Dec. 31, 1929. W. H. STILES ET AL 1,742,153

SEALING MACHINE FOR INCANDESCENT LAMPS AND SIMILAR ARTICLES

Filed May 23, 1925 4 Sheets-Sheet 1

Fig. 1

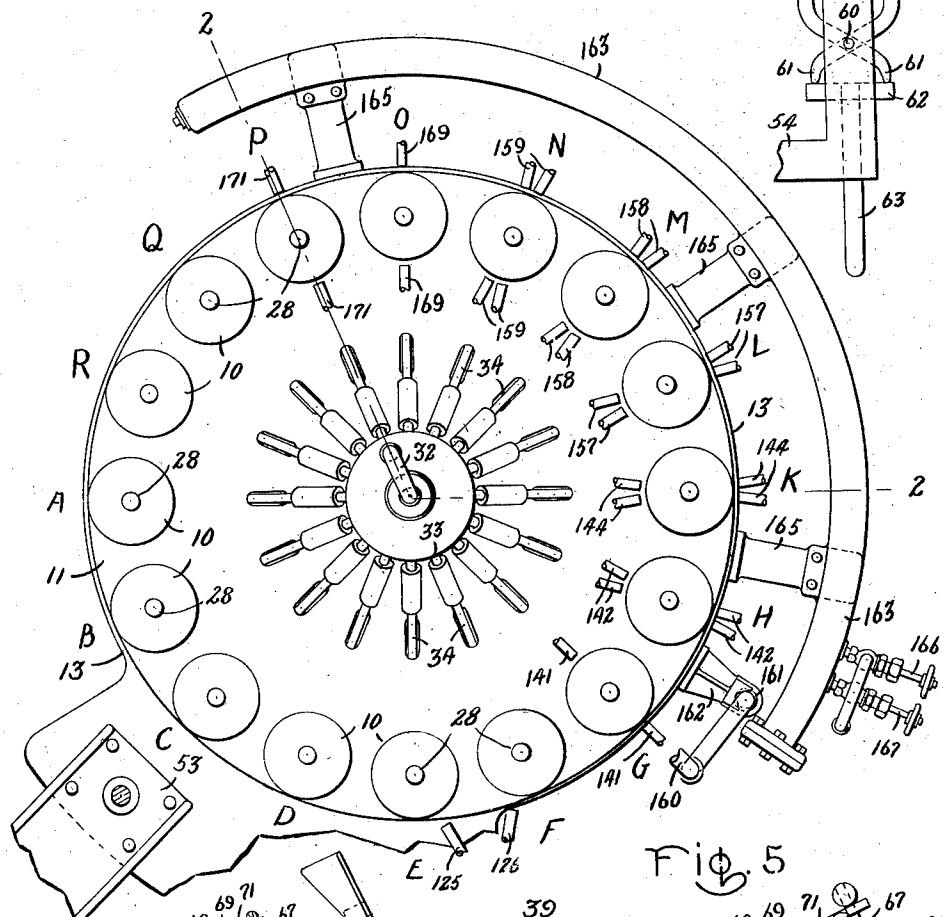


Fig. 6

Fig. 4

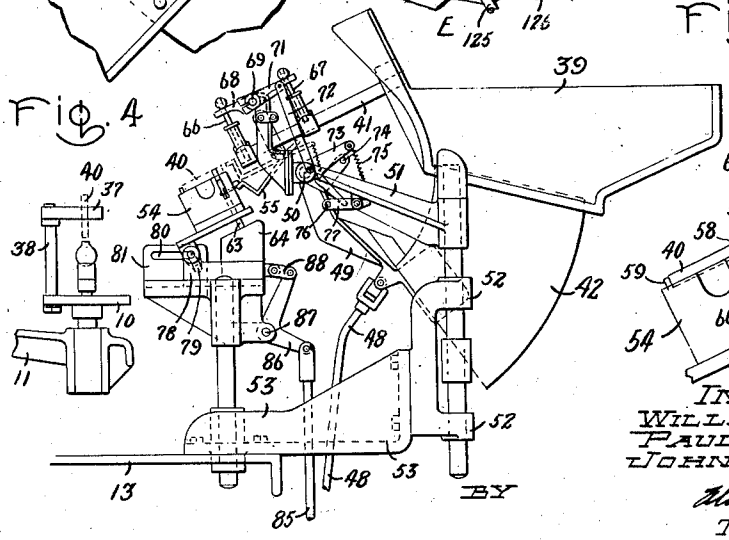
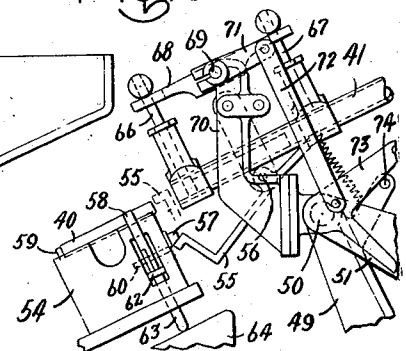


Fig. 5



INVENTORS:
WILLIAM H. STILES,
PAUL F. WAGENER,
JOHN F. DONOVAN,

Alexander S. Lamb

THEIR ATTORNEY.

Dec. 31, 1929. W. H. STILES ET AL 1,742,153

SEALING MACHINE FOR INCANDESCENT LAMPS AND SIMILAR ARTICLES

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Fig. 2

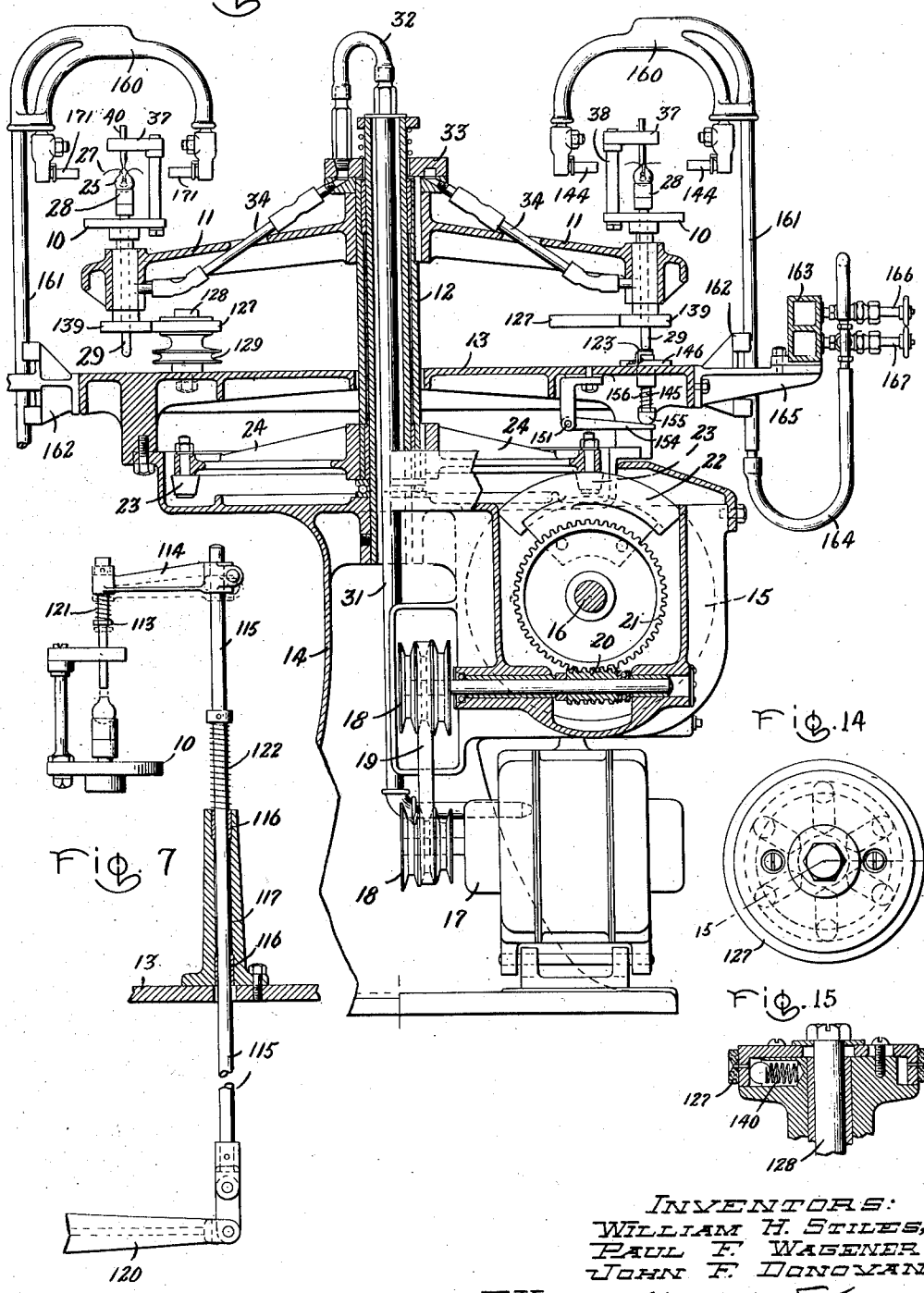


Fig. 7

Fig. 14

Fig. 15

INVENTORS:
WILLIAM H. STILES,
PAUL F. WAGENER,
JOHN F. DONOVAN,

BY Alexander S. Lane.

THEIR ATTORNEY.

Dec. 31, 1929. W. H. STILES ET AL 1,742,153

SEALING MACHINE FOR INCANDESCENT LAMPS AND SIMILAR ARTICLES

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Fig. 3

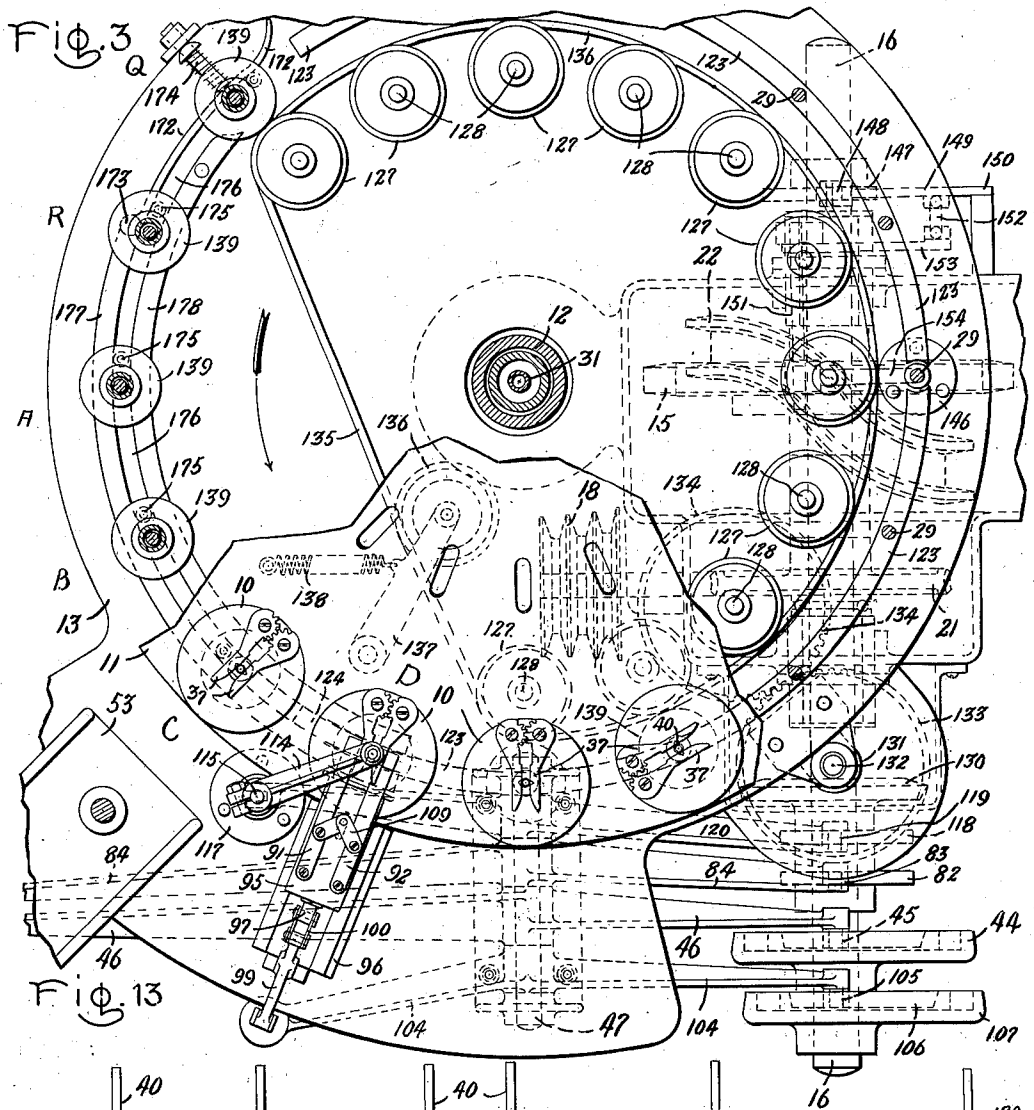
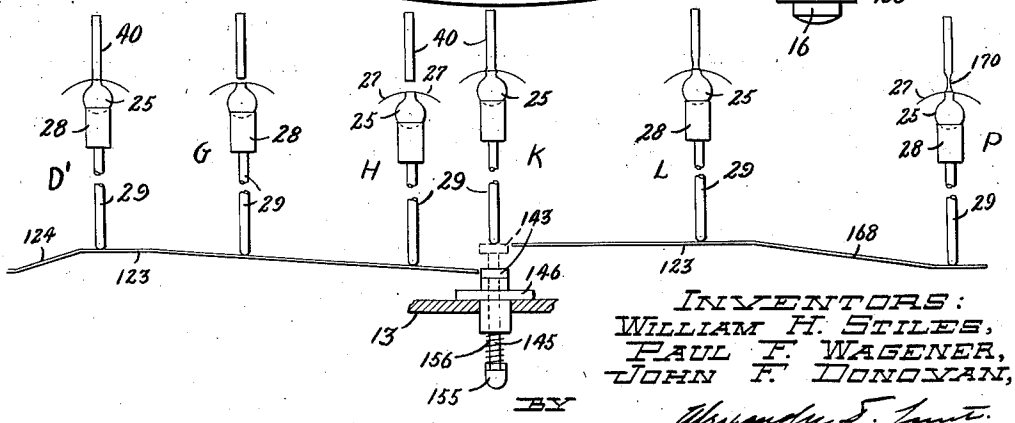


Fig. 13



INVENTORS:
WILLIAM H. STILES,
PAUL F. WAGENER,
JOHN F. DONOVAN,

BY

Alexander S. Lamb

THEIR ATTORNEY.

Dec. 31, 1929. W. H. STILES ET AL 1,742,153

SEALING MACHINE FOR INCANDESCENT LAMPS AND SIMILAR ARTICLES

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Fig. 8

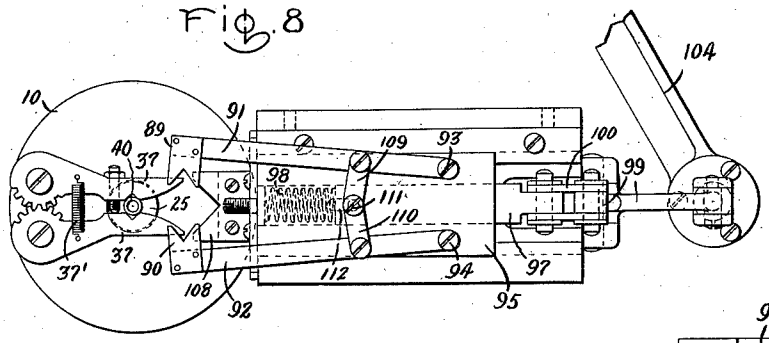


Fig. 10

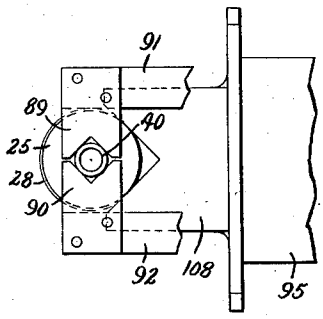


Fig. 9

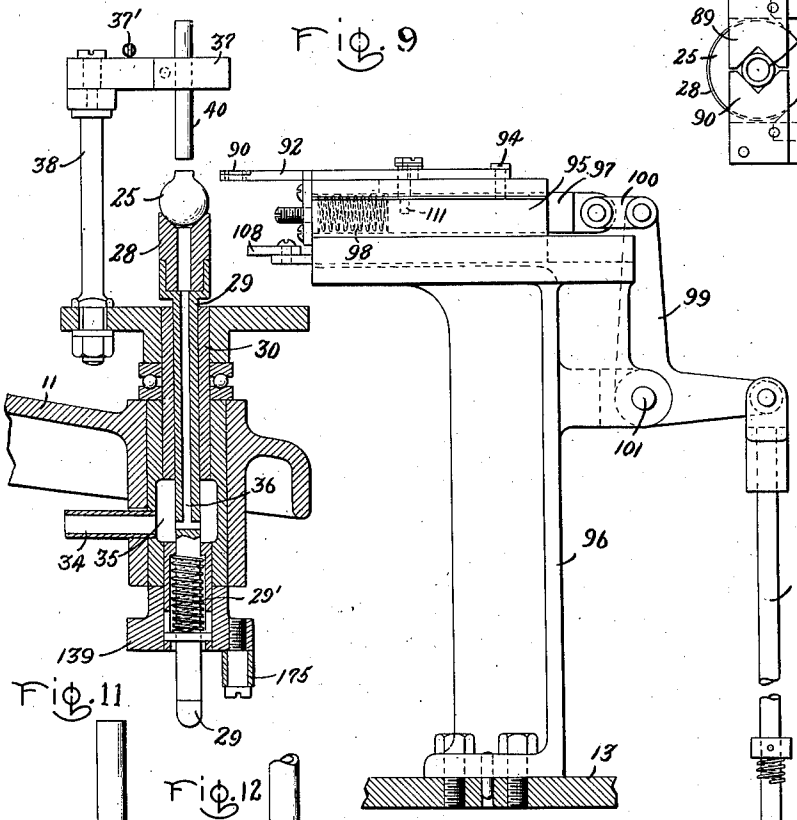


Fig. 11

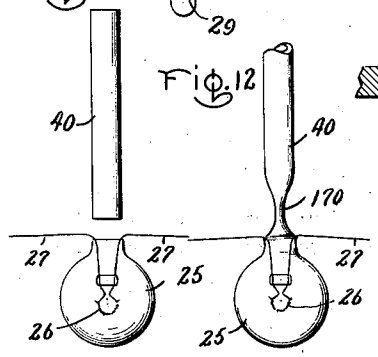


Fig. 12

INVENTORS:
WILLIAM H. STILES,
PAUL F. WAGENER,
JOHN F. DONOVAN,

BY Alexander S. Lamb.

THEIR ATTORNEY.

Patented Dec. 31, 1929

1,742,153

UNITED STATES PATENT OFFICE

WILLIAM H. STILES, PAUL F. WAGENER, AND JOHN F. DONOVAN, OF CLEVELAND, OHIO, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

SEALING MACHINE FOR INCANDESCENT LAMPS AND SIMILAR ARTICLES

Application filed May 23, 1925. Serial No. 32,470.

Our invention relates to machines for use in the manufacture of electric incandescent lamps, and more particularly to machines for automatically performing the operation usually known as butt-sealing. This operation comprises uniting an exhaust tube to the neck of the lamp bulb by fusing together the ends of the tube and neck. The filament of the lamp is supported within the bulb by leading-in conductors which usually extend between the end surfaces of the bulb neck and tube and are therefore finally sealed in the glass when these parts are fused together.

According to our invention we provide an intermittently moving, preferably rotating, turret on which is mounted a number of heads or holders adapted to receive the lamp parts to be operated upon. The turret is mounted upon a base which carries the drive gearing, indexing cam and various other cams which operate the tube feeding, gauging and bulb centering mechanisms. The operation of sealing-in is continuous and automatic, it being necessary only for the operator to place the bulbs having their filaments suspended therein upon the holders as they appear at the loading station. The exhaust tube which is to be fused to the bulb is automatically placed over the bulb after which the bulb is properly centered and the tube correctly gauged so that its lower edge will rest upon the edge of the open ended neck of the bulb. The bulb and tube are then caused to progressively pass a number of means which are caused to act upon them to fuse a portion thereof and weld them together after which a portion of the tube is constricted so as to facilitate the closing of the bulb after exhaustion.

Our invention will be more clearly understood by referring to the accompanying drawings, in which is shown an automatic machine especially adapted for the sealing-in of so-called miniature incandescent lamps and in which Fig. 1 is a fragmentary top plan view; Fig. 2 is an elevation in section along the line 2—2 of Fig. 1; Fig. 3 is a fragmentary plan view of the supporting table showing a portion of the turret; Fig. 4 is a side elevation of the tube feeding means; Fig. 5 is an enlarged view of a section of the feeding means; Fig. 6 is an enlarged front elevation of the tube transfer arm; Fig. 7 is a side elevation of the tube gauging means; Fig. 8 is an enlarged plan view of the bulb centering means shown in connection with one of the heads which supports the lamp parts to be operated upon; Fig. 9 is a side elevation partially in section of Fig. 8; Fig. 10 is an enlarged fragmentary plan of the centering jaws shown in operative relation with a bulb; Fig. 11 is an elevation of a lamp and exhaust tube prior to the sealing operation; Fig. 12 is an elevation of a lamp after it has been sealed and its exhaust tube contracted; Fig. 13 is a diagrammatic view showing the lamp at various stages of the sealing-in operation; Fig. 14 is a plan of one of the driving discs; and Fig. 15 is a sectional view along the line 15—15 of Fig. 14.

Referring first to Figs. 1, 2, 3 and 9, it will be seen that the machine comprises a number of heads 10 each of which carry means adapted to receive a bulb and length of tubing which are to be joined together. The heads 10 are rotatably supported on a turret 11 which is carried by a central hollow shaft 12 which, as shown more particularly in Fig. 2, extends through the table 13 of the machine, said table being in turn supported by a pedestal 14. The central shaft is rotated intermittently so as to cause each of the heads 10 to stop for definite periods at the various stations at which are located a series of means each of which has a definite function in producing the seal.

The intermittent drive for the central shaft 12 comprises a continuously rotating disc 15 mounted on the main drive shaft 16 which is driven from an outside source such as the motor 17, pulleys 18, belt 19 and worm gears 20—21. Mounted on the disc 15 is a grooved cam 22 which engages the rollers 23, said rollers being fastened to the underside of a circular plate 24 carried by the shaft 12. The shape of the cam 22 is such that when it engages a roller 23 the turret 11 is intermittently rotated from one station to another through the shaft 12.

As shown in Fig. 11, the bulbs 25 which are to be sealed are delivered to the operator with

their filaments 26 suspended therein and supported by means of the leading-in wires 27 resting on the edge of the bulb neck. The loading of the bulbs takes place at stations A and B where the operator places the partially assembled lamp with its neck end up into one of the cup-shaped holders 28 which is attached to a rod 29 slidably mounted in a hollow spindle 30 forming part of the head 10. The bulb is held in position in the holder 28 by means of vacuum which is supplied from a source (not shown) through the pipe 31, connections 32 and controlling valve 33. The vacuum is connected to each of the heads 10 from the controlling valve 33 by means of the connections 34 which terminate in the wells 35 (Fig. 9) located in each head, the vacuum connections from the holders 28 to the wells 35 being through the passages 36 located in the rods 29. After a bulb has been placed in one of the holders 28, the turret is advanced to the next station indicated as C on Figs. 1 and 3. It is at this station that the exhaust tube is automatically fed to a pair of jaws 37 which are rotatably mounted on the vertical rods 38 which extend from the disc portion of the head 10. The jaws 37 are adapted to receive and hold the tube in a vertical position.

As shown in Figs. 4, 5 and 6, the tube feeding mechanism is of the type disclosed in Fagan and Rippl application, Serial No. 589,249 now Patent No. 1,536,833, of May 5, 1925. Said mechanism comprises a hopper 39 partially filled with glass tubes 40 which are supplied to the tubular member 41 by means of a curved segment 42 which has a groove in its upper radial surface for receiving and properly aligning the glass tubes 40 when the segment is in its lower position, the segment being centrally placed in the hopper 39 whose sides slope toward the center. When the segment is moved upwardly so that its top grooved portion registers with the opening of the tubular member 41, the glass tubes 40 slide down the groove and into the tubular member. The segment 42 is raised and lowered by the action of cam 44 (Fig. 3) which action is transmitted through the roller 45 which rides in a slot in the said cam and is pinned to the crank 46 which is pivotally mounted on the shaft 47. At the opposite end of the crank 46 is attached the rod 48 which is pivotally connected to an arm 49 attached to the segment 42, the arm 49 being pivotally mounted on a shaft 50 carried by a bracket 51 which is attached to the standard 52 fastened to the support 53 mounted on the table 13.

The tubular member 41 which extends from the hopper 39 has mechanism at the lower end thereof to prevent the feeding of more than one tube at a time to a transfer arm 54 and which comprises a gate 55 pivotally mounted at 56. The gate 55 is opened by a lug 57 carried by the arm 54 when said arm is being lowered to the receiving position. After the arm 54 reaches the position shown, a tube slides from the tubular member 41 to the arm 54 between the open jaws 58, finally resting against the stop pin 59. As shown in Fig. 6, the jaws 58 are pivotally mounted on a pin 60 with their extensions 61 resting upon a plate 62, said plate being attached to the end of a movable pin 63. As the arm 54 reaches the receiving position, as shown in Figs. 4 and 5, the pin 63 strikes the stop 64 thereby forcing the jaws open against the action of spring 65.

In order to secure a uniform and uninterrupted feed of tubes to the transfer arm, a pair of pins 66 and 67 are provided which are carried by a cross piece 68 mounted on a shaft 69 supported in bearings carried by the stationary bracket 70. The rocking of the cross piece 68 causes the pins 66—67 to alternately register with apertures located in the tubular member 41, the rocking movement being accomplished by the rotation of the shaft 69, the latter being rotated by a crank 71 through link 72 attached to bell crank 73 which is rotatably mounted on shaft 50. A stop 74 on the arm 49 is in engagement with crank 73 so that the latter is turned counter clockwise as the arm 49 is raised, thereby lowering pin 66 through its aperture in the tubular member 41. When the arm 49 is lowered the spring 75 causes the crank 73 to turn clockwise thereby raising the pin 66 and lowering the pin 67, the result being that the line of tubes coming from the hopper is held back by the pin 67 while a tube passes down to take the place of a removed tube at the end of the tubular member 41. It may be desirable to operate the machine without actuation of the feeding mechanism just described and there is provided a stop 76 carried on the lever 77 which engages one arm of the crank 73 and holds it in raised position.

The transfer arm 54 is pivotally mounted on a slide 78 which carries the same toward the jaws 37 of the head 10. As the slide advances the arm 54 is rotated from the receiving position shown to a vertical position, and the continued movement of the slide causes the arm to force the tube between the jaws 37 which are opened against the action of the spring 37′ whereupon the jaws 37 grip the tube and the slide 78 is retracted carrying with it the arm 54 back to receive another tube. The arm 54 is rotated from the receiving position shown to the vertical position by means of a roller 79 attached thereto which follows a cam slot 80 formed in the stationary bracket 81. The slide 78 is advanced and retracted by the action of the cam 82 (Fig. 3) which action is transmitted through a roller 83 resting thereon and pinned to one arm of a crank 84 which is pivotally

mounted on the shaft 47. At the opposite end of the crank is attached a rod 85 (Fig. 4) which is connected to one arm of a bell crank 86, said bell crank being pivotally mounted at 87 and having its other arm connected to the slide 78 through the links 88.

After a tube has been inserted between the jaws 37 the turret advances to the next station indicated as D on Figs. 1 and 3. It is at this station that the bulb 25 is accurately centered in its holder 28 in order that its neck portion will be in alignment with the depending exhaust tube which is subsequently gauged or positioned with respect to the neck portion of the bulb. As shown in Figs. 3, 8, 9 and 10, the bulb centering mechanism comprises jaws 89—90 attached to arms 91—92 which are pivotally mounted at 93—94 on a block 95 which is slidably mounted in the standard 96 attached to the table 13. The block 95 is advanced and retracted by means of rod 97 extending therein and bearing against a spring 98. The rod 97 is pivotally connected to one arm of a bell crank 99 through the links 100 and is centered at 101 to the standard 96, the other arm of the bell crank being connected to an adjustable rod 102 whose other end extends through a universal joint 103 carried by a crank 104, said crank being pivotally mounted on the shaft 47. The other arm of the crank 104 (Fig. 3) carries a roller 105 which follows the cam slot 106 of the cam 107 which is mounted upon the main drive shaft 16. As the block 95 is advanced toward a waiting bulb to be centered, a forked member 108 carried on the lower end of said block and rigidly attached thereto, strikes against the bulb holder 28 which acts as a stop to arrest the forward movement of the block. At this point the jaws 89—90 are in the open position, the arc of the center line of the jaws passing through the axis of the bulb. A continued movement of the rod 97 causes the jaws to close about the neck of the bulb thereby accurately centering the same with relation to its exhaust tube. The closing of the jaws is accomplished by means of links 109—110 carried by the arms 91—92 respectively, both links being centered on a pin 111 which rides in a slot 112. The striking of the pin 111 against the end of the slot causes the jaws to close around the neck of the bulb as shown in Fig. 8.

Following the centering of the bulb the next step is to definitely position the exhaust tube. This is accomplished by a gauge having a contacting member 113 (Figs. 3 and 5) shaped to strike the top of the exhaust tube and force the same downward until its lower edge touches the upper edge of the bulb neck. The said member is adjustably carried in an arm 114 carried by a vertical extending rod 115 which works in the bearings 116 mounted in standard 117 which is supported on the table 13. The rod 115 is reciprocated by the action of the cam 118 (Fig. 3) which is mounted on the main drive shaft 16. The action of cam 118 is transmitted through the roller 119 resting thereon and pinned to the crank 120 which is pivotally mounted on the shaft 47, the opposite end of the crank being connected to the rod 115. Springs 121 and 122 serve to cushion the impact of the contacting member 113 as it strikes against the top of the exhaust tube. The lamp bulb now having been centered and its exhaust tube having been properly gauged so that its lower end rests upon the bulb neck as shown at D′ (Fig. 13), the turret advances to the next station.

As the turret rotates toward the next station a separation between the bulb and exhaust tube occurs so that when heat is applied to those surfaces which are to be welded together a uniform fusion will take place. The separation of the bulb and exhaust tube is accomplished by means of the rod 29 riding down an inclined cam track 123 thereby carrying the bulb holder 28 with its bulb away from the exhaust tube, the rod 29 having been raised against the action of spring 29′ by means of the incline 124 in the track 123 (Fig. 13) prior to its reaching station D. At stations E and F the top of the exhaust tube is heated by means of the stationary burners 125—126 (Fig. 1) for the purpose of glazing the same during which time the head 10 is rotated. The head may be rotated by various means but for illustrative purposes a friction drive is shown which comprises the discs 127 (Fig. 3) located at stations E, F, G, H, K, L, M, N, O, P and Q. As shown in Figs. 2, 14 and 15, the discs 127 are resiliently mounted upon shafts 128 and are continuously rotated by means of the pulleys 129 mounted thereon. Rotary motion is communicated to the pulleys 129 from the main power shaft 16 through the gear 130, pinion 131 mounted on shaft 132 (Fig. 3) which carries at its upper end a gear 133 which meshes with gear 134, said gear being mounted upon one of the disc shafts 128. A belt 135 encircles the various pulleys and is held comparatively taut by means of an idler 136 carried by an arm 137 and working against the tension of spring 138. The rotation of the head occurs when the turret pauses at each station at which time the discs 139 which are carried by the heads 10 are caused to contact with the discs 127. The discs 127 are kept in close contact with the discs 139 by means of the springs 140.

The top of the exhaust tube having been glazed at stations E and F, the turret advances to station G where flames from the burners 141 are directed upon the parts of the bulb and tube to be fused, the bulk of the fire striking the upper end of the bulb neck on account of it being somewhat thicker in cross section than the tube. The turret again advances to station H where flames from the

burners 142 are equally directed upon the adjacent parts bringing the glass to a semi-plastic state preparatory to welding, whereupon the turret advances to station K during which time the rod 29 continues to ride down the inclined portion of the cam track 123 thereby lengthening the separation between the bulb and exhaust tube, the maximum separation being reached as the rod 29 rides off the track 123 onto a movable member 143 located at station K. Heat is again applied at this station from the burners 144 after which the bulb is raised until its neck portion butts against the lower portion of the exhaust tube, thereby welding it to the bulb with the leading-in wires 27 embedded into the weld. The raising of the bulb is accomplished through the rod 29 by means of the member 143 which is carried on the end of a rod 145 slidably mounted in a standard 146 fastened to the table 13. The rod 145 is reciprocated by the action of cam 147 (Fig. 3) whose action is transmitted through roller 148 riding thereon, said roller being pinned to an arm 149 which is rotatably mounted at 150. The said arm 149 rotates the shaft 151 through the link 152 and arm 153. The shaft 151 has mounted at its opposite end an arm 154 which rests against a lug 155 attached to the end of rod 145, said rod being raised against the action of spring 156.

As shown in Fig. 13, the rod 29 when in the raised position, is on a level with a continuation of the cam track 123 so that when the turret is advanced the rod 29 rides off the member 143 onto the cam track. The bulb and exhaust tube having been united at station K, the turret is advanced pausing for a short interval at stations L, M, and N, where heat from the burners 157, 158 and 159 is applied to the joint where the bulb and exhaust tube is united. The heating of the joint has the effect of making the cross section of the glass more uniform at this point and hermetically sealing the leading-in wires into the glass. The various burners are supported by means of hollow brackets 160 (Figs. 1 and 2), said brackets being mounted upon hollow standards 161 which are supported on the table 13 through the brackets 162. Gas and air is supplied to the said burners from a manifold 163 through the connections 164. The manifold is supported by brackets 165 extending from the table 13 of the machine. Valves 166—167 are for the purpose of regulating the amount of gas and air supplied to the burners.

As the turret is advanced from station N, the rod 29 rides down the incline 168 of the cam track 123 (Fig. 13) causing a gradual downward movement of the bulb, thereby contracting a portion of the tube. At station O heat from the burners 169 is directed against that portion of the tube being contracted. The turret is again advanced and the downward movement of the rod 29 continues until station P is reached whereupon the contraction 170 is completed. Heat from the burners 171 is applied to the lamp at this station so that when it reaches station Q the operator may, if necessary, straighten the filament support by means of adjusting the leading-in wires 27. In order to correctly position the heads 10 for unloading and loading, there is provided a curved member 172 pivotally mounted at 173 and held in position by a spring pressed rod 174. Extending from the bottom of each rotatable disc 139 is a locating pin 175 which is guided into a slot 176 by means of the curved member 172. At station R the lamp is removed by the operator at which time the locating pin 175 is in the slot 176 thereby maintaining the head in the correct position for unloading. As shown in Fig. 3, the slot 176 is formed by the curved members 177—178 which extend around the machine to station D. As the head is advanced through stations R to D, inclusive, it remains stationary.

What we claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a butt-sealing machine, the combination of a movable carrier, a tube holder carried thereby comprising tube gripping members, a bulb holder also carried thereby and disposed below said tube holder comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost and substantially aligned with said tube, a movable contacting member disposed adjacent the path of travel of the top of said tube, means for moving said carrier to bring said tube into registry with said contacting member and means actuated in definite time relation with the movement of said carrier for forcing said contacting member against the top of said tube to cause the latter to contact with the open end of said bulb neck.

2. In a butt-sealing machine, the combination of a movable carrier, a plurality of tube holders carried thereby each comprising tube gripping members, a plurality of bulb holders also carried thereby and disposed below said tube holders each comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost and substantially aligned with said tube, a movable contacting member disposed adjacent the path of travel of the tops of said tubes, means for moving said carrier to ring said tubes successively into registry with said contacting member and means actuated in definite time relation with the movement of said carrier for forcing said contacting member against the top of each tube to cause the latter to contact with the open end of the corresponding bulb neck.

3. In a butt-sealing machine, the combination of a movable carrier, a tube holder

carried thereby comprising tube gripping members, a bulb holder also carried thereby and disposed below said tube holder comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost, a bulb centering mechanism comprising a pair of jaws normally retracted to a position adjacent the path of travel of said bulb neck, means for moving said carrier and means actuated in definite time relation with the movement of said carrier for advancing said jaws and causing the same to close around the neck of said bulb to position the same.

4. In a butt-sealing machine, the combination of a movable carrier, a tube holder carried thereby comprising tube gripping members, a bulb holder also carried thereby and disposed below said tube holder comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost, a bulb centering mechanism comprising a support, a block slidable thereon, a pair of jaws pivotally mounted on said block, connecting links whereby the movement of said block causes the opening or closing of said jaws, means for moving said carrier and means actuated in definite time relation with the movement of said carrier for advancing said block to close said jaws around the neck of said bulb to position the same.

5. In a butt-sealing machine, the combination of a movable carrier, a plurality of tube holders carried thereby each comprising tube gripping members, a plurality of bulb holders also carried thereby and disposed below said tube holders each comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost, a bulb centering mechanism comprising a pair of jaws normally retracted to a position adjacent the path of travel of said bulb neck, means for moving said carrier and means actuated in definite time relation with the movement of said carrier for advancing said jaws and causing the same to close around the neck of said bulb to position the same.

6. In a butt-sealing machine, the combination of a movable carrier, a plurality of tube holders carried thereby each comprising tube gripping members, a plurality of bulb holders also carried thereby and disposed below said tube holders each comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost, a bulb centering mechanism comprising a support, a block slidable thereon, a pair of jaws pivotally mounted on said block, connecting links whereby the movement of said block causes the opening or closing of said jaws, means for moving said carrier and means actuated in definite time relation with the movement of said carrier for advancing said block to close said jaws around the neck of said bulb to position the same.

7. In a butt-sealing machine, the combination of a carrier, a tube holder carried thereby comprising tube gripping members, a bulb holder also carried thereby and disposed below said tube holder comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost, a movable contacting member disposed adjacent to the path of travel of the top of said tube, a bulb centering mechanism comprising a pair of jaws normally retracted to a position adjacent to the path of travel of said bulb neck, means for moving said carrier, and means actuated in definite time relation with the movement of said carrier for advancing said jaws and causing them to close around said bulb neck to position the same and for forcing said contacting member against the top of said tube to cause said tube to contact with said bulb neck.

8. In a butt-sealing machine, the combination of a carrier, a tube holder carried thereby comprising tube gripping members, a bulb holder also carried thereby and disposed below said tube holder comprising a cup for receiving the bowl portion of said bulb leaving the open-ended neck thereof uppermost, a movable contacting member disposed adjacent to the path of travel of the top of said tube, a bulb centering mechanism comprising a pair of jaws normally retracted to a position adjacent to the path of travel of said bulb neck, means for moving said carrier, and means actuated in definite time relation with the movement of said carrier for advancing said jaws and causing them to close around said bulb neck to position the same, for forcing said contacting member against the top of said tube to cause said tube to contact with said bulb neck and for subsequently lowering said bulb to separate said tube and bulb neck.

In witness whereof, we have hereunto set our hands this 19th day of May, 1925.

WILLIAM H. STILES.
PAUL F. WAGENER.
JOHN F. DONOVAN.