May 15, 1934. K. A. WEBER 1,958,525

AUTOMATIC PLATE TURNING MACHINE

Filed Jan. 16, 1932 5 Sheets-Sheet 1

Fig. 1.

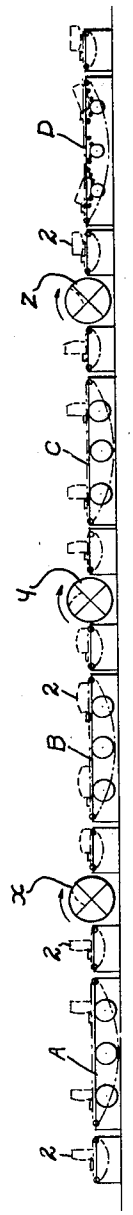
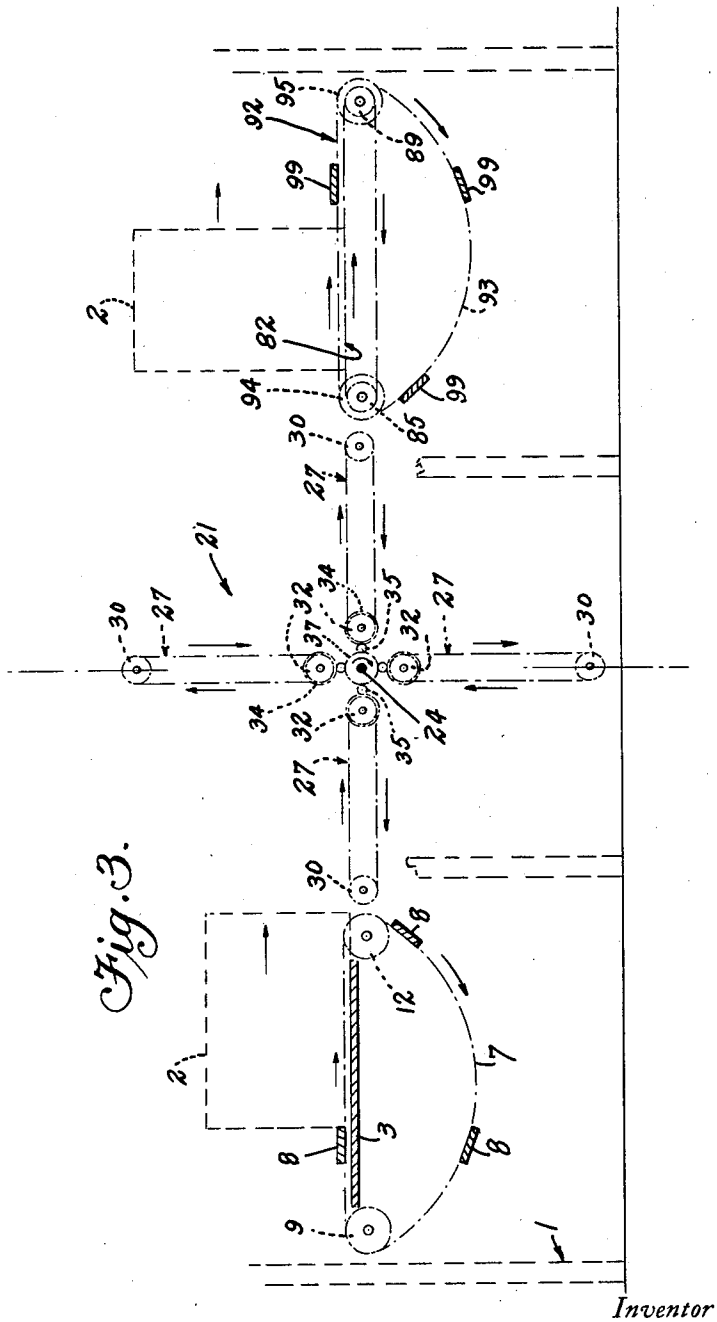


Fig. 3.



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AUTOMATIC PLATE TURNING MACHINE

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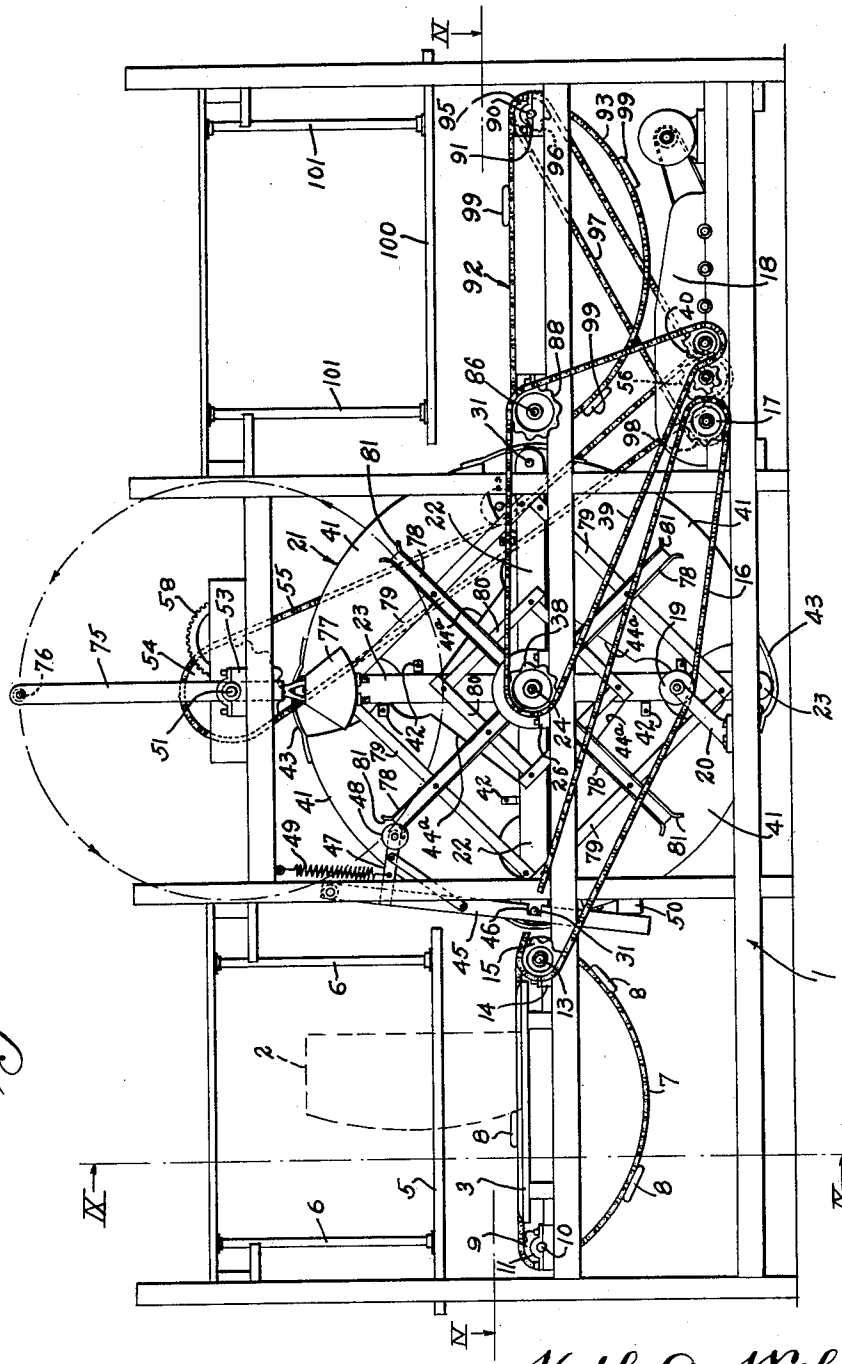


Fig. 2.

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AUTOMATIC PLATE TURNING MACHINE

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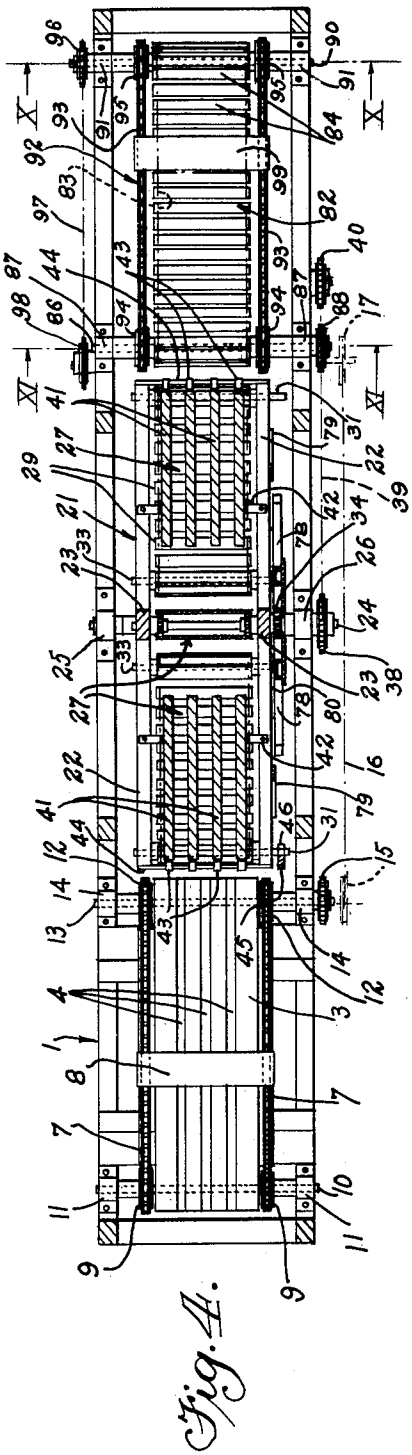


Fig. 4.

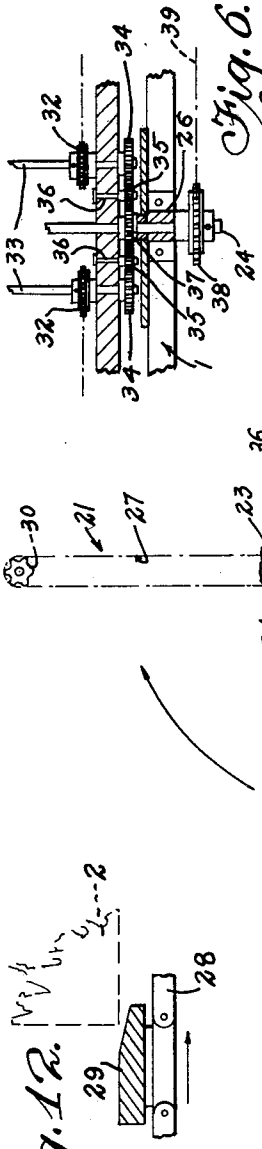


Fig. 6.

Fig. 12.

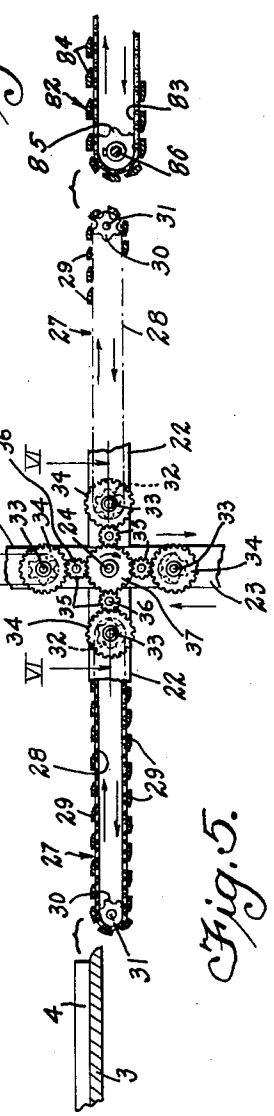


Fig. 5.

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AUTOMATIC PLATE TURNING MACHINE

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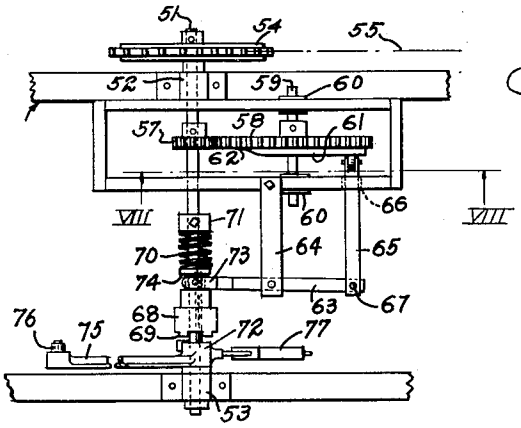
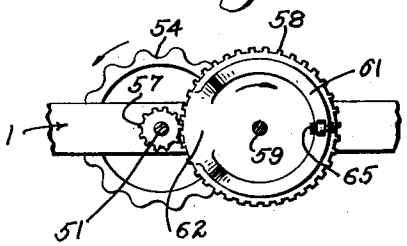


Fig. 7.

Fig. 8.



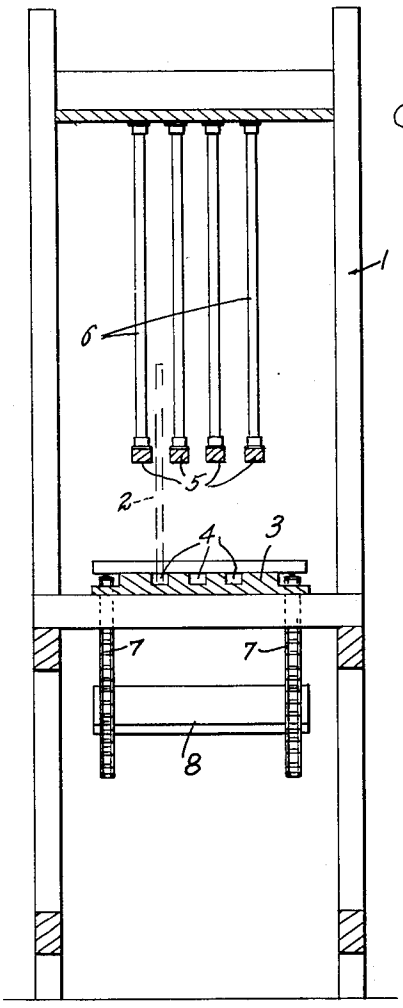


Fig. 9.

Fig. 10.

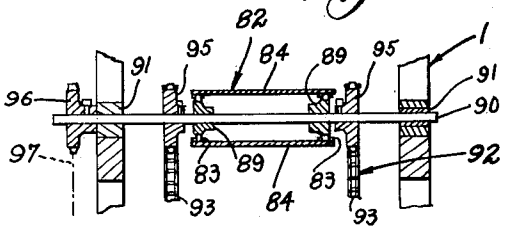
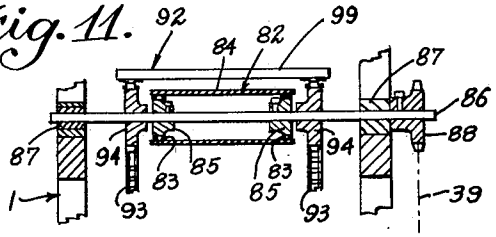


Fig. 11.



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AUTOMATIC PLATE TURNING MACHINE

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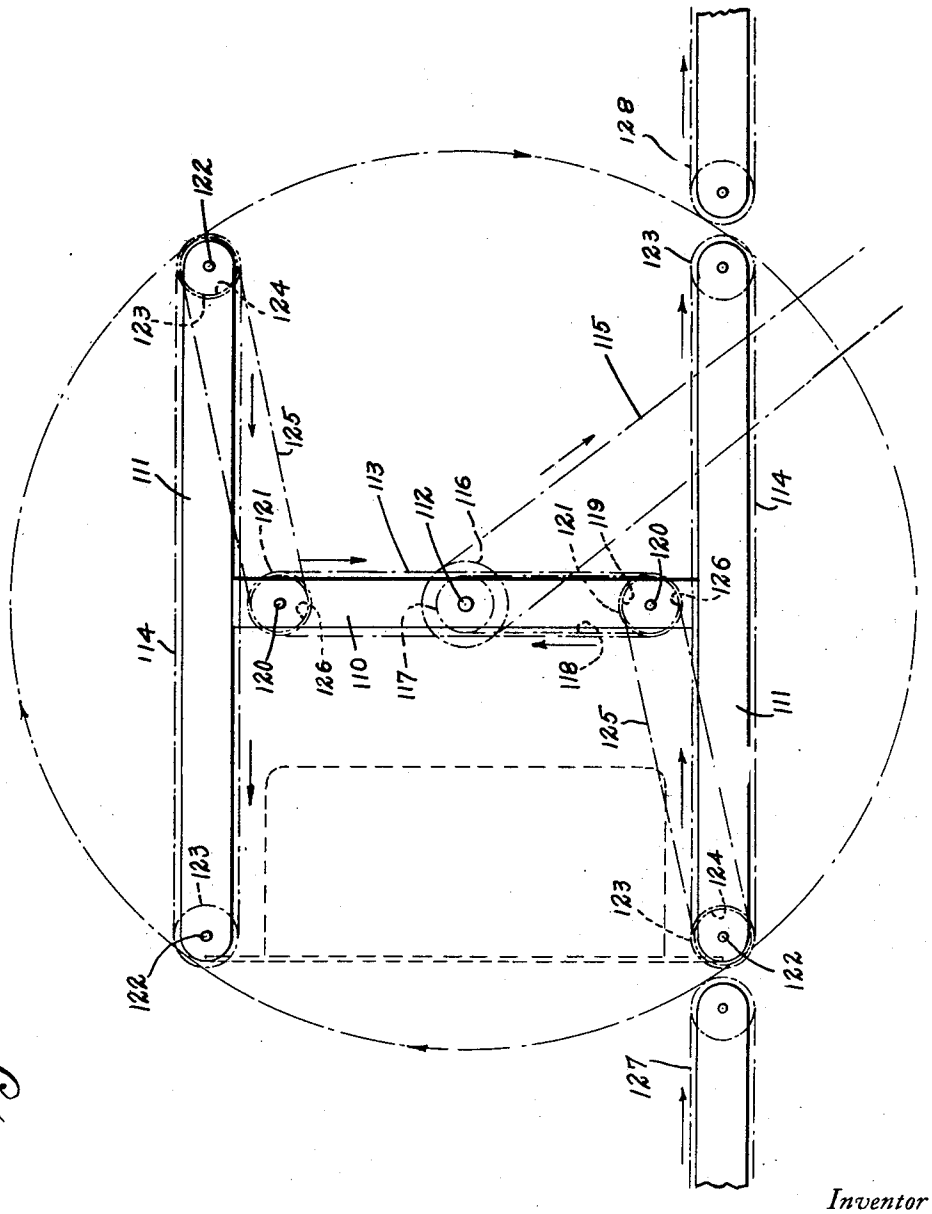


Fig. 13.

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Patented May 15, 1934 1,958,525

UNITED STATES PATENT OFFICE

1,958,525

AUTOMATIC PLATE TURNING MACHINE

Karl A. Weber, Los Angeles, Calif., assignor to Weber Showcase & Fixture Company, Los Angeles, Calif., a corporation of California

Application January 16, 1932, Serial No. 587,000

33 Claims. (Cl. 51—74)

This invention relates to a machine for automatically turning articles, such as plates of glass, and, as herein illustrated, is particularly adapted to be used in conjunction with my machine for grinding glass plates, as illustrated in my Patent #1,571,985, dated February 9, 1926.

A number of my grinding machines above referred to are usually arranged in line for successively grinding the four edges of plates of glass. It is necessary to turn the plates between each of the grinding machines in order to present a fresh edge to the grinding wheels of the next machine, and, it is, therefore, the principal object of this invention to provide such a turning machine which will turn the plates of glass 90° after the plates have left the first grinding machine so as to present to the second grinding machine fresh edges of the plates to be ground. A similar turning machine may be placed between the second a third grinding machines, and a still further turning machine may be positioned between the third and fourth grinding machines.

An important object of the invention is, therefore, to provide an organized automatic machine in which a glass plate, or a plurality of glass plates, is, or are, moved therethrough and the edges thereof ground or polished or finished, automatically operated timing means being provided for turning the plate or plates as required to successively grind or polish or finish the respective edges thereof.

It is a further object to provide a turning machine which will be fully automatic.

It is a further object of my invention to provide a turning machine which will automatically function and operate, in timed relation with the operation of the grinding machines.

It is a further object to provide a turning machine between each of the grinding machines which will automatically turn the plates of glass between each of the grinding machines, whereby a fresh edge of the plate is presented to each of the grinding machines.

It is a further object to provide a turning machine with a turning wheel having four equally spaced radially extending arms, and to provide each of said arms with a conveyer means and means for driving the conveyers.

It is a further object to provide a driving means for the turning wheel arm conveyers which will drive the conveyers when the wheel remains stationary, and will permit the conveyers to remain substantially stationary during the rotation of the turning wheel.

It is a further object to provide the turning wheel with conveyers adapted to be engageable on one side for conveying the glass plates into the turning wheel, and engageable upon the other side for conveying the glass plates out of the turning wheel.

It is a further object to provide a single driving means for driving each of the turning wheel conveyers.

It is a further object to provide a receiving conveyer operated in timed relation with the turning wheel, whereby when the turning wheel is in position to receive the plates of glass to be turned, the receiving conveyer will deliver the plates upon the adjacent turning wheel conveyer which in turn willl convey the plates toward the center of the wheel until the plates abut against the next turning wheel conveyer which is 90° in advance thereof.

It is a further object to provide a discharge conveyer which will receive the plates which have been turned and which are being conveyed from the turning wheel by the turning wheel conveyer, and which discharge conveyer will deliver the turned plates to the next grinding machine.

It is a further object to provide automatic means for rotating the turning wheels periodically through 90°, or a quarter turn of rotation, and then pause for receiving a new set of plates to be turned and for discharging the turned plates.

It is a further object to provide a turning machine with an H-shaped turning wheel which will turn the glass a half turn, or revolution, instead of a quarter turn.

Other objects and advantages of the invention will be apparent as the nature of the same is more fully understood from the following description and accompanying drawings, wherein is set forth what is now considered to be a preferred embodiment. It should be understood, however, that this particular embodiment of the invention is chosen principally for the purpose of exemplification, and that variations therefrom in details of construction or arrangement of parts may accordingly be effected and yet remain within the spirit and scope of the invention as the same is set forth in the appended claims.

In the drawings—

Figure 1 is a diagrammatic view, illustrating the arrangement in line of four grinding units and a turning machine between each pair of grinding machines;

Figure 2 is an elevation of the invention;

Figure 3 is a diagrammatic view, illustrating the several conveying means of the invention;

Figure 4 is a plan view, partially in section, as indicated substantially along line 4—4 of Figure 2;

Figure 5 is a view partially in section of the turning wheel conveyers, and the power transmitting means for the conveyers;

Figure 6 is a sectional view taken substantially in the plane of line 6—6 of Figure 5;

Figure 7 is a plan view of the turning wheel driving means, and the intermitting control means therefor;

Figure 8 is a sectional view taken substantially in the plane of line 8—8 of Figure 7;

Figure 9 is an end sectional view of the receiving table;

Figure 10 is a sectional view taken substantially in the plane of line 10—10 of Figure 4;

Figure 11 is a sectional view taken substantially in the plane of line 11—11 of Figure 4;

Figure 12 is a cross-sectional view of one of the slats used on the conveyers, showing the engaging edge beveled to prevent edges of the plates from binding or catching thereon;

Figure 13 is a diagrammatic illustration of a modified form of turning wheel, which is adapted to turn the plates a half revolution instead of a quarter revolution.

In the adaptation of the invention to the turning of plates of glass, as illustrated in the drawings, a suitable frame, or framework, 1 is provided upon which the several elements of the invention are mounted. The sheets, or plates, of glass 2 to be turned are received upon a table 3, which is mounted in frame 1, but, if desired, may be mounted in an independent framework. The glass plates 2 may be manually placed upon the receiving table, or may be delivered thereto by a suitable conveyer means, as, for example, when the turning machine is placed between grinding machines, as illustrated in Figure 1, the conveyer of the grinding machine will deliver the plates to the receiving table of the turning machine.

By reference to Figure 9, wherein is illustrated an end view of the receiving table 3, it will be observed that in this instance the table is provided with three spaced grooves 4, so as to receive simultaneously 3 plates of glass. However, the turning machine may be arranged to accommodate a single plate, or any number of plates by merely widening the machine and providing the additional runs. The number of plates which the turning machine must simultaneously handle will in most instances be governed by the number of sheets which are simultaneously received from the grinding machine. In some cases, the grinding machines are arranged to grind simultaneously three plates; in others, six plates; while in still other grinding machines, twelve plates. As illustrated in Figures 2 and 9, the plates of glass 2 are placed on edge, and are caused to travel along the grooves 4 of the table by means of a conveyer. To maintain the plates in a substantially vertical position, stationary guide rails or tracks 5 are suitably supported from the framework 1 by depending rods 6. The arrangement of the receiving table and the guide rails for a three-plate machine is clearly illustrated in Figures 2 and 9.

Means are provided for conveying the glass plates across the receiving table and onto the turning wheel, which conveyer may include a pair of endless belts or chains 7 that carry spaced driving slats 8. The driving slats 8 carried by the chains are moved along the top of the receiving table to engage the rear edge of the plates and to thus simultaneously convey or slide the plates across the table and onto the turning wheel.

The endless chains 7 are carried adjacent the receiving end of table 3 by a pair of spaced sprockets 9 mounted upon shaft 10 which is journaled in bearings 11 mounted upon the frame; while adjacent the discharge end of table 3, the endless chains 7 are carried by a pair of spaced sprockets 12 mounted upon shaft 13, which shaft is journaled in bearings 14 mounted upon the frame. The shaft 13 may be utilized as the driving shaft, and for that purpose may be extended to carry a driving sprocket 15 which sprocket is driven by the chain 16 and sprocket 17 of the gear box 18. An idler 19 may be provided to maintain chain 16 at the proper tension, and the idler may be supported by a suitable bracket 20 upon the frame.

The plates of glass 2 are conveyed from the receiving table 3 onto the turning means 21 which turning means may be made in the form of a wheel having a number of equally spaced radially extending arms. The turning means is actuated intermittently so that during the receiving and discharging of the plates, said means remain stationary, but as soon as the plates have been received and discharged, is rotated to bring the next set of arms into receiving and discharging position for the receiving of the next set of plates and the discharging of the turned plates.

The turning means 21 may include a pair of spaced arms 22 and a second pair of spaced arms 23 (Figure 4), each pair being suitably secured together intermediate their ends and arranged 90° apart, forming a cross-shaped structure, which structure is suitably journaled upon the shaft 24, the shaft being journaled in turn in bearings 25 and 26 which bearings are mounted upon frame 1.

For the handling of plates such as glass, it is advantageous to provide each pair of arms of the turning means 21 with two conveyers 27 (Figure 5). As each of the four conveyers 27 are substantially the same, one only will be described. The conveyers 27 are positioned between the spaced arms, and extend from adjacent the end of the arms to adjacent the center of the turning means. Each conveyer 27 may include a pair of spaced endless chains 28 connected by a plurality of relatively closely spaced slats 29 (Figures 5 and 12), having their forward edges beveled so as to prevent the edge of the glass plates from binding or catching thereon. The endless chains are mounted between the spaced arms by any suitable means such as the spaced sprocket wheels 30, which wheels are journaled upon the shaft 31, extending between and carried by the spaced arms adjacent the outer end thereof. The inner end of the conveyer 27 passes over a pair of spaced sprocket wheels 32, suitably mounted upon the drive shaft 33, which shaft extends between and is journaled in the spaced arms.

With the turning means 21 in the receiving and discharging position, as illustrated in Figures 3 and 5, the plane of the upper surface of slats 29 of the adjacent conveyer substantially coincide with the plane of the grooves 4 of the receiving table 3, so that as the plates are conveyed from the receiving table, they will ride smoothly onto the adjacent conveyer 27, which last named conveyer will act to convey the plates to the center

of the turning means 21, or until the forward edges of the plates abut against the conveyer 27 of the arm 23, in which location the plates remain during the turning operation.

Preferably, a driving means is provided which will actuate all of the conveyers 27, while the turning means remains stationary during the receiving and discharging portion of the operating cycle of the machine, and which driving means will permit the conveyers 27 to remain substantially stationary during the turning portion of the operating cycle.

It is preferable to operate the wheel conveyers 27 at a higher rate of speed than the speed of the receiving conveyer. One of the reasons for the higher speed of the wheel conveyers being to insure that all of the plates received from the receiving conveyer will be quickly conveyed until their forward edges abut against the next succeeding wheel conveyer before rotation of the turning wheel starts, and also because when plates of different sizes are simultaneously received from the receiving conveyer, their rear edges will all be in alignment due to the action of the slats 8 of the receiving conveyer, while when in turning position, the front edge of each plate will be in alignment and abutting against the next succeeding wheel conveyer. The smaller, or shorter, plates must therefore travel a greater distance than the larger of the plates before the turning operation begins. Therefore, by actuating the turning wheel conveyers faster than the receiving conveyer, the large plates which will be picked up first by the adjacent turning wheel conveyer and transported thereby are conveyed until their forward edges abut against the next succeeding wheel conveyer. The large plates will be retained by the wheel conveyer slipping thereunder, while the smaller plates are being quickly conveyed to likewise abut against the next succeeding wheel conveyer, thus insuring that the forward edge of each plate will substantially abut against the next succeeding wheel conveyer before the turning operation begins.

The driving means for each conveyer 27 may include a gear 34, suitably secured to a portion of the conveyer drive shaft 33 which extends beyond the arm on the drive side of the machine (note Figures 4 and 5). In mesh with gear 34, is a pinion 35 suitably journaled upon a stub shaft 36 carried by the spaced arm above referred to. The pinion, in turn, meshes with the unitary drive gear 37. The unitary drive gear is suitably secured to shaft 24, which shaft was previously described as journaled in bearings 25 and 26.

The drive shaft 24 extends beyond the bearing 26, and has secured thereon a driving sprocket wheel 38 driven by the chain 39 from the sprocket wheel 40 of the gear box 18.

With the gear arrangement above described, by rotating the unitary drive gear 37, each of the conveyers 27 is actuated while the turning means is held stationary at the receiving and discharging position, but as the gears 34 and 37 are substantially of the same diameter, and the rotation of the turning means is substantially at the same rate of speed as the speed of gear 37, the conveyers are held substantially stationary during the turning operation.

Each quadrant of the turning means, or wheel, may be provided with a plurality of plate guides 41 to maintain the plates in a substantially vertical position. A plate guide 41 is provided for each side of each plate and the outer plate guides are supported upon the arms 22 and 23 by suitable brackets 42, while the inner guides are supported by suitable straps 43 extending between adjacent quadrants and supported by the cross member 44, which cross member extends across and is supported by the ends of the adjacent arms. An opening, such as 44a, may be made in the plate guides through which the position of the plates may be observed.

An automatic locking means may be provided to lock the turning means stationary in the receiving position, which means may include a latch lever 45 having a notch 46 into which the extended ends of shafts 31 are adapted to be serially engaged. The latch lever may be pivoted to the frame and provided with a bracket 47 upon the outer end of which is journaled a roller 48, which roller is acted upon to swing the latch lever 45 out of locking engagement with the engaged shaft 31. A spring 49 acts between the frame and the latch lever bracket 47 to yieldingly urge the latch lever 45 into locking position. Any form of suitable stop means may be provided to prevent the latch lever from swinging too far under the influence of spring 49 when not in engagement with one of the shafts 31, such as the stop member 50 carried by frame 1.

The turning means, or wheel, 21 has two phases for each cycle of operation: the first phase is when the wheel is retained stationary a sufficient period of time during which phase one of the conveyers 27 actuates to receive and move the plates which are to be turned, while the opposite conveyer 27 is actuated to discharge the turned plates; the next phase of operation is the releasing of the turning wheel retaining, or locking, means, and the rotation of the wheel through 90° to turn the plates a quarter of a revolution or upon their forward edges.

The intermittent driving means for rotating the turning wheel may include a shaft 51 journaled in bearings 52 and 53 mounted upon the upper portion of the framework 1. A sprocket wheel 54 is keyed to shaft 51, and is driven by chain 55 from the sprocket wheel 56 of the gear box 18. A pinion 57, keyed to shaft 51, meshes with and drives a cam gear 58, which gear is mounted upon shaft 59 journaled in bearings 60. On one face of the cam gear 58 is a raised cam surface 61 (Figures 7 and 8). The cam surface is raised for three-fourths of its circumference while a cam depression 62 extends for one-fourth of the circumference of cam 61. A clutch lever 63 is pivoted intermediate its ends to bracket 64 which extends from frame 1. A cam rod 65 slideably extends through a portion of the frame 1 as at 66 and carries at one end a roller adapted to ride upon the cam surfaces 61 and 62 while at its opposite end is pivoted to the clutch lever 63 as at 67. A clutch member 68, having suitable clutch teeth 69, is suitably splined upon shaft 51. A spring 70 acts between the shaft collar 71, and the clutch member 68 to yieldingly urge the clutch member 68 into engagement with the clutch member 72 which is journaled upon shaft 51 between clutch member 68 and bearing 53. The clutch lever 63 is bifurcated at 73 and is operatively adapted to engage in the groove 74 of the clutch member 68, and acts to normally retain the clutch member 68 in retracted inoperative position during the time rod 65 engages the raised cam surface 61, but permits the clutch member 68 to be shifted by spring 70 into driving engagement with the clutch member 72 when the rod 65 rides upon the low section 62 of the cam.

Operated by the cam member 72 is the driving arm 75 which carries at its outer end a cam roller 76. The length of the cam surface 62 is of sufficient length to permit clutch members 68 and 72 to engage for rotating the driving arm 75 through a complete revolution whereupon the clutch is released and the driving arm 75 then remains stationary until the cam surface 62 again permits the actuation of the clutch members. The driving arm 75 is normally retained in a vertical position, as illustrated in Figure 2, being retained in such position by any suitable means such as the counter-weight 77 attached to the clutch member 72 diametrically opposite to the driving arm 75.

The rotation of the driving arm 75 causes the turning means, or wheel, to rotate 90° or a quarter turn for each revolution of said arm. The turning wheel is provided with four radially extending cam tracks 78 spaced 90° apart, which may be mounted upon the arms 22—23 or, as most clearly illustrated in Figure 2, may be mounted upon the turning wheel so as to bisect the angle between each pair of spaced arms 22—23 and secured to the arms by brace members 79 and 80. The cam tracks 78 may be channel irons having the outer end of each spread as at 81 to receive the cam roller 76 carried by the driving arm 75. During the rotation of the driving arm, the cam roller first engages the roller 48 of the latch lever 45 to release the turning wheel, while substantially simultaneously therewith, the roller 76 passes into the channel section of one of the cam tracks 78, causing rotation of the turning means 21 until the roller 76 leaves the engaged cam track after rotating the turning wheel 90°, whereupon the notch 46 of the latch lever 45 engages the next shaft end 31 to lock the turning wheel until again released for the next turning movement.

When the turning means, or wheel, 21 has been rotated a quarter turn by the driving arm 75, the plates are transferred from the conveyer upon which they were received onto the rear surface of the conveyer 27 of the arm 90° ahead, and as will be noted from Figures 3 and 5, the rear face of the conveyer upon which the plates now rest travels in a direction to convey the plates out of, or away from, the turning means and onto the discharge conveyer.

A discharge conveyer may be provided to receive the turned plates, and in turn deliver these plates to the conveyer of the grinding machine.

The discharge conveyer may include a conveyer 82, of similar construction to the conveyers 27, having a pair of endless chains 83, with a plurality of slats 84 carried thereby. The endless chains 83 pass over spaced sprocket wheels 85, which wheels are keyed upon the drive shaft 86 journaled in bearings 87. The shaft 86 is driven by the sprocket wheel 38 by means of chain 39; while the opposite ends of the endless chains 83 pass around sprocket wheels 89 journaled on shaft 90, which shaft in turn is journaled in bearings 91. It will be noted from Figure 2 that chain 39 is arranged to drive the conveyers 27 as well as the conveyer 82, and by providing sprocket wheels 85 of a greater diameter than the sprocket wheels 32, the conveyer 82 will travel at a faster rate than the conveyers of the turning means. By this arrangement, the plates will be quickly removed from the turning wheel.

To control the discharge of the turned plates from the discharge conveyer 82, a timing conveyer 92 is provided which may include a pair of spaced endless chains 93 carried at the turning wheel end of the conveyer over sprocket wheels 94 of a slightly larger diameter than the sprocket wheels 85 and journaled upon shaft 86 (note Figure 11); while the discharge end of the timing conveyer 92 is carried over spaced sprocket wheels 95 keyed to the shaft 90 and driven thereby. The shaft 90 is driven by the sprocket wheel 96 which sprocket is driven by the chain 97; while the chain 97 is driven by the sprocket wheel 98 of the gear box 18. Extending between the chains 93 are the timing slats 99.

The timing conveyer 92 is driven at the same rate of speed as the receiving conveyer 7 in order to maintain the plates of glass in correct timed relation for the receiving of the plates from the one grinding machine and the delivery of the plates to the next grinding machine.

To maintain the plates in a substantially vertical position while being discharged from the machine, stationary guide rails, or tracks, 100 are suitably supported from the framework 1 by depending rods 101. These stationary guide rails may be of the same construction as those used for the same purpose at the receiving end of the machine.

As all of the operating elements of the turning machine are driven from the gear box 18, all are operated in correct timed relation, for example, the driving slats 8 of the receiving conveyer will deliver the plates of glass onto the conveyer of the turning wheel during the pause in the rotation thereof; while the slats 99 of the timing conveyer 92 are so spaced and driven at just the right speed to deliver the plates of glass onto the conveyer of the grinding machine in just the correct timed relation for the operation of that machine.

Figure 1 diagrammatically illustrates a line of four grinding machines A, B, C, and D, in which line is included three turning machines X, Y, and Z. The plates of glass 2 are illustrated in their course through this combined grinding and turning machine. The plates of glass, once started through the machines, travel automatically in correctly timed relation for each machine, and do not require a single manual operation during the entire journey. The plates of glass discharged from the machine will have had automatically all four edges ground.

In some cases, it is desirable to turn the plates through a half revolution instead of through a quarter revolution, and for this purpose a turning wheel of H-shape is used in place of the cross-shaped turning wheel. The H-shaped turning wheel, as illustrated in Figure 13, may include a pair of spaced center members 110, to each end of which are secured arms 111, the entire structure being journaled to turn upon the shaft 112. Between the pair of spaced center members 110 may be mounted a conveyer 113 of substantially the same construction as the conveyers 27, and likewise between each pair of spaced arms 111 is a conveyer 114.

The conveyer 113 may be driven from the gear box of the machine by means of chain 115 which drives the sprocket wheel 116, which wheel is keyed to shaft 112. A sprocket wheel 117 is also keyed upon shaft 112 and drives through chain 118 the sprocket wheel 119, which sprocket is keyed to the shaft 120 which carries the driving sprockets 121 over which the endless chains of the conveyer 113 travel.

Any suitable driving means may be provided for actuating the arm conveyers 114 which may include a driving shaft 122 on which are keyed the spaced driving sprocket wheels 123 over which the endless chains of the conveyer pass.

The shaft 122 may be journaled in the spaced arms 111 and at one side extend to carry a sprocket wheel 124 which is driven by the chain 125 by the sprocket wheel 126 keyed upon the rotating shaft 120 of the conveyer 113.

Any suitable means may be provided for intermittently rotating the H-shaped turning wheel 180°, for example, the driving means illustrated in Figure 2 may be utilized by merely adding an additional driving arm 75 spaced 90° therefrom, whereby as the first driving arm leaves the channel 78 after rotating the wheel 90°, the second driving arm 75 will simultaneously enter the next succeeding channel 78 and rotate the wheel another 90°, so that the total rotation of the H-shaped turning wheel will be 180°.

In the operation of the H-shaped turning wheel, the plates are received from the receiving conveyer 127, and conveyed by conveyer 114 until the plates engage the conveyer 113. When the wheel has rotated so that the conveyer 113 is substantially horizontal, the conveyer 113 conveys the plates until they engage the conveyer 114 of the opposite arm, and when the wheel has completed a half revolution, the conveyer 114 acts to discharge the plates onto the discharge conveyer 128.

While the invention has been illustrated and described as applied to a machine for turning glass plates, it is to be understood that the invention is readily applicable for turning any form or shape of article to present different sides thereof to be worked upon. Also in the application of the invention to turning plates, although glass plates have been mentioned, plates of other materials such as wood, steel, brass, or the like, may as readily be turned.

Having fully described a preferred embodiment of the invention and the use thereof, it is to be understood that I do not wish to limit myself to the construction disclosed, which may be varied in detail without departing from the spirit of the invention as pointed out in the following claims.

What I claim is:

1. A machine for grinding edges of glass plates including a line of support upon which the glass may be stood on edge in substantially vertical position, means for guidingly maintaining said plate in such position, grinding means rotated substantially on the level with said line of support and onto which the glass plate moves so that the edge thereof may be ground, and automatic means for turning the glass in order that another edge thereof may be ground.

2. A machine for grinding edges of glass plates including supporting means, means for moving a glass plate over said supporting means with the plate standing on edge in substantially a vertical position, means for grinding the lower edge of said plate, and an automatic mechanism operable subsequently to said grinding operation to turn said glass plate so that another edge thereof may be ground.

3. In a machine for grinding edges of glass plates, horizontally disposed supporting means, means for moving glass plates along said supporting means with the plate disposed on edge in a substantially vertical position, means for grinding the lower edge of the plate, and automatic means in advance of said grinding means for turning said plate relatively to said supporting means so that another edge of said plate may be ground.

4. In a machine for grinding edges of glass plates, a line of support upon which a glass plate may be supported on edge in a substantially vertical position, and means for moving said plate over said line of support, means for grinding the lower edge of said plate during the movement thereof, and an automatic mechanism in advance of a grinding means for causing said plates to be turned upon another edge so that another edge of the plate may be ground by a subsequent grinding means without removing the plate from the support.

5. In a machine for grinding the edges of plates, a plurality of means for grinding an edge of the plate, automatic means spaced from a grinding means to turn the plate subsequent to grinding of an edge thereby so as to present another edge of the plate to a succeeding grinding means, means for supporting the plate during grinding thereof, and means for mounting the supporting means for movement from the grinding means into engagement with the turning means.

6. An article turning machine including a frame, a turning means journaled therein and having a plurality of arms, a conveyer means for each of said arms, a drive means for intermittently rotating said turning means, a drive means for said conveyers, and means for receiving and delivering the article to be turned onto one of said arm conveyers during the time said turning means is at rest.

7. An article turning machine including a frame, a turning means journaled therein, and having a plurality of arms, a conveyer means for each of said arms, a drive means for intermittently rotating said turning means, a drive means for said conveyers, a means for receiving and delivering the article to be turned onto one of said arm conveyers during the time said turning means is at rest, and a discharge means onto which the turned article is discharged during the time said turning means is at rest.

8. An article turning machine including a frame, a turning means journaled therein and having a plurality of arms, a conveyer means for each of said arms, a drive means for intermittently rotating said turning means, a drive means for said conveyers, a means for receiving and delivering the article to be turned onto one of said arm conveyers during the time said turning means is at rest, a discharge means onto which the turned article is discharged during the time said turning means is at rest, and means for discharging the turned article therefrom.

9. An article turning machine including a frame, a turning wheel journaled therein, and having four radially extending conveyers spaced 90° apart, a drive means for intermittently rotating said wheel 90° for each cycle of operation, a drive means for operating the turning wheel conveyers during the time said wheel is at rest, a receiving conveyer, and means for actuating said receiving conveyer to deliver the article to be turned onto the adjacent wheel conveyer during the rest period of said wheel.

10. An article turning machine including a frame, a turning wheel journaled therein and having four radially extending conveyers spaced 90° apart, a drive means for intermittently rotating said wheel 90° for each cycle of operation, a drive means for operating the turning wheel conveyers during the time said wheel is at rest, a receiving conveyer, means for actuating said receiving conveyer to deliver the article to be turned onto the adjacent wheel conveyer during

the rest period of said wheel, a discharge conveyer diametrically opposed to said receiving conveyer onto which the turned article is discharged by the wheel conveyer adjacent thereto.

11. An article turning machine including a frame, a turning wheel journaled therein and having two sets of diametrically opposed conveyers spaced 90° apart, a locking means operable for serially locking each of said wheel conveyers in a horizontal position, and an intermittent driving means operable for releasing said locking means and for rotating said wheel 90° for each cycle of operation.

12. An article turning machine including a frame, a turning wheel journaled therein and having two sets of diametrically opposed conveyers spaced 90° apart, a locking means for said wheel operable for serially retaining the diametrically opposed wheel conveyers in a horizontal plane, a lock releasing means and an intermittent drive means operable for releasing said locking means and for rotating said wheel 90° for each cycle of operation, a drive means for operating the turning wheel conveyers, a receiving conveyer positioned adjacent the receiving side of the wheel, means for actuating said receiving conveyer to deliver the article to be turned onto the adjacent wheel conveyer during the time said wheel conveyor is retained in locked horizontal position.

13. An article turning machine including a frame, a turning wheel journaled therein and having two sets of diametrically opposed conveyers spaced 90° apart, a locking means for said wheel operable for serially retaining the diametrically opposed wheel conveyers in a horizontal plane, an intermittent drive means operable for releasing said locking means and for rotating said wheel 90° for each cycle of operation, a drive means for operating the turning wheel conveyers, a receiving conveyer positioned adjacent the receiving side of the wheel, means for actuating said receiving conveyer to deliver the article to be turned onto the adjacent wheel conveyer during the time said wheel conveyer is retained in locked horizontal position, and a discharge conveyer positioned adjacent the discharge side of the wheel and adapted to receive the turned article discharged by the wheel conveyer adjacent thereto.

14. An article turning machine including a frame, a turning wheel journaled therein, an intermittent driving means for said wheel, a plurality of conveyers operatively mounted in said wheel, a driving means for said conveyers for rotating the inner ends of said conveyers in the same direction as that of said wheel.

15. An article turning machine including a frame, a turning wheel journaled therein, an intermittent driving means for said wheel, a plurality of conveyers operatively mounted in said wheel, a driving means for said conveyers for rotating the inner ends of said conveyers in the same direction and at the same speed as that of said wheel.

16. An article turning machine including a frame, a turning wheel journaled therein, an intermittent driving means for said wheel, a plurality of conveyers operatively mounted in said wheel, a unitary driving gear mounted for rotation about the axis of said wheel and rotating in the same direction and at substantially the same speed as that of said wheel during the rotation thereof, and a driving means operatively connecting each of said conveyers with said gear for rotating all of the conveyers in the same direction as that of said gear.

17. An article turning machine including a frame, a turning wheel journaled therein and having two sets of diametrically opposed radially extending conveyers spaced 90° apart, a locking means for said wheel operable for serially retaining each set of the diametrically opposed conveyers in a horizontal plane, an intermittent drive means operable for releasing said locking means, and for rotating said wheel 90° for each cycle of operation, and a driving means for said conveyers for rotating the conveyers in the same direction and speed as that of said wheel whereby the conveyers will be operative while the wheel is retained stationary and substantially stationary relative to said wheel during the rotation thereof.

18. An article turning machine including a frame, a turning wheel journaled therein and having two sets of diametrically opposed radially extending conveyers spaced 90° apart, a locking means for said wheel operable for serially retaining each set of the diametrically opposed conveyers in a horizontal plane, means for releasing said locking means, an intermittent drive means operable upon the release of said locking means for rotating said wheel 90° for each cycle of operation, a driving means for said conveyers for rotating all of the conveyers in the same direction and speed as that of said wheel, a receiving conveyer positioned adjacent the receiving side of the wheel, and means for actuating said receiving conveyer to deliver the article to be turned onto the adjacent wheel conveyer during the time said wheel is retained stationary.

19. An article turning machine including a frame, a turning wheel journaled therein and having two sets of diametrically opposed radially extending conveyers spaced 90° apart, a locking means for said wheel operable for serially retaining each set of the diametrically opposed conveyers in a horizontal plane, means for releasing said locking means, an intermittent drive means operable upon the release of said locking means for rotating said wheel 90° for each cycle of operation, a driving means for said conveyers for rotating all of the conveyers in the same direction and speed as that of said wheel, a receiving conveyer positioned adjacent the receiving side of the wheel, and means for actuating said receiving conveyer to deliver the article to be turned onto the adjacent wheel conveyer during the time said wheel is retained stationary, and a discharge means positioned adjacent the discharge side of the wheel and adapted to receive the turned article discharged by the wheel conveyer adjacent thereto.

20. An article turning machine turning wheel for turning the article 180° including a center frame journaled for rotation intermediate the ends thereof and having a conveyer means operatively mounted thereon, a frame member mounted upon each end of said center frame and each frame member having a conveyer means operatively mounted thereon, and a driving means for each of said conveyers.

21. An article turning machine turning wheel for turning the article 180°, including a center frame mounted for rotation intermediate the ends thereof and having a conveyer means operatively mounted thereon, a frame member formed upon each end of said center frame and each frame member having conveyer means operatively mounted thereon, a driving means for ro-

tating each of said conveyers in the direction of rotation of the wheel.

22. A glass plate turning machine turning wheel for turning the plates 90° including cross frames spaced 90° apart and mounted for rotation about their axes, a plurality of conveyer means operatively mounted in each of said cross frames, a driving means for said conveyers, guard means suitably mounted in each quarter of the wheel for supporting the glass plates on edge, and means for intermittently rotating the wheel.

23. A glass plate turning machine turning wheel for turning the plates 180° including a center frame mounted for rotation intermediate the ends thereof and having a conveyer means operatively mounted thereon, a frame member mounted upon each end of said center frame and each frame member having a conveyer means operatively mounted thereon, a driving means for each of said conveyers, guard means mounted between said frame members for supporting the glass plates on edge, and an intermittent rotating means for the wheel.

24. An article turning machine, including a frame, a turning means journaled therein and having a plurality of arms, a conveyer means for each of said arms, a drive means for intermittently rotating said turning means, a means for receiving and delivering the article to be turned onto one of said arm conveyers during the time said turning means is at rest, and a driving means for actuating said conveyers at a higher speed than said receiving means, whereby the articles to be turned are quickly conveyed to the center of the turning means.

25. An article turning machine, including a frame, a turning means journaled therein, and having a plurality of arms, a conveyer means for each of said arms, a drive means for intermittently rotating said turning means, a means for receiving and delivering the article to be turned onto one of said arm conveyers during the time said turning means is at rest, a driving means for actuating said conveyers at a higher speed than said delivery means, a discharge conveyer means onto which the turned article is discharged during the time said turning means is at rest, and a discharge conveyer driving means for actuating said discharge conveyer at a higher rate of speed than that of said turning means conveyer.

26. An article turning machine, including a frame, a turning means journaled therein, and having a plurality of arms, a conveyer means for each of said arms, a drive means for intermittently rotating said turning means, a means for receiving and delivering the article to be turned onto one of said arm conveyers during the time said turning means is at rest, a driving means for actuating said conveyers at a higher speed than that of said delivering means, a discharge conveyer means onto which the turned article is discharged during the time said turning means is at rest, a discharge conveyer driving means for actuating said discharge conveyer at a higher rate of speed than that of said arm conveyers, and a timing conveyer associated with said discharge conveyer means for timing the discharge of said article by said discharge conveyer.

27. A machine for grinding edges of glass plates comprising a line of support upon which the glass may be stood on edge in substantially vertical position, means for guidingly maintaining said plate in such position, grinding means rotated substantially on the level with said line of support and onto which the glass plate moves so that the edge thereof may be ground, and coordinated means operatively connected therewith automatically actuating in timed relation to receive, turn and deliver the glass from one grinding means into position to grind another edge thereof by a succeeding grinding means.

28. A machine for grinding edges of glass plates comprising supporting means, means for moving a glass plate over said supporting means with the plate standing on edge in substantially a vertical position, means for grinding the lower edge of said plate, and coordinated means operatively connected therewith automatically actuating in timed relation to receive, turn and deliver the glass from one grinding means into position to grind another edge thereof by a succeeding grinding means.

29. In a machine for grinding edges of glass plates, horizontally disposed supporting means, means for moving glass plates along said supporting means with the plate disposed on edge in a substantially vertical position, means for grinding the lower edge of the plate, and coordinated means operatively connected therewith automatically actuating in timed relation to receive, turn and deliver the glass from one grinding means into position to grind another edge thereof by a succeeding grinding means.

30. In a machine for grinding edges of glass plates, a line of support upon which a glass plate may be supported on edge in a substantially vertical position, means for moving said plate over said line of support, means for grinding the lower edge of said plate during the movement thereof, and coordinated means operatively connected therewith automatically actuating in timed relation to receive, turn and deliver the glass from one grinding means into position to grind another edge thereof by a succeeding grinding means.

31. In a machine for grinding edges of a glass plate wherein the plate is maintained in a substantially vertical position, a plurality of grinding means, means for supporting the plate in grinding position, means for moving the plate in grinding relation to said grinding means, and coordinated means operatively connected therewith automatically actuating in timed relation to receive, turn and deliver the glass from one grinding means into position to grind another edge thereof by a succeeding grinding means.

32. A machine for grinding edges of a glass plate including a plurality of grinding means, with means for presenting an edge of the plate into grinding relation thereto, and coordinated means operatively connected therewith automatically operating in timed relation to receive, turn and deliver said plate from one grinding means into position to grind another edge thereof by a succeeding grinding means.

33. A machine of the class described comprising a plurality of grinding means and means for supporting and moving a glass plate across said grinding means in grinding relation thereto to grind the edge thereof, and means coordinated therewith and operatively connected to be automatically actuated in timed relation to receive a plate after an edge has been ground, turn the plate and deliver the plate from one grinding means to said plate supporting and moving means whereby said plate is presented to a succeeding grinding means to grind another edge thereof.

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