Aug. 15, 1933. J. H. REDSHAW 1,922,327

SHEET GLASS APPARATUS

Filed June 29, 1932 4 Sheets-Sheet 1

Fig. 1.

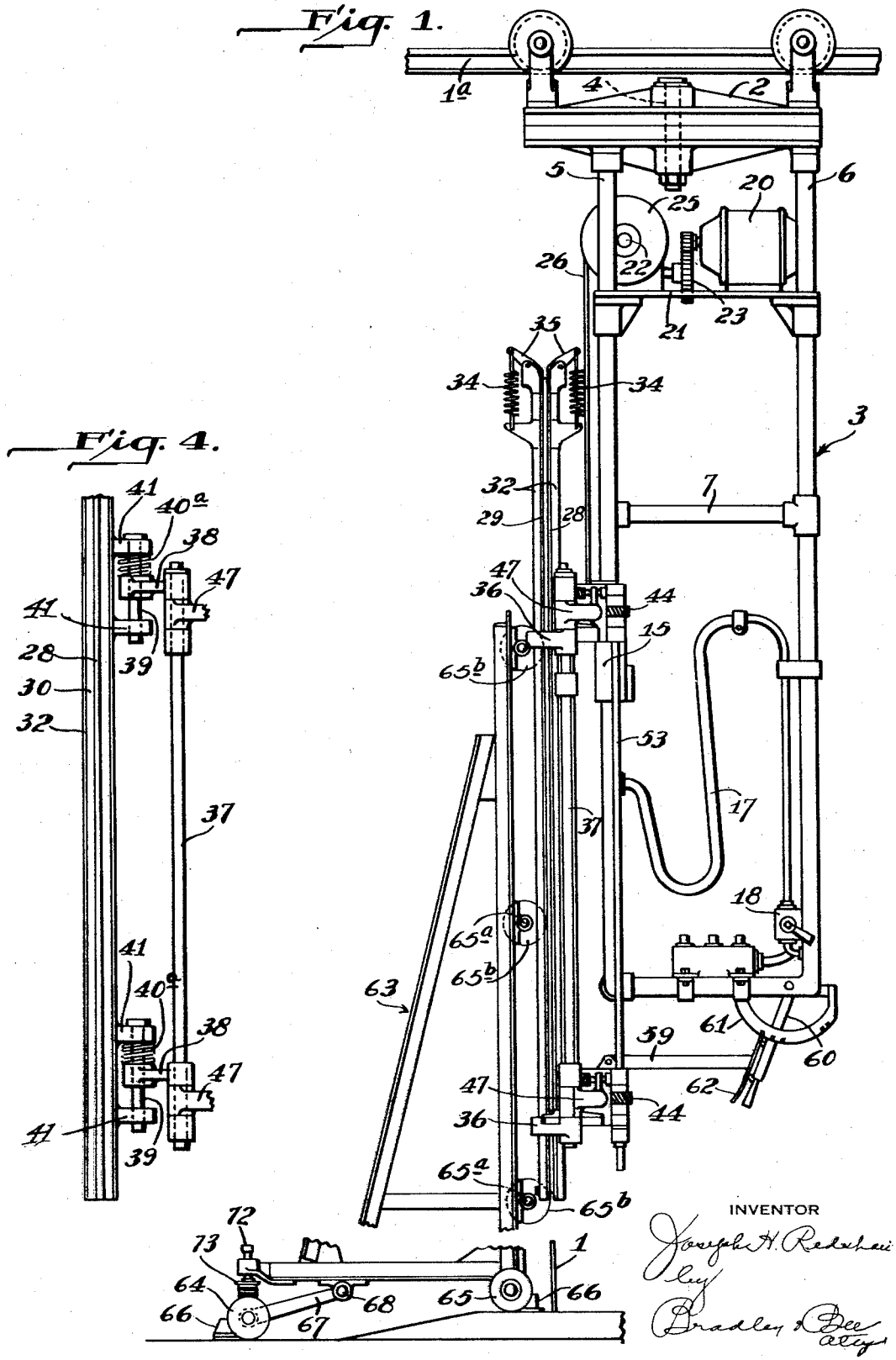


Fig. 4.

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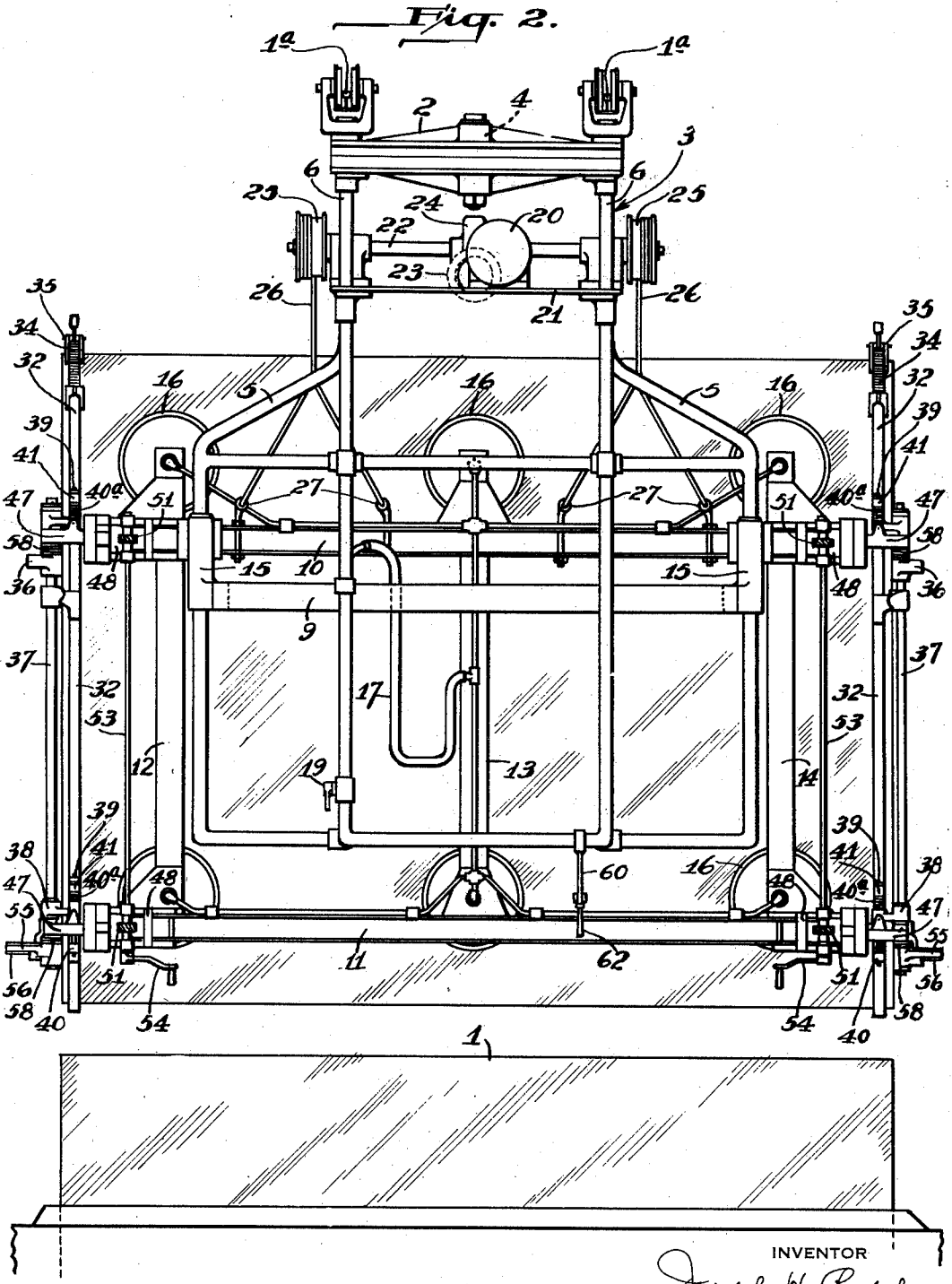
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Fig. 2.



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Fig. 7.

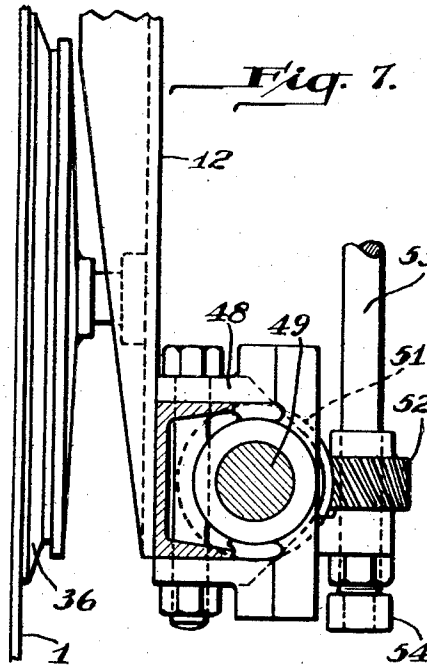


Fig. 3.

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Fig. 5.

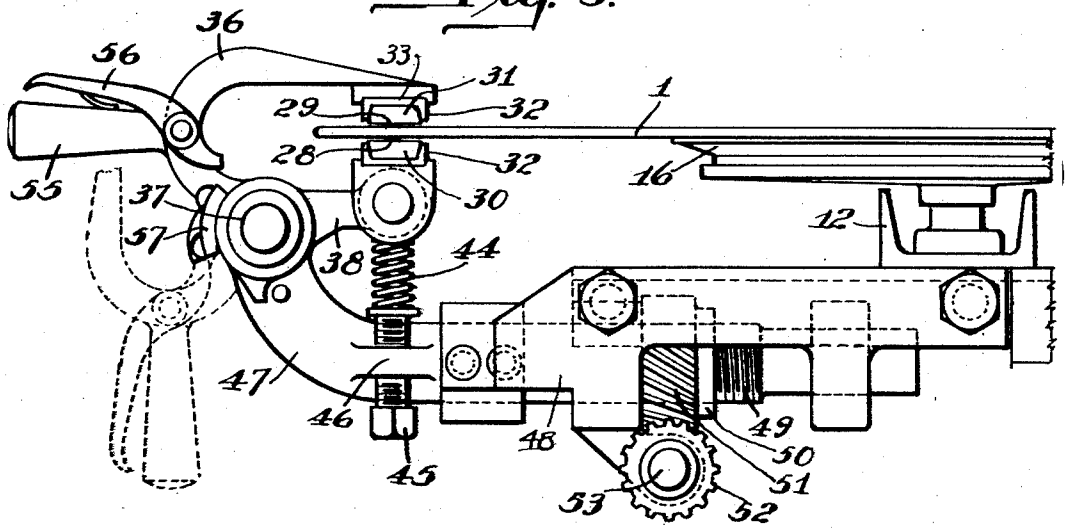
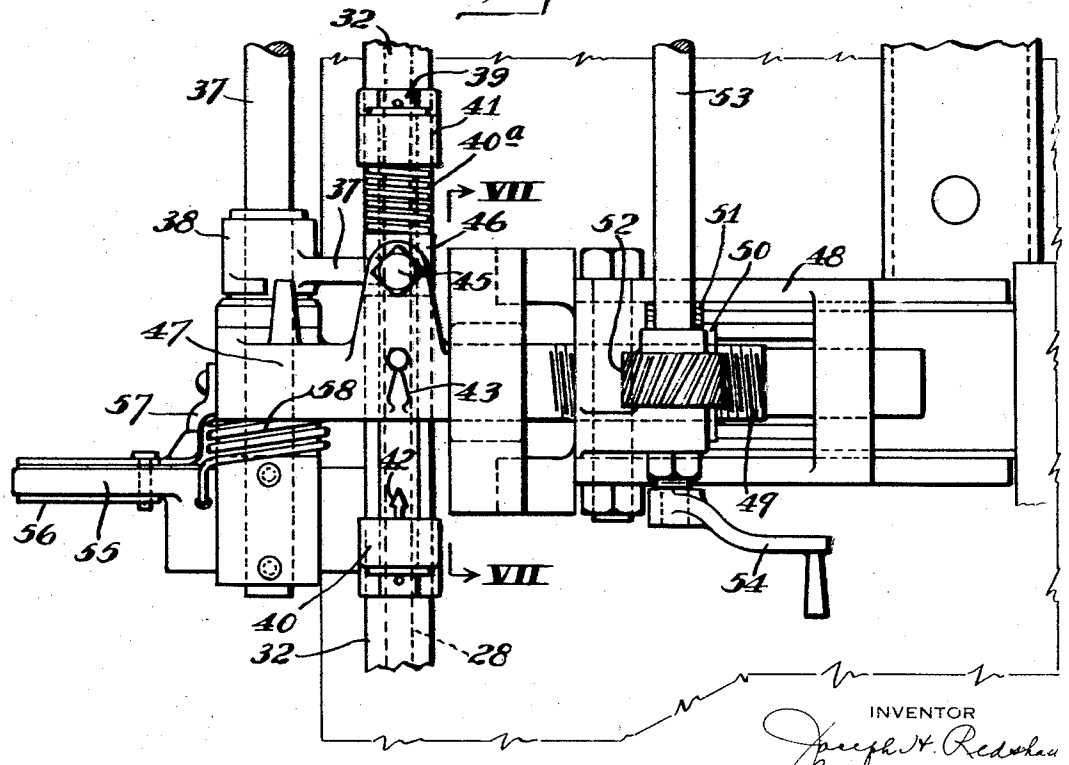


Fig. 6.



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UNITED STATES PATENT OFFICE

1,922,327

SHEET GLASS APPARATUS

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Application June 29, 1932. Serial No. 619,662

19 Claims. (Cl. 49—50)

The invention relates to the manufacture of sheet glass by the vertical drawing method, and has particularly to do with the last stage of the operation involving the engagement of the sheet above the leer, its removal after the severance of the sheets, and the trimming off of the edges of the sheet by means carried on the transporting device. The invention constitutes an improvement over the apparatus of my pending application, Serial No. 598,437, filed March 12, 1932. Such pending application discloses an apparatus of particular utility in drawing and handling very large sheets of glass, the handling apparatus being utilized to support the upper end of the glass ribbon before the sheet is severed and to apply a certain amount of lifting force to assist in drawing the sheet upward through the leer. The present improvement adds to the apparatus of the pending application a means for severing or trimming off the vertical edges of the glass sheet, so that this function may be performed while the sheet is in transit from the leer to the position at which it is deposited upon the A rack, cutting table or other receiving means for the sheets. The edge trimming means preferably comprises a pair of electrically heated wires or ribbons at each edge of the sheet which engage the glass on its opposite sides, this giving an increased heating effect as compared with a single wire or ribbon, but the invention is not limited to either arrangement, both being known in the art, and further is not limited to using electrical securing or trimming means, as various mechanical means also well known in the art, might be employed, although the electrical severing means presents substantial advantages. The edges will sometimes drop off after the heating operation by the wires, but ordinarily a cold or wetted metal member is touched to the line of heating to cause the actual cracking off of the edge strips, the transfer device being positioned at such time over a cullet box to receive the waste glass. This method of edge severance presents very substantial advantages over the electrical method heretofore employed of applying the ribbons or wires during the drawing operation and then cracking off such edges after the sheets are placed on the receiving racks, one advantage being due to the fact that, with the present method, the cracking off of the edges can be accomplished as soon as the ribbons or wires are removed from the glass, while with the former method a considerable interval of time necessarily elapsed between the heating operation above the leer and the cracking off step after the sheets were placed in the storage racks. The objects of the invention are the provision of a suitable apparatus for carrying out the operation as above outlined, which is simple in construction reliable in operation, and which can be easily handled by the workmen without the application of any special skill. One embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a side elevation of the apparatus. Fig. 2 is a front elevation. Fig. 3 is a front elevation of the supporting frame shown in Fig. 1. Fig. 4 is a detail view. And Figs. 5, 6 and 7 are enlarged detail views, the section shown in Fig. 7 being taken on the line VII—VII of Fig. 6.

Referring to the general arrangement as shown in Figs. 1, 2 and 3, the reference numeral 1 indicates the upper end of a glass sheet which is being continuously formed in a sheet glass drawing apparatus, not shown, and lying beneath the structure shown in Figs. 1, 2 and 3. This sheet drawing apparatus may be of any approved form, such as the well-known Fourcault or Slingluff apparatus which involves the use of a vertical leer provided with rollers for drawing the continuous sheet or ribbon which is cut into sections and handled as hereinafter described. The apparatus shown in Figs. 1, 2 and 3 comprises an overhead track 1^a on which is mounted a trolley 2 supporting the conveyor frame 3, such frame being swivelled on the shaft 4 as described in my copending application heretofore referred to. The conveyor frame is made up of pipe sections 5, 6, 7, 8, etc. secured together as indicated in Figs. 1 and 2 and on this frame is mounted for vertical movement a vacuum frame including the members 9, 10, 11, 12, 13 and 14, such frame being guided on the pipe members 5, 5 by means of the cross heads 15, 15. The vacuum frame carries on its front side 6 vacuum cups 16 connected by suitable piping as shown and including the hose 17 with a valve casing 18, to which a vacuum line is connected, the application and release of vacuum being accomplished in the usual way by the manipulation of the valve 19. Power means are provided for moving the vacuum frame up and down on the conveyor frame in the form of an electric motor 20 mounted upon a platform 21 and arranged to drive the shaft 22 through the intermediary of the gears 23 and suitable reduction gearing in the casing 24. The shaft 22 is provided with drums 25 carrying cables 26 whose lower ends are attached to the eye bolts 27 secured to the channel 10 which constitutes the upper transverse member of the vacuum frame.

At each end of the vacuum frame edge, trimming or severing means are provided in the form of electrically heated resistance wires or ribbons arranged in pairs, the members of which pairs lie on opposite sides of the glass sheet. The resistance members 28, 29 (Fig. 5) are in the form of ribbons backed up by strips of asbestos 30, 31 carried by vertical channels 32, 33. Suitable provision is made for stretching the ribbons tight under varying conditions as is well-known in the art. In this case, the ribbons are fixed against movement at their lower extremities, while tension is applied by means of springs at their upper extremities, this being indicated in Figs. 1 and 2. The springs 34, 34 apply tension to the levers 35, 35 connected at their inner ends to the ends of the heating ribbons. The channels 33 which support the ribbons that engage the rear face of the sheet are each mounted upon a pair of arms 36 pivoted upon the vertical shaft 37, while the channels 32 which carry the ribbons engaging the front face of the glass are each mounted upon a pair of arms 38 which are also pivoted upon the vertical shaft 37. The arms 38 are connected to the channels 32 so as to permit such channels and the ribbons carried thereby to have a limited vertical movement with respect to the glass sheet, and this is accomplished as indicated most clearly in Fig. 4, wherein the arms 38 are shown as provided with shafts 39 slidable vertically through lugs 40, 41 carried by the channels 32. Springs 40^a are provided on the shafts 39 to cushion the downward movement of the channels 32 which carry the heating ribbons. The fork 42 in conjunction with the spring 43 (Fig. 6) are provided in order to hold the channel 32 in its upper position when the cracking off ribbons are first applied to the glass sheet. At this time, the lower ends of these ribbons lie just above the transverse ribbon which is employed with apparatus of this type for severing the glass sheet from the main body of the ribbon emerging from the leer and it is practically impossible to bring the lines of heating of the ribbons 28 and 29 down to a point where they cross or intersect the transverse line of heating. As a result, the cracking off of the side edges at their extreme lower ends is liable to be imperfect and the expedient as above described is intended to overcome this difficulty, as after the glass is cut off transversely, the operator is able to move the channel 32 carrying the ribbon 28 downward by applying the slight amount of downward pressure necessary to release the fork 42 from the springs 43.

The arms 38 are normally held yieldingly in advanced position by means of springs 44 whose tension is adjustable by means of the screws 45 extending through the lugs 46 in the brackets 47 which carry the vertical pivot shaft 37. The brackets 47 are mounted for endwise movement in blocks 48 which are secured rigidly to the framework of the vacuum frame, this being accomplished by means of threaded portions 49 working through nuts 50 swivelled in the blocks 48. The nuts 50 have their outer surfaces formed into spiral gears 51 which are engaged by the gears 52, 53 mounted on a vertical shaft 53 (Figs. 1 and 2). This shaft 53 is provided at its lower end with a handle 54. By rotating the handle 54 and the gearing operated thereby, it is thus possible to move the bracket members 47 in and out, thus adjusting the position of the heating ribbons 28 and 29 with respect to the edge of the sheet which is to be trimmed. This is desirable inasmuch as the sheet may vary in width.

The arms 36 which carry the channels 33 supporting the ribbon 29 are mounted for movement through a wide arc, as indicated in dotted lines in Fig. 5, so that the channel and ribbon may be swung entirely to one side of the sheet either when positioning the apparatus or after the sheet has been carried by the conveyor to discharge position. The lower arm 36 of each pair is provided with a handle 55 carrying a latch 56 so that when the arms are swung to the dotted line position, the parts may be locked in this position by the latch 56 which engages a suitable lug 57 secured to the bracket 47. The arms 36 are normally moved to operative position as shown by Fig. 5 and the ribbon 29 caused to yieldingly engage the glass by the use of the spring 58 (Fig. 6) which is coiled around the shaft 37 and secured at one end to the arm 36 and at its other end to the bracket 47.

The glass sheet 1 as it emerges from the leer is not always in a vertical plane, but is ordinarily tilted one way or the other and it is, therefore, desirable that the vacuum frame be arranged to tilt correspondingly when it is applied to the glass. This tilting movement is possible by reason of the mounting of the brackets 47 in the brackets 48 and any desired position of adjustment is maintained by means of the connecting rod 59 (Fig. 1) secured at one end to the vacuum frame and at its other end to a lever 60 pivoted to conveyor frame and moving over a suitable quadrant 61 also secured to the conveyor frame, a latch 62 being provided to hold the lever 60 in any desired position of adjustment.

In securing the engagement of the vacuum frame with the glass sheet, it is necessary to apply some pressure against the sheet and in order to avoid any tendency to break the sheet due to this pressure, it is desirable to provide means for supporting the rear face of the glass during the step of securing the application of the vacuum cups to the glass. I preferably accomplish this result by the use of the framework 63 (Fig. 1) which is supported upon the wheels 64 and 65 and held against backward movement by means of the blocks 66. The framework is provided with a plurality of transverse shafts 65*a* on which are mounted the rubber tired rollers 65*b* adapted to engage the rear face of the glass sheet which is being drawn. In order to provide for tilting the frame to correspond to the angle at which the sheet 1 may be tilted, the frame is mounted for adjustment around the axles of the front wheels 65, and the rear wheels 65 are mounted on swinging arms 67 pivoted at 68. The axles of these wheels carry blocks 69 and 70 (Fig. 3) upon which are mounted the springs 71. Adjustment is made to vary the angle of the frame by means of the screws 72 which extend through brackets carried by the frame and engage plates 73 mounted upon the upper ends of the springs. The yielding support of the frame is desirable as it reduces any tendency to breakage due to the pressure exerted by the vacuum cups upon the glass when such cups are pressed against the glass in order to secure engagement.

The operation in using the apparatus is as follows: Assuming that the framework 63 is in position and a length of glass has been fed up to a point above the upper row of vacuum cups, as indicated in Fig. 2, the vacuum cups are at this time out of contact with the glass sheet and the transfer frame is pushed to the left (Fig. 1) to the

position indicated, thus bringing the vacuum cups into engagement with the glass sheets, after which the valve 18 is operated to secure engagement of the cups. During the application of the cups, the motor 20 is operated so that the vacuum frame which supports the cups is moved upward and after the cups have engaged, this upward movement of the vacuum frames assists in lifting the glass sheet. The glass sheet which is engaged by the vacuum cups is now severed from the ribbon by any suitable means, such as a diamond or by electrical cutting off means such as that shown in the Slingluff Patent No. 1,373,533. As soon as the sheet is severed, the transfer frame is moved to the rear and the latch 56 released from the stop 57 so that the arms 36 are swung from the dotted line position of Fig. 5 to the full line position, thus bringing the heating ribbon 29 into engagement with the glass sheet. Either automatically or by the use of a hand switch, sufficient current is supplied through the ribbons to heat the glass to the point necessary for cracking off the edges of the sheet. In order to speed up this heating up operation, it is desirable to keep a small amount of current upon the heating wires 28 and 29 at all times so that they will have a temperature of 300 or 400 degrees when they first engage the glass. After the heating ribbons have been in engagement with the glass for a few seconds, the channel iron 32 carrying the ribbon 28 is pushed down to the position shown in Fig. 6 releasing the hook 42 from the springs 43 and carrying the lower end of the ribbon 28 to a point below the lower edge of the glass sheet carried by the vacuum cups, the object being as heretofore pointed out, to insure that the vertical line of heating shall extend clear to the edge of the sheet. After a few seconds more, the ribbon 29 may be disengaged from the glass and this is accomplished by the operator grasping the handles 55 carried on the lower arms 36 and swinging them to the dotted line positions shown in Fig. 5, at which point the parts are held in position by means of the dog or latch 56. The lines of heating at each edge of the sheet may now be touched with a cold tool to start the cracking action, and the edges will crack off and drop down, the conveyor at this time being preferably positioned over a cullet box to receive the waste glass. The conveyor may now be brought to position opposite a rack or frame on which the glass is to be placed in an upright position slightly inclined from a vertical plane. This positioning on the rack is accomplished by bringing the conveyor to a point where the lower edge of the glass sheet supported on the vacuum frame is over the bottom member of the rack, after which a reverse operation of the motor 20 lowers the sheet so that its edge engages the rack. At this time, the vacuum in the cups is broken by operating the valve 19 and the sheet is thus disposed on the rack. The apparatus thus serves as a means which assists in supporting and drawing the glass sheet, which acts as a transfer means for carrying the glass from the drawing machine to a storage rack, and which acts to sever the edges of the glass sheet during the period of transfer. The invention is not limited to the particular method of operation heretofore recited as it is possible to manipulate the apparatus in various ways. If desired, the heating ribbons 28 and 29 might be applied to the glass sheet before the glass sheet is cut off from the main body of the ribbon, although it is more convenient to operate as heretofore described. If desired, the application of current to the heating ribbons may be made automatic as well as the breaking of the circuit supplying the current to the ribbons after a predetermined interval of time. The apparatus may also be arranged to apply current automatically to the heating ribbons when the arms 36 are moved to their operative full line positions as shown in Fig. 5. Various details of construction may also be modified depending upon the particular conditions to which the apparatus is subject.

What I claim is:

1. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame, and severing devices carried by the vacuum frame and adapted to trim off the vertical side edges of the glass sheet supported by the vacuum frame.

2. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, severing devices carried by the vacuum frame adapted to trim off the vertical side edges of the sheet supported by the vacuum frame, and means for adjusting the cutting devices laterally with respect to the vacuum frame.

3. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame and for tilting movement with respect thereto, power means for moving the vacuum frame upward on the conveyor frame, severing devices carried by the vacuum frame adapted to trim off the vertical side edges of the sheet supported by the vacuum frame, and means for adjusting the cutting devices laterally with respect to the vacuum frame.

4. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, and vertical resistance members heated by electricity carried by the vacuum frame in position to engage the side edges of a glass sheet supported on the vacuum cups.

5. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, fixed vertical resistance members heated by electricity carried by the vacuum frame in position to engage the side edges of a glass sheet supported on the vacuum cups on the side of the sheet engaged by said cups, a movable vertical resistance member also heated by electricity and carried by the vacuum frame in opposition to each of said

fixed resistance members, and means for moving the movable resistance members to cause them to press the glass sheet against the fixed resistance members.

6. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, and severing devices carried by the vacuum frame adapted to trim off the vertical side edges of the sheet supported by said frame, said devices each comprising a pair of vertical resistance elements electrically heated with the members of each pair on opposite sides of the sheet in yielding engagement therewith.

7. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame and severing devices carried by the vacuum frame adapted to trim off the vertical side edges of the sheet supported by said frame, said devices each comprising a pair of vertical resistance elements electrically heated with the element of each pair which lies on the side of the sheet remote from the vacuum cups mounted for movement such that it may be swung to a position at one side of the edge of the sheet.

8. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame and severing devices carried by the vacuum frame adapted to trim off the vertical side edges of the sheet supported by said frame, said devices each comprising a pair of vertical resistance elements electrically heated with the element of each pair which lies on the side of the sheet remote from the vacuum cups mounted for movement such that it may be swung to a position at one side of the edge of the sheet and spring means for normally swinging the movable elements to bring them to operative position.

9. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame and means for engaging and supporting the rear face of the glass sheet being drawn which extends above the leer when the vacuum cups are pressed against the front face of the sheet.

10. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame, and roller members for engaging and supporting the rear face of the glass sheet being drawn which extends above the leer when the vacuum cups are pressed against the front face of the sheet.

11. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement a vacuum frame provided with vacuum cups carried by the conveyor frame and yielding means for engaging and supporting the rear face of the glass sheet being drawn which extends above the leer when the vacuum cups are pressed against the front face of the sheet.

12. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame, and a frame mounted on the rear side of the glass sheet being drawn and provided with a plurality of rollers adapted to engage the rear face of said sheet being drawn which extends above the leer when the vacuum cups are pressed against the front face of the sheet.

13. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame, a frame mounted on the rear side of the glass sheet being drawn and provided with means adapted to engage the rear face of said sheet which extends above the leer when the vacuum cups are pressed against the front face of the sheet, and yielding means for holding the frame in operative position.

14. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame, and a removable yielding frame mounted on the rear side of the glass sheet being drawn and provided with means adapted to engage the rear face of said sheet which extends above the leer when the vacuum cups are pressed against the front face of the sheet.

15. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups carried by the conveyor frame, a frame mounted on the rear side of the glass sheet being drawn and provided with means adapted to engage the rear face of said sheet which extends above the leer when the vacuum cups are pressed against the front face of the sheet, and means for adjusting the frame so that it tilts away from a vertical plane.

16. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, vertical resistance members heated by electricity carried by the vacuum frame in position to engage the side edges of a glass sheet supported on the vacuum cups, and means for supporting the frame for adjustable tilting movement about its lower end.

17. In combination in apparatus for handling

and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, and vertical resistance members heated by electricity mounted for vertical movement on the vacuum frame in position to engage the side edges of the glass sheet supported on the vacuum cups.

18. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, brackets mounted for sliding vertical movement on the vacuum frame, and vertical resistance members heated by electricity carried by the brackets in position to engage the side edges of a glass sheet supported on the vacuum cups.

19. In combination in apparatus for handling and trimming glass sheets cut from a continuous sheet or ribbon emerging from a vertical leer, a conveyor frame mounted above the leer for lateral movement, a vacuum frame provided with vacuum cups mounted for vertical movement on the conveyor frame, power means for moving the vacuum frame upward on the conveyor frame, brackets mounted for sliding vertical movement on the vacuum frame, springs for cushioning the brackets at their lower extremes of movement, and vertical resistance members heated by electricity carried by the brackets in position to engage the side edges of a glass sheet supported on the vacuum cups.

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