July 28, 1925. 1,547,478

J. B. WHITMORE ET AL

MACHINE FOR MANUFACTURING STEMS FOR TIPLESS LAMPS

Filed Feb. 3, 1921 3 Sheets-Sheet 1

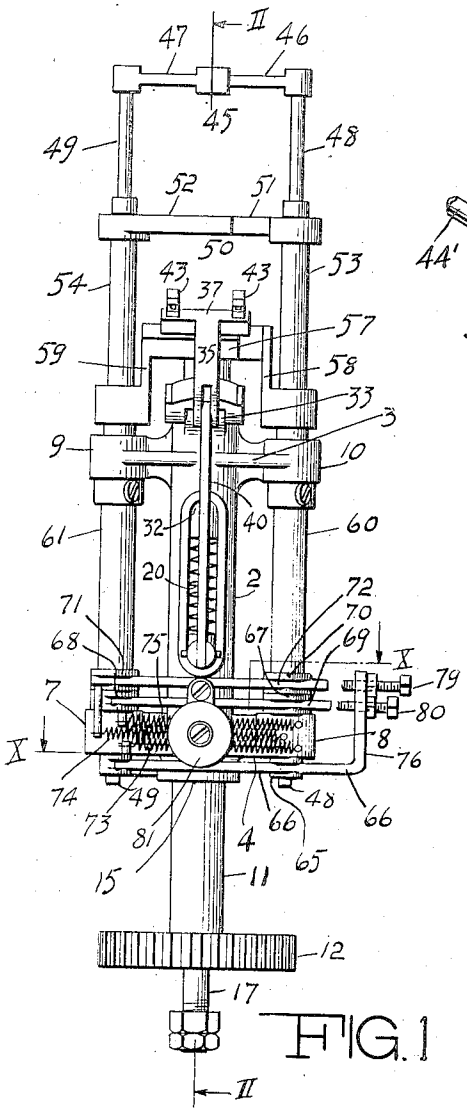


FIG. 1

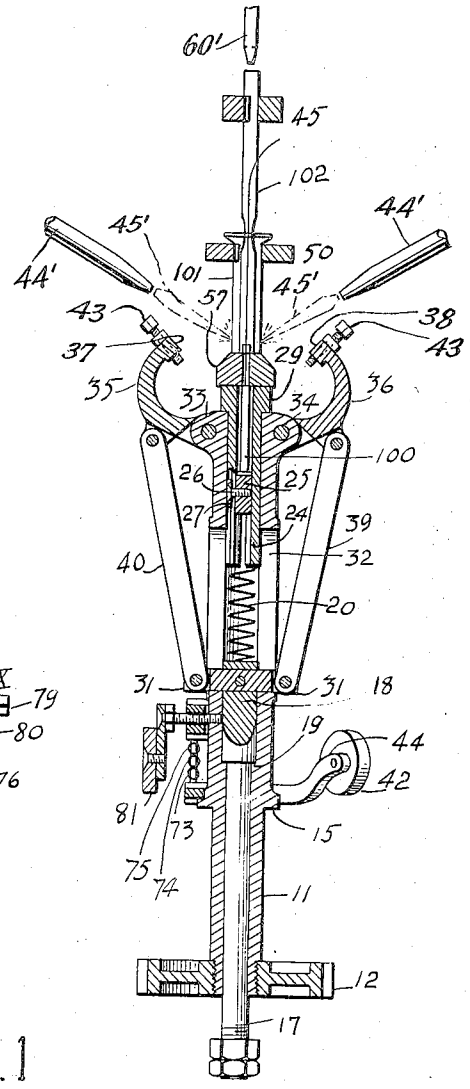


FIG. 2

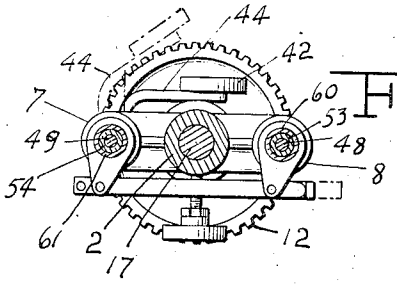


FIG. 6.

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Filed Feb. 3, 1921 3 Sheets-Sheet 2

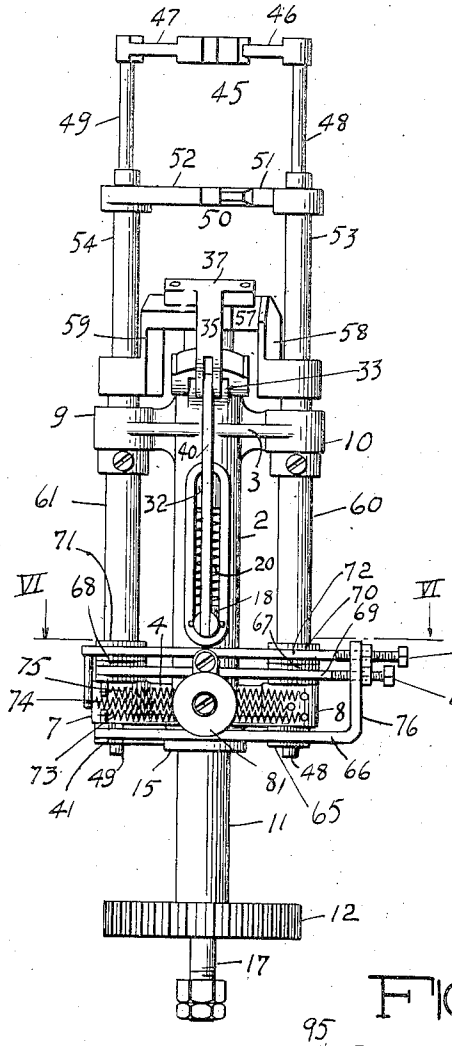


FIG. 3.

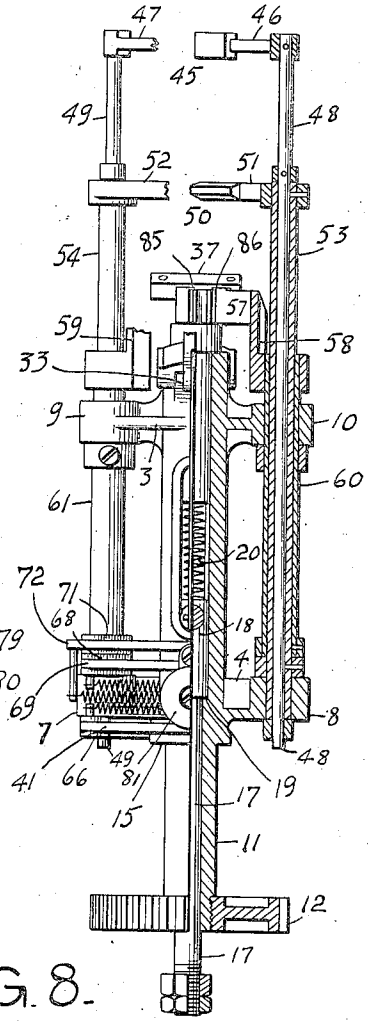


FIG. 8.

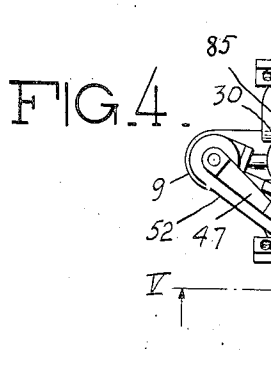


FIG. 4.

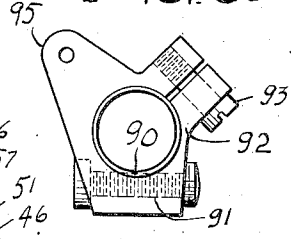


FIG. 5.

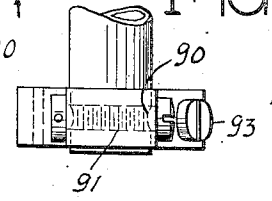


FIG. 7.

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MACHINE FOR MANUFACTURING STEMS FOR TIPLESS LAMPS

Filed Feb. 3, 1921 3 Sheets-Sheet 3

FIG. 9.

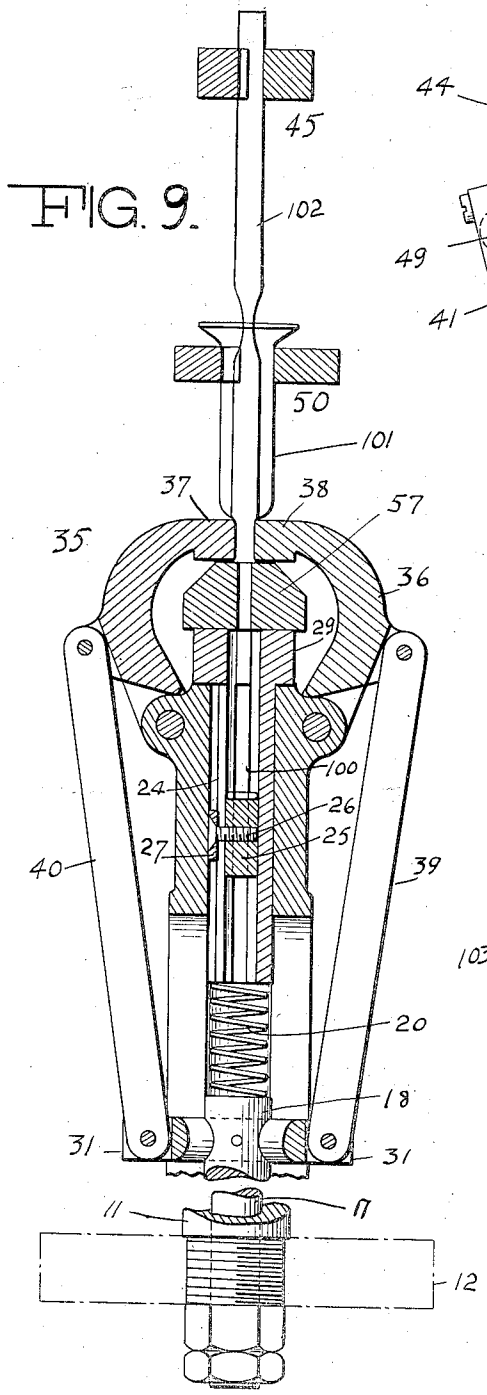


FIG. 10.

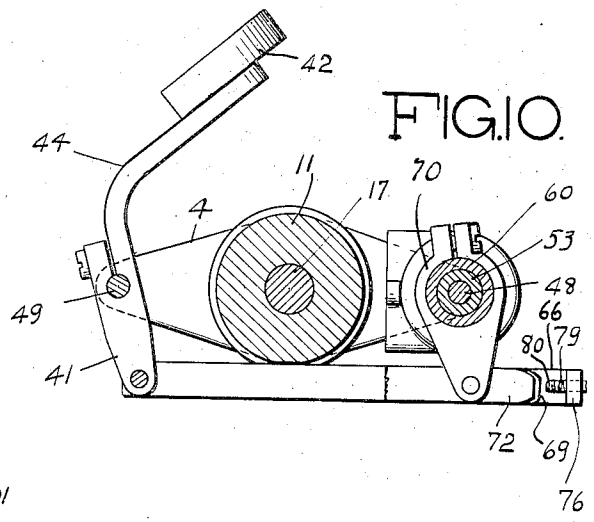
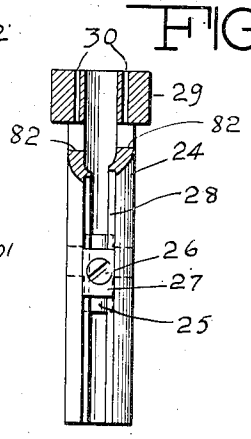


FIG. 11.



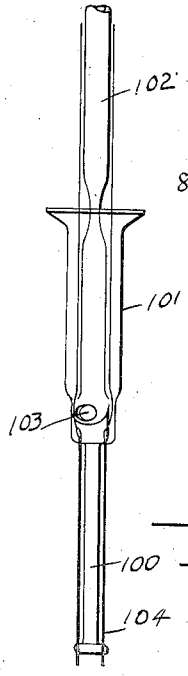


FIG. 12

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Patented July 28, 1925. 1,547,478

UNITED STATES PATENT OFFICE.

JAMES B. WHITMORE AND JOHN E. FERGUSON, OF BLOOMFIELD, NEW JERSEY, ASSIGNORS TO WESTINGHOUSE LAMP COMPANY, A CORPORATION OF PENNSYLVANIA.

MACHINE FOR MANUFACTURING STEMS FOR TIPLESS LAMPS.

Application filed February 3, 1921. Serial No. 442,219.

To all whom it may concern:

Be it known that we, JAMES B. WHITMORE, a citizen of the United States, and a resident of Bloomfield, in the county of Essex and State of New Jersey, and JOHN E. FERGUSON, a citizen of the United States, and a resident of Bloomfield, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Machines for Manufacturing Stems for Tipless Lamps, of which the following is a specification.

Our invention relates to machines in which work parts may be assembled and consolidated to form stems for incandescent lamps. The mechanism contemplated by our invention is particularly adapted for the manufacture of stems of the type used in making tipless lamps, such stems embodying a tube for exhaust purposes.

The present invention has, for one of its objects, the provision of a stem head comprising work-holding members which may consist of a plurality of sets of jaws adapted to operate in a sequence of the order required for the assembly of the work parts, the several supporting members being controlled by a single actuating lever.

Another object of the invention is the provision of work-holding members, each of which may be readily adjusted to accommodate work parts of various sizes; and the provision of suitable mechanism whereby the sequential order of operations of said members may be changed at will.

Other objects of the invention have to do with various features of construction and arrangement of parts which will manifest themselves upon a reading of the following description:

In the accompanying drawings, Fig. 1 is a front elevation of our stem-head or stem-forming mechanism; Fig. 2 is a vertical section of the head taken on line II—II of Fig. 1; Fig. 3 is a front elevation of the head showing the jaws open to receive the work blanks which form the stem; Fig. 4 is a top plan view of Fig. 3; Fig. 5 is a front elevation of the head, partly in section, taken on line V—V of Fig. 4; Fig. 6 is a transverse section of the head taken on line VI—VI of Fig. 3; Fig. 7 is an elevation of a modified form of one of the parts of the head; Fig. 8 is a plan view of the part shown in Fig. 7; Fig. 9 is an enlarged view of a portion of the head, partly in section, showing all of the jaws closed; Fig. 10 is an enlarged transverse cross-section of the head taken on line X—X of Fig. 1; Fig. 11 is a detail of one of the parts of the head, shown partly in section, and Fig. 12 is an elevation of a complete lamp stem provided with an exhaust tube.

Generally speaking, machines of the type to which this invention relates may comprise in the main, a central hub rotatably mounted upon a base and provided with a circular plate or carriage rigidly secured to the hub and having a plurality of bearings disposed near its periphery in which are mounted a corresponding number of work-holding devices or heads for supporting several work blanks, including a so-called exhaust tube. Means may be provided for revolving the carriage step by step, the heads being rotatable independently of the carriage which is indexed to move a given distance at each step, and the heads being adapted to connect with driving mechanism and rotate constantly during the stages in which the carriage is stationary. The work-holding heads carried in the outer bearings of the machine hold and rotate work-blanks in the path of a suitable flame located at given stages and designed to make the glass parts plastic, press-forming jaws being then actuated to compress the plastic portion and consolidate the blanks so that, in the final operation or completion of a given cycle, a mount or stem is formed.

Most of the apparatus just described is not of our invention and, consequently, is not illustrated or described in detail, as our invention resides in the improvement of the work-holding devices mentioned above, whereby the several parts which form the stem may be supported in vertical alignment and the said jaws may be operated either in the proper sequence to receive the work or in rapid succession to release the work.

Referring to the accompanying drawings,

the head includes a standard or post 2 having upper and lower cross arms 3 and 4, respectively. The lower arms are provided with bearings 7 and 8, and the upper arms with bearings 9 and 10. Integral with the post, and at the lower end thereof, is a stem or hollow shaft 11 which may be journaled in a suitable bearing of a carriage common to machines of this class. A shoulder 15 at the upper end of the stem affords a bearing surface for the rotatable head.

The stem 11 projects below the carriage and is equipped with a gear wheel 21 which is arranged to mesh with suitable opposing teeth to effect the rotation of the head at the required stages. The carriage is adapted to convey the gear 12 to a driving position and then away from the same when a given period of time has elapsed. The heads are rotated during the periods when the carriage is stationary and heat is being applied to the work by suitably located burners.

Within the post 2 and continuous with the hollow portion of the stem 11, is a counter bore, and, located within the stem 11, is a movable rod 17 connected to a cross-head 18 which is reciprocated within the bore of the post 2 by the movement of the said rod. A cam or other means (not shown) is provided for moving the rod 17 at the proper stages during a revolution of the carriage, for purposes to be presently explained.

The downward movement of the cross-head 18 is limited by the flange or ledge 19, and the rod 17 and cross-head 18 are normally retained in their lower positions by a helical spring 20 disposed between the cross-head and a tubular member or split-sleeve 24 fixed in the upper portion of the post 2. This tubular member serves as an adjustable arbor holder, and a variety of lengths may be supported in the sleeve 24 in which an adjustable stop 25 is provided to increase or decrease the depth of its tubular aperture in which the arbor is located when the work blanks are assembled. The stop is adjusted by means of a screw 26 which holds a small friction plate 27 against the edges 28 of a slot at one side of the member 24. (See Fig. 11). The said tubular member is machined with a collar 29 which rests upon the upper end of the post 2 and is provided with pockets 30 to receive the ends of lead-in wires.

Lugs 33 and 34 are located on opposite sides of the upper portion of the post 2 to provide bearings for arms 35 and 36 which carry press-forming jaws 37 and 38. Slots 32, disposed at opposite sides of the post, permit the vertical movement of the cross-head 18 and its projecting portions or bearings 31. The arms 35 and 36 are connected to the bearings of the cross-head 18 by links 39 and 40, and the reciprocation of the rod 17 effects the actuation of the press-forming jaws, which close upon and impress the work. The desired spacing of the said jaws, when closed, is maintained by means of the adjustment of set-screws 43.

The head is provided with a plurality of pairs of work-holding clamps which may consist of arbor-supporting jaws 57 located upon arms 58 and 59 secured at the upper ends of tubular outer-shafts 60 and 61, intermediate flare-supporting jaws 50 secured to the ends of arms 51 and 52 carried at the upper ends of tubular shafts 53 and 54 and upper exhaust-tube-holding jaws 45 fastened to the ends of arms 46 and 47 extending from the upper ends of the spindles 48 and 49. The said spindles and shafts are supported by, and are rotatable in, bearings 7, 8, 9 and 10 of the cross arms 3 and 4, and the arms carrying the three sets of jaws are adapted to swing in arcs in horizontal planes and it is important that the pairs of jaws 45, 50 and 57 shall be in vertical alignment to hold the various parts to be consolidated, on a common axial line.

An actuating lever 44, provided with a finger piece 42 and a short arm 41 (see Fig. 10), is secured to the lower end of the spindle 49, and spindle 48 is provided with a split collar 65 (see Fig. 3) and has a projecting arm similar to the arm 41. The arm 41 and the arm of collar 65 are connected by a link 66 whereby the operation of the lever 44 causes a rotative movement of the two rods 48 and 49 and the jaws attached thereto.

The shafts 53 and 54, which carry the intermediate jaws, are provided with collars having arms 67 and 68 connected by a link 69. Shafts 60 and 61, which carry the lower jaws 57, are provided with collars having arms 70 and 71 connected by a link 72. The jaws 45, 57 and 50 are held normally closed by means of springs 73, 74 and 75, respectively, each of which has one end secured to the stationary cross-arm and the opposite end connected to the respective links in such a manner as to tensionally hold the jaws closed.

For the purpose of operating the upper, lower, and intermediate jaws 45, 57 and 50, either in close sequence or substantially simultaneously, an extension arm 76 is integral with the link 66 and is arranged to move towards the ends of the links 69 and 72 as the lever 44 is actuated. Set screws 79 and 80 are located on the arm 76 opposite the link ends 72 and 69 respectively, for contact therewith as the arm is moved. This arrangement affords an adjustable mechanism controlled by the single actuating lever 44 for timing the movement of the jaws 50 and 57 in relating to the actuation of the jaws 45 which are directly connected to the lever. The initial movement of the lever

44 will thus cause the upper jaws to open, and a continued movement will, when the set screws are adjusted as illustrated, cause set screw 80 to contact with and move link 69 to effect the opening of jaws 50, and a further continued movement will cause the jaws 57 to open. A button 81, provided on the side of the post 2 opposite to the finger piece of the actuating lever 44, is so positioned as to afford a grip for the operator when manipulating the said lever.

In order to more readily conduct the lead-in wires 104 to the wells or pockets 30, a pair of supplemental guides or pockets are provided, consisting of vertical grooves 85 and 86 on the faces of the opposite jaws 57 and so disposed, when the jaws are in a closed position, as to form continuations of the wells 30. When the lead-in wires are applied to the blanks in the assembly of the stem, they pass through the grooves 85 and 86 which form pockets between the closed jaws 57 and into the wells 30 and can be either stopped by surfaces 82 provided in the member 24 or else on the lugs projecting from the opposite sides of the vertically adjustable stop 25.

For the purpose of conveniently adjusting the space between the work-holding jaws, when closed, we may provide, as shown in Figs. 7 and 8, the lower ends of the spindles 48 and 49 or the tubular shafts with an annular groove 90 having suitable teeth to engage with the threaded portion of a rotatable pin or worm 91 when in tangential contact with the said groove. The pin 91 is shown journaled in a suitable bearing provided in split collar 92 which is adapted to be secured to the spindles and shafts and is provided with an arm 95. It will readily be seen that this jaw-adjusting means is embodied in, and carried by, the split collar 92, and the same may be readily substituted for the collars shown in the assembled views and connected by the links 66, 69 and 72.

When the adjusting means is incorporated in the mechanism of the head and it is desirable to adjust any of the work-holding jaws, the screw 93 of the collar 92 is slightly loosened and the worm 91 is rotated, causing a rotation of the spindle or sleeve carrying the arm of a given jaw, with a consequent movement of the jaw under adjustment, either away from or towards the axial line of the work. The collar may then be tightly secured to the sleeve or spindle by means of the screw 93.

This construction provides a means for individually adjusting and maintaining the desired relation of the jaws to the work. The sleeves and spindles are also adapted for vertical adjustment and the vertical distance between the work-holding clamps may thus be varied to accommodate work parts of different lengths. If for instance, it is desirable to change the distance between a pair of clamps, the split collars at the lower end of the sleeves or spindles are loosened and the said sleeves or spindles may be moved up or down to adjust the clamps in given relative position.

In the operation of the stem-head-forming machines, as contemplated by the present invention, the operator presses the finger piece 42 of the actuating lever to cause all of the jaws to open. The arbor or glass rod 100 is then inserted in the holder 24 and supported in its proper position by means of the adjustable stop 25, set to accommodate a given arbor length. Upon releasing the finger piece, the jaws 57 close and grip the arbor to support it vertically in the head. The finger piece is again moved to bring the set screw 80 in contact with the end of the link 69, thus causing a movement of the link and the actuation of the jaws 50. Flare tube 101 is then placed over the exposed end of the arbor, with its smaller end resting upon the jaws 57. The release of the finger piece permits the jaws 57 to close and grip the said flare tube. Lead-in wires 104 are then inserted into the flare tube, their ends being guided into the well pockets as provided.

To apply the exhaust tube 102, it is then simply necessary to move the actuating lever 44 a relatively short distance to cause the jaws 45 to open sufficiently for the admission of the exhaust tube. When an exhaust tube has been arranged in position, the release of the lever permits the said jaws to close to grip the tube and support it vertically in the head. It will, therefore, be understood that an exhaust tube may be inserted and held in its proper relation to the flare tube and arbor and that all the parts will be held in vertical alignment, and, furthermore, it is, by virtue of the present construction, possible for the operator to apply an exhaust tube to the head without disturbing the previously assembled parts.

The parts are thus more easily assembled and may be accurately arranged on a common axial line, which is necessary to obtain a good product. When the parts have been assembled and secured on a common axial line by their respective pairs of jaws, heat is applied locally to the blanks to render plastic certain portions thereof. Any desirable form of heating element may be employed for heating the assembled glass portions of the stem. These parts are assembled so that their ends are concentrically disposed for the application of heat. Burners 44′, as shown in Fig. 2, may be properly positioned to direct flames 45′ upon the work. The burners may be disposed adjacent the path of movement of the heads so that when a head is in a given position

the flames will be caused to impinge upon the work to render a portion thereof plastic. After the glass stem parts have been rendered sufficiently plastic, suitable mechanism effects an upward movement of the rod 17 and the press-forming jaws 37 and 38 are operated to compress the plastic portion and thus consolidate the several work parts to form a lamp stem.

The tube, which is provided for exhaust purposes, having thus been combined with the arbor and flare, it becomes necessary to form an aperture near the end thereof to afford a communication (after the stem has been sealed into a bulb) between the interior of the bulb and the exhaust equipment. This may be accomplished by maintaining the lower portion of the flare tube and the exhaust tube in a plastic condition by means of heat. These tubes are thus caused to unite and form a single wall. The end of the arbor disposed within the flare tube is also rendered plastic and unites with the other glass parts. A current of air under pressure may then be directed down the exhaust tube to puncture the incandescent wall at the union of the tubes to form an aperture 103 as shown in Fig. 12. Any suitable means may be employed for puncturing the wall and, as shown in Fig. 2, an air pressure line 60′ may be so located that when the stem head is disposed in a given position, a stream of air will pass down the exhaust tube and a puncture in the incandescent wall result.

Means for forming the aperture 103 and the mechanism to effect the consolidation of the several pieces of work may be of any well known design and constitute no part of our invention which may be said to consist principally in the provision of a stem-head provided with several pairs of jaws which may be operated independently or in sequence by means of a single actuating lever, the same also being arranged to open the jaws in rapid succession.

In quantity production of articles of this character, elimination of unnecessary manual movements is an important factor. Our stem head has been constructed particularly with this end in view, and the order in which we have described the assembly of the component part of the stem has been found, in practice, to greatly aid in attaining a maximum rate of production.

Although we have shown and described our machine for use in the manufacture of stems for tipless lamps, it is obvious that it may be utilized for the production of stems in which no exhaust tube is consolidated with other work parts.

It will be seen that the machine of this invention combines, in a convenient and simple structure, elements by means of which the features for rapidly producing lamp stems may be obtained without the exercise of any particular skill on the part of the operator.

What is claimed is:

1. A stem-forming machine comprising a plurality of pairs of work-holding jaws, means for operating the jaws in a predetermined order of positive sequential movements and means associated with said jaws whereby said order of sequence may be varied.

2. A stem-forming machine comprising a plurality of pairs of work-holding jaws, means for operating the jaws in a predetermined order of sequence and means associated with said jaws whereby said sequential order may be varied.

3. A machine for assembling and uniting work parts to form a stem for an incandescent electric lamp comprising a plurality of pairs of work-holding jaws adapted to move in horizontal planes, an actuating lever for independently operating each pair of jaws to receive and support the respective work parts, means for consolidating the supported parts, said lever being adapted to actuate said pairs of work-holding jaws in succession to release the consolidated parts and adjustable means upon said actuating lever to permit a variation in the order of actuation of said work-holding jaws.

4. A means for assembling and consolidating a plurality of glass parts to form stems for incandescent electric lamps, the combination of upper, lower and intermediate work-holding clamps, an actuating lever for operating said clamps to receive and support an arbor and flare tube on a vertical axial line, said lever being adapted to independently operate the upper work-holding clamps to receive and support an exhaust tube, means upon said lever for varying the relative operation of said clamps and means for heating and compressing the parts.

5. A means for assembling and consolidating a plurality of glass parts to form stems of incandescent electric lamps, the combination of upper, lower and intermediate work-holding clamps, each of said clamps comprising a pair of oscillatory jaws, link connection between each pair of said jaws, an actuating lever for engaging said links to effect an operation of said jaws and means associated with said lever for varying the order of operation of said pairs of jaws and means for heating and compressing to consolidate said glass parts.

6. A means for assembling and consolidating a plurality of glass parts to form stems for incandescent electric lamps, the combination of upper, lower and intermediate work-holding clamps, each of said clamps comprising a pair of oscillatory jaws, link connection between said jaws, an actuating lever adapted to engage with the ends

of said links to operate said jaws, set screws upon said lever to provide adjustable contact surfaces for engagement with the ends of said links to vary the relative operations of said jaws and means for heating and compressing to consolidate said parts held by said clamps.

7. A machine for assembling and uniting work parts comprising a plurality of jaws adapted to move in horizontal planes toward the axial line of the work and means for adjusting the position of each jaw with relation to the said axial line.

8. A machine for assembling and consolidating work parts to form stems for incandescent lamps, the combination of work-holding jaws arranged to move toward the axial line of the work and means connected with each jaw whereby each of the said jaws may be adjusted to alter its operative relation with said axial line of the work.

9. In a machine for assembling and consolidating glass parts to form stems for incandescent lamps, the combination of a plurality of work-holding jaws arranged to move toward the axial line of the work, the said jaws being supported on cylindrical members having annular threads about a portion thereof, a rotatable worm disposed in mesh with the said threads for the purpose of rotating the cylindrical member to vary the position of the jaws with respect to the axial line of the work and means for locking the said cylindrical member in such position.

10. In a machine for assembling and consolidating a plurality of glass parts to form a lamp stem, the combination of upper, lower and intermediate jaws for holding the said parts on a common axial line, the said upper jaws being secured at the upper ends of spindles, the intermediate jaws being secured at the ends of shafts movable about the said spindles and the lower jaws being secured to movable outer-shafts, collars having arms integral therewith secured at the lower ends of the shafts and spindles, link connections between the collars upon the shafts and spindles carrying opposing jaws, and means for adjusting the said jaws whereby their relation to the axial line of the work may be varied and maintained as desired.

In testimony whereof, we have hereunto subscribed our names this second day of February, 1921.

JAMES B. WHITMORE.
JOHN E. FERGUSON.