July 24, 1934. L. VON REIS 1,967,638

FEEDING GLASS SHEETS FROM THE FORMING MACHINE TO THE LEERS

Filed Nov. 20, 1929 4 Sheets-Sheet 1

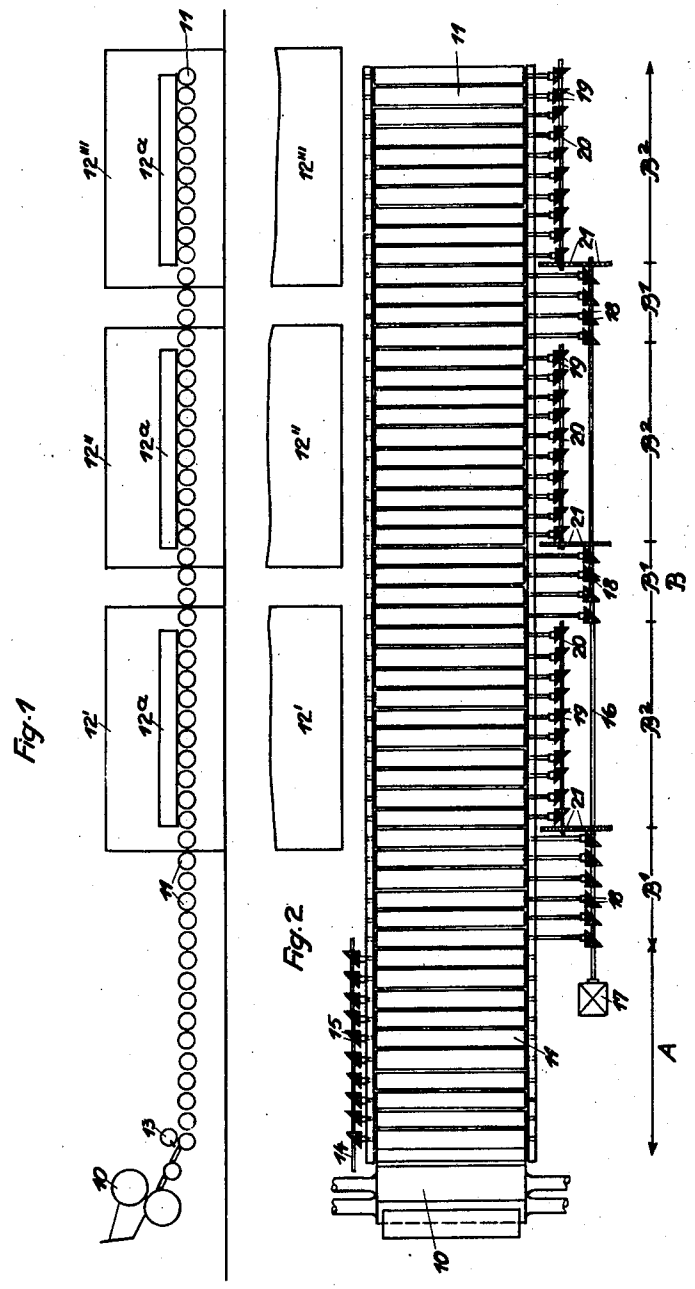


Fig. 1

Fig. 2

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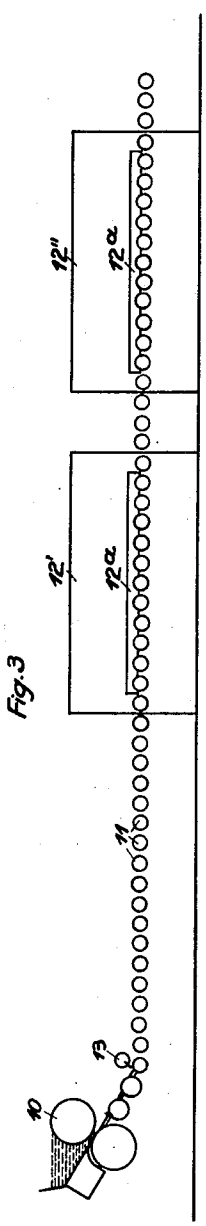


Fig. 3

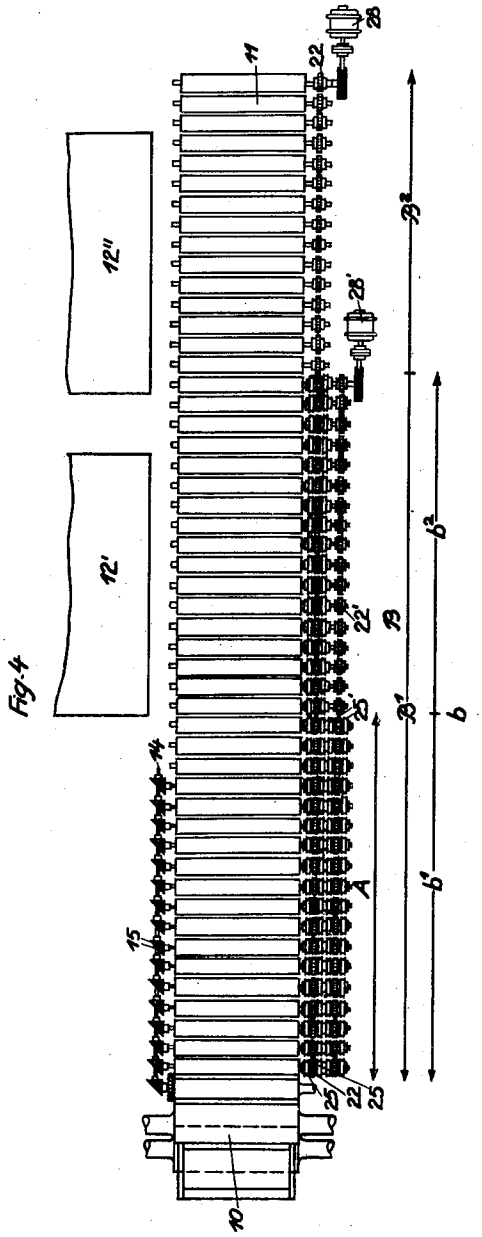


Fig. 4

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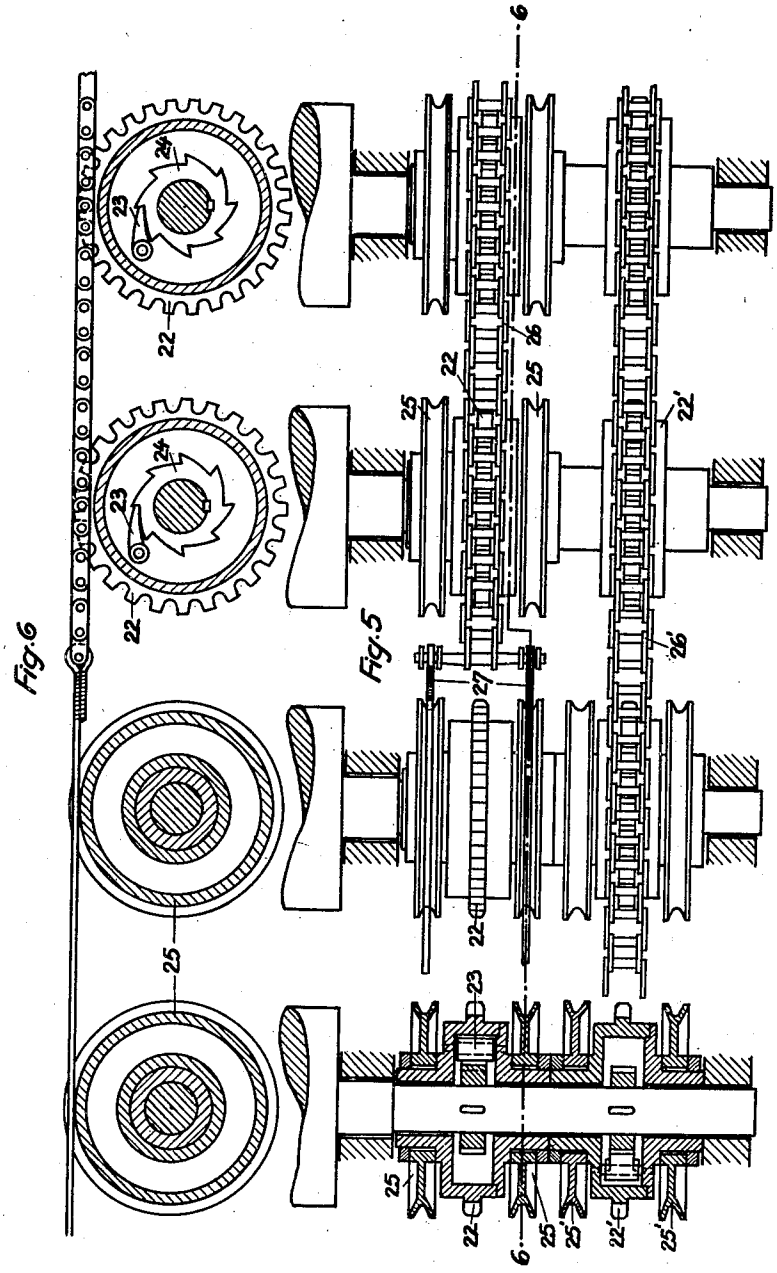


Fig. 5

Fig. 6

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FEEDING GLASS SHEETS FROM THE FORMING MACHINE TO THE LEERS

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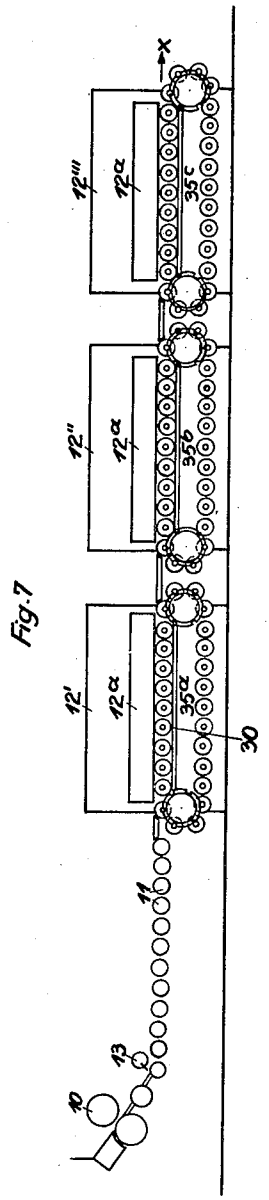


Fig. 7

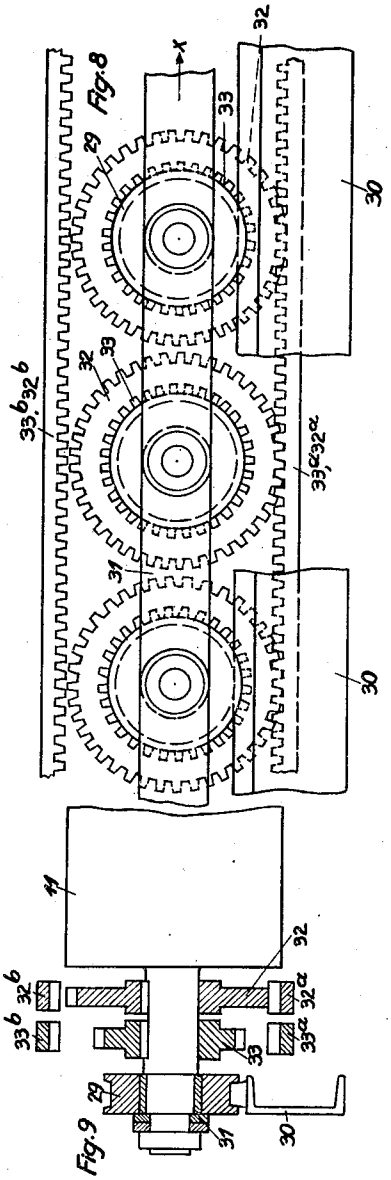


Fig. 8

Fig. 9

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UNITED STATES PATENT OFFICE

1,967,638

FEEDING GLASS SHEETS FROM THE FORMING MACHINE TO THE LEERS

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Application November 20, 1929, Serial No. 408,615
In Germany August 8, 1929

5 Claims. (Cl. 198—183)

This invention relates to plants for the manufacture of glass sheets in which a plurality of leers are arranged side by side alongside the sheet feeding path which proceeds from the forming machine and from which the sheets are introduced laterally into the leers. In plants of this kind the feeding of the sheets from the machine to the leers has hitherto been performed by means of travelling transporting tables.

Now, the invention has for its object to effect the feeding of the sheets in plants of the kind stated by means of a roller conveyer, on which the sheets are moved ahead during their formation at a speed corresponding to the speed of sheet formation and thereafter at an increased speed until they reach one or the other of the leers into which they are to be introduced. This increased feeding speed is applied to avoid cracking of the glass sheets by too strong or too rapid cooling of the glass sheets, which is otherwise liable to occur when feeding the sheets throughout the comparatively long distance from the forming machine to the leers at the speed of sheet formation or at a lower speed even.

The invention further contemplates imparting to the sheets, when they have arrived before the leers and they are not yet sufficiently stiff for being shifted into the leers, a reciprocating movement until the required stiffness is attained.

In order to allow of the invention to be more clearly understood, it will now be described with reference to the accompanying drawings in which several devices constructed in accordance with the invention are illustrated.

Fig. 1 is a diagrammatic side view and Fig. 2 a plan view of a sheet glass making and annealing device. Figs. 3 and 4 are similar views of another embodiment; Fig. 5 is an enlarged plan view, partly in section, of a portion of the high speed drive of the device shown in Figs. 3 and 4; Fig. 6 is a section on the line 6—6 of Fig. 5; Fig. 7 is a diagrammatic side view of still another embodiment; Fig. 8 is a side view of a portion of the same on an enlarged scale and Fig. 9 is a detail sectional view on the same scale.

In the several figures, 10 designates a multi-roll rolling machine on which the glass sheets are formed from a mass of liquid glass discharged into the machine from glass melting pots or in any other suitable way. 11 is a roller conveyer designed to take off the glass sheets from the machine and feed them to the stowing openings 12^a of the leers 12, of which two or more are arranged side by side laterally of the roller conveyer 11. A cutting device, arranged as at 13, divides the band of glass formed on the machine into sheets of desired lengths which are successively fed to the several leers.

In the device shown in Figs. 1 and 2, the rollers of the first section A of the conveyor 11, which commences at the machine 10 and which may be called receiving section, are driven at the speed of sheet formation by a common longitudinal shaft 14 through the intermediary of pairs of bevel gears 15. The shaft 14 is preferably operated from the rolling machine 10 itself. All other rollers of the following section B of the conveyor 11 are driven from another longitudinal shaft 16 at a peripheral speed which is higher than the linear speed of sheet formation. This shaft 16 is driven from a motor 17 or any other source of power. The rollers of the sections B^1 situated between the section A and the opening of the first leer 12' and between the openings of the several leers 12', 12'', 12''' are driven directly from the shaft 16 through pairs of bevel gears 18, while the rollers of the sections B^2 situated in front of the leer openings are driven through pairs of bevel gears 19 from counter-shafts 20, which are adapted to be operatively connected with and disconnected from the main shaft 16 by means of spur wheel gearings 21 for allowing the rollers of the sections B^2 to be stopped when pushing a sheet from them into a leer.

The section A has a length corresponding at least to the length of the sheets into which the glass band emerging from the machine is divided. During the formation of the glass band and its reception by the conveyer section A the rollers of the same rotate with the speed of sheet formation. As soon as the band has advanced on the conveyer for the desired distance, the first sheet is cut off at 13. This sheet continues to advance with the speed of sheet formation and moves on to the section B the rollers of which are driven at a higher speed. As soon as the sheet covers the section B by about half its length, the higher speed of this section becomes effective on the sheet, which is then moved quickly at this speed to the leer 12''' which is most remote from the machine 10, this being in Fig. 1 the third leer from the left hand. When the sheet has come in front of this leer the corresponding roller section B^2 is stopped by disconnecting the respective countershaft 20 from the main shaft 16, so that the sheet can be introduced into the leer. In the meantime, the second and the third sheets which immediately follow the first sheet are fed to and introduced into the second and first leers 12'' and 12' in the

same manner. In order to prevent the rollers of the high speed section B from exerting a stretching action on the sheets when they are passing from section A to section B, it is advisable to provide between the wheels 15 and the shafts of the rollers of section A one-way clutch devices, similar to those shown in Fig. 6, which are only operative in the direction of feed and which, when the higher speed of section B becomes effective on the sheets, permit the rollers of section A to rotate idly with the high speed under the action of the rapidly advancing sheets.

In the device according to Figs. 3, 4 and 6, the rollers of the first conveyer section A are also positively driven at the speed of sheet formation through a longitudinal shaft 14, which has rotation imparted to it by the rolling machine 10 and which transmits its rotation to the rollers of section A through bevel gears 15. The bevel gears mounted on the shafts of the rollers of section A act on these rollers through a ratchet and pawl mechanism of the kind shown in Fig. 6, which forms a one-way clutch. When the rollers of section A are driven by another drive at a speed which is higher than the speed of sheet formation, the pawls of the clutch devices slip on the ratchet wheels and the drive 14, 15 is thereby rendered inoperative. In addition to the drive 14, 15 there are provided for all rollers of the roller conveyer 11 drives through which the rollers can be driven at a speed higher than the speed of sheet formation, the number of these high speed drives corresponding to the number of leers arranged in the plant. Each of these high speed drives extends from the rolling machine up to a point beyond the right hand end of the front wall of each leer. Figs. 3 and 4 show, for instance, two leers 12′ and 12″. One of the high speed drives occupies the section B and the other the section *b*. As the two drives are of similar construction, it will be sufficient to describe one of them. The section B may be supposed to be divided into two sub-sections B^1 and B^2. All rollers of the section B carry sprocket wheels 22. The sprocket wheels of the sub-section B^1 are loose on the roller shafts. They carry pawls 23, as shown in Figs. 5 and 6, by means of which they engage ratchet wheels 24 which are keyed on the roller shafts. The sprocket wheels 22 of the sub-section B^2, this being the section situated in front of the second leer 12″, are rigidly fastened on the respective rollers. The roller shafts carry at each side of the sprocket wheel 22 a loose rope sheave 25 of the same operative diameter as the sprocket wheel. These rope sheaves can be dispensed with on the sub-section B^2. Running about all rollers of the section B is an endless driving element, of which one half consists of a chain 26 and the other half of a pair of ropes 27. The chain 26 drives the sprocket wheels 22, while the ropes 27 are guided on the loose sheaves 25. The endless driving elements 26, 27 have motion imparted to them through a motor 28.

On the section *b* (b^1+b^2), which extends from the rolling machine up to a point beyond the first leer 12′, the rollers are provided with a separate similar drive, comprising the sprocket wheels 22′, the rope sheaves 25′, the endless driving element consisting of chain and ropes and the motor 28′. The motors 28 and 28′ are designed to impart to the rollers 11 a peripheral speed higher than the speed of sheet formation.

The operation of the device shown in Figs. 3 to 6 is as follows: At the beginning of the rolling operation the endless driving element for the section B is adjusted so that the rear end of the chain 26, that is to say the connection between the chain 26 and the ropes 27, lies near the rolling machine 10 in juxtaposition to the place of cutting 13. During the formation of the band of glass on the rolling machine the rollers of the section A are rotated through the drive 14, 15 with the speed of sheet formation. When the band has moved on the section A the desired distance, the first sheet is cut off at 13. At the same time, the motor 28 is started, whereby the chain 26 is caused to drive all sprocket wheels 22 with the desired increased speed and the sheet is advanced at this speed until it comes in front of the second leer 12″, the connection between chain 26 and ropes 27 moving constantly in alignment with the rear end of the glass sheet. When the glass sheet lies in front of the second leer and has the stiffness required for pushing it into the leer, the motor 28 is stopped and the sheet stowed into the leer 12″ through its opening 12^a. If the sheet does not yet possess the required stiffness, the sheet has imparted to it before the leer a longitudinal reciprocating movement by reversing the motor 28, until it is sufficiently rigid. For allowing this reciprocating movement by alternate rotation of the rollers of section B^2 in opposite directions, the sprocket wheels 22 of the respective section are rigidly fastened on the roller shafts. The motor 28 also permits to bring the glass sheet into accurate alignment with the stowing opening of the leer. As soon as the sheet during its forward movement at high speed passes by its rear end beyond a roller of the section A, the action of the chain 26 on the sprocket wheel 22 of the respective roller ceases, because the end of the chain moves always in coincidence with the rear sheet end. The ropes 27 following behind the chain end run on the rope sheaves 25 of the respective roller, but do not exert any driving action on the roller because the sheaves are idle. Therefore the drive 14, 15 will again become operative on the said roller and drive it with the speed of sheet formation. It will thus be understood that, as the glass sheet advancing with high speed has passed beyond a roller of section A, the high speed of such roller is automatically changed to the speed of sheet formation. The second sheet following the first sheet can therefore be received by section A without any difficulty. In the meantime, the rear end of the chain of the endless driving element for the drive of section *b* has been brought into transverse alignment with the cutting device 13. As soon as the glass band which continues to emerge from the machine 10 has again advanced on the section A the desired distance, the second sheet is cut off and fed with the aid of the drive of section *b* to the first leer 12′ in the same manner as the first sheet has been moved to the second leer 12″. The third sheet is fed to leer 12″, the fourth sheet to leer 12′, the fifth sheet to leer 12″, and so on. The return of the chain 26 to its initial position after the stowing of the first, third, fifth sheet etc. does not interfere with the drive of section *b*, because the sprocket wheels 22 of sub-section B^1, which corresponds in position and length with section *b*, can rotate idly opposite to the direction of feed. On the other hand, the chain 26′ has no influence on the drive of section B.

In the form of device shown in Figs. 7, 8 and 9 the roller conveyer 11, except for its first or receiving section which is stationary, consists of a

plurality of successively arranged endless roller bands 35^a, 35^b and 35^c, each of which occupies a section in front of the several leers 12', 12'' and 12'''. The journals of the rollers of each roller belt carry loose wheels 29, by means of which they are guided and supported on rails 30. The journals are interconnected by chain links so as to unite them to endless bands.

On the side remote from the leers, the roller journals of the endless bands have fixed on them two pinions 32 and 33, with which rack bars 32^a, 32^b and 33^a, 33^b arranged above and below the pinions, respectively, can be placed into engagement. The rack bars are adapted to be raised and lowered and each two of them are associated with one of the pinions. The pinion 32 has the same and the pinion 33 a much smaller diameter than the roller 11. The roller bands 35^a, 35^b and 35^c are preferably driven in unison in such a manner that their upper stretch moves with constant speed in the direction x, that is to say in the direction of feed of the glass sheets. The endless bands are preferably moved with half the speed of sheet formation. When the rack bar 32^a is placed into engagement with the pinions 32, the speed of movement of the glass sheet in the direction of feed is as high as the speed of sheet formation as it corresponds to the sum of the linear speed of the roller band, which is half the speed of sheet formation, and the peripheral speed of the rollers themselves, which is also half the speed of sheet formation. When the rack bar 32^b is engaged with the pinions 32, the relative speed of the sheet is equal to nought, that is to say the sheet is at a standstill and can be stowed into the leer. When the rack bar 33^a is engaged with the pinions 33 the sheets are moved ahead with the desired increased speed, which may for instance be double as high as the speed of sheet formation. When throwing in the rack bar 33^b, a retrograde movement is imparted to the sheet. Such retrograde movement can be produced for bringing the sheet into alignment with the stowing opening of a leer.

The operation of the device according to Figs. 7 to 9 is as follows. The same as in the previously described forms, the first section of the roller conveyer is driven at the speed of sheet formation or, as the case may be, with the speed of sheet formation and with an increased speed. As soon as the first sheet has been cut off at 13 and moved a sufficient distance on the first roller band 35^a, with which the rack bar 32^a is at that time in engagement, the bar 32^a is thrown out and the rack bars 33^a of all three endless bands are thrown into operative position, whereby the sheet is caused to move with the desired high speed until it comes before the last leer 12'''. When in this position, the rack bar 33^a of the last roller band 35^c is moved to inoperative position and the rack bar 32^b into operative position, whereby the movement of the sheet is stopped. The sheet can be immediately stowed if it has the required stiffness. If, however, it is not yet sufficiently stiff, it is allowed to remain on the roller band 35^c until the prescribed rigidity is attained. In this position no danger exists for the glass sheet to sag between the rollers of the band, because these rollers continue to move forward with half the speed of sheet formation so that they support the sheet at constantly changing points.

The described play is repeated in a similar manner in feeding the second and third sheets to the intermediate leer 12'' and the forward leer 12'.

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

1. In a sheet glass conveyor, the combination with a series of travelling rollers, each roller having a plurality of wheels thereon, of a plurality of stationary members, each engageable, at will, with one of the wheels for rotating the latter on the travel of the rollers.

2. In a sheet glass conveyor, the combination with a series of travelling rollers, of wheels attached to the rollers, and stationary bars engageable, at will, with opposite sides of the wheels for rotating the rollers on the travel thereof.

3. In a device of the character described, the combination of a roller conveyor receiving glass sheets, said conveyor comprising a series of rollers driven at a constant speed and a series of rollers mounted to move in a closed path, means for driving the last-named rollers in their path at a uniform speed in the direction of the feed of the sheets, and means for rotating, at will, the last-named rollers at variable speeds.

4. In a device of the character described, the combination of a roller conveyor receiving glass sheets, said conveyor comprising a series of rollers driven at substantially the speed of sheet formation, and a series of rollers mounted to travel in a closed path, means for driving the last-named rollers in their path in the direction of the feed of the sheets at a uniform speed, and means for rotating, at will, the last-named rollers in opposite directions and for arresting their rotation.

5. In a device of the character described, the combination of a roller conveyor receiving sheets of glass, said conveyor comprising a series of rollers driven at substantially the speed of sheet reception, and a plurality of series of travelling rollers, each of such series moving in its own closed path, means for driving the several series of travelling rollers in their respective paths, and means for rotating the rollers of the individual travelling sections at speeds variable, at will, between the travelling sections.

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