No. 742,899. PATENTED NOV. 3, 1903.

W. A. PAGE & F. L. O. WADSWORTH.

APPARATUS FOR THE MANUFACTURE OF SHEET GLASS.

APPLICATION FILED JUNE 9, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

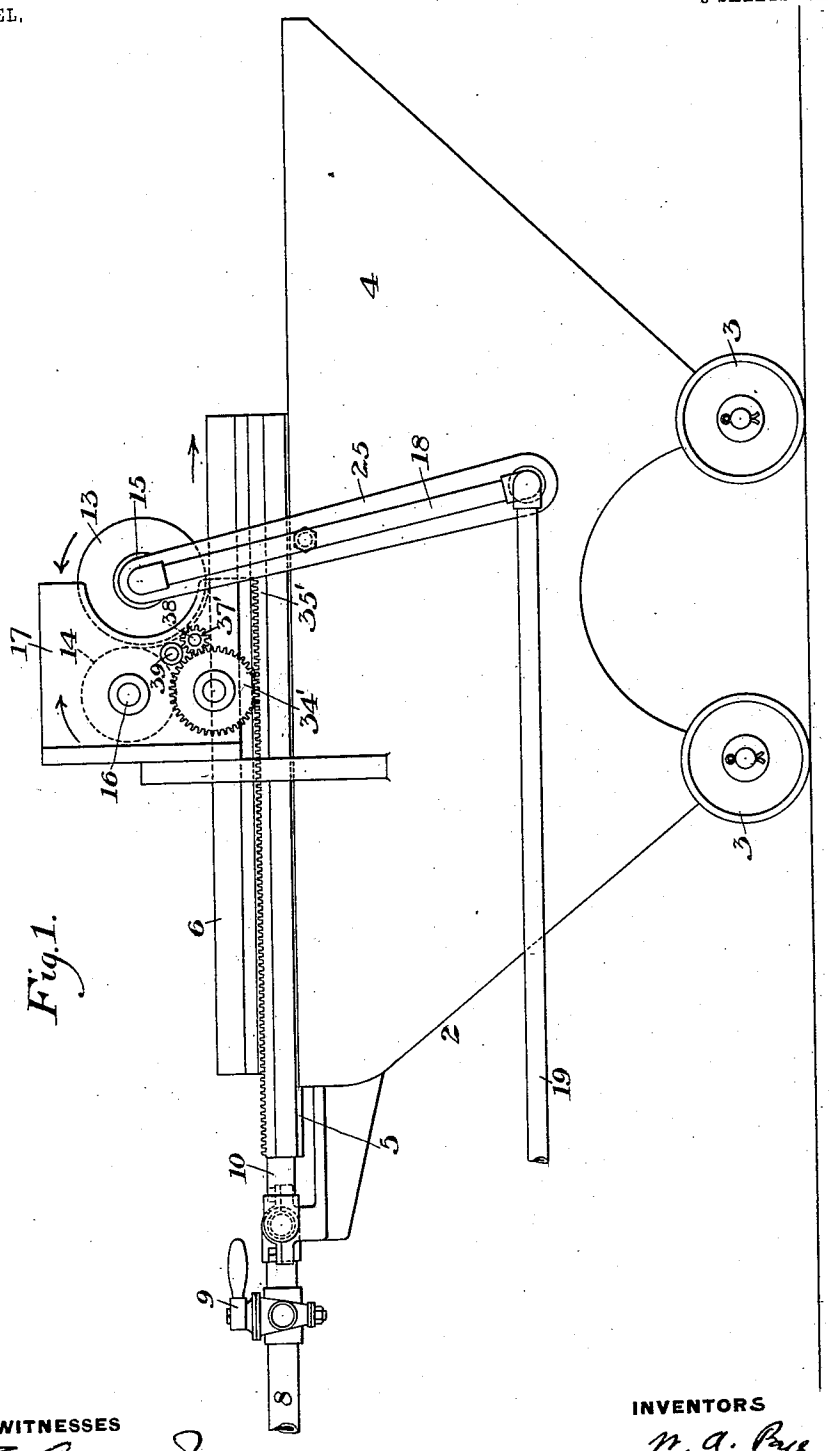


Fig. 1.

WITNESSES

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THE NORRIS PETERS CO. PHOTO-LITHO., WASHINGTON, D. C.

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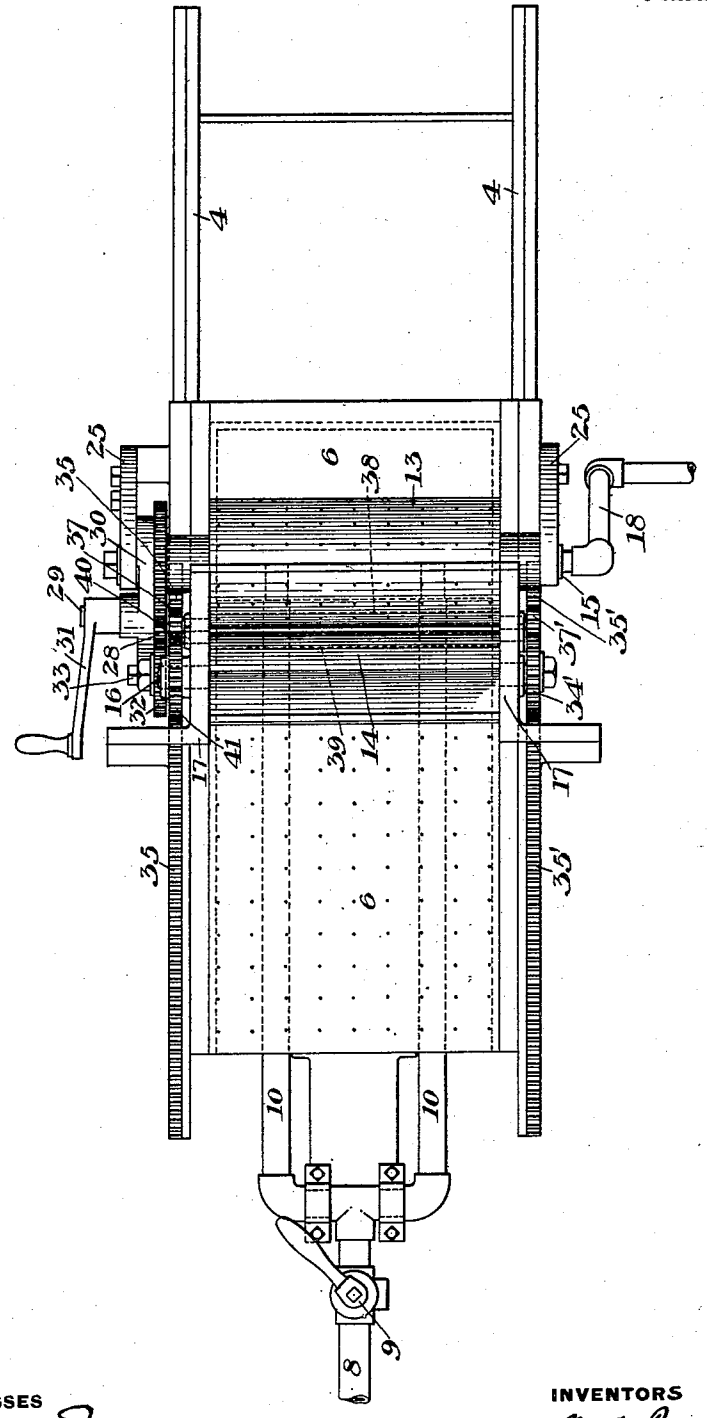
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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4.

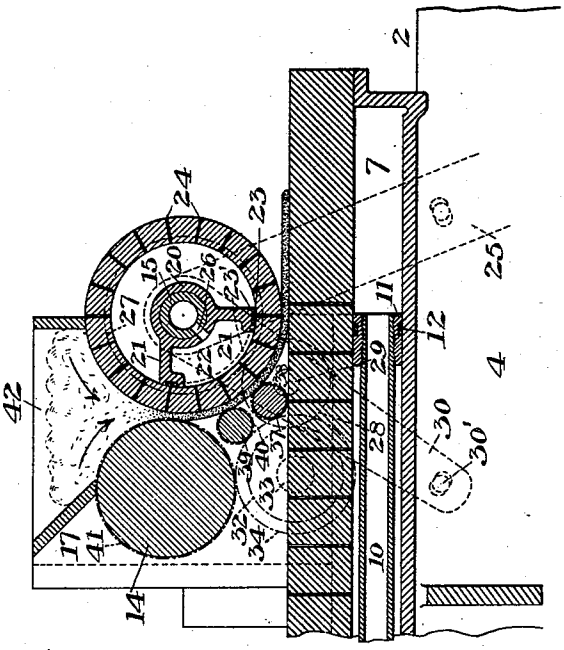
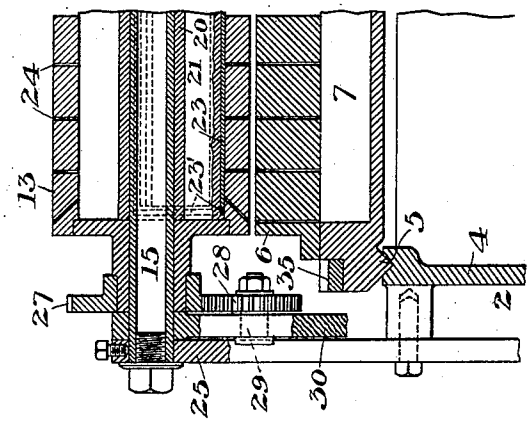


Fig. 3.



WITNESSES

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No. 742,899. Patented November 3, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM A. PAGE, OF MORGANTOWN, WEST VIRGINIA, AND FRANK L. O. WADSWORTH, OF ALLEGHENY, PENNSYLVANIA, ASSIGNORS TO PRESSED PRISM PLATE GLASS COMPANY, OF MORGANTOWN, WEST VIRGINIA, A CORPORATION OF WEST VIRGINIA.

APPARATUS FOR THE MANUFACTURE OF SHEET-GLASS.

SPECIFICATION forming part of Letters Patent No. 742,899, dated November 3, 1903.

Application filed June 9, 1903. Serial No. 160,698. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM A. PAGE, of Morgantown, Monongahela county, West Virginia, and FRANK L. O. WADSWORTH, of Allegheny, Allegheny county, Pennsylvania, have invented a new and useful Apparatus for the Manufacture of Sheet-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 side elevation showing one form of apparatus constructed in accordance with our invention. Fig. 2 is a top plan view of the same, partly broken away; and Figs. 3 and 4 are respectively a partial cross-section and a partial longitudinal section on a larger scale.

Our invention relates to the making of sheet-glass by rolling, and is designed to provide an improved apparatus for rolling such glass, whether plain or figured, on one or both sides.

In the drawings, 2 represents a supporting-frame, which we have shown as mounted on wheels 3. The side members 4 4 of the frame are provided with tracks or slideways, in which slide the shoes 5 at the sides of the moving table 6. This table is hollow and is provided at its top with a series of small perforations leading downwardly into the cavity 7. A vacuum-pump is connected to the interior of the table by means of a pipe 8, having a three-way cock 9 and leading to a pair of stationary branch pipes 10, which project through the end of the table and through a rectangular cross-head 11, which fits within the cavity 7 and is provided with suitable packings 12.

The glass-forming rollers 13 and 14 are mounted on shafts 15 and 16. The shaft 16 of roller 14 is carried in fixed bearings 17 17, attached to the frame of the machine. The larger roller 13 is hollow and rotates on its shaft 15, which is also hollow, and is connected at one end with a pipe 18, having jointed connection with an exhaust-pipe 19, also leading to the vacuum-pump. Within this cylinder the shaft is surrounded by sleeve 20, having radial partitions 21, forming a vacuum-chamber 22, the partitions bearing against the inner surface of the rollers and having longitudinal packings 23 and end circumferential packings 23′. The roll is provided with small perforations 24, which lead to its interior, and the sleeve and shaft to which it is attached are prevented from rotating by the connection at the ends with links 25 25, pivoted to the side members of the frame. Holes 26 extend through the hollow shaft and the sleeve within the cylinder and lead into the vacuum-chamber between the partitions. Attached to one end of the larger roller is a toothed wheel 27, which intermeshes with a toothed wheel 28, carried on a stub-shaft 29, mounted in a pivotal link 30, having loose engagement with a pin 30′, projecting from the frame of the machine, as shown in Fig. 4. This link is pivoted on the axle of the roller and may be adjusted by moving the slot over the pin and then clamping it by any desirable form of clamping means. This stub-shaft is provided with an operating-crank 31, and its wheel 28 intermeshes in turn with a toothed wheel 32 on a stub-shaft 33, mounted on the frame. The stub-shaft 33 is provided with a second toothed wheel 34, intermeshing with a rack 35, secured to the side of the table. Another toothed wheel 34′, similar to the wheel 34, is mounted on a stub-shaft in the frame at the other side and intermeshes with a similar rack 35′. The axes of the wheels 34 34′ are in line and the wheels themselves intermesh with pinions 37 37′ upon a shaft carrying a roller 38, arranged to hold the glass against the large roller. Another roller 39 is used for this same purpose, which roller is driven by a pinion 40 at one end intermeshing with wheel 34. Wheel 34 also intermeshes with a wheel 41, keyed to the shaft of the roller 14. The pitch-diameters of the wheels 27, 32, 34, 37, 40, and 41 are such that when the driving-wheel 28 of the system is turned the rollers 13, 14, 38, and 39 and the table 6 move together in the directions indicated by the arrows in Figs. 1

and 4 at the same peripheral speed. The relative distance between the surface of the roller 13 and the rollers 14, 38, and 39 may be adjusted by means of swinging links 25 25 and the adjustable link 30. A hopper 42 is provided above the rollers to receive the glass, the ends of the hopper, which are constituted by the bearings 17, forming cheek-pieces which bear against the ends of the rollers 13, 14, 38, and 39 and also receive and support the shafts above referred to.

In using the apparatus the plastic glass is fed into the hopper between the two main rollers, and as the crank 31 is actuated the glass is rolled downwardly into sheet form. At the same time the valves leading from the chambers 22 and 7 are opened and the air rapidly exhausted therefrom by means of the vacuum-pump. As the sheet is fed down it is held to the surface of the large roller by the pressing-rollers 38 and 39 and also by the positive air-pressure exerted over its entire surface of contact with the segmental chamber of the larger roller, due to the suction within the segmental chamber. The pressing-rollers 38 and 39 revolve at substantially the same surface speed as the surface of the glass, so that the glass is not subject to frictional retardation either by the pressure exerted by these rollers or by the pressure exerted upon it by the suction in the segmental chamber. When the glass sheet reaches the table, it passes beyond the suction-chamber of the roller and is pressed by the roller upon the top of the table, which is moving forward at the same speed as the peripheral speed of the rollers. If the smaller forming-roller is figured, the table is correspondingly figured and so adjusted in position that as the figured face of the sheet is pressed down upon the table it fits thereon as the table moves forward. The glass is held down upon the table by the suction within the chamber in front of the cross-head. The sheet therefore is formed by rolling it between the rollers and holding it in contact with one of them until partially set, and it is then transferred to a table which has the same contour as one of the rollers. The sheet is then held in contact with the table until it is set in final form.

The means which we employ for holding the glass positively to the roller acts without retardation or friction on the outer face of the glass, and thus accomplishes the desired result without injury to the glass. Stationary smoothing-blocks fixed in proximity to the roller and bearing on the outer face of the sheet would exert a frictional retarding force on the glass and would not accomplish our purpose. We therefore disclaim the use of such stationary blocks.

The advantages of our invention result from the forming of both sides of the sheet by rollers, the preservation of the formed surface by retaining it in contact with one of the forming-rollers until it has partially set, and the final transfer and pressing of the formed sheet upon a traveling table. The glass is held upon the table until finally set, so that there is no liability of its changing its form or contour. Sheets of glass having bright and polished surfaces on both sides and with either plain or figured contour of sharp and accurate outline can be produced.

Many changes may be made in the form and arrangement of the device without departing from our invention.

We claim—

1. Apparatus for making glass sheets, comprising a pair of rollers arranged to shape a mass of glass into sheet form, means acting without sliding friction on the glass at its place of contact therewith for applying positive pressure over an extended surface of the glass to hold the glass in contact with one of the rollers while it is acquiring a set, and a table to which the glass is transferred; substantially as described.

2. Apparatus for making glass sheets comprising a pair of rollers arranged to shape a mass of glass into sheet form, means acting without sliding friction on the glass at its place of contact with the glass for applying a positive pressure to hold the sheet in contact with the surface of one of the rollers while it is acquiring a set, and a traveling table arranged to receive and carry away the sheet from the roller; substantially as described.

3. Apparatus for making sheet glass figured on one side, comprising a pair of rollers arranged to shape a mass of glass into sheet form, one of said rollers being figured, means for applying a positive pressure to hold the sheet in contact with the surface of the figured roller, and a table to which the glass is transferred, said table having a similar configuration to that of the figured roller; substantially as described.

4. Apparatus for making glass sheets, comprising a pair of rollers arranged to shape a mass of glass into sheet form, means for applying a positive pressure to hold the sheet in contact with the surface of one of the rollers while it is acquiring a set, a table to which the sheet is transferred, said table having the same cross-sectional contour as one of the rollers, and mechanism for forcing the sheet against the table; substantially as described.

5. Apparatus for forming sheet-glass comprising a pair of rollers arranged to shape a mass of glass into sheet form, means for withdrawing the air or gases from between the glass sheet and the portion of one of the rollers with which it contacts, and a table to which the sheet is transferred, said table having the same surface contour as one of the rollers; substantially as described.

6. Apparatus for forming sheet-glass comprising a pair of rollers arranged to shape a mass of glass into sheet form, one of said rollers being hollow and perforated, and means

for forming a partial vacuum within at least a part of said roller; substantially as described.

7. Apparatus for forming sheet-glass comprising a pair of rollers, one of said rollers being perforated, mechanism for forming a partial vacuum within said roller through a part of its circumference, and means for pressing the glass sheet against the perforated roller through such portion of the circumference; substantially as described.

8. Apparatus for forming sheet-glass comprising a pair of rollers, one of which is hollow and perforated, means for forming a partial vacuum within the perforated roller through a portion of its circumference, a traveling table arranged to receive the glass sheet, and mechanism for forcing the glass sheet against said table; substantially as described.

9. Apparatus for forming sheet-glass comprising a pair of rollers, one of which is hollow and perforated, means for forming a partial vacuum within the perforated roller through a portion of its circumference, a traveling table arranged to receive the glass, said table being perforated, and means for forming a partial vacuum to produce a suction within the perforations; substantially as described.

10. Apparatus for forming glass articles comprising forming-surfaces, means for pressing the glass between said surfaces, and means for creating a vacuum between one of the compressing surfaces and the glass; substantially as described.

In testimony whereof we have hereunto set our hands.

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F. L. O. WADSWORTH.

Witnesses:
GEO. B. BLEMING,
JOHN MILLER.