(No Model.) 2 Sheets—Sheet 1.

W. E. HAWKINS.

MACHINE FOR BURNISHING HOLLOW ARTICLES.

No. 343,766. Patented June 15, 1886.

Fig. 2.

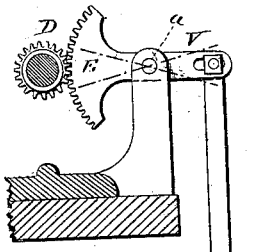
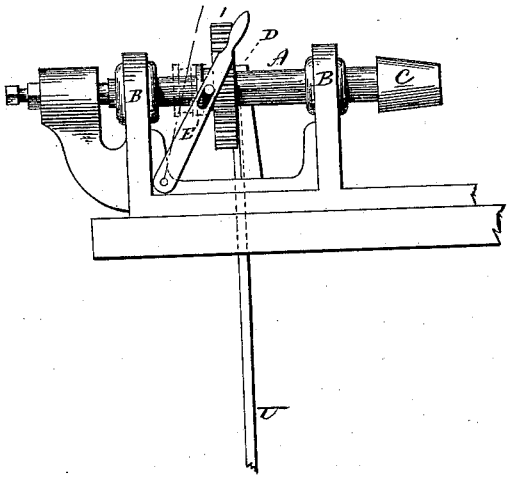
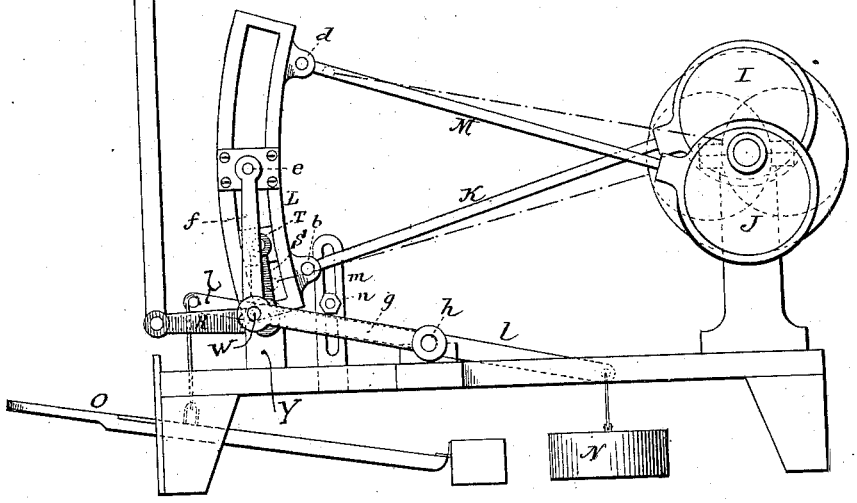


Fig. 1.





Witnesses.
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Inventor.
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Wm. P. Earle.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

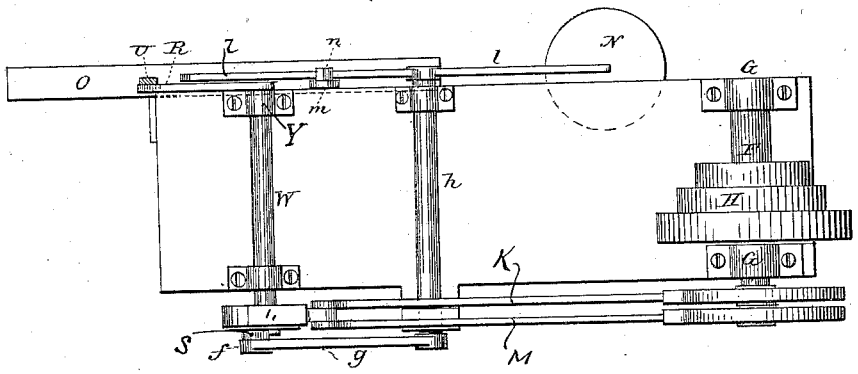
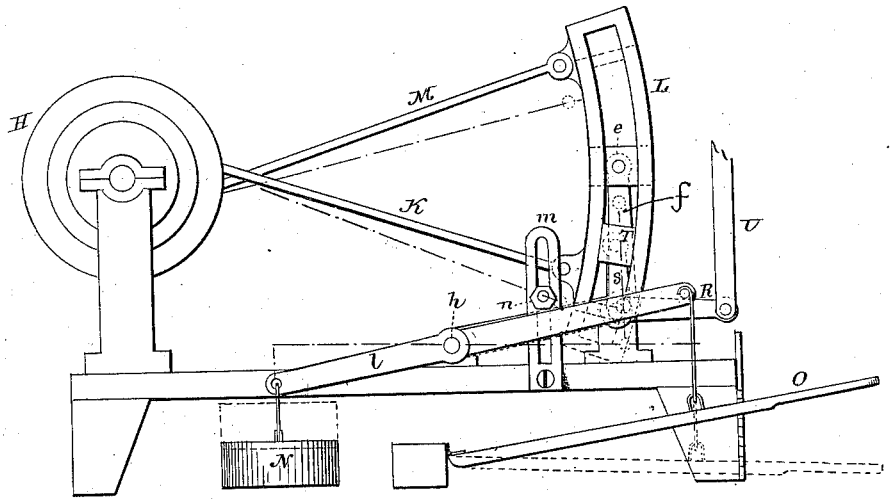


Fig. 4



Witnesses.
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UNITED STATES PATENT OFFICE.

WESTEL E. HAWKINS, OF WALLINGFORD, CONNECTICUT, ASSIGNOR TO SIMPSON, HALL, MILLER & CO., OF SAME PLACE.

MACHINE FOR BURNISHING HOLLOW ARTICLES.

SPECIFICATION forming part of Letters Patent No. 343,766, dated June 15, 1886.

Application filed January 25, 1886. Serial No. 189,589. (No model.)

To all whom it may concern:

Be it known that I, WESTEL E. HAWKINS, of Wallingford, in the county of New Haven and State of Connecticut, have invented a new Improvement in Machines for Burnishing Hollow Articles; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a side view of the mandrel, showing a portion of the connecting-rod U; Fig. 2, a transverse section cutting through the mandrel, and a side view of the link mechanism for imparting oscillatory movement to the mandrel; Fig. 3, a top or plan view of the link mechanism; Fig. 4, a side view of the link mechanism the reverse from Fig. 2.

This invention relates to an improvement in apparatus for burnishing the outer surface of hollow metal articles, such as have the surface electroplated, or on which it is desired to present a bright finished burnished surface, and particularly to that class of hollow articles which at points on the outer surface present projections or protuberances—such, for illustration, as a cup having a handle upon one side. In articles in which there are no such projections or protuberances they are placed upon a rapidly-revolving mandrel and the burnisher applied to the surface, it being free to travel over the entire surface; but in articles having projections—such as handles—the projections interfere with such rotation, and only a partial rotation can be imparted to them, and as the width of such projections vary considerably an apparatus which would give only a partial rotation—that is, limited to a specific amount of rotation—would facilitate the burnishing to a very slight extent; hence it is that in burnishing this class of work a very large proportion of it must be performed by hand.

The object of my invention is the construction of an apparatus in which the extent of rotation may be varied at will by the operator, greatly facilitating the burnishing of such articles; and it consists in the apparatus hereinafter described, and more particularly recited in the claims.

A represents a mandrel arranged in bearings B B, and adapted to full or partial rotation therein. At its projecting end it carries a holder, or what may be called a "chuck," C, adapted to enter the article to be burnished and support it so that it will revolve with the mandrel. On the mandrel is a pinion, D, preferably arranged to slide longitudinally on the mandrel under the action of a lever, E', the pinion being splined to the mandrel, so that the rotation of the pinion will be imparted to the mandrel.

E is a toothed segment hung at *a*, and so as to vibrate in a plane at right angles to the axis of the mandrel, the teeth of the segment corresponding to the teeth of the pinion, as seen in Fig. 2, and so that under vibratory movement imparted to the segment when the pinion is engaged therewith a corresponding oscillating or back-and-forth rotation will be imparted to the mandrel. To impart such vibratory movement to the segment E, I provide a driving shaft, F, arranged in bearings G, and to which power is applied through pulleys H, or otherwise, and on this shaft are two oppositely-arranged eccentrics, I J. (See Fig. 2.) From the eccentric I a rod, K, extends, and is hung to the lower end of a link, L, as at *b*. From the eccentric J a rod, M, extends to the upper end of the link L, and is hung thereto, as at *d*, after the manner of what is commonly called a "link-motion," and so that, the two eccentrics revolving, an oscillatory movement will be imparted to the link. The link is of the usual segment shape. From a point, *e*, on the link between the connections *b d* a rod, *f*, connects the link with a lever, *g*. This lever *g* extends toward the driving-shaft, and is fixed to a rock-shaft, *h*. On this shaft is a second lever, *l*, one arm extending toward the eccentrics, and there provided with a weight, N, which will substantially counterbalance the link. The other arm extends in the opposite direction, and is connected to a foot-pedal, O; hence by depressing the pedal O, as indicated in broken lines, Fig. 4, the link L will be drawn downward to a corresponding extent, as indicated

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in broken lines, Fig. 4, the weight N correspondingly rising, but as the foot is raised the weight falls and correspondingly raises the link.

R S are two levers attached to the opposite ends of a rock-shaft, W, supported in bearings Y Y, and forming, substantially, the two arms of a bell-crank lever, and arranged to swing in a plane parallel with the plane of the link L. The arm S is pivoted to a head, T, arranged in the link, but so that the link may move up or down, sliding on the head T, the axis of the head T not changing in such movement of the link. From the other arm, R, a connecting-rod, U, extends to an arm, V, projecting from the segment E, as seen in Fig. 2. The oscillating movement of the link under the action of the eccentrics will be imparted to the head T, and thence through the bell-crank lever R S to the segment, giving to that segment a vibratory movement corresponding to the extent to which the head T is moved. As in link-motions, the center of oscillation of the link is at the pivot *e*, the link turning on that point. Now, if that center be dropped to a position concentric with the pivot of the head T and the arm S, then, that being the center of oscillation of the link, no movement will be imparted to that lever R S, and consequently the segment will remain stationary, notwithstanding the fact that the driving-shaft and the links may be working; but as the link is raised from that position the oscillation of the link will be imparted to the head T to the extent that it is so raised, the extent increasing in proportion to the distance which the center *e* stands from the point of connection between the head T and the lever S; hence it follows that as the extent of vibration of the head T varies the extent of vibration of the segment E will vary accordingly.

In operation, the article to be burnished being fixed upon the chuck and power applied to the eccentrics, the vibratory motion of the link will impart oscillatory motion to the mandrel and to the article upon the chuck. As the extent of surface circumferentially on the article to be burnished diminishes, the operator, pressing down the pedal O, draws the link down accordingly to diminish the extent of rotation, and as the extent of such surface increases circumferentially he raises his foot to increase the extent of rotation. Thus he may at any time vary the extent of rotation according to the work which he is required to perform, the burnisher being applied to the surface in the same manner as when the article revolves. The oscillation may be very rapid, and is always under the control of the operator.

By this apparatus any portion of the article may be burnished without interference with other portions of the surface, or without projections interfering with the burnishing operation. The mandrel may be arranged for constant rotation, so that if certains portions require to be burnished throughout the full circumference it may be done and changed from time to time to a continuous revolution, or to impart oscillatory movement, as occasion may require. To do this it is only necessary to provide a driven or constantly-revolving gear, as indicated in broken lines, Fig. 1, into connection with which the pinion D may be moved by means of the handle whenever occasion requires, so that by throwing the pinion from the constantly-revolving gear to the segment, or vice versa, a continuous revolution or oscillation may be produced, as the case may be, or the pinion standing at an intermediate point the mandrel will remain stationary. It is desirable that a stop be arranged to limit the maximum movement of the head T, and consequently the oscillation of the mandrel. To this end I arrange a vertical post, *m*, and in this post I arrange an adjustable stop, *n*, preferably by means of a slot in the post, within which the stop may be moved up or down, and against which the lever *l* may strike as the link ascends.

While I prefer the toothed segment as the best method of communicating the oscillatory movement of the link to the mandrel, the connection may be through any of the known equivalents for such segment and pinion, it only being essential to my invention that there shall be mechanism between the lever, which is in connection with the head T of the link, and the mandrel, whereby the oscillatory movement of the link may be imparted to the mandrel.

From the foregoing it will be evident that I am aware that a machine consisting of a mandrel adapted to hold an article to be burnished has been combined with mechanism adapted to impart a predetermined extent of reciprocal rotation to the article to be burnished; but I am not aware that the rotating mechanism for the mandrel has been so constructed that the extent of oscillation or reciprocal rotation may be varied at the will of the operator while the machine is at work.

I claim—

1. In an apparatus for burnishing hollow articles, the combination of a mandrel adapted to carry the article to be burnished, two reversely-arranged eccentrics, a link, the opposite ends of which are connected to the respective eccentrics, whereby an oscillatory movement is imparted to said link, a head arranged within said link, and upon which the said link may slide, a lever arranged to swing in a plane parallel with said link, one arm in connection with said head, and mechanism, substantially such as described, between said lever and said mandrel, whereby the oscillatory movement of said link will be imparted to said mandrel, and means capable of being operated while the machine is in motion to adjust the said link with relation to said head, substantially as described, and whereby the extent of oscillation of the mandrel may be varied at the will of the operator while the machine is at work.

2. The combination of the mandrel A, adapted to carry the article to be burnished, a pinion on said mandrel, a toothed segment arranged to swing in a plane at right angles to the axis of said mandrel, and to work in said pinion on the mandrel, two reversely-arranged eccentrics, I J, link L, its opposite ends connected, respectively, with the said eccentrics I J, whereby an oscillatory movement is imparted to said link, the head T, arranged in said link, the bell-crank lever R S, one arm hung to said head T and the other in connection with the said segment, the lever *g*, and rod *f*, the said rod hung by one end to the link and by the other to the said lever *g*, substantially as and for the purpose described.

3. In an apparatus for burnishing hollow articles, the combination of a mandrel adapted to carry the article to be burnished, two reversely-arranged eccentrics, a link, the opposite ends of which are connected to the respective eccentrics, whereby an oscillatory movement is imparted to said link, a head arranged within said link, and upon which the said link may slide, a lever arranged to swing in a plane parallel with said link, one arm in connection with said head, and mechanism, substantially such as described, between said lever and said mandrel, whereby the oscillatory movement of said link will be imparted to said mandrel, with means for adjusting the said link with relation to said head, and a stop to limit the maximum movement of said head, substantially as described.

4. In an apparatus for burnishing hollow articles, the combination of a mandrel adapted to carry the article to be burnished, and to receive an oscillatory movement upon its axis, a revolving shaft, mechanism, substantially as described, between said revolving shaft and mandrel, whereby the rotation of the said revolving shaft will impart oscillatory movement to said mandrel, an adjusting mechanism, substantially as described, between said revolving shaft and mandrel, substantially as specified, and whereby the extent of oscillation of said mandrel may be varied without stopping the revolution of the said shaft or oscillation of the mandrel.

W. E. HAWKINS.

Witnesses:
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C. H. BROWN.