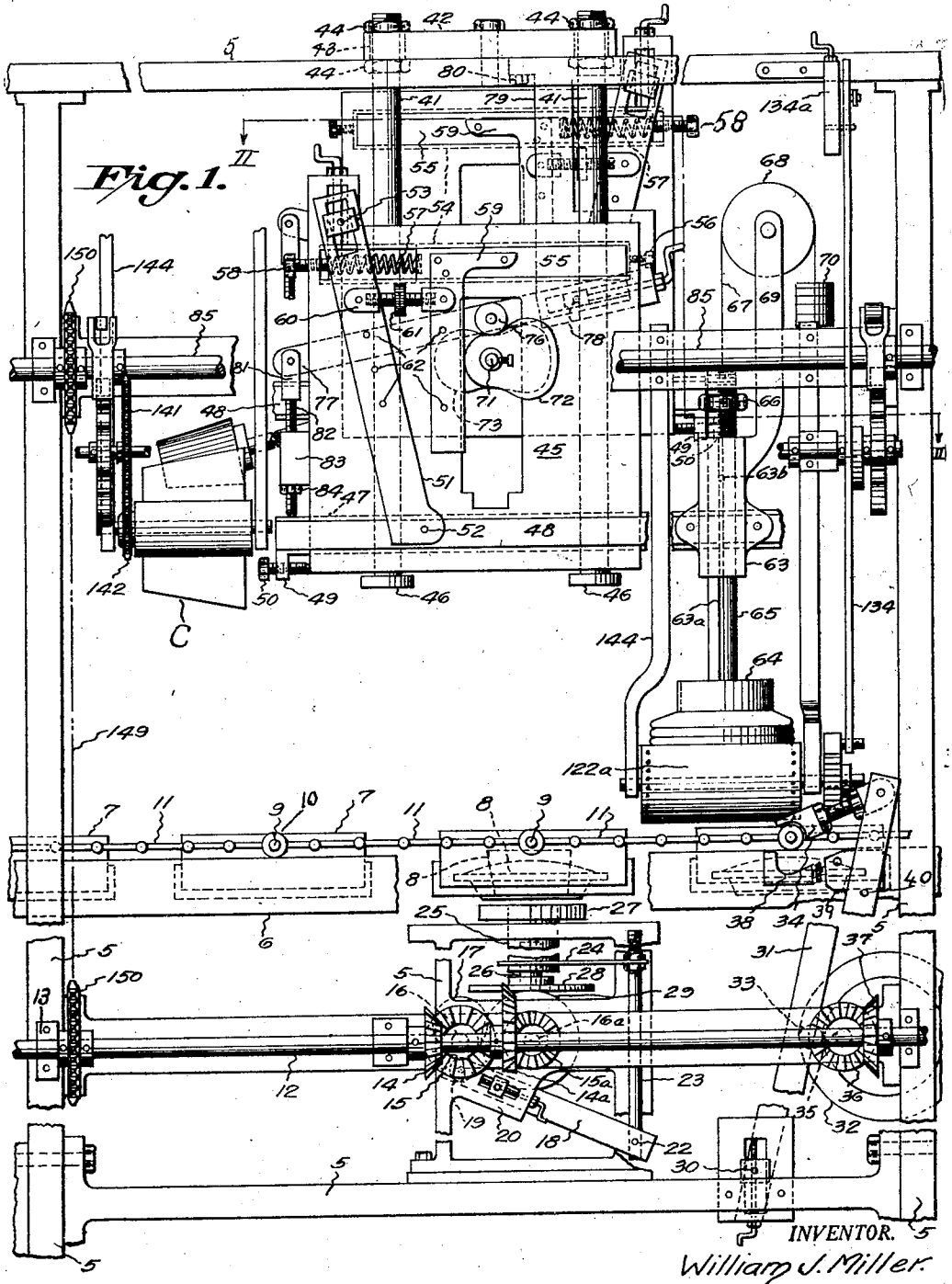
Jan. 16, 1934. W. J. MILLER 1,943,483

WARE TRANSFERRING APPARATUS

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Fig. 1.



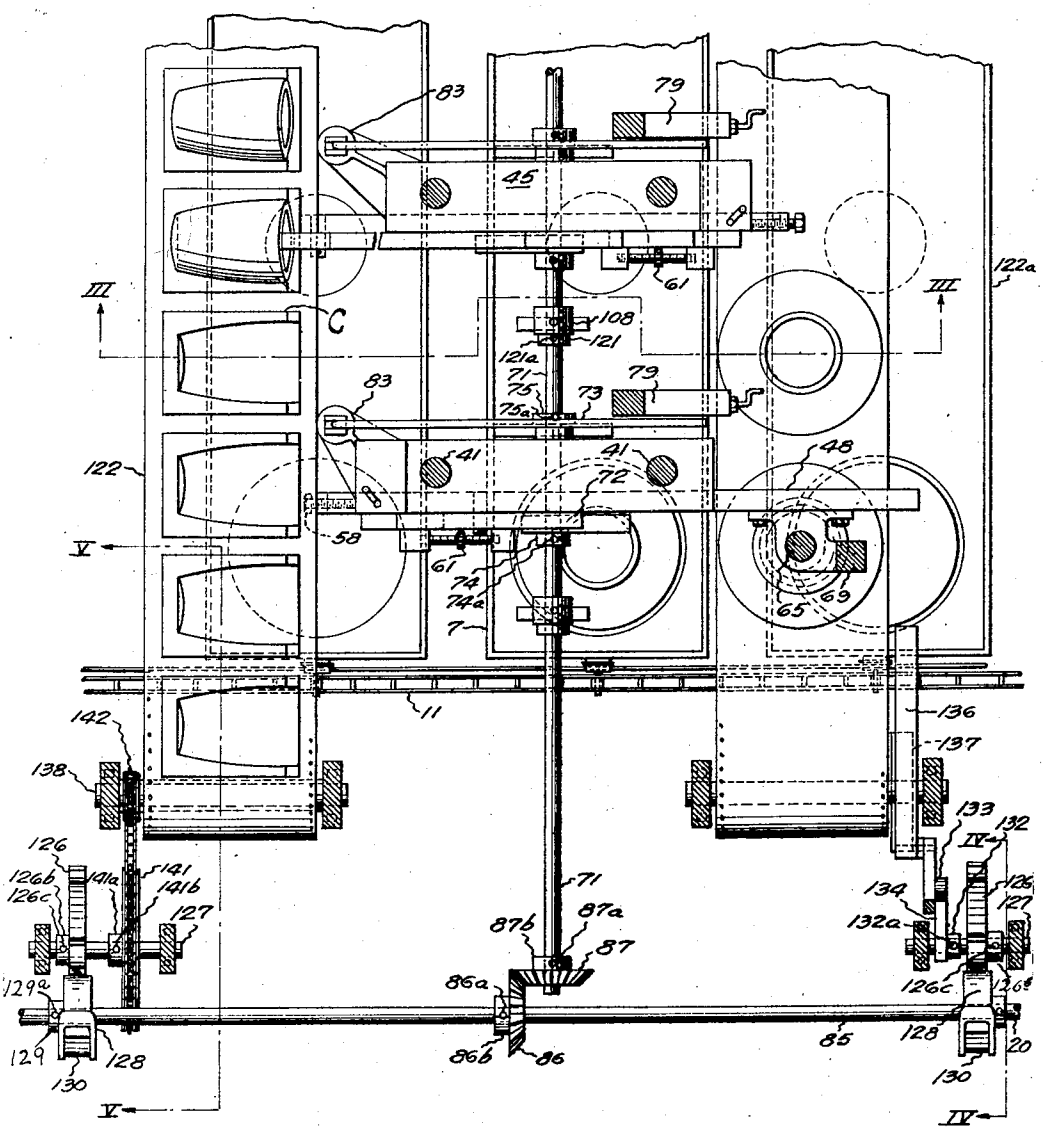
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WARE TRANSFERRING APPARATUS

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Fig. 2.



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WARE TRANSFERRING APPARATUS

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Fig. 4.

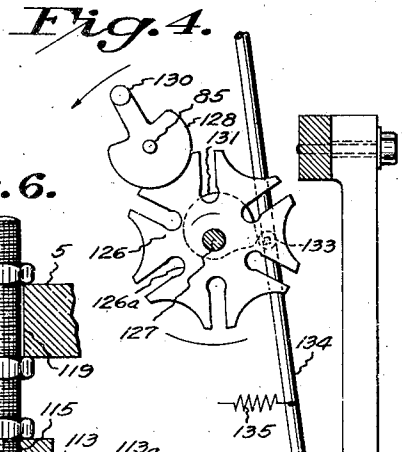


Fig. 5.

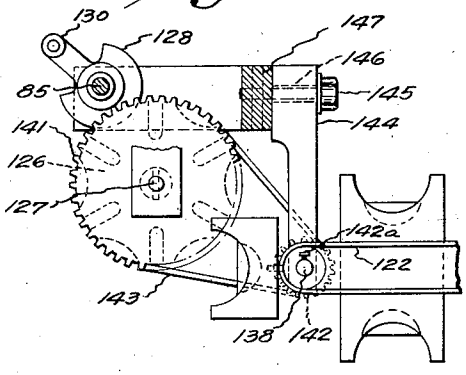


Fig. 6.

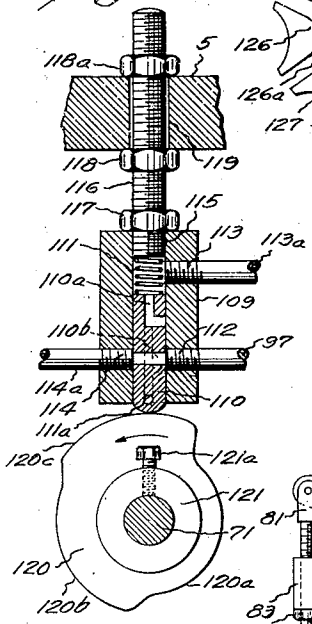
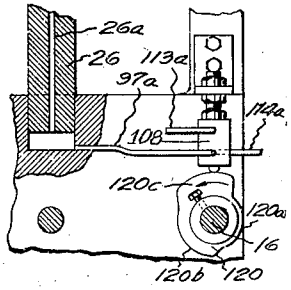


Fig. 7.



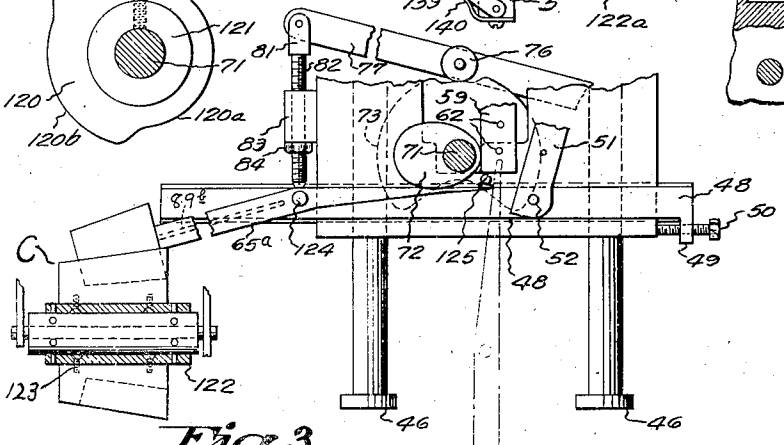
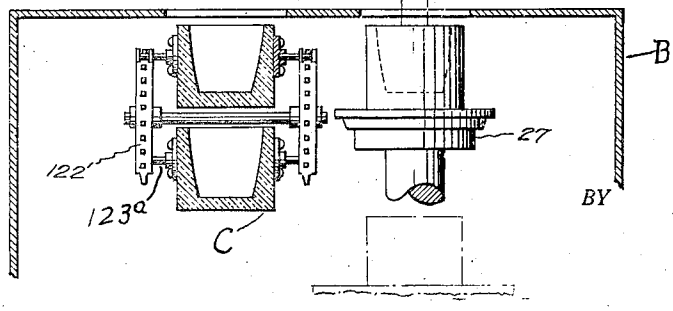


Fig. 3.



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WARE TRANSFERRING APPARATUS

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Fig. 8.

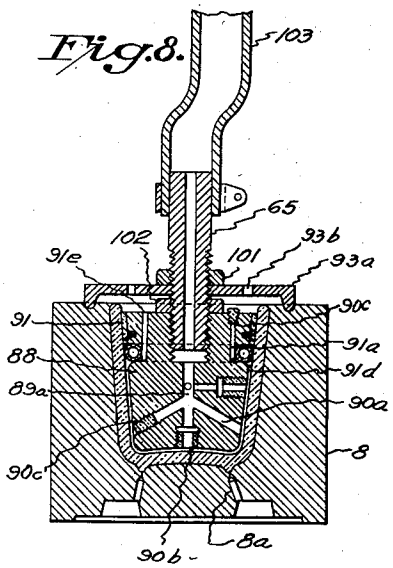


Fig. 9.

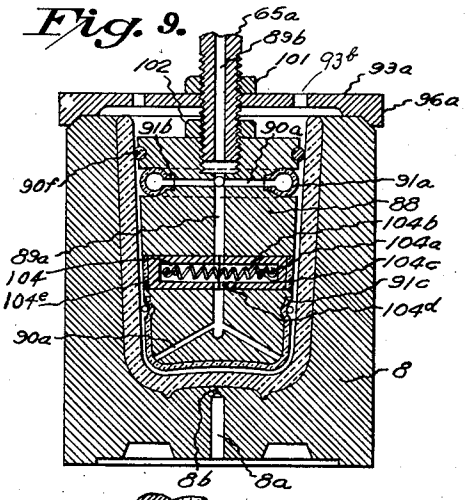


Fig. 10.

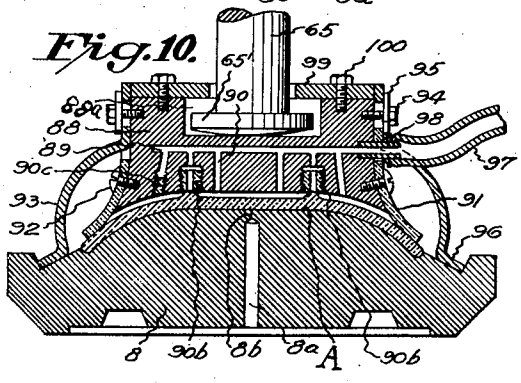


Fig. 8a.

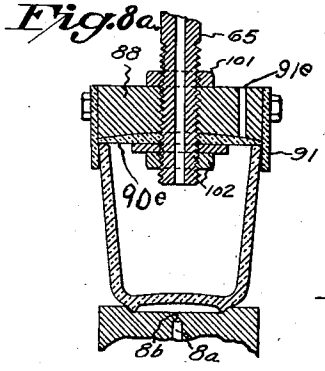


Fig. 11.

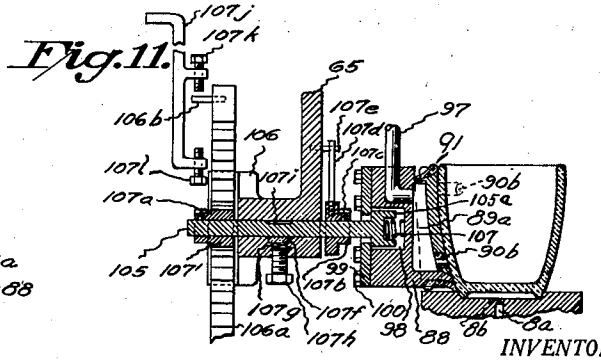
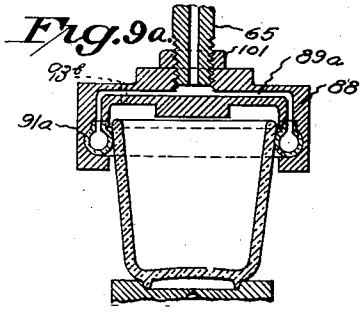


Fig. 9a.



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WARE TRANSFERRING APPARATUS

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Fig. 13.

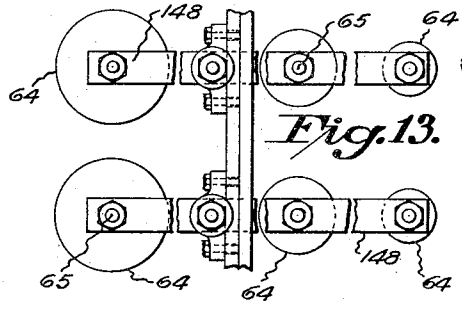


Fig. 12.

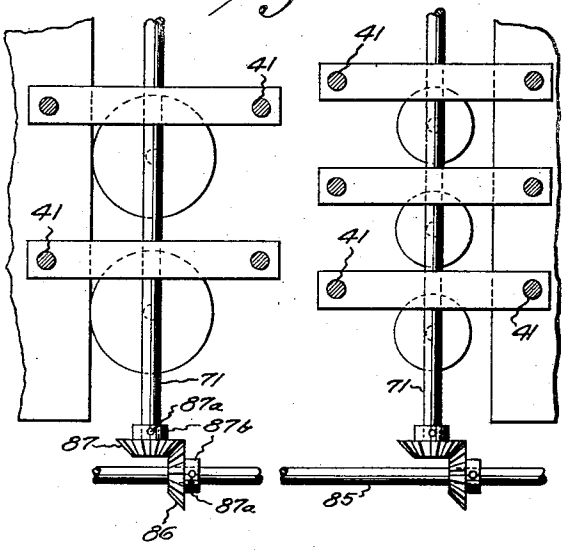


Fig. 14.

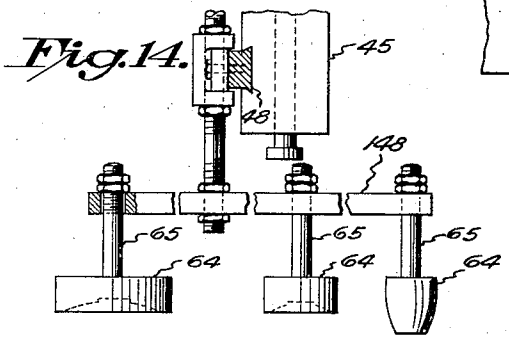
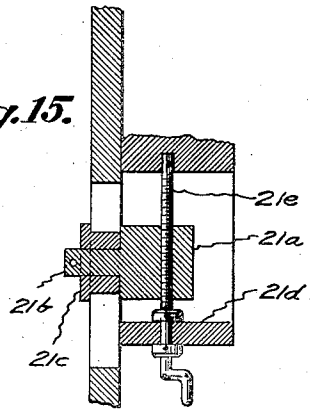


Fig. 15.



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Patented Jan. 16, 1934 1,943,483

UNITED STATES PATENT OFFICE

1,943,483

WARE TRANSFERRING APPARATUS

William J. Miller, Swissvale, Pa.

Application July 2, 1927. Serial No. 203,186

23 Claims. (Cl. 214—1)

This invention relates to ware transferring apparatus particularly adapted for use in the manufacture of pottery.

An essential object of the invention is to provide for the automatic transfer of ware, either in a finished or partly finished state, from one place to another, as for example, from a mold or molds to a conveyor, or to remove the ware from the molds and place it in suitable forms for further operations thereon and subsequently re-transfer the ware from the forms to the molds, or stack the ware on a table or conveyor, or transfer the ware from one conveyor to another; and in the event it is desired to use a conveyor or conveyors, means are provided for actuating or driving the latter in synchronism with the ware transferring means.

Another object of the invention is to provide a ware transferring means adapted to be operated through the application of a fluid medium such as super or sub-atmospheric pressure, or both super and sub-atmospheric pressure, or to grip the article by the application of suction or sub-atmospheric pressure and discharge the article by air under pressure or super-atmospheric pressure, means being provided for timing and regulating the application of the fluid medium in synchronism with the transferring operation, and also an auxiliary means for dislodging or releasing the ware from the molds previous to or during the transferring operation.

Another object of the invention is to provide an adjustable, yielding, conforming pressure, ware transferring means, to adapt the structure to ware undergoing the process of formation, or ware of different degrees of frangibility and irregular shaped ware, and thus prevent distortion or breakage of the ware or marring of the surface thereof.

Another object of the invention is to provide a means for transferring ware of different shapes and sizes simultaneously and to different places or points of deposit, as for instance, to a conveyor or series of conveyors with or without means for positioning the ware thereon, means being provided for accurately spotting or positioning the member for gripping the ware relatively to the points of removal and deposit of the ware.

Another object of the invention is to provide a structure of the class specified embodying means for gripping ware in such manner as to enable the ware to be inverted without releasing it from the transferring device, or to be turned at different angles for performing various operations thereon, or to grip the ware on one side so that in the case of deep ware, such as cups, bowls, etc., access may be had to the interior and also part of the exterior of the ware for any desired operation.

Another object of the invention is to provide for readily controlling and adjusting the operation of the ware transferring means, or any part thereof, while in operation or while the driving connection subsists, or while at rest.

A further object of the invention is to provide means in a ware transferring structure for ensuring proper contact of the ware gripping member with the surface of the ware being transferred, or for automatically conforming to the surface contour of the ware being transferred.

Among other objects are, to provide means for removing ware from molds in a drying chamber or other enclosure and transferring it to forms or other points and re-transferring it back to the said chamber or enclosure; to center the molds previous to and during transfer of the ware and to move the molds in synchronism with the transferring means; and to arrange any number of devices in multiple and series for transferring ware of various sizes and shapes simultaneously or approximately simultaneously.

With the foregoing and other objects and advantages in view, the invention consists in the preferred construction and arrangement of the several parts which will be more fully hereinafter described and claimed.

In the drawings:—

Figure 1 is a side elevation, partly broken through, of a ware transferring means embodying part of the features of the invention;

Fig. 2 is a horizontal sectional plan view on the line 2—2, Fig. 1;

Fig. 3 is a broken sectional side elevation taken on the line 3—3, Fig. 2;

Fig. 4 is a detail view of one form of means for actuating the ware conveyor taken on the line 4—4, Fig. 2;

Fig. 5 is a similar view taken on the line 5—5, Fig. 2;

Fig. 6 is a detail sectional view of a preferred form of valve for applying super or sub-atmosphere;

Fig. 7 is a further view of the valve, illustrating one of its applications;

Fig. 8 is a transverse vertical section through a mold and preferred form of grip device adapted for deep ware;

Fig. 8a is a similar view of a modification in structure relatively to Fig. 8;

Figs. 9 and 9a are views similar to Fig. 8 of modified forms of grip devices;

Fig. 10 is a similar view of a preferred form of grip device adapted for shallow ware;

Fig. 11 is a transverse vertical section through a further modified form of grip device and cooperating parts;

Fig. 12 is a broken plan view of a plurality of ware transferring structures, illustrating diagrammatically a method of arranging same in parallel and irregular series;

Fig. 13 is a similar view, illustrating a method of transferring a plurality of different sizes and shapes of ware simultaneously;

Fig. 14 is a side elevation of the structure shown in Fig. 13, and

Fig. 15 is a detail plan view of an adjustment structure.

The improved ware transferring means, for the purposes of illustration, is shown in cooperative relation with a conveyor and pottery fabricating mechanism substantially as disclosed in my copending application Serial No. 202,629, filed June 30, 1927, but it will be understood that said means may be applied to any mechanism or structure desired, to perform any function of which it is capable. By referring to my above application in connection with the lower portion of Fig. 1, this conveying and fabricating mechanism may be readily understood, and a brief description thereof should suffice.

The numberal 5 generally designates a stationary frame, which is shown broken in parts to indicate that same may be of any length desired, tracks or rails 6 being adjustably secured thereto or supported thereby, on which trays or pallets 7, carrying molds 8, have movement, said trays or pallets having projecting trunnions 9, which are provided with bearing rollers 10, for supporting the trays while on said tracks, these projecting trunnions also extending through or connected to the links of a conveyor chain 11, the trays 7 being thereby connected in series in said chain. Extending horizontally along the lower portion of the frame 5 is a main drive shaft 12, rotatably mounted in suitable bearings 13, said shaft being provided with suitable gearing along its length for operating the various fabricating units that may be driven thereby. That portion of the shaft 12 herein shown is provided with suitable bevel gears 14 and 14^a meshing with corresponding gears 15 and 15^a, secured on shafts 16 and 16^a, extending at right angles to said drive shaft 12, the shaft 16 having adjustably secured thereon a cam 17, adapted to impart movement to a lever 18, provided with a cam roller 19, said lever being adjustably fulcrumed at 20, the point of fulcrum being adjustable while in operation preferably through the medium of a sliding block adjustment shown in detail in Fig. 15. This form of adjustment may be clearly understood by referring to my copending application Serial No. 148,872, filed Nov. 17, 1926, for Multiple and automatic jigger. The numeral 21^a designates a floating block having a pin or trunnion 21^b projecting therefrom and providing a bearing for a sliding block 21^c, which moves in a slot formed in the member or lever to be pivoted or fulcrumed, in the present instance the lever 18, said block 21^c being formed with a flange to prevent lateral displacement of the lever and the pin 21^b provided with a cotter key or analogous means to prevent lateral displacement of the said block. A bracket 21^d is formed integral with or attached to the stationary frame of the mechanism, and extending through and supported by this bracket and also projecting into and supported by the frame is a screw 21^e, said screw being threaded through the block 21^a. By adjusting this screw 21^e, the pivot or fulcrum point may be varied and consequently the throw of the lever while in operation and while the pivotal or fulcrum connection subsists, with advantages which will be apparent.

The lever 18 is pivoted at one extremity, as at 22, to a pitman 23, extending vertically and adjustably connected by a cross fork 24 to a hollow spindle 25, which is telescoped over and in spline-sliding engagement with a spindle 26, the spindle 25 terminating in a chuck 27 for supporting the mold 8. Coacting friction gears 28 and 29 are adjustably secured on the spindle 26 and shaft 16^a respectively, for imparting rotation on the mold if desired or necessary for a fabricating operation, and through the cam 17, lever 18 and pitman 23, the chuck and mold may be reciprocated or raised and lowered if found desirable. In the present instance it may be preferred to dispense with the means for imparting rotation to the mold, including the shaft 16^a, bevel gears 14^a and 15^a and friction gears 28 and 29.

Adjustably pivoted to the lower portion of the frame, as at 30, through the medium of the sliding block adjustment above referred to, is a lever 31, adapted to be actuated by a cam 32, acting on a cam roller 33 mounted on said lever 31, the upper extremity of the lever 31 being provided with a pawl 34, adapted to abut against the projecting trunnions 9 of the trays 7 during the forward movement of the lever 31 and ride over said trunnions during the return stroke of said lever. The cam 32 is eccentrically mounted on a shaft 35, provided with a gear 36 meshing with a gear 37 on the drive shaft 12. An adjustable length latch 38 is pivotally mounted on the track 6, said latch being provided with a cam raise 39, adapted to contact with a pin 40 on said lever 31 when the lever reaches the limit of its return stroke. By the structure just described, the trays 7 are intermittently moved forward on the tracks 6, the latch 38 then engaging the trunnions 9 to hold the trays in immovable position until a desired fabricating operation has been completed and while the lever 31 is moving rearward, until the pin 40 contacts with the latch cam 39, releasing said latch, to thereby permit a further forward movement of the trays.

By referring to the upper portion of Fig. 1, it will be noted that guide posts 41 are shown as depending from and secured to a platform or cross brace structure 42, which is supported by the frame 5, the upper extremities of said posts being threaded and extending through openings 43 in the brace which are larger than the diameter of the posts and secured by nuts 44, thus providing for vertical and lateral adjustment of said posts 41 within these openings. The guide posts are adapted to guide and support a supplemental frame 45, which is vertically slidable on said posts, the lower ends of these guide posts being formed with stop heads 46, which may, in some instances, support the frame 45 when in its lowermost position and act as a stop for said frame. The lower part of the frame 45 is formed with a dove-tail groove 47 as shown in dotted lines in Fig. 1 and end elevation in Fig. 14, a bar 48 being mounted to slide horizontally in said groove, said bar being formed with a screw bracket 49 at one extremity for insertion of an adjusting screw 50, for a purpose which will be presently explained. A lever

51 is pivoted to said bar 48 at its lower extremity, as at 52, and at its upper extremity adjustably pivoted, through the medium of the sliding block adjustment heretofore specified, as at 53, to the frame 45. The upper portion of the frame 45 is formed with a further dove-tailed groove 54 shown in dotted lines in Fig. 1, for slidably supporting a bar 55 in a horizontal plane, said bar being adjustably limited in its lateral sliding movement towards the right as viewed in Fig. 1 by an adjusting screw 56, and at the left said bar terminates a suitable distance from the end of said groove 54, thus providing a recess for insertion of a suitable compression spring 57, adjustable through the medium of a screw 58, the bar 55 being adjustably maintained under longitudinal pressure by said screw and spring. A suitable cam-contacting member or bracket 59 is secured to the bar 55, and to connect the bracket 59 and lever 51 in readily adjustable association, a turn-buckle 60 is secured to the bracket and lever, said turn buckle having an adjusting screw 61, a plurality of securing holes 62 being formed in the bracket 59 and lever 51, so that the turn buckle may be adjustably mounted thereon, and adjusted at various elevations to adjust the throw of lever 51.

The lower lateral sliding bar 48 has secured thereto a supporting member or bracket 63, adapted to support a ware pick-up assembly, preferably comprising in the present instance a grip head 64 having a stem 65 slidable through and supported by the bracket 63, the upper extremity of said stem being threaded and provided with an adjusting and limiting nut 66 and also having attached thereto a suspending cord, chain or analogous member 67, extending over a grooved wheel or pulley 68, having bearing in an extension 69 of the bracket 63, said cord serving to support regulable counter-balancing weights 70, so that the force of contact of the grip head 64 with the article to be transferred may be regulated to prevent breakage and for other purposes. The stem 65 is formed with a longitudinal groove 63^a, a screw 63^b being secured in the bracket 63 and adjustably projecting into said groove, to prevent turning movement of the grip head when transferring irregularly shaped ware.

One preferred method of imparting vertical movement to the frame 45 and lateral movement to the bars 48 and 55, to thereby operate the transferring means as a whole, is to mount a cam shaft 71 in suitable bearings on the main stationary frame 5, said shaft having secured thereon cams 72 and 73, adjustable through the medium of hubs 74 and 75 and set screws 74^a and 75^a, (see Fig. 2), the cam 72 being adapted to contact with the bracket 59 secured to the bar 55 and thus impart lateral movement to the pick-up assembly, and the cam 73 being a double cam and contacting with a roller 76 on a lever 77, adjustably pivoted at one extremity through the sliding block adjustment heretofore referred to, as at 78, to a bracket 79, which is secured to the platform or brace structure 42 as at 80, and at its opposite extremity hingedly or pivotally connected to the frame 45 through the medium of a terminal bracket 81, threaded on a rod or bolt 82, extending through a lug or ear 83, which may be formed integral with the frame 45, an adjusting nut 84 being applied on the rod 82 below said lug 83 for adjusting while in operation the reciprocation of the frame 45.

From the foregoing it will be noted that the pick-up or transfer assembly may be caused to move vertically in a straight line from one position, then moved laterally in a straight line to another position, and again moved vertically in a straight line, these movements being primarily imparted thereto by the double cam 73 acting on the frame 45 to raise the latter, carrying the pick-up assembly therewith, the cam 72 then causing a lateral movement to the bars 48 and 55 and consequently the pick-up assembly, and the cam 73 again acting to lower the frame 45 and said assembly, these movements being repeated in the return of the assembly and said cams 72 and 73 being adjustable on shaft 71 to time the foregoing operations.

As heretofore specified, through the medium of the floating or sliding block adjustment the pivot or fulcrum point may be adjusted or shifted while in operation and without disconnecting the pivot securing means. By adjusting the pivot point 78 of the lever 77, the extent of vertical reciprocation of the frame 45 and pick-up assembly may be varied or adjusted while in operation without altering its lowermost extent of travel, and by adjusting the pivot point 53, the extent of lateral reciprocation or movement of the pick-up assembly may be varied or adjusted while in operation without altering what may be considered its position or latitude of reciprocation. By adjusting the nut 84 on rod 82, the altitude of reciprocation of the frame and pick-up assembly may be varied or adjusted while in operation without altering the extent of reciprocation thereof, and by adjusting the posts 41 through the medium of the nuts 44, the lowest point of reciprocation of the said frame and assembly may be altered without affecting its highest point of reciprocation. By adjusting the screws 50 and 56 the lateral extent of reciprocation or movement of the pick-up assembly in one direction, or toward the right in Fig. 1, may be adjusted or varied while in operation without affecting its reciprocation in the opposite direction, and vice versa by adjusting screw 61, and these adjustments are of particular advantage in positively spotting the grip head 64 relatively to the article to be operated upon. By adjusting the turn-buckle screw 61, the position of reciprocation within a desired area of the pick-up assembly may be varied without affecting the extent of reciprocation thereof, and by changing the position of the turn-buckle through the medium of the holes 62, the extent of travel of the pick-up assembly may also be varied without altering its central point of reciprocation or reciprocatory movement. The face of the cam-contacting bracket 59 is shown vertical in the present instance, so that the degree or extent of reciprocation may be constant regardless of the vertical position of the frame 45. However, the face of said bracket 59 may have various contours, to vary the degree of reciprocation in proportion to the vertical position of the frame 45. The screw 58 may serve to regulate the degree of pressure required to move the pick-up assembly in one direction in addition to maintaining the cam-contacting bracket 59 against the cam 72. In the pick-up assembly the nut 66 may be used to adjust the lowest position of the grip head 64. By adjusting the cams 72 and 73 on shaft 71, the phase or time of vertical and lateral movements of the transfer means may be varied independently of the other adjustments.

The foregoing adjustments are set forth simply to enumerate some of the advantageous features of adjustment provided in the improved transfer means, and by combining the various adjust-

ments, practically all movements may be controlled, not only while the mechanism is at rest but while in operation and without dissociating or temporarily disconnecting the parts, and furthermore, all vertical movements may be controlled independent of lateral movements, and vertical and horizontal movements may be caused to ensue simultaneously.

The cam shaft 71 is driven from a shaft 85, particularly shown in Fig. 2, through the medium of suitable mitre or bevel gears 86 and 87, respectively secured on the shaft 85 and cam shaft 71 and adjustable by screws 86[a] and 87[a] extending through hubs 86[b] and 87[b].

Figs. 8, 8*a*, 9, 9*a*, 10 and 11 show preferred forms of grip heads adapted to operate through the application of super or sub-atmospheric pressure.

In Fig. 10 the structure is particularly adapted for use in transferring ware such as plates, saucers, etc., and therein the numeral 88 designates a body member, which may be of suitable preferably light weight material, formed with a main substantially horizontal chamber 89, having a plurality of substantially vertical branches or ducts 90, which may be of annular, segmental or other form, leading therefrom and terminating in the lower surface of the device. Surrounding the lower outer periphery of the body member 88 an annular valve member 91, preferably of flexible material such as rubber, is disposed and secured as by screws 92, the lower portion of said valve flaring outwardly and extending a suitable distance below the body member 88, so as to contact with the ware A and seal the chamber 89 when a sub-atmospheric condition is created therein. Surrounding the lower portion of the grip head and adapted to contact with the mold when the grip head descends to perform its function I prefer to provide an adjustable limiting and centering member or guard 93, secured to the upper peripheral portion of the body member 88 as by screw bolts 94 and suitable sized washers 95, to provide for adjustment. However, other means of providing adjustment for this member may be adopted without departing from the scope of the invention, the present means being shown simply for the purposes of illustration. The lower portion of the guard 93 is shaped to conform to the contour of the mold at the approximate point of contact therewith, as at 96, and among other functions this member or guard 93 serves as a stop or limiting member to prevent the lower surface of the body member 88 from contacting with the ware and also may serve as an additional centering means. A suitable flexible member or tube 97 connects with the chamber 89 through the medium of a nipple 98, which is threaded or otherwise inserted in the body member 88, said tube being adapted to extend to a suitable valve, hereinafter described, or to any source or device for the application of suction or sub-atmospheric pressure under control.

The stem 65 forming part of the pick-up assembly is formed with an enlarged annular head 65', adapted to extend loosely into a recess 88[a] formed in the upper part of the body member 88, a clamping plate 99 being then secured over said recess around said head as by screw bolts 100, thus providing a loose flexible swivel connection of the stem 65 with the grip head so that the latter has more or less lateral play and swinging movement, one advantage of which is to facilitate centering of the grip head through the various adjustments and guard 93.

To ensure proper contact of the grip head with the ware, I prefer to provide adjustable contact members which are shown in the present instance in the form of threaded nipples 90[b], preferably of rubber or other resilient material, adjustably threaded in the outer portions of any desired number of the branch ducts 90 but preferably only three of the latter and situated so as to provide contact at each vertex of what may be considered for the purposes of illustration a triangle, thus enabling contact in the nature of the "three point suspension" principle. The advantages of this particular structure will be obvious, as there will always be equal contact at all points regardless of whether the gripping surface of the ware is of regular or irregular contour, thus eliminating any tendency toward gripping stress or strain which may cause distortion or breakage of the ware.

Any of the branch passages or ducts 90 may be selectively closed by members 90[c], which are shown in the form of resilient studs shaped to fit the contour of the passages or ducts and adjustably threaded therein, and these members 90[c] may also serve as additional cushioning means if desired.

Fig. 8 shows a preferred form of grip head adapted for deep molds. In this instance the body member 88 is formed with a substantially vertical passage or chamber 89[a], terminating at the lower surface of said member and having branches 90[a] leading off therefrom to the outer side surface of said member. The sealing valve in this instance is in the form of a suitable flexible or rubber tube 91[a] which is seated in an annular recess formed in the body member. This form of valve may also serve as an additional centering means relatively to the ware being operated upon. The guard or stop member 93[a] in this instance is adjustably threaded on the stem 65 and maintained in position by lock nut 101, and likewise the grip head is adjustably secured to said stem by forming a threaded recess therein, the stem 65 being threaded in said recess and secured by a lock nut 102. The grip head is flexibly connected by a suitable flexible member or tube 103, which is interposed in the stem 65, said connection being shown with a slight offset in Fig. 8 to indicate the resilient character thereof. It may be preferred in some instances to use this form of connection in operating upon very sensitive or delicate or partly hardened ware. However, the member 103 may be interposed at any suitable point. To grip the ware, sub-atmospheric pressure may be applied as the operating medium, and to ensure positive release of the ware, super-atmospheric pressure may be applied. The recess in which the sealing valve 91[a] is seated is inclined on its lower surface, as at 91[d], and vents 91[e] are provided, so that the vacuum will pull downward and outward on the ring 91[a] and the latter conform to the surface contour of the ware and seal uniformly. Vents 93[b] are also provided in the guard 93[a], to permit atmosphere to enter when ware is gripped and prevent a sub-atmospheric condition between the guard and mold and lifting of the entire mold.

As an alternate sealing valve, the annular flap valve 91 shown in Fig. 10 may be adapted to the form of grip head shown by Fig. 8, the valve being suitably secured at its lower portion or edge to the body member 88. When using this form of valve the vents 91[e] may be closed by any of

the forms of plugs or studs 90^c adapted therefor. When the grip head is disposed in operative relation to the ware and sub-atmospheric pressure applied therein, the upper portion of the flap valve 91 will be drawn outwardly against the ware and perform its sealing function, as will be understood. The contact nipples 90^b may also be used in this form of grip head and adapted to contact at three points as in Fig. 10 and with the same objects in view.

Fig. 8*a* illustrates a preferred form of outside grip head for deep ware operable through the application of sub-atmospheric pressure. The valve 91 in this instance operates in a manner substantially as in Fig. 10, and the lower portion thereof being flexible, ensures conformation of the valve to the contour of the ware and sealing of the vacuum. A cushioning means 90^e is suitably secured on the lower surface of the body 88, and as the edges thereof are preferably flexible and unsecured, this member 90^e serves as an additional or alternate sealing and conforming means, and either or both members 91 and 90^e may be used.

Fig. 9 illustrates a method of adapting the grip head for operation through the introduction of air under pressure or super-atmospheric pressure. In this instance the tubular valve 91^a is formed with a snug-fitting nipple portion, as at 91^b, opening into the upper branch passages or ducts 90^a which lead into the main passage or chamber 89^a. The lower outer periphery of the body member has applied thereover flexible means such as rubber as at 91^c, which may be secured against displacement and leakage as for instance by an annular clamping band snugly enclosing the upper portion of the said flexible means 91^c, as shown, and the lower branches or ducts 90^a terminate under this flexible covering 91^c. It will be seen that by applying air under pressure through the main chamber 89^a and ducts 90^a, the flexible means 91^a and 91^c will expand and grip the ware. Either one or both of these expansion gripping means in the form of the valve 91^a and covering 91^c may be used in this form of grip head. The degree of gripping force applied may be varied by suitable reducing valves in the fluid medium supply conduits, not shown, and as ordinarily practiced.

As an alternate construction or in conjunction with either one or both of the expansion means 91^a and 91^c, a series of movable jaws, preferably three, shown in the form of pistons or plungers in Fig. 9 may be used in the form of grip head illustrated by this figure, the body 88 being formed with transverse bores 104 for insertion of pistons or plungers 104^a, preferably three in number as just specified, which are forced outwardly by air under pressure introduced into the chamber 89^a and retracted through the medium of sub-atmospheric pressure or a spring 104^b, which is seated in recesses formed in said plungers or pistons 104^a and adjustably secured thereto as at 104^c. The inner end of each piston is formed with a bore segment, forming a complete bore 104^d, adapted to register with the passage 89^a when the pistons are retracted, and the outer end of each piston is provided with conforming and cushioning contact members 104^e.

As above specified, either one, two or all three of the expansion gripping means 91^a, 91^c and 104 shown in Fig. 9 may be used in the construction of this form of grip head. The flexible covering 91^c operates over an extended surface of the ware and conforms to the contour of such surface. The member 91^a may be in the form of a ring or series of sections of a ring or bulbs instead of the annular form shown.

The limiting or stop member 93^a in Fig. 9 is shown as being slightly modified relatively to Fig. 8, said member extending to the outer peripheral top edge of the mold and shaped as at 96^a, to facilitate centering. Sub and super-atmospheric pressure may be introduced into the chamber 89^a through a bore 89^b formed in the stem 65^a, to respectively release and grip the ware. The grip head may be prevented from contacting with the ware by any suitable means such as an annular member or rubber ring 90^f shown seated in a groove at the upper portion of the said head and which also serves as a cushioning means.

Fig. 9*a* illustrates a modified form of grip head relatively to Fig. 9, adapted to operate exterior of the ware through the application of super-atmosphere. In this instance the expansion member 91^a grips exteriorly of the ware and automatically conforms to the contour thereof, and as in the previous forms shown, this member may be a series of tubular sections or bulbs or the movable jaw construction may be adapted to this grip head.

The form of grip head shown in Fig. 11 illustrates one preferred construction for gripping ware from the side and turning same, to permit access to the interior of the ware and also the greater part of the exterior, for any finishing or other operation that may be desired. In this instance the recessed portion 98 of the body member 88 provides a seat for the head 105^a of a pin or stub shaft 105, said head being also formed with a seat for a spring 107, thus providing a cushioning means between said head 105^a and body member 88 and resiliently maintaining the head 105^a in extended position, said head being squared or rectangular in accordance with the recess 98 in the body member 88, so that the head may cause the body to rotate therewith and at the same time have lateral or horizontal movement in the recessed portion 98. The stem 65 in this instance has secured thereto, or formed integral therewith, a rack guide or bracket 106 for a rack 106^a, the latter having a stud or boss 106^b on one side of the upper extremity thereof for a purpose which will be presently explained. A pinion 107′ is adjustably and removably secured on the stub shaft 105, as at 107^a, the teeth of said pinion being adapted to mesh with the teeth of the rack 106^a. The stub shaft 105 projects through and has bearing in the stem 65 and the projecting extremity thereof is provided with a collar 107^b, adjustable through the medium of a screw 107^c, a stop pin 107^d being threaded or otherwise secured in said collar and adapted to contact with a similar pin 107^e, threaded in the stem 65. That portion of the stem 65 which supports the stub shaft 105 has a threaded bore formed therein, this bore serving to retain in position an adjustable brake assembly in the form of a brake shoe 107^f, spring 107^g and screw 107^h, the screw and spring maintaining the brake shoe in adjustable resilient contact with the stub shaft 105. If desired, notches or shoe-registering indentations 107^i may be formed in the stub shaft 105, for a purpose which will be presently explained. Suitably secured to a stationary part of the frame, such as the platform members 42, and depending therefrom in cooperative adjacency with relation to the grip head assembly just described, I show a bracket 107^j, provided with

screws 107^k and 107^l, adjustable relatively to the stud or boss 106^b on the rack 106^a.

In operation, the grip head assembly shown by Fig. 11 may be adjusted so that the stud or boss 106^b on the rack 106^a moves to a position between the screws 107^k and 107^l of the stationary bracket 107^j when the grip head moves laterally and descends into operative adjacency relatively to the ware to be transferred. By adjusting the screws 107^k and 107^l to increase or decrease the gap therebetween, the distance which the ware may be raised prior to being turned, or to clear the form or mold supporting the ware, may be correspondingly increased or decreased. As the grip head assembly, including the rack 106^a and pinion 107, rises, the boss 106^b contacts with the screw 107^k and causes the latter to turn the pinion 107 and shaft 105 and consequently the grip head and ware, until the assembly is moved laterally, thus moving the boss 106^b out of contact with the screw 107^k, and it is preferred that the collar 107^b be adjusted on stub shaft 105 so that the pins 107^d and 107^e contact at approximately this time. However, the amount of turning movement imparted to the ware may be regulated in a number of ways, as by adjusting the screw 107^k relatively to the distance the assembly is first raised, or by adjusting the collar 107^b on stub shaft 105, or by adjusting the amount of rise imparted to the assembly as a whole, or by combining any two or more of the foregoing adjustments. The brake screw 107^h may be adjusted to prevent back rotative movement of the assembly, and if an additional spotting or positioning means is desired, the indentations 107^i may be formed in the stub shaft 105 to register with the brake shoe 107^f so that approximately at the time the grip head is in its lowermost adjusted position, one of said indentations will register with the brake shoe and hold the grip head firm.

When the grip head deposits the ware at the desired point and rises and moves laterally back to grip another article of ware, it may be adjusted to move the rack boss or stud 106^b to a position between the screws 107^k and 107^l, the lower screw 107^l being adjusted so that when the assembly descends, the boss 106^b contacts with said screw and imparts a stroke to the rack 106^a and rotates the grip head back to its original upright position ready to grip another piece of ware, the stop pins 107^d and 107^e and brake screw and shoe then functioning as in the inverting or turning operation.

From the foregoing, it will be seen that the ware may be inclined to any desired degree for fabricating operations while suspended or may be deposited at a desired point for performing an operation thereon and then re-deposited at its original point of transfer or at another point. Also, the segmental or sectional form of grip head shown by Fig. 11 could be adapted to grip the ware at an intermediate point or at the top or bottom by obvious modifications in structure and any desired number of segmental or sectional forms thereof used in combination.

Figs. 6 and 7 illustrate a preferred form of valve, generally indicated at 108 in Fig. 2, for controlling the introduction of sub or super-atmosphere, or either or both, to the grip head 64, said valve comprising a casing 109, plunger 110, formed with passages 110^a and 110^b, and spring 111, against which the plunger works. A key 111^a, shown in dotted lines, projecting into a groove formed in the side of the plunger 110 serves to prevent angular displacement of said plunger. The casing 109 is formed with ports 112, 113 and 114, the port 112 being adapted for communication with the flexible tube 97 leading to the grip head in the form shown by Fig. 10, the port 113 with a suitable flexible member or tube 113^a leading to a source of application of air under pressure or super-atmosphere or may lead simply to the atmosphere, and the port 114 with a similar member 114^a leading to a source of application of suction or sub-atmosphere, such as a vacuum pump. The upper extremity of the casing 109 is formed with a threaded recess 115, for adjustable insertion of a threaded bolt or stud 116, by which the valve may be supported from a part of the frame 5, said bolt 116 being provided with lock nuts 117, 118 and 118^a, and extending through an enlarged opening 119 in said frame, whereby the valve may be adjusted on said rod and secured in adjusted position and the position of the valve as a whole universally adjusted on said frame, thus enabling accurate adjustment of the valve relatively to a cam 120, which is shown as a preferred means of operating said valve and which will now be described.

The cam 120 is adjustably secured on the shaft 71, see Fig. 2, through the medium of a hub 121 and screw 121^a, said cam being formed with a low part 120^a, a raised part 120^b and a high part 120^c. The shaft 71 is adapted in the present instance to rotate in a counter-clockwise direction, and in the position of the cam and valve as shown in Fig. 6, the forms of grip heads shown by Figs. 8, 8*a*, 10 and 11 will be gripping the ware, or the said grip head chambers 89 or 89^a will have sub-atmospheric pressure or suction applied thereto, the passage 110^b registering with the ports 114 and 112, respectively communicating with a source of application of sub-atmosphere and the grip head. When the cam revolves and the low part 120^a thereof permits the plunger 110 to move outwardly, the passage 110^a registers with the port 112, and at approximately this time the grip head is in a position to release the ware, and this may ensue by applying air under pressure or simply breaking the vacuum by the admission of atmosphere to the chambers 89 or 89^a. When the cam raise 120^b permits the plunger to move to an intermediate position, none of the ports will register, this being the neutral position of the valve to avoid waste of fluid medium. When using the forms of grip head shown by Figs. 9 and 9*a*, the cam may be adjusted so that the low part 120^a contacts with the head of the plunger when the grip head is gripping the ware and the high part 120^c when in a position of release, as will be understood.

It may be desirable to provide for injecting air under pressure or super-atmospheric pressure under the ware on the mold, to facilitate removal of the ware and for other purposes, and Fig. 7 illustrates the valve 108 applied at the lower portion of the chuck spindle, substantially as disclosed in my copending application Serial No. 170,613, filed Feb. 24, 1927, for Method and means for chucking molds in the manufacture of pottery. By referring to said application, this structure may be readily understood, the cam 120 being adjustably secured on the shaft 16 and the flexible member 97^a communicating with a socket formed in the lower frame of the machine and adapted to receive the chuck spindle 26, which may be formed with a longitudinal bore 26^a, said bore communicating with the chuck, which may be formed as disclosed in my copending application above noted. The mold 8 may also be

constructed substantially as disclosed in my copending application just specified, the holes indicated at 8a terminating in vents 8b, thus permitting air under pressure or suction, as found expedient, to be communicated to the under portion of the ware on the mold, and this operation may be readily timed to take place whenever desired, which may be at the time the grip head 64 is acting to raise or lift the ware from the mold.

In some instances it may be desirable to remove or transfer the ware from the mold to a form for a desired operation or operations thereon and then remove or re-transfer the ware back to the same or another mold or form, and for the purposes of illustration, in Fig. 3 the ware transferring means is shown disposed in operative adjacency to a drying chamber, diagrammatically illustrated and generally designated at B. The mold conveying and rotating and reciprocating mechanism illustrated at the lower portion of Fig. 1 may be continued through the drier, and at a desired point the walls of the drier, preferably the top wall thereof, is formed with suitable openings for removal and replacement of the ware passing thereunder on said mechanism. At the left of Fig. 3 a form C is shown simply for the purposes of illustration. A plurality of these forms may be used if desired and disposed on a conveyor 122, as shown in plan view in Fig. 2, and which will be hereinafter described, each of said forms being provided with a cavity or recess of such size as to accommodate the ware to be disposed therein. A conveyor 122' is also illustrated in the drier moving at right angles to the mold conveying and reciprocating mechanism, and the forms C may be secured to the conveyor 122 as by screws 123 and preferably swingably mounted through the medium of trunnions on the conveyor 122' as at 123a. Among other functions, the forms C serve as holders for the ware and a positive spotting means on the conveyor for a desired subsequent fabricating operation.

The structure illustrated in Fig. 3 includes substantially the same essential features as disclosed in Fig. 1, except that the stem 65a carrying the grip head is shown as preferably pivotally mounted on the bar 48 as at 124, a stud 125 being secured in the frame 45 and adapted to intercept the stem above the pivot 124, so that when the stem 65a is caused to move laterally by the cam 72, said stem and grip head will swing in an arc, as from the dotted position in Fig. 3 to a point adjacent the form C. To deposit the ware in the form, the stem and grip head may be swung to a point above the horizontal plane of the form C, then moved laterally above the form and lowered therein and released and the grip head again moved laterally in an opposite direction to clear the form and permitted to swing by gravity to a point above the mold, or the grip head carrying the ware may be swung to a point opposite the form C and moved laterally to slide the ware into the recess provided therefor, the ware then being released or ejected from the grip head and the latter returned laterally to clear the form and permitted to swing free to a point above the mold. The cam 73 is shown in Fig. 3 as being modified relatively to the similar cam illustrated in Fig. 1, to provide for the foregoing operations, but it will be understood that the cams 72 and 73 may be given any desired shape in accordance with the movements to be imparted to the grip head in use. It will of course be obvious that ware could be transferred from the forms C to the molds in the drier, or alternate, that is to say, transfer an article from the mold in the drier to a form on the conveyor 122 and the latter moved a step forward by means which will presently be described, bringing a succeeding form holding ware which may have been given a desired treatment or operation adjacent the grip head, and the latter caused to grip this piece of ware and transfer it back to the drier. Also, by removing the stud 125, the ware may be transferred from the molds passing through the drier or outside thereof to the forms shown on the conveyor 122' in the drier, as will be understood, the transfer operation then being substantially as heretofore described in connection with Fig. 1.

The forms of grip heads shown in Figs. 8 and 9 are particularly adapted for the structure shown in Fig. 3 it of course not being practicable to use the flexible member 103 in the stem 65a. The flexible tube 97 leading from the valve 108 connects with the stem 65a preferably at a point adjacent its pivotal connection and communicates with the bore 89b in said stem.

As heretofore specified, the present invention is not limited to transferring ware from any particular point to another, and in the present instance I have shown conveyors to which the ware may be transferred from the molds, or vice versa, these conveyors being adapted to convey the ware to any point desired or move the ware into operative adjacency to other fabricating mechanism. The conveyors 122 and 122' at the left of Figs. 1, 2 and 3 and at the lower portion of Fig. 3 in the drier may be adapted to support the forms C while the conveyor 122a shown at the right in Figs. 1 and 2 may be adapted to support shallow ware such as plates, saucers, etc. These conveyors may be continuously or intermittently driven, but I prefer to drive same intermittently, and Figs. 4 and 5 illustrate in detail a preferred form of drive which may be synchronized with the operation of the transfer means.

Fig. 4 illustrates a drive which may be used when it is desired to stack a desired number of pieces of ware on the conveyor and then move same a step forward to receive another stack. In this instance the numeral 126 designates a Geneva motion member or wheel, which is adjustably secured on a counter shaft 127 as by a hub 126b and screw 126c, see Fig. 2, said shaft being suitably supported in bearings on the main stationary frame 5. A motion plate 128 is adjustably secured as by a hub 129 and screw 129a on the shaft 85 in operative adjacency to said Geneva wheel 126, said plate being formed with a bracket in which a roller 130 has bearing, said roller being adapted to intermittently engage slots 126a formed in the wheel 126 when the motion plate revolves. A cam 131 is also adjustably secured on the counter shaft 127 as by a hub 132 and screw 132a, see Fig. 2, said cam being adapted to contact with a roller 133, rotatably mounted on a lever 134, a spring 135, which may be adjustably secured to the stationary frame 5 and said lever at a suitable point not shown as regards the frame, serving to maintain the roller 133 in contact with said cam 131. The lever 134 has pivotally secured to its lower extremity an adjustable length ratchet or pawl 136, adapted to intermittently actuate a ratchet wheel 137, secured on one of the bearing shafts 138 for the conveyor 122a. The ratchet wheel 137 is prevented from having movement imparted thereto on the return stroke of the ratchet 136 by a dog 139, pivotally secured to the frame 5 and held against the

wheel by a spring 140. The upper extremity of the bar 134 is adjustably pivoted to the frame 5, as at 134a, Fig. 1, through the medium of the sliding block adjustment heretofore explained.

In operation, the motion plate 128 rotates with the shaft 85 and may be adjusted and timed on said shaft so that it will actuate the wheel 126 at each transfer operation of the frame 45 and cooperating parts, the conveyor remaining stationary until the wheel completes five-sixths of its circuit as shown in the present instance and during which time the roller 133 is gradually moving to the low part of the cam 131 and the ratchet 136 is being retracted. The abrupt rise in the cam 131 then acts on the roller 133 and imparts a stroke to the ratchet 136 and movement to the conveyor.

The cam 131 may have various contours, as for instance, a series of raises and depressions, so that the conveyor would be actuated a number of times during the complete circuit of the wheel 126. Furthermore, the Geneva wheel 126 may have any desired number of slots 126a, to permit dwell of the conveyor for the stacking of the desired number of articles.

Fig. 5 illustrates a preferred form of drive for imparting a step-by-step movement to the conveyor at each transfer operation of the transferring means and is shown applied to the conveyor 122 at the left of Figs. 1 and 2. In this instance the cam and ratchet structure shown in Fig. 4 is substituted by a gear 141, which is adjustably secured on the counter shaft 127 as by a hub 141a and screw 141b, said gear 141 being adapted to drive a smaller gear 142, which is removably secured on the shaft 138 of the conveyor, through the medium of a flexible member or chain 143. It will be seen that at each rotation of the motion plate 128 and resulting movement of the Geneva wheel 126, a step-by-step movement will be imparted to the conveyor through the gears 141 and 142. This operation may be timed by adjusting the motion plate 128 on shaft 85 and also by adjusting gear 141 on counter shaft 127, and by replacing gear 142 with larger or smaller gears, the degree of shift imparted to the conveyor may be varied. This form of drive may also be used for the conveyor 122' in the drier.

The conveyors 122 and 122a may be removably and adjustably supported on the main stationary frame 5 through the medium of hanger brackets 144, particularly shown in Fig. 5, which are secured to said frame by screw bolts 145, universal adjustment being obtained by providing enlarged openings 146 and shims 147. The conveyors may be of any suitable type adapted for the purpose.

The ware transferring means may be driven independently from the upper shaft 85, but it is preferred to drive from the lower shaft 12 and transmit power to the shaft 85 through the medium of suitable flexible members 149 and pulleys or sprockets 150, adjustably secured on shafts 12 and 85 and by which the movement of one shaft may be synchronized relatively to the other.

Figs. 12, 13 and 14 illustrate diagrammatically methods of arranging the ware transferring structure in parallel and series and also indicate that various forms and sizes of ware may be transferred simultaneously or approximately simultaneously. It will be noted in Figs. 13 and 14 that a multiple of grip heads, adapted for both deep and shallow ware and different sizes of ware, are supported by the bar 48, thus providing for operation simultaneously and as a unit, the supporting frame 148 being broken through to indicate that same may be of any length desired.

From the foregoing the operation of the ware transferring means should be apparent and a brief summary thereof should suffice. In Fig. 1 the grip head 64 at the right is shown transferring plates from the molds 8, shown in dotted lines in trays 7, and stacking them on the conveyor 122a, while the grip head at the left of Fig. 1 is shown transferring deep ware from the molds and depositing them in the forms C on conveyor 122, the frame 45 for actuating the latter grip head being in raised position. As will be understood by referring to Figs. 4 and 5, the drive for the conveyor 122a may be timed to impart a step movement thereto after a number of plates have been stacked thereon, while the conveyor 122 may be moved a step at each transfer operation. When the cam 73 shown in Fig. 1 revolves further, it will raise the frame 45, carrying the pick-up assembly including the grip head 64 therewith, the cam 72 then contacting with the bracket 59 and sliding the bars 48 and 55 and consequently the said assembly laterally to a point above the mold 8. The cam 17 on shaft 16 and lever 18 may be adjusted and timed so as to cause the chuck to rise through the tray and elevate the mold approximately at the time the grip head is being lowered, preferably so that the chuck and mold carrying the ware or article of pottery will have reached their highest adjusted position of rise just prior to contact with the grip head. However, if desired, the mold need not be elevated, the grip head then being adjusted to lower a distance sufficient to operatively contact with the ware on the mold. The cam 120, controlling the operation of the valve 108, may be adjusted so that at approximately the time of contact of the grip head with the ware, the high part 120c of said cam will permit the passage 110b to register with ports 112 and 114, thus permitting the application of sub-atmosphere to the grip head in the forms shown by Figs. 8, 8a, 10 and 11 and gripping of the ware. If there is a tendency of the ware to stick, or if found otherwise advantageous, the valve controlling application of super or sub-atmospheric pressure to the underside of the article of pottery on the mold through the spindle 26 may be caused to operate at this time, thus facilitating removal of the ware from the mold. The double cam 73 in Fig. 1 then causes the grip head to rise, carrying the ware therewith, the cam 72 then moving same laterally and cam 73 again acting to lower the grip head. The low part 120a of cam 120 then causes registration of ports 112 and 113 of valve 108, breaking the vacuum of the grip head chamber, thus releasing the ware, or, if desired, the ware may be forcefully released or ejected by the application of air under pressure. The grip head may then be returned for another piece of ware and at which time the cam raise 120b maintains the valve in its neutral position.

The foregoing operation will of course be varied in accordance with the particular type of ware being transferred and grip head used and is simply set forth for the purposes of illustration. It will also be obvious that a fluid medium other than that specified herein could be employed in operating the ware pick-up device within the scope of the invention.

What is claimed as new is:

1. In apparatus of the class specified, a prime moving means, a ware pick-up device, and adjustable lever means interposed between said

prime moving means and device for defining the path traversed by the latter, said lever means being provided with shiftable mounting connections which are adjustable during travel of said device.

2. In apparatus of the class specified, a main frame, a ware pick-up device, members supported by said frame for movement at substantially right angles to one another for carrying said device, and levers for controlling the movement of said members, said levers being provided with shiftable pivoted mountings which are adjustable to vary the throw of said levers during the travel of said pick-up device.

3. In apparatus of the class specified, a support, a pick-up device movably mounted thereon, cam means for actuating said pick-up device, and means for adjusting said support in transverse directions during the operation of said device to define the path traversed by said device.

4. In apparatus of the class specified, a support, a pick-up device mounted for swinging movement on said support, a cam and driving connections between it and the said device for first swinging said device on said support, and a cam and driving connections between it and the support for subsequently moving said support and device in a rectilinear direction to a point of deposit.

5. In apparatus of the class specified, a support, a pick-up device pivotally mounted thereon, means for moving said support rectilinearily in one direction to lift ware from a mold, means for moving said support rectilinearily in a direction transverse to said first mentioned direction of movement and simultaneously swinging said device about its pivot, and means for adjusting the length of both of the rectilinear movements of said support during the operation of the device.

6. Apparatus of the class specified, the combination with a fluid pressure operated ware pick-up device, of a mold having a chamber adapted to be closed by contact with the ware, valve means for admitting fluid under super-atmospheric pressure to said chamber to assist in the removal of the ware, and means for synchronizing the operation of said valve means with the operation of said pick-up device.

7. Apparatus of the class specified comprising, in combination, a main frame, mold conveying means, chambered ware pick-up devices, ware conveyors, means for driving said latter conveyors in timed relation with said mold conveying means, valve means for admitting a fluid medium to said ware pick-up devices, and a means for imparting transfer movements to said pick-up devices, said means being adjustable while in operation to position said devices relatively to the mold conveying means and ware conveyors.

8. In apparatus of the class specified, the combination with an article of ware to be transferred, of a grip member, means for positioning said member adjacent said article, means for causing said member to grip said article, means for actuating said member to transfer the ware to a point of deposit, means for inverting or partially inverting the article during transfer thereof, and adjustable screw-operated cam means operable during the actuation of the inverting means for adjusting the degree of inversion of the article.

9. In apparatus of the class specified, the combination with a stationary frame, of a supplemental frame carried thereby, cam operated lever means for moving said supplemental frame vertically on said stationary frame, a support carried by said supplemental frame, cam operated lever means for moving said support horizontally on said supplemental frame, a ware gripping device carried by said support, and means for adjusting the position of the fulcrums of the cam operated levers, said means being operable during actuation of said frame and said support by said levers.

10. In apparatus of the class specified, the combination with a main stationary frame, of a supplemental frame carried thereby, cam operated lever means for moving said supplemental frame on said main frame, a support carried by said supplemental frame, cam operated lever means for moving said support on said supplemental frame, a ware grip device carried by said support, and means for adjusting the position of the fulcrums of the cam operated levers, said means being operable during actuation of said frame and said support by said levers.

11. In apparatus of the class specified, the combination with a main stationary frame, of a supplemental frame vertically slidably mounted on said stationary frame, slide members mounted in said supplemental frame, a ware grip member supported from said slide members, and cam means mechanically engaging said supplemental frame and slide members for imparting reciprocating movements having components in two coordinate directions to said supplemental frame and slide members.

12. In apparatus of the class specified, a main stationary frame, a supplemental frame movably mounted on said stationary frame, a ware grip device provided with a cam-shaped stem, means for supporting said device, said means being movably mounted on said supplemental frame and said stem being pivotally mounted on said supporting means, and a contact device mounted in the path of movement of said stem.

13. In apparatus of the class specified, a main stationary frame, a supplemental frame mounted to slide vertically on said main frame, a ware grip device provided with a cam-shaped stem, slide members mounted in said supplemental frame and slidable at right angles thereto, said stem being pivotally mounted on one of said slide members, and a contact device secured in said supplemental frame and adapted to contact with said stem.

14. In apparatus of the class specified, a main stationary frame, a vertically reciprocating supplemental frame mounted thereon, a ware-grip device supported from said supplemental frame, drive means for reciprocating said supplemental frame, and adjustable screw-operated cam means for adjusting the extent of reciprocation of said supplemental frame, said adjustable screw-operated cam means being operable while the frame is being reciprocated by the drive means.

15. In apparatus of the class specified, a main stationary frame, a supplemental frame movably mounted thereon, a ware-grip device, means for supporting said device, said means being movably mounted on said supplemental frame, cam means for imparting reciprocating movements having components in two coordinate directions to said supplemental frame and said supporting means to thereby impart transfer movements to said grip device, and means for adjusting the reciprocation of said supplemental frame and said supporting means during movement of said grip device.

16. In apparatus of the class specified, a carriage, a ware pick-up device supported therein for substantially unresisted vertical movement relatively to the carriage, means for moving the

carriage and pick-up device to and fro in a predetermined path between ware receiving and ware delivery stations, means for adjustably locating the ends of said path, and means for raising and lowering the carriage whereby gentle arrest of the pick-up device at either station is effected by means of s id unresisted movement of the pick-up device.

17. An apparatus for transferring fragile ware, comprising a carriage, means for moving the carriage vertically, means for moving the carriage horizontally, a ware pick-up device freely slidably mounted on the carriage for vertical movement, and means for counterbalancing the ware pick-up device to eliminate collision shock between the ware pick-up device and fragile ware when the carriage is lowered in the direction of the ware to be transferred.

18. In an apparatus for handling fragile ware, a carriage, means for bodily reciprocating the carriage vertically, a ware pick-up device, and means for floatingly mounting the ware pick-up device on the carriage for substantially unresisted vertical movement relatively to the carriage, whereby the pick-up device may be gently moved into contact with the fragile ware to be handled.

19. In an apparatus for handling fragile ware, a carriage, means for bodily reciprocating the carriage vertically, a ware pick-up device, and means for floatingly mounting the ware pick-up device on the carriage for substantially unresisted vertical movement relatively to the carriage, said last-named means including a counterweight associated with the pick-up device, whereby the pick-up device may be gently moved into contact with the fragile ware to be handled.

20. In an apparatus for handling fragile ware, a carriage. means for bodily reciprocating the carriage vertically, a ware pick-up device, and means for floatingly mounting the ware pick-up device on the carriage for permitting continued movement of the carriage after establishment of contact between the pick-up device and the ware, said last-mentioned means including adjustable means for counteracting the weight of the pick-up device sufficiently to substantially eliminate pressure at the contact surface.

21. In an apparatus for handling fragile ware, a carriage, means for bodily reciprocating the carriage vertically, a ware pick-up device, means for floatingly mounting the ware pick-up device on the carriage for substantially unresisted vertical movement relatively to the carriage, whereby the pick-up device may be gently moved into contact with the fragile ware to be handled, and means for moving said carriage to and fro in a predetermined path between ware receiving and ware delivering stations having ware locating surfaces.

22. In an apparatus of the class specified, the combination of means for supporting ware, a pick-up mechanism for lifting and depositing the ware articles, said pick-up mechanism comprising a carriage, means for bodily reciprocating the carriage vertically, a ware pick-up device, means for floatingly mounting the ware pick-up device on the carriage for substantially unresisted vertical movement relatively to the carriage, whereby the pick-up device may be gently moved into contact with the fragile ware to be handled, a conveyor intermittently movable in the range of action of the pick-up device, means for moving said pick-up device to and fro between the means for supporting ware and the conveyor, and means for adjusting the duration of dwell between successive movements of the conveyor to the extent required for a plurality of ware depositing movements of the pick-up device whereby articles are stacked on the conveyor.

23. In an apparatus of the class specified, the combination of means for supporting ware, a pick-up mechanism for lifting and depositing the ware articles, said pick-up mechanism comprising a carriage, means for bodily reciprocating the carriage vertically, a ware pick-up device, means for floatingly mounting the ware pick-up device on the carriage for substantially unresisted vertical movement relatively to the carriage, whereby the pick-up device may be gently moved into contact with the fragile ware to be handled, a conveyor intermittently movable in the range of action of the pick-up device, means for moving said pick-up device to and fro between the means for supporting ware and the conveyor, means for adjusting the duration of dwell between successive movements of the conveyor to the extent required for a plurality of ware depositing movements of the pick-up device whereby articles are stacked in the conveyor, and means for adjusting the extent of each movement of the conveyor to vary the distance between the stacks of ware deposited thereon in accordance with the diameter of the ware.

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