R. S. PEASE.

METHOD OF DRAWING GLASS.

APPLICATION FILED JUNE 28, 1912.

1,136,362.

Patented Apr. 20, 1915.

3 SHEETS—SHEET 1.

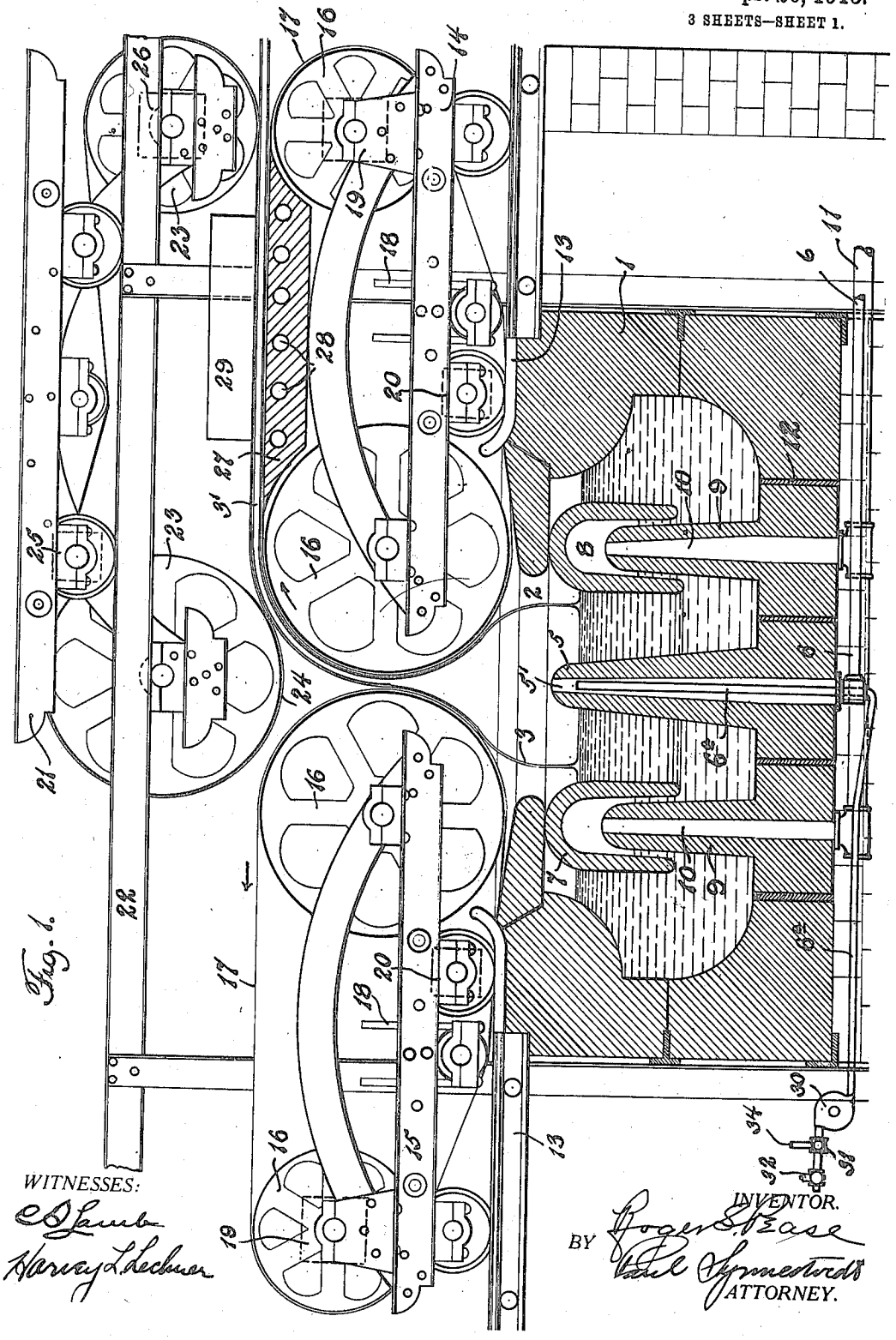


Fig. 1.

WITNESSES:

C. B. Lamb

Harvey L. Lechner

INVENTOR.

BY Roger S. Pease

Paul Symmes Reed

ATTORNEY.

R. S. PEASE.

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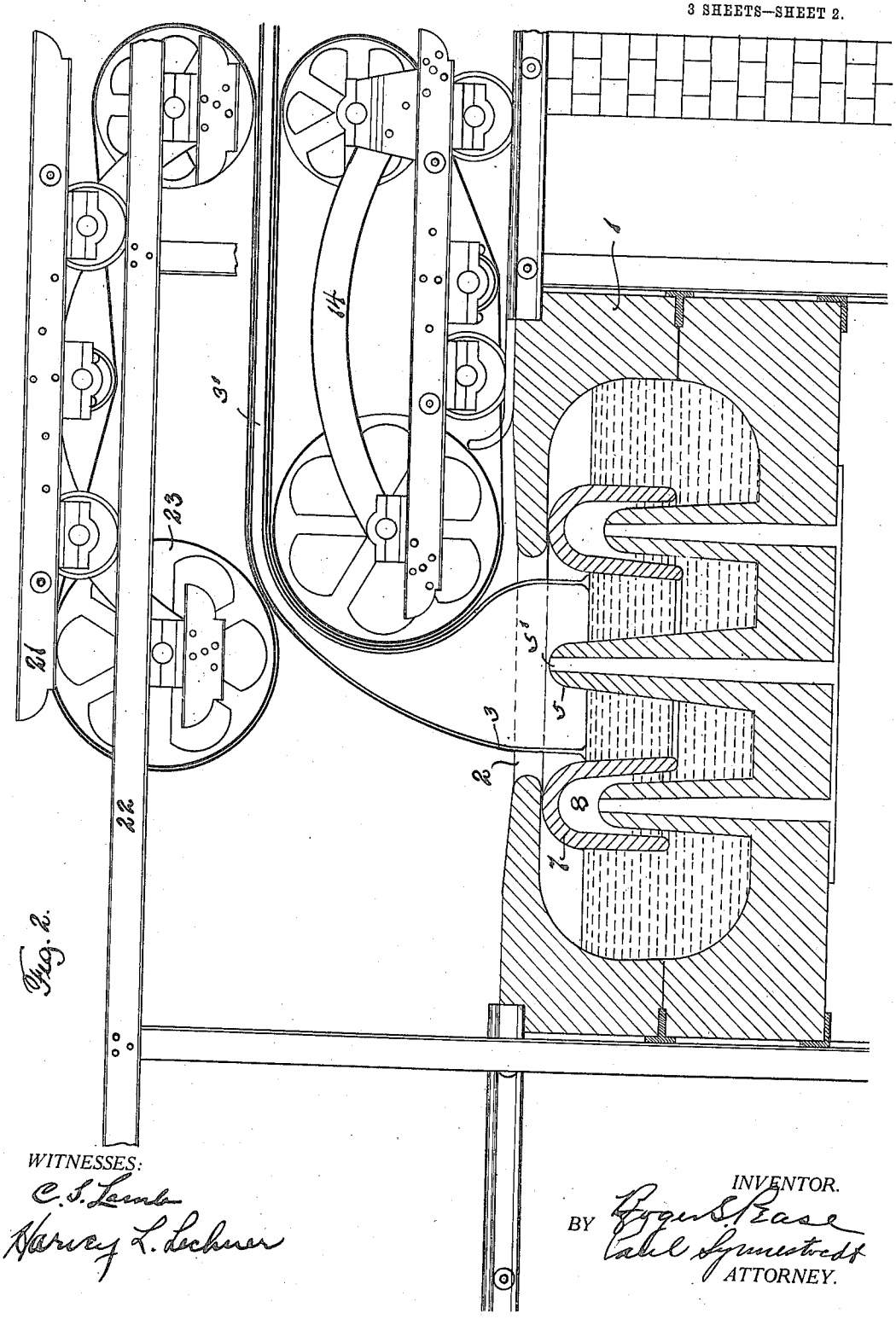



Fig. 2.

WITNESSES:

C. S. Lamb

Harvey L. Lechner

INVENTOR.

BY Rogers S. Pease

Cahill Symmes & ATTORNEY.

R. S. PEASE.

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3 SHEETS—SHEET 3.

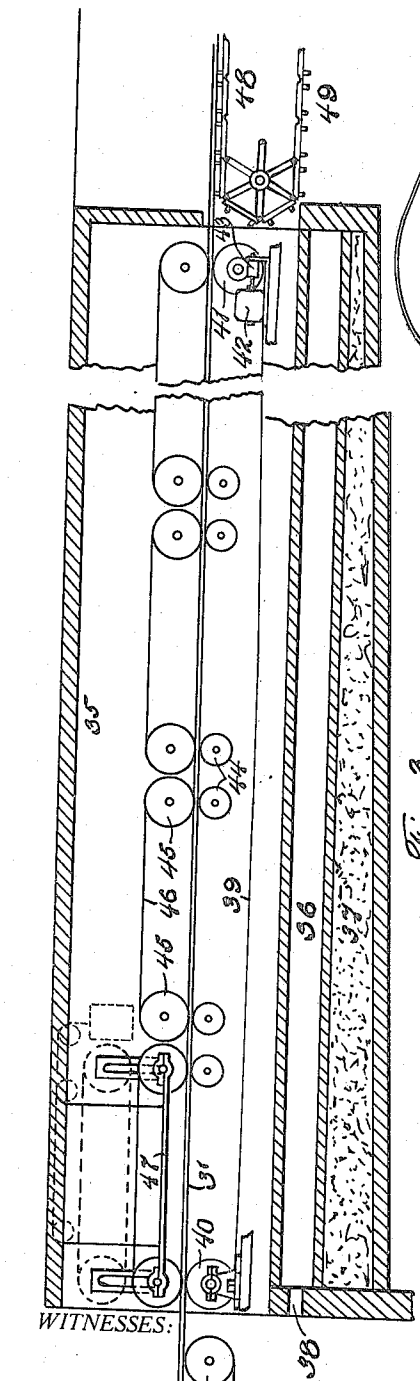



Fig. 3.

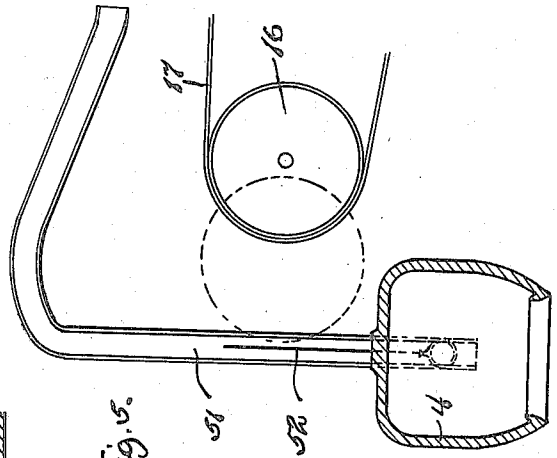



Fig. 5.

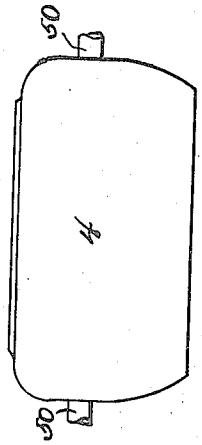



Fig. 4.

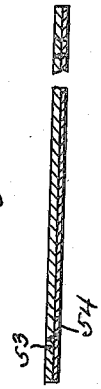



Fig. 6.

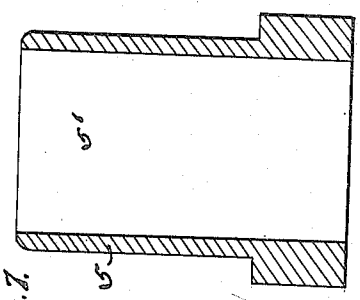



Fig. 7.

WITNESSES:

Harvey L. Lechner

R. J. Martin

INVENTOR.

Roger S. Pease

BY

Paul Symmestedt

ATTORNEY.

# UNITED STATES PATENT OFFICE.

ROGER S. PEASE, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO THE PITTSBURGH PLATE GLASS COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## METHOD OF DRAWING GLASS.

1,136,362. Specification of Letters Patent. Patented Apr. 20, 1915.

Application filed June 28, 1912. Serial No. 706,528.

*To all whom it may concern:*

Be it known that I, ROGER S. PEASE, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Drawing Glass, of which the following is a specification.

This invention relates to a method of and apparatus for drawing glass, and has for its primary objects the provision of an improved method of drawing glass in flat or sheet form; the provision of an improved method of drawing glass wherein a tubular member is compressed into flat form, the operation being continuous in character; the provision of an improved method of drawing window glass and annealing it as it is being drawn; the provision of an improved arrangement of annealing leer; and in general, the provision of improved apparatus for carrying out the method described. These, together with such other objects as hereinafter appear or are incidental to the invention, I attain by means of a construction which I have illustrated in preferred form in the accompanying drawings, wherein:

Figure 1 is a section through a tank extension or dog house showing an application of my improved apparatus and the formation of a sheet of glass; Figure 2 is a similar section through a slightly modified form of apparatus; Fig. 3 is a longitudinal section through my improved form of leer; Figure 4 is a side elevation of the bait employed; Fig. 5 illustrates a sectional view of the bait and diagrammatically illustrates the movement of the bait in the initial drawing operation; and Fig. 6 is a section through a preferred form of conveyer belt used in connection with my apparatus; Fig. 7 is a section through a detail of my invention.

In carrying out my invention, I propose to draw a tubular member from the body of molten glass and press together the sides of the tubular member in the form of a sheet, the sheet so formed being drawn through an annealing leer, thus in effect constituting the process a continuous one.

Referring to Figure 1, of the drawing, it will be seen that I have illustrated in cross section a dog-house or furnace extension 1, provided with a drawing orifice 2 through which a tubular member 3 is drawn by means of the bait 4. The air pressure required in drawing the tubular member 3 is supplied from beneath through the dog house and to this end I provide a hollow core or standard 5 removably mounted in the bottom of the dog-house, the cavity 5′ of the core being closed at the bottom by a plate and opening at the top above the level of the glass. Air from any suitable source is supplied by means of the pipe 6 which opens into the cavity 5′. In order to shut off the heat and flames in the dog-house from the tubular member being drawn, I provide an air drawing ring 7 which is provided with an annular recess or groove 8 adapted to receive the ends of the pedestals 9 which are provided with air ports or passages 10. These air ports or passages, as will clearly appear from inspection of Fig. 1, open at their upper ends into the cavity 8 and at their lower ends to a pipe 11 which leads to any suitable source of air supply. When a tubular member is to be drawn, air pressure is admitted to the cavity or recess 8 through the ports 10 and the drawing ring is thereby elevated until it comes in contact with the top-stone of the dog-house, thus preventing the heat and flames of the dog-house from having access to the tubular member being drawn. It will be noted that the pedestals are also removably mounted in the bottom of the dog-house, asbestos packing 12 being provided for the standard 5 and the pedestals. The standard 5 is of an extended flat shape as will appear from inspection of Fig. 7, and the bait 4 is of similar configuration so that it may be immersed in the glass about the standard. The tubular member 3 is drawn in the usual manner by partially immersing the bait in the glass in the dog house and thereafter elevating it, air being supplied to the interior of the tubular member formed through the pipe 6 of the cavity 5′ as hereinbefore set forth.

The apparatus for compressing the tubular member into sheet form will now be described. Mounted on tracks 13 on the top of the dog-house are a pair of oppositely disposed carriages 14 and 15, each of which is provided with a pair of rolls 16 which carry conveyer belts 17. The belts are tightened by any preferred means of belt tighteners 18 and are driven by means of motors 19, the belts being driven in opposite directions as indicated by the arrows in Fig. 1. The car-

riages 14 and 15 are driven by means of motors 20 and when in advanced position, as illustrated in Fig. 1, are adapted to press together the sides of the tubular member 3, thus compressing such member into a flat form or sheet 3′, which sheet, as will hereinafter further appear, is drawn through an annealing leer.

As a further means for compressing the sheet, I have provided an overhead carriage 21 supported from tracks 22 and provided with a pair of rolls 23 which carry a conveyer belt 24, the rolls and belt 24, when in operative position, being adapted to bear against the sheet 3′ as indicated in Fig. 1. The carriage 21 is driven by a motor 25 and the conveyer 24 is driven through one of the rolls by means of the motor 26.

The operation of the apparatus thus far described is as follows: The carriage 15 is moved to the left a sufficient distance to permit of the movement of the carriage 21 in the same direction a sufficient distance so that the bait 4 will clear as it is being lowered to the drawing orifice 2. The bait is preferably supported on the conveyer belt 17 of the carriage 14, or may be supported from above, as desired, as it is being lowered into the dog-house, the carriage 14 being retracted so that the bait, as it moves downward, will embrace the standard 5. The bait is then elevated and the tubular member 3 is drawn, the bait being raised a sufficient distance to clear the carriage 14 which is then advanced to the position shown in Fig. 1, after which the bait is moved to the right in a manner hereinafter to be described, and deposited on the belt 17 of the carriage 14. The carriage 21 is then moved to operative position, after which the carriage 15 is advanced to the position indicated in Fig. 1, at which time the rolls 16 will compress the tubular member into sheet form. It is to be observed that while the rolls 16 are the positive means for compressing the tubular member, the said member is compressed immediately between the conveyer belts 17 which are driven at the same rate of speed as that at which the bait moves.

The carriage 14 is provided with a copper plate 27 which is provided with a plurality of pipes 28 to which steam or other suitable heating agent is supplied in order to prevent the cooling of the sheet 3′ before it is carried into the annealing leer. The plate 27 serves the additional purpose of providing a platform or support for the belt 17 when the sheet 3′ is being flattened or smoothed out by the block 29 which, when the occasion therefor arises, is moved back and forward across the sheet 3′ and flattens out any irregularities therein. The block 29 is preferably composed of bass-wood boiled in a saturate solution of borax, which, when so treated, chars but does not readily burn with a flame, and has been found most suitable for the purpose indicated.

In order to maintain a uniform pressure within the tubular member 3 as the drawing operation continues, I provide in addition to the air supply pipe 6, an outlet pipe $6^a$ which leads from the cavity 5′ in the standard to the exterior of the dog-house and is provided with a suction fan 30, three-way cock 31 and an automatic relief valve 32. In normal operation, the fan 30 is not driven and the three-way cock 31 is turned to establish communication between the pipe $6^a$ and the valve 32, the valve being set so as to maintain a uniform pressure within the tubular member 3. If desired, the three-way cock may be turned to cut out the relief valve 32 and vent the pressure in the pipe $6^a$ through the pipe 34, the suction fan 30 being driven in such case so as to cause a circulation of air through the pipe 6, the tubular member 3 and the pipe $6^a$ to the atmosphere.

Referring to the Figure 3, it will be seen that I diagrammatically illustrate an annealing leer 35, which may be of any preferred construction but which is preferably provided with a plurality of longitudinally extending heating flues 36 beneath which are located corresponding chambers filled with storage material 37, such, for example, as broken brick and sand, the depth decreasing toward the cool or discharge end of the leer. This arrangement secures proper graduation of the temperature through the entire length of the leer. Heat is applied to the flues 36 by means of burners located at 38. The leer is located immediately adjacent the dog-house and the sheet 3′ is carried from the conveyer belt 17 of the carriage 14 to a conveyer mechanism comprising a plurality of oppositely disposed conveyer belts. The lower member of the conveyer mechanism is preferably composed of but one belt 39, but may be composed of two or more belts, as found most suitable. The belt 39 is carried on rolls 40 and 41, the bearing for the roll 40 being movable longitudinally in order that the belt may be tightened. The roll 41 is driven by means of the motor 42 and worm 43. Located between the rolls 40 and 41 are a plurality of idler rolls 44. The upper conveyer member is preferably divided into sections, each section comprising a pair of rolls 45 which carry a conveyer belt 46. The rolls are carried in a suitable frame-work 47 mounted in the leer for vertical movement as clearly indicated at the left hand of Figure 3. Previous to a drawing operation, all of the upper sections are moved to the positions indicated in dotted lines so as to permit the passage of the bait as it is being moved along with the lower conveyer belts, the sections being lowered successively as the bait passes through

the leer until the belts 46 engage the upper surface of the glass sheet 3'. The sheet is thus substantially inclosed and protected from any draft of air in the annealing leer the presence of which would result in breakage of the sheet.

At the discharge end of the leer, the sheet is fed onto a link-belt conveyer 48, the links of which are provided with transversely disposed tread members 49 which serve as supports on which the sheet may be cut into sections.

Referring to Fig. 5 it will be seen that I have diagrammatically illustrated the relation of the bait and carriage 14 with respect to each other during the initial drawing movement. The bait 4 is provided with trunnions 50 which engage the tracks 51 preferably composed of channels the flanges of which serve to guide the trunnions as the bait is being elevated by the cable 52 or other suitable elevating means. The bait is elevated a sufficient distance to clear the carriage and rolls and is then moved to the right and deposited on the belt 17 and then carried into the leer as previously pointed out.

In Fig. 6 I have shown a preferred form of conveyer belt comprising a copper body member 54 and a covering sheet 53 of asbestos or similar refractory material. This construction gives a uniform and rapid distribution of heat and provides a suitable surface upon which to compress the tubular member.

Assuming that the tubular member 3 is being drawn and compressed as the drawing operation continues, the flattened glass is carried on the belt 17 of the carriage 14 over the plate 27 where it is supplied with heat and is flattened and smoothed out if necessary by the block 29. It is then gradually carried through the leer 35 between the oppositely disposed conveyer belts where it is substantially out of contact with the atmosphere. By the time it reaches the discharge end of the leer the glass has become annealed and is cut on the link belt conveyer 48.

One of the chief advantages of my invention is the reduction in the cost of production which results not only from the continuous character of the operation but also from the fact that the drawing and the annealing of the glass are practically one operation, thus dispensing with frequent handling of the glass. The apparatus is simple and the feetage of glass obtained is greatly increased.

In Fig. 2 I have illustrated a slightly modified form of apparatus. In this case the carriage 15 is dispensed with and the tubular member is compressed between the belts of the carriages 14 and 21.

It will be understood that I have but diagrammatically illustrated apparatus for carrying out my invention and that other forms of mechanism can be employed without departing from the spirit thereof. Other advantages will readily occur to those skilled in the art.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is the following:—

1. The herein described process of making sheet glass which consists in drawing a tubular member from the body of glass and in compressing said member as it is being drawn into sheet form.

2. The herein described process of making sheet glass which consists in drawing a tubular member from a body of glass, in compressing the tubular member to form a sheet at a predetermined distance from the body of glass, and in maintaining a uniform air pressure within the tubular member.

3. The herein described process of making flat glass articles which consists in drawing a hollow article and in compressing the article to form a sheet.

4. The process of making a glass sheet, which consists in continuously drawing a cylinder of glass and continuously forming the cylinder into a flat sheet as the drawing progresses.

In testimony whereof I have hereunto signed my name in the presence of the two subscribed witnesses.

ROGER S. PEASE.

Witnesses:
ARCHWORTH MARTIN,
HARVEY L. LECHNER.