Aug. 28, 1945. W. T. BARKER 2,383,700

AMPULE FILLING AND CONVEYING MACHINE

Filed Dec. 17, 1941 5 Sheets-Sheet 1

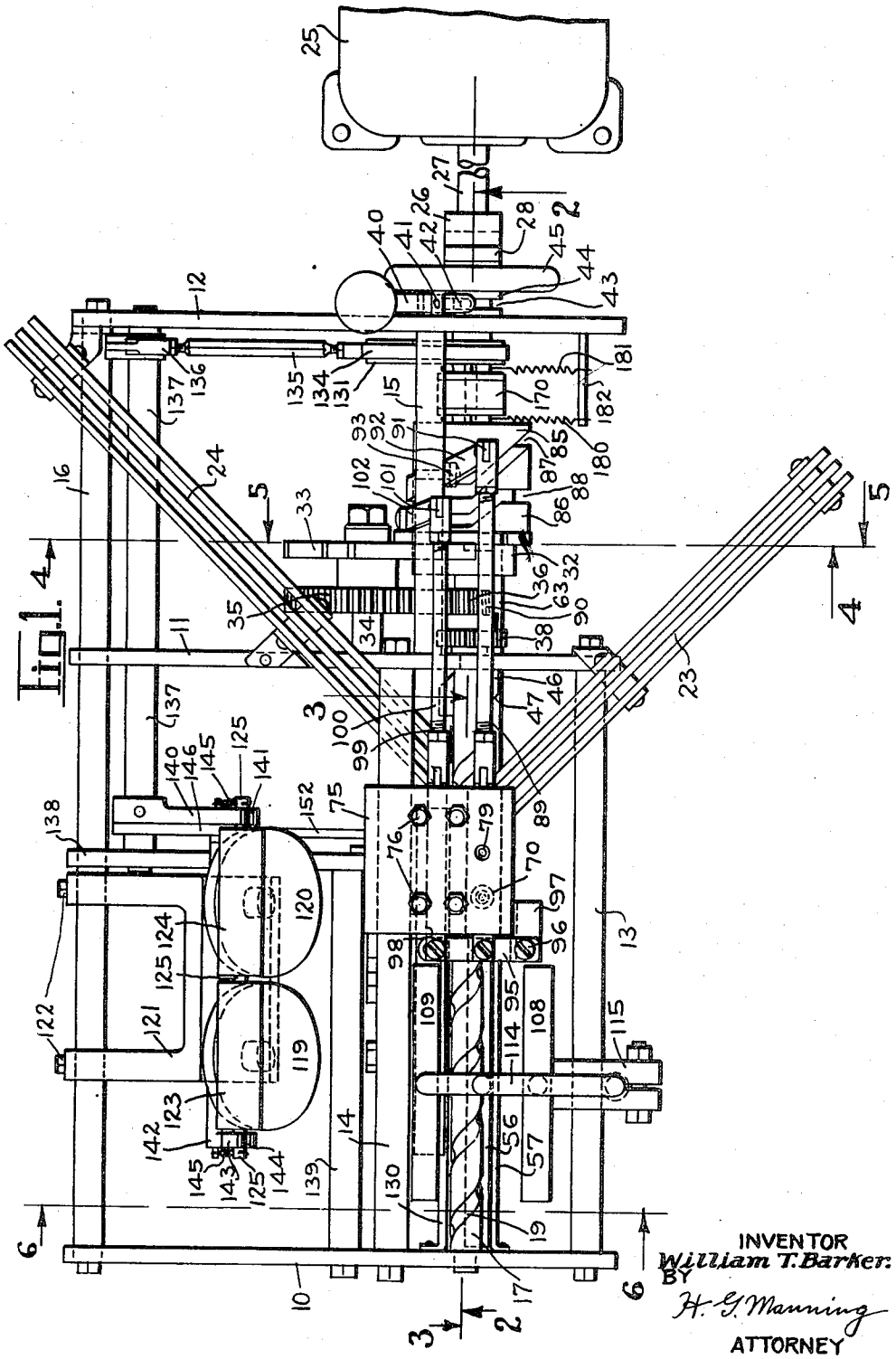


Fig. 1.

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Filed Dec. 17, 1941 5 Sheets-Sheet 2

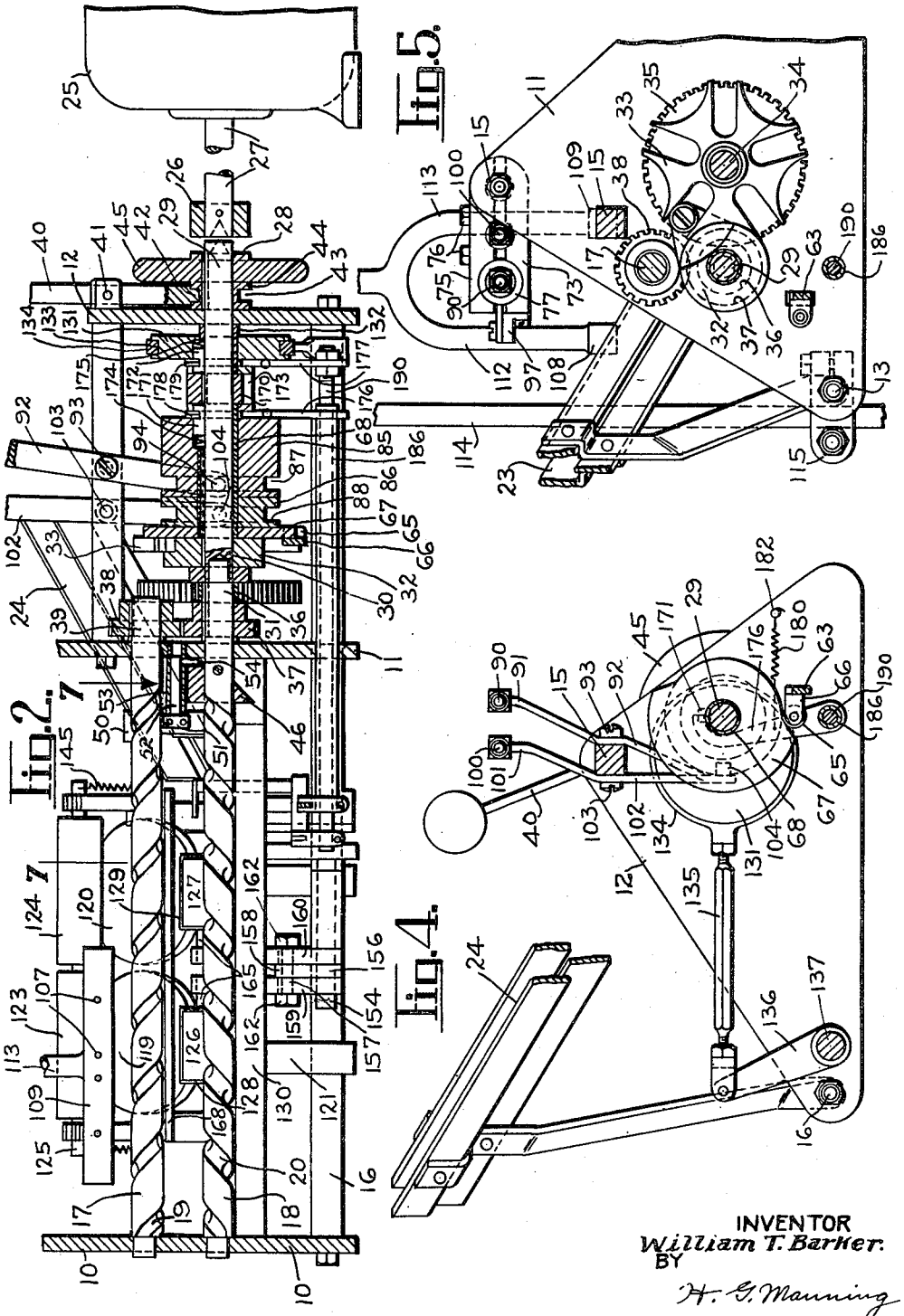


Fig. 2.

Fig. 5.

Fig. 4.

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Filed Dec. 17, 1941. 5 Sheets-Sheet 3

Fig. 6.

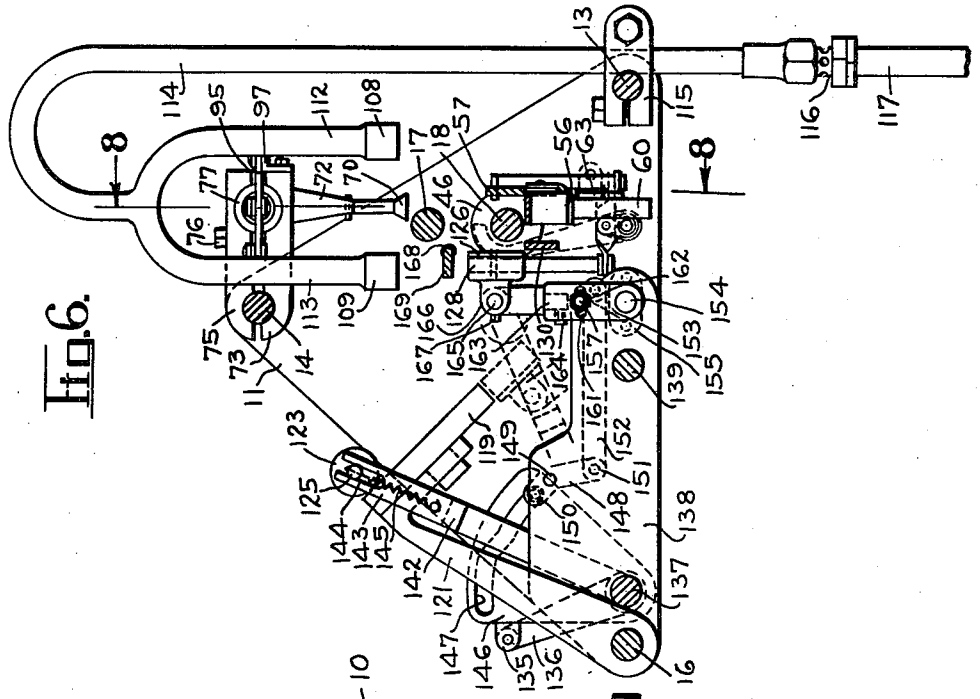
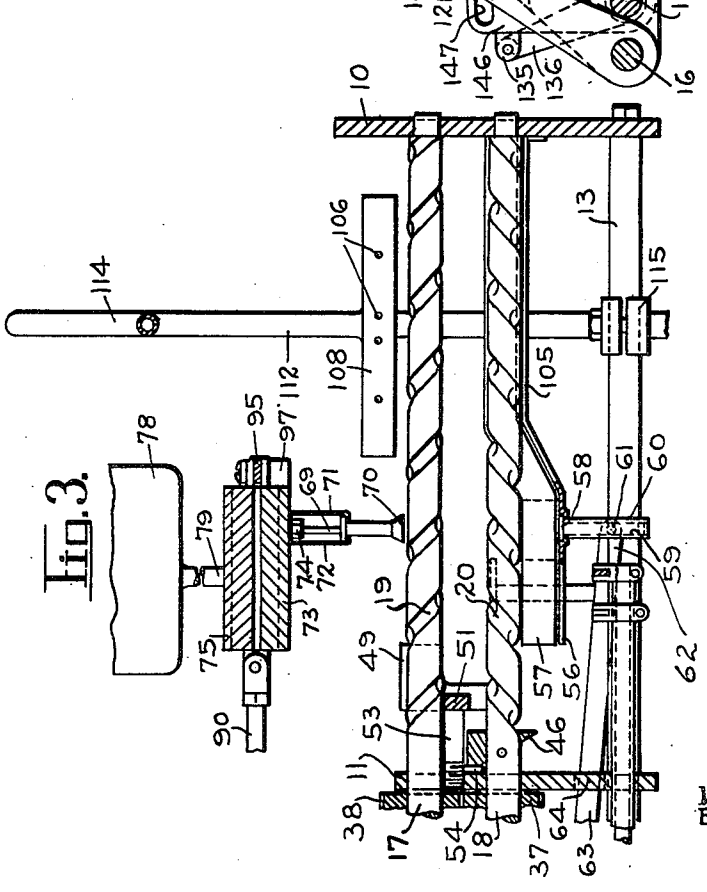


Fig. 3.



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AMPULE FILLING AND CONVEYING MACHINE

Filed Dec. 17, 1941 5 Sheets-Sheet 4

Fig. 7.

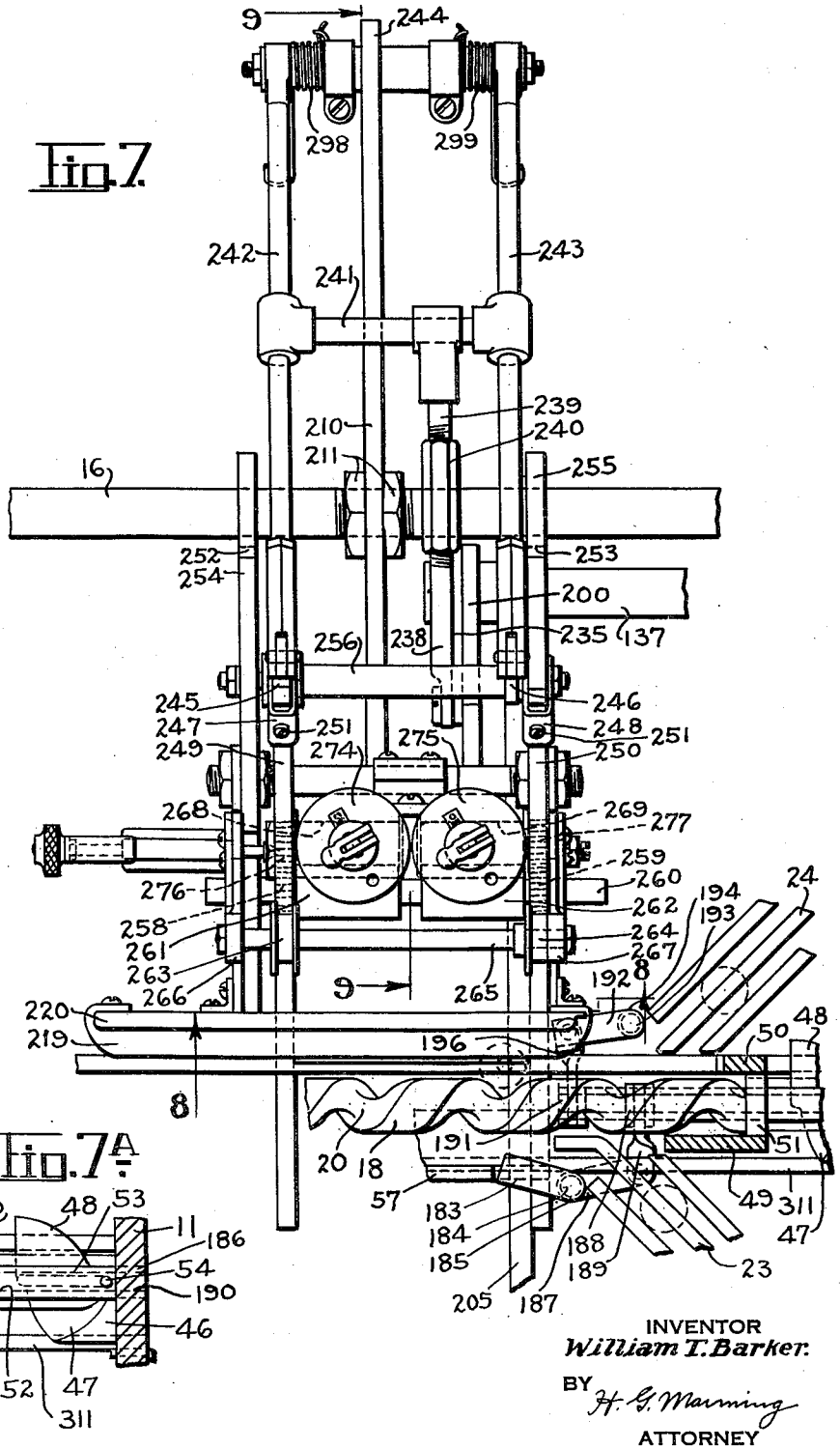


Fig. 7A.

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AMPULE FILLING AND CONVEYING MACHINE

Filed Dec. 17, 1941 5 Sheets-Sheet 5

Fig. 9.

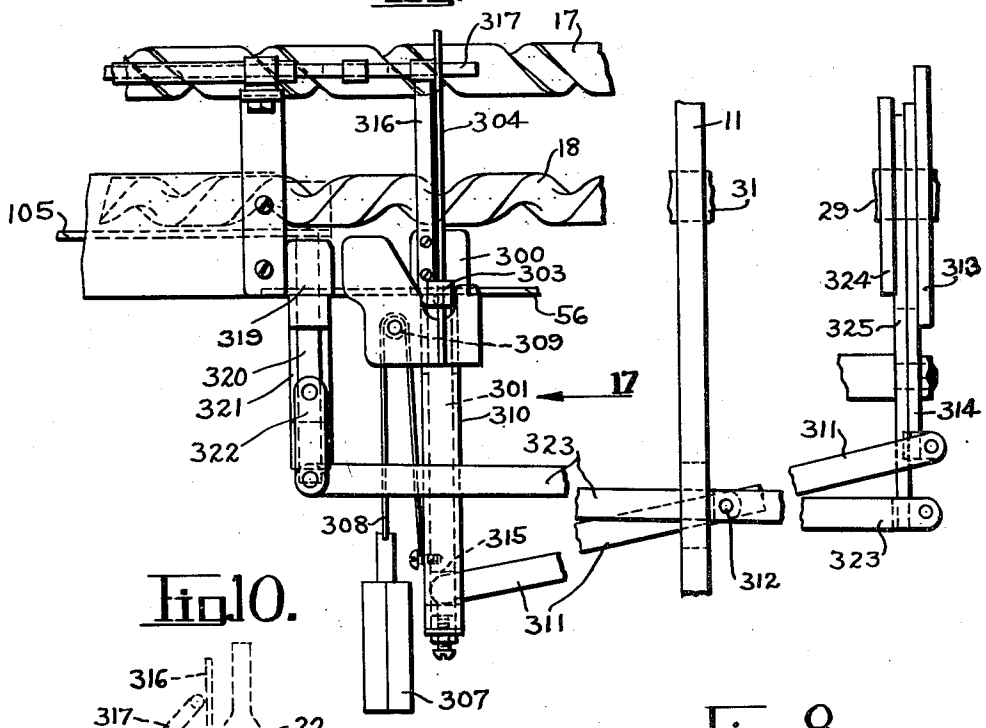


Fig. 10.

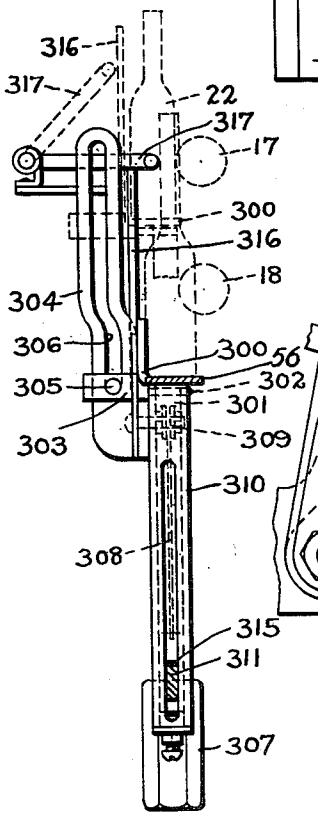
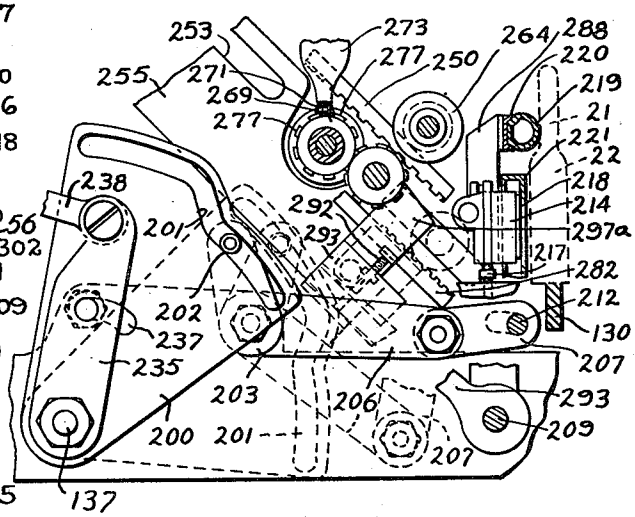


Fig. 8.



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UNITED STATES PATENT OFFICE

2,383,700

AMPOULE FILLING AND CONVEYING MACHINE

William T. Barker, Mount Vernon, N. Y.

Application December 17, 1941, Serial No. 423,270

7 Claims. (Cl. 226—96)

This invention relates to the automatic filling of ampoules and the like, and more particularly to a machine for filling, and conveying ampoules, which are adapted to serve as containers for serums, vaccines, and other medicinal preparations.

One object of this invention is to provide a machine of the above nature having the filling means located on one side thereof, together with a common central screw feed means to cause the ampoules to pass through the machine.

A further object of this invention is to provide an improved ampoule filling machine of the above nature which will be relatively inexpensive to manufacture, simple in construction, compact, substantially automatic in operation, which will print in two colors, and will be very efficient and durable in use.

With these and other objects in view, which will appear as the description proceeds, there has been illustrated in the accompanying drawings, one form in which the invention may be conveniently embodied in practice. This application is a continuation in part of applicant's co-pending application, Serial No. 262,667, filed March 18, 1939, for "Ampoule filling machines," patented January 9, 1945, No. 2,367,085.

In the drawings:

Fig. 1 is a top plan view of a machine embodying the principles and features of this invention.

Fig. 2 is a longitudinal sectional view through the machine, taken on the line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a broken longitudinal sectional view taken on the line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is a transverse cross-sectional view taken on the line 4—4 of Fig. 1.

Fig. 5 is a transverse cross-sectional view, taken on the line 5—5 of Fig. 1, looking in the opposite direction from Fig. 4.

Fig. 6 is a transverse cross-sectional view, taken on the line 6—6 of Fig. 1.

Fig. 7 is a top plan view of a modified form of device associated with the ampoule feeding means shown partly in section and looking in the direction of arrow 7 of Fig. 2.

Fig. 7A is a view of the right hand end of the ampoule feeding means shown in Fig. 7.

Fig. 8 is a somewhat diagrammatic view of the operative parts of the device of Fig. 7 for illustrating the operations thereof.

Fig. 9 is a broken front view of the machine showing a modified form of ampoule elevating mechanism installed therein.

Fig. 10 is a side view of one of the ampoule elevators looking in the direction of arrow 17 in Fig. 9.

Referring now to the drawings wherein like reference characters denote like parts throughout the several views, the numerals 10, 11, and 12 designate three spaced-apart upright frame plates. The intermediate plate 11 is secured to the end plate 10 by tie rods 13 and 14, and to the end plate 12 by a tie rod 15. The plates 10, 11, and 12 are secured together by a tie rod 16 which passes through the plate 11.

In order to feed the ampoules in vertical position through both sides of the machine, provision is made of two parallel vertically spaced-apart helical screws 17 and 18 which extend between and are journaled in the plates 10 and 11. The feed screws 17 and 18 are provided with right and left-hand helical grooves 19 and 20, respectively. The groove 19 in the upper screws 17, in this instance, is of the proper contour and width to engage the upper small neck portion 21 of the ampoules (see Figs. 2, 3, 8, 9 and 10, while the groove 20 in the lower screw 18 is shaped to engage the lower portion 22 of said ampoule. The spiral grooves 19 and 20 are of equal pitch, and the screws 17 and 18 are arranged to be rotated in opposite directions so the ampoules directed against the front side of said screws will be fed to the left, as viewed in Figs. 1 and 2, from the plate 11 toward the plate 10, and in so doing, will pass the ampoule filling and sealing stations. The ampoules directed against the rear of the screws 17 and 18 will be likewise fed to the left, and will pass the printing station where suitable indicia will be stamped upon the body portion 22 of the ampoules.

It will be understood that the filling and sealing devices at the front of the machine or the printing device at the rear may be simultaneously or selectively operated as desired. The ampoules are introduced into the machine by separate guides or chutes 23 and 24, each comprising three metal bars, down which said ampoules slide by gravity toward the feed screws 17 and 18 respectively.

Screw driving mechanism

An electric motor 25 serves as the common source of power for all of the operating parts of the machine, and provision is made of a clutch part 26 rigidly secured upon the end of the motor shaft 27. Another clutch part 28, which is adapted to have frictional engagement with the clutch part 26, is slidably mounted upon a common drive shaft 29 extending through and journaled in the frame plate 12, see Fig. 2. The end 30 of the drive shaft 29 adjacent the frame plate 11 is rotatively supported upon a reduced end 31 of the lower feed screw 18, which is extended through the plate 11 for this purpose. The crank member 32 of a "Geneva" gear is secured upon the end 30 of the shaft 29 to cooperate with the disc 33 of said gear to intermittently drive said feed

screw 18. The disc 33 of the "Geneva" gear is rotatively mounted upon a stud shaft 34 extending from the frame plate 11. A gear 35 secured to and rotatable with the disc 33 meshes with a gear pinion 36 secured to the end 31 of the lower feed screw 18, whereby said "Geneva" disc 33 will be intermittently driven.

Another gear 37 is secured on the end 31 of the lower feed screw 18 and meshes with a gear 38 secured to one end 39 of the upper feed screw 17, which is extended through the frame plate 11 for this purpose.

The clutch part 28 is adapted to be slid along the shaft 29 by means of a clutch shifting lever 40 pivoted on a bracket 41 to the frame plate 12 and having a forked end 42 riding in a groove 43 formed in a hub member 44 of the clutch part 28. A hand wheel 45 is provided on the clutch part 28 whereby the shaft 29 may, if desired, be rotated by hand for the purpose of adjusting and timing the various devices driven by said shaft.

In order to transfer the ampoules from the chutes 23 and 24 into the machine, provision is made of a rotary wedge cam 46 secured on the lower feed screw 18 adjacent the frame plate 11, and said cam 46 has curved camming surfaces 47 and 48 (Figs. 7 and 7A) which serve to drive a pair of parallel slidable ampoule pushers 49 and 50 toward and away from the delivery ends of the chutes 23 and 24, respectively. The pushers 49 and 50 are carried, one at each side of the feed screws 17 and 18, by a cross-block 51 having a longitudinal stem 52 which is slidably mounted in a sleeve 53 secured in and extending from the frame plate 11 over the cam 46. A pin 54 extending downwardly from the stem 52 is alternately acted upon by the camming surfaces 47 and 48 to simultaneously move the pushers 49 and 50 back and forth. The arrangement is such that at every stroke of the pushers 49 and 50, ampoules will be pushed from the delivery ends of both magazine chutes 23 and 24, along which the same are being fed, into the grooves 19 and 20 of the feed screws 17 and 18 to start the feed of the ampoules thereby.

Ampoule filling apparatus

As the ampoules are fed along toward the frame plate 10 by the feed screws 17 and 18, their bases will ride upon a support bar 56, and the body portions 22 of said ampoules are loosely held against the lower screw 18 by a side guide bar 57 (see Figs. 1, 3, 6, and 7). As each ampoule is fed along the support bar 56 to the filling device, it rides onto an elevator plate 58 having a downwardly projecting stem 59 (see Fig. 3) slidably mounted in a stationary sleeve 60. A horizontal pin 61 extending from the stem 59 is connected to one end 62 of a lever 63 pivoted at 64 to the frame plate 11 (see Fig. 3). The lever 63 is extended along the machine and has a roller 65 mounted upon an offset end 66 thereof (see Fig. 4). The roller 65 is disposed to ride upon the periphery of a cam 67 secured to a sleeve 68, rotatably mounted upon the shaft 29. The rotation of the cam 67 will rock the lever 63 and cause the elevator plate 58 to lift the particular ampoule resting thereon into filling position with respect to a filling needle tube 69 extending downwardly from a liquid measuring device supported upon the tie rod 14 (see Figs. 1 and 3). The needle tube 69 is adapted to enter the neck portion 21 of the ampoule for a substantial distance when the ampoule is raised by the elevator 58.

The neck portion 21 of the ampoule is accurately centered with respect to the needle tube 69 entering the same by a funnel-shaped member 70 mounted for free up and down sliding movement on the needle tube 69 and hung from the liquid measuring device by fingers 71 and 72 secured to a square lower casing member 73 of the measuring device by a nut 74, surrounding said needle tube 69. The interior of a cylindrical sleeve 77 in the casing member 73 is connected by a pipe 78 to an overhead source of liquid supply, such as a reservoir 78 (Fig. 3). The sleeve 77 is secured to the rod 14 by a clamp 75 and nuts 76. The cylinder 77 is connected to the tube 69 by a lower aperture in which the screw 74 is located. It will be understood that the lifting of the ampoules at the filling station takes place during a "dwell" of the feed screws.

Operation of ampoule filling device

The camming groves 87, 88 are of such contour that the filling piston will force liquid down through the needle tube 69 into the ampoule at the proper time, as fully described in my prior Patent No. 2,367,085, previously mentioned.

The reciprocating liquid filling piston is connected to one end 89 of a rod 90 (see Fig. 4) which is connected at its other end to the upper end 91 of a depending lever 92 pivoted at 93 to the tie rod 15, and extending downwardly therefrom to a point adjacent the periphery of the cam 85. A roller 94 on the lower end of the lever 92 rides in the camming groove of the cam 85 (Fig. 2).

A hollow plug in the liquid filling cylinder is connected to a lever 95 (Figs. 1, 3, 6) which is pivoted at 96 in a bracket 97 secured on the lower casing member 73. The free end of the lever 95 is connected to a horizontal bar 98, slidably mounted between the casing members 73, 75 of the measuring apparatus.

The other end of the bar 98 is pivoted to a rod 100 having a threaded section 99, and said rod in turn is connected at its other end to the upper end 101 of a lever 102. The lever 102 is pivoted at 103 to the tie rod 15 and extends downwardly therefrom to a point adjacent the periphery of the cam 86. A roller 104 on the lower end of the lever 102 rides in the camming groove 88 of the cam 86.

Ampoule sealing device

After the ampoule has been filled with liquid, the "Geneva" gear is then partly rotated to cause the feed screws 17 and 18 to force the filled ampoule along the bar support 56 which is inclined upwardly for lifting the ampoule to a raised portion 105 of said bar 56. The ampoule neck portion 21 will at this time be disposed in the path of a plurality of small converging gas jets emitted from a like number of opposed openings 106 and 107 provided respectively in a pair of parallel spaced-apart burner bars 108 and 109 located above the feed screws 17 and 18.

The burner bars 108 and 109 are hollow and supplied with gas under suitable pressure by tubes 112 and 113 (Fig. 6) to a common pipe 114 which is secured to the tie rod 13 by a clamp 115. The supply tube 114 extends from the clamp 115 to a burner regulator 116 and thence to a source of gas supply (not shown) through a tube 117. Manual adjustment of the burner regulator 116 may be readily made to insure the proper blue flames of

sufficient heat to melt the top of the neck portions 21 of the ampoules during the dwell period of the spiral screws, whereby perfect seals 118 will be obtained.

Ampoule printing device

The ampoule printing device includes a pair of circular inking ratchet and pawl driven platens 119 and 120 of the usual flat form, said platens being mounted for rotation on a frame member 121 which is secured to the tie rod 16 by screws 122. Inking rollers 123 and 124 mounted to rotate on a common shaft 125 are arranged to be reciprocated over the surface of the platens 119 and 120, respectively, to collect ink therefrom and carry it to printing type 126 and 127 carried by holders 128 and 129, respectively. The holders 128 and 129 are arranged to be swung toward and away from the ampoules being fed by the screws 17 and 18, the bases of said ampoules being slidingly supported by an elongated bar 130 (see Fig. 6).

The movement of the inking rollers 123 and 124 over the platens 119 and 120, and of the type holders 128 and 129 toward and away from the ampoules being fed by screws 17 and 18, is effected by an eccentric disc 131 secured upon a sleeve which is rotatably mounted on the common drive shaft 29 adjacent the frame plate 12. The periphery of the disc 131 has a groove in which rides a ring 134. By this construction, it will be seen that the continuous rotation of the disc 131 will reciprocate a connecting rod 135 connected to the ring 134 and cause it to rock an arm 136 secured to a rock-shaft 137 (Fig. 4) journaled in and extending between the frame plates 11 and 12. The rock-shaft 137 extends beyond the frame plate 11, and is also journaled in a bearing plate 138 which extends forwardly from the tie rod 16. A tie rod 139 connects the plate 138 to the frame plate 10.

An arm 140 secured to the rock-shaft 137 (Fig. 6) and extending upwardly therefrom is provided with an elongated slot 141 in its upper end to receive one end of the inking roller shaft 125. An elongated bracket 142 secured to the arm 140 extends under the platens 119 and 120 and then upwardly as an arm 143. The arm 143 has an elongated slot 144 in its upper end to receive the other end of the shaft 125. Springs 145 are connected to each of the arms 140 and 143 and to the adjacent ends of the shaft 125 to retain the respective shaft ends in the slots 141 and 144.

A segment cam 146 (see Fig. 6) having a cam slot 147 therein is secured to the rock-shaft 137, said cam slot embracing a roller 150 carried by a bell-crank lever 148 pivoted at 149 to the bearing plate 138. The other end 151 of the lever 148 is connected by a link 152 to an arm 153 secured to a shaft 154 journaled in a bracket 155 secured on the bearing plate 138. The shaft 154 extends out of the bracket 155 toward the frame plate 10 and has an arm 156 secured thereto (see Fig. 2). The arm 156 has a screw threaded pin 157 therein adjacent its free end 158.

Provision is also made of arms 159 and 160 rotatably mounted on the shaft 154, one on each side of the arm 156. Each of the arms 159 and 160 has an elongated slot 161 therein through which the pin 157 extends. Nuts 162 are screw-threaded on each end of the pin 157 to clamp each of the arms 159 and 160 to the arm 156.

A stud 163 is pivoted on a vertical axis in the upper end of each of the arms 159 and 160, and is clamped in place by a set screw 164 (Fig. 6). Pins 165 are provided in the upper end of each of the studs 163, said pins 165 extending from the studs 163 in opposite directions for receiving lugs 166 extending rearwardly from the type holders 128 and 129 in which the pins 165 are journaled. The lugs 166 are held in place on the pins 165 by set screws 167. The provision of the pin 157 and the elongated slots 161 permits adjustment of the holders 128 and 129 toward and away from the ampoules in respect to the arm 156. The pivoted studs 163 permit twisting of the type holders on a vertical axis and the pins 165 permit movement of the type holders on a horizontal axis to adjust them relatively to the ampoules being fed along by the feed screws 17 and 18. A rubber covered edge 168 of a stationary bar 169 engages the neck portions 21 of the ampoules as they are fed past the type holders 128 and 129 to cause said ampoules to spin about their vertical axes upon the supporting bar 130.

Selective drive arrangement

Since the ampoule filling and sealing mechanisms need not be in operation when the printing mechanism is in operation, means are herein provided to independently and selectively drive said mechanisms. For this purpose, provision is made of a small cylindrical hub 170 (see Fig. 2) keyed to the common drive shaft 29 and disposed between the sleeves 68 and 132, which are freely rotatable on the shaft 29. A pair of clutch keys 171 and 172, which are freely slidable axially in the cam 85 and in the disc 131 respectively, are adapted to be slid into a key-way 173 formed in the hub 170 by springs 174 and 175, respectively. Clutch control fingers 176 and 177 are arranged to lie in beveled slots 178 and 179 formed in the clutch keys 171 and 172, respectively, to hold the respective keys in retracted position and out of the key-way 173. The clutch control fingers 176 and 177 are urged and retained in key-holding position by springs 180 and 181 (see Figs. 1 and 2) secured to a stud 182 extending from the plate 12 and to each finger 176 and 177, respectively.

The clutch control fingers 176 and 177 are adapted to be automatically held out of the slots 178 and 179, respectively, to selectively release either of the keys 171 and 172, so long as the ampoules are being fed along by the screws 17 and 18 from the delivery end of either of the chutes 23 and 24. When ampoules are being delivered in front of the screws 17 and 18 from the chute 23 and fed toward the filling device, they are caused to engage a filling detector finger 183 (see Fig. 7) having a stem 184 supported in a stationary bearing sleeve 185 to swing on a vertical axis. The stem 184 extends downwardly and is connected to one end of a hollow shaft 186 (Fig. 7) by means of an arm 187 secured to the lower end of the stem 184, an arm 188 secured on the shaft 186, and a link 189 connecting the arm 187 and 188. One clutch control finger 176 is secured to the other end of the hollow shaft 186.

The other clutch finger 177 is connected to one end of a shaft 190 which extends through the hollow shaft 186 and has an arm 191 secured upon its other end. A detector finger 192 similar to the finger 183 is positioned to be engaged by ampoules as they are being fed toward the printing device from the chute 24 and has a stem 193 supported in a stationary bearing sleeve 194 and adapted to swing on a vertical axis depending therefrom. An arm 195 is secured to the lower

end of the stem 193 and is connected to the arm 191 by a link 196.

Selective operation of filling and sealing mechanism

When a plurality of ampoules are being fed from the delivery end of the chute 23 toward the filling and sealing mechanisms, they will automatically engage the detector finger 183 (Fig. 7) and swing it in a direction to rock the clutch control finger 176 out of the slot 178 in the clutch key 171 (Fig. 4), whereupon the key 171 will be pressed into the key-way 173 (Fig. 2) in the hub 170 by the spring 174. The connection between the piston cam 85 and the hub 170 (Fig. 1) by the key 171 drivingly connects the piston cam 85, the plug cam 86, and the ampoule elevating cam 67 through the sleeve 68 to the common drive shaft 29. This causes the ampoules as they pass the filling device to be automatically filled with liquid and to continue past the sealing device as long as there are any ampoules in engagement with the detector finger 183.

When the supply of ampoules in the chute 23 is exhausted, the clutch control finger 176 will be swung into key-withdrawing position by the spring 180, and the above operations will be instantly stopped, thereby preventing the discharge of filling liquid from the needle tube 69.

Modified form of printing device

Referring now to Figs. 7 and 8 wherein a modified form of printing mechanism is illustrated, the reference number 200 designates a segment cam which, like the corresponding segment cam 146, supra (see Fig. 1), is secured to the rock-shaft 137. The cam 200 has an arcuate slot 201 therein embracing a roller 202 carried by one end of a bell crank lever 203. The other end 206 of the bell crank lever 203 is connected by a link 207 to a pair of arms secured to a shaft 209 adjacent an elongated bar 210 which extends rearwardly from the shaft 209 and is secured to the tie rod 16 by a pair of nuts 211.

A printing type holder 214 is rockably mounted on a bracket which is secured to the upper surface of a pair of link arms by a threaded rod 217 whereby vertical adjustment of the type 218 in the holders 214 may be obtained. By means of this construction, it will be seen that a rocking movement of the shaft 137 through the instrumentality of the cam slot 201, roller 202, bell crank lever 203, link 207, and the link arms will cause the printing types 218 to move either forwardly to the printing position shown in full lines in Fig. 8 to print upon ampoules 22 as they pass thereby, or to move rearwardly into the dotted line position shown in Fig. 8, to be inked. The neck portions 21 of the ampoules 22 as they are fed along the supporting bar 130 engage a rubber tubing 219, held by an adjustable stationary channel bar 220, whereby they are caused to spin uniformly as they are being printed.

A pivoted printing type holder frame member 221 (see Fig. 8) is provided for each type 218.

The type 218 is arranged to be inked once for every ampoule 22 which passes through the machin and this is accomplished by the oscillation of the rock-shaft 137 in timed relation with the action of the cam slot 201. For this purpose, provision is made of an adjustable arm 235 (see Fig. 8) secured to the segment cam 200 by being pivoted on the shaft 137 and by a bolt passing through the arm 235 and an elongated slot 237 in said segment cam 200, is pivotally secured to one end of an adjustable link 238 having a turnbuckle 240, whereby the throw of the driving racks 249 and 250 may be adjusted as desired. The outer end 239 of the turnbuckle link 238 is pivoted upon a cross-rod 241 (Fig. 7) extending between a pair of inclined parallel rods 242 and 243 which are pivoted at their lower ends to the rear end 244 of the bar 210.

The rods 242 and 243 extend upwardly and have their upper ends pivotally secured to the upper ends of a pair of short links 245, and 246 respectively, which links have their other ends pivotally secured to inverted U-shaped clips 247 and 248. The clips 247 and 248 are loosely secured to the upper ends of a pair of inclined elongated floating toothed racks 249 and 250 respectively by screws 251. By means of this construction, it will be seen that a rocking movement of the shaft 137 will oscillate the rods 242 and 243 to slide the racks 249 and 250 upwardly and downwardly as guided by slots 252 and 253 formed in a pair of fixed elongated side supporting plates 254 and 255, which slots receive the outer ends of a shaft 256 upon which the clips 247 and 248 are pivoted and which extends between the supporting side plates 254 and 255.

The racks 249 and 250 are inclined downwardly and forwardly and have teeth on their lower faces which are adapted to mesh with shiftable pinions 258 and 259 (see Fig. 7), which are secured on the common shaft 260 of a pair of resilient composition-covered inking rollers 261 and 262. Provision is also made of a pair of idle guiding flanged rollers 263 and 264 freely rotatable on a cross shaft 265 which is journaled at each end in journal plates 266 and 267 secured to the side supporting plates 254 and 255 to maintain the teeth of the racks 249 and 250 in mesh with the respective pinions 258 and 259 and limiting upward swinging movement of said racks.

The above described system of links, arms and levers is arranged to be counterbalanced by coil springs 298 and 299 acting on the inclined rods 242 and 243 respectively (see Fig. 7).

The soft composition inking rollers 261 and 262 are adapted to ink the types 218 twice on each operation by rolling forwardly and then reversely over them. The rollers will then be retracted into contact with metallic ink rollers 268 and 269 respectively, which are adapted to receive ink from wicks 271 carried at the end of spouts 273 leading from sources of ink supply in the form of cups 274 and 275 which are adapted to be regulated to adjust the flow of ink therefrom and to the spouts 273 respectively in the manner of any well-known standard oil cup. The metallic ink rollers 268 and 269 are rotatably mounted between the journal plates 266 and 267, and said metal rollers 268 and 269 are provided with gear pinions 276 and 277 secured thereto (see Fig. 8). The gear pinions 276 and 277 are adapted to mesh with the shiftable pinions 258 and 259 respectively, whenever the inking rollers 261 and 262 are in retracted position as indicated in full lines in Fig. 8, in which position the metallic ink rollers 268 and 269 will transfer a coating of ink from the wicks 271 to the inking rollers 261 and 262.

During the transfer of ink from the rollers 268 and 269 to the composition inking rollers 261 and 262, both of said sets of rollers will rotate one complete turn due to the meshing relation of the respective pinions on said rollers, and the racks 249 and 250 will be moved in the proper

direction to rotate the shiftable pinions 258 and 259. The composition rollers 261 and 262 with their pinions 258 and 259 will be guided upwardly against the metallic rollers 268 and 269 and downwardly over the type 218 by having the ends of the common shaft 260, upon which they are mounted, guided in elongated slots formed in each of the plates 266 and 267 (see Fig. 7).

It will be clear that as the racks 249 and 250 are moved upwardly, the shiftable pinions 258 and 259 will rotate in the proper direction so that the shaft 260 will be advanced upwardly to cause the pinions 258 and 259 to mesh with the gear pinions 276 and 277 respectively.

Moreover, as the racks 249 and 250 are moved downwardly, the reverse action will take place, and the pinions 258, 259, and 276, 277 will become disengaged. The pinions 258 and 259 will also mesh with short racks 282 disposed beneath said pinions and secured upon each of the side plates 254 and 255 respectively. The first tooth of each of said racks 282 will be out of mesh with the pinions 258 and 259, while they are in engagement with the gear pinions 276 and 277. When the pinions 258, 259 engage the short racks 282, the racks 249 and 250 will cooperate therewith to cause the shaft 260 to move downwardly and rotate the ink covered rollers 261 and 262 over the printing types 218, the latter having been previously moved into position to be inked.

The bar which supports the rubber tube 219 is pivotally supported upon the shaft 209 by means of arms 288 (see Fig. 8) and said bar is limited in its rearward swinging movement by adjustable screws, not shown, arranged to be engaged by the arms 288.

In order to prevent the shiftable rollers 261, 262 from moving downwardly prematurely before the type holder has been swung back into inking position, the type holder frame members are each provided with a stop plate 297*a*. The stop plates 297*a* will obstruct the path of the shaft 260 of the rollers 261, 262, and will prevent it from moving into contact with the first tooth of the short racks 282 until the type holder frame members have been swung down out of the way by the engagement of the type holders 214 with a stop screw not shown. The numerals 298 and 299 indicate coiled springs (see Fig. 7).

Selective operation of filling and sealing mechanism

When a plurality of ampoules are being fed from the delivery end of the chute 23 toward the filling and sealing mechanisms, they will automatically engage the detector finger 183 (Fig. 7) and swing it in a direction to rock the clutch control finger 176 out of the slot 178 in the clutch key 171 (Fig. 4), whereupon the key 171 will be pressed into the key-way 173 (Fig. 2) in the hub 170 by the spring 174. The connection between the piston cam 86 and the hub 170 (Fig. 2) by the key 171 drivingly connects the piston cam 86, the plug cam 66, and the ampoule elevating cam 67 through the sleeve 68 to the common drive shaft 29. This causes the ampoules as they pass the filling device to be automatically filled with liquid and to continue past the sealing device as long as there are any ampoules in engagement with the detector finger 183.

When the supply of ampoules in the chute 23 is exhausted, the clutch control finger 176 will be swung into key-withdrawing position by the spring 180, and the above operations will be instantly stopped, thereby preventing the discharge of filling liquid from the needle tube 69.

Improved form of ampoule elevating mechanism

In Figs. 9 and 10, a modified form of ampoule elevating mechanism is shown which may be used in place of the previously described elevator 56 (see Fig. 3). In this modified form, provision is made of an angular elevator plate 300 which is seated upon the upper end of a vertically reciprocable rod 301 to which it is slidably connected as by a pin 302 extending from a lug 303 secured to the plate 300 and passing into a hole provided in the upper end of the rod 301, whereby the plate 300 may slide laterally upon the end of the rod 301 but is connected thereto for reciprocable movement therewith. The plate 300 is normally in alignment with the upper surface of the ampoule guide strip 56 (see full lines in Fig. 10), to receive ampoules fed therealong by the feed screws 17 and 18, and when in raised position, said plate disposes the ampoule rearwardly in filling position in accurate registration with the funnel-shaped member 70 (see Fig. 6). In its vertical reciprocable movements, the plate 300 is guided by a camming strip 304 and is moved laterally away from the feed screws 17 and 18 by the cooperating action of a roller 305 in the lug 303 with an offset camming slot 306 provided in the strip 304 to swing the body 22 of the ampoule away from the feed screw 17 into filling position, as indicated in dotted lines in Fig. 10.

The plate 300 is adapted to be moved upwardly by a weight 307 attached to the end of a cord 308 which is led over a small pulley 309 and then secured to the rod 301 adjacent the lower end thereof. The rod 301 is guided by being enclosed in a stationary tubular guide 310, to which the camming strip is secured. The tubular guide 310 is slotted in both sides to allow the end of a lever 311, corresponding to the lever 63 (see Fig. 3 supra), to pass therethrough. The lever 311 may thus move up in the guide tube, and if for any reason the filling needle tube 69 fails to enter the neck of the ampoule the possibility of injury to or breakage of said ampoule is thereby prevented. The filling operation occurs during a dwell in the motion of the elevator plate and is similar to that described on pages 5 and 6 for the first form of the invention. The lever 311 is pivoted at 312, corresponding to the pivot point 64, supra, and extends to a point below a cam 313, corresponding to the cam 67 on the shaft 29, supra, where it is connected to the cam 313 as by a slidable link 314 (see Fig. 9). The lower end of the lever 311 passes into a slot 315 formed in the lower end of the rod 301 whereby rocking movement of the lever 311 by the cam 313 in a clockwise direction will permit the weight 307 to raise the table 300 and movement of said rod 301 in the other direction to pull the plate 300 downwardly into its aligned position in respect to the guide 56. The movement of the cams 313 is timed in relation to the other machine operations to raise an ampoule into filling position when the filling mechanism is actuated. Simultaneous with the raising of the plate 300, the upper end of a flat vertical bar 316 movable with the plate 300 will engage a swingable T-shaped guide rod 317 to raise it out of the way of the ampoule being lifted, as indicated in dotted lines in Fig. 10, thus preventing jamming of the ampoules when the latter are in raised position.

Another elevator table 318 for raising the am-

poules into sealing position is secured upon the upper end of a rod 320 guided in a stationary bracket 321. The plate 319 is adapted to receive an ampoule after it has been filled from the guide 56 and to raise it still higher to the level of the raised guide portion 105. This action is accomplished by pivotally connecting the rod 320 by means of a link 322 to the end of a lever 323 also pivoted at 312 and extended to below a cam 324 secured on the shaft 29 adjacent the cam 313 where it is connected to the cam 324 by a slidable link 325. The cam 324 is timed in relation to the feed of the ampoules along the guide 56 by the feed screws 17 and 18, and serves to lift the ampoules up to the level of the raised guide portion 105 to be guided thereby into position to be sealed by the ampoule sealing means above described.

While there has been disclosed in this specification several forms in which the invention may be embodied, it is to be understood that these forms are shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosures, but may be embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new and for which it is desired to secure Letters Patent, is:

1. In an ampoule conveying machine, a pair of vertically spaced-apart horizontal intermittently-rotated feed screws, each having a helical groove formed in the surface thereof, means to guide a plurality of ampoules in vertical position and hold them in the successive turns of said feed screws and on both sides thereof comprising a horizontal ampoule-supporting bar below the lowermost feed screw, and side guide members for said ampoules. whereby said ampoules will be automatically advanced in a horizontal direction by the rotation of said feed screws, filling means and means responsive to the absence of ampoules in said feed screws to automatically stop the operation of said filling means.

2. In an ampoule conveying and filling machine, a pair of vertically spaced-apart horizontal intermittently-rotated feed screws, each having a helical groove formed in the surface thereof, means to hold said ampoules in the successive turns of said feed screws, whereby they will be advanced horizontally by the rotation of said screws, an ampoule filling nozzle, a movable plate for supporting an ampoule in vertical position below said nozzle, said plate being initially located at one side of and below said nozzle, and cam-operated means to simultaneously raise said plate and move it laterally to carry the ampoule supported thereon into exact registry with said nozzle to permit said ampoule to be filled.

3. In an ampoule conveying machine, a pair of vertically spaced-apart horizontal intermittently-rotated feed screws of identical pitch, said upper feed screw having a shallow narrow helical groove in its surface to fit the small necks of the ampoules, said lower feed screw having a deep wide helical groove in its surface to fit the large bases of said ampoules, a flat horizontal guide member below the lower screw to support a plurality of ampoules on one side of said feed screws, and means to hold said ampoules in vertical position in the successive turns of said feed screws and on both sides thereof, whereby said ampoules will be advanced in a horizontal direction by the rotation of said feed screws.

4. In an ampoule conveying machine, a pair of vertically spaced-apart horizontal intermittently-rotated upper and lower feed screws, said screws having helical grooves in their surfaces to fit the top and bottom sections, respectively, of the ampoules conveyed thereby, a flat horizontal guideway below said lower screw to support said ampoules, means to hold said ampoules in vertical position in the successive turns of said feed screws and on both sides thereof, whereby said ampoules will be advanced in a horizontal direction by the rotation of said feed screws, an inclined magazine to hold a supply of ampoules, a reciprocating pusher member, and a cooperating cam cooperating with said pusher member for successively forcing said ampoules horizontally into contact with said feed screws.

5. In an ampoule conveying machine, a pair of vertically spaced-apart horizontal intermittently-rotated upper and lower feed screws, said screws having helical grooves in their surfaces to fit the top and bottom sections, respectively, of the ampoules conveyed thereby, a flat horizontal guideway below said lower screw to support said ampules, means to hold said ampoules in vertical position in the successive turns of said feed screws and on both sides thereof, whereby said ampoules will be advanced in a horizontal direction by the rotation of said feed screws, a pair of inclined magazines containing vertical ampoules, a reciprocating pusher member, and a rotary wedge ear having a pair of opposed cam blades mounted on the end of said lower feed screw cooperating with said pusher member for forcing the ampoules from both of said magazines alternately into contact with said feed screws on both sides thereof.

6. In an ampoule conveying machine, a pair of vertically spaced-apart horizontal intermittently-rotated upper and lower feed screws, said screws having helical grooves in their surfaces to fit the top and bottom sections, respectively, of the ampoules conveyed thereby, a flat horizontal guideway below said lower screw to support said ampoules, means to hold said ampoules in vertical position in the successive turns of said feed screws and on both sides thereof, whereby said ampoules will be advanced in a horizontal direction by the rotation of said feed screws, a pair of inclined magazines containing vertical ampoules, a rotating wedge having a pair of opposed cam blades mounted on the end of said lower feed screw, and a reciprocating pusher member having a vertical pin which is engageable by said blades alternately to cause ampoules to be pushed from the delivery ends of said magazines into the grooves of said feed screws.

7. In an ampoule conveying machine, a horizontal intermittently-rotated feed screw having a deep helical groove formed in the surface thereof, a flat guideway below said screw to support a plurality of ampoules in vertical condition, means to hold said ampoules in successive turns of said groove on both sides of said feed screw, whereby all of said ampoules will be advanced simultaneously by said feed screw, an inclined magazine for initially holding said ampoules in vertical position, a reciprocating pusher block for successively engaging said ampoules as they come from said magazine, and a rotary cam mechanism driven by said feed screw for actuating said pusher block.

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