Aug. 11, 1931. W. E. NOBBE 1,818,154

APPARATUS FOR THE MANUFACTURE OF SHEET OR PLATE GLASS

Filed May 13, 1929

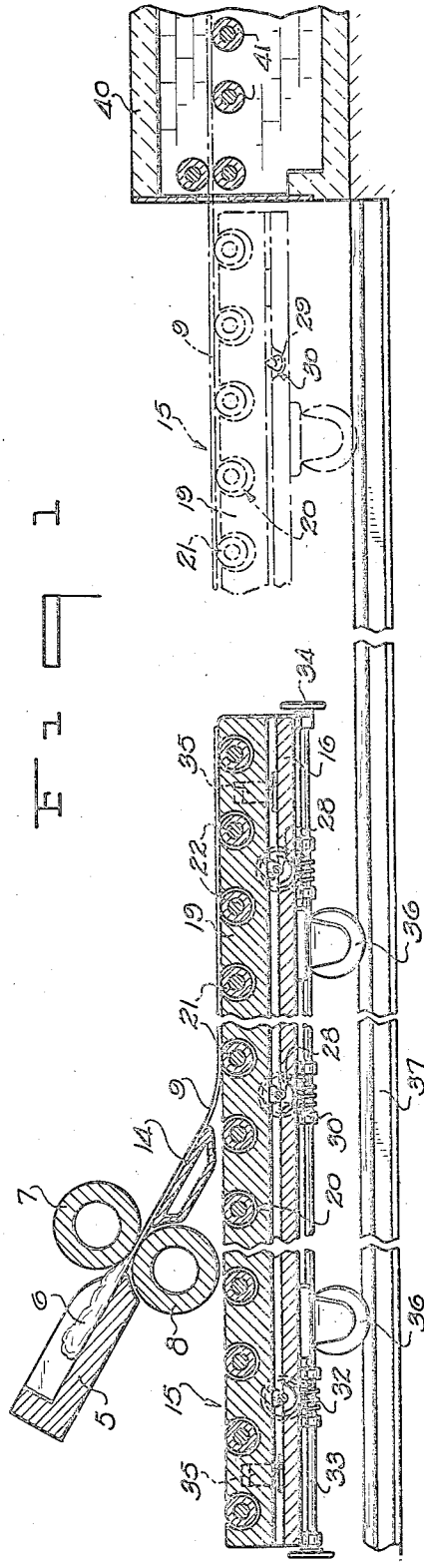

Fig. 1.

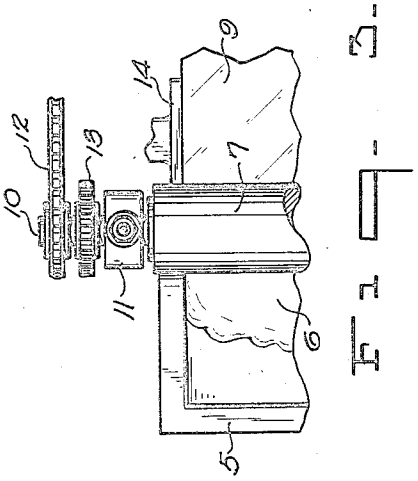

Fig. 3.

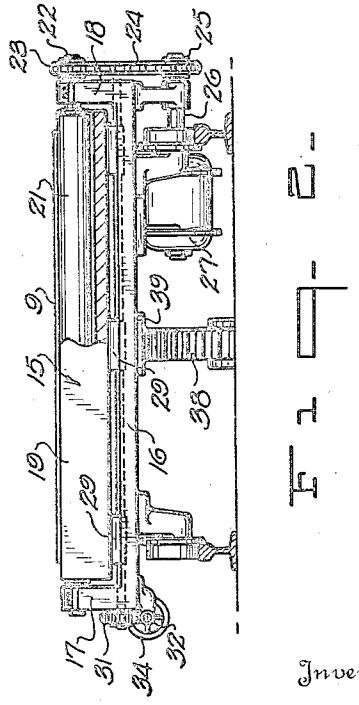

Fig. 2.

Inventor

William E. Nobbe.

By Frank Fraser

Attorney

Patented Aug. 11, 1931

1,818,154

UNITED STATES PATENT OFFICE

WILLIAM E. NOBBE, OF TOLEDO, OHIO, ASSIGNOR TO LIBBEY-OWENS-FORD GLASS COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO

APPARATUS FOR THE MANUFACTURE OF SHEET OR PLATE GLASS

Application filed May 13, 1929. Serial No. 362,605.

This invention relates broadly to apparatus for the manufacture of sheet or plate glass and more particularly to means for receiving and supporting a newly formed sheet thereon.

An important object of the present invention resides in the provision of novel and improved means adapted to be associated with sheet rolling mechanism for receiving the sheet as it is formed therefrom and conveying it to a position for discharge into an annealing leer.

Another important object of the invention resides in the provision of a sheet supporting table or the like having a substantially solid top construction for receiving the sheet thereupon whereby the danger of the sheet sagging thereon during its transfer to the annealing leer will be minimized, said table also embodying means for effecting the rapid and convenient transfer of the sheet therefrom into said leer in such a manner as to avoid warping or buckling of the sheet.

Another object of the invention is to provide a sheet supporting table of the above described character adapted to be moved in proximity to sheet rolling mechanism for receiving the sheet therefrom, said table being of a substantially solid top construction and including a plurality of sheet supporting rolls, said rolls being in horizontal alignment with respect to the leer rolls so that when the sheet is formed and laid upon the table it is in proper position to be fed into the leer, thereby avoiding the necessity of raising or lowering the supporting rolls to first bring them into proper alignment with the leer rolls before the sheet can be removed from the table into the leer.

A further object of the invention is to provide sheet supporting means of the above described character mounted to travel beneath the sheet forming mechanism during the forming and laying of the sheet thereupon, whereby said sheet can be formed at a relatively high rate of speed and subsequently fed into and through the annealing leer at a relatively slower speed.

Other objects and advantages of the invention will become more apparent during the course of the following description when taken in connection with the accompanying drawings.

In the drawings forming a part of this application and wherein like numerals are employed to designate like parts throughout the same,

Fig. 1 is a vertical longitudinal section through apparatus provided by the present invention.

Fig. 2 is an end elevation of the improved sheet supporting table, partially in section, and

Fig. 3 is a top plan view of a portion of the sheet rolling mechanism showing the drive means therefor.

Referring now more particularly to the accompanying drawings, the numeral 5 designates a receptacle or receiver upon which is adapted to be deposited a mass or charge of completely melted and refined molten glass 6. Arranged at one end of the receiver 5 are the substantially superimposed sheet forming rolls 7 and 8 spaced from one another in a manner to create a sheet forming pass therebetween. These rolls are adapted to receive the molten glass 6 from receptacle 5 and reduce it to a sheet 9 of substantially predetermined and uniform thickness. As shown in Fig. 3, the forming rolls 7 and 8 are mounted upon shafts 10 journaled at their opposite ends in bearings 11. One of the forming rolls is adapted to be positively driven such as through a suitable chain and sprocket drive 12 and the other forming roll is driven from the positively driven roll through the intermeshing gears 13 keyed to the roll shafts 10. As the sheet 9 issues from between the forming rolls 7 and 8 it is supported upon and moved downwardly over an inclined runway or slab 14 and laid upon the improved supporting table provided by the present invention.

This supporting and conveying table is herein designated in its entirety by the numeral 15 and comprises more specifically a truck including a horizontal bottom 16 having the upstanding side portions or boards 17 and 18 extending substantially the entire

length thereof. Adapted to be freely supported upon the bottom 16 of the table is the substantially solid stationary sheet supporting bed 19. This bed is provided in its upper surface with a plurality of spaced parallel transversely extending recesses or grooves 20 within which are disposed the rotatable sheet supporting members or rolls 21. The rolls 21 are mounted upon shafts 22 journaled at their opposite ends in the side portions 17 and 18 of the table. For the purpose of driving these rolls, the shaft 23 of each roll is projected beyond the side portion 18 of the table and has keyed thereto a gear 23. Trained about all of the gears 23 is a drive chain 24, said chain being also trained about a gear 25 carried by shaft 26 driven from a motor 27 hung from the bottom 16 of the table. Thus, upon operation of the motor 27, all of the sheet supporting and conveying rolls 21 will be driven at a uniform speed in the same direction.

The stationary supporting bed 19 is adapted to be raised and lowered relative to the supporting rolls 21 and when in its raised position the said bed and rolls cooperate with one another to produce a substantially solid top table having a substantially flat unbroken surface for supporting the sheet thereupon. In other words, the upper surfaces of the rolls 21 are adapted to be in horizontal alignment with the upper surface of the bed. However, the bed 19 is adapted to be lowered relative to the rolls 21 when it is desired to effect the removal of the sheet from the table as will be more clearly hereinafter described. For the purpose of raising and lowering said bed with respect to said rolls, there is positioned beneath the bed 19, a plurality of transversely extending spaced shafts 28 also journaled at their opposite ends in the side portions 17 and 18 of the table and each carrying a plurality of spaced cam members 29. Upon rotation of the shafts 28, it will be seen that the cam members 29 engaging the undersurface of bed 19 will serve to effect a raising of the bed and will hold it in such raised position as illustrated in Fig. 1. Upon further rotation of the shafts, however, the cam members will be moved from engagement with the bed and this will permit lowering of said bed relative to the rolls 21. When the bed is in its lowered position, the cam members will be received within recesses 30 formed in the upper surface of the bottom 16 of the table.

All of the transverse shafts 28 are preferably simultaneously rotated so that the bed 19 will be uniformly raised throughout its entire length at a plurality of spaced points and to this end, there is keyed to one end of each shaft 28 a worm gear 31 meshing with a worm 32 mounted upon the lay-shaft 33 which is carried by and extends longitudinally along one side of the table. The shaft 33 may be operated by suitable mechanical means or may be manually rotated by the provision of hand wheels 34 carried at one or both ends thereof.

Supported upon the bottom 16 of the table are a plurality of vertical pins or the like 35 received within recesses formed in the bed 19, said pins being provided to guide the bed in its vertical movements and prevent lateral movement thereof. The improved table 15 herein provided is adapted to travel beneath the sheet forming or rolling mechanism above described during the forming of the sheet and to this end is supported upon wheels 36 running upon the tracks or rails 37. Any desired means may be utilized for driving the table along the tracks such as for example, a drive pinion 38 meshing with a rack 39 secured to the underside of said table.

In operation of the present invention, the mass or charge of molten glass 6 is first deposited upon the receiver 5 and is then moved therefrom to the sheet forming rolls 7 and 8 which function to reduce it to sheet form as indicated at 9. Simultaneously with the forming of the sheet, the table 15 is moved to the right along the tracks so as to receive the sheet as it passes from the runway 14. The linear travel of the table 15 is preferably the same as the peripheral speed of the forming rolls 7 and 8 so that the sheet will be laid upon the table without buckling, stretching, etc. During the laying of the sheet upon the table, the supporting rolls 21 are stationary and the bed 19 is elevated to its raised position by means of the cams 29 so that said bed and rolls will cooperate with one another to form a substantially flat unbroken sheet supporting surface as above pointed out. Due to such an arrangement, it will be apparent that any danger of the sheet sagging during the time it is being supported upon the table will be minimized. The table, with the newly formed sheet thereupon, is then moved along the tracks 37 to a position opposite the intake end of an annealing leer 40 as indicated by the broken lines in Fig. 1. When in such position, the travel of the table is stopped and the cam members 29 are rotated so that they will be received within the recesses 30 and thus allow the bed 19 to be lowered. When the bed is lowered, the rolls 21 will naturally project slightly thereabove and these rolls are then rotated by the driving means above described to feed the sheet into and through the annealing leer, said sheet being supported and carried along within the leer upon a series of leer rolls or other suitable mechanism 41. The supporting rolls 21 therefore not only cooperate with the bed 19 to support the sheet in a manner to pre-

vent sagging thereof but further provide an effective and efficient means for rapidly and conveniently effecting the removal of the sheet from the table into the leer. By such an arrangement, the sheet may be fed into the leer in such a manner as to avoid warping or buckling thereof such as might be very apt to result from the practice of the usual pushing or pulling method. It is also to be noted that the sheet supporting rolls 21 are at all times in horizontal alignment with the leer rolls 41 so that after the sheet is formed and laid upon the table, it is in proper position to be fed into the leer, thereby avoiding the necessity of raising or lowering the supporting rolls and sheet to first bring the rolls into proper alignment with the leer rolls before said sheet can be removed from the table into the leer.

In accordance with the present invention, the sheet 9 may be formed at one speed and annealed while traveling at a different speed. In fact, the sheet 9 is preferably formed at a relatively high rate of speed by rapidly rotating the forming rolls 7 and 8 during the formation of the sheet, the table is moved to the right beneath the forming mechanism at a linear speed equal to the peripheral speed of the forming rolls to receive the sheet thereupon. After the sheet has been completely laid upon the table, the said table can be moved to a discharge position adjacent the annealing leer at the same speed or even at a greater speed if desired. After the table has been brought to its discharge position adjacent the leer, and stopped, however, the sheet is fed into the leer by the rolls 21 at a relatively slower speed than its speed of formation and preferably at the same speed it is adapted to travel through said leer while being annealed.

It is to be understood that the form of the invention herewith shown and described is to be taken as the preferred embodiment of the same, and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. In apparatus of the character described, a table for receiving and supporting a newly formed sheet of glass thereupon, said table comprising a bottom, a stationary bed freely supported upon said bottom and having a plurality of spaced parallel transversely extending recesses in its upper surface, rotatable rolls disposed within said recesses, means for driving the rolls in unison, means carried by the bottom and engaging the undersurface of the bed for raising and lowering the same with respect to said rolls, and means also carried by the bottom and engaging the bed for guiding said bed in its vertical movements and for preventing lateral movement thereof.

2. In apparatus of the character described, a table for receiving and supporting a newly formed sheet of glass thereupon, said table comprising a bottom and upstanding side portions, a stationary bed freely supported upon said bottom and having a plurality of spaced parallel transversely extending recesses in its upper surface, rolls disposed within said recesses, shafts carrying said rolls and journaled within said side portions, means for driving said shafts to rotate the rolls in unison, means carried by the bottom and engaging the undersurface of the bed for effecting raising and lowering thereof relative to said rolls, and means also carried by the bottom and received within recesses in the undersurface of the bed for guiding said bed in its vertical movements and for preventing lateral movement thereof.

3. In apparatus of the character described, a table for receiving and supporting a newly formed sheet of glass thereupon, said table comprising a bottom, a stationary bed freely supported upon said bottom and having a plurality of spaced parallel transversely extending recesses in its upper surface, rotatable rolls disposed within said recesses, means for driving said rolls in unison, and means for raising and lowering the bed relative to said rolls including a plurality of cams carried by the bottom and engaging the undersurface of said bed, said bottom being provided with recesses for receiving the cams therein when the bed is lowered.

4. In apparatus of the character described, a table for receiving and supporting a newly formed sheet of glass thereupon, said table comprising a bottom and upstanding side portions, a stationary bed freely supported upon said bottom and having a plurality of spaced parallel transversely extending recesses in its upper surface, rolls disposed within said recesses, shafts carrying said rolls and journaled within said side portions, means for driving said shafts to rotate the rolls in unison, means for raising and lowering the bed relative to said rolls including a plurality of cams carried by the bottom and engaging the undersurface of said bed, said bottom being provided with recesses for receiving the cams therein when the bed is lowered, and means carried by the bottom and received within recesses in the bed for guiding the same during its vertical movements and for preventing lateral movement thereof.

5. In apparatus of the character described, a table for receiving and supporting a newly formed sheet of glass thereupon, said table comprising a bottom, a stationary bed freely supported upon said bottom and

having a plurality of spaced parallel transversely extending recesses in its upper surface, rotatable rolls disposed within said recesses, means for driving the rolls in unison, means carried by a portion of the table and engaging the bed for raising and lowering the same with respect to said rolls, and means also carried by a portion of the table and engaging the bed for guiding said bed in its vertical movements and for preventing lateral movement thereof.

6. In apparatus of the character described, a table for receiving and supporting a newly formed sheet of glass thereupon, said table including a truck having a bottom and upstanding side portions, a stationary bed freely supported upon said bottom and having a plurality of spaced parallel transversely extending recesses in its upper surface, rolls disposed within said recesses, shafts carrying said rolls and journaled within said side portions, means for driving said shafts to rotate the rolls in unison, means carried by the truck and engaging the bed for effecting raising and lowering thereof relative to said rolls, and means also carried by the truck and engaging the bed for guiding said bed in its vertical movements and for preventing lateral movement thereof.

Signed at Toledo, in the county of Lucas and State of Ohio, this 11th day of May, 1929.

WILLIAM E. NOBBE.