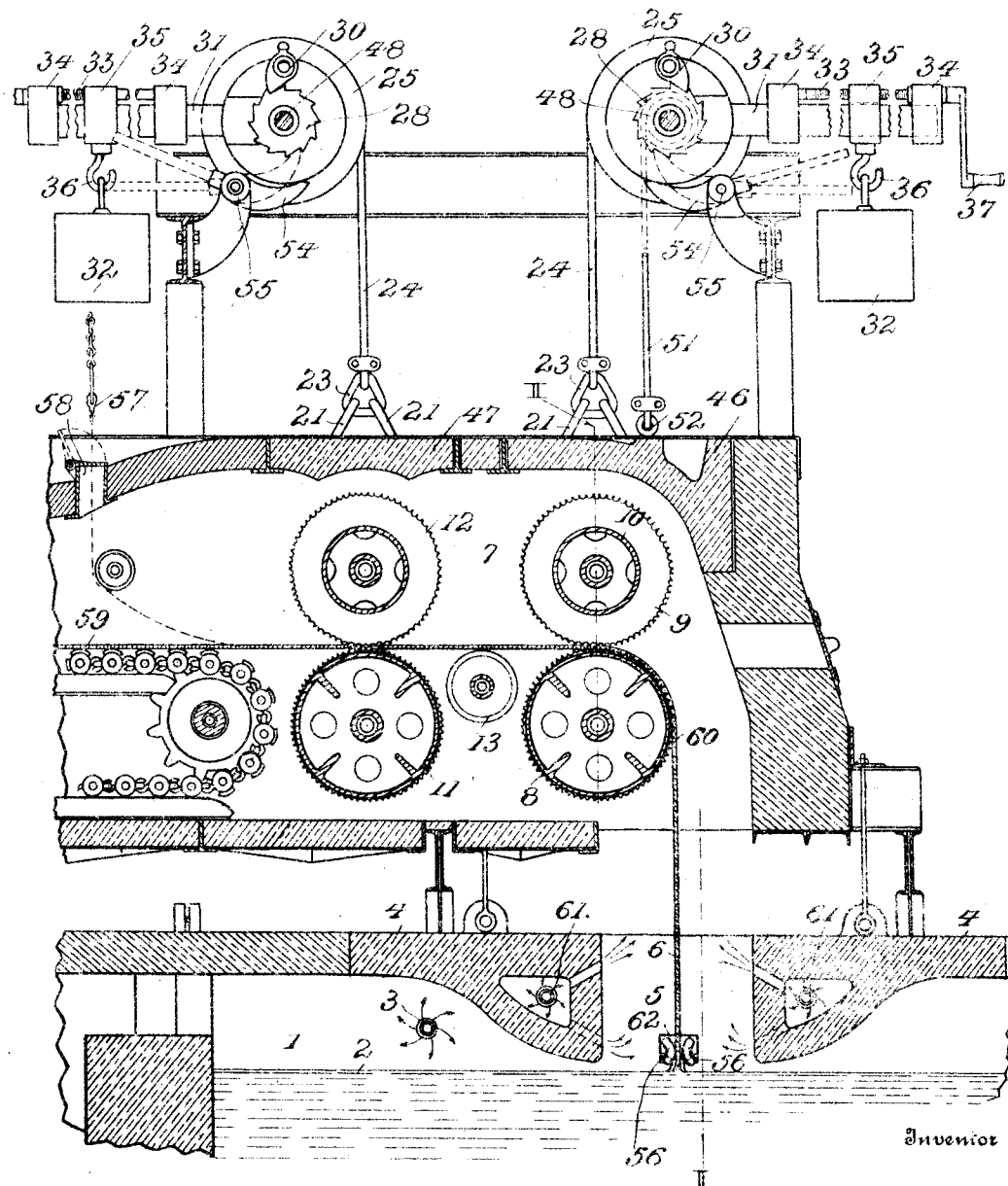


J. PLAYER.
MACHINE FOR DRAWING SHEET GLASS.
APPLICATION FILED AUG. 29, 1908.

1,032,238.

Patented July 9, 1912.

4 SHEETS-SHEET 1.



Witnesses
Gustave R. Thompson
Ruth C. Fitzhugh.

FIG. 1

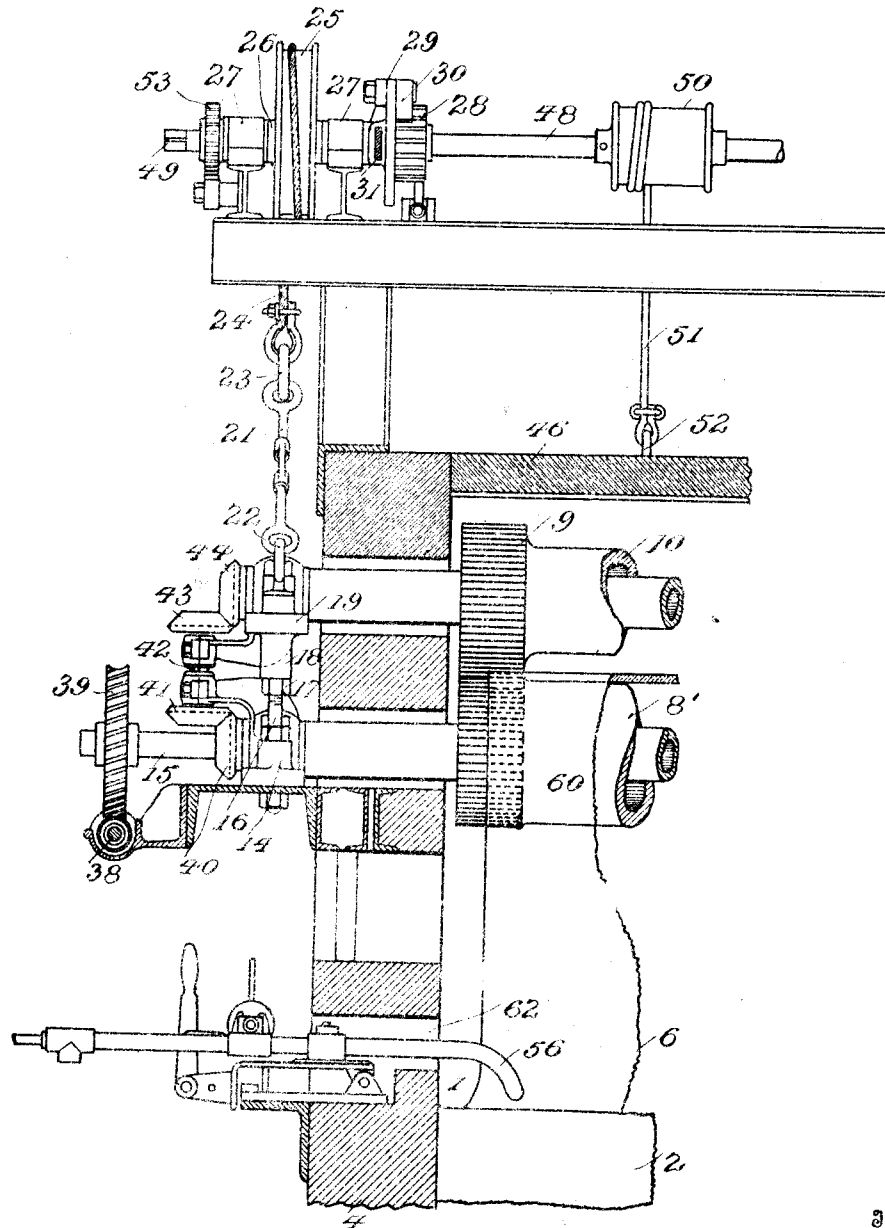
John Player
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4 SHEETS-SHEET 2



Inventor

FIG. 2.

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Witnesses

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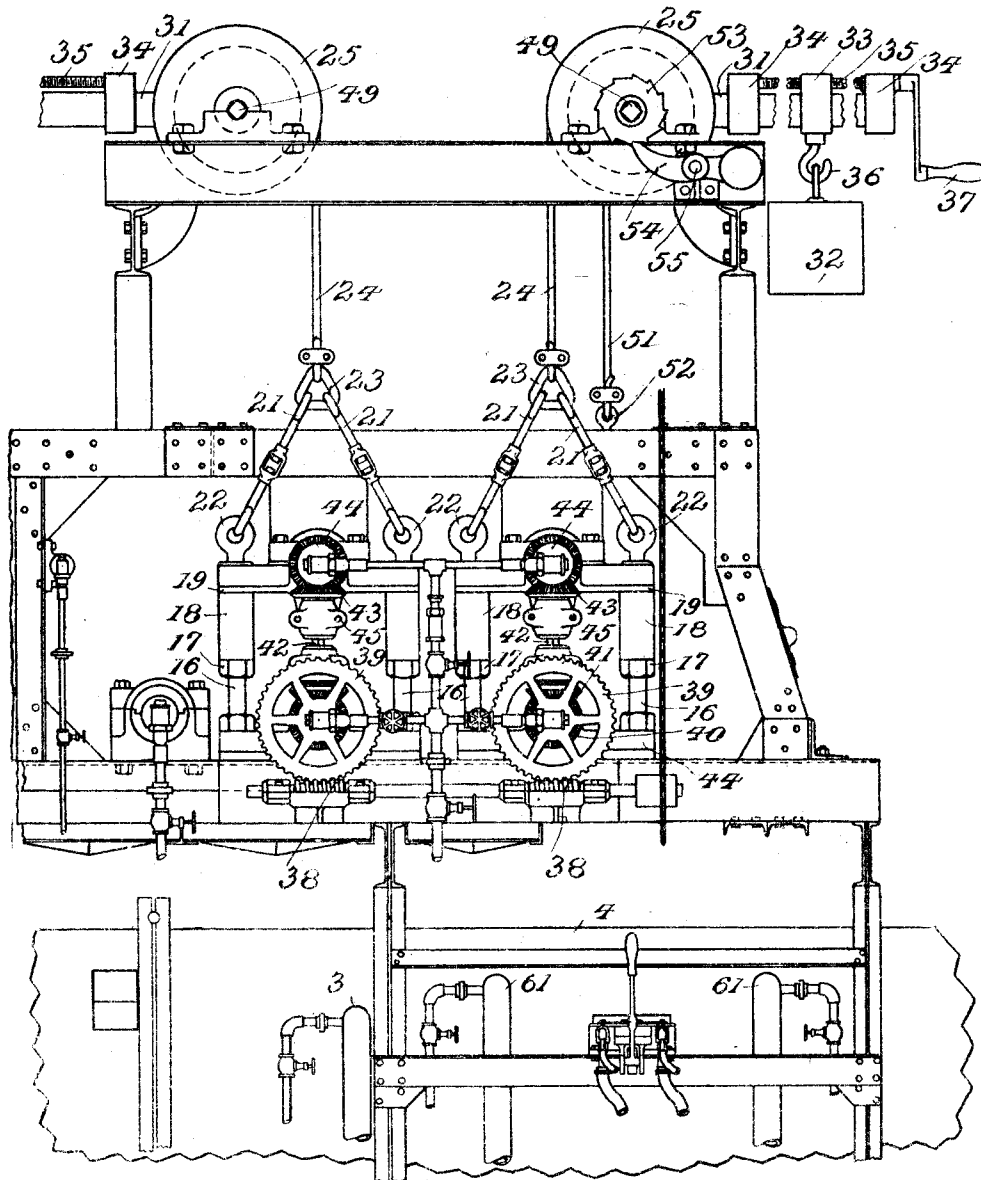
Mauro Curran & Lewis Martin
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4 SHEETS-SHEET 3.



Inventor

FIG 3

Witnesses

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Ruth C. Fitzhugh

John Player

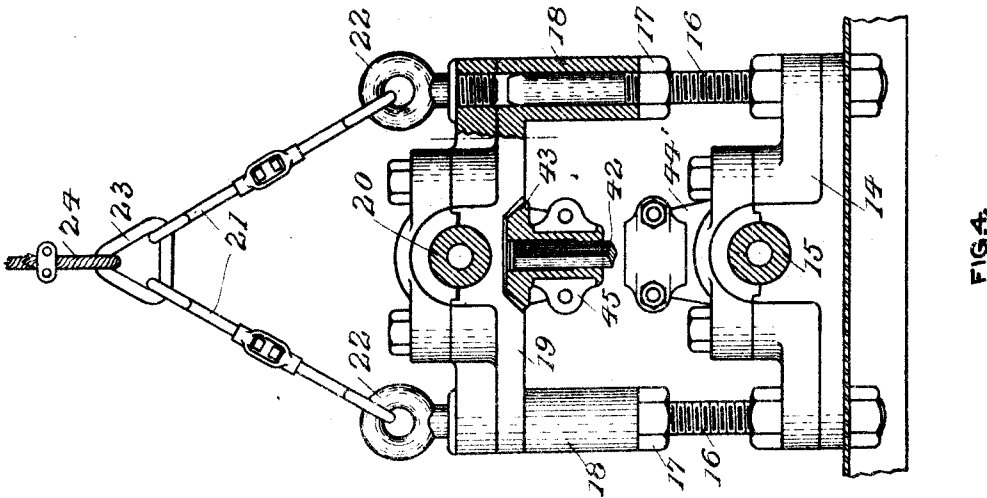
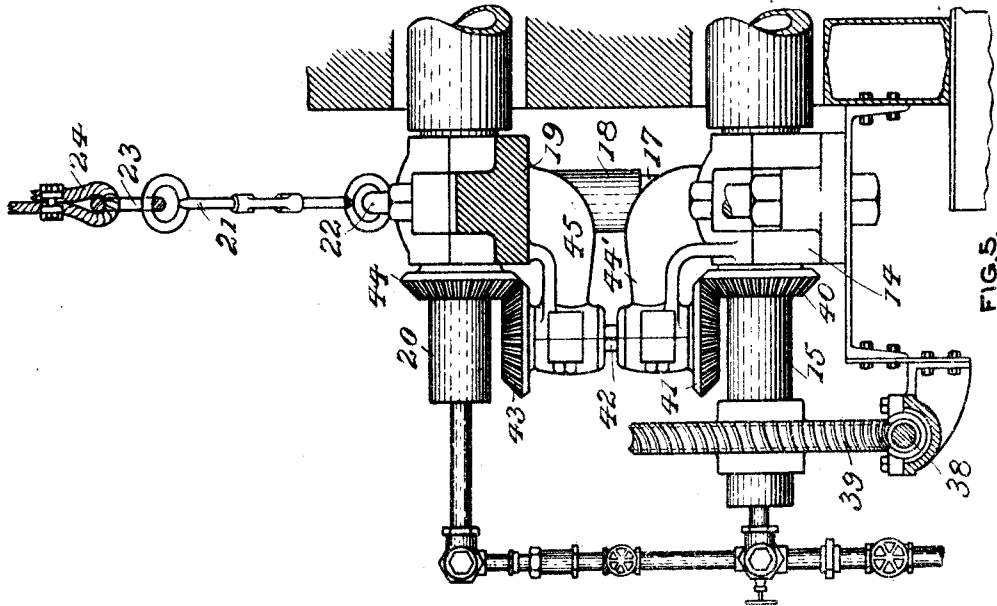
By *Mauro Curran & Lewis Mason*
Attorneys

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4 SHEETS-SHEET 4



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UNITED STATES PATENT OFFICE.

JOHN PLAYER, OF RIVER FOREST, ILLINOIS.

MACHINE FOR DRAWING SHEET-GLASS.

1,032,238.

Specification of Letters Patent.

Patented July 9, 1912.

Application filed August 29, 1908. Serial No. 450,806.

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 Machines for Drawing Sheet-Glass, which improvement is fully set forth in the following specification.

This invention relates to the art of drawing sheet glass, and more particularly to apparatus designed for the continuous production of sheet glass in which the glass is drawn in a long unbroken sheet in an upward direction, after which its direction is changed, preferably to a horizontal direction, and the continuous sheet passes slowly through an annealing leer, from which it emerges fully annealed and is preferably cut into sections as it emerges.

The object of the invention is to provide simple and efficient means for drawing a sheet of glass and changing its direction of movement, the particular construction of the leer forming no essential part of the present invention.

The invention will be best understood in connection with the accompanying drawings constituting one mechanical expression of the inventive idea, though it will be understood that the invention is capable of being embodied in numerous other mechanical structures.

In said drawings, Figure 1 is a vertical longitudinal section through the forward end of the machine; Fig. 2 is a vertical transverse section on the line II—II of Fig. 1, parts being shown in elevation; Fig. 3 is a side elevation of that part of the machine shown in Fig. 1; and Figs. 4 and 5 are elevational details illustrating the bearings for the drawing rolls and the connecting gearing therefor.

Within a working chamber 1, there is provided a mass 2 of molten glass heated in any suitable manner, as by burners 3, or by the gases passing from the melting furnace, not shown. The working chamber 1 is covered by suitable tiles two of which, 4, 4, Fig. 1, extend downward to within close proximity to the surface of the molten mass 2, and are

separated so as to leave a slot 5 between them through which the sheet of glass 6 is drawn. At a suitable distance above the top of the working chamber 1 is the forward end 7 of the annealing leer within which the temperature of the glass is gradually reduced for the purpose of properly annealing the same. Within this forward end of the chamber 7, there are mounted means for drawing the sheet upward and changing its direction of movement, and as here shown, such means draw the sheet in a vertical direction and change its direction of movement to a horizontal direction, though it is not absolutely essential that these two movements should be in the vertical and horizontal direction respectively, as shown. For the purpose of engaging the sheet to thus draw it upward and advance it into the annealing leer, there are provided, adjacent to each edge of the sheet as it is drawn, and within the chamber 7, two cooperating revoluble surfaces 8 and 9, one of which, and preferably both of which, are roughened. As here shown, these surfaces consist of a roll 8 with the end portions thereof roughened and the intermediate portion 8', which is of substantially the same diameter as the end portions, smooth. This roll 8 is mounted in fixed bearings, and immediately above the roughened end portions thereof are corresponding cooperating roughened portions, here shown as the end portions of a roll 9, which roll is mounted upon bearings hereinafter described, by means of which it may be adjusted toward and from the roll 8. While as here shown, the roughened end portions of the roll 8 and the smooth intermediate portions thereof are shown as formed integral, it will be manifest that, if desired the roughened portions could be formed separate and distinct from the smooth portion, said rough portions being keyed to the driving shaft, while the smooth portion 8' is left free to turn idly upon said shaft. In like manner, as here shown the roughened portions 9 cooperating with the roughened portions of the roll 8, are shown as connected by an intermediate portion 10

of reduced diameter, said portion 10 and the roughened portions 9 constituting one integral structure. This intermediate connecting portion, however, is merely employed for convenience of construction, and if desired may be entirely omitted. Within the chamber 7 and to the rear of the roll 8, there is also mounted a second roll 11, which preferably is in every way a duplicate of the roll 8 and cooperating therewith is a roll 12 which is a duplicate of roll 9. While it is preferred to thus employ the duplicate rolls 11 and 12, I may, and in some cases do, omit these rolls, but the best results are secured when the duplicate rolls are employed. Preferably, there is provided an idler roll 13 between the rolls 8 and 11, with the upper portion of its periphery in the same plane as the upper portions of the peripheries of said rolls 8 and 11.

As before stated, the rolls 8 and 11 are mounted in fixed bearings. The rolls 9 and 12, however, are mounted in movable bearings, to the end that the position of said rolls 9 and 12 may be properly adjusted with relation to the rolls 8 and 11 to suit the same for drawing sheets of glass of different thicknesses, and also to provide an opportunity for said rolls 8 and 11 to yield for the purpose of permitting the bait to enter therebetween, for example, or for the purpose of permitting lumps or other things that might cause an abnormal thickness of the sheet of glass being drawn to readily pass between the rolls.

The fixed bearings for the rolls 8 and 11 and the yielding or movable bearings for the rolls 9 and 12 are illustrated in Figs. 4 and 5. It will be understood that each of said rolls is mounted upon a hollow shaft through which a suitable fluid, as water, may be circulated; that the ends of these shafts project outward through the walls of the chamber 7; and that the bearings are mounted on the exterior walls of the chamber one on either side of the chamber for each of said rolls.

Referring to Fig. 4, 14 is any suitable fixed bearing for the shaft 15 of the roll 8 or 11, as the case may be, which fixed bearing has projecting upwardly therefrom pins 16, 16, which are screw-threaded on their lower portions as shown. Nuts 17, 17, are mounted on the screw-threaded portion of said pins, and normally resting upon said nuts are downwardly projecting sleeves 18, 18, secured to the bearings 19 for the shafts 20 of the roll 9 or 12, as the case may be. By adjusting the nuts 17, 17, it will be perceived that the distance intervening between the roughened portions of the rolls 8 and 9 may be readily adjusted, that is, the roll 9 can approach no nearer to the roll 8 than it is permitted to do by the adjustment

of the nuts 17, 17. The movable bearing 19, however, is free to move upward or have its weight removed from the nuts 17, 17. It is not desirable that the total weight of the roll 9 or the roll 12 should be supported by the sheet of glass being drawn, and for the purpose of partially supporting the weight of the roll 9 or the roll 12, means are provided for yieldingly supporting the movable bearings 19. As here shown, this is accomplished by means of links 21, 21, suitably secured at one end to eye-bolts 22, 22, attached to the movable bearings 19 and at the other end to a ring 23 which is attached to one end of a cable 24, the other end of which passes around and is secured to a drum 25 mounted on a sleeve shaft 26 turning in bearings 27, 27, suitably supported on the upper framework of the machine. This sleeve shaft 26 has a ratchet-wheel 28 rigidly secured thereto, and a pawl plate 29 is mounted to turn loosely around the sleeve shaft, carrying a pawl 30 to cooperate with the ratchet-wheel 28. A lever 31 is secured to the plate 29 for the purpose of operating the same, and has a counter-weight 32 mounted to slide thereon. For the purpose of effecting this sliding motion of the weight to adjust it upon the lever 31, and to secure it in such adjusted position, a screw 33 is mounted to turn in suitable bearings 34, 34, on the lever, and is engaged by a nut 35 to which the weight hanger 36 is secured. By revolving the handle 37 on the screw 33, the weight 32 may be adjusted along the lever 31, as may be desired, to the end that the said weight may be so positioned as to counter-balance so much of the weight of the roll 9 or the roll 12 as may be desired.

Each of the shafts 15 of the rolls 8 or 11 is positively driven by means of a worm 38 actuated by any suitable source of power and engaging a worm gear 39 fast on the shaft 15. The shaft 20 of the upper roll 9 or 12, as the case may be, is driven in the following manner: A miter gear 40 on the shaft 15 engages a miter gear 41 on a squared shaft 42 on the upper end of which there is slidably mounted a miter gear 43 engaging a miter gear 44 keyed to the shaft 20. The miter gear 41 has a hub portion turning in a fixed bearing 44' mounted on the fixed bearing 14, and miter gear 43 has a hub portion turning in a bearing 45 secured to and moving with the movable bearings 19, the miter gear 43 sliding on the squared shaft 42 to permit this movement.

In some cases, it is desirable to remove the upper tiles 46 and 47 of the chamber 7, either entirely, for the purpose of removing the rolls 9 and 12 or inspecting the same; or it may be desirable to slightly elevate said tiles 46 or 47 or both, for the purpose of assisting in adjusting the temperature of

the chamber 7. For the purpose of accomplishing this, means are provided whereby said tiles may be thus lifted, and such means will be understood from an inspection of
 5 Figs. 1 and 2, in which 48 is a shaft passing through the sleeve shaft 26 and having its end portion 49 squared for the reception of a suitable tool, and carrying a drum 50 to which there is secured one end of a cable
 10 51, the other end of which is secured to eyebolt 52 fast to the tile 46. The exterior end of the shaft 48 is provided with a ratchet wheel 53, and a weighted pawl 54 is pivoted at 55 so as to engage the ratchet-wheel 53.
 15 By inserting a suitable wrench or tool over the squared end of the shaft 48 and revolving the same, the cable 51 may be wound upon the drum 50 and the tile 46 lifted as desired.

20 Any suitable means may be employed for overcoming the tendency which the drawn sheet has to draw to a string or thread. As herein shown, such means consists of side-holding fingers 56, 56, of the construction
 25 shown, described and claimed in my application Serial No. 459,805, filed on the 29th day of August, 1908, but as the same form no specific part of the present invention, it is not deemed necessary to further describe
 30 them herein.

Operation: The mass of molten glass 2 in the working chamber 1 having been brought to the desired temperature and working condition, the sheet of glass is
 35 started in any suitable way known to the art, as for example, by lowering a bait 57 through an opening 58 in the top of the chamber 7, and passing it between the rolls 11 and 12, and 8 and 9, respectively, the
 40 rolls 9 and 12 having been previously elevated a suitable height to permit the bait to readily pass between the rolls, and the bait is then dropped down into the mass of molten glass 2. When the bait has become suffi-
 45 ciently heated for the molten glass to adhere thereto, the bait is slowly elevated by any suitable means and passed upward over the rolls 8 and 11 and on to the carrier table 59, which may be of any suitable construction
 50 for receiving and advancing the drawn sheet 60 through the leer. The bait may be either separated from the sheet and removed through the opening 58, or it may be permitted to rest upon the table to pass out-
 55 ward through the leer and be severed from the sheet as it emerges at the cutting table at the farther end of the leer. The bait having been passed between the rolls 8 and 9, and 11 and 12, respectively, the rolls 9
 60 and 12 are adjusted so as to bring them into proper cooperative relation with the sheet. This adjustment should be such as to permit the roughened ends of the rolls to properly engage the sheet to elevate the same into and

advance it through the chamber 7 on to the
 table 59. At the same time, care should be exercised not to permit too great a portion of the weight of the roll 9 or the roll 12 to rest upon the sheet. This desired adjustment is secured through the medium of the
 70 lever 31 and the pawl 30 and ratchet 28, and, when secured, is maintained with the desired pressure of the rolls 9 and 12 upon the sheet by adjusting the counter-balancing weight 32 along the lever 31, as will be readily
 75 understood.

In drawing sheets of glass, it will be understood that the glass may be, and in practice is, drawn of various thicknesses, and it is essential that the rolls 9 and 12 should be
 80 free to approach nearer the rolls 8 and 11 when drawing a thin sheet of glass than would be the case when drawing a thick sheet. It is for the purpose of determining the nearest approach of these upper rolls to the lower
 85 rolls that the nuts 17 are provided upon the screw-threaded portions of the pins 16. With these nuts 17 adjusted in the proper position, it will be seen that the rolls 9 and 12 can approach no nearer to the rolls 8 and
 90 11 than they are permitted to do by the nuts 17, while at the same time the rolls will be free to yield upwardly to permit irregular thicknesses of glass at the edge portions of the sheet to pass between the rolls 8 and 9, or
 95 11 and 12, without bringing undue pressure to bear thereon. After the sheet of glass is drawn from the molten mass of glass 2, and as it advances upward between the tiles 4, 4, and on its way to the bending roll 8, it is
 100 essential that its temperature should be maintained at such a degree that it may be safely bent or turned over the bending roll 8 without breaking, while at the same time the glass should be sufficiently hard so that the fine fire finish of the drawn sheet will not be marred by its contact with the bend-
 105 ing roll. As the drawn sheet of glass passes from the opening between the tiles 4, 4, and before it enters the chamber 7, it is exposed to the cooling influence of the atmosphere, and in order to prevent it from being cooled thereby to a point where it will be liable to break when it is turned over the bending roll—in other words, in order to retain a
 115 sufficient amount of the original heat in the sheet to keep it sufficiently near the plastic state, so that this bending action can take place without breaking, means are provided for preventing the sheet from cooling below
 120 the desired degree. As here shown, these means consist of burners 61, 61, located in any suitable position above the drawing point 62, and directing hot gases of combustion against the sheet as it passes to the
 125 drawing roll. By this means, I am enabled to retain a sufficient amount of the initial heat of the drawn sheet to maintain it in a

sufficiently plastic condition to enable it to be bent over the roll 8, while at the same time insuring that the surface of the glass will be sufficiently hard to prevent said bending roll from marring the fire finish thereof.

What I claim is:—

1. In a machine for drawing sheet glass, a pair of drawing rolls cooperating to draw the sheet one of said rolls being provided with a roughened surface and engaging only the edge portions of the sheet.

2. In a machine for drawing sheet glass, a pair of cooperating revoluble surfaces engaging the opposite faces of the edge portion of the sheet, one of said surfaces being roughened, and engaging only the edge portion of the sheet.

3. In a machine for drawing sheet glass, a pair of positively driven coacting drawing rolls, one of which is a bending roll beneath the sheet and the other of which is above the sheet, and means tending to counterbalance the upper roll whereby its pressure upon the sheet is partially relieved.

4. In a machine for drawing sheet glass, the combination of a pair of vertically aligned positively driven drawing rolls, a bending roll between said drawing rolls and the drawing point, and gravity actuated means tending to counterbalance one of said drawing rolls.

5. In a machine for drawing sheet glass, a series of pairs of drawing rolls, said rolls being horizontally aligned as to pairs, the rolls of said pairs being vertically aligned as to each other, and gravity-actuated means for regulating the pressure between the two rolls of the respective pairs.

6. In a machine for drawing sheet glass, a bending roll over which the sheet is drawn and is turned from an upward to a horizontal position and a second roll cooperating with the bending roll to draw the sheet.

7. In a machine for drawing sheet glass having cooperating rolls for advancing the sheet, one of which is a bending roll, the combination of a fixed bearing for the bending roll and a movable bearing for the other roll, means for adjusting the movable bearing, and means for maintaining the relative position of said bearings.

8. In a sheet glass drawing machine having cooperating revolving means for advancing the sheet, a fixed bearing for one of said means, and a movable bearing for the co-acting means, a supporting means carried by said stationary bearing for said movable bearing, and adjusting means for adjusting the supporting bearing.

9. In a sheet glass drawing machine having cooperating rolls adapted to advance the sheet, the combination of a fixed bearing for one of said rolls with a movable

bearing for the co-acting roll, means upon said fixed bearing for maintaining the relative alinement of said bearings, and a counter-balancing means for one of said bearings.

10. In a sheet glass drawing machine, the combination of a receptacle containing a mass of molten glass, a leer chamber having its end portion projecting over said receptacle with an intervening space between the receptacle and said chamber exposed to the open atmosphere, and a pair of revoluble sheet-drawing surfaces located in said leer chamber and grasping the edge portions only of the sheet during the drawing operation.

11. In a sheet glass drawing machine, the combination of a receptacle containing a mass of molten glass, with a leer chamber whose end projects over said receptacle, a pair of revoluble sheet-drawing surfaces located in said leer chamber and grasping the edge portions only of the sheet, one of said surfaces being roughened.

12. In a sheet glass drawing machine, the combination of a receptacle containing a mass of molten glass and having a cover with an opening therethrough, a leer chamber whose end projects over said receptacle with an intervening air space open to the external atmosphere between said receptacle and chamber, said chamber having an opening in its bottom above the opening in the cover to said receptacle, a sheet glass carrier located in said leer chamber and moving in an approximately horizontal direction, a smooth bending roll located in said leer chamber and over which roll the sheet is bent into substantially horizontal direction, roughened sheet-drawing surfaces on the ends of said roll, and revolving surfaces cooperating with the roughened surfaces on the bending roll and engaging the edge portions only of the sheet.

13. In a sheet glass drawing machine, the combination of a receptacle containing a mass of molten glass and having a cover with an opening therein, a leer chamber located above said receptacle with an intervening space open to the atmosphere and having an opening in its bottom above the opening in the cover to said receptacle, revoluble roughened sheet-drawing means located in said chamber and engaging the edge portions only of the sheet, and a bending roll intermediate said roughened sheet-drawing means.

14. In a machine for drawing sheet glass, the combination of a receptacle containing a mass of molten glass having a cover with an opening therein, a leer chamber whose end portion projects above said receptacle and having an opening in its bottom over the opening in the cover of said receptacle

with an intervening air space open to the external atmosphere between the opening in the cover of the receptacle and the opening in the bottom of the leer chamber, two pairs
5 of roughened drawing rolls engaging the opposite edge portions only of the sheet, a bending roll, a carrier device for receiving the sheet after it has been bent, and means for regulating the temperature of the sheet

between the drawing point in said receptacle 10 and said bending roll.

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

JOHN PLAYER.

Witnesses:

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