J. PLAYER.

SHEET GLASS DRAWING MACHINE.

APPLICATION FILED AUG. 29, 1908. RENEWED JAN. 19, 1910.

953,973.

Patented Apr. 5, 1910.

2 SHEETS—SHEET 1.

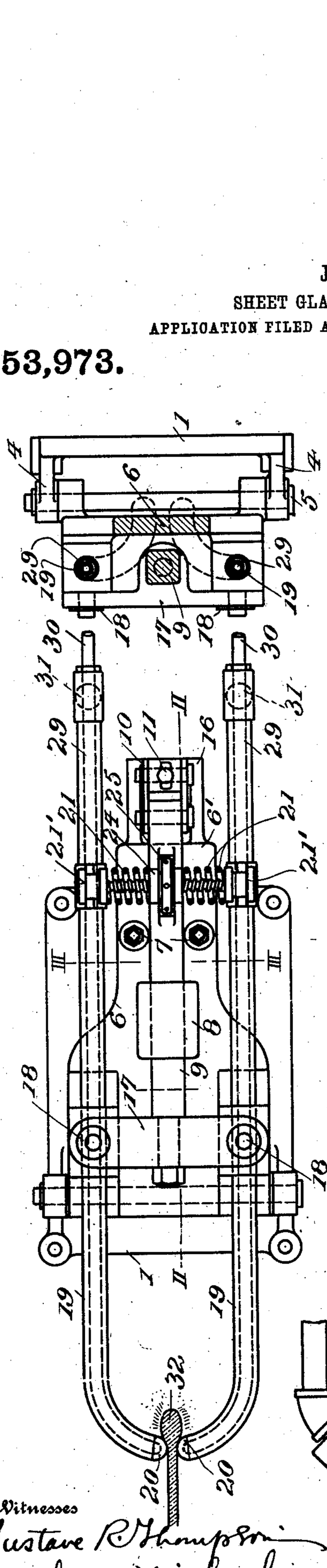

FIG. 1.

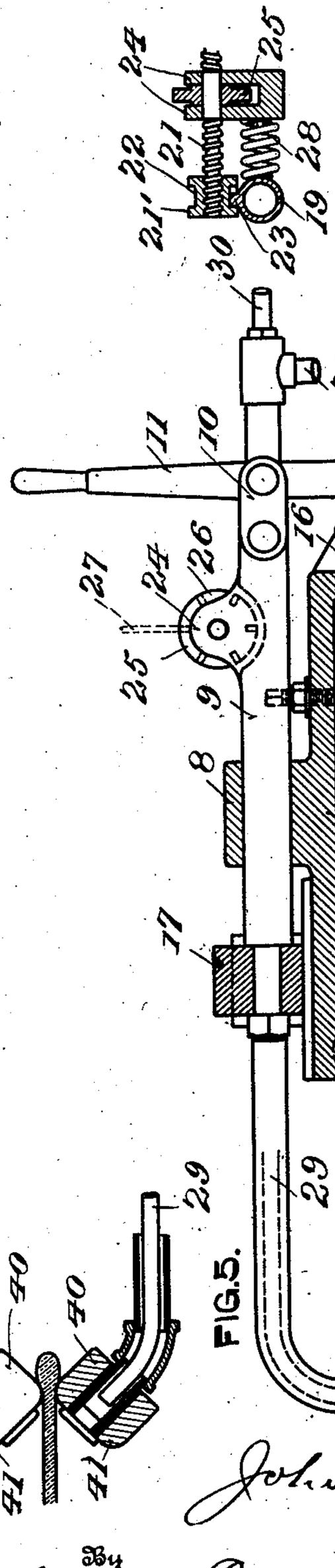

FIG. 2.

FIG. 4.

FIG. 3.

FIG. 5.

Witnesses

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2 SHEETS—SHEET 2.

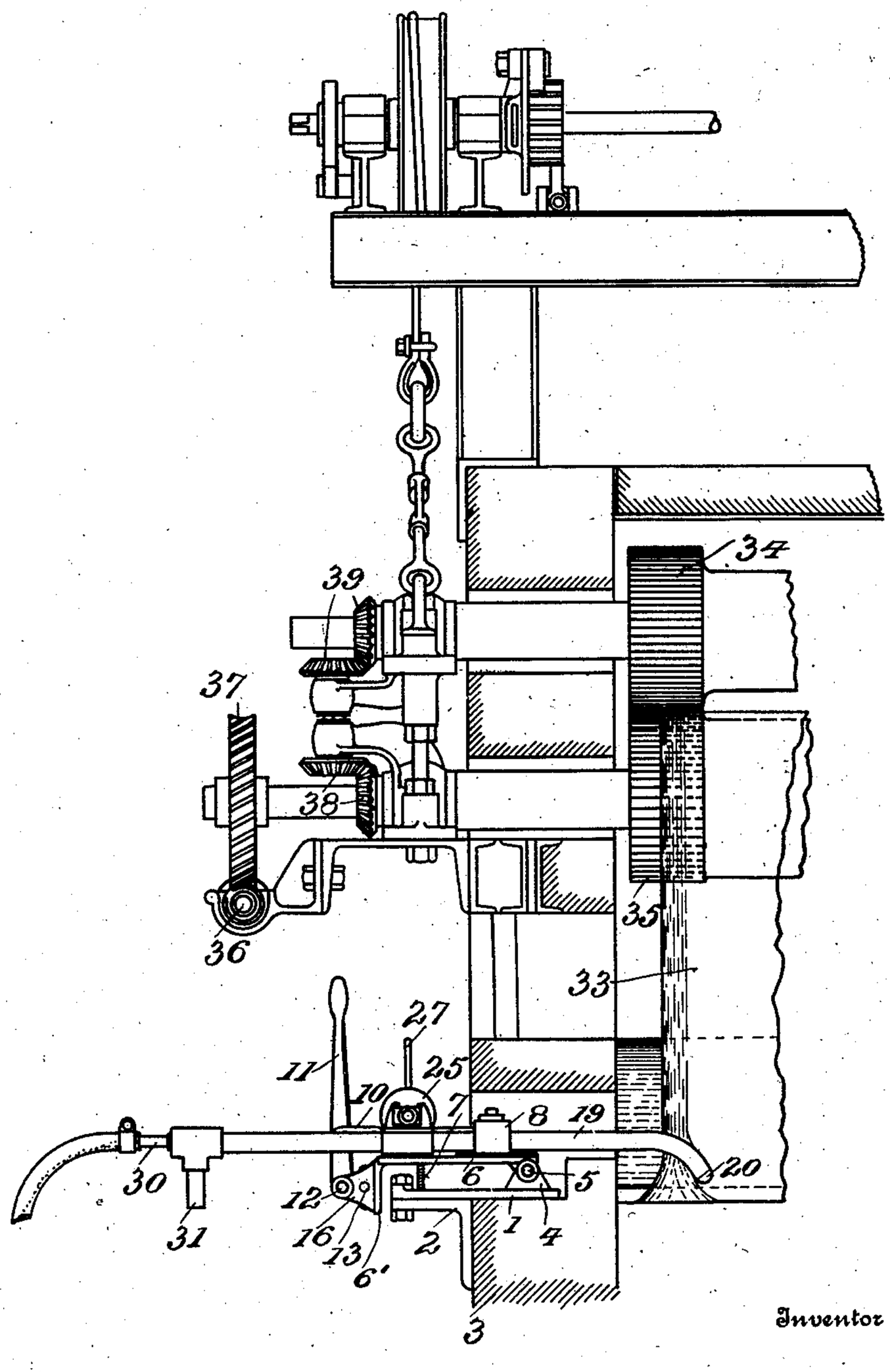

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FIG. 6.

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UNITED STATES PATENT OFFICE.

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SHEET-GLASS-DRAWING MACHINE.

953,973. Specification of Letters Patent. Patented Apr. 5, 1910.

Application filed August 29, 1908, Serial No. 450,805. Renewed January 19, 1910. Serial No. 538,912.

To all whom it may concern:

Be it known that I, JOHN PLAYER, of River Forest, Illinois, have invented a new and useful Improvement in Sheet-Glass-Drawing Machines, which improvement is fully set forth in the following specification.

This invention relates to the art of glass working, and more particularly to the art of drawing sheet glass.

As is well known in this art, when efforts are made to draw glass in sheet form from a mass of molten glass, there is a constant tendency for the sheet to narrow or draw to a string or thread, and the object of the present invention is to overcome or counteract this narrowing tendency of the sheet, to the end that the sheet may be drawn of uniform width.

The invention is applicable either to drawing sheets of certain measured specified lengths or to the continuous production of sheet glass. In the present instance, it is illustrated in connection with a machine for the continuous production of sheet glass, but it is to be understood that such showing is not to be taken as limiting the invention to continuous sheets.

The inventive idea involved may be embodied in a great variety of physical structures, one of which for the purpose of illustration is shown in the accompanying drawings, in which,

Figure 1 is a plan view of one form of my device for counteracting the narrowing of the sheet; Fig. 2 is a central section on the line II—II of Fig. 1; Fig. 3 is a transverse section on the line III—III of Fig. 1; Fig. 4 is a sectional detail; Fig. 5 is a broken detail showing a slightly different form of the gripping ends of the side holding device, parts being shown in section; and Fig. 6 is a broken elevational detail showing my side-holding apparatus in position and operating in conjunction with a continuous sheet glass producing machine.

Referring to the drawings, in which like reference numerals indicate corresponding parts, 1 is a suitable base-plate rigidly supported, as by brackets 2 (Fig. 6) on the wall 3 of a glass-working chamber containing molten glass. There are two of these plates, one mounted on each side of the working chamber, and there are provided two of the side-holding devices hereinafter described, one operating in conjunction with each edge of the sheet as it is being drawn. As each of these side-holding devices, however, is identical with the other, it will suffice to illustrate and describe one of them.

Mounted on the plate 1 are lugs 4 forming bearings for a transverse pivot 5 around which turns a plate 6. The rocking of the plate 6 on its horizontal pivot 5 may be effected in any suitable way, and the angle of inclination of the plate 6 is determined by a screw 7 passing through the plate 6 and reacting against the plate 1. On the upper side of the plate 6 is an upwardly projecting lug 8 having an opening therethrough in which slides a rod or bar 9, which is connected at its outer end by links 10 to a lever 11 fulcrumed at 12 to a downwardly projecting portion 6′ of the plate 6. By rocking the lever 11 upon its fulcrum, the rod or bar 9 may be caused to slide inward or outward through the bearing 8, and when adjusted in the desired position, the lever may be held in such position by means of a pin 13 projecting through holes 14 in an arc-shaped disk 15 rigid with the lever, the pin 13 projecting into a corresponding hole in the lug 16 upon which the lever 11 is fulcrumed.

On the inner end of the bar 9, there is carried a laterally extending slide 17, shown in plan in Fig. 1 and in section in Fig. 2. Mounted to turn on the vertical pivots 18, 18 (Fig. 1), secured to the slide 17, are two oppositely disposed arms 19, 19, which on their inner ends are bent or turned downward and also inward or toward each other, so that at their immediate ends 20, 20, they come into close proximity to each other.

Suitable means are provided for adjusting the inner ends of the lever arms 19 toward or from each other, to the end that they may be placed in position to coöperate with the edge of the sheet of glass. As here shown, such means consist of a right and left-handed screw 21, on each end of which are nuts 21′, said nuts being provided with a peripheral groove 22 engaging a rib 23 (see Fig. 4), on the upper side of each of the arms 19. At its central portion the screw 21 is not threaded and turns freely in bearing lugs 24, 24, projecting upward from the rod or bar 9. Between the lugs 24, the screw shaft has fast thereon a disk 25 having radial holes 26 therein within which may be inserted a suitable tool, as a simple rod 27, for turning the screw shaft, and thereby causing the nuts 21′, 21′, to ap-

proach toward or recede from each other, as the case may be, with the result that the operative engaging ends of the lever arms 19 will recede from or approach each other, thereby adjusting the space that will intervene between the adjacent ends of these arms.

Preferably, the peripheral grooves 22 and the nuts 21′ are wider than the rib 23 on the lever arms 19, so that there is more or less lost motion, and there is interposed between each of the lugs 24 and lever arms 19 a yielding member such as the coiled spring 28, which springs normally act to force the lever arms 19 as far apart as they will be permitted to move by the grooves in the nuts 21′, 21′. These springs and the lost motion between the lever arms and the nuts permit a limited amount of yielding action at the operative ends 20, 20, of the lever arms, to permit these ends to accommodate themselves to any variations in the thickness of the edge portions of the sheet. These inwardly turned adjacent ends 20, 20, of the arms 19, 19, are designed to grasp the edge portion of the sheet and hold it against the tendency to draw inward in the well-known manner. This holding action of the ends 20, 20, is facilitated by reason of the fact that when glass is drawn in sheet form, the immediate edge portions are slightly thicker than the main body of the sheet, and by having these holding ends 20, 20, take hold of the sheet just inside of the thickened portion 22 of the sheet, they secure an efficient hold thereon, and thus counteract the tendency which the sheet of glass naturally has during the drawing operation to rapidly narrow. This is accomplished by reason of the fact that the sheet is held to full width by the holding ends 20, 20, of the lever arms, which as shown in Fig. 6, engage the sheet at the formative point within a very short distance from the surface of the molten glass from which the sheet is drawn.

By reason of the fact that the inner portions 20, 20, of the lever arms are inserted into the furnace in close proximity to the highly heated molten glass, they would soon become heated to a temperature where they would have a tendency to stick to the sheet as it advanced upward between them. For the purpose of keeping down the temperature of the said holding ends of the lever arms, any suitable cooling fluid, as water, may be circulated through the arms. With this object in view, said arms are formed hollow, and a small pipe 29 is inserted in each of said arms, which pipes are shown in dotted lines in Figs. 1 and 2. These pipes extend nearly, but not quite, to the inner ends 20, 20, of the lever arms, and are connected at their outer ends to any suitable source of cooling fluid by the pipes 30. The cooling fluid passes inward through the pipes 20 and 29, and after reaching the inner end of said pipes passes outward between said pipes and the inner surface of the hollow arms 19, and is carried off through eduction pipes 31, Fig. 2, to the sewer, or any other suitable place of discharge.

In the operation of my side-holding devices, two of said devices are mounted one on each side of the working chamber or furnace containing the molten glass, with the inner ends of the lever arms 19 in close proximity to the surface of the molten glass, and, a sheet of glass having been started and advanced by any suitable drawing means, the inner ends 20, 20, are caused to lightly grasp the edge portions of the sheet just inside of the enlargement 32 on the immediate edge portion thereof, the screw 21 holding the fingers in contact with the sheet, as described.

As illustrated in Fig. 6, my side-holding device is shown in operation in connection with a continuous glass-drawing machine, in which the sheet of glass 33 is continuously advanced upward through the coöperative action of two rolls 34 and 35 having roughened ends which grasp and advance the sheet, the said rolls being driven in any suitable manner, as by a worm 36 engaging a worm gear 37 on the shaft of one of the rolls, the other roll being geared to said shaft by suitable beveled gears 38 and 34. As the particular construction of rolls and gearing do not form any part of the present invention, a further description thereof is unnecessary.

In the operation of my device, there is no lateral stretching of the sheet, the inner ends 20, 20, of the lever arms 19, 19, simply operating to hold the sheet to the full width to which it is originally drawn, thus counteracting the narrowing tendency of the sheet without imparting any lateral stretch thereto. If desired, the inwardly projecting ends 20, 20, of the lever arms may be provided with anti-friction devices for holding the sheet. One form of such anti-friction devices is shown in Fig. 5, in which 40, 40, are anti-friction rolls mounted upon the inwardly projecting ends 20, 20, of the lever arms 19, said rolls 40, 40, preferably having their edges which contact with the sheet beveled, as shown at 41 in said figure. In this construction the pipes 29 for conveying the cooling fluid conduct said fluid to the interior of the bearings for the anti-friction rolls 40, 40, to the end that said rolls may be kept at a temperature sufficiently low to prevent them from sticking to the glass during the drawing operation. It will be readily understood that by rocking the plate 6 upon its pivot 5, the outer end of said plate may be elevated or depressed, as may be de-

sired, and thus the position of the inner ends 20 of the lever arms with relation to the surface of the molten glass within the working chamber or receptacle may be adjusted, while by operating the lever 11 the said ends 20, 20, may be advanced in or out of the working chamber to accommodate the device to different widths of the sheet of glass being drawn.

Various modifications of the device as herein described will readily suggest themselves to those skilled in the art. It is also apparent that certain parts of the device may be omitted without in any way impairing the efficiency of the remaining parts, and all such modifications and changes in the device are intended to be included within the appended claims.

What I claim is:—

1. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with width-maintaining means continuously engaging the face of the sheet inside of its thickened edge portions.

2. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with two oppositely disposed width-maintaining devices each continuously engaging the face of the sheet inside of its thickened edge portions.

3. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with vertically adjustable width-maintaining means continuously engaging the face of the sheet, inside of its thickened edge portions.

4. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with horizontally adjustable width-maintaining means continuously gripping the edge portions of the sheet.

5. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with yieldable width-maintaining devices continuously engaging the opposite faces of each of the edge portions of the sheet.

6. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with a pair of lever arms whose oppositely disposed inner ends continuously engage the opposite faces of the edge portion of the sheet during the drawing operation.

7. In sheet glass drawing mechanism, the combination with means for drawing a sheet of glass, of width-maintaining devices, one engaging each of the opposite edge portions of the sheet during the drawing operation, each of said devices consisting of two levers adjustable to bring their respective inner ends into engagement with the edge portions of the sheet, and means securing the parts in such adjusted position.

8. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with a pair of levers adjustable horizontally with relation to the edge of the sheet, and means rocking said levers on their fulcrums to cause the ends of the levers to engage opposite faces of the edge portion of the sheet.

9. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with two pairs of lever fingers stationary during the drawing operation, one pair located at each edge of the sheet being drawn, and the two members of each pair engaging the opposite faces of the edge portions of the sheet, whereby the narrowing tendency of the sheet is counteracted.

10. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, means for overcoming the narrowing tendency of the sheet, which latter means consist of two pairs of lever fingers one pair operatively engaging the opposite faces of each of the edge portions of the sheet during the drawing operation, and means for vertically and horizontally adjusting the lever fingers of each pair.

11. In sheet glass drawing mechanism, means for drawing a sheet of glass, combined with two pairs of lever fingers one pair located in operative engagement with each of the edge portions of the sheet with said edge portion of the sheet passing between the ends of the lever fingers, and positive means for adjusting the operative ends of the lever fingers toward or from each other, whereby said fingers may be adjusted for sheets of different thickness.

12. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass upward and width-maintaining devices engaging each of the edge portions of the sheet for counter-acting the narrowing tendency of the sheet, each of said devices consisting of a plate mounted to turn around a horizontal axis, a slide mounted on said plate, a pair of lever-fingers fulcrumed on said slide and operatively engaging the opposite faces of the edge portion of the sheet, means for rocking said plate on its horizontal axis, and means for turning said finger-levers on their fulcrums, whereby the operative ends of said finger-levers may be adjusted into proper relation with the edge portions of the sheet.

13. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass, with two pairs of width-maintaining finger-levers the members of each pair engaging the opposite edge portions of the sheet during the drawing operation, and means for cooling said finger-levers.

14. In sheet glass drawing mechanism, the combination of means for drawing a sheet of glass and sheet width-maintaining devices consisting of two pairs of hollow

finger-levers the members of each pair operatively engaging the opposite faces of the edge portions of the sheet during the drawing operation, and means for circulating a cooling fluid through said hollow finger-levers.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN PLAYER.

Witnesses:
J. D. YOAKLEY,
S. T. CAMERON.