

H. A. HARVEY.

MACHINE FOR MAKING WASHERS.

No. 379,393.

Patented Mar. 13, 1888.

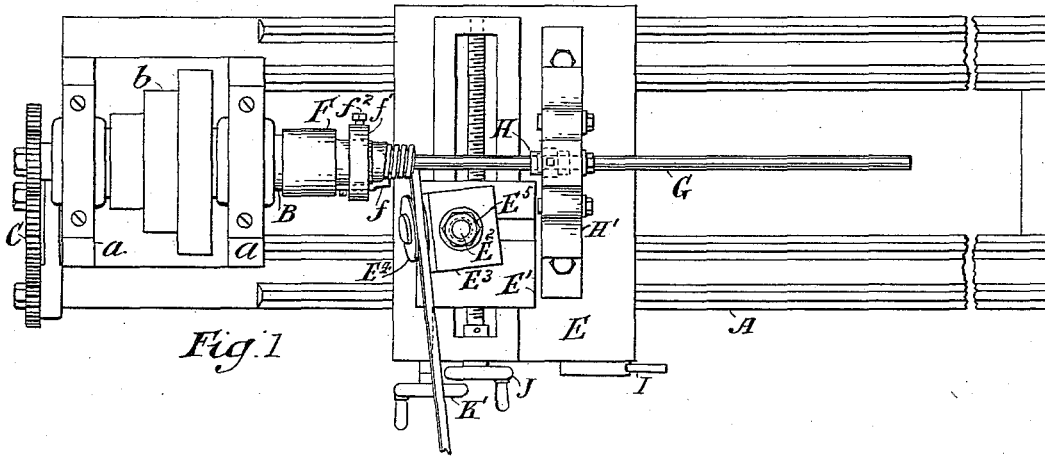


Fig. 1

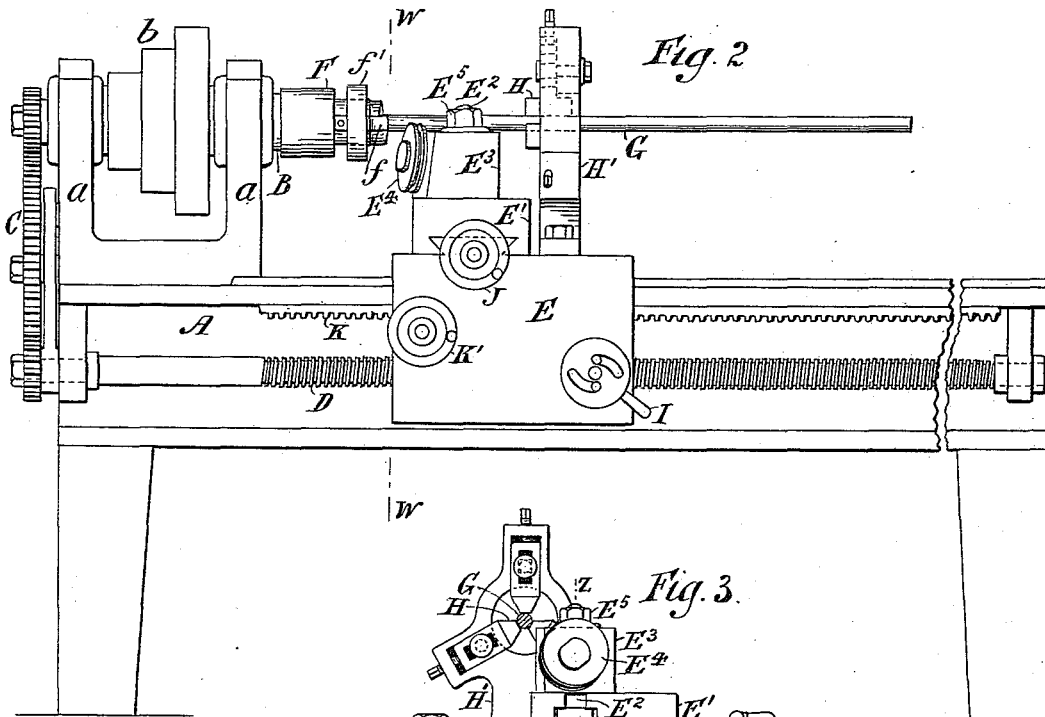


Fig. 2

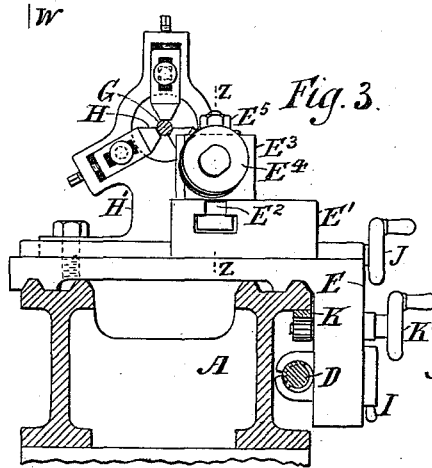


Fig. 3

Witnesses  
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(No Model.)

2 Sheets—Sheet 2.

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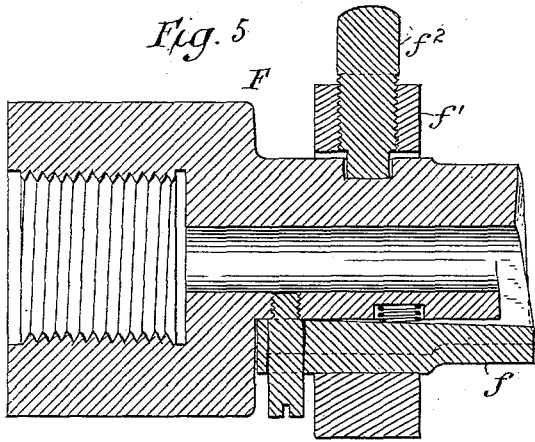


Fig. 5

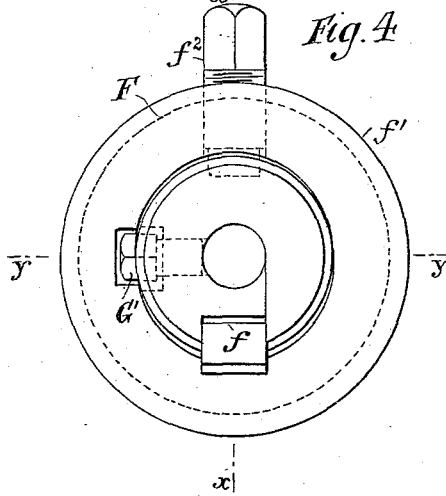


Fig. 4

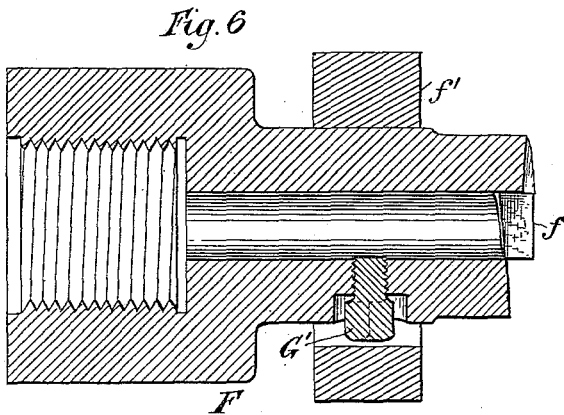


Fig. 6

Fig. 8

Fig. 9

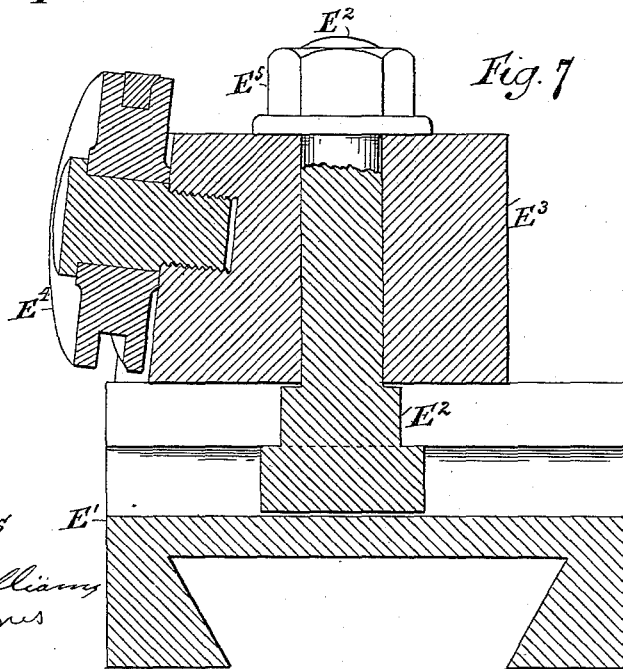
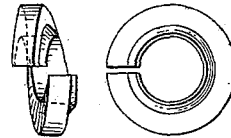


Fig. 7

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# UNITED STATES PATENT OFFICE.

HAYWARD A. HARVEY, OF ORANGE, NEW JERSEY.

## MACHINE FOR MAKING WASHERS.

SPECIFICATION forming part of Letters Patent No. 379,393, dated March 13, 1888.

Application filed January 13, 1888. Serial No. 260,627. (No model.)

*To all whom it may concern:*

Be it known that I, HAYWARD A. HARVEY, of Orange, New Jersey, have invented certain Improvements in Machines for Manufacturing Spiral Washers, of which the following is a specification.

This invention relates to machines employed in carrying out the first step in the process of manufacturing spiral washers, which consists in winding a metallic bar or rod of the required size and shape in cross-section into the form of a continuous spiral of a prescribed pitch preparatory to the removal of such spiral to another machine, in which the several convolutions of the spiral thus formed are severed from each other by longitudinally slitting or cutting through the spiral on one side of its axis. This process is especially applicable to the manufacture of spiral washers of the type of those described in Letters Patent of the United States No. 340,308, issued April 20, 1886, to H. A. Harvey. The peculiarity of such washers is that they contain around the concave edge of the side which is intended for contact with the nut a projecting rib, which, by the screwing home of the nut, is made to embed itself in the face of the nut and to press the metal thereof radially inward against the bolt to which the nut is applied. It thereby follows that the frictional hold of the nut upon the bolt is contributed to not only by the resilient force of the compressed spiral washer, but also by the described radially-inward grip of the nut upon the bolt.

The spiral washer is a spring of prescribed strength, and the work of the projecting rib in displacing the metal upon the face of the nut is performed progressively during the gradual compression of the spiral washer as the nut is being screwed home. It is hence desirable to regulate the pitch of the spiral washer with reference to the work it has to do, in order that a series of washers intended for use under like conditions may possess substantially uniform capacities in respect of their range of compression and resilient strength.

The machine for performing the first step in the process referred to embraces, essentially, first, a rotating chuck which is centrally perforated to receive the end of the

mandrel upon which the bar is to be wound, and which is provided with a clamp for clamping the end portion of the bar against the mandrel, and which has its face spirally formed, so as to afford a bearing for the side of the bar during the winding of the first convolution of the helix; secondly, a movable bearing for supporting and centralizing the portion of the mandrel projecting from the chuck; thirdly, a slide rest or carriage which is driven in a path parallel with the axial line of the mandrel by means of a worm of prescribed pitch, upon which carriage or rest is mounted a guide-roller provided upon its periphery with a flat-bottomed groove to receive and guide the bar which is being wound.

The accompanying drawings of a machine containing the present invention are as follows:

Figure 1 is a top view. Fig. 2 is a front elevation. Fig. 3 is a transverse section through the line W W on Fig. 2, affording a view in elevation of the guide-roller and of the tail-bearing for the mandrel. Fig. 4 is an elevation of the face of the chuck. Fig. 5 is a longitudinal section of the chuck, taken through the line X X on Fig. 4. Fig. 6 is a longitudinal section of the chuck, taken through the line Y Y on Fig. 4. Fig. 7 is a vertical section of the guide-roller and of the transverse slide upon which it is mounted, taken through the plane indicated by the letters Z Z on Fig. 3. Figs. 8 and 9 are respectively side and face views of a spiral washer consisting of a single convolution of a helix.

The machine represented in the drawings in its general appearance resembles a lathe. The frame A is provided at one end with suitable standards, *a a*, affording the bearings for the chuck-spindle B, upon which is mounted the usual cone-pulley, *b*, to which power is applied to rotate the chuck-spindle. A suitable train of gearing, C, transmits motion from the chuck-spindle to the leading-screw D for giving motion to the carriage E. The chuck F, affixed to the end of the spindle B, is centrally perforated to receive the end of the removable mandrel G, and is provided with a clamping-jaw, *f*, which is operated by means of a yoke, *f'*, and set-screw *f''*, for the purpose of clamping against the mandrel the end of the bar which is to be wound. When clamped in the

chuck, the bar extends outwardly therefrom at an angle which is determined by the pitch which the helix when wound is to have.

To facilitate the winding of the first convolution of the helix to the desired pitch, the annular face of the chuck, outside the mandrel, is slightly dished and is made of spiral form, so that it may present a continuous bearing for the side of the bar during the winding of the first convolution, and thereby resist any tendency of the bar to assume a position at a right angle to the axis of the mandrel at the commencement of the winding operation.

A transversely-adjustable slide,  $E'$ , is loosely dovetailed upon the carriage  $E$ , and is provided with the movable stud or bolt  $E^2$ , which extends vertically through and serves as the axis for the holder-block  $E^3$ , upon which there is mounted a guide-roller,  $E^4$ , the axis of which is slightly inclined from the horizontal, as shown in Fig. 3. By means of the nut  $E^5$  the holder-block  $E^3$  is securely fastened to the transverse slide  $E'$ . Provision is made for a sufficient range of swiveling movement for the holder-block  $E^3$  to permit it to be so adjusted that the vertical plane of the axis of the roller  $E^4$  will be slightly diagonal with relation to the vertical plane of the axis of the mandrel  $G$ , so that the plane of motion of the guide-roller will coincide with the direction in which the bar is fed to the mandrel when being wound into a helix of the desired pitch, this pitch being determined by the speed of rotation of the leading-screw  $D$ , which imparts the longitudinally-sliding movement to the carriage  $E$  and the appurtenances mounted thereon.

It will be observed that the carriage  $E$ , the transversely-adjustable slide  $E'$ , and the holder-block  $E^3$ , adjustable upon the vertical axis afforded by the stud  $E^2$ , constitute a construction substantially like the compound slide-rest of an ordinary lathe. The facilities for adjusting the guide-roller which are thus afforded are desirable, although not absolutely essential to the operation of the machine. The circumferential groove of the guide-roller is shaped in cross-section to fit the polygonal bar which is to be seated in it, and to thus exert a slight torsional stress upon the bar.

The spiral washer for the manufacture of which the machine is especially intended is illustrated in Figs. 8 and 9, and, as will be seen, is a single convolution of a helix made by winding upon the mandrel a steel bar which in cross-section is trapezoidal, but is provided upon one edge with a projecting rib, which increases the width of that one of the flat sides of the bar which is next the mandrel during the winding. The torsional stress exerted upon the bar by the grooved guide-roller is for the purpose of causing the bar to be laid around the mandrel in convolutions which are slightly flaring, as shown in Fig. 3, so that the resilient force of the spiral washer when put into use will be increased by its torsional resistance to compression. During the winding of the first convolution the required coarse-

ness of pitch of the helix is insured by the bearing of the side of the bar against the spiral face of the chuck. The speed of rotation of the leading-screw  $D$  is regulated with reference to imparting such a speed of movement to the carriage  $E$ , and consequently to the guide-roller  $E^4$ , as will enable the guide-roller to hold the straight portion of the bar at a proper angle with relation to the mandrel, so that the successive convolutions of the helix shall be alike in pitch.

The portion of the mandrel  $G$  projecting from the chuck is supported and centralized in the tail-bearing  $H$ , which is carried in the movable tail standard  $H'$ . The tail standard  $H'$  is preferably affixed to and moves with the carriage  $E$ , in order that the tail-bearing  $H$  may, during the winding operation, be in close proximity to the part of the mandrel upon which the bar is being wound, and may thus prevent the mandrel from springing. In practice there are provided a suitably large number of mandrels like the mandrel  $G$ .

To perform the winding operation, a mandrel  $G$  is inserted through the tail-bearing  $H$  into the recess in the center of the chuck, in which it is fastened by means of the set-screw  $G'$ . The chuck is brought to rest with the clamping-jaw standing underneath the mandrel, and, the carriage having been brought back to a position adjoining the chuck, the bar to be wound is deposited in the groove of the guide-roller and has its end inserted and clamped between the mandrel and the clamping-jaw. The machine being then set in motion, the bar is wound upon the mandrel and made to assume the shape of a helix the convolutions of which are of uniform pitch.

When the operation of winding a bar into a helix is completed, the machine is stopped, the set-screw  $f^2$  loosened, the carriage  $E$ , carrying the tail-standard  $H'$ , moved back—that is, farther away from the chuck—and the mandrel  $G$ , with the helix  $L$  remaining upon it, is removed from the machine preparatory to being placed in the slitting-machine. Another mandrel is then clamped in place in the winding-machine, the carriage is brought back to its starting-point, and another bar clamped in the chuck preparatory to the repetition of the winding operation.

In its general features the carriage  $E$  has the construction of the ordinary slide-rest of a lathe. It is provided with the usual jaws or two-part nut, which, by means of the usual lever,  $I$ , may be thrown into or out of engagement with the leading-screw  $D$ . The upper part,  $E'$ , of the carriage is transversely dovetailed to the lower part,  $E$ , and, by means of the usual transverse feed-screw, provided with the hand-wheel  $J$ , can be moved transversely, so that, if occasion arises, the guide-roller  $E^4$  may be moved nearer to or farther from the mandrel  $G$ . The usual stationary horizontal rack,  $K$ , is provided upon the frame of the machine. The carriage is provided with the usual cog-wheel for engaging the rack  $K$  and

the usual hand-wheel,  $K'$ , for rotating this cog-wheel, and thus moving the carriage rapidly to or fro, as may be desired.

What is claimed as the invention is—

5 1. In a machine for winding into the form of a helix a metallic bar from which spiral washers are to be made, the combination, as herein set forth, of a revolving chuck, a mandrel inserted therein, a clamping-jaw for clamping  
10 the end of a metallic bar thereto, a guide-roller mounted in suitable proximity to the mandrel upon a sliding support, and a movable tail bearing for centralizing and supporting the portion of the mandrel projecting from  
15 the chuck, as and for the purposes set forth.

2. The chuck  $F$ , provided with a clamping-jaw and having its face spirally formed to present a continuous bearing for the side of the bar which is being wound into a helix during

the operation of winding the first convolution 20 of such helix.

3. The grooved guide-roller  $E^1$ , mounted upon the adjustable block  $E^3$  and rotating upon an axis the vertical plane of which is diagonal with relation to the vertical plane of 25 the axis of the mandrel, for the purpose of making the plane of motion of said guide-roller coincide with the direction in which the bar is fed to the mandrel while being wound into a helix of prescribed pitch. 30

4. The centrally-perforated chuck  $F$ , provided with the clamping-jaw  $f$ , in combination with the yoke  $f'$  and the set-screw  $f^2$ , as and for the purpose set forth.

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Witnesses:

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A. M. JONES.