

1,338,240.

Fig. 1.

WITNESSES

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 AUTOMATIC CONVEYER AND LEER.
 APPLICATION FILED DEC. 11, 1917.

1,338,240.

Patented Apr. 27, 1920.

5 SHEETS—SHEET 2.

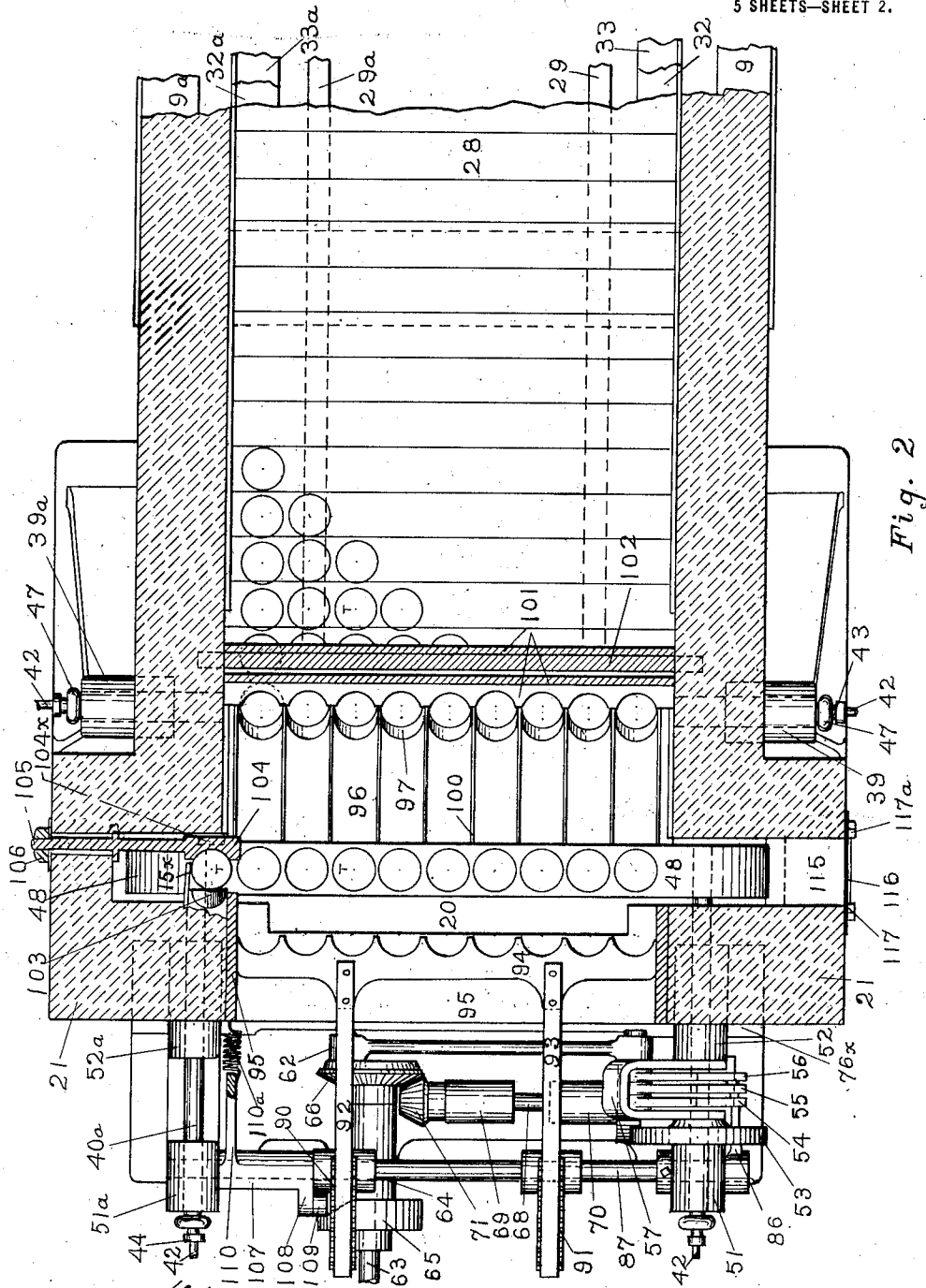


Fig. 2

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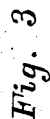
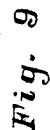
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5 SHEETS—SHEET 3.



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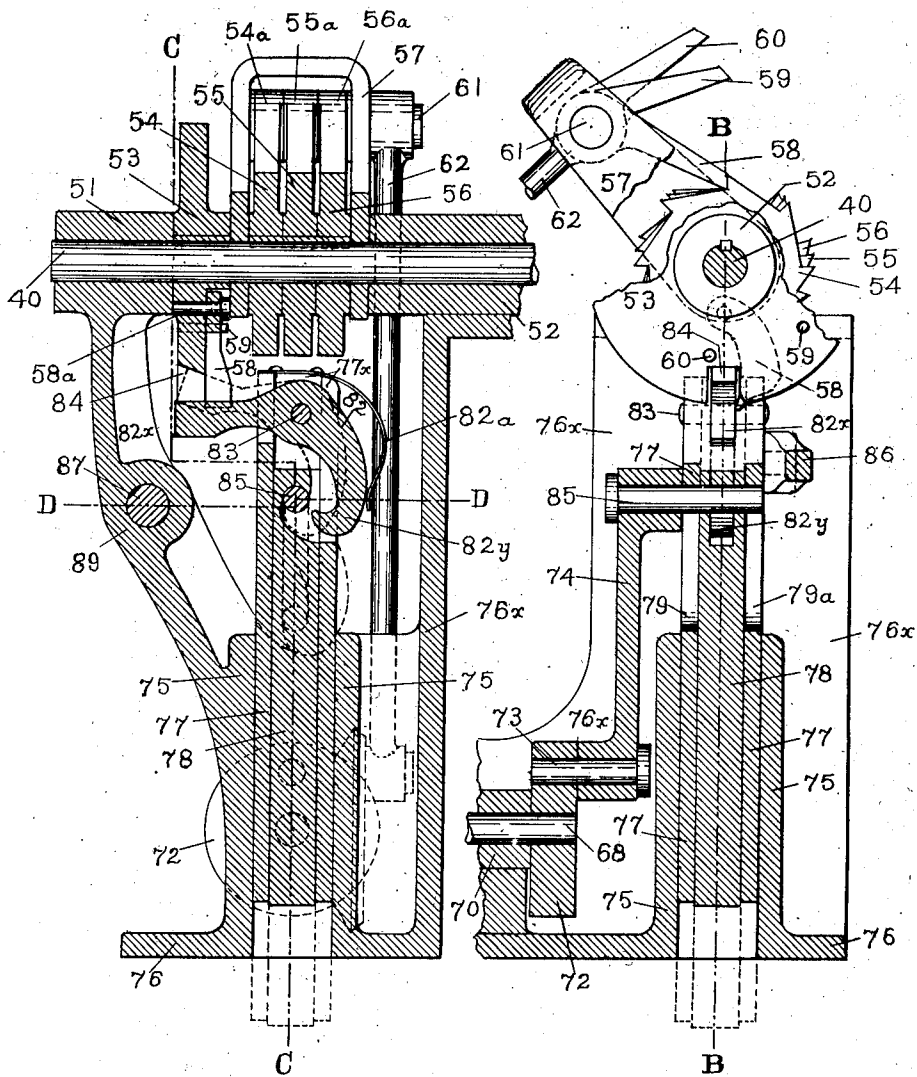


Fig. 4

Fig. 5

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Witnesses

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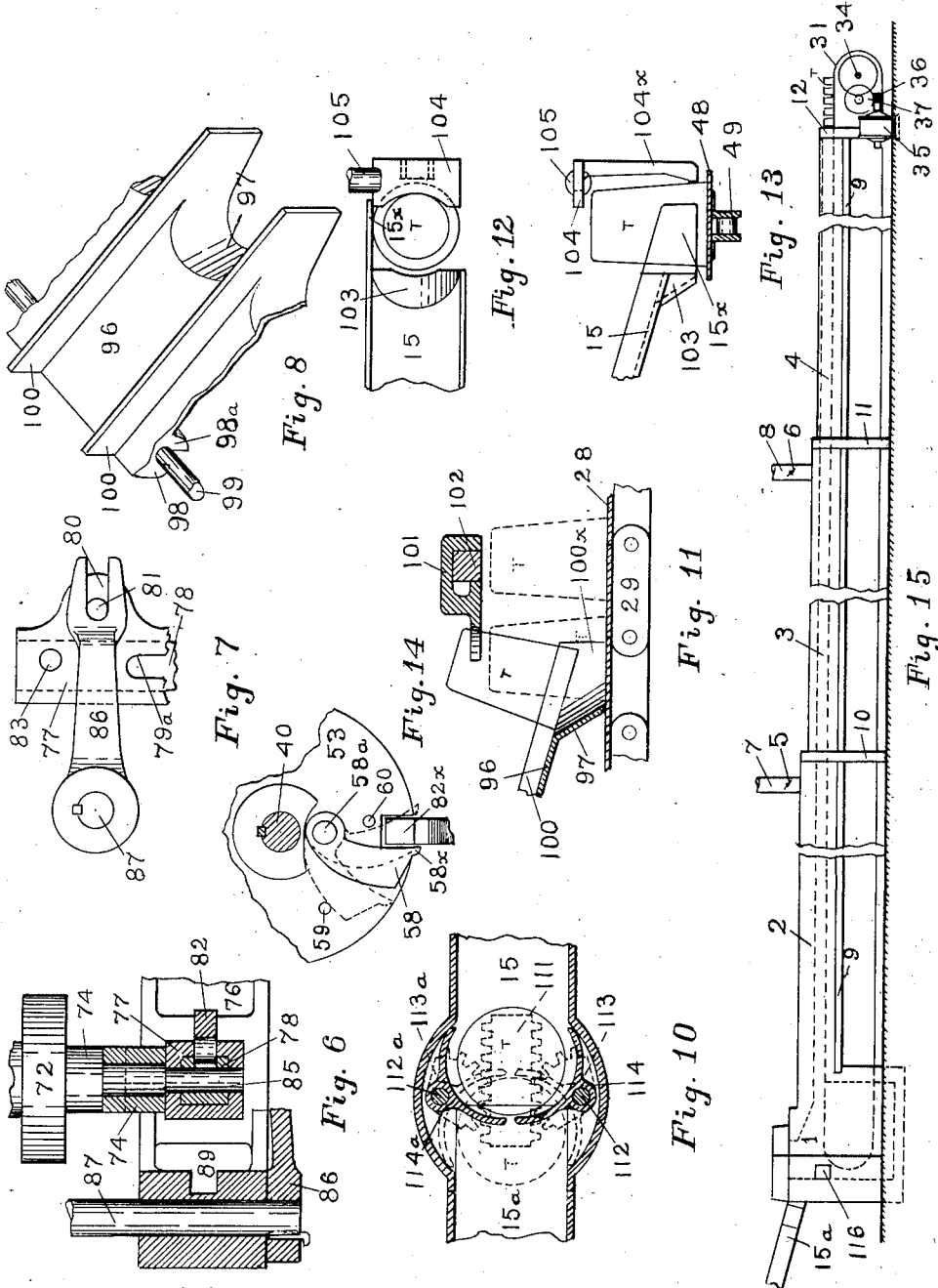
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5 SHEETS—SHEET 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

WILBUR S. MAYERS, OF FAIRMONT, WEST VIRGINIA.

AUTOMATIC CONVEYER AND LEER.

1,338,240.

Specification of Letters Patent.

Patented Apr. 27, 1920.

Application filed December 11, 1917. Serial No. 206,666.

To all whom it may concern:

Be it known that I, WILBUR S. MAYERS, a citizen of the United States, residing at Fairmont, in the county of Marion and State of West Virginia, have invented new and useful Improvements in Automatic Conveyer and Leers, of which the following is a specification.

My invention relates to annealing furnaces or leers for use in glass manufacturing plants for such articles as tumblers, packing jars, certain classes of bottles and table-ware. Heretofore the annealing of these articles has been accomplished in special furnaces requiring a considerable amount of fuel for reheating the ware and several hours for the operation. In my device the ware is taken hot from the molds and quickly placed in a closed and heat-insulated chamber thus avoiding the necessity of reheating, and greatly reducing the time and cost required for annealing. Furthermore there are produced better results than are possible with the leers now in use owing to the fact that the internal stresses produced by the non-uniform shrinkage due to the rapid cooling of the ware are avoided.

In the accompanying drawings, forming a part of these specifications, and in which similar characters of reference indicate like parts throughout the several views, Figure 1 is a partial side view of the operating mechanism with the side wall broken away showing a vertical longitudinal section through the receiving end of the leer and a partial sectional view through the feeding chute. Fig. 2 is a horizontal section through the receiving end on the line 2—3 of Fig. 1. Fig. 3 is an end view of the receiving end broken away in section at the cullet chute. Fig. 4 is a vertical section through a part of the operating mechanism on the line 4—4 of Fig. 5. Fig. 5 is a vertical section through the same parts on the line 5—5 of Fig. 4. Fig. 6 is a horizontal section on the line 6—6 of Fig. 4. Fig. 7 shows the upper end of the hollow slide and the rocker-shaft driving arm. Fig. 8 is a perspective of a section of the multiple chute and deflectors. Fig. 9 is a longitudinal section through the outer ends of the three conveyer shafts showing the water cooling device. Fig. 10 is a section through the valve in the feeding chute. Fig. 11 is a side view of the multiple stop, chute and deflectors. Fig. 12 is a plan of the single stop and

deflector at the end of the feeding chute. Fig. 13 is a side view of the feeding chute, deflector and stop and a section of the cross-conveyer. Fig. 14 shows the reverse side of the timer-disk from that shown in Fig. 5, and Fig. 15 shows a side view of the entire leer with the feeding mechanism omitted.

The main body of the leer consists of the receiving and distributing chamber 1 and the cooling sections 2, 3 and 4, Fig. 15.

The walls of the chamber 1 are made of refractory and heat-insulating materials of a thickness sufficient to reduce the heat radiation to any desired extent. The walls of section 2 have less heat-insulating properties than those of chamber 1; those of section 3 less than section 2 and so on in any number of sections, gradually increasing the cooling by radiation as the discharge end of the leer is reached. In order to hasten the cooling when desirable the dampers 5, 6, in the vent pipes 7, 8, are opened more or less, allowing the heated air to escape directly at these points.

The cooling sections 2, 3 and 4 are just large enough to house the upper run of the main conveyer and the largest size ware to be annealed so that the radiating surfaces may be kept at the minimum. The receiving-chamber walls rest directly upon the floor and the cooling sections are carried by the steel angle bars 9, 9^a and the columns 10, 11 and 12, in pairs.

The bottom member of the conveyer-seal 13, under the rear end wall of the receiving-chamber, extends between the side walls. The top of this casting just touches the under side of the main conveyer bars and is rounded on the edge as shown in order that any warped bars may ride smoothly over it. In order to prevent the cold air from entering the chamber over the inclosed conveyer run the top member of the conveyer-seal 14 is made to closely fit over the main conveyer bars and chains. This casting, extending between the side walls, has a small vertical travel and is loosely fitted under the rear end wall of the chamber. It rides upon the conveyer and the flange 14^x, extending its entire length, seals the air space between it and the end wall and retains it in place against the friction with the main-conveyer. Both the castings 13 and 14 are made rather loose fitting and easily removable.

The metal feeding-chute 15 extends

through the front end wall of the receiving-chamber and is set at an angle of about 16 degrees from the horizontal which inclination is just sufficient to cause the ware to slide thereon by gravity. The chute section 15 joins the outer section 15^a at the joint 16 and the outer section may be extended to any desired distance to a point near the mold from which the ware is transferred to the chute either by hand or by suitable mechanism. The hinge 17 at the joint provides for the upward swinging of the outer section but it is evident that the hinge may be placed at the bottom or on the sides so that the chute section may swing in any direction.

At the bottom of the receiving-chamber is the combustion-chamber 18 separated from the upper part of the chamber by the corrugated cast iron muffle-plate 19. This plate fills the entire horizontal area of the receiving-chamber with the exception of the recess or throat 20 in the front end wall 21. The curved end of the muffle plate terminates a short distance above the bottom of the throat and close to the bottom of the cross-conveyer.

The cap 22 of the receiving-chamber may be swung upward upon the hinge 23 to permit access to the chamber. The sand seal 24 consists of a marginal bead around the bottom of the cap extending downward and into a corresponding groove in the walls and stationary cover of the chamber. The bead does not fill the groove and the intervening space is filled with sand which makes a heat-tight joint between the members. The eye bolt 25 provides an attachment for lifting the cap 22 on its hinges.

The gas burner 26 is placed under the rear end of the muffle-plate near the casting 13 and its mixer 27 outside of the rear wall, their connecting pipe extending through a hole in the casting. Ignition of the gas is made through the hole 27^a. The purpose of the burner is primarily to provide means of preheating the bars of the main conveyer by radiation from the muffle-plate, as hot glassware is cracked or checked by contact with cold metal. It is further useful as a means of making up for heat losses by radiation and to retard the cooling of certain classes of ware. It is apparent that the cross-conveyer will also be heated both by radiation from the muffle-plate and by direct contact with the hot gases, as well as by the hot ware. The chute sections 15, 15^a, will also be heated by the passage of a part of the hot gases through them and by direct contact with the hot ware.

The main-conveyer consists of a series of thin metal bars 28 attached to the links of the endless chains 29, 29^a, these chains running upon suitable sprocket wheels 30,

31 in adjacent pairs and tightly keyed to their respective shafts. The length of the conveyer bars as well as the width of the leer are determined by the diameter of the articles to be annealed and the number of pieces in each cross-row. Fig. 2 shows nine pieces in each cross-row but it is evident that this number may be increased or diminished without affecting the working of the mechanism as hereinafter described. It is also evident that the length of the main-conveyer and cooling sections may be likewise increased or diminished. The upper or loaded run of the conveyer is supported by the angles 32, 32^a and the lower or empty run upon similar angles 33, 33^a. The shaft 34, Fig. 15, passes through the pair of sprocket wheels 31 and suitable bearings and is geared to a motor 35 through the worm 36, worm-wheel 37 and a train of spur gears. The shaft 38 passes through the walls of the receiving-chamber in suitable bearings 39, 39^a and through the sprocket wheels 30. The bearings are partly, and may be entirely, outside of the walls in order that they may not be subjected to the heat therein. The sprocket wheels are maintained in continuous motion, clockwise in direction, with reference to Figs. 1 and 15.

The ends of the shaft 38 as well as those of the cross-conveyer shafts 40, 40^a are fitted with water cooling devices shown in Fig. 9. These shafts are end bored to a depth equal to their extension beyond the inside line of the receiving-chamber walls. Into this bore 41 extends the tube 42 whose external diameter is slightly less than that of the bore 41. Outside of the tube 42 and within the counterbore at the extreme end of the shaft is the nipple 43 terminating in the stuffing-box 44 around the tube 42. On the nipple 43 between the stuffing-box and the end of the shaft are two integral or close fitting flanges 45, 46 and between these flanges a series of holes 43^a are drilled through the walls of the nipple. These flanges are loosely inclosed in the split casing 47. The tube 42 is stationary and is connected to a water supply pipe. The casing 47 is also stationary and is connected to a waste pipe. The nipple 43 is tightly threaded into the counterbore at the end of the shaft and therefore revolves with it. It will be seen that the water entering the tube 42 discharges at its inner end into the bore 41, then reversing its direction and passing through the annular space between the tube and the bore, it is discharged through the holes in the nipple 43 into the casing 47 and finally to the waste pipe.

The cross-conveyer 48 is similar in design to the main-conveyer except that its width is but slightly greater than a single piece of ware and its length between shaft centers

is equal to or slightly greater than the length of a cross-row. The use of a single chain 49 and single sprocket wheels 50, 50^a is preferable in this conveyer.

5 The shafts 40, 40^a are journaled in the bearings 51, 52 and 51^a, 52^a, respectively, and, passing through the end wall 21, they are keyed to the sprocket wheels 50, 50^a.

10 The conveyer head shaft 40 carries in addition the timing-disk 53, the ratchet-wheels 54, 55, 56, all keyed thereto, and the pawl-carrier 57 loosely fitted. The pawls 54^a, 55^a, 56^a engage respectively the ratchets 54, 55, 56, any of which may be independently
15 thrown out of engagement. The pin 61 is loose in the connecting-rod 62, and the pawls, and tightly fitted in the pawl-carrier. The oscillatory motion of the pawl-carrier and pawls is continuous with a fixed
20 amplitude, and the travel of the pawls at their bearing points upon the ratchets is slightly greater than the pitch of the largest tooth and less than the arc subtended by two of the smallest adjacent teeth. It will
25 be observed that the shaft 40 and sprocket wheel 50 will, at each forward stroke of the pawl-carrier, be turned through an angle equal to 360° divided by the number of teeth in the ratchet engaged. The intermittent
30 movements of the cross-conveyer, caused by the engagement of one of the ratchets by its pawl, being slightly greater than the greatest diameter of each piece of ware deposited upon it, contact between the
35 pieces of ware and cohesion between them are avoided.

The drive shaft 63 is journaled in the bearing 64 and is keyed in the cam 65 and the bevel gear 66. This gear also serves as a
40 crank-disk and the crank-pin 67, tightly fitted therein, is journaled in the lower end of the connecting-rod 62, the driven shaft 68 is journaled in the bearings 69, 70 and carries the bevel gear 71 and the crank-disk
45 72 both tightly keyed. The crank-pin 73 in the crank-disk 72 is journaled in the lower end of the connecting-rod 74.

The vertical guide 75 is integral with the base plate 76 and base plate flange 76^x and
50 is planed inside to receive the hollow slide 77. The inside of the hollow slide is planed to receive the inner or solid slide 78. The hollow slide has in its upper end the two longitudinal vertical slots 79, 79^a each hav-
55 ing a length slightly greater than the vertical travel of the connecting-rod 74, and near the top on one side is the projecting lug 80 carrying the tightly fitting pin 81, Fig. 7. In a slot 77^x in the top of the hollow
60 slide is pivoted the latch 82 on the pin 83. This latch has a downward extending arm 82^y terminating in a hook and a horizontal arm 82^x which, in its uppermost position, occupies at certain times a notch 84 in the
65 edge of the timing-disk 53. The bent flat

spring 82^a presses the hook into the slot in the slide 78 when the arm 82 is opposite the notch 84. The dog 58 has a radially projecting lug 58^x and is loosely pivoted on the pin 58^a which is screwed tight in the timing-
70 disk. When, due to the force of gravity, the dog hangs in the vertical position as shown in the dotted lines in Fig. 14, its lower face is tangential to the edge of the timing-disk and it is directly over the notch
75 84. It swings freely on its pivot and is limited in its arc of travel by the studs 59, 60. The inner slide 78 is slotted at the top to receive at certain times the hook 82^y. The pin 85 passes tightly through the inner
80 slide at the top of the slot so that its under side is engaged at stated intervals with the hook. This pin also passes loosely through the vertical slots 79, 79^a in the hollow slide 77 and extends into the top of the connect-
85 ing-rod 74, loosely fitted thereto.

The rocker-shaft driving arm 86 has a U shaped swinging end which envelops the pin 81 and its other end is keyed to the rocker-shaft 87 which is rotatably sup-
90 ported in the bearings 88, 89. The pusher-arms 90, 91 are keyed to the rocker-shaft and terminate at their upper ends in segmental spur gears 90^x, 91^x. Meshing into these gears are the rack-rods 92, 93. These
95 rods extend into the end wall 21 and are riveted to the integral multiple pusher-bar 94. The pusher-bar and rack-rods rest upon and are guided by the metal frame 95 extending to the inside of the wall 21 and
100 cut away over the recess 20. The top section is recessed over the rack-rods and has a close sliding fit with these rods and the pusher-bar on the edge flush with the throat
105 20. It is inclined upward from this edge a sufficient amount to permit the rods to be raised so that their teeth may clear those of the segmental gears 90^x, 91^x. The pusher-
bar and rods may thus be entirely with-
110 drawn and replaced by another such member when it is desired to change the size of the ware. The pusher-bar is notched or fluted on its inner edge for the purpose
hereinafter set forth and its under side is at
115 an elevation slightly higher than the top of the conveyer 48. Its horizontal travel is sufficient to push the cross-row of glasses off the conveyer 48 at certain intervals.

The multiple chute 96 is preferably made in an integral casting and is fixed at an in-
120 cline of about 16 degrees from the horizontal. The deflectors 97 at the bottom of each chute section consist of short segments cut from the walls of round tubes whose internal
diameters are slightly greater than that of
125 the pieces of ware which pass over them. The axes of the deflectors are set at an angle of about 45 degrees from the horizontal and their bottoms rest upon the metal bars of the main conveyer 28. The under side of the
130

chute at its upper end is provided with lugs 98, 98^a and between these the fixed rod 99 extends across the leer and forms the upper support of the chute. On the top surface of the chute the raised guides 100, spaced according to the number and width of the pieces of ware, prevent them from touching one another while sliding by gravity down the chute, and deposit them upon the main conveyer in the proper spacing. In order that the pieces may not touch one another after dropping to the main-conveyer the guides 100 have extensions 100^x carried to a point beyond the deflectors and directly under the striking edge of the multiple-stop 101 and downward to the level of the bottoms of the deflectors. In case the ware is annealed with the largest diameters up these guide extensions are carried upward to the stop 101. When tumblers of a different size are to be annealed the integral multiple-chute is lifted out of position and removed and another is inserted in which the raised guides and deflectors are spaced according to the size of the ware.

Upon sliding down each chute section the top of the tumblers T, or other articles, strike the multiple stop 101 as shown by the dotted lines in Fig. 1. The bottoms of the tumblers are then carried on by their inertia and, clearing the concave end of each section, they are righted to their vertical position and, guided by the deflectors, drop to the main conveyer so that they will now pass under the stop.

The square or rectangular metal bar 102 extends across the leer chamber and is firmly embedded in the side walls. The multiple-stop 101 is cast in one piece in the form shown in Fig. 11 and hooks over the bar 102 so that its striking edge is in the proper position. This striking edge is fluted as shown in Fig. 2 and is spaced and designed so that it occupies the correct position with reference to the size of the tumbler and the end of the multiple-chute. When tumblers of a different size are to be annealed the stop is lifted from the bar and another stop inserted in which the striking edge will be in the correct position for that size of tumbler and the number and spacing of the fluted pockets will correspond to that size of ware. The height of the bar 102 will be such that tumblers of the maximum height, as shown in Fig. 1, will pass under it and when smaller sizes are to be annealed the striking edge will be lower and farther from the bar to suit the height and diameter of the various sizes.

The bottom of chute 15 terminates in a concave end with a deflector 103 similar to those of the multiple-chute 96 above described. The stop 104 is placed in the path of the top of the descending tumbler and is held in position by the stud 105 which

passes through a hole in the side wall and is clamped thereto by means of the flanged nut 106. The hole is larger than the stud so that vertical and horizontal adjustment of the stop is obtained. The action of the tumbler upon striking the stop is precisely similar to that described in relation to the multiple-chute 96 and stop 101, and it is obvious that articles with slanting sides, such as tumblers, will take the positions as above described, either when they descend with their open ends up or inverted as shown in Figs. 1 and 11. It is also evident that any piece of ware which will maintain its stability upon the chute, such as shallow bottles, will take similar positions. The arm 104^x is attached to the stop 104 and extends downward to a point slightly above the top of the cross-conveyer. The purpose of this arm is to prevent the tumbler from receding from the deflector 103 when it drops to the cross-conveyer.

The stops 101, 104 are concaved on their striking edges to conform to the curved surface of the pieces of ware in order to lessen any tendency to distort or fracture the ware by the impact. Freedom from distortion is furthermore insured by virtue of the well known inherent qualities of glass, which, though hot enough to be luminous and pliant and yielding to steady pressure of definite duration, resists sudden blows and may even be fractured under severe blows.

The hollow shaft 107 is rotatably mounted on the rocker-shaft 87. On one end of the hollow shaft is the downward extending arm 108 and on the swinging end of this arm is the roller 109 which engages the wearing surface of the cam 65. On the other end of the hollow shaft the arm 110 extends upward and terminates in the duplex segmental bevel gear 111. The shafts in the timing valve 112, 112^a, Fig. 10, are journaled in bearings in the top casing and the bottom of the chute 15 and are keyed to the segmental bevel gears 113, 113^a and the valve wings 114, 114^a. The travel of the cam roller and the radii of the segmental gears are such that the valve wings swing between the positions shown in the dotted lines and the solid lines in Fig. 10.

The helical spring 110^a is attached at one end to the arm 110 and the other end is attached to a suitable fixture in the end wall 21. The spring has a tension sufficient to cause the roller 109 to bear firmly upon the cam 65 and to operate the valve wings 114, 114^a through the gears 111, 113, 113^a when the roller enters and leaves the depression in the wearing face of the cam.

The bottom of the vertically swinging chute 15^a extends between the side walls of chute 15 to a point near the bearings of shafts 112, 112^a so that when the swinging section is raised any ware which may have

lodged against the wings 114, 114^a will drop to the floor or into a receptacle.

It is understood that the swinging section is not raised while the device is in normal operation. In case that the ware is accidentally fed into it faster than it can pass through the timing valve, or that clogging is otherwise caused, the section can be easily cleared by raising it and allowing the ware therein to drop to a suitable receptacle for cullet, after which it is lowered to working position and normal operation is resumed.

The side 15^x of the chute 15 extends to a point near the stop 104 for the purpose of preventing the tumbler from bouncing toward the adjacent end of the cross-conveyer after dropping from the chute.

The cullet chute 115 extends from the discharge end of the cross-conveyer 48 through the side wall. The small metal door 116 swings upon the horizontal hinges 117, 117^a at the top and closes by gravity. This chute is so placed that any ware falling upon it from the end of the cross-conveyer is discharged by gravity through the small door which is lifted by the ware passing through it.

Pressed glassware is commonly taken from the molds at a temperature which causes the pieces to cohere when brought together and it is therefore essential that contact between two or more pieces be avoided while in the hot end of the leer. This condition is attained by means of the mechanism above described.

The ware is taken from the molds either by hand or by any form of automatic take-out device and is placed upon the upper end of the chute 15^a. Upon being released it slides down the chute until it strikes the timing-valve wings 114, 114^a while they are in the position shown in the dotted lines in Fig. 10. At this instant the depression in the cam 65 reaches the roller 109 and acting under the tension of the spring 110^a the hollow shaft makes a partial turn, thereby shifting the valve wings to the position shown in solid line section. The piece of ware, following the movement of the wings, passes to the chute section 15 and slides to the stop 104 where it drops into position on the cross-conveyer as above described.

The drive shaft 63 makes one revolution in the interval of time required to produce one piece of ware and may be connected to an independent motor through gearing, properly synchronized, but where motor driven presses are employed this shaft is preferably connected to a rotating member of the machine and permanently synchronized through proper gearing. The movements of the pawl-carrier 57, as well as the valve wings, are made in cycles corresponding in frequency to the revolutions of the drive shaft though their action is not

simultaneous. The cam is set so that the valve wings are in the dotted line position when the ware reaches the bottom of the chute 15^a at which time the wings are shifted. At a certain subsequent interval of time, corresponding to the time required for the ware to reach the cross-conveyer in the manner above described, a predetermined one of the pawls engages a tooth of its corresponding ratchet and the upper run of the cross-conveyer is moved away from the chute through a space equal to the largest diameter of the piece of ware plus a certain amount of clearance. A short interval of time now occurs until the next piece of ware starts down the chute 15^a thus completing the cycle of operation for the valve wings and ratchet.

The diameters of the cross-conveyer sprocket wheels are such that one revolution advances the straight runs of the conveyer a distance equal to the number of pieces in the cross-row multiplied by the greatest diameter and clearance of each piece. The number of teeth in the bevel gear 66 must be a multiple of the number in its companion gear 71, and their ratio is preferably 2 to 1. At this ratio the crank-disk 72 will revolve twice for each piece of ware produced and the pusher-bar will be thrust forward and withdrawn without interfering with the first piece of ware on the next cross-row. The point of one tooth in each of the ratchets is set in the same radial plane at a point diametrically opposite the center of the notch 84 in the timing-disk 53. The timing-disk is set at such a position on its shaft that its notch 84 exactly registers with the arm 82^x of the latch 82 at the instant when the cross-conveyer stops, after having received its full row of pieces. At this instant the arm 82^x rises into the notch, due to the tension of the flat spring 82^a against the hook arm 82^y. The gear 71 is set at such a position on its shaft that at this same instant the connecting rod 74, carrying with it the inner and solid slide 78 and pin 85, will have reached its highest point of travel. The latch arms will now be in the positions shown in the dotted lines, Fig. 4, and, upon descending, the pin 85 will engage the hook 82^y. It will be seen that when this engagement takes place the latch is drawn down and with it the hollow slide 77, the fixed pin 81 and the swinging end of the rocker-shaft arm 86. Upon the upward or return stroke the pin 85, which is now at the top of the slots 79, 79^a, will carry the hollow slide up to its highest position and with it the end of the rocker-shaft arm. When the latch leaves the notch in the timing-disk on the downward stroke the dog 58 falls to the vertical position, thus closing the notch, and at the top of the succeeding upward stroke the arm 82^x is depressed by the dog and the

hook thrown out of engagement with the pin 85. The hook is likewise thrown out of engagement by the edge of the timing-disk at every stroke except the one which occurs while the arm 82^x is in the notch. When the disk rotates to the position shown in Fig. 5 the arm 82^x engages the lug 58^x, as shown in the dotted lines in Fig. 14, thus preventing the dog from swinging in and prematurely closing the notch, but it is evident that the notch will be closed at the next stroke as above described. The slots 79, 79^a in the hollow slide permit the pin 85 to descend without moving this slide and its connections at all times except when the hook engages the pin as above described.

Upon the operation of the rocker-arm and shaft as above described the pusher-bar 94 is actuated by the gears 90^x, 91^x and the rack-rods 92, 93 and the bar is thrust into the chamber over the cross-conveyer. Each piece of ware on this conveyer is by this action pushed off simultaneously, and dropping to its respective chute section 100 is deposited upon the main-conveyer in the manner above described. If, from any cause, any piece of ware should, in dropping from chute 15, rest upon the cross-conveyer out of its proper space the fluted edge of the pusher-bar will correct such displacement and in a like manner the fluted edge of the stops 101 and 104 maintain the proper spacing of the pieces.

The motor 35 is so geared to the main-conveyer drive shaft that the horizontal runs of this conveyer travel a distance equal to the largest diameter of the pieces of ware being annealed, plus a predetermined clearance, in the period of time between the actuations of the pusher-bar. In order to vary the speed of the main-conveyer to suit the rate of production and size of the ware the motor is provided with any of the well known speed regulators.

When tumblers or such like which are deposited in the outer end of the swinging chute come in contact with the timing-valve wings 114, 114^a they are held at this point for a predetermined interval of time, depending upon the regularity and rate of production, this time interval corresponding to the maximum variation in the intervals between the deposits of the pieces in the chute. For example, if the wings are actuated at intervals of three seconds and if there is a maximum interval of four seconds between the deposits of any of the tumblers, the wings will be set to retard each tumbler one second, based upon the regular time for such deposits. Thus it will be seen that the tumblers will leave the valve at regular intervals even if deposited in the chute out of time, within certain limits. In case that two or more pieces of hot ware are placed in the chute before the valve is actuated through

a complete cycle they will cohere and can not pass through it. No damage to the wings and other connected mechanism will result however as the inward or feeding-in stroke of the wings gets its force from the tension of the spring 110^a. Should a piece of ware lodge in the position shown in solid line below the wings, as shown in Fig. 10, it will be forced outward in the chute by the wings, positively driven, and the mechanism cannot in this case be damaged. It is obvious that the chute sections 15, 15^a may, if desirable, be located at the opposite side of the receiving-chamber, as would be shown if all the drawings were reversed as they would appear if seen in a mirror, without affecting the operation of the device. The chute 15^a may be curved laterally if its inclination is made slightly steeper to overcome the friction of the ware against its sides. As it is essential that the passage of the pieces of ware through the chutes 15, 15^a shall take place in a space of time short enough to prevent their cooling below the point at which they are pliant, the receiving end of the leer must be located near enough to the point of delivery from the mold to render practicable the transfer of the ware by gravity through the chutes within the stated limit of time.

Having thus described my invention I claim:

1. A leer comprising a practically inclosed receiving-chamber, a combustion-chamber, a series of cooling-chambers connected to said receiving-chamber, a main-conveyer, a cross-conveyer, a multiple-chute from the cross-conveyer to the main-conveyer, a chute from the outside to the cross-conveyer, stops adjacent to and deflectors attached to the lower ends of both chutes, a pusher-bar and means for actuating the conveyers and the pusher-bar, substantially as described.

2. A leer comprising a receiving-chamber, a combustion-chamber, means for heating the combustion-chamber, a series of cooling-chambers connected to the receiving-chamber, a main-conveyer partially within the receiving- and cooling-chambers, a cross-conveyer entirely within the receiving-chamber, a multiple-chute with deflectors from the cross-conveyer to the main-conveyer, a jointed chute with deflector from the outside to the end of the cross-conveyer, an adjustable stop adjacent to the lower end of the said jointed chute, an interchangeable multiple-stop adjacent to the lower end of the said multiple-chute, a multiple-pusher-bar and means for actuating the said conveyers and pusher-bar.

3. A leer comprising interconnected and heat insulated receiving and cooling chambers, a main-conveyer with its upper section within said chambers, a cross-conveyer entirely within said receiving-chamber, a chute

for transferring articles of glass in a pliant state from the molds to the receiving chamber in a space of time in which said articles cannot cool below a point where setting or partial solidification takes place, a concaved deflector at the bottom of said chute, a stop with a concaved striking edge, means for heating the metal parts with which said articles are in contact and said receiving chamber, and means for depositing the articles upon the main-conveyer for the purpose and in the manner described.

4. The combination of a leer comprising a heat insulated chamber, a single inclined chute adapted to conveying stable pieces of ware, such as tumblers, by gravity, one by one, from a point without said chamber to a point within it in a space of time short enough to prevent the cooling of the ware beyond certain described limits, a cross-conveyer, a pusher-bar with periodical reciprocating motion above and across the cross-conveyer, an inclined multiple chute for receiving the rows of stable ware pushed off of the cross-conveyer and carrying them by gravity to the main conveyer, guides in said multiple chute for preventing contact between the pieces of ware, a main conveyer below said multiple chute and means for actuating the parts in said combination substantially as described.

5. In a leer the combination of an outward projecting closed chute set in close proximity to a mold from which formed ware is delivered, said chute being adapted to convey each piece of ware deposited upon its outer end to the receiving-chamber of said leer within a described time limit, a concaved deflector at the bottom of said chute, a stop with a concaved striking edge and a downward projecting arm in line with and in fixed relation to said chute.

6. In a leer of the character described a chute adapted to carry pieces of ware which are slidable by gravity thereon in either upright or inverted positions, a concaved deflector at the bottom of said chute, a stop with a concaved striking edge and a downward extending arm positioned in definite relations to said chute and deflector, as and for the purposes described.

7. In a leer of the character described a row of chutes in multiple, each unit being adapted to carry pieces of ware which are slidable thereon by gravity in either upright or inverted positions, concaved deflectors and guides at the bottoms of said multiple chutes and stops with concaved striking edges positioned in definite relations to said multiple chutes and deflectors, as and for the purposes described.

8. In a leer of the character described the combination of a cross-conveyer, mechanism for actuating said conveyer intermittently in predetermined periods of time corre-

sponding to the rate of continuous production of ware of any desired diameter, and means for advancing the said conveyer at each step any desired distance corresponding to the diameter of the pieces of ware produced:—the elements of time and distance being correlated for each diameter, a multiple pusher-bar with notched pushing edge, means for actuating said pusher-bar at certain periods, a multiple chute with guides, a multiple stop with notched striking edge and means whereby the said multiple pusher-bar, multiple chute and multiple stop may be easily withdrawn from the leer and others inserted therein, with the spacings between the said notches and guides conforming to the desired diameter of the pieces of ware produced, plus a given clearance.

9. In a leer of the character described, the combination of a muffle-plate below the return or lower run of an endless conveyer and in heating relation thereto, a combustion-chamber and a source of heat below said muffle plate, a heat insulated receiving chamber above the upper run of the receiving end of the conveyer, a passage for hot gases between the said combustion- and receiving-chambers and a cross-conveyer in a position to be heated to a certain degree by radiation from said muffle-plate and by direct contact with the hot gases.

10. In a leer of the character described a conveyer-seal consisting of a fixed lower section closely fitted to the conveyer parts, and a close fitting flanged upper section adapted to ride upon the conveyer.

11. In a leer a feeding chute comprising a fixed and inclosed lower section, an upwardly swinging upper section, an extension of the bottom of the upper section between the sides of and replacing a portion of the bottom of the lower section and a timing valve at the top of the said lower section.

12. In a leer a feeding mechanism comprising a chute having a bottom section fixed and a top section hinged thereto, a pair of oscillating timing-wings geared to an arm of a rocker-shaft, a roller on an arm of said rocker-shaft adapted to engage the wearing surface of a cam and means to rotate said cam in synchronism with the rate of production of the pieces of ware.

13. In a leer a feeding mechanism comprising a chute, timing-wings within said chute and means for oscillating the said wings through a positive drive on their outward or retarding stroke and through a spring tension drive on their inward or feeding in stroke.

14. In a leer a feeding mechanism comprising a chute, a valve in said chute for retarding the passage of articles a given interval of time and advancing them at regular intervals of time and means for actuating said valve with a positive drive in the retarding

stroke and a spring tension drive in the advancing stroke.

15. In a leer feeding mechanism the combination of a chute, a timing-valve in said chute, a cross-conveyer, means for actuating the timing-valve and cross-conveyer at intervals of time corresponding with the rate of production of the pieces of ware, means for depositing the ware in position upon the cross-conveyer, a pusher-bar and means for actuating it at certain intervals of time, a main-conveyer, a multiple-chute from the cross-conveyer to the main-conveyer and means for depositing the ware in position on the main-conveyer.

16. In a leer feeding mechanism the combination of a chute, a timing valve in the chute, a cross-conveyer, a deflector and a stop at the end of the chute and above the cross-conveyer, a pusher-bar moving across the conveyer, a multiple chute receiving articles pushed from the conveyer, means for actuating the said timing valve and cross-conveyer at intervals of time corresponding to the rate of production of the ware and means for actuating the said pusher-bar at intervals corresponding to selected multiples of the rate of production of the ware.

17. In a leer feeding mechanism the combination of a drive shaft geared to a motor, a cam and a combined gear and crank-disk on the drive shaft, a driven shaft having on one end a crank-disk and on the other end a gear, a hollow slide, a solid slide within the hollow slide, a connecting rod between the solid slide and the crank-disk on the driven shaft, a latch having an outward extending arm and a downward extending arm terminating in a hook adapted to engage a pin in the solid slide, a pin in the hollow slide engaging a driving arm on a rocker-shaft, segmental gears on the rocker-shaft, rack-rods meshing into said segmental gears and attached to a pusher-bar, a cross-conveyer head shaft, a series of ratchets and a pawl-carrier with pawls on said conveyer shaft, a timing-disk on said conveyer shaft adapted to control the action of the said outward extending arm on the latch and a connecting-rod between the pawl-carrier and the crank-disk on the drive shaft.

18. In a leer feeding mechanism the combination of a chute for conveying ware by gravity to a cross-conveyer of a pusher-bar having notches or teeth in the edge, which comes in contact with the ware, a main-conveyer and means for actuating the said pusher-bar and conveyers, substantially as described.

19. In a leer feeding mechanism a pusher-bar and means for actuating it controlled by a timing-device comprising a drive shaft geared to a motor, a driven shaft geared to

the drive shaft, a crank-disk on the driven shaft, a hollow slide with a periodical reciprocating motion, a drive arm on a rocker-shaft actuated by a stud on the hollow slide, a solid slide with a continuous reciprocating motion within the hollow slide, a connecting rod between the crank-disk and the solid slide, a latch in the hollow slide adapted to engage a pin in the solid slide at fixed intervals of time, a timing-disk with a notch adapted to receive an arm of the latch once in each revolution, a dog pivoted on the timing-disk, and means for driving the timing-disk at a speed which is at a given ratio to that of the crank-disk.

20. In a leer feeding mechanism a cross-conveyer, a cross-conveyer head shaft, one or more ratchets keyed to the head shaft, a pawl carrier pivoted on the head shaft, one or more pawls in the carrier with all but one thrown out of engagement, a crank-disk on a drive shaft, a connecting-rod between the crank-disk and the pawl carrier, the arc of travel of the carrier being such that the cross-conveyer is advanced a distance equal to the largest diameter of each piece of ware, plus a predetermined clearance, at each revolution of the crank-disk.

21. In a leer feeding mechanism the combination of a gravity feeding chute, a cross-conveyer entirely within the heated receiving chamber of the leer, a pusher-bar disposed above the cross-conveyer, said pusher-bar having a toothed pushing edge, the spacing of the teeth being in relation to the spacing of the ware on the cross-conveyer, means for actuating the pusher-bar giving it a quick forward and return stroke at certain intervals of time across the cross-conveyer a multiple chute for carrying transverse rows of ware from the cross-conveyer to a main-conveyer, the said chutes conveyers and pusher-bar being adapted to prevent contact between the pieces of ware.

22. In a leer feeding mechanism the combination of a gravity feeding chute, a cross-conveyer within a receiving chamber, a multiple chute for conveying ware from the cross-conveyer to a main-conveyer, a pusher-bar for pushing ware from the cross-conveyer to the multiple chute, a cullet or waste material chute at the discharge end of said cross-conveyer adapted to receive and discharge at a point outside of the receiving chamber any ware which may not have been pushed off of the cross-conveyer and an automatic door at the lower end of the cullet chute adapted to open by the weight of the outgoing pieces of ware and to close by gravity.

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Witnesses:

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