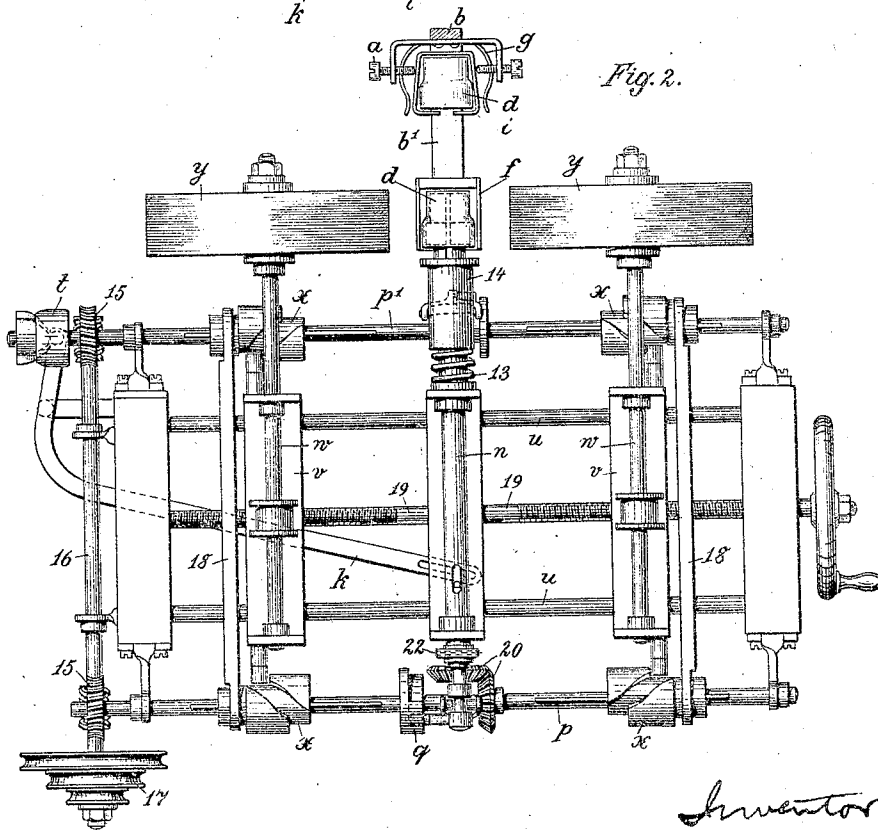
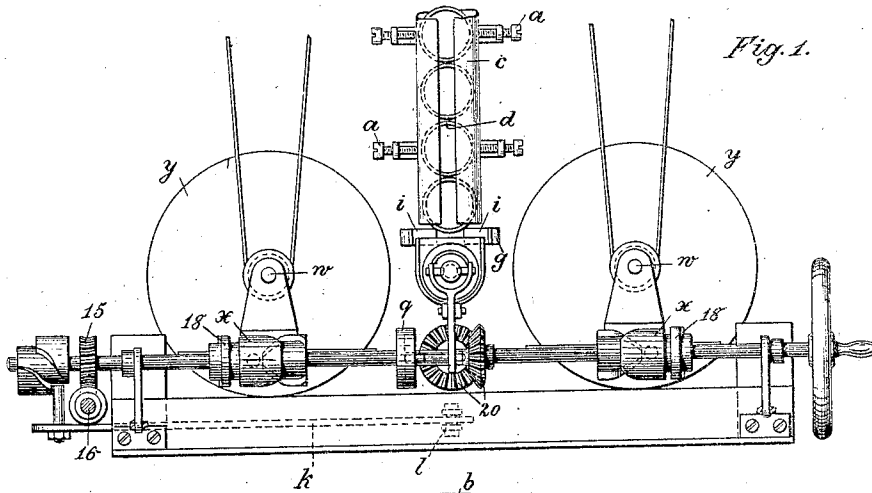


No. 855,644.

PATENTED JUNE 4, 1907.

E. KRÜGER.
POLISHING MACHINE.
APPLICATION FILED MAR. 20, 1906.

2 SHEETS—SHEET 1.



Witness:
L. E. Barkley,
J. C. Lawson

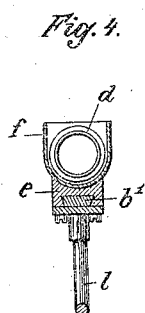
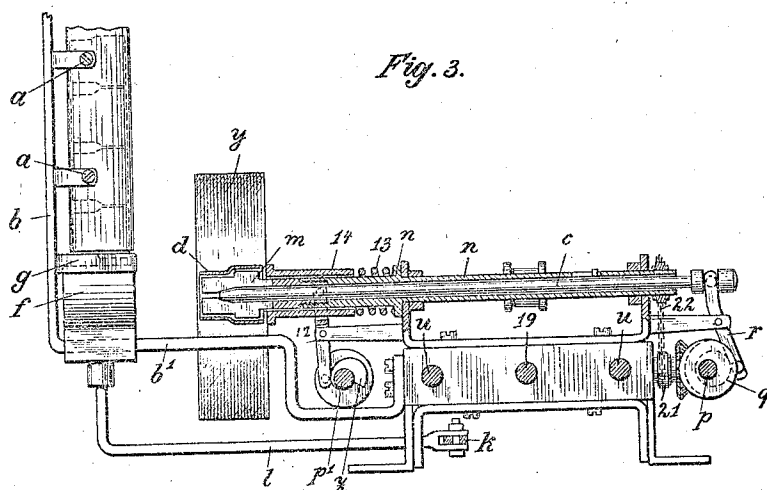
Inventor
Ernest Krüger
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att

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Witnesses:
L. E. Barkley.
W. E. Lawson.

Inventor
Ernst Krüger
by Francis Appelman
att'y—

UNITED STATES PATENT OFFICE.

ERNST KRÜGER, OF BERLIN, GERMANY.

POLISHING-MACHINE.

No. 855,644.

Specification of Letters Patent.

Patented June 4, 1907.

Application filed March 20, 1906. Serial No. 307,006.

To all whom it may concern:

Be it known that I, ERNST KRÜGER, a subject of the King of Prussia, and a resident of Gormannstrasse 89, Berlin, Germany, have invented a new and useful Improved Polishing-Machine, of which the following is the specification.

This invention relates to and has for its object a machine for automatically polishing round objects, especially round metal cases, in uninterrupted succession, by means of several polishing disks or the like, which machine, in contradistinction to well-known polishing machines which likewise feed, polish and throw off the piece of work automatically, has as its chief feature the arrangement that the piece of work is automatically pushed by the feeder on a rotating mandrel which is mounted between two or more polishing disks revolving at high speed and which is expanded or spread out by an automatically operating gripping device like a lathe-chuck, so that said mandrel holds the piece of work fast while it is being polished and indeed until the gripping device is automatically loosened again and the finished polished object is thrown off by a pushing device. Meanwhile the feeder has already again taken hold of a new piece of work and the cycle of operation is repeated.

One embodiment of a machine according to the present invention is shown in the accompanying drawings, in which

Figure 1 is a side elevation of the machine, the upper portion of the feeding shaft being broken off. Fig. 2 is a plan, and Fig. 3 is a side view of the machine partly in section, the feeding shaft being broken off. Fig. 4 shows the feeding device in section.

The following description of the cycle of operations explains at the same time the construction of the machine.

As shown in Fig. 1, the objects to be polished, cylindrical metal cases *d* for example, are placed one over another in the feeding-shaft *c* which is adjustably fastened to the holder *b* means of screws *a*. The horizontally bent part *b'* (Fig. 3) of the holder *b* has a trapeziform cross section (Fig. 4). The feeder *f* is guided on it in a straight line by means of a dovetail-shaped guide *e*. A U-shaped spring *g* is fastened immediately under the feeding-shaft *c* to the holder *b*, the ends of said spring being provided with wedge-shaped noses *i* pointing inward on

which the lowest piece of work *d* generally rests. Now as soon as the feeder *f* which has the form of a U (Fig. 4) is moved back by means of a rod *l* which is operated by the two-armed lever *k* (Fig. 2) moved by a cam *t* mounted on the shaft *p'* out of the position shown in Fig. 2 into the position according to Fig. 3, the rear edges of the feeder *f* strike upon both the wedge-shaped noses *i* and thereby press the U-shaped spring *g* so much apart that the lowest piece of work *d* in the feeder *f* can fall into the said feeder. The next piece of work is then caught by the noses *i* of the spring *g* and is held until its turn comes at the next operation. Now the feeder *f* goes forward on its guide *b'* with the piece of work *d* lying in it and pushes the piece of work *d* on to the mandrel *m* (Fig. 3). Said mandrel *m* consists of several parts which can be expanded or spread apart in a similar manner to the parts of an expanding chuck. For this purpose a rod *o* pointed at its front end is arranged displaceably in the hollow shaft *n* of the mandrel *m*, which rod is at a suitable moment pushed forward by a cam *q* arranged on the shaft *p* by means of a lever *r* and thereby expands the mandrel *m* so that the same holds fast the piece of work *d* pushed on to it. Now the lever *k* is turned back again by the cam *t* on the shaft *p'* and consequently the rod *l* moves the feeder *f* back again into the position according to Fig. 3. At this moment the cams *x, x* which are likewise on the shafts *p, p'*, cause the bearings *v* of the polishing-disk shafts *w* to approach so near to one another, until both the polishing disks *y* touch the piece of work *d*. As the polishing disks revolve round their axles at a speed of about 2500 revolutions per minute and for this purpose are driven by means of belting or the like as Fig. 1 indicates by dotted lines, and as the mandrel shaft *n* revolves however only about 5 or 6 times round its axle in the same time, the polishing disks *y* revolve about 500 times during one revolution of the piece of work. But as there are two polishing disks and consequently each works on half the circumference of the piece of work, half a revolution of the piece of work suffices in order to brightly polish its periphery. In addition to this, the axles *w* may also be mounted in a well-known manner, so that they can be moved simultaneously to and fro in the direction of their axles by for ex-

ample cams which can be likewise arranged on shaft p or p^1 , in such a way that every point of the circumference of the piece of work d is touched many times by the polishing disk. Now, as soon as the piece of work d has finished revolving half a revolution, the cam q on the shaft p pulls the expanding rod o back again by means of the lever r . Consequently the parts of the mandrel m are no longer expanded. At the same time a cam z (Figs. 2 & 3) arranged on the shaft p^1 releases a spring 13 by means of a lever 12; the spring has previously been compressed by a muff or sleeve 14 which is displaceable on the shaft n of the mandrel and is connected with the lever 12, the cam z moving the lower arm of the lever 12 to the left as in Fig. 3. But as soon as the expanding rod o has released the mandrel m , the roller of the lever 12 has reached the highest point of the cam z . Now on the latter being rotated further, the spring 13 suddenly drives the sleeve 14 forward and this sleeve pushes the piece of work d which is now loose on the mandrel off the same so that it falls into a receptacle placed underneath to receive it. Hereupon the expanding rod o is pulled back once more by its lever r , so that the mandrel m is fully contracted and the feeder f is able to place a new piece of work on it. The cycle of operations repeats itself.

Both the shafts, p , p^1 suitably receive their drive from a transverse shaft 16 by means of the worm-gear 15. This is provided with a speed-pulley 17 which again, on its part, may be driven from countershafting by rope or belt drive or the like. The cams x are able to be shifted on the shafts p , p^1 by means of grooves and tongues and are revolvably mounted in the ends of cross bars 18 which on their part again are displaceable on the parallel guide u and have female threads in their center. A screwed spindle 19 having right and left hand threads is in the middle part of the frame of the machine and is revolvably mounted at the ends of the same being in engagement with the cross bars 18, so that said cross bars approach one another or retreat from one another if the screwed spindle 19 is rotated. In this way the cams x which drive the shafts w of the polishing disks positively to and fro, can be gradually placed back in correspondence with the wear of the polishing disks, that is, they can at any time be brought closer together.

The mandrel shaft n suitably receives its drive from one of the two shafts p , p^1 , as these have approximately the same speed of rotation. For this purpose, the bevel wheel gear 20 (Figs. 1 & 2) may either be employed directly for driving the shaft n , or, where this is not feasible on account of want of space, may be so arranged that it in the first place drives a chain-wheel, 21 (Fig. 3) which then rotates the shaft n by means of chain

22. The shaft n may also be driven from a separate machine or other source of power.

What I claim as my invention and desire to secure by Letters Patent, is:—

1. An automatic polishing machine of the type described, comprising in combination a frame, means for holding a plurality of articles to be polished, a revoluble expandible mandrel mounted on the frame, means for feeding the articles on to said mandrel, means for expanding said mandrel into operative engagement with the article fed thereon and for maintaining the mandrel in its expanded condition during the operation of polishing, and for releasing the same thereafter, means for polishing the article, and means for throwing the article off the mandrel after the release of said operative engagement.

2. An automatic polishing machine of the type described, comprising in combination a frame, means for holding a plurality of articles to be polished, a revoluble expandible mandrel mounted on the frame, means for feeding the articles on to said mandrel, means for expanding said mandrel into operative engagement with the article fed thereon and for maintaining the mandrel in its expanded condition during the operation of polishing, and for releasing the same thereafter, a plurality of revoluble polishing disks arranged around said mandrel, means for moving said polishing disks up against the article on the mandrel and for withdrawing the same therefrom, and means for throwing the article off the mandrel after the release of said operative engagement.

3. An automatic polishing machine of the type described, comprising in combination a frame, means for holding a plurality of articles to be polished, a mandrel mounted on the frame, means for feeding the articles on to said mandrel, means for operatively interconnecting the mandrel and the article fed thereon, a plurality of revoluble polishing disks arranged around said mandrel, shafts w carrying said disks one shaft on each side of and parallel to the mandrel, rectilinearly guided slides v supporting said shaft, pins attached to said slides, cams x engaging said pins and adapted to reciprocate said slides, rectilinearly guided cross-bars 18 revolvably supporting said cams, revoluble shafts p , p^1 having feathers in sliding engagement with said cams for rotating said cams, a spindle 19 having right-handed and left-handed screws, one screw revolvably engaging one cross-bar and the other screw the other cross-bar, and means for rotating the spindle 19 by hand for the purpose of adjusting said cams on said shaft p , p^1 and so adjusting said polishing disks with regard to the article on the mandrel, means for disengaging the operative connection between the mandrel and article, and means for throwing the article

off the mandrel after the disengagement of said operative connection.

4. An automatic polishing machine of the type described, comprising in combination a frame, means for holding a plurality of articles to be polished, a revoluble expansible mandrel, a hollow revoluble shaft supporting said mandrel, means for feeding the articles on to said mandrel, a rod in said hollow shaft for expanding said mandrel into operative engagement with the article fed thereon and for maintaining the mandrel in its expanded condition during the operation of polishing, and for releasing the same thereafter, means for driving said rod into said mandrel to expand the same and for withdrawing said rod, means for polishing the article, and means for throwing the article off the mandrel after the release of said operative engagement.

5. An automatic polishing machine of the type described, comprising in combination a frame, means for holding a plurality of articles to be polished, a revoluble expansible mandrel, a hollow revoluble shaft supporting said mandrel, means for feeding the articles on to said mandrel, means for expanding said mandrel into operative engagement with the article fed thereon and for maintaining the mandrel in its expanded condition during the operation of polishing, and for releasing the same thereafter, means for polishing the article, and means for throwing the article off the mandrel after the release of said operative engagement, said means consisting of a sleeve on the mandrel shaft, a spring acting on said sleeve and tending to press it against the article to be polished and means for periodically moving said sleeve against the force exerted by the spring and releasing the same.

6. An automatic polishing machine of the type described, comprising in combination a frame, a substantially vertical feeding-shaft for holding a plurality of articles to be polished, a mandrel mounted on the frame, a feeder *f* having a slide *e*, a guide *b*¹ for said slide arranged between the base of said feeding-shaft and said mandrel, means for reciprocating said feeder to and fro on said guide, means for releasing the lowermost article from the feeding-shaft on the return of the feeder into its position under said feeding-shaft whereby said article drops into the feeder and is fed on to said mandrel, means for operatively interconnecting the mandrel and the article fed thereon, means for polishing the article while operatively connected with the mandrel means for disengaging the operative connection between the mandrel and article, and means for throwing the article off the mandrel after the disengagement of said operative connection.

7. An automatic polishing machine of the type described, comprising in combination a

frame, a substantially vertical feeding-shaft for holding a plurality of articles to be polished, a mandrel mounted on the frame, a feeder *f* having a slide *e*, a guide *b*¹ for said slide arranged between the base of said feeding-shaft and said mandrel, means for reciprocating said feeder to and fro on said guide, a U-shaped spring *g* immediately under the feeding-shaft said spring having wedge-shaped noses *i* normally adapted to support the lowermost article in said shaft, said spring being arranged in the path of the feeder *f* whereby on the return of the feeder into its position under said shaft said feeder engages the spring and releases said article whereupon the latter drops into the feeder and is subsequently fed on to said mandrel, means for operatively interconnecting the mandrel and the article fed thereon, means for polishing the article while operatively connected with the mandrel, means for disengaging the operative connection between the mandrel and article, and means for throwing the article off the mandrel after the disengagement of the said operative connection.

8. An automatic polishing machine of the type described, comprising in combination a frame, a substantially vertical feeding-shaft for holding a plurality of articles to be polished, a revoluble expansible mandrel mounted on the frame, a feeder *f* having a slide *e*, a guide *b*¹ for said slide arranged between the base of said feeding-shaft and said mandrel, means for reciprocating said feeder to and fro on said guide, means for releasing the lowermost article from the feeding-shaft on the return of the feeder into its position under said feeding-shaft whereby said article drops into the feeder and is fed on to said mandrel, means for expanding said mandrel into operative engagement with the article fed thereon and for maintaining the mandrel in its expanded condition during the operation of polishing, and for releasing the same thereafter, means for polishing the article, and means for throwing the article off the mandrel after the release of said operative engagement.

9. An automatic polishing machine of the type described, comprising in combination a frame, a substantially vertical feeding-shaft for holding a plurality of articles to be polished, a revoluble mandrel mounted on the frame, a feeder *f* having a slide *e*, a guide *b*¹ for said slide arranged between the base of said feeding-shaft and said mandrel, means for reciprocating said feeder to and fro on said guide, means for releasing the lowermost article from the feeding-shaft on the return of the feeder into its position under said feeding-shaft whereby said article drops into the feeder and is fed on to said mandrel, means for operatively interconnecting the mandrel and the article fed thereon, a plurality of revoluble polishing disks arranged around said mandrel, means for moving said polishing

disks up against the article on the mandrel
and for withdrawing the same therefrom,
means for disengaging the operative connec-
tion between the mandrel and article, and
5 means for throwing the article, off the man-
drel after the disengagement of said opera-
tive connection.

In testimony whereof I have signed my
name to this specification in the presence of
the two subscribing witnesses.

ERNST KRÜGER.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.