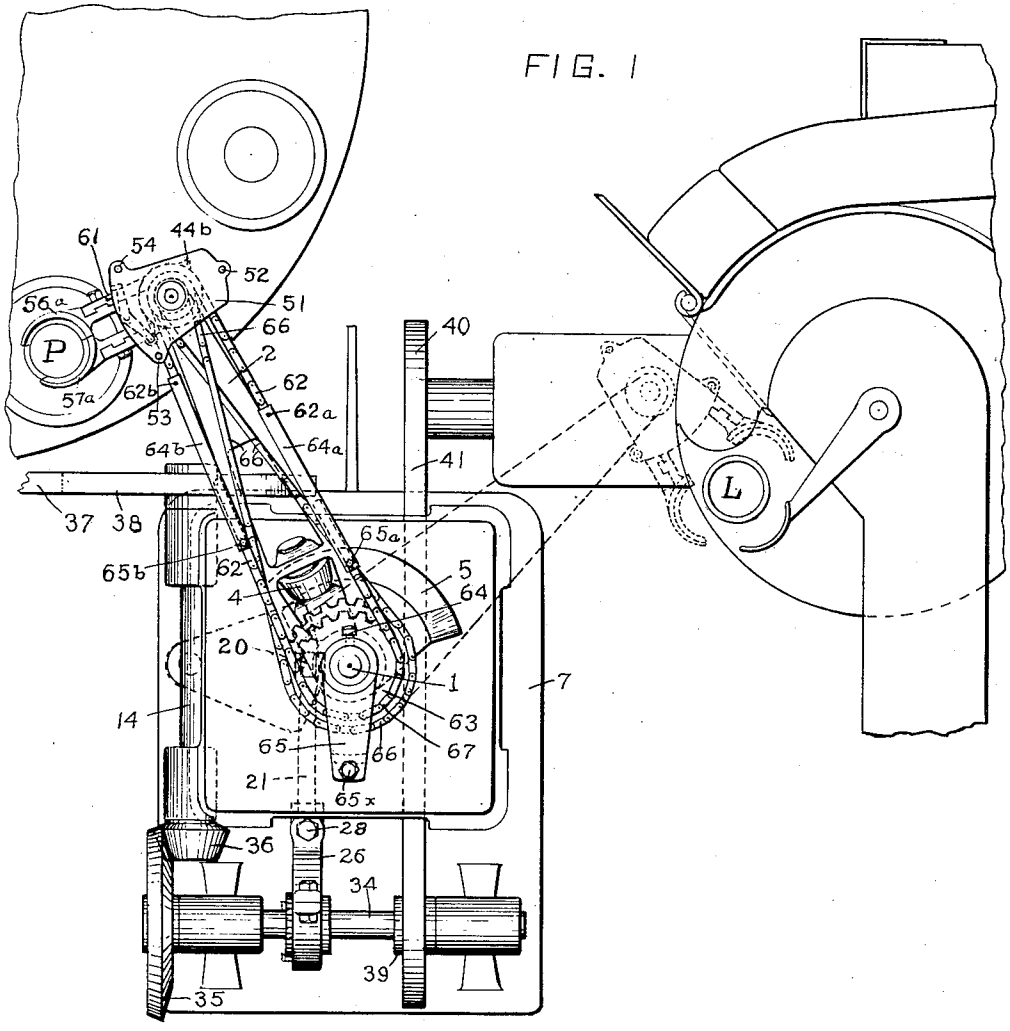
June 23, 1931. W. S. MAYERS 1,811,832

AUTOMATIC TRANSFER MACHINE

Original Filed Aug. 23, 1926 3 Sheets-Sheet 1

FIG. 1



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AUTOMATIC TRANSFER MACHINE

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FIG. 2

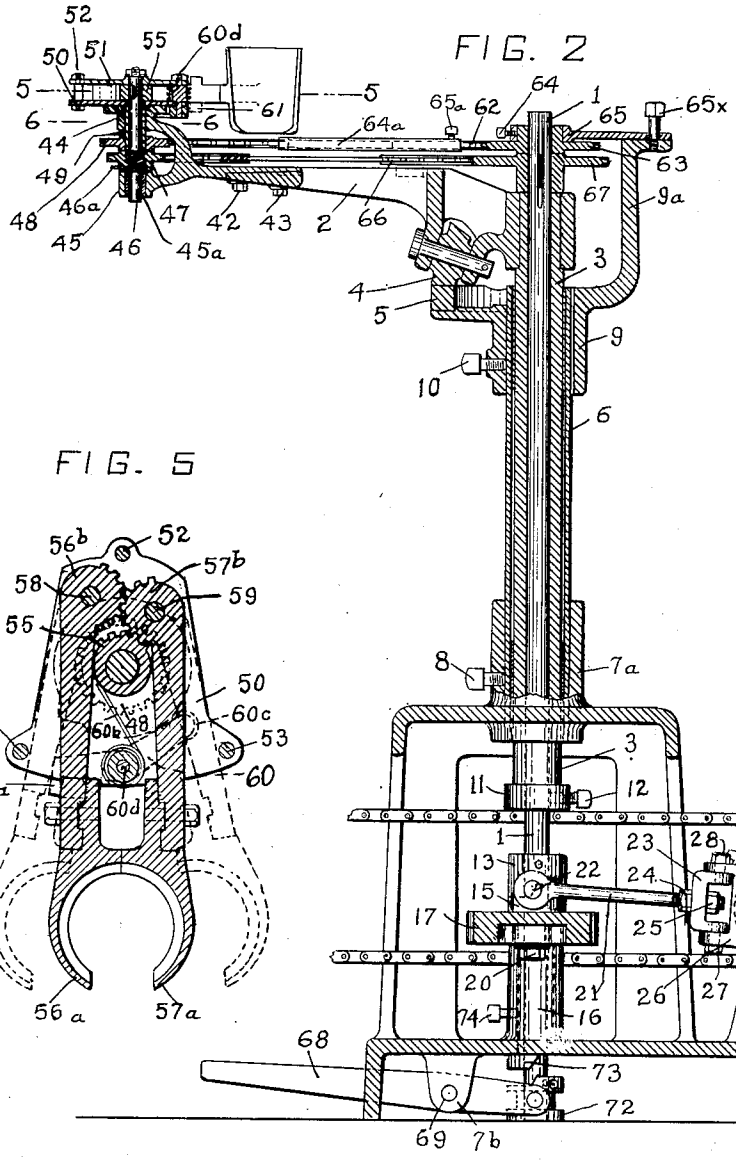


FIG. 5

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FIG. 4

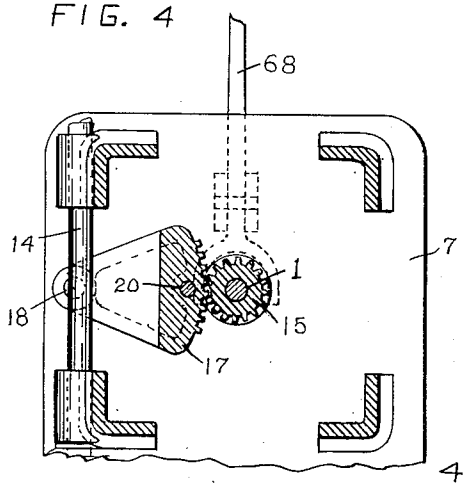


FIG. 3

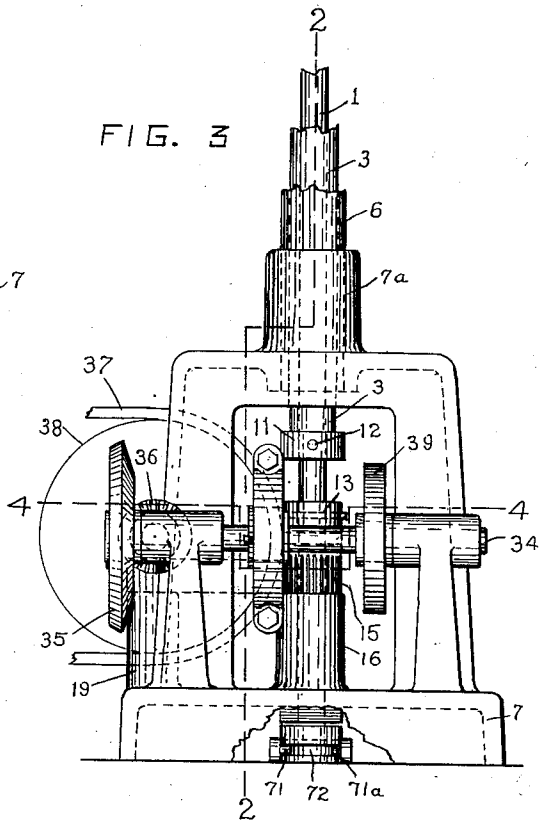


FIG. 8

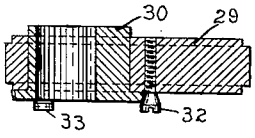


FIG. 7

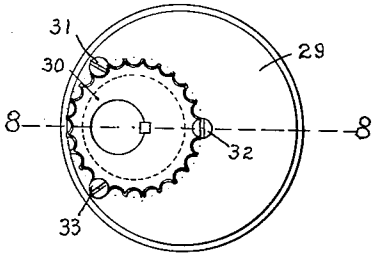


FIG. 9

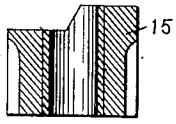
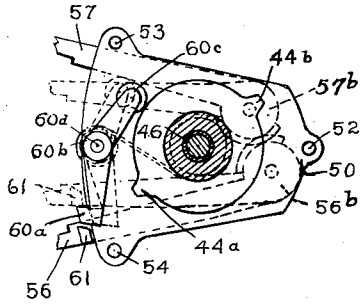


FIG. 6



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Patented June 23, 1931

1,811,832

UNITED STATES PATENT OFFICE

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AUTOMATIC TRANSFER MACHINE

Application filed August 23, 1926, Serial No. 130,915. Renewed October 4, 1928.

This invention relates to machinery for automatically transferring articles from one position to another at regular time intervals, such as the transfer of pieces of glassware from a pressing machine mold to a fixed point in a lehr, or a like transfer of containers or packages from one fixed point to another in industries where such objects are to be accomplished.

In the accompanying drawings Figure 1 shows the application, in plan view, of the device for the transfer of glassware from a mold in a temporarily fixed position to a delivery point.

Fig. 2 is a vertical section taken on line 2—2 in Fig. 3.

Fig. 3 is a partial elevation showing the driving mechanism.

Fig. 4 is a horizontal section taken on line 4—4, Fig. 3.

Fig. 5 is a horizontal section taken on line 5—5, Fig. 2.

Fig. 6 is a partial horizontal section taken on line 6—6 in Fig. 2, looking from below.

Fig. 7 is an elevation of the eccentric.

Fig. 8 is a transverse section through the center line of the eccentric and

Fig. 9 is a vertical section through the center line of the combined drive gear and clutch member.

The transfer machine is set in a suitable position with its vertical drive shaft 1 about equidistant from the points of delivery and discharge, as in Fig. 1. The horizontal arm 2 is rotatably mounted upon the end of the hollow shaft 3 and is supported by the roller 4 running upon the fixed cam 5.

The hollow shaft is rotatably journaled upon the solid drive shaft 1 and within the fixed casing 6. It is simply a trunnion for the arm 2 and a bearing for the shaft 1 and has no operative connection other than the arm itself. The casing 6 is set into the top of the base in the socket 7*a* and held fixed thereto by the set screw 8. The cam 5 is rigidly fixed to the flange on the collar 9 which is held immovable by the set screw 10.

The bottom of the hollow shaft 3 rests rotatively upon the thrust collar 11 which is fixed to the solid shaft by the set screw 12. The upper half of the jaw clutch 13 is firmly keyed or pinned to the solid drive shaft 1. The member 13 rests upon the member 15 which is a combination of the lower half of the jaw clutch and the driving gear, in integral construction. The bottom of this gear rests rotatably upon the vertical fixed bearing 16 which thus supports the weight of the solid and hollow vertical shafts 1 and 3 in conjunction with the roller 4.

The sector gear 17 is rigidly secured to the vertical shaft 18 which is journaled into the bearing 19, the teeth of this gear meshing with those of the gear 15.

At a central point near the swinging end of the sector gear the eye-bolt 20 is pivoted thereon. The holes in the forked end of the eccentric link 21 register with that in the eye-bolt 20 and through them the pin 22 passes, loosely fitted in the eye-bolt and tightly fitted in the link 21. This link is threaded at its opposite end and passes through the U shaped swivel connection 23, being adjustable therein by means of the nuts 24, 25. The swiveled connection is pivotally held between the lugs of the eccentric yoke 26 by the stud bolts 27, 28. It will be seen that the connections of the link 21 are universal at both ends.

The eccentric center 29 is rotatably mounted upon the eccentric bushing 30 but is held in certain positions thereon by the taper screws 31, 32, 33 which engage the semicircular notches in the flange of the bushing. The travel of the eccentric rod may be varied at will by shifting the position of the bushing with reference to the eccentric center. The adjustable travel of the eccentric rod and its connected parts is essential in lengthening or shortening the travel arc of the oscillating drive shaft, according to requirements.

The eccentric center is keyed to the drive shaft 34 and this shaft is driven in double reduction through the bevel gears 35, 36, the shaft 14 and the chain 37 running upon the driven sprocket wheel 38 and a driver sprocket wheel on a shaft in the pressing machine, the parts of which are not shown in the drawings.

The sprocket wheels 39, 40 and their chain 41 have no function in the operation of this transfer machine and are included as means for driving another machine upon which the transferred articles are deposited as, for example, the automatic lehr and feeding equipment described in Letters Patent No. 1,552,941, issued September 8th, 1925.

The shaft 34 is geared to the machine press, or any other machine supplying the articles, in such relation that this shaft shall make one complete rotation in the exact time interval between each deposit by the supply machine.

The arm 2 is preferably made in two parts which are held firm at the joint by the screws 42, 43. At the outer end of this arm are the bearings 44, 45 and in them the tong shaft 46 is journaled. The sprocket wheel 47 has a threaded bore which threads upon an enlarged section of the shaft 46. These parts have preferably four or more threads and are made right or left hand, depending upon the direction in which the articles are to be transferred. The bushing 45*a* is made removable to permit the passage of the threaded portion of the shaft through the bearing 45. The pin 46*a* is inserted only when it is desired to stop the turning of the threaded shaft in the sprocket wheel for a purpose hereinafter stated.

The sprocket wheel 48 is tightly secured to the lower end of the hollow shaft 49 and the upper end of this shaft is keyed into the lower tong plate 50. The companion upper tong plate 51 is separated a certain distance from the plate 50 and is held rigidly thereto by the stud bolts 52, 53, 54. These two plates with their connecting bolts constitute what is hereinafter referred to as the tong case. Keyed to the upper end of the shaft 46 the sector gear 55 meshes into the tong arm gear 57*b* which in turn meshes into the companion tong arm gear 56*b*. The gears 56*b*, 57*b* are integral with their tong arms 56 and 57 respectively and are pivoted within the tong case upon the pins 58, 59 respectively. The tong arm 56, hereinafter termed the long tong arm and the tong arm 57, hereinafter termed the short tong arm, are constructed in different lengths so that the pivot of the long arm may be set further from the shaft 46 in order that the teeth of the long arm gear will not mesh with those of the gear 55.

It is evident that a partial rotation of the gear 55 in a counter-clockwise direction, as seen in Fig. 5, will close the tong receptacles 56*a*, 57*a*, while in reverse rotation they will be opened. In Fig. 1 the tong case is shown as seen from above while in Fig. 5 the case and its contained parts are taken looking upwardly from the plane of line 5—5. The tong receptacles 56*a*, 57*a*, are preferably made detachable from the tong arms to facilitate the replacements required on account of the variations in size and shape of the transferred articles.

In order to prevent the accidental opening or closing of the tongs while in mid stroke or partial stroke the tong lock comprising the members 60 60*a*, 60*b*, 60*c*, 60*d*, is provided. This device consists of a lever arm 60 of the first class fulcrumed on the pin 60*d* below the tong case and carrying at one end the roller 60*c* and at the other end the catch 60*a*. The lever 60 is held in the locking position, as shown in dotted lines in Fig. 6, by the coiled spring 60*b* within the tong case and attached to the upwardly extending lever pivot shaft to which the lever 60 is fixed. In this position the catch 60*a* is in engagement with the downward extending stop lug 61 on the tong arm 56, on one side with the tongs open, as indicated by the heavy lines in Fig. 6, and on the other side when the tongs are closed, as indicated by the dotted lines.

In both the advance and return strokes the tong case swings substantially 180 degrees on the shaft 46 for the purpose hereinafter specified. At the end of the return stroke in the receiving position P, Fig. 1, the roller 60*c* engages the stationary cam lug 44*a* causing the lever catch 60*a* to be thrown out of engagement with the lug 61, thus allowing the tongs to be closed as shown in Fig. 1. At the other end of the advance stroke in the depositing position L the roller engages the cam lug 44*b* and in a like manner allows the tongs to be opened by means hereinafter described.

It is obvious that the tong case, with its attached parts may be located at the bottom end of the shaft 46 instead of at the top by providing an extension of that shaft below the bearing 45, at the same time transferring the fixed cam lugs 44*a*, 44*b*, to the bearing 45 and in working relation to the roller 60*c*.

The ratio chain 62 runs upon the sprocket wheels 48, 63. The wheel 63 is loosely journaled upon the shaft 1 and held non-rotatable by the set screw 64 in the arm 65. This arm is held in a radially fixed position by the loosely fitted shoulder screw 65*x* and has a limited vertical adjustment thereon.

In order that the ratio wheel 63 may be replaced in larger or smaller diameters the ratio chain 62 is made in two sections, the two ends of the outer section terminating at the rivets 62*a*, 62*b*, in the square tubes 64*a*, 64*b*, respectively, while the two ends of the inner section of the chain extend into the square tubes a certain distance and are there held by the screws 65*a*, 65*b*. By this provision the chain, as a whole, may be lengthened or shortened to suit the diameter of the wheel 63.

The drive chain 66 runs upon the sprocket wheels 47, 67, and is crossed as shown in Fig. 1. In the sections where the crossing occurs the ordinary links are replaced by very long links, the inner long links of one strand of the chain passing between the outer ones of

the other strand, so that there is no chain displacement. In Fig. 1 the relative positions of the long links are indicated by their connections to the ordinary short links, the inner long links being shown as lying between the outside short links, and the outer long links are shown as being outside of the inner short links. In other words the long inside and outside links simply replace corresponding inside and outside links in the ordinary chain. It may be observed that the movement of these chains is reciprocating with a small travel in either direction. The drive sprocket wheel 67 is slidably keyed to the solid vertical drive shaft 1. It is obvious that a train of spur gears in proper ratios may be substituted for the chain gearing herein described without affecting the operation of the device.

By loosening the set screws 8 and 12 the outer casing 6 is slidable to a limited extent up and down in the socket 7*a*, thus providing adjustability in the height of the swinging arm 2 and the other members supported by the casing. This adjustment may also be accomplished by loosening the set screw 10 and sliding the collr 9 upward or downward.

In a machine of this description it becomes necessary at certain times to throw the swinging arm out of gear quickly and without stopping the driving mechanism. For this purpose the mechanism shown at the bottom of the base 7, in Figures 2 and 3, is provided. The treadle lever 68 is fulcrumed on the pin 69 which passes through the downward extending lugs 7*b* which are cast in the base 7. At its inner end the lever is forked and though the holes therein the short pins 71, 71*a*, are driven with a tight fit. The jaw clutch collar 72 is pinned to the shaft 1 and has a groove into which the pins 71, 71*a* extend with a loose fit allowing the collar to turn freely. The upper half of the jaw clutch 73 is integral with a bushing extending upward into the bore of the bearing 16 and around the drive shaft 1 which is free to rotate therein. This bushing is rotatable in the bore of the bearing 16 and is held in a fixed position by the set screw 74. A depression of the treadle 68 lifts the collar 72 and with it the solid drive shaft 1, the upper half of the jaw clutch 13, the hollow shaft 3 and all parts above the base except the outer casing 6 and collar 9 which are rigidly attached to the base, the member 65 sliding upwardly with respect to the bolt 65*x*. The lifting of the jaw clutch member 13 throws it out of mesh with the lower half, and the engagement of clutch 73 and collar 72 positively stops the oscillatory motion of the vertical shafts and their connected parts. It is evident that the treadle may be depressed and the vertical shafts thrown out of gear only when the clutch parts 72, 73, are in position to mesh, as in Fig. 2. This is a requirement in some cases where the tongs would be damaged if stopped in certain positions. The stopping point in the travel arc of the arm 2 may be fixed as desired by the rotary adjustment of the upper half of the clutch 73 in either direction. The engaging jaws of the clutch 13, 15, are cut at such an angle that any obstruction in the path of the arm 2 at a certain range of its path of movement, producing excessive pressure on the jaws, will cause the upper member 13 to rise, thus automatically throwing the arm and shafts out of gear.

In order that this transfer machine may function it is necessary that the machine delivering the articles to be transferred shall be in operation and in synchronism with the transfer machine and that each article shall be moved from its place of deposit by the transfer tongs before the succeeding article is deposited. It is evident, in this connection, that the operation of placing each article at the receiving point and its removal from the delivery point of the transfer machine may be accomplished manually if so desired.

In operation the shaft 34 is speeded so that the eccentric and its connected parts each make a complete motion cycle in the time interval between the production of each article to be transferred. The reciprocating motion from the eccentric is imparted to the sector gear 17, pinion 15, drive shaft 1, sprocket wheel 67, drive chain 66, and sprocket wheel 47, each connected to the other in the order named.

Starting at the receiving position P, as in Fig. 1, at the end of the return stroke, from the lehr to the mold, the tongs are open with the main arm 2 in the position shown. At the beginning of the advance stroke, from P to L, the first event in the cycle, due to the counter-clockwise rotation of the sprocket wheel 47, is the closing of the tong arms through the gears 55, 56*b*, 57*b*. The full lines in Fig. 1 show the position of the arm and tongs at the end of this part of the cycle.

After the tongs have closed the rotative effort from the sprocket wheel 47 tends to rotate the entire tong casing counter clockwise. This action is retarded, however, by the reaction of the tongs and tong plates 50, 51, through the hollow shaft 49, sprocket wheel 48, ratio chain 62 and the fixed ratio sprocket wheel 63.

Due to this retardation the next cycle event is the lifting of the shaft 46 by means of its threaded portion in the sprocket wheel 47, the wheel 48 and the tong case remaining non-rotative. The shaft 46 is lifted by the screw threads engaging the sprocket wheel 47 and this in turn lifts the tong case by the engagement of the gear 55 with the upper tong plate 51, the lifting action being limited by the engagement of the hub of sprocket

48 with the lower face of the bearing 44. The lifting action provides for raising a glass article vertically from its position at the ware-receiving station prior to its being moved laterally from said station, and thus prevents any possible tendency to deform or scratch the bottoms of the glass articles. If it is desired that the tongs shall not be lifted and lowered the thread action in the wheel 47 and the shaft 46 is rendered inoperative by the insertion of the pin 46*a* which connects the two parts rigidly together. This in no way affects the closing and opening of the tongs and the swinging of the arm, the only effect being to require a slight decrease in the travel of the eccentric rod. After the shaft 46 together with the tong case and tongs, hollow shaft 49 and wheel 48 have reached the limit of their upward travel all the movable parts in the gearing become as if locked in a fixed position with reference to the arm 2. The rotative effort of the solid drive shaft 1 is then expended in swinging the arm and the members thereon to the end of the advance stroke as determined by the travel of the eccentric rod. During the swinging of the arm the sprocket wheel 48, the hollow shaft 49 and the tong mechanism rotate upon their shaft substantially 180 degrees relative to the arm, this being due to the fact that the fixed ratio sprocket wheel 63 is of larger diameter than its companion wheel 48, the ratio between the two wheels being such as to produce the results named. This ratio depends upon the amplitude of the arc described by the arm and is predetermined. The semi-rotation of the tongs is necessary in order that the receptacles 56*a*, 57*a*, may properly clear the transferred article at the end of each stroke. It is essential that the center line between the two tong arms be approximately at right angles to the radial center line of the arm at the end of each stroke. Due to the variation in the diameters of the sprocket wheels 63, 48, 67, 47, the angular travel of the shaft 1 will be slightly greater than that of the arm and the hollow shaft 3.

Upon the return stroke, that is from positions L to P, the events of this half cycle follow in the reverse order from those in the other half cycle.

The angular travel of the tong arms is limited at the beginning of the advance stroke by their coming together and at the beginning of the return stroke by their contact with the stud bolts 53, 54.

It will be observed that all the gears in this machine are interconnected and that the reaction of the non-rotative gear 63 through the intervening connections and against the oscillating drive gear 67 produces each event in the cycle in regular sequence as above described.

In order that the machine may function as above described it is evident that the force expenditure required to open or close the tongs must be less than that required to lift the tong parts, and that this lifting force must be less than that required to swing the arm. These conditions are inherent in the machine constructed as above described. The inertia of the arm and the friction of the hollow shaft 3 furnish ample reaction in the tong closing and lifting actions, but extra frictional retardation may be supplied if desired.

Pressed glass tumblers and blown bottles often have concave bottoms and in this case the lifting of the closed tongs at the position P becomes necessary in order that the pieces of ware may not interfere with the convex mold bottoms in the lateral swing of the tongs.

The hubs of the plates 50, 51, are similar in size and shape so that the tong mechanism many be inverted when it is desired to reverse the direction of transfer, as for example, from the position L to P. In this case the shaft 46 and sprocket wheel 47 must be replaced by others having threads of the opposite hand provided that the thread action is necessary.

By disengaging the pinion 15 from the sector gear 17 the travel arc of the arm 2 may be located at any desired position in the complete circle, the casing 6 being rotated in the socket 7*a* to a corresponding position. The timing and sequences of the various events in the complete cycle, as above described, are entirely independent of the length of the travel arc and its angular location within the circle.

The swinging of the tongs 180 degrees upon the arm adds twice the radial distance from the center of the tong receptacle to the tong case shaft to the natural reach of the main arm thus allowing this arm to be made shorter and its inertia thus reduced. The tangential position of the tong arms to the arc of the main arm travel also permits them to be inserted into narrow openings, such as hinged molds for glassware.

The compound swinging arm also reduces the length of the path traveled by the tong receptacle and if the tong arms are made about half the length of the arm, center to center, the path of the tong receptacle will be in an approximately straight line.

I claim:

1. An automatic transfer machine comprising a vertical drive shaft, a horizontal oscillating arm, means for imparting uniform oscillatory motion to said arm, a tong case pivotally mounted upon the swinging end of said arm, means for imparting a uniform oscillatory motion to the tong case relative to the arm, a pair of pivoted tongs within said case and having geared actuating mechanism for closing them at the beginning

of the advance stroke and opening them at the beginning of the return stroke.

2. An automatic transfer machine comprising a horizontally swinging arm mounted upon a vertical hollow shaft journaled within a fixed casing, a solid drive shaft journaled within the said hollow shaft, means for imparting oscillatory motion to the solid drive shaft, a tong case pivotally mounted at the swinging end of said arm, a pair of pivoted tongs geared together and geared to a pinion within the said case, drive gearing for imparting rotative force from the said drive shaft to the tong gears for the purpose of closing and lifting the tongs at the beginning of the advance stroke and for opening and lowering them at the beginning of the return stroke, and ratio gearing for controlling the rotation of the said tong case and its connected parts through a predetermined angular travel with reference to the said arm.

3. An automatic transfer machine comprising a fixed base and housing, an eccentric adapted to impart an oscillating motion to a sector gear, means for actuating said eccentric at a certain speed relative to that of an external machine supplying the articles to be transferred, a pinion gear fixed to a vertical drive shaft and meshing with the said oscillating sector gear, an arm connected through gearing to the vertical drive shaft, a tong shaft journaled into the swinging end of said arm and into a tong case, a threaded portion on the tong shaft threaded into a chain gear wheel for raising and lowering the said tong shaft, a pair of pivoted tongs geared together and geared to a pinion on the tong shaft, a hollow shaft fixed at one end to the said tong case and at the other end to a ratio chain gear wheel which is connected by a chain to a non-rotative chain gear wheel journaled on the said vertical drive shaft.

4. An automatic transfer machine comprising a horizontal oscillating arm, means for imparting uniform oscillatory motion to said arm, geared members at the swinging end of said arm adapted to close and lift a pair of tongs geared thereto, at the beginning of an advance stroke, followed by the swinging of the arm a certain angular advance and to open and lower said tongs at the beginning of a return stroke followed by the swinging of the arm through an equal angular return.

5. An automatic transfer machine having a swinging arm and carrying at its swinging end a pivoted tong case, said case containing a pair of tongs geared together and geared to a pinion on a tong shaft, a chain gear connection between said tong shaft and a vertical drive shaft, the tong gear combination and the chain gears forming a series of connections by which the impulses from the vertical drive shaft are transmitted to the arm through the said gear combination as and for the purposes described.

6. An automatic transfer machine having a horizontal swinging arm, a tong case positioned at the swinging end of said arm, a pair of pivoted tongs within said tong case geared together in opposition and geared to a pinion on a tong shaft which is further geared to an oscillating drive shaft, the impulses from said drive shaft through the said gearing producing in the described order a series of three events, the first two being the result of the reaction due to the inertia of the arm and the friction in its bearings, and the third event being due to the condition of the several geared members in having reached their limits of travel in relation to the said arm, all three events occurring in combination with the reaction against ratio gearing terminating in a non-rotative chain gear wheel.

7. In automatic transfer machines a pair of pivoted tongs with limited angular travel and small frictional resistance geared together in reverse rotational direction and further geared to a tong shaft journaled into a swinging arm and into a tong case on a common axis, said tong shaft being geared to an oscillatory drive shaft, the impulses from which, through the geared members, primarily open or close the said tongs on account of their small frictional resistance, and said tongs, after reaching the limits of their angular movement upon their pivots and consequently reacting against the impulses of said drive shaft, cause the force of the impulses to be expended in the swinging of the arm by means of the now positive geared connection, which overcomes the heavy frictional resistance and inertia in the arm, at the same time causing the partial rotation of the tong case in its bearings as controlled by the retarding reaction of separate ratio gearing between the tong case and a non-rotative gear.

8. In automatic transfer machines a driving chain wheel upon a drive shaft having an oscillatory motion, a crossed chain running upon the driving chain wheel and upon a driven chain wheel, said driven wheel being threaded with a limited rotary motion upon a tong shaft, which rotary motion causes a slight lifting of the said tong shaft and tong case, after which the threaded members are locked together, a gear keyed to the tong shaft, a pivoted short tong arm having at its pivoted end a gear meshing with the said gear on the tong shaft and also meshing with a gear on the pivoted end of a long tong arm, the two tong arms having a limited travel in opposite directions; the impulses from the said drive shaft, during the advance stroke, effecting first the closing of the tongs, second, the lifting of the tong case and lastly, the swinging of the arm in its bearings and the

rotation of the tong case and tong members upon the tong shaft, the same sequences of actions taking place upon the return stroke except that they are in reverse direction.

9. In automatic transfer machines a drive shaft from which oscillatory impulses are transmitted by gearing to a tong shaft, a gear fixed to the tong shaft and meshing with a gear at the pivoted end of a short tong arm within a tong case, a gear at a pivoted end of a long tong arm meshing with the said gear in the short tong arm, the two tong arms being geared in opposing rotational directions and having limited angular travel upon their pivots, a geared connection between the said tong case and a non-rotative gear.

10. In automatic transfer machines an oscillatory drive shaft geared to a series of interconnected gears adapted to primarily open and close a pair of pivoted and geared tongs and secondarily to actuate a swinging arm having at its outer end a pivoted tong case containing the said tongs in such a manner that during the angular travel of the arm the tong case is turned a half revolution relative to the arm in a reverse direction from that of the arm around its fulcrum.

11. In automatic transfer machines an oscillatory drive shaft geared to a series of interconnected gears adapted to primarily open and close a pair of pivoted and geared tongs, secondarily to lift and to lower the tongs at certain times and thirdly to actuate a swinging arm having at its outer end a pivoted tong case containing the said tongs in such a manner that during the angular travel of the arm the tong case is turned a half revolution relative to the arm in the reverse direction from that of the arm around its fulcrum.

12. In automatic transfer machines the combination of a swinging arm having at its swinging end an oscillatory member containing a pair of pivoted and geared actuated tongs, a tong lock comprising a lever of the first class having at one end a catch adapted to engage at certain times a stop lug upon a tong arm, and at the other end a roller, the said catch being held by a spring in position to engage the stop lug in both the open and closed positions of the tong arms during a partial stroke of said arms, and a pair of stationary cam lugs set diametrically opposite one another, said cam lugs being in the path of the roller and positioned so as to engage it at the end of each stroke of the tong oscillating member, in which position the tongs are free to open or close as required.

13. In automatic transfer machines the combination of a swinging arm having at its swinging end an oscillatory member containing a pair of pivoted and gear actuated tongs, a tong lock adapted to lock the tong arms in either their open or closed positions during a partial stroke of the said oscillatory member and to unlock them at the end of each stroke in either direction.

14. In automatic transfer machines the combination of an oscillating vertical drive shaft having firmly attached thereon the upper member of a jaw clutch meshing with a companion member forming an integral part of a pinion gear, and the lower member of a second jaw clutch likewise firmly attached to the said shaft and meshing with a stationary companion member with rotative adjustment the two clutches being adapted for alternate engagement and operated by means of a treadle lever as and for the purpose described.

15. Transfer apparatus comprising an arm, means for oscillating the arm in a horizontal plane between spaced points, tongs carried by said arm, means for operating said tongs to grasp an article when said arm is in one extreme position of movement and to release an article when said arm is in its other extreme position of movement, a pivoted supporting member for said tongs, and means for oscillating said member in a horizontal plane about its pivot in predetermined relation and in a direction opposite to the oscillatory movements of said arm, whereby the relative movement of said arm and said member is such that the direction of movement of said tongs as a whole adjacent to the receiving and delivery stations for the articles being transferred is substantially perpendicular to the direction of the opening and closing of the gripping members of said tongs.

16. Transfer apparatus comprising an arm, means for oscillating said arm in a horizontal plane between spaced points, tongs carried by said arm, means for operating said tongs to grasp an article when said arm is in one extreme position of movement and to release an article when said arm is in its other extreme position of movement, a pivoted supporting member for said tongs, and means for oscillating said member about its pivot in a direction opposite to the movement of said arm in predetermined relation to the oscillatory movements of said arm, all of the movements being derived from a single source of mechanical power.

17. A transfer device comprising an arm, a ware-supporting device pivotally mounted on said arm, means for moving said arm about a vertical axis, and means for moving said supporting device about its pivot in predetermined relation to the movement of said arm about the vertical axis, the last-named means comprising a pair of sprocket wheels and a chain connecting them, whereby an article of glassware may be given a desired predetermined rotation during the transfer about the pivot of the supporting device.

18. A transfer device comprising an arm mounted for oscillatory movement about a

fixed axis, ware-supporting tongs mounted on said arm, a common driving means coaxial with said axis for oscillating said arm about said axis and for opening and closing said tongs, said common driving means being connected to said tongs through sprockets and a chain and operating first by differential motion with respect to said arm to open or close said tongs, and by continued motion to move said arm about said axis.

19. A device for transferring glassware from a ware-receiving station to a ware-delivery station, comprising an arm mounted for oscillatory movement about a vertical axis, ware-supporting tongs mounted on said arm for limited vertical movement with respect thereto, and a common driving means coaxial with said axis for opening or closing said tongs, moving said tongs vertically with respect to said axis and oscillating said arm, the three movements taking place in the order named at both said stations, the first two of said movements taking place due to a differential movement of said driving means and said arm, and the last by continued movement of said driving means.

20. A transfer device comprising an arm mounted for oscillatory movement about a vertical axis, a tong-supporting member pivoted adjacent to the outer end of said arm to swing in a horizontal plane, the pivotal connection between said member and said arm being designed to permit relative vertical motion of the parts, tongs in said member, common mechanical means coaxial with said axis to open or close said tongs, raise or lower said member respectively with reference to said arm, and oscillate said arm, and means constraining said member to rotate about its pivot in predetermined relation to the movements of said arm.

21. A transfer device comprising an arm mounted for oscillatory movement about a vertical axis, a tong-supporting member pivoted adjacent to the outer end of said arm to swing in a horizontal plane, the pivotal connection between said member and said arm being designed to permit relative vertical motion of the parts, tongs in said member, common mechanical means coaxial with said axis to open or close said tongs, raise or lower said member respectively with reference of said arm, and oscillate said arm, and means constraining said member to rotate about its pivot in predetermined relation to the movements of said arm, both said common means and said constraining means including sprockets and an inter-connecting chain.

22. Glassware handling apparatus, comprising a member pivotally supported at one end, ware-gripping means on the other end of said member, means for effecting translatory movement of said member in a substantially horizontal plane and about a center in one direction from a ware-receiving station toward a ware-delivery station, and means for simultaneously moving the last-named end of said member about the first-named end as an axis in the opposite direction, whereby the ware gripping means travel in a substantially straight line from the ware receiving station to the ware delivering station.

23. Glassware transferring apparatus comprising an arm mounted to oscillate about a vertical axis, a tong carrying member pivoted on a vertical pivot to said arm at a point remote from said axis, tongs in said member, means to open and close said tongs, means to oscillate said arm, and means constraining said member to oscillate about its pivot through an arc of substantially 180° in a direction opposite to that of the oscillation of said arm whereby the path of an article of glassware engaged by said tongs approaches a straight line extending between a ware-receiving station and a ware-delivery station to minimize the centrifugal force acting on the article during the transfer.

24. Glassware handling apparatus comprising a vertical pivot, an arm, one end of which is mounted for angular movement on said pivot, a pivot on said arm, a member mounted on said pivot, ware gripping means on said member, means to actuate said ware gripping means, and means to move the arm in one angular direction and the member in the opposite angular direction.

25. Glassware handling apparatus comprising a member pivotally supported at one end, ware gripping means on the other end of said member, means for effecting a translatory movement of said member in a horizontal plane about a center in one direction, and means for simultaneously moving the last named end of said member about the first named end as an axis in the opposite angular direction.

Signed at Fairmont, West Virginia, this twentieth day of August, nineteen hundred and twenty six.

WILBUR S. MAYERS.