June 6, 1933. H. L. VANDEVORT 1,912,552

APPARATUS FOR POLISHING ARTICLES

Filed April 17, 1929 5 Sheets-Sheet 1

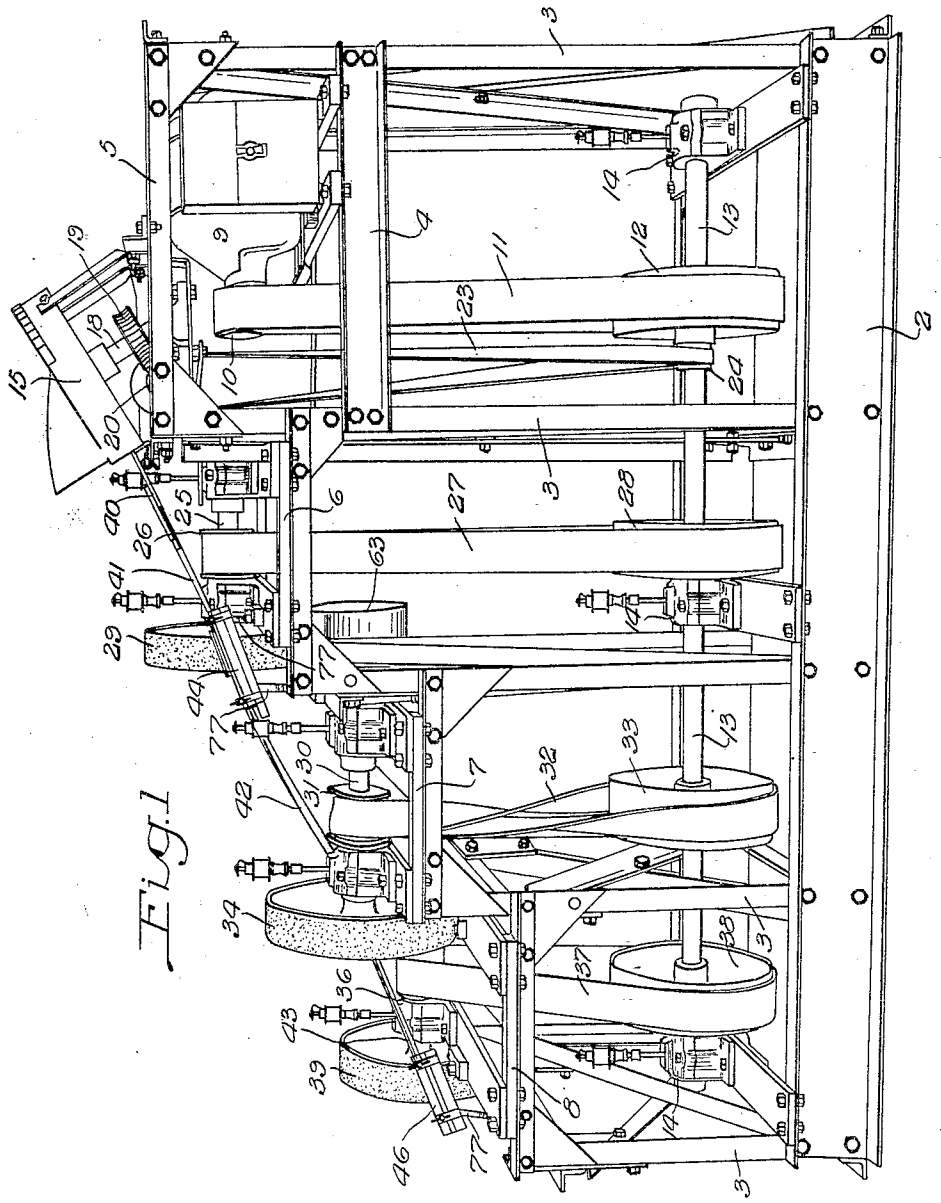


Fig. 1

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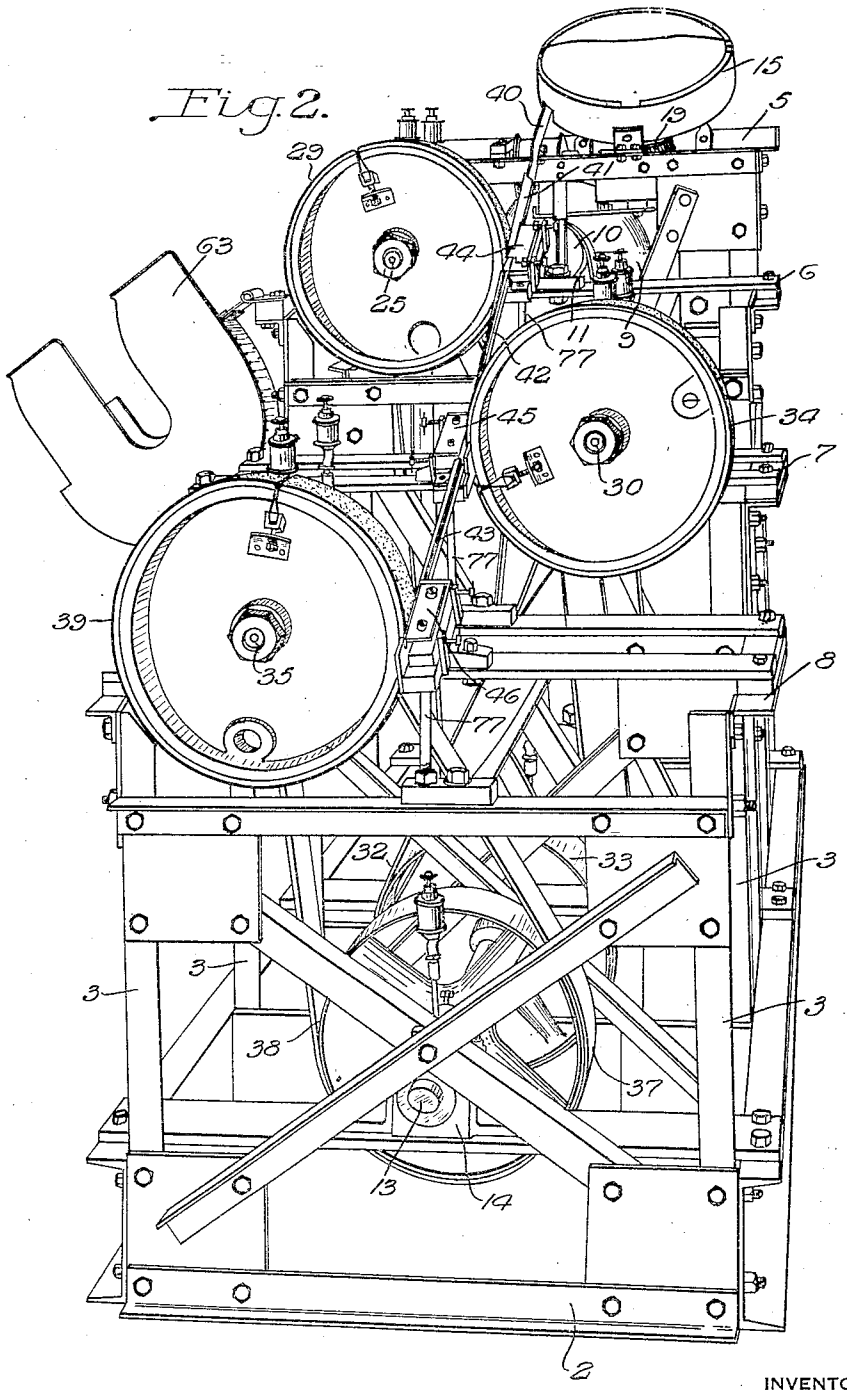
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APPARATUS FOR POLISHING ARTICLES

Filed April 17, 1929 5 Sheets-Sheet 2

Fig. 2.



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APPARATUS FOR POLISHING ARTICLES

Filed April 17, 1929 5 Sheets-Sheet 3

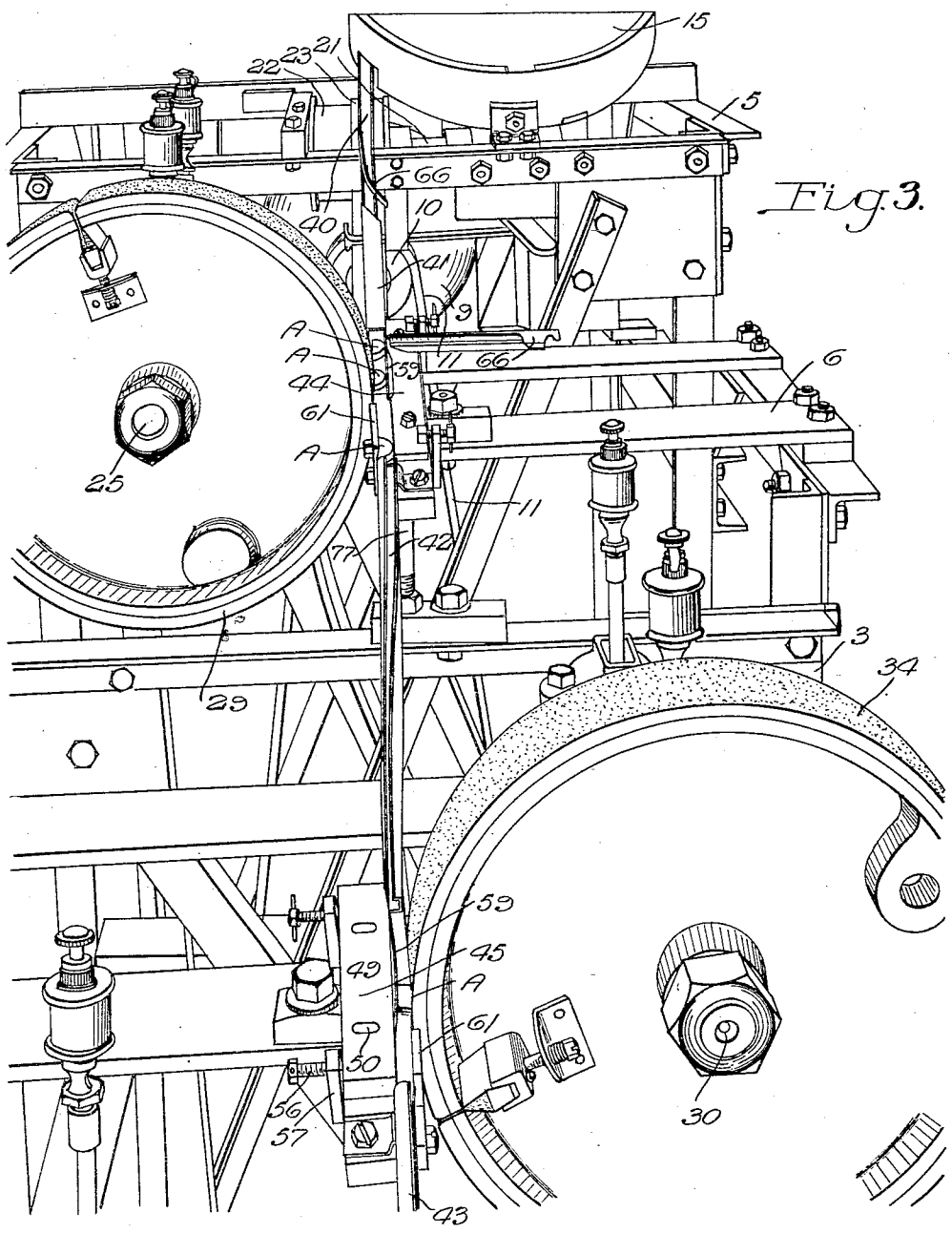


Fig. 3.

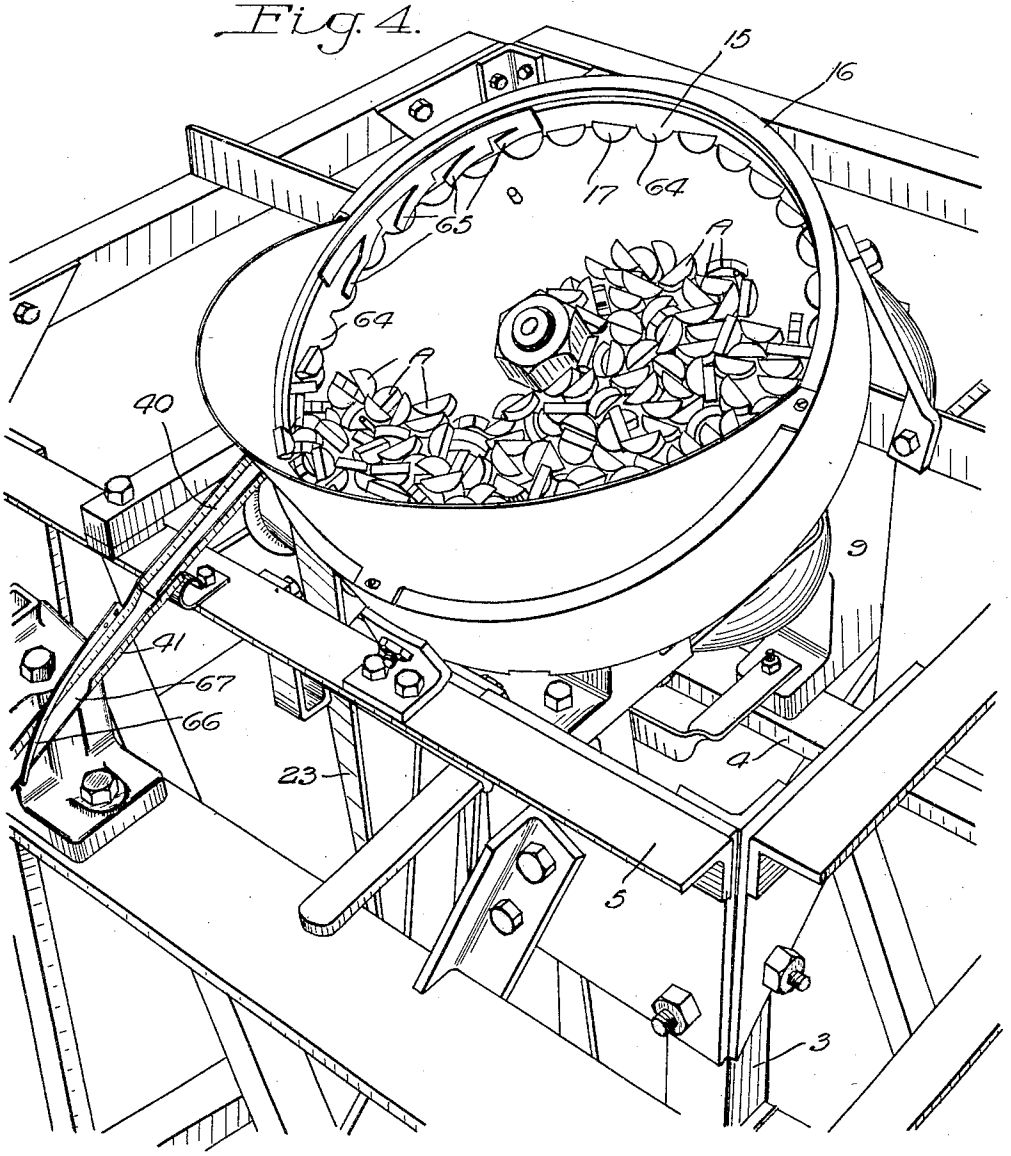
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APPARATUS FOR POLISHING ARTICLES

Filed April 17, 1929 5 Sheets-Sheet 4

Fig. 4.



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APPARATUS FOR POLISHING ARTICLES

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Fig. 5.

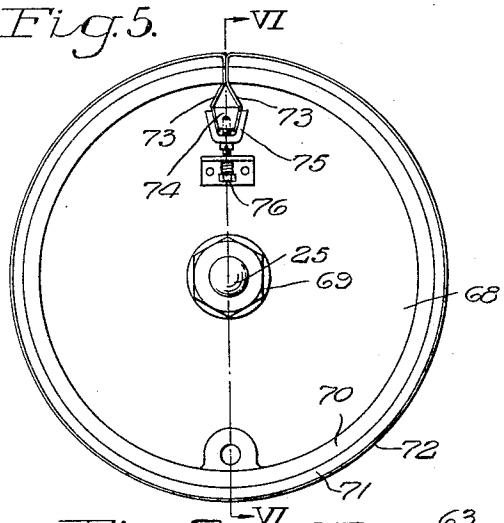


Fig. 6.

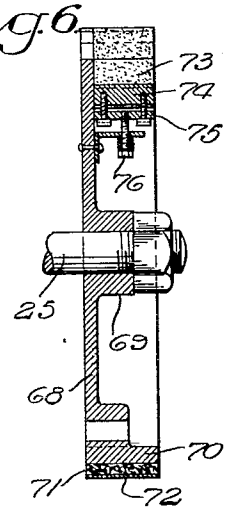


Fig. 7.

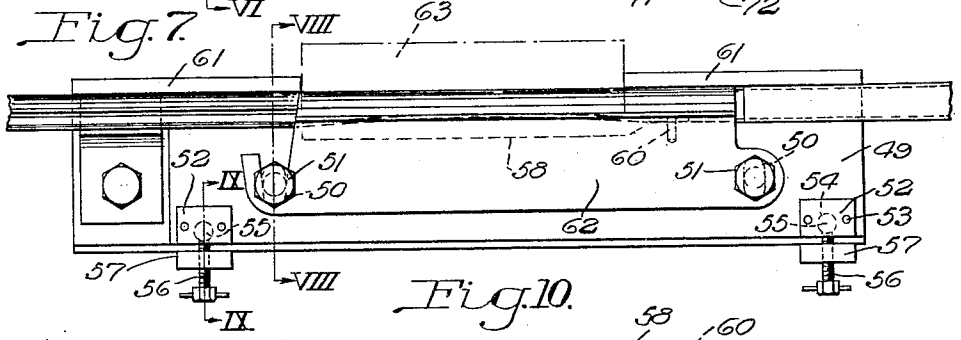
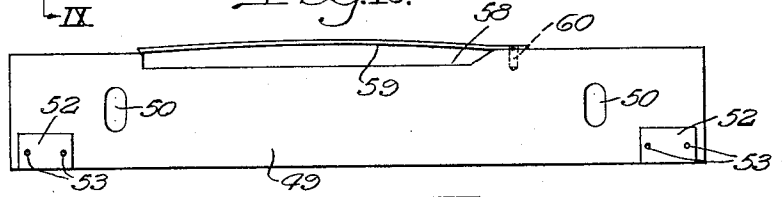


Fig. 10.



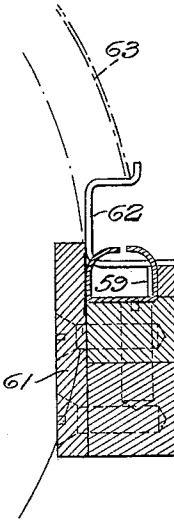
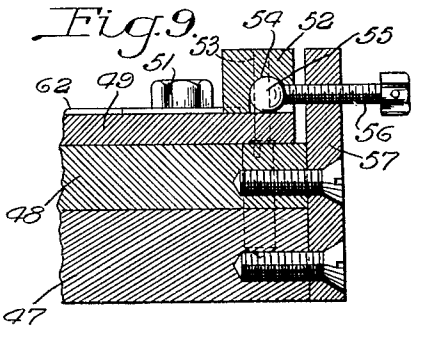


Fig. 8.

Fig. 9.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR POLISHING ARTICLES

Application filed April 17, 1929. Serial No. 355,858.

The present invention relates broadly to the art of grinding and polishing, and more particularly to an improved method and apparatus especially adapted for the finishing or polishing of articles of different characteristics. In the present application, the apparatus has been illustrated as adapted for the polishing of keys, but it will be understood that the utility of the invention is not limited in this regard.

It is customary in the manufacture of metal articles, such for example as keys, to cut, stamp, or punch the same in rapid succession from a suitable piece of parent stock. Such a severing operation results in the formation of slight irregularities, burrs, fins, or the like, which are objectionable where absolute precision is desired, as is the case, for example, with a key adapted to be utilized in machine production for the keying together of different parts which it is desired to rotate in unison. In the present invention, there is provided a method and apparatus adapted to take articles of the character referred to and rapidly and automatically feed the same in such manner as to subject the desired portions thereof to a polishing operation whereby the desired uniformity and accuracy is insured.

In the accompanying drawings there is shown for purposes of illustration only, a preferred embodiment of the present invention.

In the drawings:—

Figure 1 is a side elevational view of one form of machine constructed in accordance with the present invention;

Figure 2 is an end view of the machine of Figure 1, the view being taken from the left hand end of the machine, as shown in Figure 1;

Figure 3 is a perspective view, on an enlarged scale, of a portion of the machine;

Figure 4 is a perspective view of the feed hopper;

Figure 5 is a detail elevational view of one of the polishing elements;

Figure 6 is a transverse sectional view on the line VI—VI of Figure 5, looking in the direction of the arrows:

Figure 7 is a top plan plan view, on an enlarged scale, of a portion of the centering and holding mechanism for the articles being polished;

Figure 8 is a transverse sectional view, on an enlarged scale, on the line VIII—VIII of Figure 7, looking in the direction of the arrows;

Figure 9 is a transverse sectional view, on an enlarged scale, on the line IX—IX of Figure 7, looking in the direction of the arrows; and

Figure 10 is a detail plan view of the backing-up plate included in the assembly of Figure 7.

In accordance with the present invention, there is provided a mechanism including generally a feed mechanism in the form of a hopper adapted for the reception of a plurality of articles to be polished. This hopper is in cooperative relation with a feeding mechanism, which in turn delivers the articles in the desired sequence and in the proper position to a succession of polishing elements by means of which the desired operations are performed thereon. It will be apparent as the machine becomes better understood, by reference to the following detail description thereof, that the term polishing is used generically as definitive of a finishing operation which may include a slight grinding or abrading, depending upon the characteristics of the particular elements utilized. This term, therefore, is used as a word of definition inclusive of operations of the character referred to, and not as a word of limitation.

In accordance with the present invention, there is provided a suitable base 2, from which a series of uprights 3 project in the desired spaced relation for the support of a motor platform 4, a hopper platform 5, and article positioning and polishing supporting platforms 6, 7 and 8.

Supported on the motor platform 4 is a motor 9, herein illustrated as having its armature shaft provided with a pulley 10 for cooperation with a belt 11, extending around a pulley 12 on drive shaft 13. This drive shaft extends longitudinally of the base 2

and is journalled in suitable bearings 14 at desired intervals.

Suitably supported on the hopper platform 5 is a feed hopper 15, including a stationary rim portion 16 and a rotating feeder disk 17. The feeder disk is secured in any desired manner to the upper end of a shaft 18, angularly disposed, as illustrated more particularly in Figure 1, for the purpose of facilitating the discharge of properly positioned articles from the hopper. This shaft is provided at a suitable intermediate point with a worm wheel 19, meshing with a worm 20 on a shaft 21, extending transversely of the hopper platform. For driving this shaft, it is provided with a pulley 22 around which passes a belt 23 driven by a small pulley 24 on the main drive shaft 13.

Journalled on the platform 6 is a shaft 25 carrying a pulley 26 cooperating with a belt 27, driven from the drive shaft 13 by a pulley 28. On one end of the shaft 25 is a polishing element 29, adapted to perform the initial operation on the articles delivered thereto.

Suitably journalled on the platform 7 is a shaft 30, generally similar to the shaft 25, and provided with a pulley 31 cooperating with a belt 32 driven from the drive shaft 13 by a pulley 33. As will be apparent more particularly from Figures 2 and 3, the shafts 25 and 30 are not only positioned on different platforms, but are laterally offset. The shaft 30 carries a second polishing element 34, generally similar to the element 29, but adapted to rotate in the opposite direction, such rotation being obtained by suitably twisting the belt 32, as indicated in the drawings.

On the platform 8 is a third shaft 35, carrying a pulley 36, cooperating with a belt 37 driven from the drive shaft 13 by pulley 38. This shaft carries a third polishing element 39, in general alignment with the element 29, but at a lower elevation, as clearly apparent from Figure 1.

Extending continuously from the feed hopper 15 and in cooperative relation with the polishing elements 29, 34 and 39, is a conveying and positioning mechanism herein illustrated as comprising a series of trough or chute sections 40, 41, 42, and 43. Intermediate the sections 41 and 42 is an article centering and holding mechanism 44. Intermediate the sections 42 and 43, is a second centering and holding mechanism 45, while adjacent the lower end of the section 43 is a third centering and holding mechanism 46. These mechanisms may all be of generally similar construction, and each is mounted in such manner as to occupy a position adjacent one of the polishing elements so as to center an article in cooperative relation thereto and properly position the same during the polishing operation. One of these centering and holding mechanisms is illustrated in detail in Figures 7 to 10, both inclusive, and in view of the similarity existing between them, a detail description of one will suffice for all. Such a mechanism may comprise a bottom plate 47, on which is carried an article supporting plate 48, having superimposed thereon an adjustable backing-up plate 49. The backing-up plate, as illustrated more particularly in Figure 10, is provided adjacent its opposite end portions with slots 50, through which are adapted to project clamping screws 51, as shown in Figure 8, whereby the backing-up plate may be adjustably clamped in different positions on the supporting plate 48.

For effecting such adjustment of the backing-up plate, it is provided adjacent each end with a bearing 52, illustrated in detail in Figure 9, keyed to the backing-up plate by pins 53, and provided with a substantially spherical bearing surface 54. Positioned in engagement with each bearing surface, is a ball 55 carried by a screw 56, threaded through an upright 57, which is in turn secured to the supporting plate 48 and the bottom plate 47, as illustrated in detail in Figure 9.

By the provision of the adjusting means 56, the entire backing-up plate may be adjusted transversely on the supporting plate 48, or it may be angularly adjusted thereon into any desired position.

The backing-up plate is provided intermediate its ends with a recess 58, across which extends a backing-up spring 59, secured at one end only to the backing-up plate, as indicated at 60. This backing-up spring is longitudinally curved and constitutes in effect a continuation of the chute sections lying on opposite sides thereof. Each of the backing-up springs lies substantially parallel to and facing the plane of the working face of its respective polishing element, thereby providing a yielding means for maintaining an article in operative engagement with the polishing face of such element. On the side of each centering and holding mechanism, opposite the uprights 57, there may be provided guard plates 61, which guard plates are spaced apart a distance such as to just receive therebetween one of the polishing elements, as illustrated in chain lines in Figure 7.

Also clamped in position by screws 51 is a guard plate 62, for cooperation with the inner edge of a pivotally mounted guard 63, one of which is indicated in inoperative position in Figure 2. It will be understood, however, that a similar guard may be provided for each of the polishing elements, all of the guards preferably being pivotally supported so that they may be swung into and out of operative position at will to provide free access to the polishing elements.

The rotatable feeding disk 17 on the feed hopper is formed around its entire periphery with pockets 64, each of which is shaped for

the reception in predetermined position only of one of the articles A carried thereby. Upon rotation of the feed disk 17, the articles as agitated fall into the respective pockets. In case the articles are improperly positioned in the pockets, they are wiped off during the rotation of the feeder disk by means of fingers 65, projecting over the pockets 64. Articles which are properly positioned pass from the hopper into the chute section 40, as will be clearly apparent, all necessarily entering this chute section in the same relative position. The dimensions of the chute section are such as to prevent the articles from assuming a different relative position.

The chute section 41, which receives the articles from the chute section 40, is preferably provided with a deflecting finger 66, extending there-across in such manner that if an oversized article is received by this chute section, it will be engaged by the deflecting finger 66 and discharged through the open side 67 on this chute section.

Assuming the article to be of proper size, it will pass under the deflecting finger into the first centering and holding mechanism adjacent the polishing element 29. In Figure 3 there are illustrated three articles A in position in this centering and holding mechanism, one of these articles being shown substantially in cooperative relation to the polishing element, another of the articles being shown in position before it reaches such polishing element, and the third article being shown in position after it has been operated upon by the polishing element 29, and just prior to its entry into the chute section 42.

In Figures 5 and 6, one of the polishing elements is illustrated in detail, it being assumed for purposes of description that the polishing element of these figures is the element 29. This element, carried by the shaft 25, comprises a main disk portion 68, having a hub 69 cooperating with the shaft and having a laterally projecting flange 70 formed thereon, this flange preferably being continuous except for a short space provided for the purpose hereinafter more fully pointed out. Carried by the flange 70 is a flexible seat 71, conveniently formed of leather, around and upon which is supported the polishing cloth 72. The seat 71 is placed on the flange 70 in such manner that the end portion of the seat coincides with the space before referred to in the flange 70. By reason of this relationship of the parts, the ends 73 of the polishing material may be passed through such space into position to be engaged by the wedge-shaped clamping and tightening block 74 adjustable in a seat 75 by means of an adjusting screw 76.

This construction not only facilitates the clamping of a new piece of polishing material in the desired position, but enables the rapid replacement of such material as found necessary.

Where it is desired to perform a substantially abrading operation on an article, the yielding seat 71 may be omitted entirely, or its choice made with respect to the yielding properties desired. In like manner, in such case, the backing-up spring 59 of each of the centering and holding mechanisms may possess different characteristics.

With the construction illustrated, an article in passing the element 29 has its back in engagement with the backing-up spring 59, and its base in engagement with a polishing element. In this manner, the base is subjected to a predetermined polishing action.

By reference more particularly to Figure 1 of the drawings, it will be noted that the chute sections and the article centering and holding mechanisms provide a substantially continuously inclined path for the articles from the hopper to the discharge end of the machine, thus providing for automatic feeding of the articles into polishing position, across the face of the successive polishing elements, and into the succeeding chute sections. To those skilled in the art it will be apparent that the speed of travel of the articles, and consequently the time of duration of each polishing operation, and therefore the extent of polishing, will be determined by the speed of rotation of the polishing elements and the inclination of the particular mechanism supporting the article being polished.

In order to provide for changing this inclination at will, each of the bottom plates 47 is carried by two screw threaded pins 77, adapted to be adjusted at will to thereby vary the inclination of the respective mechanism supported thereby.

After an article has been subjected to the polishing influence of the element 29, it is discharged into the chute section 42, which chute section, as illustrated more particularly in Figure 3, is of such characteristics as to turn an article traversing the same through an angular distance of approximately 90 degrees so that by the time the second article centering and holding mechanism is reached, the article will be in the position illustrated in Figure 3 with one side thereof in position to be polished. This polishing operation being completed, the article enters the chute section 43 which is effective for maintaining it in its previous relative position and bringing it into position to be operated upon by the element 39. Due to the laterally offset elements 34 and 39, the element 39 will be effective for polishing the other side of the article.

From the foregoing it will be apparent that I provide a machine entirely automatic in its operation except for the delivery of the articles into the feed hopper. After the hop-

per has once been filled, the articles are automatically positioned thereby and delivered in rapid succession and in proper position for cooperation with the first polishing element. The first polishing operation having been performed, the chute section 42 is effective for turning each article through such an angular distance that another portion of the same is operated upon by the element 34. Thereafter, the travel of the articles through the chute section 43 brings them into position to have a third side polished by the element 39. It will be apparent that the number of the elements may be increased or decreased, depending upon the characteristics of the article being polished and the number of sides which it is desired to subject to a polishing operation. It will also be understood that the speed of rotation of the respective polishing elements may be varied by the use of a suitable variable speed motor, to thereby change the polishing characteristics; and that the inclination of the respective parts may be changed to correspondingly increase or decrease the duration of each polishing operation.

By a proper choice of seating material on each of the polishing elements, and a corresponding choice of backing-up springs, the extent of the polishing operation may be controlled. This operation may likewise be increased or decreased at will by the choice of polishing material applied to the various elements. In case of keys, as herein illustrated, where only a slight burr exists, the polishing need not be excessive. With other articles, however, a greater polishing or even abrading or grinding may be desirable by reason of the manufacturing processes to which they are subjected.

Certain advantages of the present invention arise from the provision of a mechanism effective for rapidly and accurately treating successive articles such as to give uniform characteristics thereto with respect to size and appearance, thereby enabling them to be interchangeably used in parts previously accurately machined for their reception.

The automatic characteristics of the machine are such as to enable the desired operations to be performed in the minimum of time with a minimum of attention, and therefore at a minimum cost.

While I have herein illustrated one preferred embodiment of the present invention, various modifications thereof such as required to adapt the apparatus to other articles or to different degrees of polishing, abrading or grinding will readily suggest themselves. Changes, therefore, may be made in the construction and operation of the various parts without departing either from the spirit of the present invention or the scope of my broader claims.

I claim:—

1. In a machine of the class described, comprising a frame, a plurality of horizontal shafts parallel to each other and in different horizontal planes, a polishing wheel on each of said shafts and in different vertical planes, an article runway extending across a polishing face of each wheel at an angle to the vertical and horizontal, whereby articles may be fed by gravity first across the face of one wheel and then across the face of another wheel in a lower plane.

2. In a machine of the class described, comprising a frame, a plurality of horizontal shafts parallel to each other and in different horizontal planes, a polishing wheel on each of said shafts and in different vertical planes, an article runway extending across a polishing face of each wheel at an angle to the vertical and horizontal between at least two of the wheels, whereby articles may be fed by gravity first across the face of one wheel and then across the face of another wheel in a lower plane.

3. In a machine of the class described, comprising a frame, a plurality of horizontal shafts parallel to each other and in different horizontal planes, a polishing wheel on each of said shafts and in different vertical planes, a feeding device above the wheels, an article runway extending from the feeding device across a polishing face of each wheel at an angle to the vertical and horizontal, whereby articles may be fed by gravity first across the face of one wheel and then across the face of another wheel in a lower plane.

4. In a machine of the class described, comprising a frame, a plurality of horizontal shafts parallel to each other and in different horizontal planes, a polishing wheel on each of said shafts and in different vertical planes, an article runway extending across a polishing face of each wheel at an angle to the vertical and horizontal, means for adjusting the angle of the runway, whereby articles may be fed by gravity first across the face of one wheel and then across the face of another wheel in a lower plane.

5. In a machine of the class described, comprising a frame, a plurality of horizontal shafts parallel to each other and in different horizontal planes, a polishing wheel on each of said shafts and in different vertical planes, an article runway extending across a polishing face of each wheel at an angle to the vertical and horizontal, a resilient backing in the runway opposite the polishing face of each wheel, whereby articles may be fed by gravity first across the face of one wheel and then across the face of another wheel in a lower plane.

6. In a machine of the class described, comprising a frame, a plurality of horizontal shafts parallel to each other and in different horizontal planes, a polishing wheel on each

of said shafts and in different vertical planes, a horizontal driving shaft parallel with the polishing wheel shafts, means for driving the polishing wheel shafts from the driving shaft, an article runway extending across a polishing face of each wheel at an angle to the vertical and horizontal, whereby articles may be fed by gravity first across the face of one wheel and then across the face of another wheel in a lower plane.

In testimony whereof I have hereunto set my hand.

HARRY L. VANDEVORT.