C. P. BYRNES.

DRAWING GLASS.

APPLICATION FILED JULY 26, 1905.

1,141,932.

Patented June 8, 1915

3 SHEETS—SHEET 1.

Fig. 1.

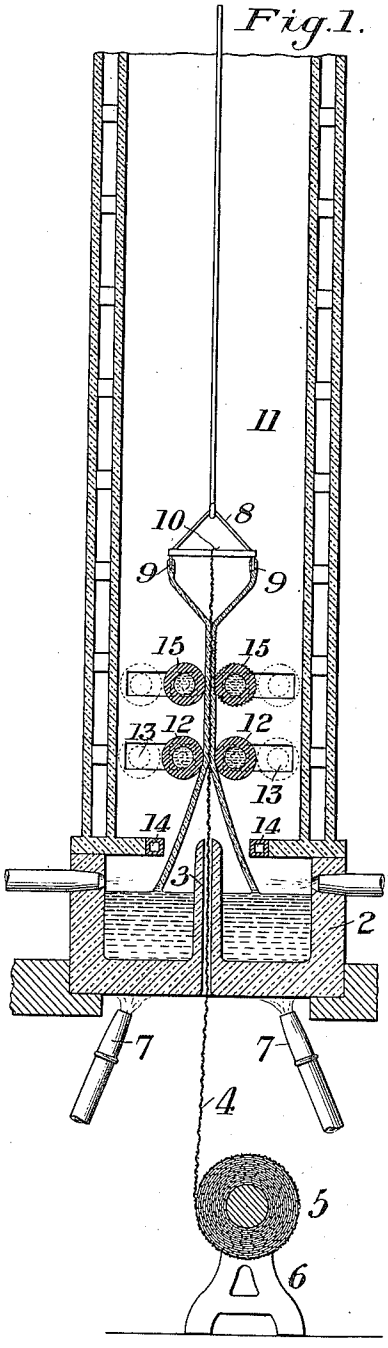
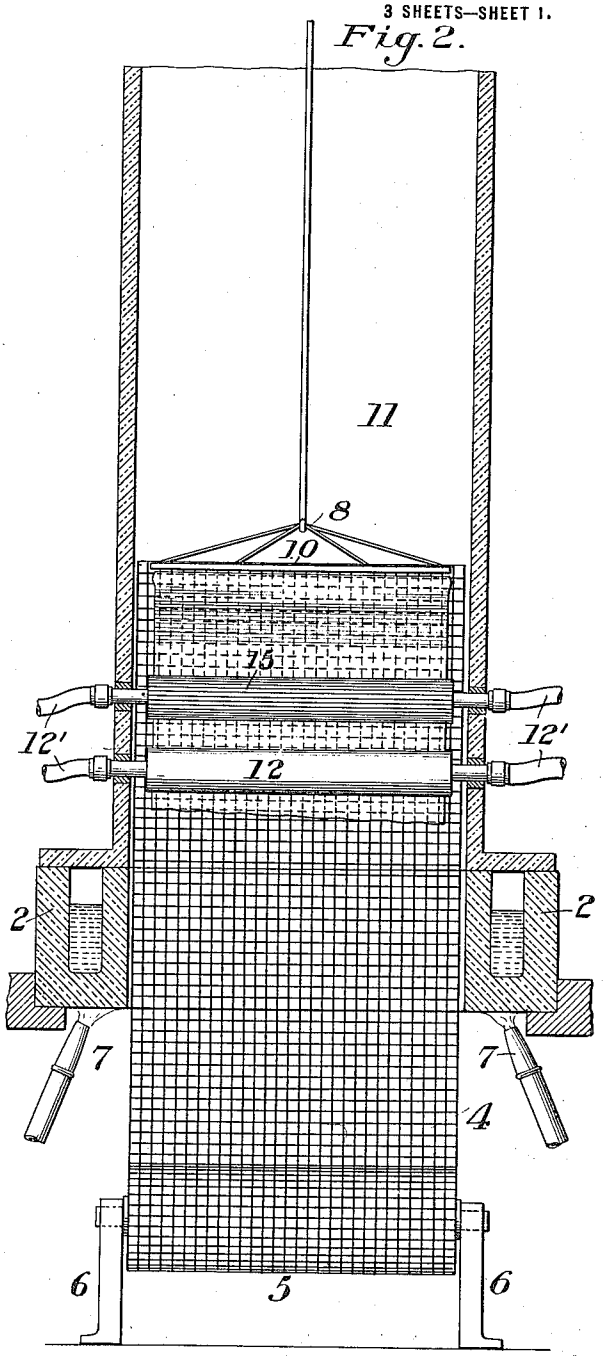


Fig. 2.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 3.

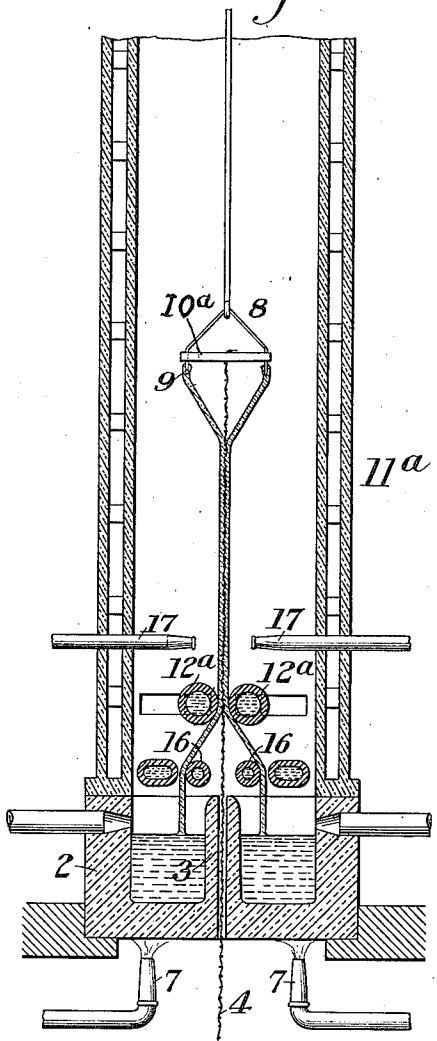


Fig. 4.

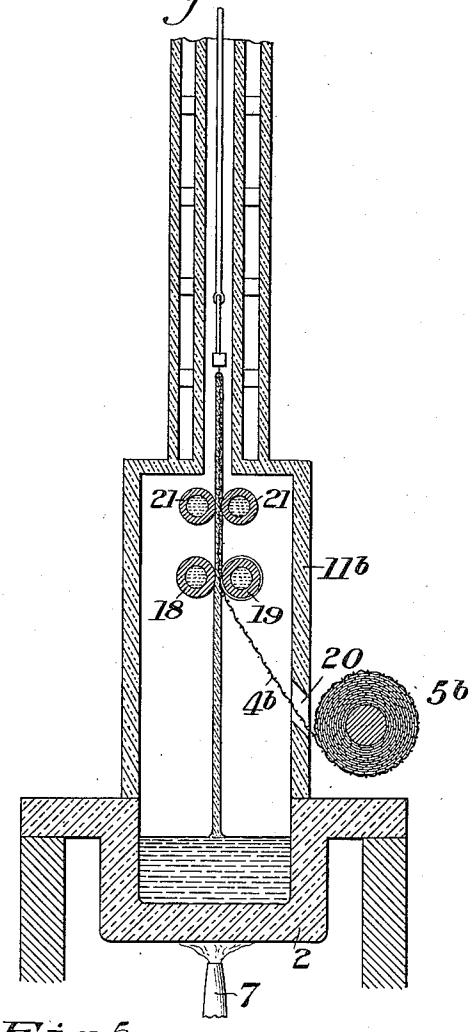


Fig. 5.

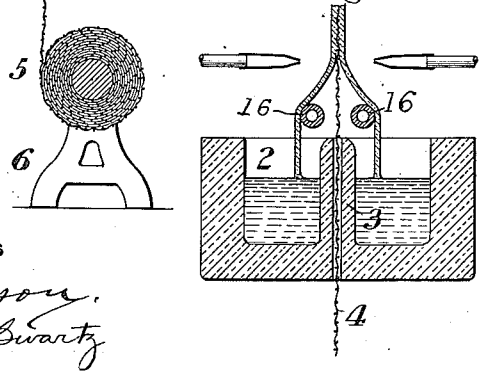
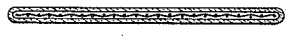


Fig. 6.



WITNESSES

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3 SHEETS—SHEET 3.

Fig. 7.

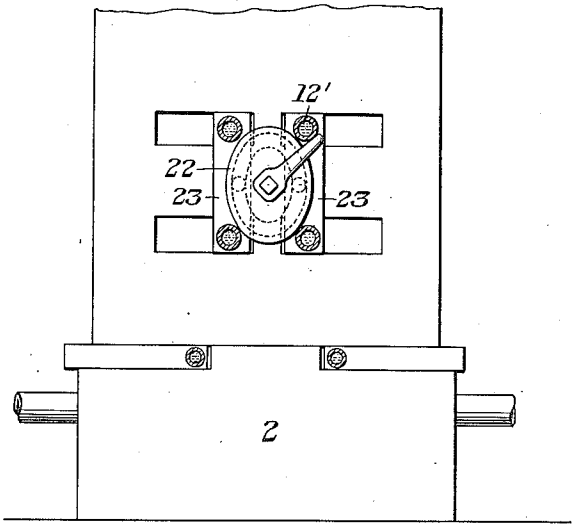
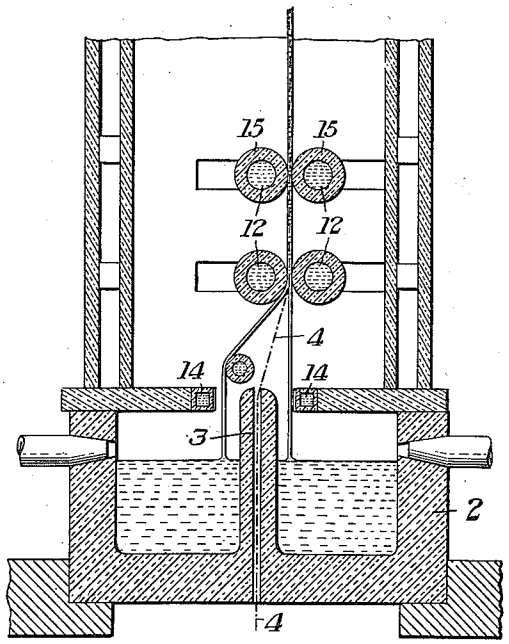


Fig. 8.



WITNESSES

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UNITED STATES PATENT OFFICE.

CLARENCE P. BYRNES, OF SEWICKLEY, PENNSYLVANIA.

DRAWING GLASS.

1,141,932. Specification of Letters Patent. Patented June 8, 1915.

Application filed July 26, 1905. Serial No. 271,284.

To all whom it may concern:

Be it known that I, CLARENCE P. BYRNES, of Sewickley, Allegheny county, Pennsylvania, have invented a new and useful Improvement in Drawing Glass, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a sectional side elevation showing one form of apparatus for carrying out my invention in the manufacture of wire glass; Fig. 2 is a sectional front elevation at right angles to Fig. 1; Fig. 3 is a view similar to Fig. 1 showing another and preferred arrangement of apparatus; Fig. 4 is a view similar to Fig. 3 showing the applying of wire fabric to a single sheet or plate; Fig. 5 is a detail view showing another means for uniting sheets; and Fig. 6 is a cross-sectional view showing the glass sheets integrally joined at their edges prior to forcing them against the wire fabric; Fig. 7 is a side elevation showing cam mechanism; and Fig. 8 is a vertical section showing a modification.

My invention relates to the drawing of glass, and particularly to the forming of sheets or plates, and the making of wire glass.

The invention consists in drawing a sheet or plate of glass from a bath of glass, and at the same time applying a wire structure or fabric thereto, during the drawing operation.

It further consists in drawing two or more sheets of glass simultaneously and then uniting the same with a wire fabric between them, preferably while the glass of the sheets is still plastic.

It further consists in drawing a sheet or sheets of glass and combining therewith during drawing, a wire fabric of greater width than the sheet.

It further consists in fire-polishing the combined sheets or plates during drawing, and in other details and steps hereinafter described and claimed.

In the drawings, referring to Figs. 1 and 2, 2 represents a pot arranged to contain molten glass, which may be of elliptical or rectangular form, and is provided with a refractory partition, nozzle or well 3 extending lengthwise for the major part of the entire length of the pot. In the form shown the well extends only a part of the length, though the glass may be entirely divided into two separate baths by this partition if desired. The bridge or well is centrally slotted, so that a web 4 of wire fabric may be drawn up through it from the reel 5 supported below the pot on suitable standards 6. The glass-holding pot is preferably supported in a suitable furnace which may be heated in any desirable manner, as by gas jets 7. The drawing frame 8 is preferably provided with two parallel baits 9, 9 which are adapted to enter the glass bath on either side of the central partition. It is also preferably provided with central means shown at 10 for securing the upper end of the wire fabric 4 thereto. A drawing chamber 11 preferably surrounds the space above the pot for a considerable height, in order to prevent too sudden cooling of the glass. Within the lower part of this drawing chamber I place a pair of pressing rollers 12. 12 which are preferably hollow and provided with hollow trunnions which are mounted in sliding bearings. These bearings may move within suitable slots 13 in the sides of the chamber, so that the rollers may be moved back during the beginning of the operation. The rollers may be kept at any desired temperature by a heating or cooling fluid circulated through them, by flexible pipes 12′. The rollers may be forced forward and held by cams or any suitable devices, and may be covered with asbestos or similar material.

In Fig. 7 I show a cam 22 having a grooved track acting on bearing lugs on the bars 23 and arranged to simultaneously force the rollers inwardly against the sheet being drawn.

In beginning the operation of making wire glass the baits are lowered into the bath in the usual manner, and are then drawn upwardly. The glass may be chilled or set at the drawing point by movable water-cooled chilling bars 14, on one or both sides of the sheets, if desirable. After the two glass sheets being drawn have been lifted above the compressing rollers 12 I force in these rollers so as to unite the plastic glass sheets upon and around the wire fabric. The pressure should be sufficient to embed the wire or unite the plates in the meshes, and make the three parts into a glass plate with the fabric embedded therein. The two sheets or

plates may be drawn of the same thickness, in which case the fabric will be at the center; or one sheet may be drawn thicker than the other, to bring the fabric nearer one surface of the final plate. The operation continues as long as desired, when the lower end may be severed from the bath by shears, by flame, or in any other desirable manner. The glass may be figured or a pattern or prism shape given thereto on one side if desired, by using another pair of rollers 15 above the compressing rollers. One of these rollers 15 has a figured or patterned surface corresponding to that which it is desired to give the glass. These rollers are also movable toward and from each other within the chamber.

It will be noticed by reference to Fig. 2 that the glass sheets which are drawn are of less width than the width of the wire fabric. This is preferable since it avoids the necessity for breaking off the side portions of the glass to expose the fabric for securing in the sash or frame. I may, however, draw the glass sheets as wide or wider than the wire fabric; and I may draw the sheets with integral joining portions at the ends as shown in Fig. 6, the sheets then forming the sides of an inclosed article.

In some cases the compressing rollers may be withdrawn after they have acted upon the first portion of the sheets, as the inclination of the draw will pull the two plastic glass sheets together, and tend to unite them on the wire fabric. The sheets may be drawn together by moving the baits toward each other.

In order to avoid the moving of the line of draw from the surface of the bath toward the slotted partition, which is liable to take place in the first form, I preferably use separating means, such as the rollers 16 shown in Fig. 3, between the sheets. These rollers form guides which hold the sheets as they are formed at a certain distance apart from each other, the sheets being deflected to and between the compressing rollers 12^a as in the first form. The rollers 16 may be hollow and cooled or heated by a circulation of fluid therethrough.

The compressing rollers and the separating rollers may be faced with asbestos to prevent injury to the glass, but as they are liable to injure the surface of the sheets during compression and forcing together upon the fabric, I preferably fire polish the combined plate during its drawing, and while still in a plastic condition. For this purpose I show the gas burners 17, a row of which or a wide thin burner may extend within the drawing chamber 11^a on both sides of the plate. A highly polished sheet will thus be obtained which will avoid the necessity for grinding and polishing, where wire plate glass is desired.

In Fig. 4 I show a form of apparatus where a single plate or sheet of glass is drawn in the ordinary manner and the wire fabric is forced in through one face thereof. In this form lower rollers 18 and 19 are used, the roller 19 being preferably circumferentially grooved or corrugated, so as to force into the plastic plate the wire fabric 4^b which is drawn from the reel 5^b through the slot 20 in the side of the drawing chamber 11^b. The upper plain compressing rollers 21, 21 then close the glass over the fabric and smooth the face of the sheet. In this operation the fabric is therefore forced into the plastic plate as it is drawn, to any desirable distance, and the face of the plate is then rolled and smoothed down. This species, as well as the article produced by my invention, are reserved for separate applications, not being covered in this application.

The process of drawing the two sheets and uniting them is also applicable for the manufacture of thick sheet glass. Thus I may draw two sheets of plates by apparatus similar to that of Fig. 3, except that the slotted partition in the pot is done away with and the two sheets are forced together while plastic, thus making a thick plate, which may then be drawn upward and fire polished if desired while still plastic.

In forming wire glass according to my invention, I preferably employ a wire fabric in which the cross wires are welded to the strand wires at the crossing points. This welded fabric will reduce the strain upon the glass during expansion and contraction of the fabric and give less liability to cracking and breaking. An integral expanded sheet metal fabric may also be used.

Instead of using rollers to unite the sheets I may use other means, thus in Fig. 5 I show the use of thin wide jets of gaseous fluid, such as air to force the sheets together above the guide rolls. Instead of deflecting both sheets into a plane intermediate of the two points of drawing, I may deflect one sheet only, this sheet together with the wire fabric being forced over against the other sheet which is drawn upwardly in a flat plane as shown in Fig. 8.

The advantages of my invention result from the cheap and simple method for obtaining wire glass; also from the obtaining of a thick sheet of glass which may be fire polished whether wire is embedded therein or not. The relative width of the fabric to the glass may be regulated as desired, the wire fabric will be heated to a considerable degree before it is embedded in the glass, hence reducing the liability of air bubbles, etc., and a large output may be obtained at low cost. If the fire polishing is employed during drawing, this will do away with the necessity for grinding and polish-

ing, where wire glass of plate glass quality is desired. Where the wire fabric is used it aids in maintaining the width of the sheets, which tend to narrow as they are drawn.

By the word "glass" in the claims I intend to include any glass-like substances such as enamels, etc. By the words "two sheets" I intend to cover the sheets or plates whether joined at their side edges or not. By the word "united" in the claims as applied to the fabric, I intend to cover either a welded fabric as above described or an integral metal fabric having meshes.

Many variations may be made in the form of the apparatus, as well as in the process, without departing from my invention.

I claim:—

1. The method of making wire glass, consisting in continuously withdrawing glass from the upper portion of a molten glass bath, shaping it into sheet or plate form as it is withdrawn, combining a metal fabric or structure with the successive body portions of the sheet at a point above the level of the bath, and uniting the same thereto, substantially as described.

2. The method of making wire glass, which consists in drawing a sheet of glass upwardly from a mass of molten glass and then embedding a metallic fabric in said drawn sheet, while the drawing action continues; substantially as described.

3. The method of making glass sheets, consisting in simultaneously drawing two layers of glass and uniting them together during drawing and while plastic; substantially as described.

4. The method herein described which consists in simultaneously drawing two layers of glass on opposite sides of a reinforce and forcing such layers together and on to the sides of the reinforce; substantially as described.

5. The method of making wire glass, consisting in continuously withdrawing glass from the upper portion of a molten glass bath, shaping it into sheet or plate form as it is withdrawn, and continuously uniting a metal fabric or structure with the successive portions of the sheet after initial formation; substantially as described.

6. The method of uniting metal with glass, consisting in forming a relatively thin glass shape by drawing it directly from the upper portion of a glass bath, bringing a metal structure or fabric into contact with the glass shape after its initial formation, and embedding the metal structure therein; substantially as described.

7. The method of making wire glass, consisting in continuously drawing glass from the upper portion of a mass of molten glass and uniting a metal fabric therewith at a point separate from the bath during the process of forming the sheet; substantially as described.

8. The method of making wire glass, which consists in drawing a sheet of glass upwardly from a mass of molten glass, then embedding a metallic fabric in said drawn sheet while it is still plastic, and then surfacing the sheet; substantially as described.

9. The method of making wire glass, consisting in drawing a glass plate or sheet from a bath, heating a metal fabric and continuously applying it to the plastic glass sheet after it leaves the bath during drawing; substantially as described.

10. The method of making glass articles, consisting in continuously drawing glass from a glass bath, uniting a metal fabric therewith exterior to the bath, and continuously fire-polishing the same within an inclosed chamber; substantially as described.

11. The method of making wire glass, consisting in continuously withdrawing glass from a molten bath and shaping it, continuously uniting a metal fabric or structure therewith at a point removed from the bath, and reheating the shaped article; substantially as described.

12. The method of making wire glass, consisting in drawing a sheet or plate of glass from a glass bath and uniting therewith at a point removed from the bath a metal fabric of greater width than the glass sheet or plate during the successive formation thereof, substantially as described.

13. The method of making wire glass, consisting in continuously drawing glass from the upper portion of a molten glass bath and shaping it into double sheet form as it is withdrawn, and embedding a metal structure between the two layers during the sheet-forming operation; substantially as described.

14. The method of making wire glass, consisting in drawing two sheet or plates of glass from a bath and embedding a metal fabric between them during the drawing operation; substantially as described.

15. The method of drawing wire glass, consisting in simultaneously drawing two sheets or plates of glass upwardly from a glass bath, drawing a wire fabric between them and pressing the two sheets together to embed the fabric; substantially as described.

16. The method of drawing wire glass, consisting in simultaneously drawing two sheets or plates of glass upwardly from a glass bath, drawing a wire fabric between them, pressing the two sheets together to embed the fabric, and then fire-polishing the wire glass during the upward drawing of the structure; substantially as described.

17. The method of making wire glass, consisting in drawing two sheets or plates of glass from a bath and embedding between them at a point removed from the bath a

wire fabric of greater width than the sheets during the successive formation thereof; substantially as described.

18. The method herein described which consists in simultaneously drawing two layers of glass, forcing such layers into contact with each other and determining the thickness of the compound sheet; substantially as described.

19. The method herein described which consists in simultaneously drawing two layers of glass, forcing said layers into contact with each other, and reducing the compound sheet to a uniform predetermined thickness.

20. The method herein described which consists in simultaneously drawing two layers of glass on opposite sides of a reinforce, forcing such layers together on to opposite sides of the reinforce and determining the thickness of the compound sheet.

21. In apparatus for making wire glass, mechanism for drawing a continuous glass sheet or plate from the upper portion of a bath of molten glass, and mechanism arranged to unite a metal fabric therewith at a point exterior to the bath; substantially as described.

22. In apparatus for drawing glass, mechanism arranged to draw two sheets simultaneously, and means for uniting the sheets near the point of drawing, and while they are still plastic; substantially as described.

23. In apparatus for making wire glass, means for drawing two sheets or plates, means for simultaneously feeding a metal fabric between them, and means for uniting the three layers; substantially as described.

24. In glass drawing apparatus, means for drawing two sheets, a pair of rollers arranged to act upon the sheets, and means for deflecting the sheets over the rollers, and uniting them; substantially as described.

25. In glass drawing apparatus, means for drawing two sheets, and means for deflecting at least one sheet toward the other and uniting the two sheets; substantially as described.

26. In a machine for drawing sheet glass, the combination of a receptacle arranged to contain a mass of molten glass, means for drawing a sheet of glass upwardly therefrom, and means for forcing a wire fabric into said drawn sheet during the continuance of the drawing operation; substantially as described.

In testimony whereof, I have hereunto set my hand.

CLARENCE P. BYRNES.

Witnesses:
N. M. GRIFFIN,
H. M. CORWIN.