E. E. KIMBLE & J. M. LEVIS.

VIAL NECKING MACHINE.

APPLICATION FILED APR. 8, 1909.

1,009,418.

Patented Nov. 21, 1911.

8 SHEETS—SHEET 1.

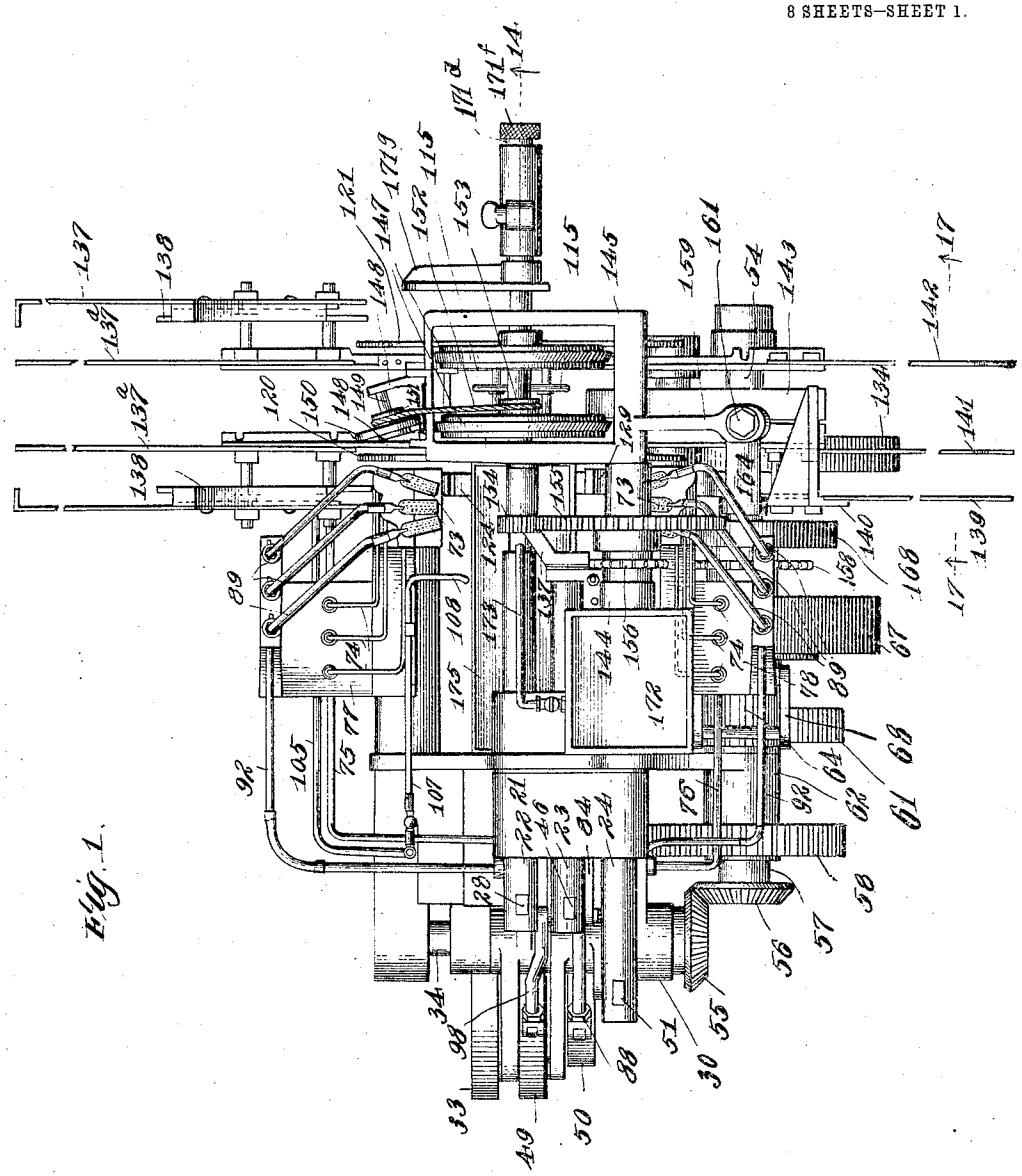

Fig. 1.

Witnesses:

G. A. Pauberschmidt

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys.

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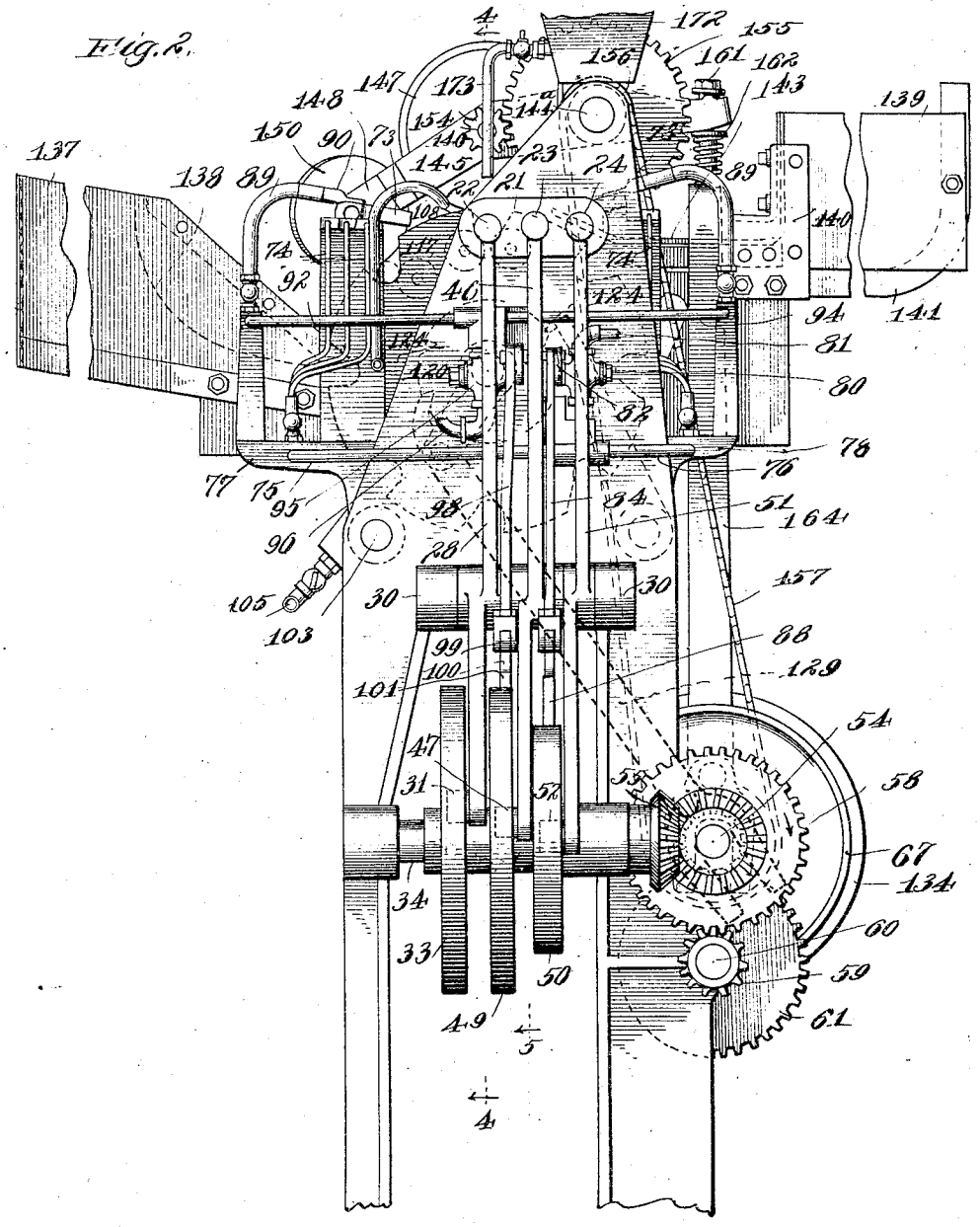
Fig. 2.



Witnesses,

G. A. Paulsenschmidt

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

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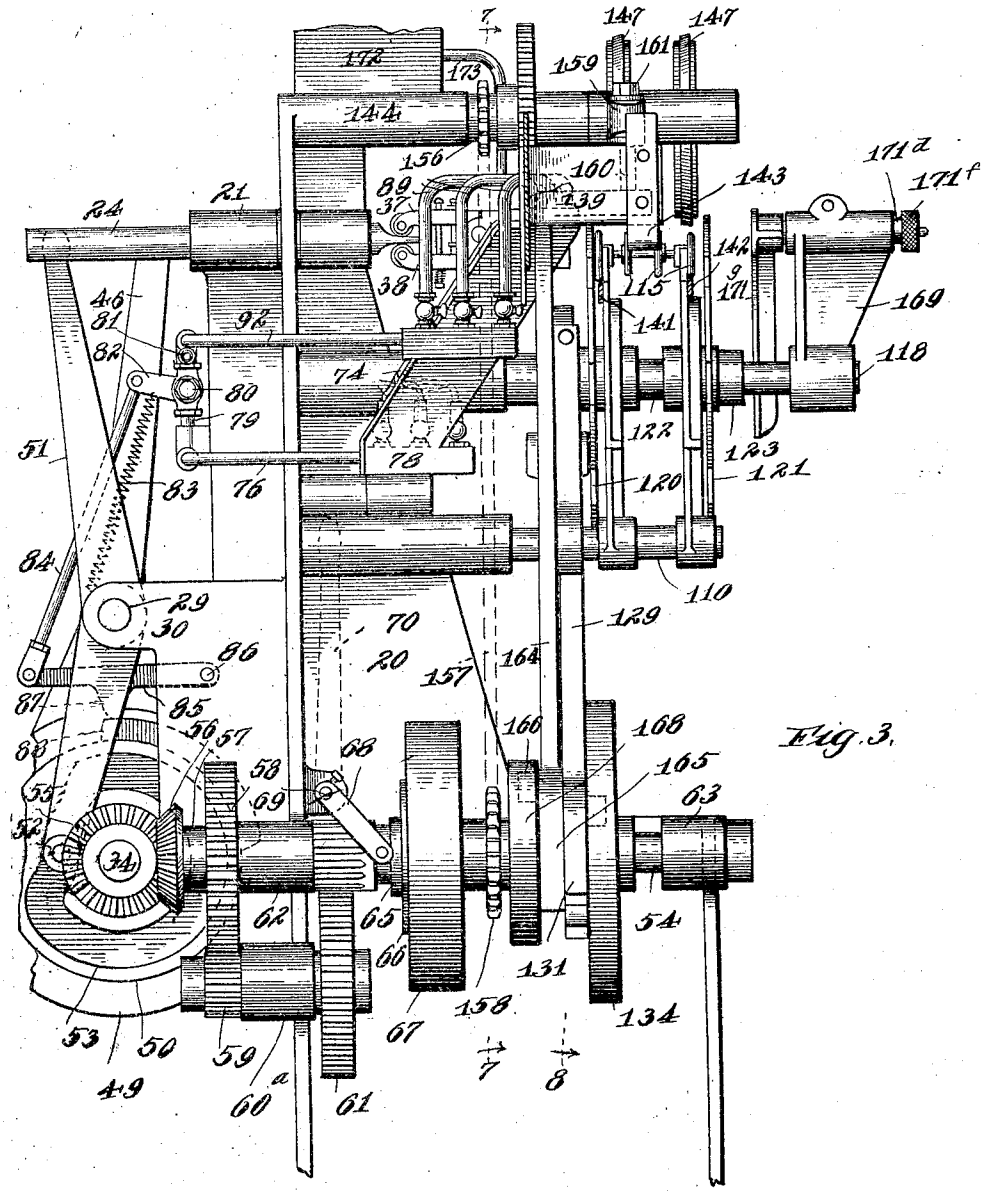

Fig. 3.

Witnesses:

G. A. Vaubenschmidt.

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys.

E. E. KIMBLE & J. M. LEVIS.

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Fig. 4.

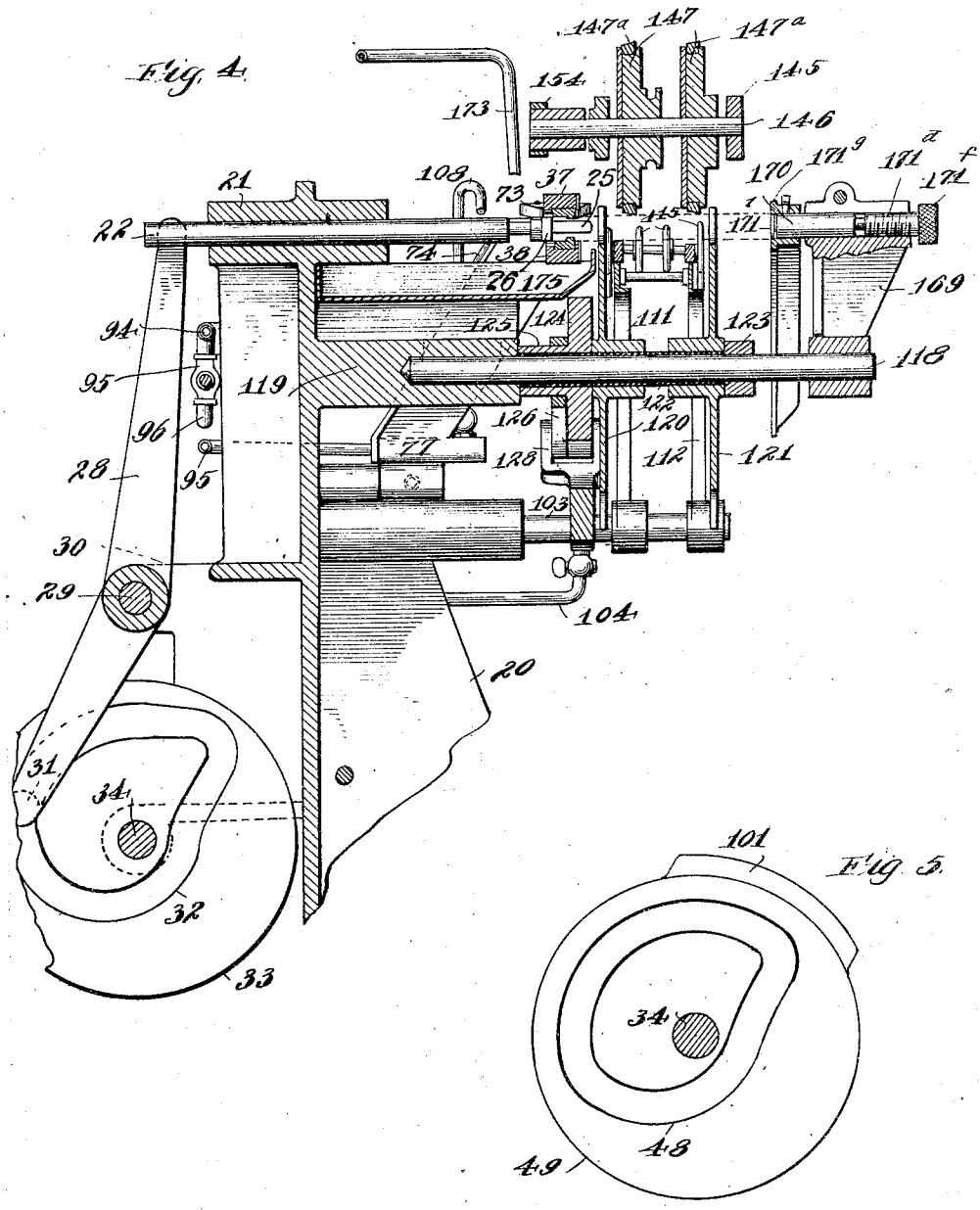

Fig. 5.

Witnesses:

D. A. Rauberschmidt

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys.

E. E. KIMBLE & J. M. LEVIS.

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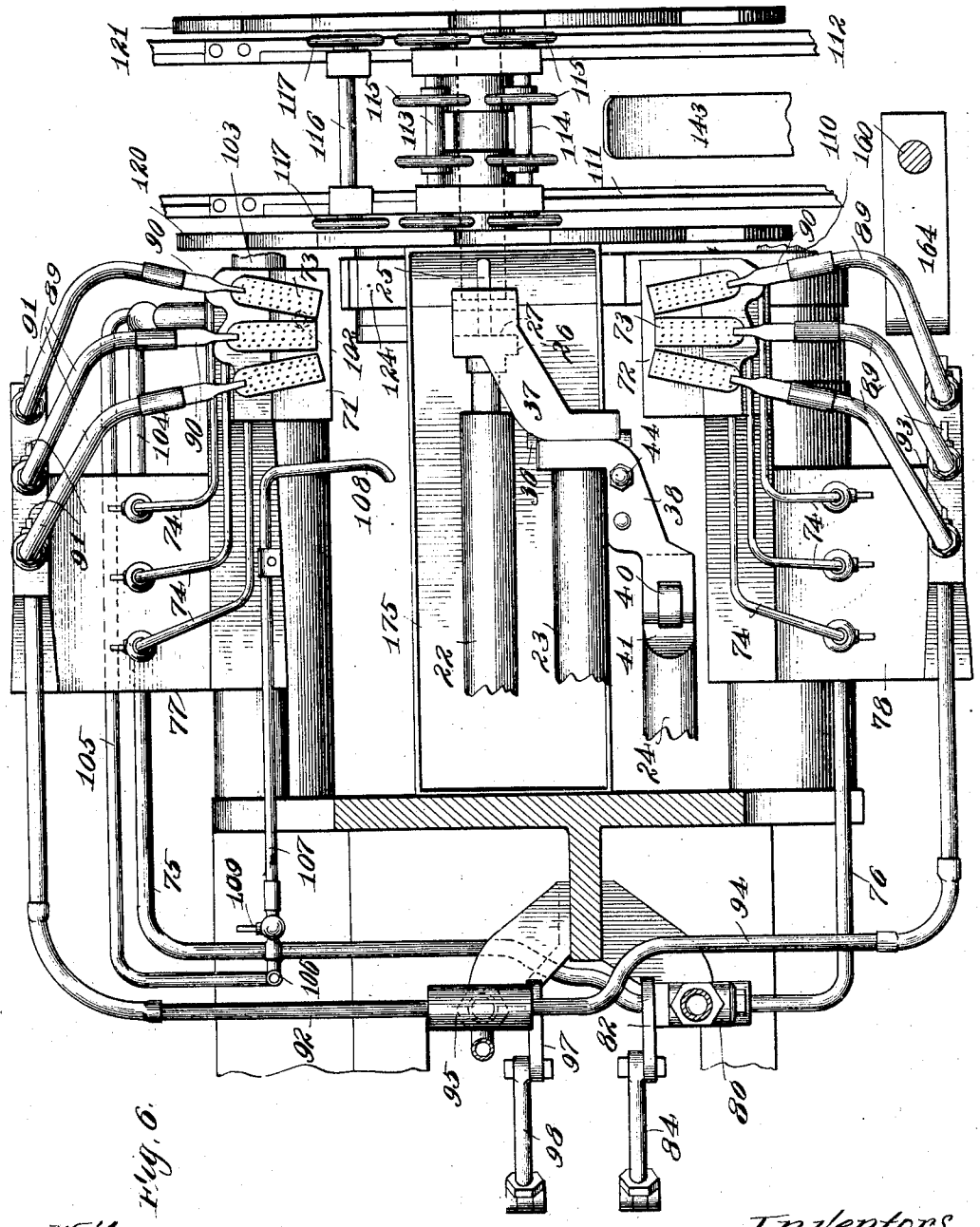

Fig. 6.

Witnesses.

J. A. Vandenschmidt

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys

E. E. KIMBLE & J. M. LEVIS.

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Fig. 7.

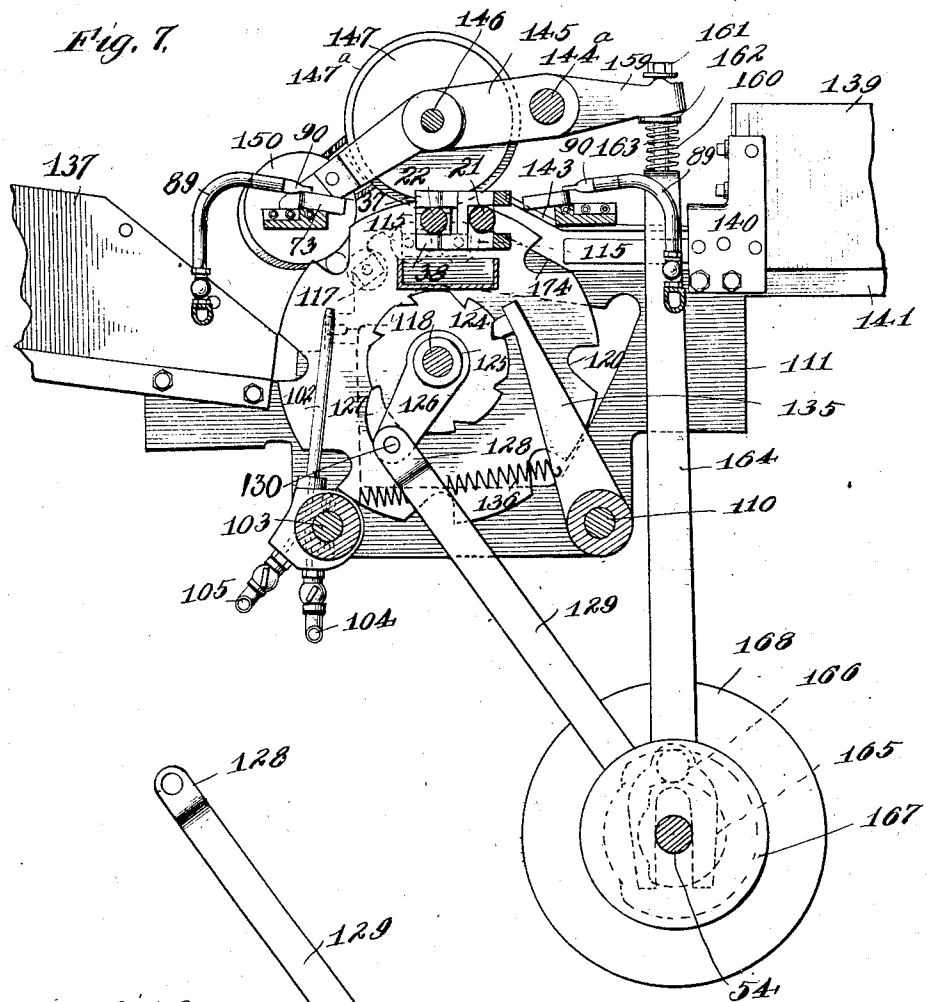
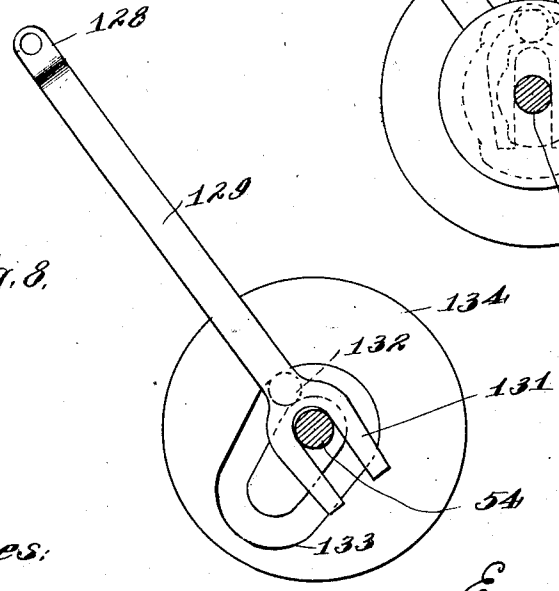


Fig. 8.



Witnesses:

G. A. Paubenschmidt

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys

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Fig. 9.

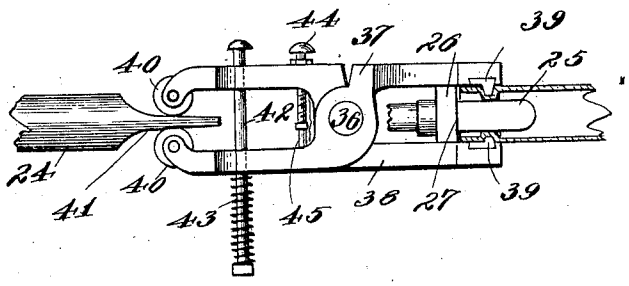


Fig. 10.

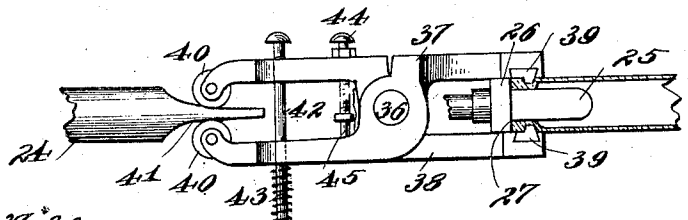


Fig. 12.

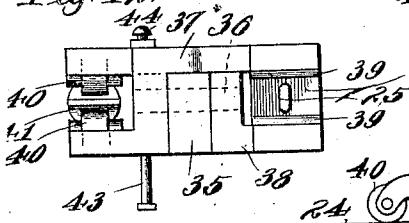


Fig. 11.

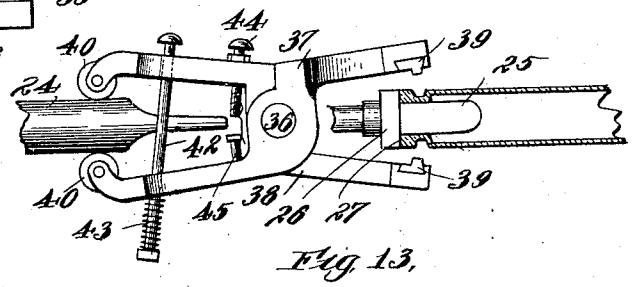
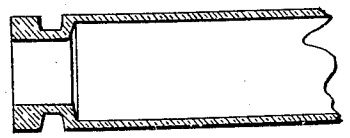


Fig. 13.



Witnesses:

G. A. Vanderschmidt

Walter M. Tulle

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys

E. E. KIMBLE & J. M. LEVIS.

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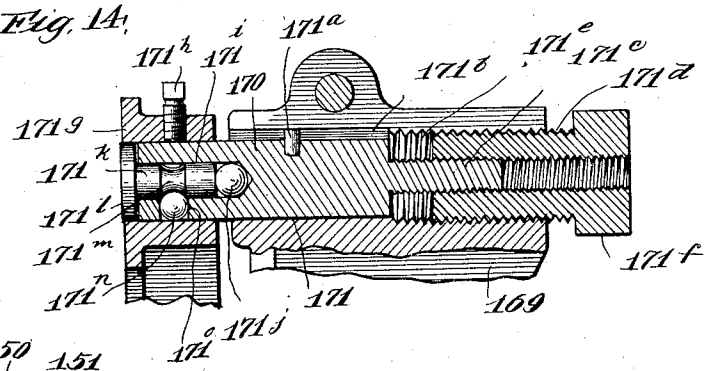
8 SHEETS—SHEET 8.

Fig. 14.



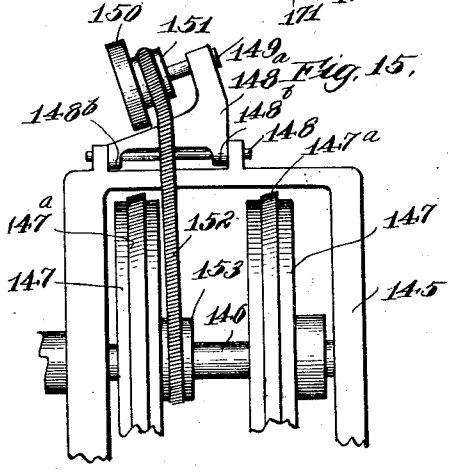


Fig. 15.

Fig. 17.

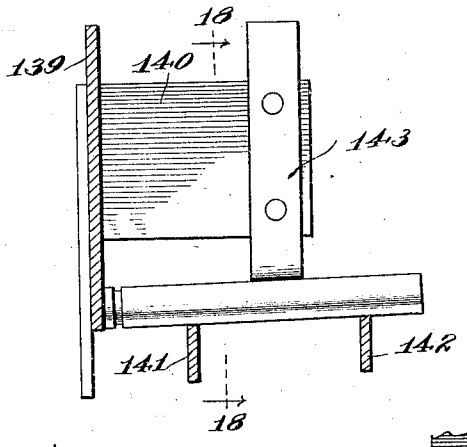


Fig. 18.

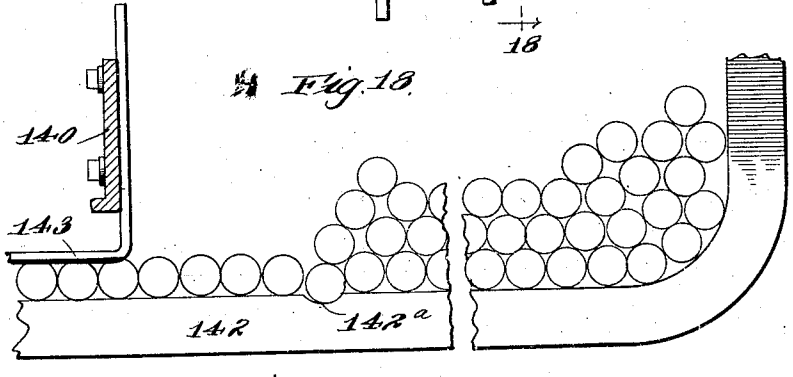
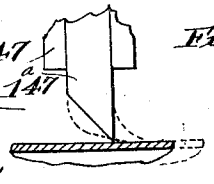


Fig. 16.



Witnesses

G. A. Rauberschmidt

Walter M. Fuller

Inventors

Evan E. Kimble

John M. Levis

By Offield Towle & Linthicum

Attys

UNITED STATES PATENT OFFICE.

EVAN E. KIMBLE AND JOHN M. LEVIS, OF CHICAGO, ILLINOIS, ASSIGNORS TO KIMBLE GLASS COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

VIAL-NECKING MACHINE.

1,009,418. Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed April 8, 1909. Serial No. 488,761.

To all whom it may concern:

Be it known that we, EVAN E. KIMBLE and JOHN M. LEVIS, both citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have jointly invented certain new and useful Improvements in Vial-Necking Machines, of which the following is a specification.

Our invention pertains to improvements in machines for automatically providing on the ends of glass tube sections shoulders, necks, and lips, whereby, after both ends of such sections have been thus necked, they may be divided at the center and their two parts closed to form independent vials.

There are several features of our machine having marked advantages over those of the prior art, and among such we may mention the employment of means to primarily or initially heat the ends of the glass tube sections while they are on the carrier or conveyer and before they reach the position where they are acted upon by the main heaters and neck-forming tools. By the use of such a contrivance we are enabled to produce vials with considerable rapidity, the preliminary heating of the blanks preparing them, without loss of time, for the main heaters and tools. We have also found that in a device of this kind it is highly desirable, if not quite necessary, that the mouth of the bottle should be faced up or formed true to the body after the tools have produced the neck of reduced diameter rather than coincidently or simultaneously with the neck-forming operation.

Other features of novelty and improvement will be made apparent from the following description of a preferred embodiment of the invention, taken in connection with the accompanying drawings, forming a part of this specification, and throughout the various views of which like reference characters refer to the same parts.

In these drawings—Figure 1 is a plan view of the contrivance, certain parts being broken away; Fig. 2 is an end view of the machine, the lower portion being omitted; Fig. 3 is a back or rear elevation, fragments of certain parts only being shown; Fig. 4 is a vertical section on line 4—4 of Fig. 2; Fig. 5 is a vertical section on line 5 of Fig. 2 illustrating one of the actuating cams; Fig. 6 is a horizontal section on an enlarged scale; Fig. 7 is a vertical section on line 7—7 of Fig. 3, certain parts being omitted for the sake of clearness; Fig. 8 is a section on line 8 of Fig. 3; Fig. 9 is a somewhat diagrammatic view illustrating the action of the neck-forming tools on the tube section; Fig. 10 is a similar view showing the truing up of the mouth of the bottle; Fig. 11 is a similar view illustrating the manner in which the external tools open up preparatory to backing away; Fig. 12 is an end view of the tools and their actuating mechanism; Fig. 13 is a section of one of the finished necked blanks, showing the same on an enlarged scale; Fig. 14 is a vertical section on an enlarged scale on line 14 of Fig. 1; Fig. 15 is a fragmentary plan on an enlarged scale of frames and rollers employed to rotate the blanks; Fig. 16 is a view illustrating how the larger beveled rubber rollers act to hold the rotated tube or blank against the back stop or guide; Fig. 17 is a vertical section through the discharge magazine or compartment on line 17—17 of Fig. 1; and Fig. 18 is a section on line 18—18 of Fig. 17 taken longitudinally of the discharge compartment.

Referring to the drawings, it will be noticed that the machine has a main supporting frame 20 of irregular shape (Figs. 2, 3 and 4), and is supplied at its top with a flat horizontal enlargement 21 provided with apertures extended longitudinally therethrough for three round shafts or rods 22, 23, and 24 arranged side by side, as is clearly indicated in Figs. 1, 2 and 6. The inner end of the shaft 22 is supplied with an inner flat tool portion 25 adapted to enter the tube blank to be acted upon and to determine the interior caliber or diameter of the finished neck, this tool having a square enlargement 26 with a flat face or shoulder 27 adapted to be brought against

the end of the heated tube section to form the mouth of the bottle and true its outer face. The outer end of shaft or rod 22 is slotted to accommodate the upper end of a lever 28 loosely fulcrumed on an end shaft 29 suitably supported in brackets or bearings 30, the lower end of the lever being equipped with a roller 31 on one side, traveling in a cam slot 32 provided in the face of a cam 33 fixed to turn with the cam shaft 34 on which it is mounted.

The middle reciprocatory shaft 23 at its inner end is supplied with a block 35 through which passes a hinge-pin 36, shown in dotted lines in Fig. 12, protruding from opposite sides of the block, and on such pin we fulcrum the pair of jaws 37, 38 off-set laterally on one side of the shaft 23, such off-set portion being equipped with the inserted external neck-forming dies or tools 39 (Fig. 9). The rear ends of these jaws or arms are off-set on the other side of the shaft 23, and each is supplied with a roller 40, the two rollers co-acting with the top and bottom surfaces of the third rod or shaft 24, the inner end of which 41 is of wedge shape, as is clearly shown for example in Fig. 9. The jaws 37 and 38 are normally pressed to closed position by a spring 43 encircling a screw 42 threaded into the upper jaw and loosely passing through the lower one, such spring pressing against the latter and a nut on the lower end of the screw. Turning of such screw adjusts or varies the action of the spring on the jaws. The closing of such jaws is limited and restricted by a screw-threaded adjustable stop 44 extending through one of the jaws and adapted to co-act with a fixed stop or abutment 45 on the other jaw. A slot is provided in the outer end of shaft 23 to accommodate the top end of a lever 46 mounted to rock on the shaft 29, as is the lever 28, and likewise supplied at its lower end with a roller 47 traveling in a cam groove 48 (Fig. 5) of a cam 49 similarly fixed to rotate with the cam shaft 34. The remaining shaft 24 is likewise operatively connected to a cam 50 on shaft 34 by a rocking lever 51 oscillatory on the shaft 29, this lever, as in the previous instances, being equipped with a roller 52 working in a cam slot 53 of the cam 50.

The shaft 34 is driven from a lower back driving shaft 54 (Fig. 3), rotatable in bearings 62 and 63, by means of meshing bevel pinions 55 and 56, the former being fixed to shaft 34, while the latter is fixed to shaft 54. Also keyed to shaft 54 beside hub 57 of gear 56 is a spur-gear 58, the teeth of which mesh with those of a pinion 59 on a jack-shaft 60 rotatable in bearing 60^a, the other end of such shaft having fixed thereto a gear wheel 61 meshing with a pinion 64, forming part of a clutch sleeve 65 loose on shaft 54 and slidable thereon to render the clutch 66, inside of the driving pulley 67 also loose on shaft 54, operative or inoperative. Clutch sleeve 65 is operated by one or more oscillatory arms 68 on a small rock shaft 69 to which is connected an actuating or controlling handle 70, shown in dotted lines in Fig. 3. Obviously shafts 34 and 54 rotate at a much less speed than pulley 67.

Two main suitably-supported heating appliances 71 and 72 (Fig. 6) are employed at the front and back of the machine and are so arranged that the blow pipe blasts of burning gas and air will be directed on to the end of the tube section when in position to be acted upon by the internal and external neck-forming tools described above. The two heaters 71 and 72 are each supplied with a plurality of gas burners or tips 73 each having a considerable number of perforations for the escape of the gas, which is conducted to the individual burners by the valved gas pipes 74, 74, connected, respectively, to the gas pipes 75 and 76 by means of apertures in the parts 77 and 78 of the main frame. These two pipes, by means of a single short connecting pipe 79 (Fig. 3), are brought into communication by a gas valve 80, connected at its upper end to a main gas supply pipe 81. As is clearly indicated, the arm 82 of this gas valve is normally pulled downwardly by a coil contractile spring 83, and is connected by a link 84 to the outer end of a cam arm 85 suitably fulcrumed on the frame at 86 and supplied with a finger or projection 87, which co-acts with the cam 88 on the outer surface of the shaft controlling cam 50 mentioned above. It will, therefore, be apparent that during the operation of the machine and the rotation of the cam 88 the gas valve 80 for a part of the time will be opened to its full extent to allow a generous supply of gas to the burners, and that during a portion of the rotation of the cam the gas will be almost entirely shut off, permitting a sufficient flow to the burners, however, to prevent extinguishment of the flames.

Each of the gas burners 73 has associated therewith a compressed air pipe 89 (Fig. 6), each terminating in a nozzle 90 at the end of its burner, whereby the jet of air issuing therefrom will supply oxygen for the complete combustion of the gas, and will direct or blow the flame on to the end of the tube to be operated upon. The three air pipes 89 at the front of the machine are each supplied with a valve 91 and are all connected to a single air supply pipe 92, while the corresponding air pipes at the back of the machine are likewise equipped with individual control valves 93, these back air pipes being similarly joined to the single supply pipe 94. Both pipes 92 and 94 are connected to the top end of an air valve 95,

the lower end of which is connected by a pipe 96 with any suitable source of compressed air supply. As in the case of the gas valve, the arm 97 of this air valve is normally spring-pulled down, and by means of a link 98 is connected to a rock arm 99, similar to the arm 85, and supplied with a projection 100 on its under surface, co-acting with a cam 101 on the exterior surface of the cam 49. It will, therefore, be apparent that the rotation of this cam 101 will control the opening and closing of the compressed air valve 95 and the flowing air to the burners.

The preliminary heater or gas burner 102, shown in full lines in Fig. 7 and in dotted lines below the front burner 71 in Fig. 6, comprises nothing more than an ordinary Bunsen burner mounted on a rod 103 projecting lengthwise the machine from the main frame, and supplied with gas through a pipe 104 connected to the apertured block 77, and furnished with air through a pipe 105 connected to an air supply pipe 106, which also conducts compressed air through the pipe 107 (Fig. 6) to a discharge blower or nozzle 108 adapted to direct a jet or blast of air against the neck-forming tools and shafts described above to cool them at intervals if found to be necessary, the supply of air passing through the pipe 107 being controlled by a valve 109 inserted therein.

Referring to Figs. 3, 6 and 7, it will be noticed that on the outstanding rod 103 and a similar rod 110 we mount a pair of plates or supporting members 111 and 112 centrally apertured and of irregular shape, which may be traced on Fig. 7. In suitable bearings on these two spaced plates and at their top portions we mount two shafts 113 and 114 (Fig. 6) each supplied with a plurality of rollers 115 adapted to support the tube section while it is being acted upon by the main heaters and neck-forming tools described above. Somewhat removed from these shafts and rollers toward the front of the machine and also mounted on plates 111 and 112, we supply a shaft 116 having on its ends similar rollers 117 on which the tubes are adapted to rest while being acted upon by the preliminary heater 102, the position of these rollers being indicated in dotted lines in Fig. 7. A tube carrier or conveyer is loosely mounted on an outwardly-extended stud shaft 118 (Fig. 4), the inner end of which is supported in an apertured boss 119 forming part of the machine frame, this carrier comprising a pair of notched wheels 120 and 121 fixed to a sleeve 122 rotatable on the supporting shaft 118 and held in place by the collar 123. Also fixed to this sleeve and rotatable with the carrier we provide a ratchet wheel 124 (Figs. 4 and 7) with a cylindrical hub 125 on which is loosely mounted the inner end of an oscillatory arm 126, the lower end of which, as well as the pawl 127 co-acting with the ratchet, is received between and is pivoted to the upper bifurcated end 128 of a cam arm 129, a suitable pivot-pin 130 passing through all the parts for the obvious purpose of securing their pivotal connection. The lower end of arm 129 is forked at 131 (Fig. 8) so as to straddle shaft 54, the arm having mounted on one side a roller 132 traveling in a cam slot 133 in a cam 134 fixed to and rotatable with the back shaft 54. Loosely mounted on supporting rod 110 is a stop pawl 135 (Fig. 7) pulled inwardly by a coil spring 136 and engaging the teeth or notches of the ratchet wheel 124 to prevent backward or unintentional turning. Obviously, the rotation of shaft 54 and cam 134 causes the reciprocation of cam arm 139, the lower end of which is guided by its fork 131, and also occasions the forward feeding of the ratchet and carrier step by step.

At the front side of the machine and supported on the pair of plates or members 111 and 112 is an inclined supply hopper 137 (Figs. 1 and 2) having a pair of parallel inclined bottom supporting bars 137ª, adapted to contain the tube blanks and deliver them individually to the notched carrier, the feeding of more than one tube at a time to the carrier being prevented by a pair of curved guards 138 secured to the inner sides of the vertical walls of the hopper, these guides or guards being so positioned with relation to the bottom of the hopper that only one layer of tubes can pass beneath the same.

A discharge magazine is mounted on the back of the machine and is composed of a single vertical plate 139 carried by a bracket 140, the latter being supported by the member 111, as is indicated in Fig. 7. Also projecting out rearwardly from the two members 111 and 112 are a pair of bars 141 and 142 (Figs. 1 and 17) on which the finished tubes are adapted to roll. To normally bring the tubes against plate 139 the outer bar 142 is positioned slightly higher than its companion (Fig. 17). To facilitate the proper discharge of the tubes from the carrier, a flat spring 143 is mounted on the bracket 140 and beneath such spring the tubes pass as they leave the carrier and travel to the tracks or supporting bars 141 and 142 (Figs. 1, 2, 17 and 18). In order that this delivery compartment may fill up with the tubes substantially uniformly, even though they are fed in from the bottom, the outer ends of bars 141 and 142 are curved upwardly, as shown in Fig. 18, and either or both bars are equipped on their top edges with a slight depression or recess 142ª to accommodate one of the necked tubes. If

the number of tubes back of the one in the recesses is small, the tubes as they come into the compartment from under spring 143 will push back the tube in the recess and the others will successively take the place of the former. As the tubes begin to travel up the curved back ends of bars 141 and 142 they will roll down forwardly on top of the others, as shown in Fig. 18, and, if an accumulation of such tubes occurs at the back of the compartment, as shown in such figure, the tube in the recesses 142[a] for a time thereafter will act to block the backward travel of the incoming tubes, and will act as a wedge to compel such tubes to fill up the front part of the chamber before the remainder of the back part will fill. Obviously, from such an open delivery compartment or chamber the tubes may be readily removed.

On the stud or shaft 144[a] projecting outwardly from and supported by a socket 144 (Figs. 1, 3, 4 and 7) we mount an oscillatory skeleton frame 145 carrying a rotary shaft 146 supplied with a pair of friction rollers 147 fixed thereto and adapted to contact with the top of a glass tube when it is supported by the rollers 115, whereby rotation of the tube is readily secured. In the present instance the rollers 147 are supplied with rubber tires or peripheral bands 147[a] beveled as indicated to rotate the tube and push it back against a rotary stop described hereinafter.

Fig. 16 indicates how as the roller is brought down on to the top of the tube its thin beveled edge is shifted sidewise carrying the tube with it because of the frictional contact between the two. Inasmuch as, during the rotation of the roller, fresh and successive portions of such edge are continually being pressed out sidewise, the tube is readily maintained endwise against the rotary abutment or stop referred to.

Hinged to the front part of frame 145 on a hinge pin 148 we provide a frame or swinging bearing member 148[a] carrying a canted or oblique stub shaft 149 supplied with a friction roller 150 and a small grooved pulley 151 rotated by a spiral spring belt 152 passing around a similar pulley 153 on shaft 146. The descent of bracket 148[a] is limited by its shoulders 148[b] coming in contact with the front face of frame 145. The rotation of this latter shaft is effected by means of a pinion 154 (Figs. 2 and 4) mounted thereon externally of the frame 145 and having its teeth meshing with those of a gear 155 loose on the shaft 144[a] and rigidly connected to a sprocket wheel 156, co-acting with which is a sprocket chain 157 passing around sprocket wheel 156 and also around a sprocket wheel 158 fixed to the lower back shaft 54. It should, therefore, be perfectly clear that the rotation of the back shaft 54 is transmitted, through the sprocket chain and parts described, not only to the friction rollers 147 but also to the canted roller 150 which is located above the supporting roller 117 and is intended to rotate the glass tube while resting upon the latter during the initial or preliminary heating of the same. By bringing roller 150 to frame 145, the former by its own weight is sure to contact with and rotate the tube blank while being preliminarily heated, the spring belt 152 assisting in pulling the hinged pulley down. The oblique arrangement of roller 150 shifts the tube blank toward and maintains it against a curved guide or stop hereinafter described. In order to raise and lower this rocking frame and the friction rollers carried thereby to permit the glass tubes to be advanced step by step by the carrier the frame 145 (Fig. 7) is equipped with a rearwardly-extended apertured arm 159, through the hole of which extends a vertical rod 160 supplied at its top end above the arm with a nut 161 and below the arm with a washer 162, a compression spring 163 being interposed between such washer and the top laterally-bent end of a cam bar 164 forked at its lower end at 165 to straddle the shaft 54 and supplied with a roller 166 operating in a cam groove 167 in cam 168 rotatable with shaft 54.

In order to properly position the tube sections or blanks in the carrier, and especially during the heating and forming operations, we mount in the top apertured divided or split portion of a bracket 169, mounted on the outer end of shaft 118, a cylindrical supporting stud 170 (Figs. 4 and 14) longitudinally slidable in a correspondingly shaped hole 171 of the bracket and equipped with a pin 171[a] sliding in a slot 171[b] of the bracket to prevent rotation of the stud. In order to provide effective means for adjusting such stud in and out of the bracket, that is toward and from the neck-forming tools, the stud is supplied with a threaded extension 171[c] of reduced diameter, coöperating with which is an adjusting nut 171[d] axially threaded to receive a portion of the extension 171[c] and externally threaded to engage the internal threads 171[e] at the end portion of the aperture or hole through the bracket, these two sets of threads being of different pitch whereby turning of the nut by its knurled end 171[f] will slide or adjust the stud as desired. A curved bracket 171[g] is fitted on the protruding end of the stud 170 and is held in proper position by a set-screw 171[h]. The inner end of stud 170 is provided with a recess 171[i] containing a single ball bearing 171[j] at its inner end against which is adapted to bear the inner reduced end 171[k] of a rotary stop or abutment 171[l] positioned in alinement with the tube supported by the rollers 115. As is indicated, this rotary

abutment 171^{j} is received partially or wholly within the aperture of the curved guide 171^{g}, its extension 171^{k} having a curved annular recess 171^{m} coöperating with which is a retaining ball 171^{n} partially located in a cavity or hole 171^{o} of the stud, such ball retaining the rotary abutment or stop in position as long as the guide 171^{g} is fitted over the same to retain the ball in this recess. To remove the parts it is necessary first to slide off the guide, after which the ball 171^{n} can be taken out and the other parts readily removed, as will be obvious. Owing to the fact that the ends of these glass blanks possess considerable grinding action during their rotation, this rotary abutment, which may be hardened if desired, is supplied to prevent any grinding or wearing on the curved guide 171^{g}, it being apparent that this stop because of its ball bearing arrangement is readily rotated, the ball 171^{j} taking all of the longitudinal thrust. Since no neck-forming or similar tools are applied to the blanks during their preliminary heating, it is not necessary ordinarily in a device of this kind to provide a rotary stop of this character opposite the end of the blank when in its preliminary heating position.

In order to facilitate the operation of the tools acting on the heated tubes, we provide the top of the device with an oil tank 172 having a discharge pipe 173 from which the oil may drip on to the tool 25 adapted to enter the heated tube, the oil also dripping, of course, on the reciprocating shaft 22. Below this tube and shaft we place a catch-basin 175 for the recovery of the surplus oil

The operation of this machine is substantially as follows:—Assuming that the supply compartment 137 has been furnished with a plurality of glass tube sections of the proper length, such tubes roll down the inclined bottom bars 137^{a} of the hopper and in a single layer beneath the curved members 138, the tubes individually rolling into a pair of alined notches of the rotary carrier 120—121. The frame 145 and the friction rollers carried thereby will be lifted at intervals by cam 168 and the parts connecting the same with the frame, and during such raising of the rollers the carrier, through the operation of the ratchet 124 and pawl 127, will be turned a definite amount by means of cam 134, bringing the tube section which has just rolled out of the hopper into the notches of the carrier around into such position that it temporarily rests upon the rollers 117, where its end will receive its preliminary heating from the burner 102, it being understood that the tube section which had previously occupied this position was simultaneously carried farther along to be acted upon by the neck-forming tools. The tubes having been advanced as indicated, the cam permits the frame 145 to descend, bringing the canted or oblique roller 150 into contact with the top surface of the tube resting on rollers 117, the rotation of this upper roller causing the rotation of the tube section and also forcing the same longitudinally into contact with the front face of the curved guide 171^{g}. After a predetermined amount of preliminary heating of the tube section the frame 145 is again raised by its actuating cam, lifting the rollers sufficiently to permit the carrier to advance another step, causing the tube section just heated to be advanced so as to rest upon the rollers 115, the frame 145 then descending again so that the rotation of the friction rollers 147 is transmitted to the tube to effect its revolution. As will be readily understood, spring 160 yieldingly maintains the rollers in contact with the tubes. After the tube section in its new position has been heated sufficiently by the front and rear blow pipes, the supply of gas is nearly shut off by the action of cam 88, a sufficient flow of gas being permitted to maintain the burners lighted. At the same time the supply of compressed air is entirely cut off by the action of cam 101. At approximately the same time the two shafts 22 and 23 are advanced by their respective cams, the inner tool 25 entering the heated open mouth of the tube, it being understood that the rollers 40 of the tool carrying jaws 37 and 38 ride on the top and bottom surfaces of the shaft 24 during their advance, and just as the rollers reach the wedge part 41 of this wedge shaft the latter is partially retracted from between the rollers, permitting the spring 43 to close both jaws upon the heated tube section during its revolution, whereby the pair of external tools 39 form the neck of the vial, as is clearly indicated in Fig. 9. During this operation the internal caliber of the neck is determined and maintained by the inner tool 25. The latter is then caused to advance farther into the heated tube so as to bring the flat surface 27 against the end of the tube, truing the same up and making the mouth of the bottle somewhat thicker than the neck or main portion of the body, as is indicated in Fig. 10, this inward travel of the part 26 squeezing the glass somewhat outwardly into contact with the inner faces of the tools carried by the jaws. The movement of the parts is so timed that after the shoulder, neck and mouth have been properly formed, shaft 24 will advance, thrusting its wedge terminal portion between the rollers 40, thereby causing the opening of the jaws 37 and 38 and the withdrawal of the tools 39 from the tube, as is indicated in Fig. 11, and after such action both of the shafts 22 and 23 retract, carrying the tools away with them, whereupon the carrier is given another advance

step by the pawl and ratchet mechanism and the tube is discharged into the receptacle 139 beneath the spring 143, the tubes rolling down the inclined portions 174 (Fig. 7) of the pair of supports 111 and 112. Obviously, then, each tube is brought to the position in which it is acted upon by the neck tools in a highly heated condition, the temperature of the same having been preliminarily raised almost to the melting point by the extra burner 102. As soon as a new tube has been brought to forming position, the blow pipes both at the front and back of the machine are again brought into action by the opening of the gas and air valves, the operation above described being then repeated for each tube.

With a mechanism of this character, the necks, shoulders, and mouths may be formed on one end of the tube sections and then on the other, after which the sections may be divided centrally and closed to form the bottoms of the bottles. Actual demonstration and investigation have shown that the necking operation can be carried on with considerable rapidity, owing to the preliminary heating, and that bottles or vials of uniform size can be readily produced with but a comparatively small percentage of breakage, it being merely necessary to keep a quantity of tube blanks in the supply hopper and remove the finished articles from the receptacle at the back of the machine, the device being otherwise entirely automatic in its operation. By having separate and individual cams for controlling the actuation of the three shafts or rods 22, 23, and 24, a ready adjustment of such cams can be secured whereby to obtain the nicety of movement required for the successful operation of these parts of the mechanism.

Whereas we have set forth herein with some considerable degree of particularity the structural features of the various elements of this mechanism, it is to be understood, nevertheless, that the invention is not limited and restricted to the exact and precise construction shown, because the same is susceptible of considerable variation without departure from the substance and essence of the invention.

In order that the desired nicety of adjustment may be secured for the tools acting on the tube section necks, we preferably mount cams 33, 49 and 50 on the shaft 34 so as to be capable of angular adjustment, as, for instance, the attachment to such shaft may be by means of set screws, not shown, through the hubs of the cams, which is a common expedient for permitting adjustment in devices of various characters.

We claim:

1. In a machine of the character described, the combination of a conveyer for glass tube sections, means to heat the ends of such sections, means to form necks, shoulders and lips on such sections while thus heated, means to preliminarily heat such section ends, a friction roller adapted to contact with and rotate the tube section while acted upon by said forming means, a gage, and a canted friction roller adapted to act upon and rotate the tube section during the preliminary heating and acting to maintain the unheated end of the section against such gage, substantially as described.

2. In a machine of the character described, the combination of a conveyer for glass tube sections, means to actuate said conveyer step by step, means to heat the ends of such sections, means to form necks, shoulders, and lips on said sections while thus heated, means to preliminarily heat such section ends, a rocking frame, a roller in said frame adapted to contact with the tube section while acted upon by said forming means to rotate said section, a stationary gage, a friction roller in said frame obliquely arranged with respect to said gage and adapted to rotate the tube section during the preliminary heating, and cam means to lift said frame and rollers during the actuation of said conveyer, substantially as described.

3. In a machine of the character described, the combination of means to heat a glass tube section, means to rotate said section on its own axis, a sliding rod carrying a tool adapted to enter said tube section and determine the interior caliber of the neck formed, and adapted also to true up the mouth or open end of the vial, a second sliding rod carrying a pair of external neck-forming tools, a lever to slide said first rod, a second lever to slide said second rod, and independently-adjustable cams for actuating said rods and tools, the mouth or open end of the vial being trued up after the neck is formed, substantially as described.

4. In a machine of the character described, the combination of means to heat a glass tube section, means to rotate said section on its own axis, a sliding rod, in substantial alinement with the axis of said section, a shouldered tool carried by said rod having a portion adapted to enter the tube section and determine the inner caliber of the neck to be formed, a second sliding rod out of alinement with the axis of said section, a pair of external neck-forming tools mounted on said second rod, a cam to slide said first rod to cause said tool to enter the tube section and to cause said shoulder to true up the end or mouth of the tube section after the neck has been formed, means governing the opening and closing of said external tools on said section, and cam means to slide the second rod, substantially as described.

5. In a machine of the character described, the combination of a conveyer for glass tube sections, means to actuate said conveyer step by step, means to heat the ends of such sections, a sliding rod, an inner tool carried by said rod and adapted to enter said tube section and determine the inner caliber of the neck to be formed, a cam to slide said rod, a second rod, a pair of external neck-forming tools mounted on said second rod, a cam to slide said second rod, a third rod supplied with means to govern the opening and closing of said external tools on said tube sections, and means to slide said third rod, substantially as described.

6. In a machine of the character described, the combination of a conveyer for glass tube sections, means to actuate said conveyer step by step, means to heat the ends of such sections, a sliding rod, an inner tool carried by said rod adapted to enter the heated tube section and determine the inner caliber of the neck to be formed, a second sliding rod, a pair of external neck-forming tools pivoted on said second rod, a third rod coacting with said external tools and adapted to govern the opening and closing of the same on the tube section, and independent cams to slide said rods, substantially as described.

7. In a machine of the character described, the combination of a conveyer for glass tube sections, means to actuate said conveyer step by step, means to heat the ends of such sections, means to rotate each of said sections on its own axis when acted upon by said heating means, a sliding rod, an inner tool carried by said rod adapted to enter the heated tube section and determine the interior caliber of its neck, means to slide said rod, a second rod, a pair of jaws pivoted on said second rod and equipped with external neck-forming tools adapted to act upon the heated tube sections, a roller on each of said jaws, means to slide said second rod, a third rod having a wedge portion adapted to co-act with said rollers, and means to slide said third rod, substantially as described.

8. In a machine of the character described, the combination of a conveyer for glass tube sections, means to actuate said conveyer step by step, a gas burner, a gas pipe connected to said burner and adapted to conduct gas thereto, a valve for said gas pipe, a compressed air pipe adapted to discharge a blast of air against the gas flame to direct the same on to the end of one of the glass tube sections carried by said conveyer, a valve for said compressed air pipe, a slidable inner tool adapted to enter the heated tube section, a cam to actuate said inner tool, a pair of external neck-forming tools, a second cam to slide said pair of tools, means governing the opening and closing of said external tools on the tube sections, and a third cam to actuate said governing means, two of said cams having additional cam surfaces, a pair of means co-acting with said additional cam surfaces, and connections between said means and the air and gas valve whereby the supply of air is cut off during the action of the tools on the tube sections and the supply of gas to the burners is considerably diminished, substantially as described.

9. In a machine of the character described, the combination of a conveyer for glass tube sections, means to actuate said conveyer step by step, means to heat the ends of said sections, means to form necks, shoulders, and lips on such sections while thus heated, an inclined discharge track down which the tube sections are adapted to pass after leaving said conveyer, a flat spring above said track pressing on said sections and beneath which said sections pass, and a receptacle for said sections having a depression to occasion a substantially uniform filling thereof, substantially as described.

10. In a machine of the character described, the combination of means to heat glass tube sections, tools to form necks, shoulders, and lips on one end of such sections, means to rotate the sections on their own axes during the action of said tools thereon, and a rotary stop or abutment against which the opposite ends of said sections are adapted to bear during the operation of said tools, substantially as described.

11. In a machine of the character described, the combination of means to heat glass tube sections, tools to form shoulders, necks, and lips on one end of such sections, means to rotate the sections on their own axes during the action of said tools thereon, a rotary stop or abutment against which the opposite ends of said sections are adapted to bear during the operation of said tools, and a single ball-bearing for said stop or abutment to bear the thrust of said sections on said stop or abutment, substantially as described.

12. In a device of the character described, the combination of a receptacle for glass tube sections, and means to feed such sections into the lower part thereof, the bottom of said receptacle having a depressed portion to compel said sections to fill the receptacle substantially uniformly, substantially as described.

13. In a device of the character described, the combination of a receptacle for glass tube sections, and means to feed such sections into the lower part thereof, the bottom of said receptacle being provided with a depression into which one of the sections is

adapted to rest whereby to compel said sections to fill the receptacle substantially-uniformly, substantially as described.

14. In a device of the character described, the combination of a receptacle for glass tube sections, and means to feed such sections into the lower part thereof, the bottom of said receptacle being composed of a plurality of bars disposed on edge and having their ends upwardly-bent, the top edges of said bars being supplied with depressions whereby to compel the tube sections to fill the receptacle substantially-uniformly, substantially as described.

EVAN E. KIMBLE.
JOHN M. LEVIS.

Witnesses to the signature of E. E. Kimble:
A. C. WARD,
WALTER M. FULLER.

Witnesses to the signature of J. M. Levis:
A. C. WARD,
F. W. WARD.