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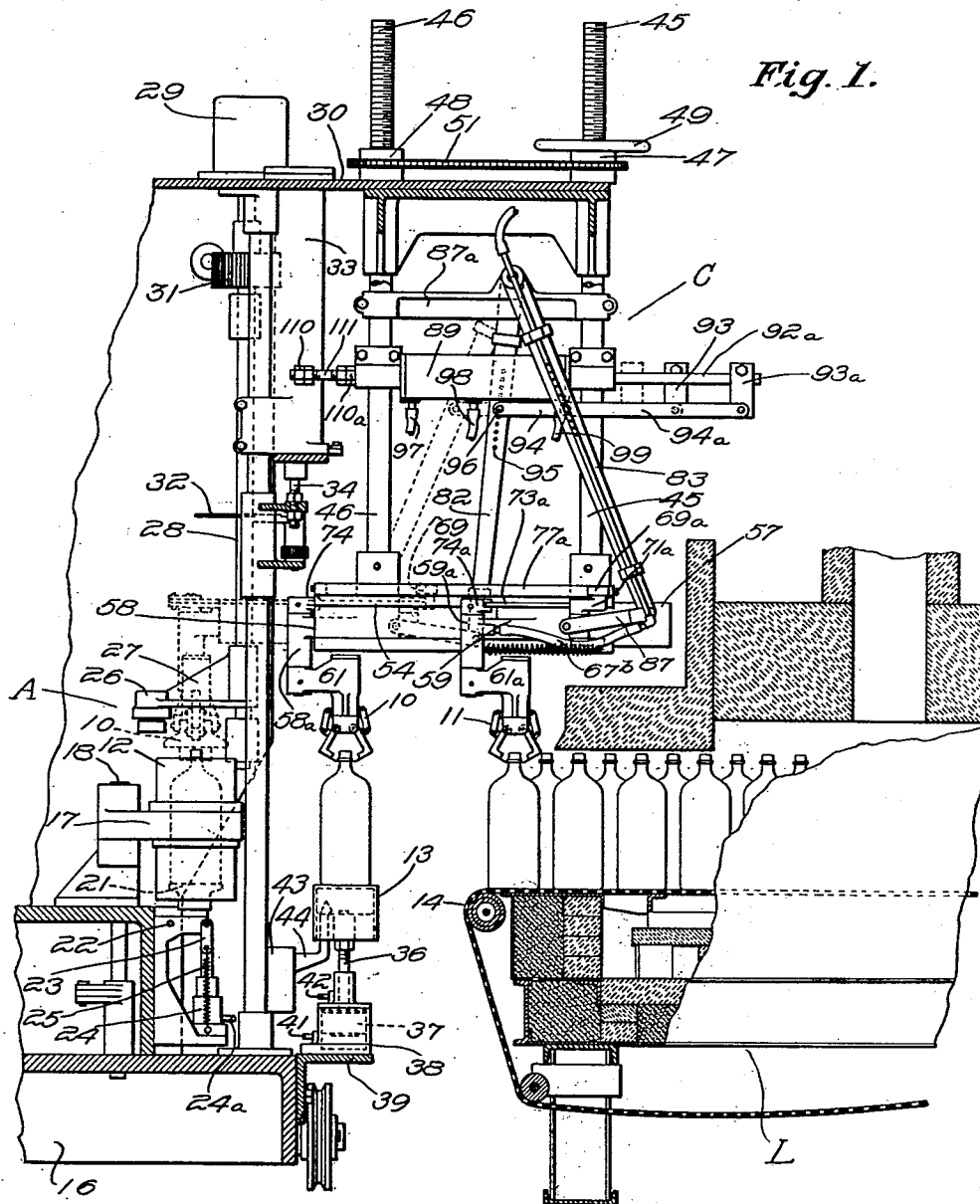
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2,253,155

APPARATUS FOR STACKING GLASSWARE

Filed March 27, 1939

5 Sheets-Sheet 1



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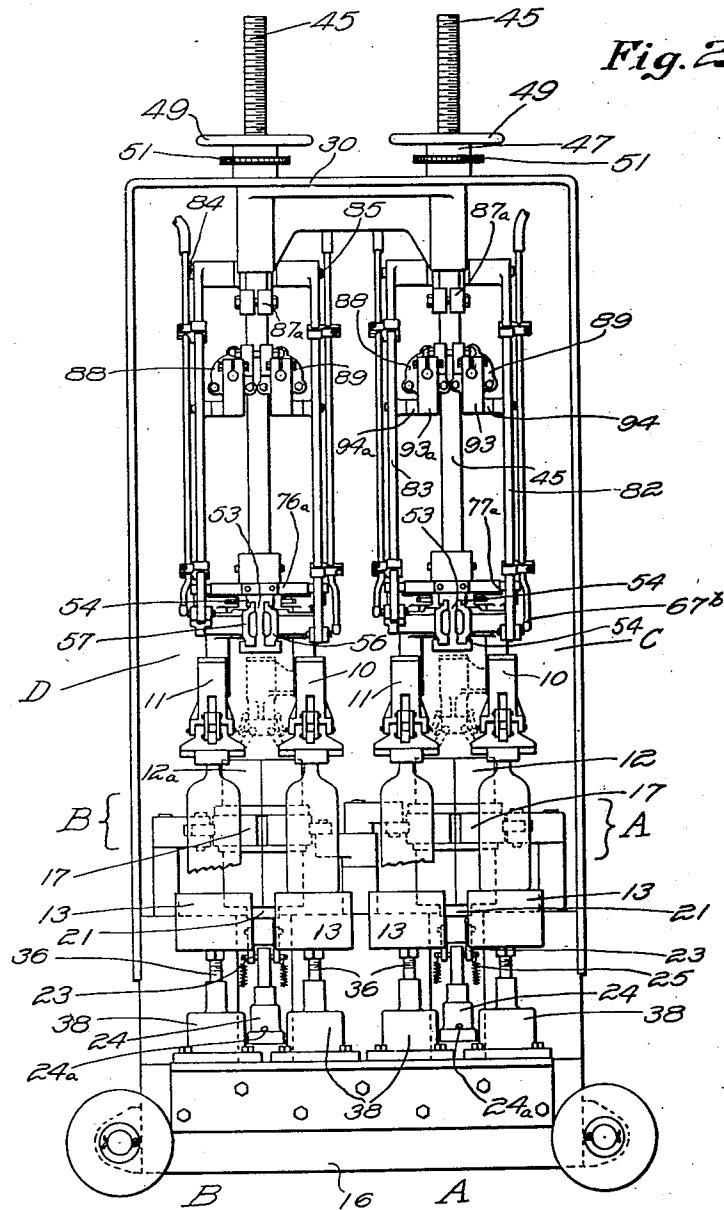
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APPARATUS FOR STACKING GLASSWARE

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5 Sheets-Sheet 2



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APPARATUS FOR STACKING GLASSWARE

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Fig. 3.

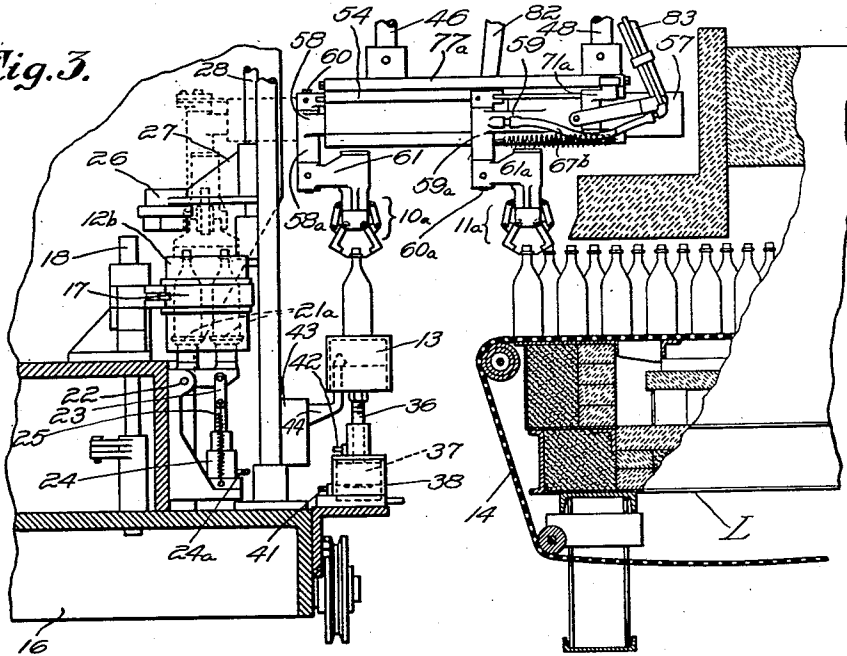
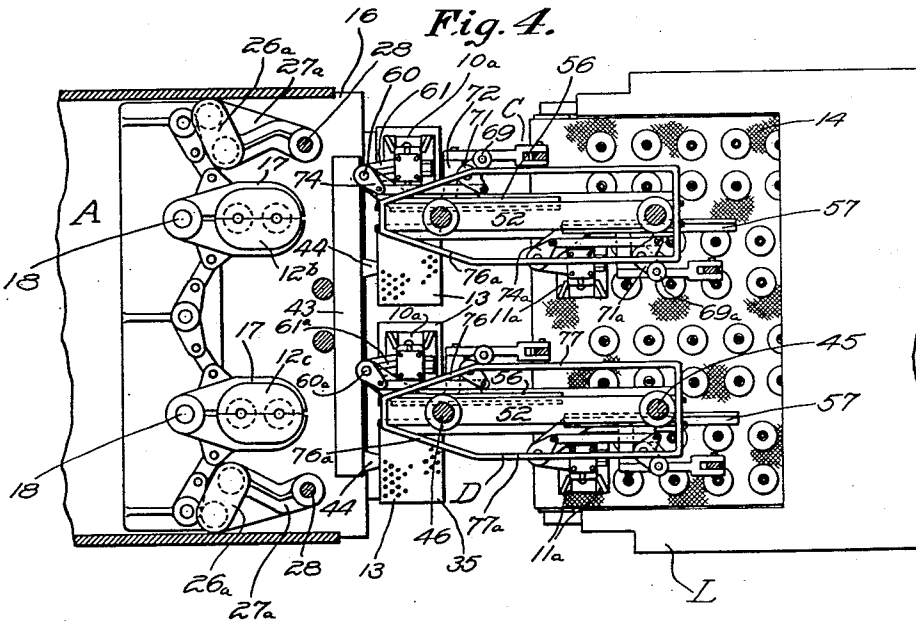


Fig. 4.



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APPARATUS FOR STACKING GLASSWARE

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Fig. 5.

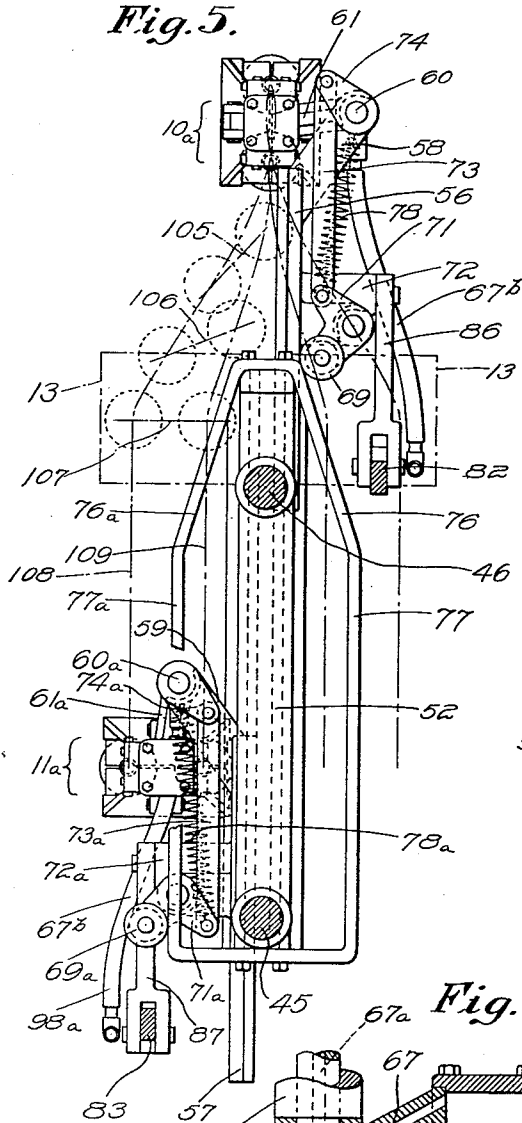


Fig. 6.

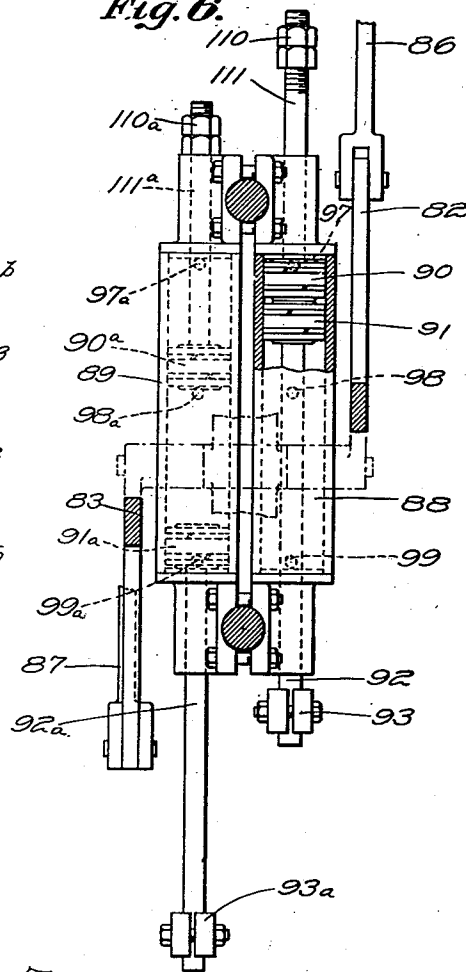
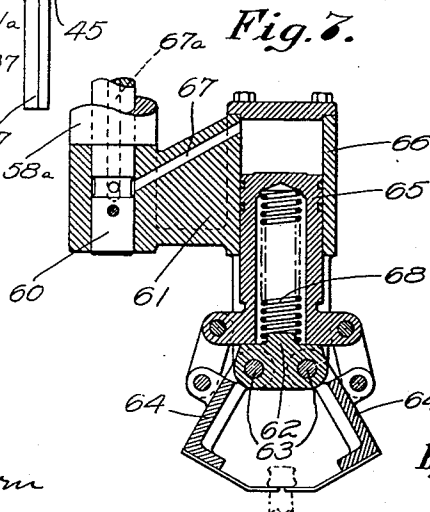


Fig. 7.



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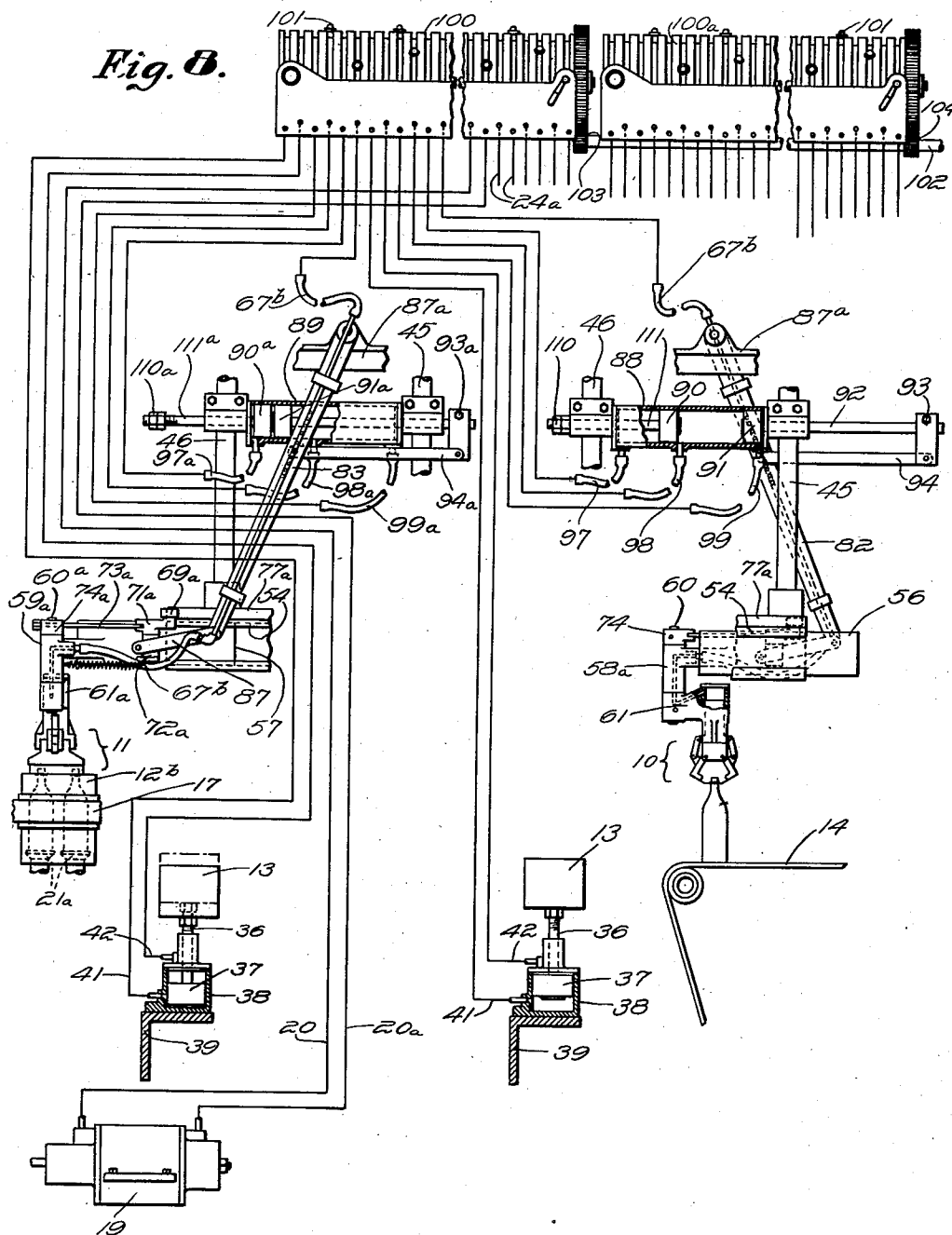
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APPARATUS FOR STACKING GLASSWARE

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5 Sheets-Sheet 5

Fig. 8.



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UNITED STATES PATENT OFFICE

2,253,155

APPARATUS FOR STACKING GLASSWARE

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Application March 27, 1939, Serial No. 264,340

14 Claims. (Cl. 49—14)

This invention relates to apparatus for stacking glassware and has particular relation to stacking apparatus adapted to remove articles of glassware from the blow molds of a forming machine and to stack the articles in compact relation on the conveyor or belt of a Lehr or other heat treating apparatus. The invention is more specifically directed to glassware stacking apparatus which includes transfer tongs by means of which the articles may be positively or accurately handled and controlled as distinguished from other types of stacking apparatus which so operate that the ware is loosely or roughly handled and therefore is apt to be injured or marred and may be upset and damaged.

The general object of the invention is to provide novel glassware stacking apparatus of the foregoing type capable of handling articles varying widely in weights at widely varying speeds and more particularly to handle safely and efficiently and at high speeds articles in the lower range of weights.

More specifically, it is an object of the invention to avoid the limitation on the speed at which glassware may be transferred from a forming machine to a Lehr belt which exists in apparatus requiring the ware to pass in one line or through a single point. Such conditions constitute a "bottle neck" definitely limiting the speed at which the ware can be transferred. Such "bottle neck" and the limited speed of transferring resulting therefrom, may be avoided by my invention by the use of which the articles of glassware may be transferred from a blow mold to a Lehr conveyor through spaced paths and delivered at spaced points on the conveyor and stacked thereon in distinct rows.

It is a further object of the invention to provide novel glassware stacking apparatus which includes, or to provide in conjunction with such apparatus, novel means for cooling the glassware during the cycle of the transfer or stacking operation. The provision of such cooling means is desirable to permit a higher rate of productivity of the molds of the forming machine, the cooling of the ware after it has been removed from the molds permitting a reduction in the time that the ware remains in the blow molds. Preferably the apparatus of our invention is so constructed and operated that the articles may be cooled while suspended by their necks from the tongs of the apparatus, thus reducing injury to and possible loss of glassware which often results from setting down and picking up the ware.

Another object of the invention is to provide

for the stacking or transfer of glassware from the blow mold of a forming machine to a Lehr conveyor in separate paths through which paths alternately formed articles are moved and in which paths the respective articles are suspended for cooling, and in such manner that, if desired, one article may be cooled while another article is stacked on the conveyor and a third article is being blown in the blow mold.

Other objects and advantages of the invention will be pointed out in the following detailed description of two embodiments illustrated in the accompanying drawings. It will be understood that various changes in the details of construction and the mode of operation may be made in the illustrated embodiments without departing from the invention as defined in the appended claims.

In said drawings:

Fig. 1 is a view in vertical longitudinal sectional elevation illustrating our novel stacking apparatus associated with a glassware forming machine having single cavity molds and with a glassware annealing Lehr;

Fig. 2 is a view in front elevation of the associated stacking apparatus and forming machine shown in Fig. 1;

Fig. 3 is a view similar to Fig. 1, showing a modified form of stacking apparatus associated with a glassware forming machine having plural cavity molds;

Fig. 4 is a view in horizontal sectional top plan of the apparatus shown in Fig. 3;

Fig. 5 is a partly diagrammatic enlarged view in horizontal sectional top plan of a unit of our novel stacking apparatus, showing details of means for supporting and guiding the movements of the tongs of said unit;

Fig. 6 is a view in horizontal sectional top plan of the means associated with a unit of our novel apparatus for effecting the movements of the tongs of said unit;

Fig. 7 is an enlarged view in vertical section of a tongs transfer device of the novel stacking apparatus; and

Fig. 8 is a piping diagram illustrating connections between a timing mechanism and several parts of the stacking apparatus and forming machine shown in Figs. 1 to 7, inclusive.

Considering first the general arrangement of the forming machine, stacking apparatus and Lehr and referring particularly to Figs. 1 and 2, it will be seen that we have illustrated a forming machine which may comprise two molding units or sections A and B. There have been omitted from

the drawings mechanisms and devices which will, in practice, be provided for supplying glass to the machine, for forming the glass into blanks and for transferring the blanks to the blow molds of the molding units, the illustration of such mechanisms and devices being unnecessary for a complete understanding of the present invention.

The glassware stacking apparatus comprises units C and D associated respectively with the molding units A and B. The stacker units C and D serve to transfer the ware from the molding units to ware cooling positions and then to stack the ware in the lehr L. The stacker units C and D may be substantially identical in construction and therefore the description will, for the most part, be directed to one only of said units, namely, the unit C.

The stacker unit C comprises two pairs of tongs 10 and 11, respectively, which alternately remove articles of glassware from a blow mold 12 of the molding unit A and carry them to positions above one or the other of two dead plates 13 for cooling. From the cooling positions the tongs 10 and 11 carry the ware in separate paths into spaced positions to be stacked in distinct rows on the belt 14 of the lehr L. There are two dead plates 13 associated with each of the identical blow molds 12 and 12a of the molding units A and B.

The glassware forming machine includes the base structure 16 which carries blow molds 12 and 12a of the molding units A and B (Fig. 2), each mold being of the sectional type, the sections being mounted in holders 17 hinged on pins 18, Figs. 1 and 4. The respective holders 17 for the molds 12 and 12a are connected for joint operation by suitable linkage as shown in Fig. 4, operated through shafts and connections, not fully illustrated, from a cylinder shown at 19 in Fig. 8 and which, in practice is mounted within the bed 16 of the machine. Air conduits 20 and 20a are connected to said cylinder.

The molds 12 and 12a of Figs. 1 and 2 are of the single cavity type, whereas the molds 12b and 12c of Fig. 4 are of the double cavity type. The double cavity molds may be so designed as to be mounted on the same mold holders 17 as the single cavity molds of Figs. 1 and 2. Each of the tongs 10a and 11a, shown in Figs. 3, 4, 5 and 8, also is of the double type; that is, adapted to transfer two bottles at once and the said tongs are interchangeable, respectively, with tongs 10 and 11.

Associated with each of the molds 12 and 12a is a bottom plate 21, Fig. 1, pivoted at 22 and connected by links 23 to a piston in cylinder 24 which receives air through a conduit 24a to force the bottom plate into, and hold it in uppermost position where the halves of mold 12 may close about it. When the blow mold opens leaving an article of ware supported by the bottom plate 21, air is exhausted from the cylinder 24 through conduit 24a and the bottom plate is lowered by tension springs 25, leaving the article suspended from one of the pairs of tongs 10 and 11.

By reference to Fig. 3 it will be observed that each of the double cavity molds 12b and 12c has a double bottom plate 21a associated therewith operated by mechanisms similar to that illustrated and described in connection with the single bottom plate 21 of Fig. 1 and having air conduits 24a connected thereto.

Each of the blow molds 12 and 12a has a blow head 26 associated therewith, the blow head be-

ing carried by an arm 27 on a vertical shaft 28, which shaft is moved up and down by a piston (not shown) in cylinder 29 on the top frame member 30 and is oscillated by means (not fully shown) including pinion 31 on said shaft, to move the blow head into and out of engagement with the blow mold.

The locations of the blow heads for the respective blow molds at the slides thereof are shown in Fig. 4, each of the blow head arms 27a in this figure carrying double blow heads 28a for cooperation with the double mold cavities of the molds 12b and 12c.

In Fig. 1 there is partially shown one type of mechanism which may be embodied in the forming machine and associated with each of the blow molds for receiving blanks and transferring them to each of the blow molds. The illustrated transfer mechanism comprises a pair of tongs as indicated at 32 to which suitable means (not shown) may be connected for opening and closing the tongs, the tongs being vertically reciprocated toward and away from a blow mold 12 by means of a piston (not shown) in cylinder 33, the rod 34 of which piston is suitably connected to the tongs 32.

As shown in Figs. 2 and 4, there are four dead plates 13 arranged in a straight line parallel to a line through the centers of the blow molds. Each of the dead plates 13, of which there are two associated with each blow mold 12 and 12a, (or 12b and 12c) comprises a hollow box like structure, having a perforated top as shown at 35, Fig. 4 to direct air against the ware. Each of said dead plates is mounted on a rod 36 of piston 37 in cylinder 38 on a bracket 39 secured to the forming machine base 16. Air is admitted to and exhausted from opposite ends of each cylinder 38 through conduits 41 and 42 to raise and lower each dead plate. As shown in Figs. 1, 3 and 4 cooling air is supplied to the interior of the dead plates from a manifold 43 mounted on the front end of the machine base 16 and having four take-offs 44 each of which leads to the interior of one of the four dead plates and has a sliding fit therein (see Fig. 1). The mountings and arrangements of the dead plates are provided for the purpose of moving them individually toward and away from, or into and out of contact with, articles of glassware suspended thereover from the transfer tongs of the ware stacking apparatus.

Considering now the details of the stacking apparatus, it will be seen by reference to Figs. 1 and 2 that the stacker units C and D are suspended from the top frame member 30 of the forming machine. Each unit comprises vertical rods 45 and 46 threaded through bushings 47 and 48 journaled in the top frame member 30. The bushing 47 carries hand wheel 49 and both of said bushings carry sprockets meshing with a chain 51. By turning the handle 49 on bushing 47, both rods 45 and 46 may be simultaneously raised or lowered to adjust vertically the support for the tongs of said unit so that the horizontal path of the tongs may be vertically adjusted for articles of varying heights.

Connected to the lower ends of the rods 45 and 46 is a plate 52 to the underside of which is secured a guide rail 53, Figs. 1, 2 and 3. The guide rail 53 is of inverted T-shape in cross section. Said guide rail 53 and the guides 54 on opposite sides thereof provide guideways for slides 56 and 57 which carry the tongs 10 and

11, respectively, and provide for horizontal travel thereof.

In order that each pair of tongs may be moved into position over blow mold 12 to grip an article therein, then moved away from the mold into position over one of the dead plates 13 and thereafter caused to travel in a path separate from the path of the other tongs to its stacking position, each pair of tongs is supported on its slide or carriage for rotary movement, and mechanisms are provided for rotating each pair of tongs between ware removing and cooling positions. The supports and mechanisms referred to will now be described.

The slides 56 and 57 have brackets 58 and 59 formed respectively thereon, Figs. 1, 3 and 5. These brackets extend in different directions rearwardly of and at angles to the respective slides and terminate in journals 58a and 59a for vertical rock shafts 60 and 60a on the bottom ends of which are mounted tongs arms 61 and 61a for tongs 10 and 11 (or 10a and 11a) respectively, see Figs. 1, 3, 4, 5 and 7.

The arms 61 and 61a and the parts associated therewith are substantially identical and a description of one will suffice for both. As shown in Fig. 7, arm 61 has a mounting 62 depending therefrom for horizontal pivots 63 for the tongs holders 64. Said holders are connected by links to a piston 65 in cylinder 66 formed in the arm 61. Upon admission of air into the cylinder 66 through a duct 67, the tongs are closed and upon exhausting air from the cylinder, a compression spring 68, located between the head of piston 65 and the mounting 62, acts to raise the piston and open the tongs. Duct 67 communicates through a passage 67a in shaft 60 and through bracket 58 with air conduit 67b, Figs. 2 and 5, and similar connections leading to a conduit 67b are provided for arm 60a for the operation of the tongs carried thereby.

The mechanisms for rotating the tongs arms 61 and 61a will now be described with particular reference to Fig. 5. The respective mechanisms are similar in construction but are so arranged that the arms are turned in different directions as they move away from blow mold 12 and as they move into position over said mold.

The turning mechanisms for arms 61 and 61a include cam rollers 69 and 69a on bell cranks 71 and 71a pivoted in lugs 72 and 72a formed respectively on slides 56 and 57. Links 73 and 73a connect the respective bell cranks to cranks 74 and 74a fast on the upper ends of shafts 60 and 60a, respectively.

Cam rollers 69 and 69a engage a cam rail which is bolted in horizontal position to plate 52 and which comprises diverging portions 76, 76a which effect rotation of arms 61 and 61a, respectively, and parallel portions 77 and 77a which cause the arms to travel in separated straight line paths. Such movements occur in response to the horizontal travel of slides 56 and 57 which cause the cam rollers 69 and 69a to ride along their respective cam portions. Cam roller 69 is held in engagement with cam portions 76 and 77 by a tension spring 78, and roller 69a is likewise held in engagement with its cam portions 76a and 77a by a tension spring 78a.

Mechanisms for reciprocating the slides 56 and 57 to effect horizontal travel and turning movements of the tongs arm 61 and 61a and the tongs and ware carried thereby comprises arms 82 and 83 horizontally pivoted at 84 and 85 at their upper ends for oscillatory movements and con-

nected at their lower ends by links 86 and 87 to the lugs 72 and 72a on slides 56 and 57, respectively. The horizontal pivots for the arms 82 and 83 are mounted in a cross head 87a clamped at its ends to the vertical rods 45 and 46. The arms 82 and 83 are oscillated by pistons in cylinders 88 and 89, Figs. 1, 2 and 6, which cylinders likewise are clamped to the vertical rods 45 and 46 below the cross head 87a.

Cylinder 88 contains two pistons 90 and 91. The piston 90 acts to move the piston 91 to in turn move arm 82 connected to slide 56 in order to cause tongs 10 or 10a to travel from above blow mold 12 to a position above a dead plate 13. The subsequent movement of the tongs from above the dead plate to above the Lehr belt is effected only by the piston 91 and this piston is used to return the tongs to ware removal position. The piston 91 is connected through its rod 92, cross head 93 and link 94 to arm 82, the throw of the arm being made adjustable by the provision of a row of holes 95 formed in said arm for a pin 96 in the end of link 94. The cylinder 89 likewise comprises a piston 90a and a piston 91a, rod 92a of which is connected through a cross head 93a and link 94a to the arm 83 by adjustable connections such as provided for arm 82.

Stop nuts 110 and 110a on rods 111 and 111a of pistons 90 and 90a, respectively, provide for the adjustment of the forward limits of movement of the pistons and hence of the slides 56 and 56a, so that the positions of the tongs and the ware suspended therefrom over the dead plates 13 may be adjusted horizontally. By employing a piston with limited stroke such as pistons 90 and 90a, stopping of the tongs and ware in exactly the desired position for cooling is assured which would not be true if a single piston were used to effect the complete travel of the tongs, it not being feasible to stop a piston in exactly the desired position in the course of its stroke.

The supply and exhaust of air to and from cylinders 88 and 89 to effect the reciprocation of the pistons contained therein may best be understood by reference to Figs. 1, 6 and 8. Considering first the cylinder 88, it will be seen that a conduit 97 is connected to the rear end of the cylinder for the admission of air to, and exhaust of air from, the space behind the piston 90.

Near the center of the cylinder 88 is a conduit 98 and at the forward end of the cylinder a conduit 99. Admission of air through conduit 98 and exhaust of air through conduit 99 causes piston 91 to move forwardly to the end of its stroke. The return travel of the piston 91 is accomplished by the admission of air through conduit 99 and exhaust of air through conduits 97 and 98. Such movement of the piston 91 returns the piston 90 to its rearmost position, as shown in Fig. 6. Similar conduits 97a, 98a and 99a are connected to cylinder 89 for actuation of pistons 90a and 91a in substantially the same manner as the pistons 90 and 91, it being noted, however, that the operations of the pistons in the respective cylinders, while having substantially the same cycle of operations, go through their cycles of operations at different times or out of phase so that the tongs 10 and 11 (or 10a and 11a) are moved alternately into ware removal position without interfering with one another.

The operations of the various parts of the forming machine and stacking apparatus are effected in the desired timed relations by suitable timing apparatus such as timing drums 100 and

100a, shown in Fig. 8. The drum 100 may control the operations of the molding unit A and the associated stacking unit C while the drum 100a may control the operations of the molding unit B and the stacking unit D. The respective drums 5 carry adjustable buttons 100a, 101a which operate valve mechanisms (not shown) for admitting air to and exhausting air from the various conduits which are connected to the valve boxes. The drums 100 and 100a may be driven from a 10 common shaft 102 through spur gearing shown at 103 and 104. Thus, the two stacking units C and D are caused to cooperate with the two molding units in timed relation with the molding units, and with each other in the removal of the ware 15 from the molds, the cooling of the ware by the dead plates, and the stacking of the ware in uniformly spaced relation on the belt 14 of the lehr L.

The timing of the operations of the molding unit B and its associated stacking unit D preferably is the same as the timing of the operations of the molding unit A and its associated stacking unit C and therefore the piping diagram in Fig. 8 illustrates the complete air connections only for the molding unit A and stacking unit C.

In the operation of the apparatus shown in Figs. 1 and 2, articles or bottles are blown consecutively in the blow mold 12, the blow mold 12 opens leaving each bottle supported by bottom 30 plate 21. The tongs 10 and 11 alternately grip consecutive bottles or articles which are left suspended from the tongs by the lowering of the bottom plate 21. The consecutive articles or bottles are then carried horizontally and alternately into position first over one and then over the other of the dead plates 13 associated with the mold 12. As the tongs alternately move into ware cooling position they are swung through angles of 90° by the cam control mechanisms previously referred to, the tongs 10 being turned counter-clockwise and the tongs 11 being turned clockwise. The movements of the tongs from ware removal positions to ware cooling positions are effected by pistons 90 and 90a.

When a bottle has arrived at the ware cooling position the dead plate 13 at such position is elevated into or just short of contact with the bottom of the article and cooling air is blown around the bottom and bottom portion of the article so that it will be self-sustaining at least by the time that it arrives at the stacking position. This cooling operation is carefully controlled and timed with regard to the blowing of the article in the blow mold and may be varied according to requirements. When the cooling of the article is completed, the dead plate 13 is lowered and the article is moved to the stacking position where it is released by the opening of the tongs. In the mean time, the other pair of tongs will have been moved into ware removal position and may have arrived at its ware cooling position by the time that the first pair of tongs has arrived at the stacking position. Thus, as shown in Fig. 1, one article may be cooled at the ware cooling position 55 while another article is being stacked on the lehr belt and a third article is being blown in the blow mold. The operations of blowing, cooling and stacking may be varied in duration by the adjustment of the appropriate buttons 101 on the drum 100.

The alternate operations of the tongs and the turning movements thereof permit consecutive articles to be moved alternately over the dead plates and through separate paths without inter-

ference so that the articles may be stacked at spaced points and in distinct rows on the conveyor belt. This sub-division of the line of bottles from the blow mold permits greater speed in the forming and stacking operations and more uniform weight loading and hence more efficient operation of the lehr than would be the case if all the ware from the mold had to move in a single line or through a single point.

The turning movements of the tongs 10 and 11 and the movements thereof in separate paths are particularly advantageous in the removal of ware from double cavity molds as illustrated in Figs. 3, 4 and 5. By reference to Figs. 4 and 5 it will be seen that the double tongs are moved into registry with the two cavities of either of the molds 12b or 12c and operated to grip two articles or bottles therein and then caused to travel horizontally while turning in a clockwise direction through an angle of approximately 90° to carry the two articles to ware cooling position above a dead plate 13. The tongs 10a are shown in ware cooling position in Figs. 3 and 4. After cooling of the ware, the tongs move in a straight line to stacking position and the ware is stacked on the lehr belt. The rotation of a pair of bottles as it is carried from the mold to ware cooling position by tongs 11a is illustrated in Fig. 5 where the center lines 105, 106 and 107 of the dotted circles representing the bottoms of the bottles are shown in various angular positions. The lines at 108 and 109 indicate the straight line travel of the articles suspended from tongs 11a from the dead plate to above the lehr. It will be understood that similar operations occur with the tongs 10a except that they are turned in a clockwise direction in moving toward the dead plate. Upon the return travel of each pair of tongs from stacking position to take-out position the tongs are turned through an angle of 90 degrees to bring them into registry with cavity or cavities of the mold so that they may be closed about the necks of the ware when the molds open.

The word "lehr" as used in the specification and claims is intended to apply to any heat treating apparatus in which glassware may be annealed, decorated or tempered.

Changes may be made in the details of construction and mode of operation of the illustrated embodiment of the invention without departing from the scope of the appended claims. For example, instead of merely cooling the ware in the position in which the tongs stop over the dead plate, other heat treatment, chemical treatment or scavenging of the interiors of the hollow articles may be carried out at such position.

The position into which the tongs are moved for removal of ware from between the mold sections is referred to in the claims as the "takeout position"; the position into which the tongs are moved for cooling or other treatment of the ware is referred to in the claims as the "ware cooling position" or "intermediate position"; and the position into which the tongs are moved to release the ware to the conveyor is referred to in the claims as the "stacking position." The term "multiple tongs" as used in the claims means a pair of tongs adapted to grip and handle a plurality of articles simultaneously.

Having described our invention, what we claim is:

1. Glassware stacking apparatus comprising two pairs of tongs, means for supporting said pairs of tongs for horizontal travel from the same glassware takeout position through separate

paths to different stacking positions over a lehr conveyor, said stacking positions being located in fixed and spaced relation, each with respect to the other, means for moving each of said pairs of tongs from said takeout position to its said stacking position, and means for closing the said pairs of tongs at said takeout position and for opening said tongs at said stacking positions.

2. Glassware stacking apparatus comprising two pairs of tongs, separate slides, means for supporting said slides for horizontal travel, means for pivotally mounting the respective pairs of tongs on said slides for movements with the slides and also for horizontal swinging movements relative to their slides, means for reciprocating said slides independently of each other to move said pairs of tongs alternately from a common takeout position over a blow mold through separate paths to separate stacking positions over a lehr conveyor, means for effecting horizontal swinging movements of said tongs relative to their slides, and in opposite directions as they move away from said takeout position, and means for closing said pairs of tongs at said takeout position and for opening said tongs at said stacking positions.

3. Glassware stacking apparatus comprising two pairs of tongs, means for supporting said pairs of tongs for horizontal travel from a common takeout position over a blow mold of a forming machine through separate paths to different, relatively fixed and spaced stacking positions over a lehr conveyor, means for moving each of said pairs of tongs from said takeout position to its said stacking position, means for closing the said pairs of tongs at said takeout position and for opening said tongs at said stacking positions, separate dead plates located beneath the respective paths of travel of said pairs of tongs for cooling ware suspended from the tongs and means for causing each pair of tongs to stop as a unit over its dead plate for a predetermined period of time while en route from said takeout position to its stacking position.

4. Glassware stacking apparatus comprising two pairs of tongs, means for supporting said pairs of tongs for horizontal travel from a common takeout position over a blow mold of a forming machine through separate paths to different, relatively fixed and spaced stacking positions over a lehr conveyor, and for swinging movements about axes perpendicular to the plane of said paths, means for moving each of said pairs of tongs from said takeout position to its said stacking position, means for closing the said pairs of tongs at said takeout position and for opening said tongs at said stacking positions, and means for effecting swinging movement of each of said pairs of tongs during the travel thereof from said takeout position toward its stacking position and about an axis perpendicular to the plane of the path of its said travel.

5. Glassware stacking apparatus comprising two pairs of tongs, means for supporting said pairs of tongs for horizontal travel from a common takeout position over a blow mold of a forming machine through separate paths to separate, relatively fixed and spaced stacking positions over a lehr conveyor, means for moving each of said pairs of tongs from said takeout position to its said stacking position, means for closing the said pairs of tongs at said takeout position and for opening said tongs at said stacking positions, vertically movable ware-cooling dead plates respectively located beneath the paths of travel of

said pairs of tongs, means for causing each pair of tongs to stop temporarily over its said dead plate en route from said takeout position to its stacking position, and means for raising each dead plate toward an article held suspended by the tongs thereover.

6. Glassware stacking apparatus comprising two pairs of tongs, means for supporting said pairs of tongs for horizontal travel from a common takeout position over a blow mold of a forming machine through separate paths to separate, relatively fixed and spaced stacking positions over a lehr conveyor, means for moving each of said pairs of tongs from said takeout position to its said stacking position, means for closing the said pairs of tongs at said takeout position and for opening said tongs at said stacking positions, vertically movable ware-cooling dead plates respectively located beneath the paths of travel of said pairs of tongs, means for causing each pair of tongs to stop temporarily its said dead plate en route from said takeout position to its stacking position, and means for so timing the horizontal movements of the respective pairs of tongs that one pair is held over its said dead plate while the other pair is held in its stacking position.

7. In combination, a glass ware forming machine comprising two molding units each comprising a stationary blow mold, vertically movable ware-cooling dead plates associated with said blow molds, glassware stacking apparatus comprising pairs of tongs, means for closing said tongs about articles formed in said blow molds, means for effecting travel of said tongs from over said molds to positions over said dead plates and thence to positions over a conveyor, means for raising said dead plates from downwardly retracted positions toward articles suspended from said tongs to cool said articles, and means for opening said tongs to release the ware to said conveyor.

8. In combination, a glassware forming machine comprising a stationary blow mold, means for successively blowing articles to final shape in said mold, stacking apparatus comprising two pairs of tongs cooperating solely with said blow mold to remove ware therefrom and stack it on a lehr conveyor, means for supporting said tongs for horizontal travel through separate paths from a common takeout position over said blow mold to separate relatively fixed and spaced, stacking positions over said conveyor, means for closing and opening said tongs, means for effecting horizontal travel of said pairs of tongs, and means for so timing the travel of said tongs relative to each other and for so timing the opening and closing of said tongs, that articles consecutively formed in said blow mold are alternately removed from said mold and alternately stacked on said conveyor in spaced parallel longitudinal rows.

9. In combination, means for forming glassware comprising a blow mold, a dead plate for cooling articles formed in said mold, a pair of tongs, means for effecting travel of said tongs from a takeout position over said mold to a cooling position over said dead plate and thence to a ware stacking position, means for closing and opening said tongs, and means for causing said tongs to stop completely for a predetermined period of time over said dead plate to cool an article suspended from the tongs.

10. In combination, means for forming glassware comprising a blow mold, a dead plate for cooling articles formed in said mold, a pair of tongs, means for effecting travel of said tongs

from a takeout position over said mold to a cooling position over said dead plate and thence to a ware stacking position, means for closing and opening said tongs, means for causing said tongs to stop as a unit for a predetermined period of time over said dead plate to cool an article suspended from the tongs, and means for moving said dead plate upwardly toward said suspended article.

11. In combination, means for forming glassware comprising a blow mold, a dead plate for cooling articles formed in said mold, a pair of tongs, air actuated means for effecting travel of said tongs from a takeout position over said mold to a position over said dead plate to cool an article of glassware suspended from said tongs and to stop for a predetermined time over said dead plate, additional air operated means for effecting travel of said tongs from over said dead plate to a stacking position over a Lehr conveyor, and means for closing said tongs at said takeout position and for opening said tongs at said stacking position.

12. Glassware stacking apparatus comprising two pairs of tongs, a pair of slides for the tongs, means for mounting each pair of tongs on one of said slides for horizontal rotary movements as a unit relative to the slide and about a vertical axis, horizontal guideways in which said slides are mounted, means for reciprocating each of said slides to move each pair of tongs from a takeout position over a mold to a ware cooling position and thence to ware stacking position, a cam operated mechanism for each pair of tongs for effecting horizontal rotation thereof about its said vertical axis during movement of the tongs between takeout and ware cooling positions, means for closing each pair of tongs at the takeout position and for opening said tongs at the stacking position, and means for so timing the

movements of said slides that the tongs are alternately moved into said takeout position.

13. Glassware stacking apparatus for removing articles from the blow mold of a glassware forming machine and placing said articles on a conveyor, comprising a pair of tongs, means for effecting travel of said tongs from a takeout position over said mold to a stacking position over said conveyor, means for stopping such travel of said tongs in an intermediate position for treatment of the ware, and means for closing and opening said tongs to grip and release said articles.

14. Glassware stacking apparatus for transferring a plurality of articles of glassware simultaneously from a plurality of cavities in a mold of a glassware forming machine to a horizontal conveyor, said cavities being spaced along a line extending in the same direction as the direction of length of said conveyor, comprising a pair of tongs, means for supporting said tongs for horizontal travel from a takeout position over said mold to a stacking position over said conveyor, means for moving said tongs between said takeout and stacking positions, means for closing said tongs at the takeout position and for opening the tongs at said stacking position, said tongs being adapted to grip all of said articles in said cavities of the mold simultaneously when the tongs are closed at the takeout position and to release all of said articles when the tongs are opened at said stacking position, and means for turning said pair of tongs angularly through 90° about a vertical axis during horizontal travel of said tongs between said takeout and stacking positions to dispose the articles released by the opening of the tongs at the stacking position along a line extending transversely of the conveyor.

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CERTIFICATE OF CORRECTION.

Patent No. 2,253,155-

August 19, 1941.

HAROLD A. WADMAN, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, second column, line 21, claim 6, after "temporarily" insert --over--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of September, A. D. 1941.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.