Jan. 3, 1928.

J. T. FAGAN

1,655,140

STEM MAKING MACHINE

Filed July 29, 1920

3 Sheets-Sheet 1

Fig. 1

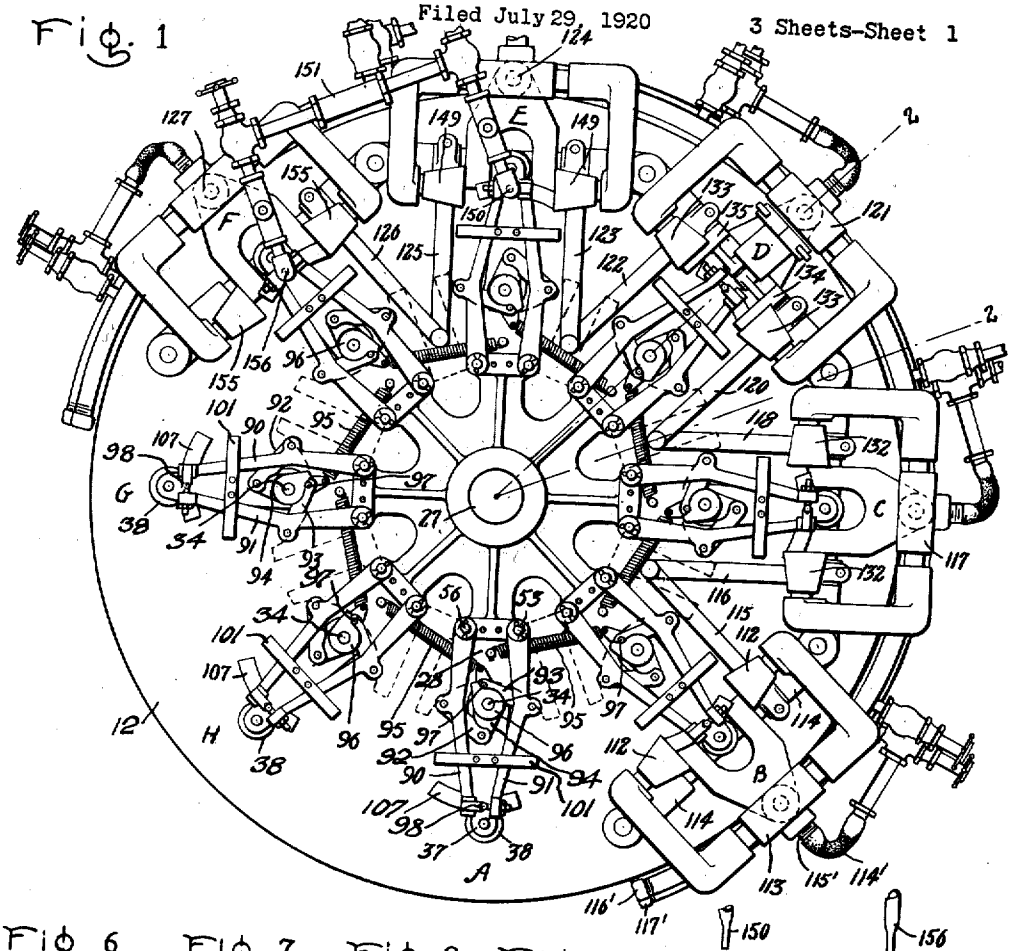


Fig. 6

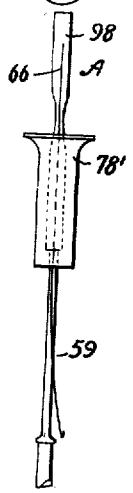


Fig. 7

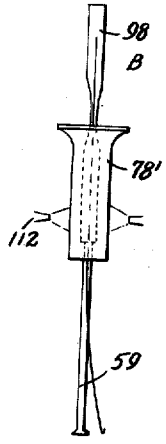


Fig. 8

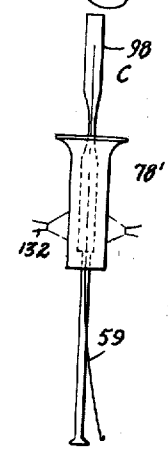


Fig. 9

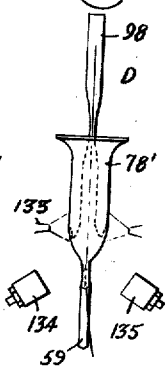


Fig. 10

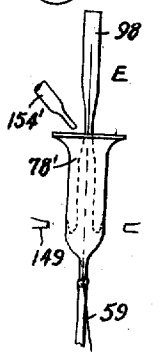
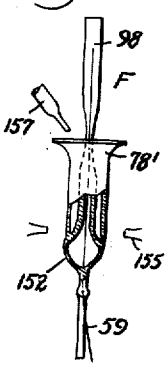


Fig. 11



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STEM MAKING MACHINE

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3 Sheets-Sheet 2

Fig. 2.

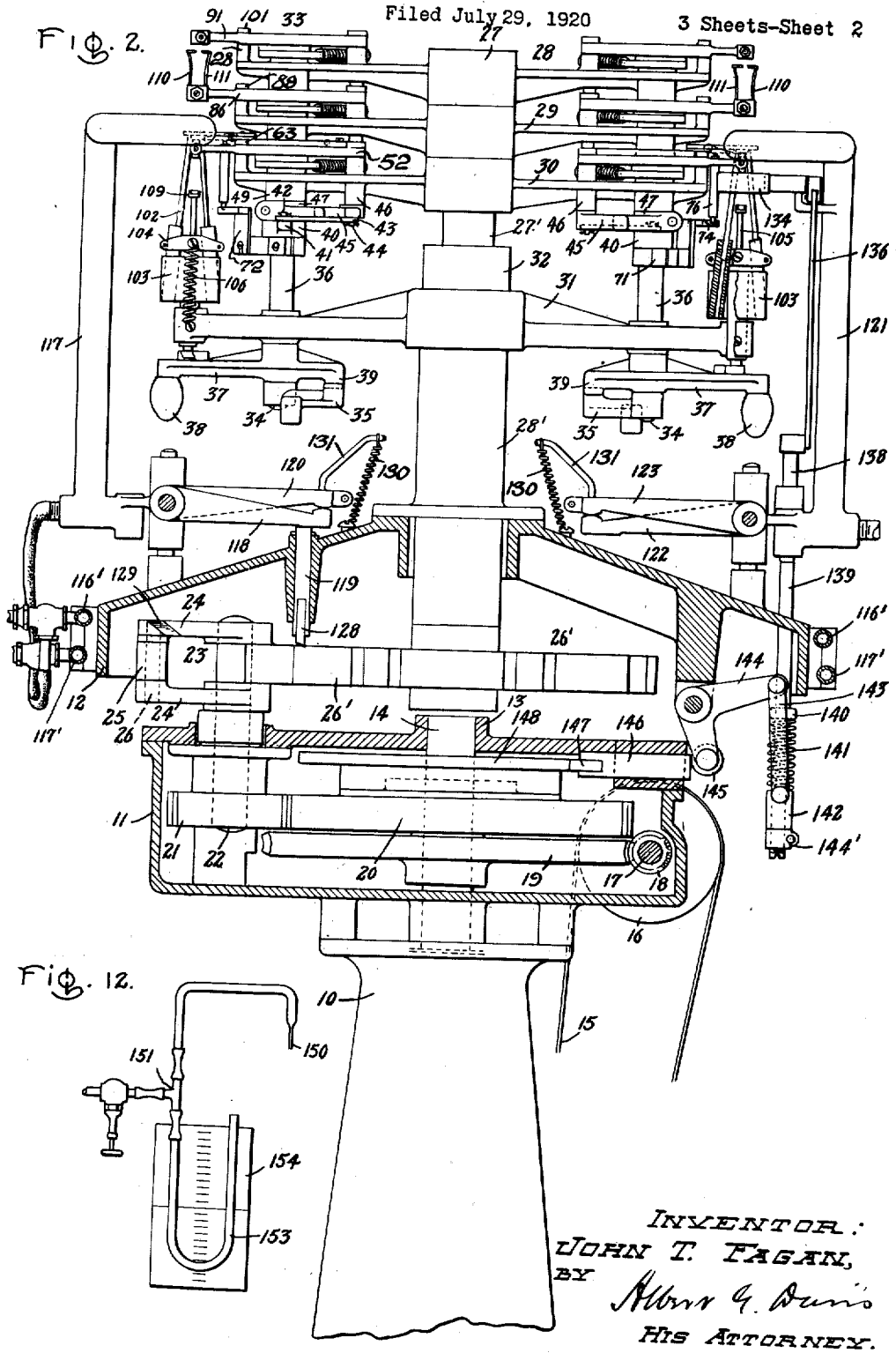

Fig. 12.

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3 Sheets-Sheet 3

Fig. 4.

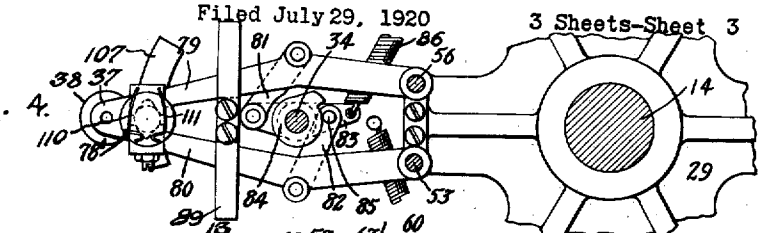


Fig. 5.

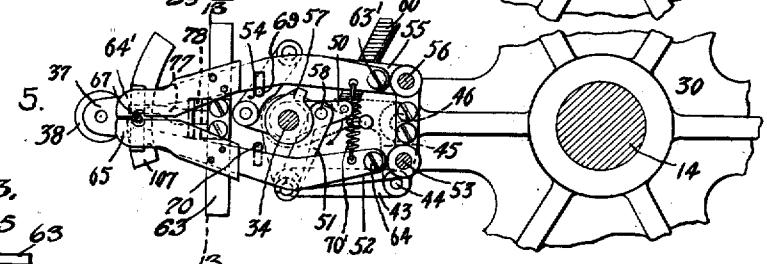


Fig. 13.

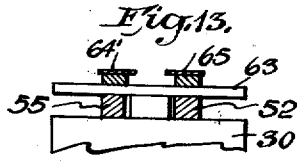
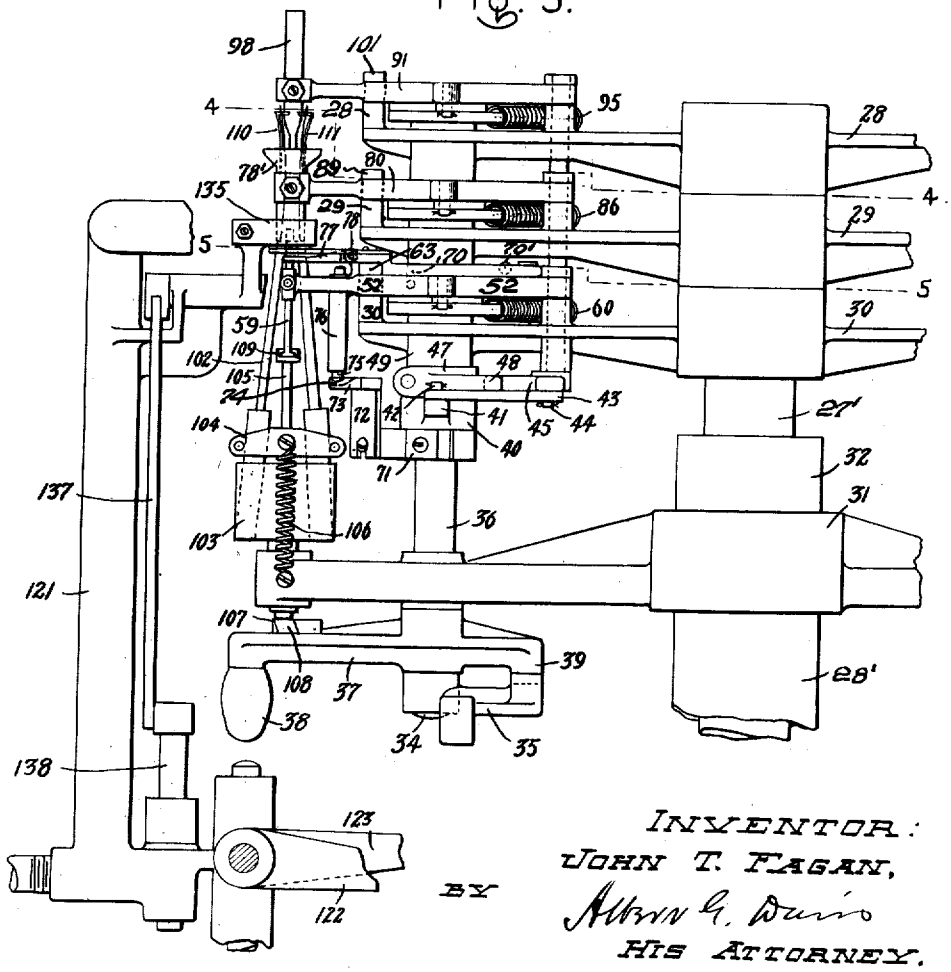


Fig. 3.



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Patented Jan. 3, 1928. 1,655,140

UNITED STATES PATENT OFFICE.

JOHN T. FAGAN, OF CLEVELAND, OHIO, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

STEM-MAKING MACHINE.

Application filed July 29, 1920. Serial No. 399,801.

My invention relates to machines for making stems for incandescent lamps and similar articles, and more particularly to machines for making stems for tipless lamps and similar articles such as disclosed in Patent No. 1,423,956, issued July 25, 1922, to Mitchell and White, although my invention is also applicable to the making of other types of stems. One object of my invention is to produce a compact machine which will have a comparatively high output and in which the parts will be so disposed as to minimize the wear and warping of parts. Machines of this character in which the article manufactured is subjected to heat are particularly subject to warping of parts, and one of the important features of my invention is that the actuating mechanisms for the holders of the stem parts and the heating means are so related that these mechanisms are not subject to high heating. Other features and advantages of my invention will appear from the description of a specific embodiment thereof which follows.

In the operation of this specific machine embodying my invention, the assembling of the stem parts in the machine and the removal of the completed stem is accomplished manually. The stem parts are placed in the head preferably in the following order, the stem tube, the leading-in wires, the exhaust tube if a tipless stem is being made, and the filament support rod which is ordinarily of cane glass. The steps of the operation of making a tipless stem comprise assembling the stem parts, heating the parts to fuse that portion which forms the seal about the leading-in wires, clamping together the fused portion to form the seal, and blowing air into the exhaust tube to form an aperture through the walls of the exhaust tube and stem tube which have lost their separate identity by the fusing. If an ordinary stem is to be made, the exhaust tube is omitted from the assembly and the blowing step from the stem-making operation. There are a number of heads mounted on a carrier and the drive is intermittent so that each head pauses in succession in operative relation to each of a series of means each performing a function in the manufacture of the stem. I have provided means for causing a relative movement between the flame directing fusing means and the head to allow passage of the latter as the carrier is moved. In the specific embodiment the burners are swung out of the path of the head as the rotary carrier indexes.

In the accompanying drawings, Fig. 1 is a top plan view of a machine embodying my invention; Fig. 2 is a sectional elevation on the line 2—2 of Fig. 1; Fig. 3 is a fragmentary enlarged elevation of one of the heads; Fig. 4 is a top plan view on the section line 4—4 of Fig. 3; Fig. 5 is a top plan view on the section line 5—5 of Fig. 3; Fig. 6 illustrates the operation performed in position A; Fig. 7 in position B; Fig. 8 in position C; Fig. 9 the clamping operation in position D; Fig. 10 the partial blowing operation in position E; Fig. 11 the completion of the blowing operation in position F; and Fig. 12 is a diagram of the air pressure indicating means and Fig. 13 is a section on the line 13/13 of Fig. 5.

Referring to the drawings, the standard 10 (Fig. 2) carries the table 11 which supports the apron 12. The indexing mechanism is driven as follows. Through the bearing 13 on the table 11 passes the vertical shaft 14 which also has suitable bearings in the standard 10. The shaft 14 is driven by a motor (not shown) through a belt 15 which drives a pulley 16 on the shaft 17 carried by the table 11 and which has a worm 18 fastened to the other end. The worm 18 meshes with and drives the worm wheel 19 which is carried by the shaft 14 but is free to rotate separately therefrom and which has an intermittent gear 20 attached thereto. To cause the machine to index, the gear 20 periodically meshes with and drives the gear 21 on the vertical shaft 22 which is carried in suitable bearings by the table 11. On the upper end of the shaft 22 is a Geneva pinion comprising a disc 23 having an arm 24 on each side, and these arms carry a roller 25 on a pin 26 between their ends. When the gear 21 is driven by the gear 20, the disc 23 and roller 25 mesh with the Geneva gear 26′ which is fastened to the vertical shaft 27′ which passes through the bearing 28′ on the apron 12. This drive gives an intermittent motion to the shaft 27′ causing each of the heads, described later, to pause for a time at each position and then to be moved on to the next position.

On the shaft 27′ are mounted three superposed spiders constituting the carrier 27. The uppermost spider 28 supports the ex-

haust tube holding and operating means, the intermediate spider 29 supports the flare tube holding and operating means; and the lowermost spider 30 supports the holder and operating mechanism for the filament support rod and positioning means for the leading-in wires. There is another spider 31 which rests on the bearing 28′ and is positioned on the shaft 27′ by the collar 32. This spider serves to support the means for holding the leading-in wires and also the means for operation and controlling the various stem parts holding means. In the specific machine shown each of these spiders has eight arms and they each support parts which collectively make eight similar heads 33.

Mechanism is provided on each head to support a stem tube, exhaust tube, filament support rod and a pair of leading-in wires. This mechanism is distributed on the head 33 as follows. For each head 33, the spider 31 carries a vertical control shaft 34 (see Figs. 3, 4 and 5) which is suitably supported in each of the members of the carrier and which carries the actuating means for the mechanisms on these members. On the lower end of the shaft 34 is fastened a crank 35 (Fig. 3) and above the crank on the shaft 34 is a rotatable sleeve 36 having fastened on the lower end a lever 37 which has a handle 38 at one end and a projection 39 at the other end. The lever 37 gives the operator a means of controlling the shaft 34 as the projection 39 strikes one arm of the crank 35 so as to turn the shaft 34 when the lever 37 is turned to the left by means of the handle 38. The rotation of the lever 37 to the left actuates all the mechanisms and they are closed in succession as the lever returns to the right until it reaches its normal position. A further movement to the right causes an opening of one of the holders, namely, that for the filament support rod. On the upper end of the sleeve 36 is fastened a collar 40 having an arm 41 which carries a pin 42. Through a link 43 (see also Fig. 5) the pin 42 is connected to the pin 44 on one arm of the crank 45 which is pivoted on the spider 30 at 46. A collar 47 (Fig. 3) having a projection 48, which may be engaged by the crank 45 to cause rotation thereof, is fastened to a sleeve 49 (see also Fig. 5) which passes through the spider 30 around the shaft 34 and which has a crank 50 (Fig. 5) attached to its upper end. When the lever 37 is turned to the right it causes the crank 45 to engage the projection 48 consequently rotating the collar 47, sleeve 49, a crank 50 to open the filament supporting rod holding jaws as hereinafter described. One arm of the crank 50 is connected through a link 51 with the finger 52 which is pivoted on a rod 53 passing through the members 28, 29 and 30 as more fully explained hereinafter, and the other arm of the crank 50 is connected through the link 54 to a finger 55 pivoted on a rod 56 supported in a manner similar to the rod 53 as more fully explained hereinafter. Rotation of the crank 50 in the direction of the arrow (Fig. 5) causes a separation of the fingers 52 and 55. This rotation may be caused by the rotation of the lever 37 to the right causing the crank 45 to engage the projection 48 as previously mentioned or by the following mechanism. A cam 57 is fastened to the shaft 34 between the fingers 52 and 55 so that when the shaft is rotated to the left, as by turning the lever 37 to the left as previously described, the cam 57 engages a pin 58 fastened in the crank 50 and upon further rotation forces the fingers 52 and 55 to separate as for the insertion or removal of the rod 59 as more fully described later. The spring 60 fastened to the lower member 30 and one arm of the crank 50 tends to keep the fingers in a closed position.

The fingers 52 and 55 slide in guideways formed by the lower member 30, a spacing washer and a top piece 63. Pivoted at 63′ and 64 respectively on the fingers 55 and 52 respectively are the leading-in wire holding fingers 64′ and 65 which rest on the fingers 55 and 52 respectively but pass over the top piece 63 of the guideways. The fingers 64′ and 65 when closed hold the leading-in wires 66 in position to prevent shifting during the clamping operation which is more fully described later, and are notched at 67 to permit the passage therethrough of the rod 59. Pins 69 and 70 are respectively so placed on each finger 55 and 52, that when the fingers are opened as previously described they respectively bear against and cause the fingers 64′ and 65 to open. A spring 70′ attached to fingers 64′ and 65 tends to keep them in a closed position. If the lever 37 is turned to the right the crank 45 through the link 43 will be forced into engagement with the projection 48 of the collar 47 which is fastened to the sleeve 49 on the upper end of which is the crank 50 and further turning of the lever 37 to the right will cause the crank 50 to be rotated to the left and so to open the fingers 55 and 52 and also the fingers 64′ and 65.

A collar 71 (Fig. 3) fastened to the lower part of the sleeve 49 carries an upright 72 with an arc-shaped arm 73 which has an incline 74 which, when the lever 37 is turned from its center position to the left as previously described, engages and forces upward a rod 75 resting in and sliding in the vertical support 76 carried by the spider 30. The rod 75 in its upward movement engages a finger 77 pivoted at 78 on the spider 30 causing the finger 77 to move upwardly about the pivot 78 to gauge the stem tube 78′ when the head 33 is loaded as well

as to force upwardly the completed stem at the seal when it has been formed just above the pair of fingers 64′ and 65 which are simultaneously opened by movement of the lever 37 to the left as previously described.

On the middle member 29 are carried the stem tube holding fingers 79 and 80 (Figs. 3 and 4) which are respectively pivoted on the rods 56 and 53 previously mentioned. The fingers 79 and 80 are connected through the links 81 and 82 respectively to either arm of the crank 83 which is rotatably positioned on the vertical shaft 34 so that when lever 37 is turned to the left the cam 84 fastened to the shaft 34 engages a pin 85 on the crank 83 causing the crank to force apart the fingers 79 and 80 for the insertion or removal of the stem tube 78′. A spring 86 fastened to one arm of the crank 83 and to the spider 29 tends to keep the fingers 79 and 80 in a closed position. The fingers slide in guideways formed by the middle member 29, a spacing washer, and the top piece 89. Movement of the lever 37 to the right does not affect the fingers 79 and 80.

The spider 28 (Figs. 3 and 1) carries the exhaust tube holding fingers 90 and 91 which are respectively pivoted on the rods 56 and 53 previously mentioned and are connected through links 92 and 93 respectively to either arm of the crank 94 rotatably carried on the shaft 34. A spring 95 fastened to one arm of the crank 94 and to the spider 28 tends to keep the fingers closed. When the lever 37 is turned to the left a cam 96 fastened to the shaft 34 engages a pin 97 on the crank 94 causing the fingers 90 and 91 to be separated for the insertion or removal of the exhaust tube 98. The fingers slide in guideways formed by the spider 28, a spacing washer and the top piece 101. The movement of the lever 37 to the right does not affect the fingers 90 and 91. The spider 28 may be raised on the shaft 27′ and separated from the middle member 29 in order to adapt the machine to making stems with a longer stem tube 78′ than that shown in the drawing, Fig. 3. In fact, the spiders 28, 29, 30 and 31 may be given different relative positions on the shaft 27′ if desired or found more convenient.

When the lever 37 is in a radial position with reference to the spider 31 as shown in Fig. 1 and the head 33 is not loaded with stem parts, the pairs of fingers 52 and 55, 79 and 80, and 90 and 91 are not completely closed together as the respective cranks 50, 83 and 94 are prevented from further rotative action on the part of the respective springs 60, 86 and 95 by suitable stops. Thus it is possible to remove any finger or pair of fingers without disturbing the rest of the head. Inasmuch as the rod 53 (Fig. 3) carries the fingers 52, 80 and 91 and the rod 56 carries the fingers 55, 79 and 80 either side of the head 33 may be readily removed.

The leading-in wire protector gauges 102 (Fig. 3) are pivoted at their lower end in a block 103 which is supported by the spider 31 and each gauge 102 is restrained in either side of an H-shaped member 104 supported on the cane glass gauge 105 and having a spring 106 attached thereto and to the bottom member 31 tending to bring the H-shaped member 104 into contact with the block 103 and consequently to bring the protector gauges 102 together at their upper end. This facilitates the insertion therein of the leading-in wires 66 at the loading position. The cane glass gauge 105 extends through the block 103 and the bottom member 31 and comes into engagement with an arc shaped cam 107 (see also Figs. 1 and 5) which is carried on the lever 37 and which normally holds up the H-shaped member 104 against the action of the spring 106. An incline 108 on the right end of the cam 107 facilitates the engagement of the cam 107 with the lower end of the cane glass gauge 105 the upper end of which has a rim 109 partially encircling the top to facilitate the loading of the cane glass.

Position A (Fig. 1) is a loading position and to load the head 33 the operator turns the lever 37 the full distance to the left. This permits the cane glass gauge 105 (Fig. 3) to fall and the leading-in wire protector gauges 102 to be brought together at their upper end and also opens the pairs of fingers 52 and 55, 64′ and 65, 79 and 80, and 90 and 91 as previously described. The stem tube 78′ is inserted and the lever 37 moved slightly to the right to close the fingers 79 and 80 which hold the stem tube. The leading-in wires 66 are inserted through the stem tube in the protector gauges 102 and are positioned in the supports 110 and 111 carried on the finger 79. The exhaust tube 98 is then positioned in the stem tube and the lever 37 turned to the right to close the fingers 90 and 91 upon the exhaust tube and also to separate the leading-in wire protector gauges 102. The pairs of fingers 52 and 55 and 64′ and 65 have been closed by the rotation of the lever 37 to the right but after the normal position has been reached further rotation to the right opens them again and leaves the others unmoved. The cane glass 59 is now inserted so as to rest upon the gauge 105 and the fingers 52 and 55 closed upon it by returning the lever 37 to the left until it lies in a line extending radially from the center of the spider 31. The head is now loaded for the formation of a stem (see Figs. 3 and 6).

Position B (Fig. 1) is a heating position and here the parts located just above the fingers 64′ and 65 (Fig. 7) are heated by

the burners 112 (Fig. 1) carried on either side of the support 113 which is pivoted at 114 to the apron 12. The gas and air mixture is supplied to the burners through a rubber hose 114′ attached to a nipple 115′ on the burner support 113 and to the supply lines 116′ and 117′. The support 113 has a finger 115 resting on a finger 116 which is attached to the burner support 117 (at position C) whose other finger 118 rests on a rod 119 (Fig. 2) carried in the apron 12. Resting on the finger 118 (Fig. 1) is a finger 120 attached to the clamp and burner support 121 at position D. The support 121 has a second finger 122 upon which rests a finger 123 attached to the burner support 124 (at position E) upon whose other finger 125 rests the finger 126 of the burner support 127 in position F. At the time of indexing a roller 128 (Fig. 2) pivoted in the lower end of the rod 119 rides up the inclined surface 129 in the upper arm 24 of the Geneva pinion, previously mentioned, so that the rod 119 is raised, thus raising the whole series of fingers and causing their respective supports to be tilted back about their respective pivots so as to withdraw their respective burners from the path of the heads 33 during the indexing movement. Similar springs 130 (Fig. 2) attached to the apron 12 and the similar supports 131 on fingers 115, 120, 123 and 126 (Fig. 1) of the respective burner supports return the burner supports into operative position. The relative disposition of the burners and the means and mechanism for supporting the stem parts is such that the flame is not directed on these means or mechanism. This is an important feature of my invention.

In position C the burners 132 (Figs. 1, 2 and 8) on the burner support 117 intensively heat the stem parts above the fingers 64′ and 65. The burners 132 are supplied with a gas and air mixture similarly to the burners 112 previously mentioned.

In position D the burners 133 (Figs. 1, 2, 3 and 9) on the support 121 intensively heat the stem parts above the fingers 64′ and 65. The burners 133 are supplied with a gas and air mixture similarly to the burners 112 previously mentioned. The seal is then formed in the stem by the clamps 134 and 135 which are carried by the support 121 and which are connected through links 136 (Fig. 2) and 137 (Fig. 3) to a rod 138 (Figs. 2 and 3) also carried by the support 121. Below the lower end of the rod 138 and in line therewith is a rod 139 (Fig. 2) carried by the apron 12. On the lower part of the rod 139 is an adjustable stop 140 and below the stop is a spring 141 encircling the rod 139 and resting on the cylinder 142 connected through links 143 to one arm of a crank 144 carried by the apron 12. A stop 144′ on the lower end of the rod 139 prevents the accidental removal of the cylinder 142. A roller 145 pivoted in the other arm of the crank 144 rides on the end of a horizontal rod 146 carried by the table 11 and in the other end of the rod 146 is pivoted a roller 147 which rides on a cam 148 fastened to the shaft 14 previously described. Just before the carrier 27 indexes, the cam 148 forces the rod 146 outwardly and the rod 146 causes the crank 144 through the links 143 to pull upwardly on the cylinder 142 tending to compress the spring 141 against the stop 140 which causes the rod 139 to be raised forcing the rod 138 upwardly and thus causing the clamps 134 and 135 through the links 136 and 137 to close upon the glass to form the seal. The cam 148 then permits the rod 146 to return thus releasing the clamps.

In position E (Figs. 1 and 10) the burners 149 carried by the support 124 heat the stem just above the seal or clamped portion, the burners being supplied with a gas and air mixture similarly to the burners 112 previously mentioned. A nozzle 150 (Fig. 1) which is attached to the pipe 151 carried by the apron 12 and connected to a source of air pressure, is aligned with and just above the upper end of the exhaust tube 98 and directs air preferably of low pressure into the end of the exhaust tube. As the glass above the seal is fused by the burners 149, the air pressure from the nozzle 150 causes a bulb-shaped part to form gradually just above the seal and then to blow out forming an aperture 152 (see Fig. 11) which connects the passage through the exhaust tube with the outside of the stem tube. This complete operation is fully described and explained in the application of Mitchell and White, Serial No. 283,801, filed March 20, 1919, now Patent No. 1,423,956, July 25, 1922, and also in the Patent 1,423,957 to Mitchell et al. In order to secure an indication of the amount of air pressure, one end of a U-tube 153 (Fig. 12) containing a fluid such as water or mercury is connected to the pipe 151, the other end of the U-tube being open to the atmosphere. The difference in the height of the columns of fluid in the U-tube 153 as measured on a graduated card 154 attached thereto is an indication of the pressure of air directed from the nozzle 150. In order to cool the stem tube 78′ and exhaust tube 98, I preferably provide a nozzle 154′ connected to the pipe 151 to direct a stream of low pressure air into the stem tube 78′.

In position F (Figs. 1 and 11) I have provided burners 155 on the support 127 to heat the stem just above the seal and a nozzle 156 similar to the nozzle 150 and similarly placed and connected to the source of air pressure with similar means for securing an indication of the pressure of air directed

into the exhaust tube from the nozzle 156. While usually the aperture forming operation may be completed in position E, it may be desirable or preferable to perform the operation in two steps using a lower air pressure in each step. In such case the burners 155 are lighted and air pressure turned on through the nozzle 156 and the operation as explained for position E will be completed in position F while the preliminary heating and forming of the bulb-shaped portion above the seal will be carried out in position E. If the two-step aperture forming operation is used, I prefer to provide a nozzle 157 (see Fig. 11) similar to the nozzle 154′ for the purpose of cooling the stem tube 78′ and exhaust tube 98.

In positions G and H (Fig. 1) the now completed stem is allowed to cool although position H may be used as an unloading position, if desired. Usually the unloading is preferably done at the loading position, that is, position A, as it requires such a short period of time to be accomplished. The unloading is performed by turning the lever 37 (Figs. 1 and 3) to the left which opens all the pairs of fingers and causes the finger 77 to force upwardly on the end of the seal of the completed stem to facilitate the unloading.

In operation the stem parts are assembled in position A as shown in Fig. 6; are heated preliminarily in position B as shown in Fig. 7; and are intensively heated in position C as shown in Fig. 8. In position D, as shown in Fig. 9, the fused seal is clamped; in position E, as shown in Fig. 10, an aperture is blown through the nozzle 150; and in position F, as shown in Fig. 11, the stem is allowed to cool although the aperture forming operation may be partially performed at this step. Positions G and H are cooling positions although position H may be used as an unloading position if desired. If position H is not used as an unloading position, the unloading is performed at position A.

While I have described my invention as embodied in a machine for making stems for tipless lamps, it should be understood that the same machine may readily be adapted to the production of stems for the usual tipped lamp. Furthermore while I have described a specific machine, I do not wish to be limited in scope thereto as various modifications will readily suggest themselves to those skilled in the art.

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

1. In a stem making machine, the combination with a movable carrier and means for moving said carrier, of a head on said carrier comprising means for supporting a stem tube, means for supporting an exhaust tube in said stem tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting a filament support rod aligned with the ends of said stem tube and said exhaust tube, means for causing the successive engagement of said supporting means with the aforesaid stem parts, and means for uniting said stem parts together.

2. In a stem making machine, the combination with a movable carrier and means for moving said carrier, of a head on said carrier comprising means for supporting a stem tube, means for supporting an exhaust tube in said stem tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting a filament support rod aligned with the ends of said stem tube and said exhaust tube, means for uniting said stem parts and means for causing the simultaneous release of said supporting means for the removal of the completed stem.

3. In a stem making machine, the combination with a movable carrier, means for moving said carrier and a head on said carrier for supporting stem parts comprising means for supporting a stem tube, means for causing said stem tube supporting means to engage said stem tube, means for supporting an exhaust tube in said stem tube, means for causing said exhaust tube supporting means to engage said exhaust tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting a filament support rod aligned with the ends of the said stem tube and said exhaust tube, means for causing said rod supporting means to engage said rod, and means for causing the successive engagement of said engaging means of said respective supporting means with the aforesaid stem parts.

4. In a stem making machine, the combination with a movable carrier, means for moving said carrier and a head on said carrier for supporting stem parts comprising means for supporting a stem tube, means for causing said stem tube supporting means to engage said stem tube, means for supporting an exhaust tube in said stem tube, means for causing said exhaust tube supporting means to engage said exhaust tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting a filament support rod aligned with the ends of the said stem tube and said exhaust tube, means for causing said rod supporting means to engage said cane glass and means for causing the simultaneous release of said engaging means of said supporting means for the removal of the aforesaid stem parts.

5. In a stem making machine, the combination with a movable carrier, means for moving said carrier and a head on said carrier

for supporting stem parts comprising means for supporting a stem tube, means for causing said stem tube supporting means to engage said stem tube, means for supporting an exhaust tube in said stem tube, means for causing said exhaust tube supporting means to engage said exhaust tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting filament support rod aligned with the ends of the said stem tube and said exhaust tube, means for causing said rod supporting means to engage said rod and means for causing the simultaneous release of said engaging means of said supporting means for the removal of the completed stem and co-acting means for forcing said stem upward to assist in the removal thereof.

6. In a stem making machine, the combination with a movable carrier, means for moving said carrier and a head on said carrier for supporting stem parts comprising means for supporting a stem tube, means for causing said stem tube supporting means to engage said stem tube, means for supporting an exhaust tube in said stem tube, means for causing said exhaust tube supporting means to engage said exhaust tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting filament support rod aligned with the ends of the said stem tube and said exhaust tube, means for causing said rod supporting means to engage said rod, and means for causing the successive engagement of said engaging means of said respective supporting means with the aforesaid stem parts comprising a cam shaft, cams mounted thereon corresponding to the stem tube supporting means, the exhaust tube supporting means and the cane glass supporting means, means successively co-acting with said cams and respective means and means for causing the rotation of said cam shaft to cause said cams to disengage said co-acting means to permit the respective aforesaid engaging means to function.

7. In a stem making machine, the combination with a movable carrier, means for moving said carrier and a head on said carrier for supporting stem parts comprising means for supporting stem tube, means for causing said stem tube supporting means to engage said stem tube, means for supporting an exhaust tube in said stem tube, means for causing said exhaust tube supporting means to engage said exhaust tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting filament support rod aligned with the ends of the said stem tube and said exhaust tube, means for causing said rod supporting means to engage said cane glass, and means for automatically releasing said engaging means of said respective supporting means to permit the removal of the said supporting means.

8. In a stem making machine, the combination with a movable carrier, means for moving said carrier and a head on said carrier for supporting stem parts comprising means for supporting a stem tube, means for causing said stem tube supporting means to engage said stem tube, means for supporting an exhaust tube in said stem tube, means for causing said exhaust tube supporting means to engage said exhaust tube, means for supporting leading-in wires between said exhaust tube and said stem tube, means for supporting filament support rod aligned with the ends of the said stem tube and said exhaust tube, means for causing said rod supporting means to engage said rod, means for gauging the position of the cane glass, means for causing the independent release of the cane glass engaging means, means for operating said gauging means.

9. A machine for assembling and uniting work parts to form a stem for an incandescent lamp or similar article comprising a plurality of pairs of jaws adapted to move in horizontal planes and means for sequentially actuating the pairs of jaws to receive the work parts in the order of their assembly.

10. A machine for assembling and uniting work parts to form a stem for an incandescent lamp or similar article comprising a plurality of pairs of jaws adapted to move in horizontal planes and means for successively actuating said jaws to permit the insertion of said work parts for assembly, said jaws being adapted for substantially simultaneous actuation to release said work parts.

11. In apparatus for assembling and consolidating work blanks consisting of an arbor, a flare tube and an exhaust tube to form stems for incandescent lamps or similar articles, the combination of a plurality of work-blank-supporting clamps, each of the said clamps comprising two opposing jaws arranged to swing in horizontal planes and about independent axes, an actuating lever for operating said jaws to receive and support the blanks, means for applying heat locally to the assembled parts and means for directing a current of air through the exhaust tube to provide a communication for exhaust purposes.

12. In means for assembling and consolidating a plurality of glass parts to form stems for incandescent lamps, the combination of upper, lower and intermediate work-holding clamps, and an actuating lever for operating said clamps to receive and support an arbor and flare tube on a vertical axial line, the above mentioned lever being adapted for independently operating the upper clamps to receive and support an exhaust tube.

13. In a stem machine, the combination of

means for projecting a flame in a generally horizontal direction and a head comprising a plurality of superposed pairs of clamps extending in the same direction, each pair being shaped at one end to hold a stem part, supporting means for said clamps located entirely near the opposite ends thereof, a substantially vertically extending shaft also located near said opposite ends and co-acting means whereby the movement of said shaft controls the opening and closing of said pairs of clamps.

14. In a stem machine, the combination of a movable carrier, means mounted adjacent to said carrier for projecting a flame in a substantially horizontal direction and a head mounted on said carrier and comprising a plurality of superposed pairs of substantially horizontally extending clamps each adapted to support a stem part so that the stem assembly extends through the line of the aforesaid flame, and supporting and actuating means for said clamps located out of line of said flame.

15. In a stem machine, the combination of a movable carrier, having mounted thereon a plurality of heads each comprising superposed pairs of substantially horizontally extending clamps each adapted to support a stem part, means disposed in the path of travel of said stem for directing a flame against a portion thereof, supporting and actuating means for said clamps disposed out of the line of said flame, and means for causing a relative movement between said flame directing means and said head to allow intermittent movement of said carrier.

16. In a stem machine, the combination of a movable carrier having a plurality of heads supported thereon each comprising means for holding stem parts, a burner mounted adjacent to the said carrier, means for intermittently moving said carrier to bring said stem parts successively into operative relation to said burner and means for moving said burner transversely to the path of travel of said stem parts to allow their passage as the carrier is moved.

17. In a stem machine, the combination of a rotary carrier having a plurality of heads supported thereon each comprising means for holding stem parts, a burner mounted adjacent to the said carrier, means for indexing said carrier to bring said stem parts successively into operative relation to said burner and means for moving said burner transversely to the path of travel of said stem parts to allow their passage as the carrier is indexed.

18. In a stem machine, the combination of a movable carrier having a plurality of heads supported thereon each comprising means for holding stem parts, a burner pivotally mounted adjacent to the said carrier, means for intermittently moving said carrier to bring said stem parts successively into operative relation to said burner and means for swinging said burner transversely out of the path of travel of said stem parts to allow their passage as the carrier is moved.

In witness whereof, I have hereunto set my hand this twenty-sixth day of July, 1920.

JOHN T. FAGAN.

means for projecting a flame in a generally horizontal direction and a head comprising a plurality of superposed pairs of clamps extending in the same direction, each pair being shaped at one end to hold a stem part, supporting means for said clamps located entirely near the opposite ends thereof, a substantially vertically extending shaft also located near said opposite ends and co-acting means whereby the movement of said shaft controls the opening and closing of said pairs of clamps.

14. In a stem machine, the combination of a movable carrier, means mounted adjacent to said carrier for projecting a flame in a substantially horizontal direction and a head mounted on said carrier and comprising a plurality of superposed pairs of substantially horizontally extending clamps each adapted to support a stem part so that the stem assembly extends through the line of the aforesaid flame, and supporting and actuating means for said clamps located out of line of said flame.

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CERTIFICATE OF CORRECTION

Patent No. 1,655,140. **Granted January 3, 1928, to**

JOHN T. FAGAN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 66, for the numeral "80" read "90"; page 6, line 63, claim 7, strike out the words "cane glass" and insert the word "rod"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of February, A. D. 1928.

M. J. Moore,
Acting Commissioner of Patents.

Seal.

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