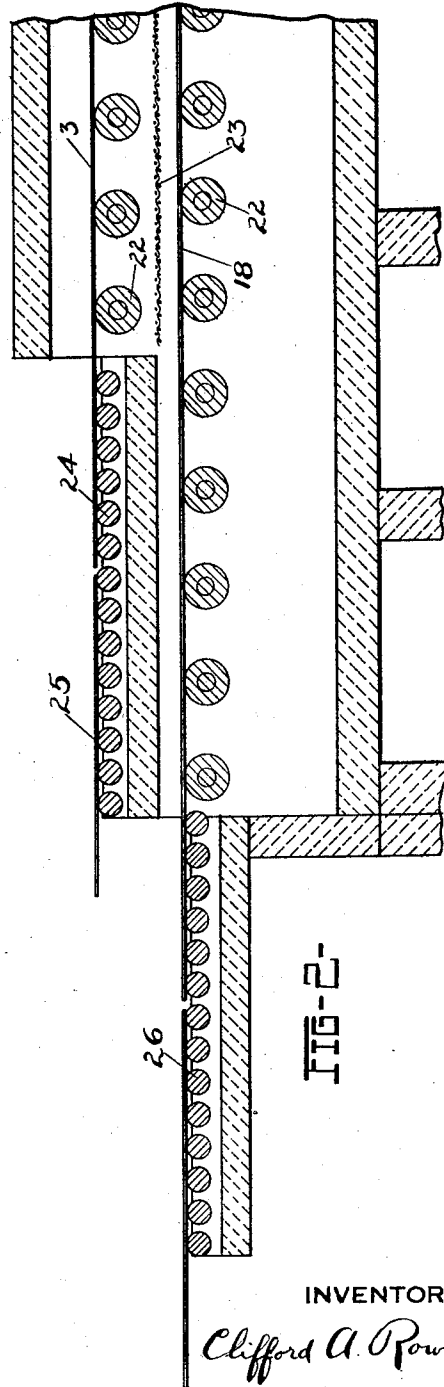
C. A. ROWLEY

1,761,235

DRAWING SHEET GLASS

Filed Jan. 25, 1924

2 Sheets-Sheet 1



INVENTOR

Clifford A. Rowley

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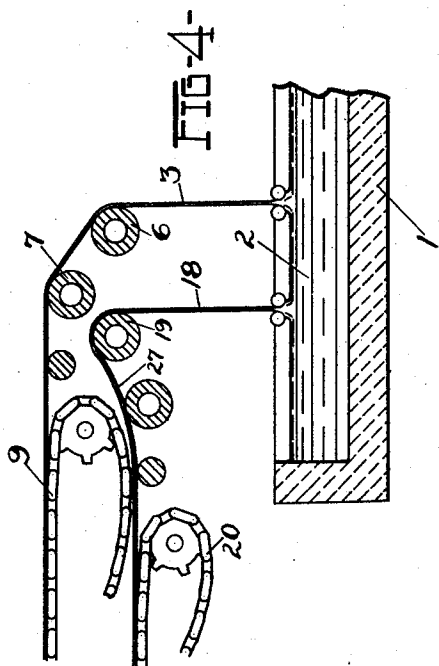
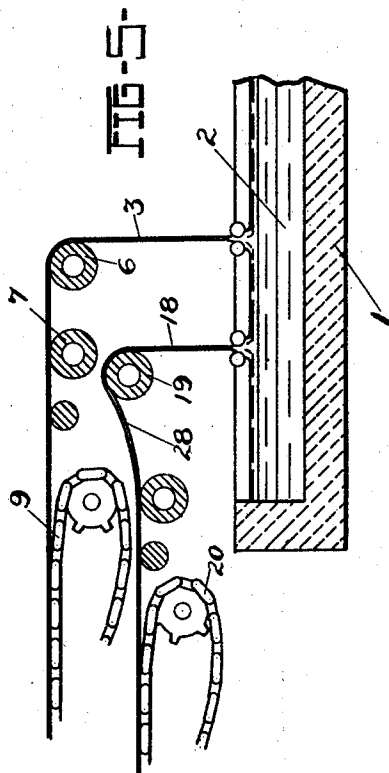
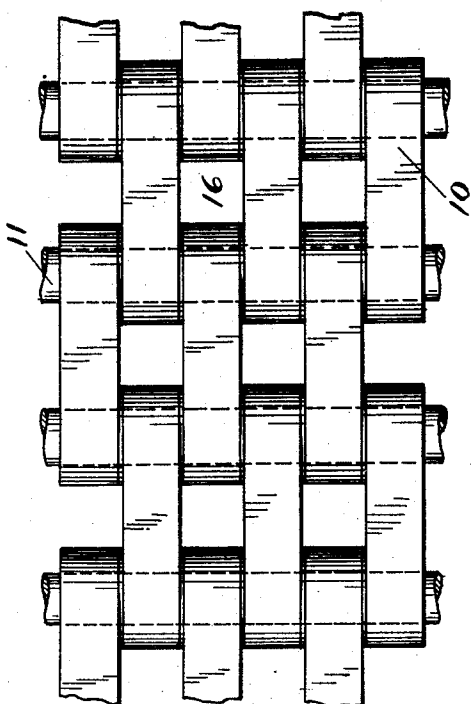
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2 Sheets-Sheet 2



INVENTOR
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UNITED STATES PATENT OFFICE

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DRAWING SHEET GLASS

Application filed January 25, 1924. Serial No. 688,358.

This invention relates to improvements in the art of drawing sheet glass, and more particularly to an improved process and apparatus for simultaneously and independent-
5 ly drawing a plurality of sheets of glass.

In the patent to Colburn 1,248,809, granted December 4, 1917, is disclosed a process and apparatus for drawing a single glass sheet. The sheet is drawn upwardly from a pool
10 of molten glass, bent while still plastic about a cooled bending roller, and then carried horizontally over a moving drawing and flattening table, after which it passes horizontally through a long leer to a cutting table
15 where it is divided into suitable sheet sections. By using the principles of the present invention this process is so modified that two or more sheets may be simultaneously but independently produced from the same tank and through the same drawing machine and
20 leer.

The separate sheets are drawn vertically in spaced parallel planes from the same pool of molten glass, each sheet is bent into the
25 horizontal about its own bending roller, and the sheets are passed horizontally in spaced parallel planes through the same leer from which each sheet emerges onto its own cutting table. The most difficult problem to
30 be solved in designing this new apparatus is to provide a drawing and flattening mechanism that can be installed in the necessarily narrow space between the parallel horizontally traveling sheets. This has been accom-
35 plished principally by making three changes from the form of drawing mechanism previously used; first, shorter links are used for the flexible moving flattening table or belt upon which the sheet is carried; second, a
40 simpler and more compact drawing mechanism above the sheet for holding the sheet in frictional contact with the flattening table has been adopted; and third, the separate drawing mechanisms are arranged in stag-
45 gered vertical relation so that the upper drawing mechanism for the lower sheet and the lower sheet-supporting drawing mechanism for the upper sheet may be arranged in substantial horizontal alignment, whereby
50 the space between the superposed sheets need

be no greater than necessary for either one of the two mechanisms.

The objects and advantages of this invention will be more apparent from the following detailed description of certain approved
55 forms of mechanism designed according to the principles of this invention.

In the accompanying drawings:

Fig. 1 is a longitudinal vertical section through the sheet-forming portion of this
60 apparatus and the entrance end of the leer.

Fig. 2 is a similar view through the exit end of the leer, indicating the cutting tables for the different sheets. It is to be under-
65 stood that a considerable portion of the leer has been omitted between the left-hand end of Fig. 1 and the right-hand end of Fig. 2.

Fig. 3 is a plan view of a fragment of the sheet-supporting draw-table.

Figs. 4 and 5 are views illustrating some-
70 what different arrangements of the bending rollers.

It will be understood that the drawings here used are largely diagrammatic, and in detail the mechanism will be much the same
75 as shown in the Colburn patent referred to above. At 1 is shown the draw-pot or receptacle containing the shallow pool of molten glass 2 from which the glass sheets are drawn. This pool 2 is in open communication with
80 a continuous tank furnace wherein the molten glass is produced and from which the supply of glass in the pool 2 is replenished. One of the glass sheets such as 3 is drawn
85 upwardly from the pool 2 between pairs of edge-forming rollers 4 and coolers 5, all as described in detail in the Colburn patent. The sheet is bent into the horizontal plane
90 about a cooled polished bending roller 6 and then carried over certain intermediate supporting rollers such as 7 and 8 onto the drawing and flattening table 9. This table is of the general construction illustrated in Fig. 3,
95 comprising a series of similar overlapping links 10 pivoted at their ends on pintle rods 11 which extend across the full width of the table. This table is in the form of a flexible loop which is driven by and passes around
100 supporting sprockets 12 and 13 at the ends of the loop, and the upper sheet-carrying run

of the belt or chain is supported upon a stationary table 14 having an upper flat horizontal surface.

In the flattening table heretofore in use, the links 10 are about six inches in length, with four inches between pivot centers. It has been discovered that by decreasing the length of these links so that the distance between pivot centers is not over two, or two and one-half inches, the chain is rendered much more flexible and may be passed about smaller sprockets 12 and 13 at the ends of the loop. By employing a plurality of idler supporting drums 15 for the lower return run of the loop, and decreasing the vertical height of the stationary supporting table 14, the over-all vertical height of the drawing and flattening table is made no greater than the necessary turning diameter at the ends of the loop, in the form described being less than ten inches over all. This is approximately the distance between each pair of glass sheets as they are passed horizontally through the drawing machines and the leer. The draw-table using the shorter links 10 has the same area of sheet-supporting surface as the table heretofore in use with longer links, and this area is better distributed, the holes 16 which represent unsupported portions of the sheet being smaller than in the older form.

Instead of the endless loop of draw-bars above the sheet for holding the sheet in frictional engagement with the draw-table, as disclosed in the prior Colburn patent, a single roller 17, or preferably a pair of these rollers bearing upon the edge portions only of the sheet, is now used. It has been demonstrated that these rollers, which are preferably driven, are amply sufficient to provide the necessary frictional drawing contact between the glass sheet and the surface of the sheet-supporting and flattening table.

The second glass sheet 18 is drawn upwardly in a separate vertical plane parallel to the first sheet 3 from the same pool of molten glass 2, and is bent around a cooled bending roller 19 similar to bending roll 6, but positioned somewhat lower than roll 6, so that the sheet 18 in the horizontal plane will pass just below the bottom of the lower return loop of draw-table 9 which supports and draws the upper sheet 3. As stated above, the distance between the two sheets 3 and 18 in the construction here shown will be approximately 10 inches. By suitably controlling the temperature conditions around the separate sheets 3 and 18, each of these sheets may successfully be drawn, although there is the small difference noted in the height of their vertical runs. The drawing and flattening table 20 for the lower sheet 18 may be made of exactly the same form as table 9 used for the upper sheet. Since the sheet 18 is drawn upwardly in a plane spaced to the left of that of sheet 3, the bending roll 19 and the intermediate support-

ing rollers will also be spaced to the left of the corresponding rollers used with sheet 3. For the same reason the right-hand end of the lower flattening table 20 will not project as far to the right as that of the upper table 9, and the left-hand end of the lower table will project out beneath and beyond the left-hand end of the table 9. Preferably the lower table 20 is made somewhat longer than the upper table 9 so that a sufficient portion of the flat horizontal run of this table 20 extends beyond the upper table 9 to allow the drawing rollers 17 for the lower sheet to rest thereon. It will be noted that these drawing rollers 17 for the lower sheet are in substantial horizontal alignment with the drawing and supporting table 9 for the upper sheet, so that the distance between sheets 3 and 18 need be no greater than that required for the loop table 9.

After leaving the drawing and flattening mechanism, each of the sheets 3 and 18 is passed independently through the leer 21 over its own system of driven supporting rollers 22. A shield or screen 23 is preferably interposed between the upper conveyor rollers 22 and the lower sheet 18 to protect the lower sheet from breakage which might be caused by broken glass or other material falling from the upper conveyor. Preferably, this screen 23 will be of some mesh construction which will not impede the passage of air currents, thus maintaining even temperature conditions around both sheets.

At the exit end of the leer the upper sheet 3 passes out onto a cutting table, here shown as comprising a series of spaced wooden sheet-supporting rollers 24. On this table the continuous strip or ribbon of glass 3 may be divided into suitable sections such as 25. The conveyor for the lower sheet 18 extends under the cutting table 24, so that this sheet may be carried onto its own cutting table 26, which may be similar in every way to the table 24 already described.

In Fig. 4 is illustrated a slight modification, wherein the bending rollers 6 and 19 are arranged at the same vertical height above the molten glass 2. In this case sheet 3 is bent upwardly at an angle from bending roll 6 and bent again through a small angle into the horizontal about the intermediate roller 7. The lower sheet 18, after passing over its bending roller 19, is allowed to droop downwardly as is shown at 27 before it passes over the intermediate supporting rolls onto the lower table 20.

A slightly different modification is shown in Fig. 5. In this case the sheet 3 is drawn in the same manner as in Fig. 1, but the bending roll 19 for lower sheet 18 is arranged somewhat higher than in Fig. 1, and sheet 18 is allowed to droop downwardly as at 28 before it passes onto its flattening table 20.

The many advantages of this improved form of sheet-producing apparatus will be

apparent. The production is doubled with only slight increases in the size and cost of the apparatus used. Although the parts used in the drawing machine are multiplied to
 5 some extent, the machine will be much less expensive than two single machines. The capacity of the tank which supplies the molten glass will have to be increased but this tank will not be twice as large or expensive
 10 as a tank used for supplying glass to a single sheet machine. Only one leer is necessary for the two sheets. There will be only one tank, machine, and leer to heat, and the heating cost will only be slightly greater than
 15 that for a single sheet apparatus. The factory room for this installation need be no wider, and only a few feet longer than the room required for a single sheet machine. In most instances the labor necessary for the
 20 single machine will suffice for the double machine here disclosed.

While this apparatus has been described and shown as drawing two sheets of glass, it will be apparent that the apparatus might be
 25 modified to draw three or more sheets.

Claims:

1. In an apparatus for simultaneously drawing a plurality of sheets of glass, a container for a pool of molten glass, a plurality
 30 of bending members, one for each sheet, a plurality of horizontal drawing and flattening tables, a roller above each table and the sheet carried thereby for holding the sheet in engagement with the table, the tables being
 35 staggered so that the roller for a lower sheet may be positioned in substantial horizontal alignment with the table for the next upper sheet, a leer, and a plurality of superposed conveyors in the leer, for individually carrying
 40 the sheets therethrough.

2. In an apparatus for simultaneously producing a plurality of sheets of glass, a horizontal leer, a series of conveyors for carrying the separate sheets in parallel horizontal
 45 planes through the leer, and a reticular member positioned between each pair of conveyors for protecting the lower sheets from falling material.

3. In an apparatus for simultaneously
 50 drawing a plurality of sheets of glass, a receptacle containing a mass of molten glass, a plurality of staggered draw tables arranged one above the other and in spaced relation, a bending roll for each draw table and over
 55 each of which a sheet drawn from the molten glass is deflected, a roller above each draw table and the sheet carried thereby for holding the sheet in engagement with the table, the roller for the lowermost sheet being positioned
 60 in substantial horizontal alignment with the table for the next upper sheet, a leer, and a plurality of superposed conveyors in the leer for individually carrying the sheets therethrough.

65 4. In an apparatus for simultaneously

drawing a plurality of sheets of glass, a receptacle containing a mass of molten glass, a plurality of staggered draw tables arranged one above the other and in spaced relation, a
 70 bending roll for each draw table and over each of which a sheet drawn from the molten glass is deflected, a roller above each draw table and the sheet carried thereby for holding the sheet in engagement with the table, the roller for the lowermost sheet being positioned
 75 in substantial horizontal alignment with the table for the next upper sheet, a leer, a plurality of superposed conveyors in the leer for individually carrying the sheets therethrough, and means positioned between each
 80 pair of conveyors for protecting the lower sheets from falling material.

5. In an apparatus for simultaneously producing a plurality of sheets of glass, a horizontal leer, a series of conveyors for carrying
 85 the separate sheets in parallel horizontal planes through the leer, and means positioned between each pair of conveyors within the leer for protecting the lower sheets from falling material while at the same time allowing
 90 the passage of air currents therethrough whereby to maintain even temperature conditions around the sheets.

6. In an apparatus for simultaneously producing a plurality of sheets of glass, a horizontal leer, a series of conveyors for carrying the separate sheets in parallel horizontal
 95 planes through the leer, and perforated means positioned between each pair of conveyors for protecting the lower sheets from falling material.
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Signed at Toledo, in the county of Lucas and State of Ohio, this 23d day of January, 1924.

CLIFFORD A. ROWLEY. 105

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