2 Sheets—Sheet 1.

T. B. ATTERBURY & W. BECK.

Machine for Shaping and Finishing Open-Ended Glassware.

No. 214,345. **Patented April 15, 1879.**

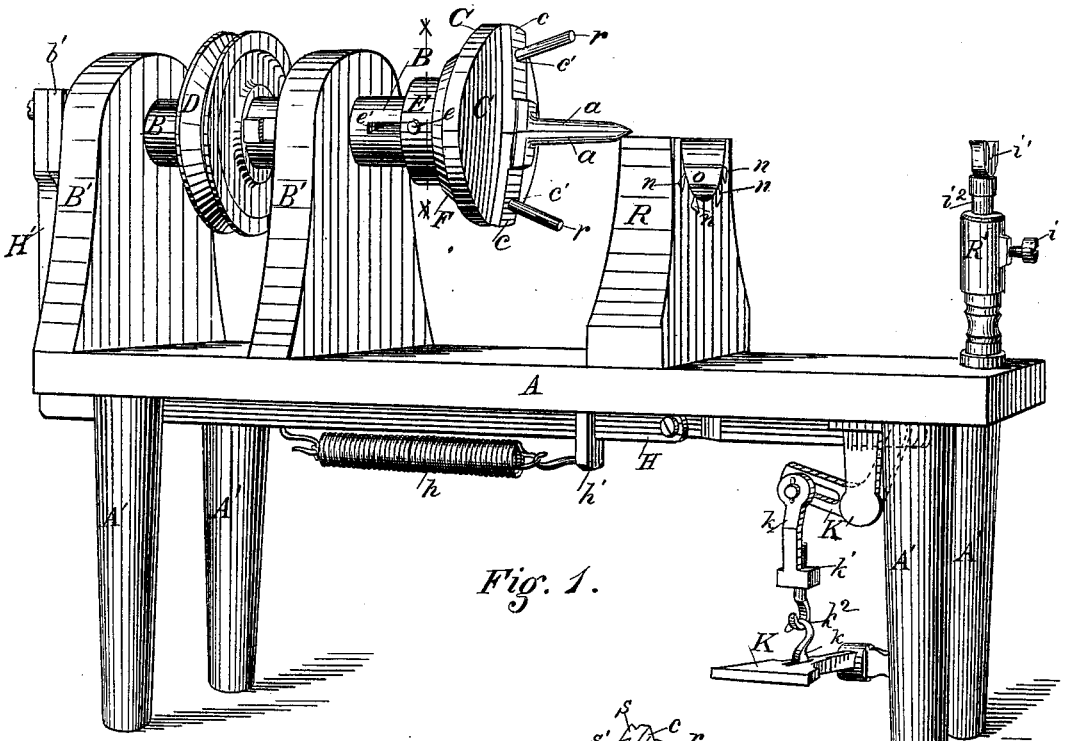

Fig. 1.

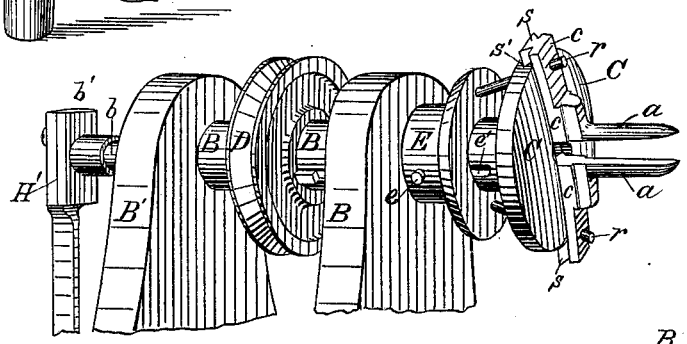

Fig. 2.

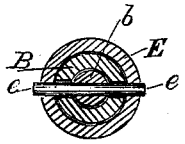

Fig. 3.

Witnesses
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2 Sheets—Sheet 2.

T. B. ATTERBURY & W. BECK.

Machine for Shaping and Finishing Open-Ended Glassware.

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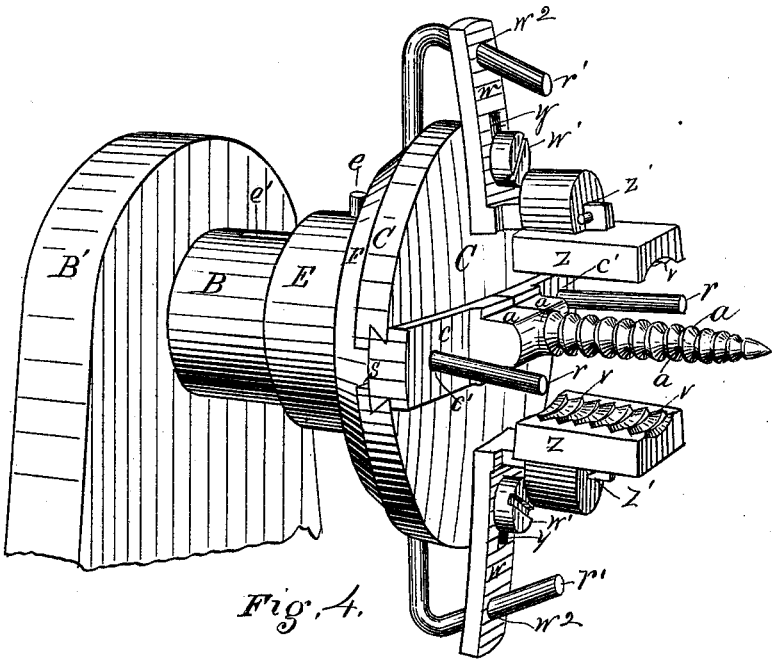

Fig. 4.

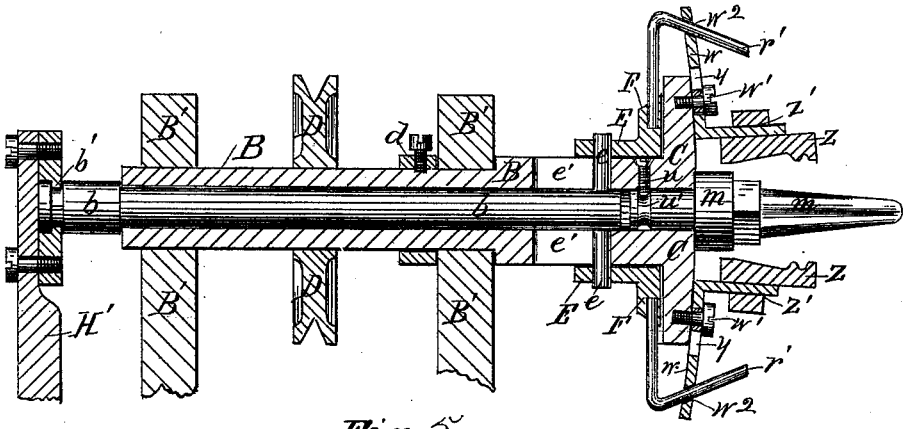

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

THOMAS B. ATTERBURY AND WASHINGTON BECK, OF PITTSBURG, PA.

IMPROVEMENT IN MACHINES FOR SHAPING AND FINISHING OPEN-ENDED GLASSWARE.

Specification forming part of Letters Patent No. **214,345**, dated April 15, 1879; application filed January 27, 1879.

To all whom it may concern:

Be it known that we, THOMAS B. ATTERBURY and WASHINGTON BECK, both of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Machines for Shaping and Finishing Open-Ended Tubular Glassware; and we do hereby declare the following to be a full, clear, concise, and exact description of the invention, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a perspective view of our improved machine, showing the same as adapted to opening out, shaping, and finishing the ends of hollow tubular or open-ended articles of glassware. Fig. 2 is a like view of a detached portion of the same. Fig. 3 shows a section through the main driving-shaft in the line *x x*, Fig. 1. Fig. 4, Sheet 2, is an enlarged perspective view of a detached portion of our machine, showing the same as adapted to the shaping and finishing of both the inside and outside of glass articles; and Fig. 5 shows a longitudinal vertical section through the driving-shaft and attached mechanism, illustrative of a modification presently to be described.

Our present improvement relates to mechanism for opening out or perforating and opening out, shaping, and finishing either the inside or outside, or both inside and outside, of open-ended hollow or tubular articles of glassware.

In Figs. 1 and 2, Sheet 1 of the drawings, we have illustrated our improvement as arranged for perforating, opening out, shaping and finishing the interior of glass articles, in which A represents the table or base of the machine, supported in any convenient way, as by posts A′. Two or more plumber-blocks, B′, rest on the table, and in these blocks is journaled a hollow or tubular driving-shaft, B, to which rotary motion is given by band-wheel D, the shaft being held in place by one or more collars, *d*, Fig. 5. Extending through the interior of this shaft is a longitudinally-moving rod, *b*, which is operated by a sliding frame, H H′, the vertical arm H′ of which is journaled to the rear end of the rod *b* by a suitable box, *b′*, or otherwise, while the horizontal bar H extends along under the table, through suitable guides or boxes *h′*, to or adjacent to the operator's stand, where it is connected to a treadle, K, by a bell-crank lever, K′, and link *k k*, the length of which is made adjustable by nut and screw k^1, and also detachable or separable by hooks k^2.

As the workman presses upon the treadle K the rod *b* will be drawn backward, and the extent of this movement can be regulated by means of the adjustable link *k k*.

Upon releasing the treadle the rod *b* will be carried forward by the spring *h*. If preferred, however, the treadle K may be attached to an arm projecting out from the front side of the lever K′, and by arranging the spring *h* to operate in the opposite direction the movements of the rod *b* will be reversed, the treadle giving it a forward movement and the spring a backward movement.

To the front end of the shaft B is removably attached an oval or convex-faced disk, C. In the face of this disk are cut one or more curved dovetail grooves, *s′*, concentric, by preference, with the curved face, and describing in outline an arc of a circle. We have shown two such grooves cut in line across the face of the disk, and stems *c*, having tongues *s*, corresponding to the grooves, move back and forth within them.

To each of the adjacent ends of these stems is attached by threaded socket and pin connection, or otherwise, one-half of a conical or tapering, and preferably sharp pointed, inside opening and finishing tool *a a*. The adjustment of these parts is such that when closed, as shown in Fig. 1, the parts of the tool *a a* will fit together so as to form a sharp-pointed perforating cone or mandrel, and when opened or separated, as in Fig. 2, the opposite outer faces of these tools may be either parallel, or more or less inclined, either toward the base or point, according to the shape or form desired in the interior of the article.

In case a cylindrical form is desired, as in the base of "slip" lamp-chimneys, the taper of the tool *a* is so proportioned with relation to the distance it is to move outward and to the

curve in which it is moved by the stems *c* that when opened the outer edges or faces of the tool may be parallel; or if, in opening and finishing bottle-mouths or other articles, it is desired to have a contracted or "choke" mouth, it can readily be effected by changing the relation of the taper and curve mentioned. This may be done either by substituting another disk, C, having its stems *c* and tools *a* moving in an arc of different radius, so as to open the tools to the desired angle; or, practically, the same result can be attained by removing the tools *a a* and substituting others therefor having different form, such that when opened out the opposite edges or faces shall sustain the desired relation to each other and give the interior of the article a tapering form, contracting either toward the end, so as to make a choke-mouth, as in some kinds of bottles, or contracting inward, giving a bell-mouth or flaring end, as in ordinary lamp-chimneys; also, in or around such interior expansible tool, or the parts of the same, one or more beads may be made adapted to form a corresponding groove or depression in the inner wall of the article, and such beaded opening or expanding tools may be used to form or shape beaded lamp-chimneys or bottle-necks having an interior groove or depression for receiving the expansion of the cork or stopper.

Motion is given to the stems *c* and tools *a* by means of a sliding hub or sleeve, E, keyed to the inner end of the rod *b* by a pin, *e*, which passes through and moves back and forth in longitudinal slots *e'* in the hollow shaft B, so that the rod and hub may move endwise within and upon the shaft, and yet will be rotated by the shaft. The hub E carries a wheel, F, or equivalent radial arms, to which are attached rods *r r*, arranged in the plane of the stems *c*, through the outer ends of which they pass at *c'*. These rods are inclined to the longitudinal line of motion of the hub E, and we have shown them diverging toward the disk C, so that upon being moved backward by attachment to rod *b* the tools *a* will be opened out, and upon being moved forward such tools will be closed together.

The operation of these devices in perforating, opening out, and finishing the ends of glass articles will be presently described.

In Fig. 4 we have shown our improved machine arranged to shape and finish both the inside and outside of the article at one operation. As before described, the interior tools, *a*, are operated by stems *c*, moving in the arc of a circle through their connection with hub E and inclined rods *r*. We also arrange a set of stems, *w w*, preferably at right angles to the stems *c c*, and they may move in curved slots cut in the face of the disk, as before described; or they may slide or move on the face itself, as shown in the drawings, and be held and guided by bolts w^1 passing through slots *y*. To these stems *w* are secured, by socket and pin *z'*, outside formers, *z z*, having any desired form of working face, as presently described, and they are operated toward and from each other by inclined rods *r'* passing through the ends of the stems, as at w^2, and attached to the wheel F or to equivalent radial arms. We have shown the rods *r'* converging toward the disk C, while the rods *r* diverge from such disk. As thus arranged, upon moving the hub E backward by pressing upon the treadle K the exterior tools, *z*, will be closed down upon, and the interior tools will be opened out against the interposed article; and upon releasing the treadle the spring *h* will close the interior and open out the exterior tools. Both sets of tools will thus co-operate to shape and finish the interior and exterior of the article at one operation.

By using two sliding hubs instead of one, one arranged to operate in rear of the other, and attaching one set of inclined rods to each hub, the interior and exterior tools may be operated separately, suitable connections being made from each hub to the sliding frame H H', substantially as before described; and by employing any suitable connection between such hubs the operator can use both sets of tools or either set at pleasure.

If preferred, the upright bar H' of the sliding frame may be connected directly to the hub E and the rod *b* dispensed with. We prefer, however, the arrangement shown.

In Fig. 5 we have shown exterior shaping-tools, *z*, arranged and operated substantially as described, in connection with a solid mandrel, *m*, which is journaled loosely in the end of the shaft B, and held therein by pin or screw *u*, projecting into a circumferential groove, *u'*, made on the inner end of the mandrel. As thus arranged, the mandrel will not be rotated by the shaft B. Any desired form may, therefore, be given to this mandrel, and the glass article being worked down upon it by the outside formers, *z*, will receive a form on its interior corresponding to the form of the mandrel, whether oval, angular, or other form, while at the same time the article being supported by the mandrel its exterior will be shaped and finished as desired. When such solid mandrel is employed the tools *a* and stems *c* may be removed.

In operating our improved machine the driving-shaft is rotated with some rapidity, and the end of the glass article to be shaped and finished being properly heated is presented to the tool *a*. If such end is already opened the article may be passed onto the tool; but if no opening is made a suitable one may be made with the sharp point of the tool by confining the air in the interior of the article, and then pressing the end against the sharp point. When the article is properly placed on the tool *a*, or its equivalent mandrel, the treadle K is depressed, and either the inside or outside tools, or both inside and outside tools, are brought into action, the inside tools expanding or opening out the interior of the article to the desired size, and the exterior tools closing down upon the same, and by rotating the tools

inside and around the article they give it a shape and finish corresponding to the form of the tools. When finished the treadle is released, the tools withdrawn from the article by the spring *h*, and the article removed.

Any desired form of tools may be used adapted to finish bottle-mouths, the ends of lamp-chimneys, fruit-cans, and other open-ended or tubular articles.

By giving the parts of the formers a curvilinear motion toward and from each other, as described, we not only secure the advantages mentioned in shaping the interior, but also, the points of the tools having a greater range of motion than the base, a better opening is secured between the tools for inserting and removing the article to be shaped, and also a better motion is given to the tools for forming certain shapes or forms.

It is often desirable to form a screw-thread on the neck or mouth of bottles, fruit-jars, and other like articles. Such thread may be formed on the outside of such glass article by forming one or more spiral ribs or ridges, *v*, on the working faces of the formers *z z*, Fig. 4, having the required pitch of the screw-thread, and having a form and arrangement the counterpart of the thread or threads desired; and these ribs on the two formers may be arranged to follow each other, so as to form a single thread; or they may be arranged to form two or more parallel threads, as desired, by varying the pitch and relationship of the ribs on the formers.

In operating our machine with this modification, the end of the article to be threaded is placed on the mandrel or tool *a*, and pushed along up the same until it is in proper position with relation to the rib or ribs *v* for them to take a bite upon such end and start the thread or threads. The formers are then depressed or brought down upon the article, as before described, until the ribs *v* indent the plastic glass; then upon the rotation of the formers the glass article will be drawn along under them by the action of the ribs, and a corresponding screw thread or threads formed in the article. When this is formed to the desired length the formers may be separated and the article removed, or, by reversing the motion of the apparatus in any convenient way, the article will be moved back from under the formers, and a more perfect form and finish be given to the extreme end or beginning of the thread.

If desired the forward feed of the article may be regulated by means of suitable connection from the article to a nut and screw having the pitch which it is desired to give to the thread on the article.

By forming a screw-thread on the tool *a a*, as in Fig. 4, a thread may be formed on the inside of the article, and in such case outside formers of any desired construction may be used, or threads may be formed on both the inside and outside of the article at one operation; but in such case the thread on both sets of formers should correspond, so that they may operate in unison; also, a thread may be made on the loose mandrel *m*, Fig. 5, and the plastic glass worked into such thread by the outside formers, *z*; then, by attaching a ratchet and pawl to shaft and mandrel, the article can be unscrewed from the mandrel when finished.

By making depressed spiral grooves in the formers corresponding raised threads may be formed on the article.

We have shown in Fig. 5 outside formers, *z z*, adapted to shaping and finishing the outside of bottle-mouths, and such formers or others adapted to other work may be substituted for the threaded formers shown in Fig. 4, as also the inside tools shown in Figs. 1 and 2 may be substituted for those of Fig. 4, according to the kind of article to be finished.

We have shown at R an improved form of rest adapted for use with the described device. In opening out and finishing the base end of lamp-chimneys it is important that such end shall be central with or in the axial line of the body of the chimney, and especially the bulb or globe part. In order to secure this with the greatest precision, we have erected a wooden rest, R, in such proximity to the tool *a a* that as the base of the chimney is being opened out and finished the bulb or globe of the chimney may rest in a concave seat, *o*, made in the top of the rest. The outer rest, R′, is made vertically adjustable by screw *i*, binding a shaft or stem, i^2, carrying the V-seat i^1, and sliding inside the main post R′. These rests R and R′ being properly adjusted both laterally and vertically, and the front rest, R, being located with reference to the opening-tool, as described, the base of the chimney may be shaped and aligned with great accuracy. If desired, strips of copper *n*, or other metal, may be arranged across the face of the concave seat *o*, to prevent the wood from being worn away too rapidly; also, this rest may be made vertically adjustable, if desired, in similar manner to the outer rest, R′. These rests can be used to advantage with other articles than lamp-chimneys; but we do not broadly claim an exterior finishing-rest as constituting any part of the present invention.

One of the important features of our invention—viz., the curvilinear or circular motion or travel of the opening or finishing tools—may be secured by making the guiding-faces in the disk C, which govern the motions of the tools, of a concave or dish shape in the direction of their length, instead of convex. The principle involved or mode of operation will still remain the same, and one form may, for the purposes in view, be considered as the mechanical equivalent of the other. Such modified form, however, will be chiefly useful in making a flare or bell-mouth shape in the mouths of tumblers and goblets, in opening out lamp and goblet feet, in flaring lamp-chimneys, and in other work of like character; and in either case—that is, whether the guid-

ing-faces which give the curvilinear motion to the tools be concave or convex—any desired radius of curvature may be employed.

We make no claim, however, in the present application, broadly and generally, to the method of opening and shaping glassware by pressing it over and upon an expansible or expanding two or more part former, without external pressure, one or the other, or both, being rotated.

We claim herein as our invention—

1. In a machine for shaping and finishing open-ended or tubular articles of glassware, the combination of a two-part shaping and finishing tool, and sliding stems for operating the tools arranged to move in the arc of a circle, such stems having suitable connections with shaft B and hub E, for receiving rotary and endwise motion, substantially as set forth.

2. In combination with the main driving-shaft of a glass-finishing machine, a radially-movable inside or outside shaping-tool, stems for carrying the tool arranged to move endwise in the arc of a circle, inclined rods for operating the stems, and a hub or collar for carrying the rods, arranged to move back and forth upon the shaft, substantially as set forth.

3. The combination of radially-movable inside shaping-tools, radially-movable outside shaping-tools, and curved stems arranged to move endwise in the arc of a circle, substantially as set forth.

4. The combination of expansible opening-tools, radially-movable outside shaping and finishing tools, sliding stems *c* and *w*, converging and diverging guides *r r'*, sliding hub E, and shaft B, substantially as and for the purposes set forth.

5. In a device for shaping and finishing glassware, the combination of a loose journaled interior supporting and shaping mandrel and exterior forming-tools, such tools being adapted to rotate around and move toward and from the mandrel, substantially as set forth.

6. As a device for forming a screw-thread on the exterior of open-ended glass articles, the combination of main driving-shaft, and interior supporting-mandrel attached to or carried by the shaft, and one or more movable outside formers having a spiral rib or groove on their working faces corresponding to the thread desired, such formers having suitable connections with the main shaft for receiving rotary motion and motion toward and from the mandrel, substantially as set forth.

7. As a device for forming a screw-thread on the interior of glass articles, the combination of an interior opening and finishing tool having a screw thread or threads raised on or cut in its outer surface and suitable mechanism for giving such tool rotary motion, substantially as described.

8. The combination of a threaded interior shaping-tool, a threaded exterior shaping-tool, and suitable mechanism for giving such tools rotary motion and motion toward and from each other, substantially as and for the purposes set forth.

In testimony whereof we have hereunto set our hands.

THOS. B. ATTERBURY.
WASHINGTON BECK.

Witnesses:
R. H. WHITLESEY,
C. L. PARKER.