April 3, 1934. F. T. MAY 1,953,492

COMBINATION BUTT SEALING AND EXHAUST MACHINE

Filed Feb. 5, 1929 5 Sheets-Sheet 1

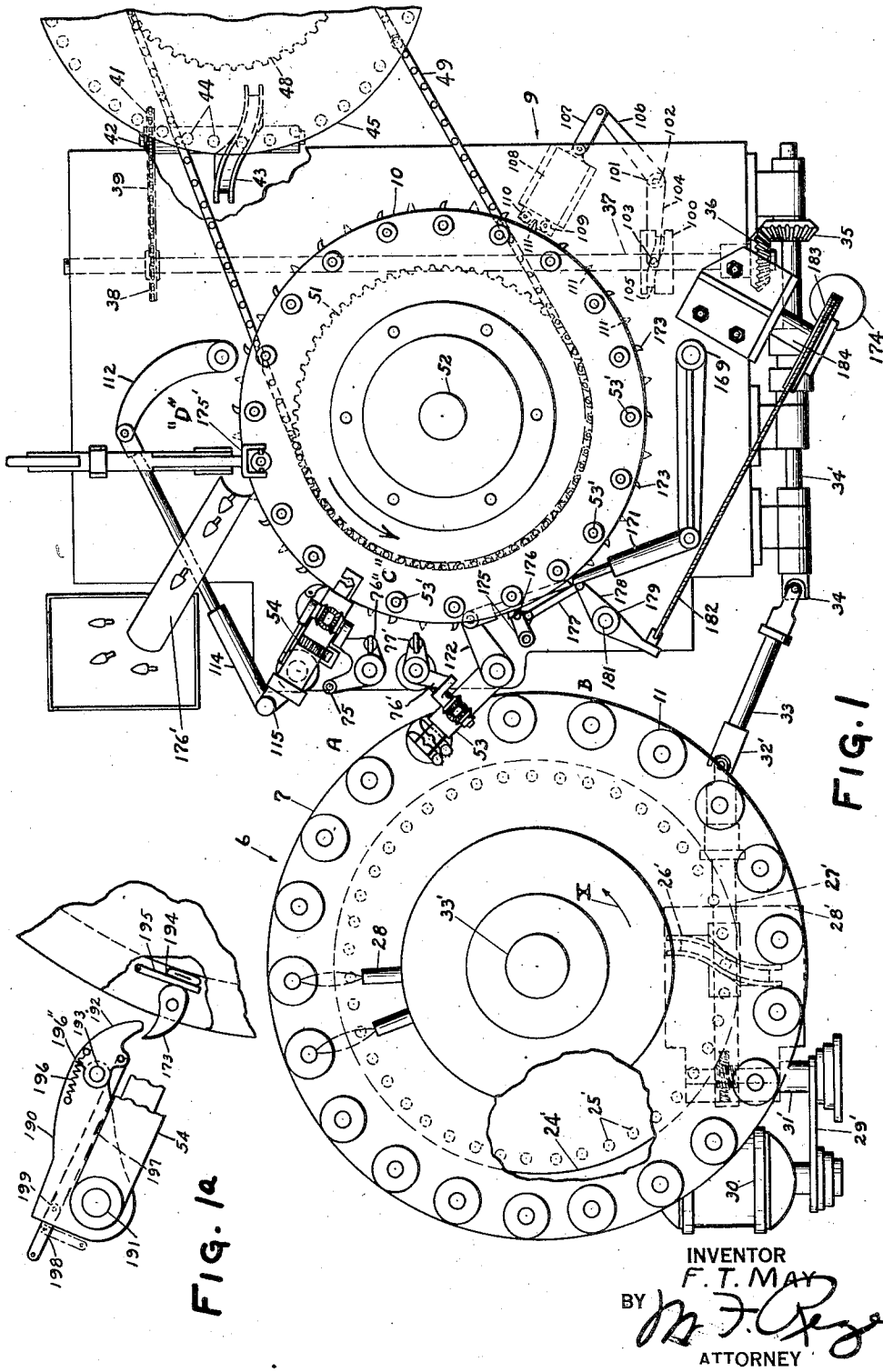


FIG. 1



FIG. 1a

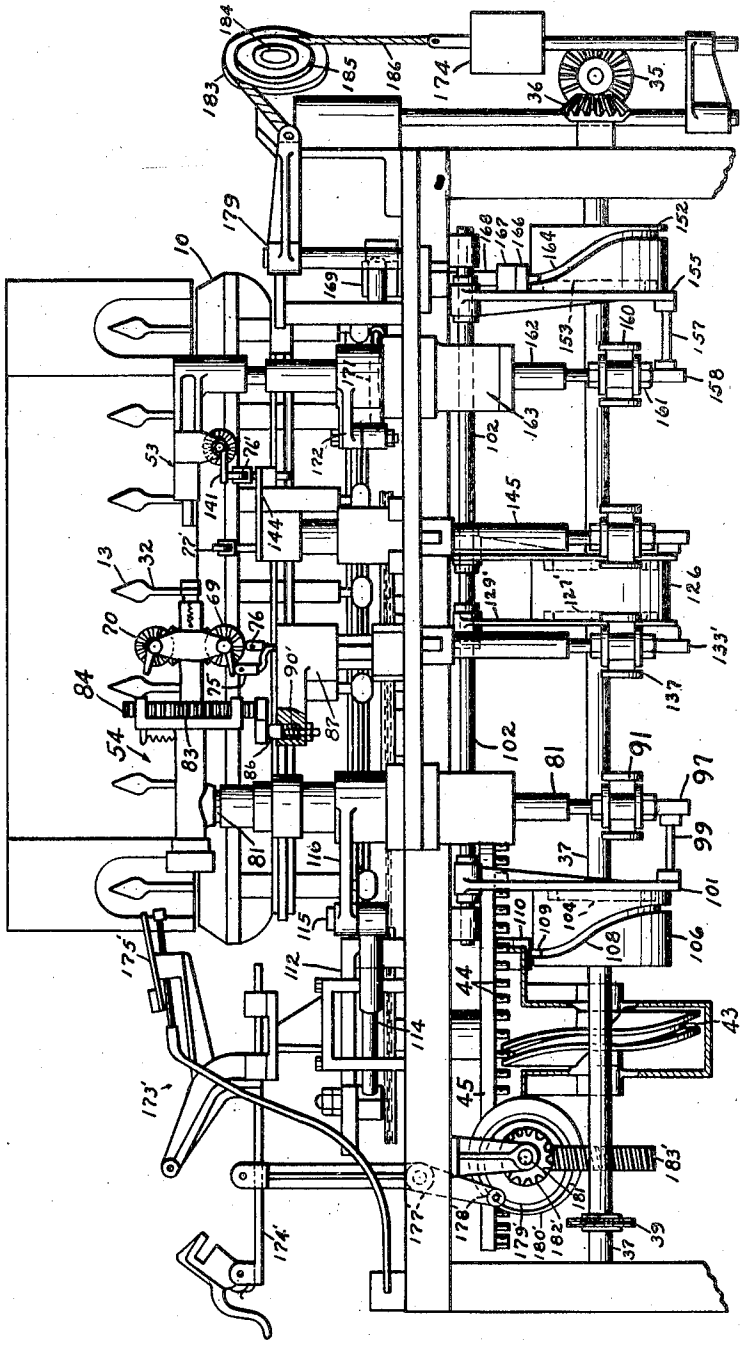
INVENTOR
F. T. MAY
BY
ATTORNEY

April 3, 1934. F. T. MAY 1,953,492

COMBINATION BUTT SEALING AND EXHAUST MACHINE

Filed Feb. 5, 1929 5 Sheets-Sheet 2

FIG. 2

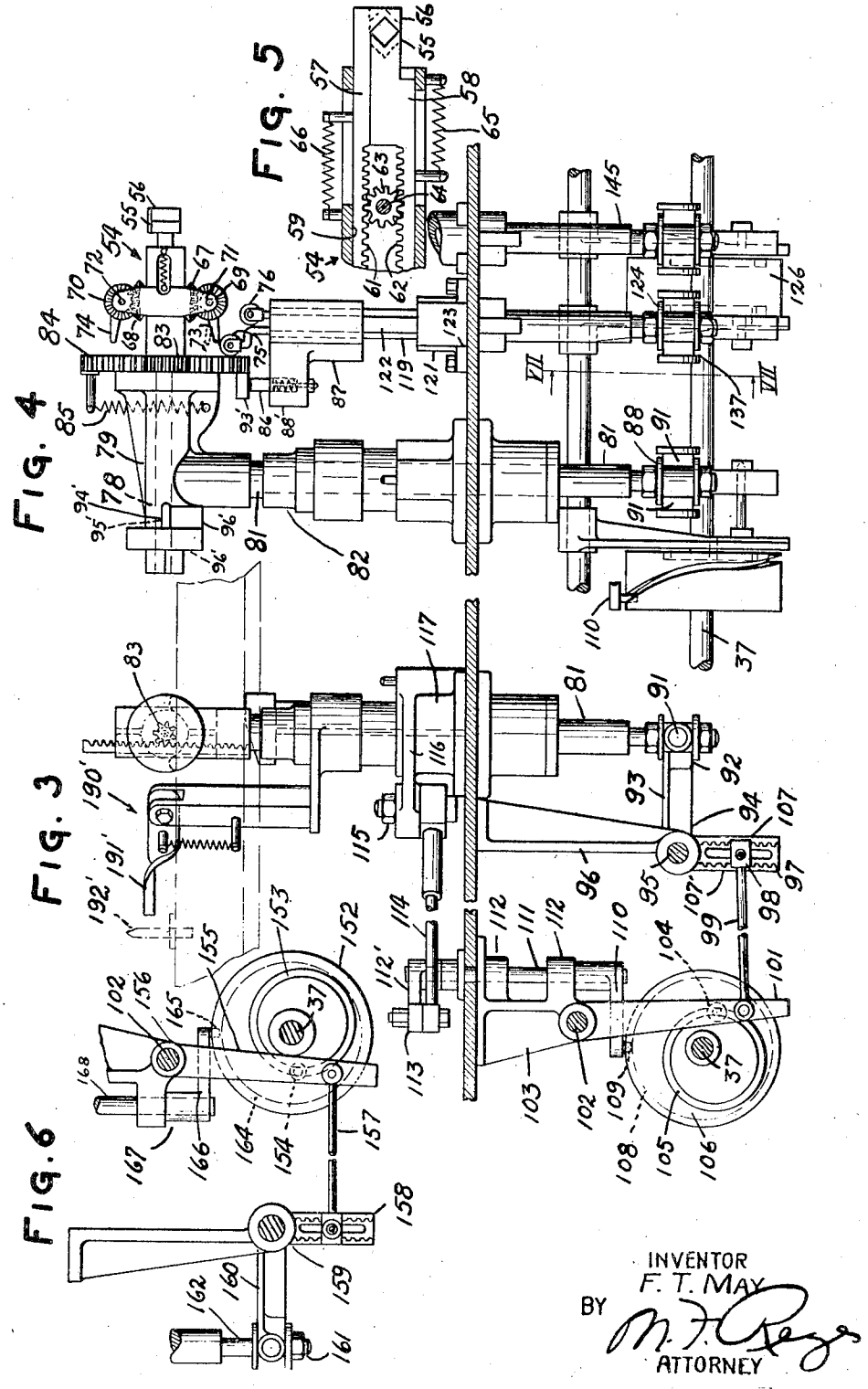


INVENTOR
F. T. MAY
BY
ATTORNEY

April 3, 1934. F. T. MAY 1,953,492

COMBINATION BUTT SEALING AND EXHAUST MACHINE

Filed Feb. 5, 1929 5 Sheets-Sheet 3



INVENTOR
F. T. MAY
BY
ATTORNEY

April 3, 1934. F. T. MAY 1,953,492

COMBINATION BUTT SEALING AND EXHAUST MACHINE

Filed Feb. 5, 1929 5 Sheets-Sheet 4

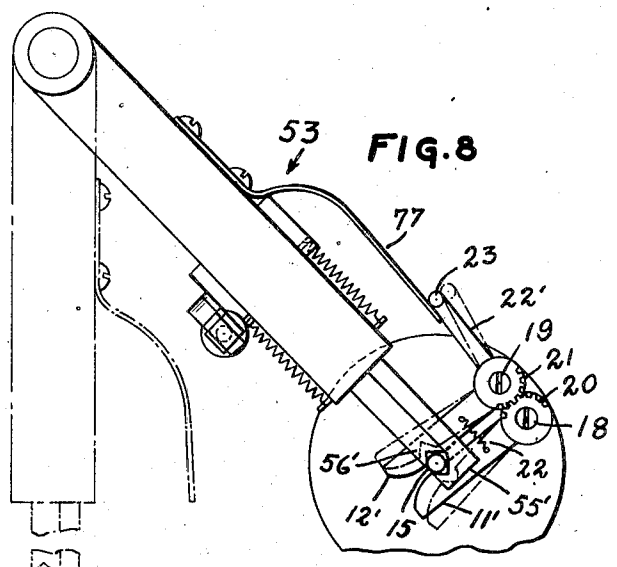



FIG. 8

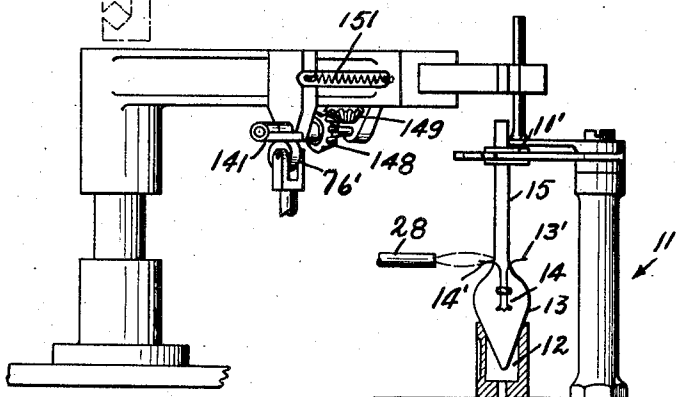



FIG. 7

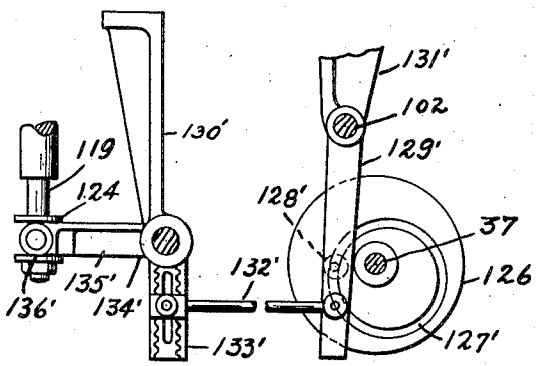
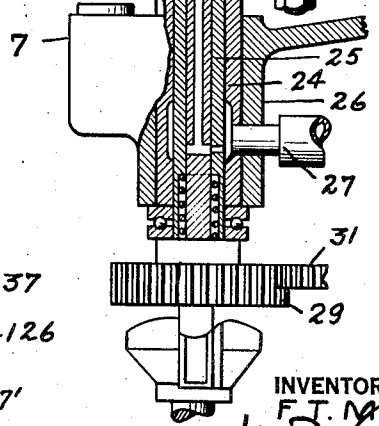



FIG. 7a




INVENTOR
F. T. MAY
BY
ATTORNEY

April 3, 1934. F. T. MAY 1,953,492

COMBINATION BUTT SEALING AND EXHAUST MACHINE

Filed Feb. 5, 1929 5 Sheets-Sheet 5

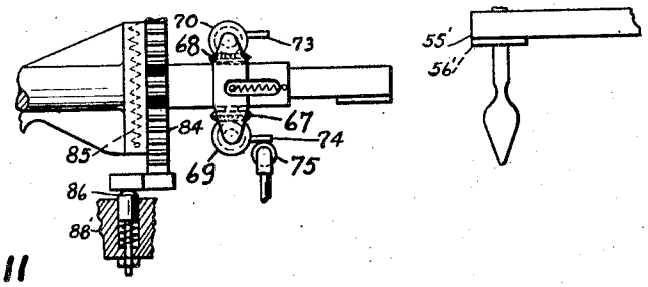



FIG. 11

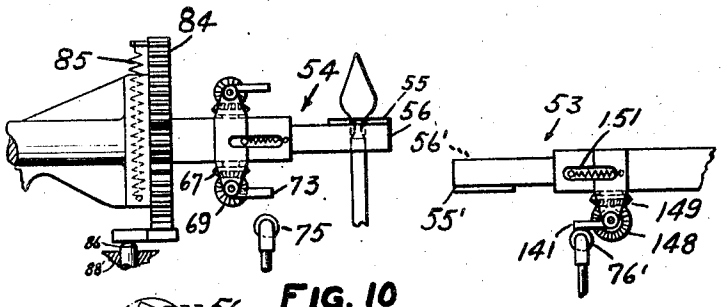



FIG. 10

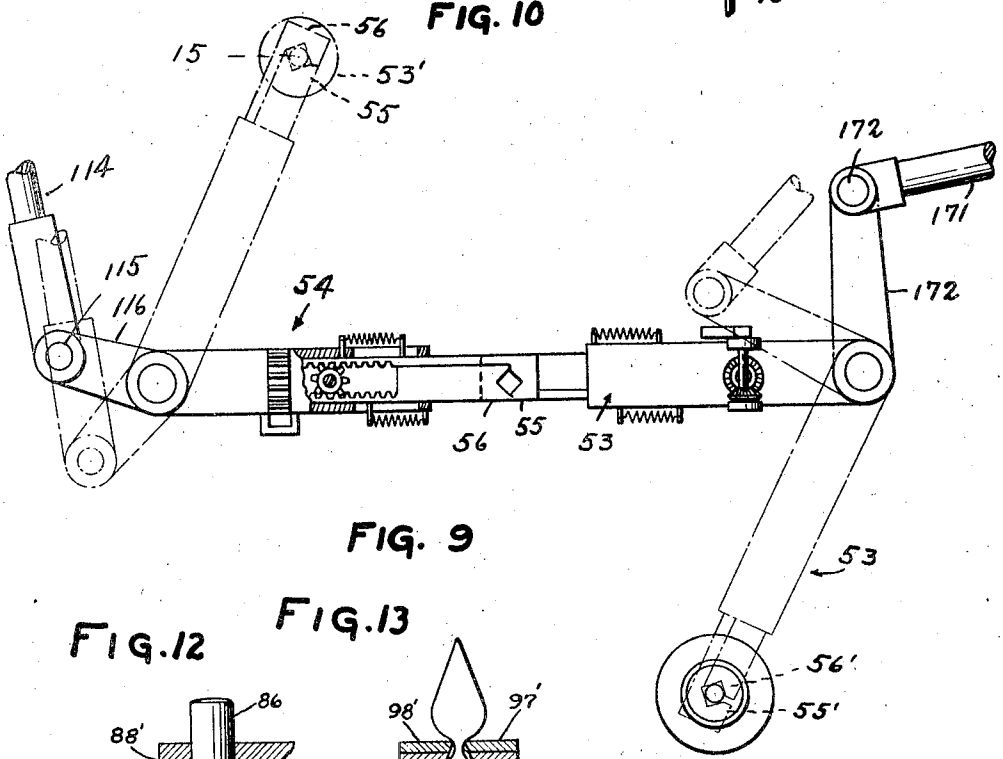



FIG. 9

FIG. 12

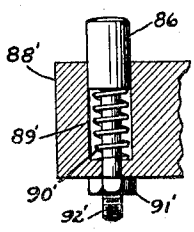



FIG. 13




INVENTOR
F. T. MAY
BY
ATTORNEY

Patented Apr. 3, 1934

1,953,492

# UNITED STATES PATENT OFFICE

1,953,492

## COMBINATION BUTT SEALING AND EXHAUST MACHINE

Frederick Theodore May, Montclair, N. J., assignor to Westinghouse Lamp Company, a corporation of Pennsylvania

Application February 5, 1929, Serial No. 337,632

5 Claims. (Cl. 176—2)

This invention relates to a machine for manufacturing incandescent electric lamps and relates more particularly to the operations of sealing-in and exhausting lamps of the miniature type.

The manufacture of incandescent electric lamps includes the production of lamps of small size termed miniature lamps. Miniature lamps include a bulb having a relatively short neck portion and the internal structure of the lamp includes a filament connected to a pair of lead wires separated by a glass bead. This internal structure is called the mount, and in the making of a miniature lamp in certain types of machines the bulb portion is disposed in a holder comprising a socket connected with a conduit so that when the bulb is in position it may be so held by creating a vacuum in the socket. The bulb is disposed with the neck portion upwardly and the filament portion of the mount is positioned within the bulb and with the lead wires of the mount extending over the edges of the bulb neck. When the bulb and mount are thus supported an exhaust tube having substantially the same diameter as the neck portion of the bulb, is disposed with one of its ends in contact with the neck so that the extending lead wires are compressed between the bulb neck and the exhaust tube. Heat is then applied to the adjacent portions of the bulb neck and exhaust tube until these two elements become united by fusion at the same time sealing the lead wires in the fused portion. This operation is called butt-sealing, and the lamp a butt-sealed lamp.

The above operation is termed the sealing-in operation and as pointed out is performed with the exhaust tube extending upwardly in a vertical direction. It then becomes necessary to transfer the sealed-in bulb to a machine for performing an exhausting and what is termed, a tipping off operation. Heretofore butt sealed lamps of the above type were produced on a sealing-in machine and transferred in bulk to an exhaust machine.

When attempting to individually transfer the sealed-in bulbs to an exhaust machine, difficulty was encountered by reason of the fact that in the exhaust machine the exhaust tube of the bulb is inserted into a port on a horizontal conveyor which necessitates complete reversal of the position of the bulb from the position it occupied in the sealing-in machine.

It is an advantage, however, to be able to combine the butt-sealing machine with the exhaust machine and an object of the present invention is therefore to provide mechanism whereby a sealed in lamp may be automatically transferred from one machine to the other.

Another object of the invention is to provide bulb handling mechanism operable in timed relation with a sealing in and exhaust machine so as to transfer a sealed in bulb from one machine to the other for the sequential performance of the sealing-in and exhausting operations.

Other objects and advantages of the invention will be evident from the following description together with the accompanying drawings in which,

Fig. 1 is a plan view of an exhaust machine and a portion of a sealing in machine, certain parts being broken away to more clearly show internal mechanism.

Fig. 1[a] is a fragmentary detail view of valve closing mechanism carried on a transfer arm.

Fig. 2 is a side elevational view of an exhaust machine with the present invention applied thereto.

Fig. 3 is a fragmentary view of mechanism for transferring a bulb from one machine to another.

Fig. 4 is a front view of the mechanism shown in Fig. 3.

Fig. 5 is a detail view partly in section showing jaw operating mechanism.

Fig. 6 is a fragmentary side view showing mechanism for raising and lowering one of the transfer arms.

Fig. 7 is a fragmentary view of a portion of a sealing in machine showing a sealing in head partly in section with a bulb therein and a portion of the mechanism for transferring the bulb to an exhaust machine.

Fig. 7[a] is a view taken on line VII—VII in Fig. 4.

Fig. 8 is a plan view of an oscillatory arm for transferring a bulb from a sealing in machine to a bulb receiving arm of an exhaust machine.

Fig. 9 is a plan detail view showing bulb transfer arms, portions of one of the arms being broken away to show jaw actuating mechanism.

Fig. 10 is a side view of a pair of arms showing their positions with respect to each other for the transfer of a bulb.

Fig. 11 shows a pair of arms in transfer position, one arm being ready to grip the bulb and the other arm ready to release the bulb.

Fig. 12 is a detail sectional view of a portion of a cross-head having a spring controlled plunger therein, and

Fig. 13 is a detail view of a lamp held between jaws ready to be inserted in an exhaust machine, the jaws being shown in cross section.

Although the present invention may be employed in connection with the handling of objects of various shapes, it is shown and described herein as applied to the transfer of a lamp bulb from one machine to another.

A practical embodiment of the invention may comprise a sealing-in machine 6 having a conveyor 7 disposed adjacent to an exhaust machine 9 having a conveyor 10. The said sealing-in machine may be of the type having holders 11 in which a bulb is held in a suction cup 12 (see Fig. 7) and an exhaust tube is supported in jaws 11' and 12'.

These holders for the bulb and exhaust tube are called heads and as shown a head may comprise the suction cup 12 to receive a bulb 13, a mount 14 is then positioned with the lead wires 13' and 14' thereof resting on the bulb neck, an exhaust tube 15 is then secured by jaws 11' and 12' with an end adjacent to the edge of the bulb neck, lead wires 13' and 14' of the mount 14 are disposed between and in contact with the bulb neck and exhaust tube 15. The said jaws are pivoted at the ends of posts 18 and 19 respectively. The hubs of the jaws having meshing pinions 20 and 21 and spring 22 normally urges the jaws together to grip the exhaust tube 15 when disposed therebetween.

Extending from hub 21 is an arm 22' having an upwardly projecting finger 23 to be engaged by means (to be later described) for opening the jaws to release the exhaust tube. The heads 11 may be of any suitable number positioned in spaced relation around the periphery of the conveyor 7 of the sealing-in machine. Each head is provided with a spindle 24 having therein a hollow shaft 25 rotatable in a hub 26 integral with the conveyor 7. An air duct 27 is provided for creating a vacuum in the cup 12 and means are also provided for rotating the head when disposed adjacent to fires 28 to seal the bulb to the exhaust tube. The mechanism for rotating each head may comprise a gear wheel 29 connected to the lower end of the shaft 24 in mesh with a gear 31 driven by suitable means (not shown). Means for moving the shaft 24 downwardly are also provided so that after the exhaust tube and bulb have been united the fused portion is stretched to form constriction 32 as shown in Figs. 10 and 11 to facilitate the tipping off operation.

The above described mechanism for butt-sealing is the same as commonly employed in lamp making except the arm 22' and finger 23 are provided which adapt this type of machine for use in connection with the present invention.

The butt-sealing machine operates to complete the glass working operation in the making of a lamp and it is then necessary to transfer the lamp to the exhaust machine.

The exhaust machine 9 may be of any suitable type and disposed in operative relation to the sealing-in machine 6 which may be of any standard type as employed in lamp manufacture and the conveyor 7 may be mounted for rotation on a central shaft 33'. The underside of the conveyor is provided with an intermittent driving mechanism including a plate 24' having pins 25' disposed in circular and spaced relation to be engaged by a peripherally grooved cam 26', secured to a shaft 27'. The cam when rotated engages the pins successively and imparts an intermittent movement to the conveyor. The shaft 27' on which the cam 26' is mounted is an element of a reduction gear box 28'. Motion is supplied by a motor 30 connected by a belt 29' with a shaft 31' extending from the gear box 28'.

The shaft 27' upon which the cam 26' is secured is connected by a coupling 32' with a link 33 which in turn is coupled at 34 to a secondary driving shaft 34'. The shaft 34' is provided with a bevel gear 35 in mesh with a bevel gear 36 at one end of a counter shaft 37. The shaft 37 extends across the entire length of the exhaust machine 10 and has mounted thereon a plurality of cam elements for actuating portions of the mechanism to be later described. These cam elements and connecting lever members have been omitted in Fig. 1 for the sake of clearness but are shown in Figs. 3 to 6.

The shaft 37 is also provided with a sprocket wheel 38 connected by a chain 39 with a sprocket wheel 41 secured to a shaft 42 upon which is secured a peripherally grooved cam 43 so disposed as to engage pins 44 (see Fig. 1) depending from a plate 45 secured to a vertical stub shaft (not shown) which may be supported in the framework of the exhaust machine.

A toothed wheel 48 may be secured to the stub-shaft upon which the plate 45 is secured and may be rotatable therewith. For the purpose of transmitting motion to the conveyor 10 of the exhaust machine an endless chain 49 is provided which chain is led over the wheel 48 and a toothed wheel 51 movable with the conveyor 10 about a vertical shaft 52. The conveyor is provided with a plurality of so called exhaust ports 53' into which the exhaust tubes 15 of lamps to be evacuated are inserted. The exhaust ports consist of orifices having rubber sleeves to receive and hold the exhaust tubes. Each port connects with the vacuum apparatus comprising the usual valves and pumps (not shown).

The exhaust machine may be of any suitable type and the above general description will be fully comprehensive to anyone skilled in the art.

Having now set forth a sealing-in machine and an exhaust machine the mechanism for transferring a lamp from one machine to the other will be more clearly understood.

The transfer mechanism may comprise a pair of arms 53 and 54 (see Figs. 9 and 10). Both arms are, in the present construction, mounted on the exhaust machine and arm 53 may be termed the delivery-arm and the arm 54 the receiving-arm.

The receiving arm 54 is the most complicated and will therefore be first described; the mechanism is, however, duplicated in the delivery arm. The receiving arm 54 may comprise a pair of jaws 55 and 56 as shown in Fig. 5. The jaws for the delivery arm 53 are also of the same construction as those shown in Fig. 5. These jaws are disposed at the ends of slide rods 57 and 58 respectively, slidable in a slot 59 in the arm. The slide rods are provided with racks 61 and 62 in mesh with a pinion 63 at one end of a shaft 64. Springs 65 and 66 serve to hold the jaws normally closed.

The shaft 64 extends from opposite sides of the arm 54 and is provided with bevel gears 67 and 68 in mesh with bevel gears 69 and 70 respectively, the said gears being mounted on stub shafts 71 and 72 supported in bearing brackets secured to the arm 54. The shafts 71 and 72 are provided with fingers 73 and 74 for engagement with push rods or lifter members 75 and 76 which operate to engage the said fingers to open the jaws 55 and 56 when the arm 54 is in posi-

tion to grip an exhaust tube of a lamp transferred from a head 11 of the sealing-in machine by the delivery arm 53 and to release a lamp after deposit in an exhaust port.

Referring to the delivery arm 53 it will be noted as above mentioned that lamps are positioned in the sealing-in machine with the exhaust tubes uppermost and means are therefore provided to carry the arm 53 above the exhaust tube after which it is lowered and moved toward the exhaust tube at which time jaws 55' and 56' (see Figs. 7 and 8) are opened by a movement of push rod 76' (see also Fig. 2) the operation of which will be later described. As the arm 53 moves toward a head 11 a resilient member 77 attached to the arm engages the projecting finger 23 of the head and opens the jaws 11' and 12' to release the exhaust tube, the bulb 13 having been released from the pocket by the opening of a valve (not shown) to destroy the vacuum in the pocket. This operation may be performed at any time subsequent to the sealing-in operation since the jaws 11' and 12' will support the lamp.

After the jaws 55' and 56' of the arm 53 embrace the exhaust tube the push rod 76' descends and permits the jaws to close and secure the lamp. The arm 53 is then raised to lift the bulb 13 from the pocket or cup 12 and is moved to position to deliver the lamp to the arm 54. Mechanism for causing this oscillatory movement of arm 53 will be later described.

After the arm 54 has received a lamp it is actuated to reverse the position of the lamp, that is the arm rotates one hundred and eighty degrees. Mechanism for causing this rotation may comprise a spindle 78 (see Figs. 3 and 4) journaled in a bearing 79 secured to the upper end of a shaft 81 which latter is movable in a guide-bearing 82. The spindle 78 constitutes an extension of the slotted portion of the arm in which the slidable jaws are carried. The shaft 78 is provided with a gear wheel 83 disposed in mesh with a vertical rack 84. The said rack is supported to slide vertically and is normally held in a lower position by a spring 85 thus by reason of the gear wheel 83 the jaws 55 and 56 will be retained in a normal position so as to be ready to be disposed about an exhaust tube. It will, therefore, be evident that a movement of the rack 84 will cause a rotation of the gear wheel 83 with a consequent bodily rotation of the jaws 55 and 56.

Means for causing a movement of the rack 84 may comprise a spring controlled plunger 86 (see Figs. 2 and 4) carried on a movable cross-head 87, which is reciprocated vertically by mechanism to be later described. The said head is provided with an arm 88' having an aperture 89' (see Fig. 12) in which a helical spring 90' is disposed so as to normally urge the plunger 86 upwardly. The upward movement of the plunger is limited by a stop nut 91' on a lower end 92' of the plunger which extends through the arm 88'.

When the cross-head is raised the plunger 86 engages an offset piece 93' (see Fig. 4) on the rack 84 and as the head rises the rack is moved causing the pinion 83 to rotate the shaft 78 and consequently the jaws 55 and 56 one hundred and eighty degrees. After this degree of movement the rotation of the shaft 78 is terminated by a stop-pin 94' extending from a collar 95' secured to the shaft 78. The said stop-pin engages one of a pair of stops 96' at opposite sides of the shaft 78.

The construction is such that the spring 90' which controls the plunger 86 is of greater strength than the spring 85 controlling the rack. The plunger may therefore actuate the rack 84 without reaching the end of its movement. Thus the plunger may be maintained in engagement with the rack while the cross-head continues to move upwardly to engage the push rod 75 with the finger 73 to open the jaws 55 and 56 as above set forth. From the above it will be evident that as the arm 54 is moved to position to receive a lamp the jaws 55 and 56 are first rotated as a whole. As soon as the jaws grip a lamp they again rotate in an opposite direction as the cross-head 87 moves downwardly and thus reverse the position of the lamp preparatory to its transfer to position for insertion in an exhaust port 53'. In order to securely hold a lamp for an insertion of the exhaust tube thereof into an exhaust rubber the jaws 55 and 56 are provided as shown in Fig. 13 with gripper plates 97' and 98' which secure the lamp at the constricted portion 32 thus the lamp is prevented from slipping when the exhaust tube is forced into the rubber of an exhaust port 53'.

When operating, the arm 54 is first raised and then oscillated. For the purpose of causing this oscillation the shaft 81 is provided with a collar 88 having an annular groove to receive pins 91 of a bifurcated end 92 of an arm 93 (see Fig. 3) of a bell-crank 94 which is pivoted at 95 on a bearing-bracket 96. An arm 97 of the bell-crank is pivotally connected at 98 by a link 99 to a crank 101 pivoted at 102 in a depending bearing 103. Intermediate the pivot point 98 and the pivot point 102 of the crank is a crank pin 104 movable in a cam slot 105 of a cam member 106 secured to shaft 37. A rotation of the cam 106 will therefore, by reason of the cooperating elements, cause a vertical reciprocation of the shaft 81 and consequently cause an upward and downward movement of the arm 54.

The formation of the cam and its rate of movement may be such as to actuate the arm 54 in proper time relation to the other machine elements so that when the delivery arm 53 has carried a lamp to delivery position the receiving arm 54 will be in position to have the jaws thereof grip the exhaust tube of the lamp.

For the purpose of obtaining an accurate movement of the arm 54 the link 99 is adjustably connected with arm 97 of the bell crank 94. This connection consists of a clamp 107 having teeth to engage rectilinear gear teeth 107' on the arm 97 whereby the clamp may be adjusted to the proper position and held by suitable lock or jam nuts (not shown).

From the above it will be evident that motion is transmitted from the shaft 37 to the arm 54 to cause an up and down movement thereof. In addition to this vertical reciprocation it is necessary to provide an arcuate or oscillatory movement of the arm and this movement is produced by a rotation of the cam member 106 which is provided with a peripheral groove 108 to receive a pin 109 at one end of a lever 110. The said lever is secured to a shaft 111 journaled in bearings 112 integral with the bracket 103. The opposite or upper end of the shaft 111 is provided with an arm 112' pivotally connected at 113 with a link 114 which link is pivoted at 115 to a rocker-arm 116 integral with a hub 117 secured to shaft 81.

The cam 106 operates by reason of the groove 108, to oscillate the lever 110 and a rocking movement is therefore imparted to the shaft 81 and consequently the arm 54. It will be understood that the formation of the groove 108 may be such that the proper timed relation of the arm in connection with the other actuating parts of the machine will be attained.

When the arm 54 reaches a position to receive a lamp it is necessary to actuate the finger 73. The lifter members 75 and 76 are therefore supported on the cross head 87 secured to a rod 119 movable in a bearing 121. A guide rod 122 depends from the cross head and is movable in a guide 123 to hold the cross head from lateral movement. For the purpose of actuating the cross head 87 and consequently the lifter members, the lower end of the rod 119 is provided with a collar 124 having an annular groove. Motion is transmitted to the rod 119 by means comprising a cam member 126 mounted on shaft 37. The cam is provided with a lateral slot 127' (see Fig. 7[a]) to receive a pin 128' on a lever 129' mounted on shaft 102 carried in bracket 131'. The lever 129' is connected by a link 132' with one arm 133' of a bell crank member 134' rockable on a pivot of bracket 130'. The other arm 135' of the bell crank is provided with a forked end 136' for engaging the annular groove 137 at the lower end of the shaft 119. A rotation of the cam 126 will cause a reciprocation of the shaft 119 and actuate the lifter members 75 and 76.

The foregoing description sets forth the actuating mechanism for the receiving arm 54.

The delivery arm 53 is operated by mechanism of similar construction to that which actuates the arm 54.

As shown in Fig. 2 the arm 53 is provided with a single finger 141 which is engaged by lifter members 76' and 77' carried on a cross head 144 secured to a lifter rod 145. The mechanism of the arm 53 including jaws 55' and 56' (see Fig. 8) is of the same construction as that for actuating the jaws 55 and 56 on the arm 54 and the finger 141 is provided with bevel gears 148 and 149 which operate in the same manner as the gears of the arm 54. Inasmuch as the arm 53 is not rotated to reverse the position of the lamp it is only necessary to have the single finger 141 and associated mechanism for opening the jaws, a spring 151 being provided to normally urge the jaws to their closed positions.

The oscillatory movement of the arm 53 is accomplished by mechanism similar to that employed for moving the arm 54 and comprises a cam member 152 (see Fig. 6) secured to shaft 37. The cam member 152 is provided with a lateral slot 153 in which a pin 154 adjacent to an end of a lever arm 155 is disposed. The said lever is provided with a hub 156 secured to shaft 102. Connected with the lower end of the lever 155 is a link 157 which connects with an arm 158 of a bell crank member 159 the opposite arm 160 of the bell crank is bifurcated and pivotally attached to the lower end 161 of a vertical shaft 162 reciprocable vertically in bearing 163 (see Fig. 2).

An oscillatory movement of the arm 53 is also attained by means of the cam 152 which is provided with a peripheral slot 164 in which a pin 165 at the end of a lever arm 166 is disposed. The arm 166 is provided with a hub 167 secured to a shaft 168 (see Figs. 2 and 6) which extends upwardly and is provided with a lever arm 169. One end of the lever arm 169 is secured to the shaft 168 and the opposite end of the said arm is pivotally connected to one end of a link 171. The opposite end of the link is pivotally connected to an arm 172 integral with the shaft 162. A rotation of the cam 152 will therefore impart a rocking motion to the shaft 162 during its reciprocation and consequently the arm 53 will be given the same movement. It is obvious that in order to provide for this compound motion that the shaft 162 must be provided with a feather or keyed connection in the bearing 163 so as to permit the sliding movement of the shaft 162 during its rotary movement. This construction is also embodied in the construction of the arm 54 and is a well known mechanism.

The various machine elements may be so proportioned and arranged as to move the arm 53 in proper timed relation to the co-operating mechanism.

The foregoing gives a description of a mechanism embodying the main feature of the present invention. Certain other features, are, however, shown such for example, as tipping torch mechanism 173'. This mechanism operates to heat the exhaust tube after the bulb has been evacuated and to seal the end of a tipped-off bulb. Any suitable mechanism may be used for this purpose as such devices are well known. The present construction includes a slidable carrier 174' (see Figs. 1 and 2) which carries a tipping torch 175' adapted to be moved to and from the exhaust machine to tip off lamps which are then blown by an air jet (not shown) into chute 176'. The bracket is rocked by means of a lever 177' one end of which is provided with a pin 178' disposed in a slot 179' of a cam 180' mounted on a shaft 181'. This shaft is provided with a spiral gear 182' in mesh with a spiral gear 183' secured to shaft 37. No complete description is given of the tipping off mechanism since the same is well known and any suitable construction may be used. The tipping torch tips off or severs the lower portion of the exhaust tube which remains in the exhaust port and in the present invention this remaining portion of the exhaust tube is removed by means carried on the arm 54 which means will be later described.

The present machine also includes means for actuating the cams 173 for closing the valves of such exhaust port in the event that a lamp is not inserted by the arm 54 which mechanism does not however concern the present invention, except in that certain operative elements thereof cooperate with means embodied in the transfer arm 54 of the present construction to actuate the cams to open the valves.

When operating machines of the character above described it may happen that an operator fails to put a lamp in a sealing-in head thus when the transfer mechanism operates, no lamp will be inserted into an exhaust port. When this happens mechanism including what is termed a leak detector operates through a solenoid (not shown) to permit a weight 174 to drop causing mechanism to actuate a cam 173 to close the port in which no lamp is inserted. The leak detector and combined mechanism for causing this operation is not illustrated, since the same is well known in the lamp making art. The mechanism controlled by the weight is, however, illustrated and may comprise a lever 175 having one end pivotally attached to the frame of the machine and the opposite end 176 so disposed as to normally lie adjacent to the path of movement of the cams 173. The lever 175 is connected to one end of a link 177 the opposite end of which is pivotally attached to

an arm 178 of a rocker-member 179 pivoted at 181. The opposite arm of the rocker-member is connected with one end of a cable 182. The opposite end of the cable is attached to a sheave 183 so as to wind therearound. The sheave is rotatable on a shaft 184 and is integral with a sheave 185 to which one end of a cable 186 is secured. The opposite end of cable 186 is connected to the weight 174. The weight is normally held suspended in a given position by means of leak detector mechanism to which reference has been made above. The normal position of the weight is such as to hold the member 175 from contact with cams 173. When no lamp is in an exhaust port or if a lamp leaks the weight drops and the above described connecting mechanism operates the member 175 to engage a cam 173 and close the valve or what is termed a pinch-cock. The present invention however, includes a novel construction for again actuating the cams 173 to open the pinch-cocks or valves.

This mechanism as shown in Fig. 1ª may comprise an arm 190 pivotally attached at 191 to arm 54. The free end of the arm 190 is provided with a finger or dog 192 pivoted at 193 for engagement with cam 173 to rock the latter and release the portion 194 of an exhaust rubber compressed by the pinch cock finger 195 when the member 175 engages the cam 173 which is moved in an opposite direction.

The dog is provided with a spring 196 to hold the dog in an operative position against a stop 196''. A lock rod 197 is also provided to lock the dog 192 in an inoperative position. The rod 197 extends through a passage in the arm 190 and is provided with a finger 198 pivoted at 199. Normally the rod may move back and forth in its passage but if it is desirable to lock the dog the rod is pulled out and the finger bent over as shown in dotted lines so that the dog is held inoperative.

The provision of the above described cam releasing device carried on the transfer arm 54 affords a simple and effective construction and co-operates with the transfer mechanism to produce a high speed and practical machine.

As hereinbefore described the present apparatus includes conveyors which move in a series of intermittent stages or indexes from one position to another. When applying a lamp to an exhaust port of the exhaust machine conveyor it is important to stop the conveyor in exactly the proper position. Ordinarily a certain amount of lost motion exists with the usual indexing mechanism and the present invention provides what may be termed an index corrector.

This mechanism as shown in Fig. 1 may comprise a barrel cam 100 secured to shaft 37. A bell-crank 101 pivoted at 102 may have a pin 103 on an arm 104 thereof disposed in slot 105 of the cam 100. The opposite arm 106 of the bell-crank may be connected to a link 107 attached to a slide plate 108.

The said plate is provided with a pair of spaced rollers 109 and 110 to engage lugs 111 extending from the conveyor 10. The lugs may be wedge-shape so that as the cam 100 operates the rollers 109 and 110 engage a lug. Thus as the conveyor comes to rest after each partial rotation the index corrector will automatically adjust it to align an exhaust port with the longitudinal axis of an exhaust tube held in the arm 54.

The machine operates as follows:

Referring to Fig. 1 a bulb 13, mount 14, and exhaust tube 15 may be assembled in a head 11 of the sealing-in machine 16 at position "A". The conveyor 7 rotates in the direction of the arrow "X" upon a rotation of the cam 26' receiving motion transmitted from motor 30. By reason of the cam and pin drive a movement of the conveyor 7 is intermittent and as the assembled lamp parts are moved with the conveyor they are positioned adjacent to fires 28 and other heating and annealing fires (not shown) which heat the bulb neck and adjacent exhaust tube and fuse the two glass parts together.

By the time the bulb is moved around to position "B" the parts have been consolidated and cooled and the lamp is ready to be transferred to the exhaust machine 9. As the conveyor 7 of the sealing-in machine positions a head 11 at station "B" the motor 30 operating through shaft 33, shaft 34' gears 35 and 36 rotates shaft 37 upon which cam 152 is mounted and thus actuates the lever 155 (see Figs. 2 and 6) transmitting motion to the bell-crank 159 whereupon the shaft 162 and arm 53 is lifted as it oscillates and the jaws 55' and 56' (see Fig. 8) are positioned over an exhaust tube 15 of a lamp positioned in a head 11.

As the cam 152 moves, the arm 53 is lowered and cam 126 on shaft 37 operates to raise lifter member 76' to engage finger 141 and open the jaws 55' and 56'. A continued movement of the cam member operates to lower the lifter member and to close the jaws to grip an exhaust tube 15. At this time the jaws 11' and 12' of the head on the sealing-in machine are opened through the action of the tension member 77 which engages the finger 23 on lever 22'. A continued movement of the cam member 152 causes the arm 53 to move away from the head 11 and at the same time lift the bulb portion of the lamp from its socket in the head and to carry the lamp to a position intermediate the sealing-in and exhaust machines.

During the movement of the arm 53 the cam 106 (see Fig. 3) is rotated causing the arm 54 to oscillate toward the arm 53 and as the arm 54 reaches the arm 53 or its bulb receiving position, the head 87 ascends and the plunger engages the rack 84 causing the arm 54 to be rotated 180 degrees, thus placing the jaws in position to grip a lamp between the plates 97' and 98'. A continued upward movement of the head causes the lifter member 75 to contact with the finger 73 causing jaws 55 and 56 of the arm 54 to open and embrace the exhaust tube 15 (see Fig. 11). The lifter member 75 is then lowered and the jaws 55 and 56 grip the exhaust tube about the constricted portion at which time the arm 53 is over the lifter member 77' which moves upwardly opening jaws 55' and 56' of the arm 53, which arm then moves back to its initial position to receive and transfer another lamp.

The arm 54 having gripped the lamp a continued rotation of cam 106 causes the arm to oscillate and as the head 87 moves away, the rack 84 under the action of the spring 85 causes the arm 54 to rotate effecting a bodily rotation of the jaws and lamp held therein. The rotation of the lamp being 180° the same is inverted so that the exhaust tube projects downwardly instead of upwardly.

The inverted lamp is then carried by the arm 54 to position over an exhaust port 53' of the exhaust machine and a continued movement of the cam 106 effects a downward movement of the arm 54 so that the exhaust tube 15 is inserted into an exhaust port at which time a lifter member 76 moves upwardly to engage a finger 74 which

is now in a lower position, to release the exhaust tube and the arm 54 is moved away and into position to repeat the operation of transferring a lamp from the arm 53. As the arm 54 moves to its initial position the dog 192 engages cam 173 opening the port 53' in the event that the same has been closed.

Previous to the insertion of an exhaust tube into an exhaust port it is necessary to remove the remaining portion of an exhaust tube from a previously tipped off lamp. Mechanism in the form of an arm 190' is therefore carried with the arm 54 and comprises a finger 191' which upon a movement of the arm 54 sweeps across and adjacent exhaust port 53' thereby contacting with the portion of exhaust tube 192' therein removing the same by a sweeping action from the port.

From the foregoing it will be evident that the present invention provides an apparatus wherein an article may be automatically removed from one machine and adjusted for deposit in another machine. This operation when employed in connection with a butt-sealing and exhaust machine serves to speed up production and makes it possible to produce lamps at lower cost.

Although a preferred embodiment of the invention is shown and described herein it is to be understood that modifications may be made therein without departing from the spirit and scope of the invention as set forth in the appended claims.

What is claimed is:

1. A sealing-in machine and an exhaust machine, means for supporting a lamp in said sealing-in machine, an oscillatory arm for removing said bulb from said machine, means for removing said bulb from said arm, means for reversing the position of said lamp and means for actuating said last mentioned means to dispose said lamp in said exhaust machine.

2. A lamp making machine comprising means for supporting a lamp in position for a lamp making operation, a delivery arm for moving said lamp to a given position and a receiving arm for transferring the lamp to another position.

3. A lamp making machine comprising means for supporting a lamp in a given position during a lamp making operation, a delivery arm for moving the lamp to a given position, a receiving arm for transporting the lamp from said position to another position and means for rotating the lamp bodily to change the position of its longitudinal axis.

4. A machine for sealing-in and exhausting a lamp comprising a support for a lamp during a sealing-in operation, an oscillatory arm, gripper members on said arm, means for actuating said arm to remove a lamp from said support, an oscillatory and rotatable member, jaws on said member for gripping said lamp when held by said arm, means for actuating said member to grip a lamp held by said arm, means for rotating said member to reverse the position of said lamp and means for moving said member to position said lamp for an exhausting operation.

5. A machine for exhausting and tipping off lamps, said machine having exhaust ports, a movable member for inserting a lamp in an exhaust port for a tipping-off operation and means controlled by said member for removing the portion of the lamp remaining in the exhaust port after a tipping-off operation.

FREDERICK T. MAY.