(No Model.) 4 Sheets—Sheet 1.

H. A. HARVEY.

MACHINE FOR MAKING SPIRAL WASHERS.

No. 420,557. Patented Feb. 4, 1890.

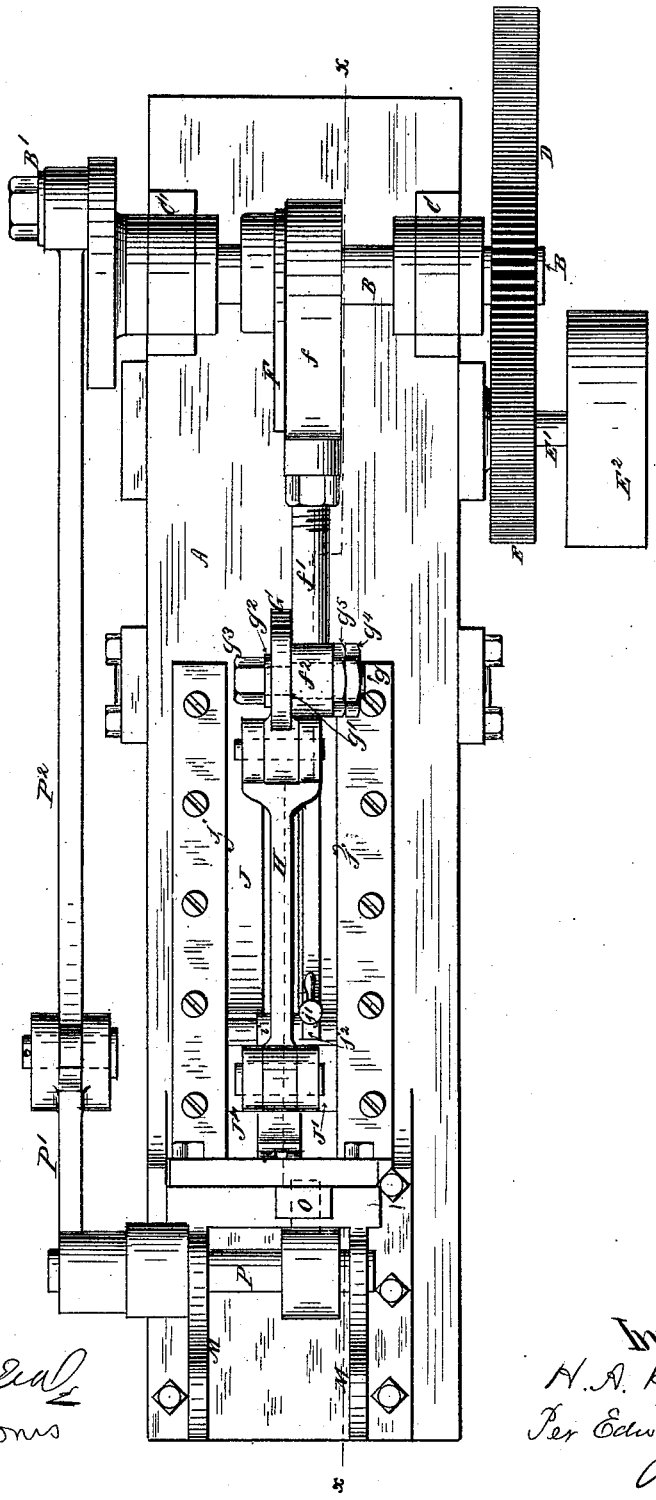

Fig. 1.

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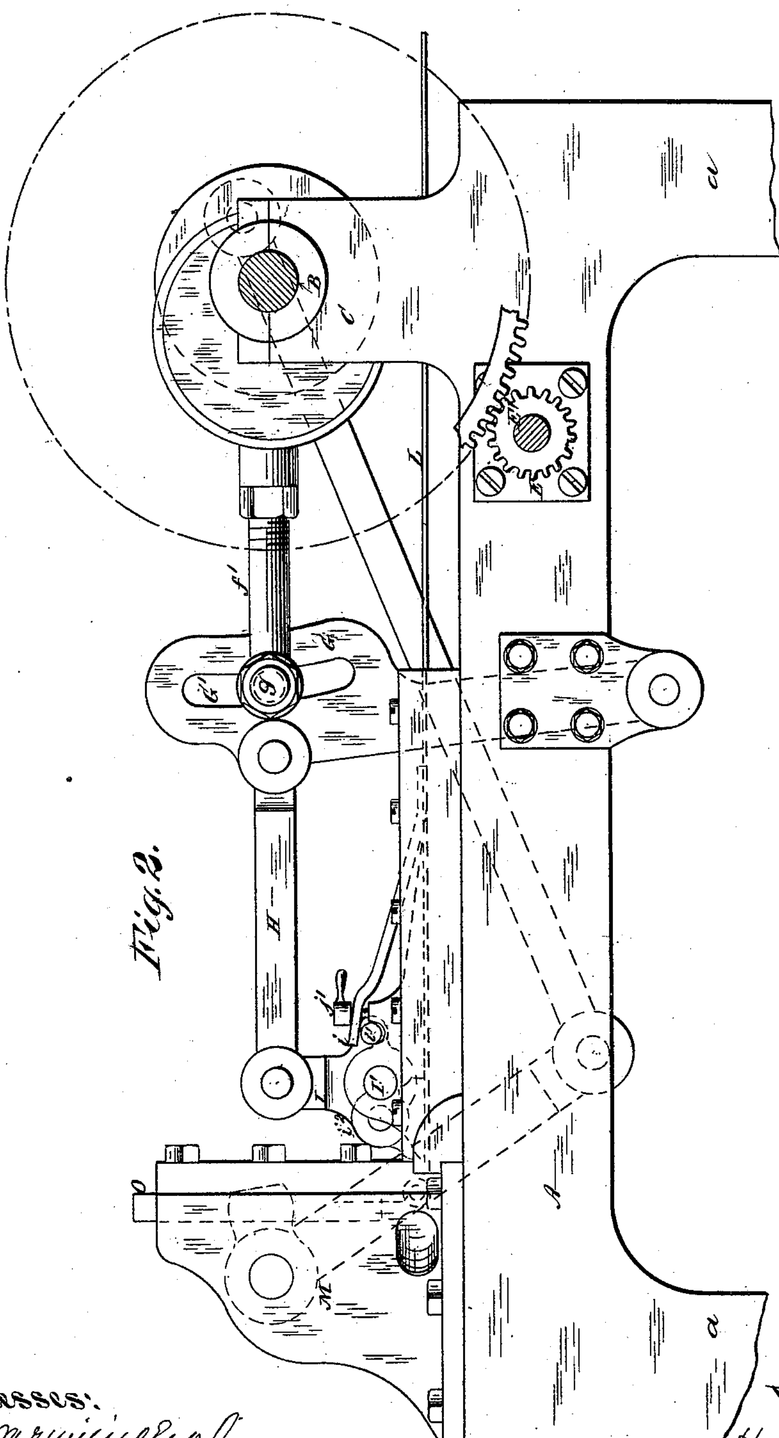

Fig. 2.

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H. A. HARVEY.

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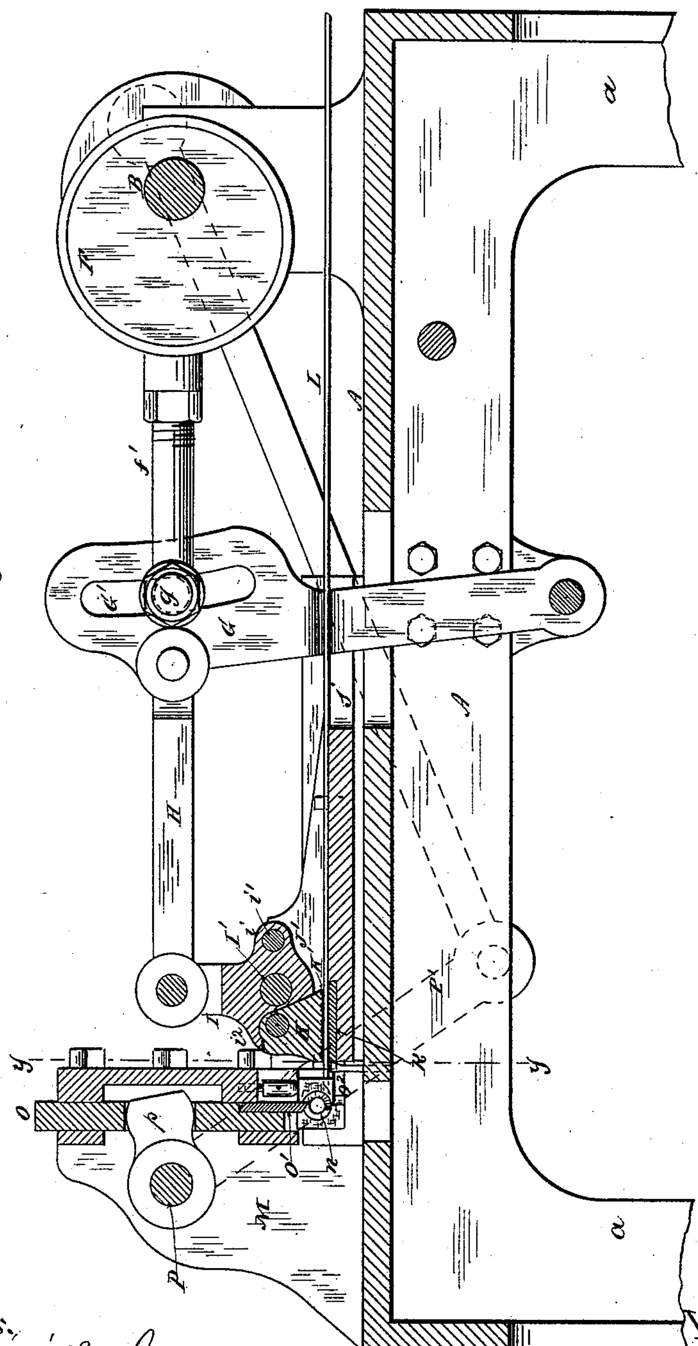
Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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MACHINE FOR MAKING SPIRAL WASHERS.

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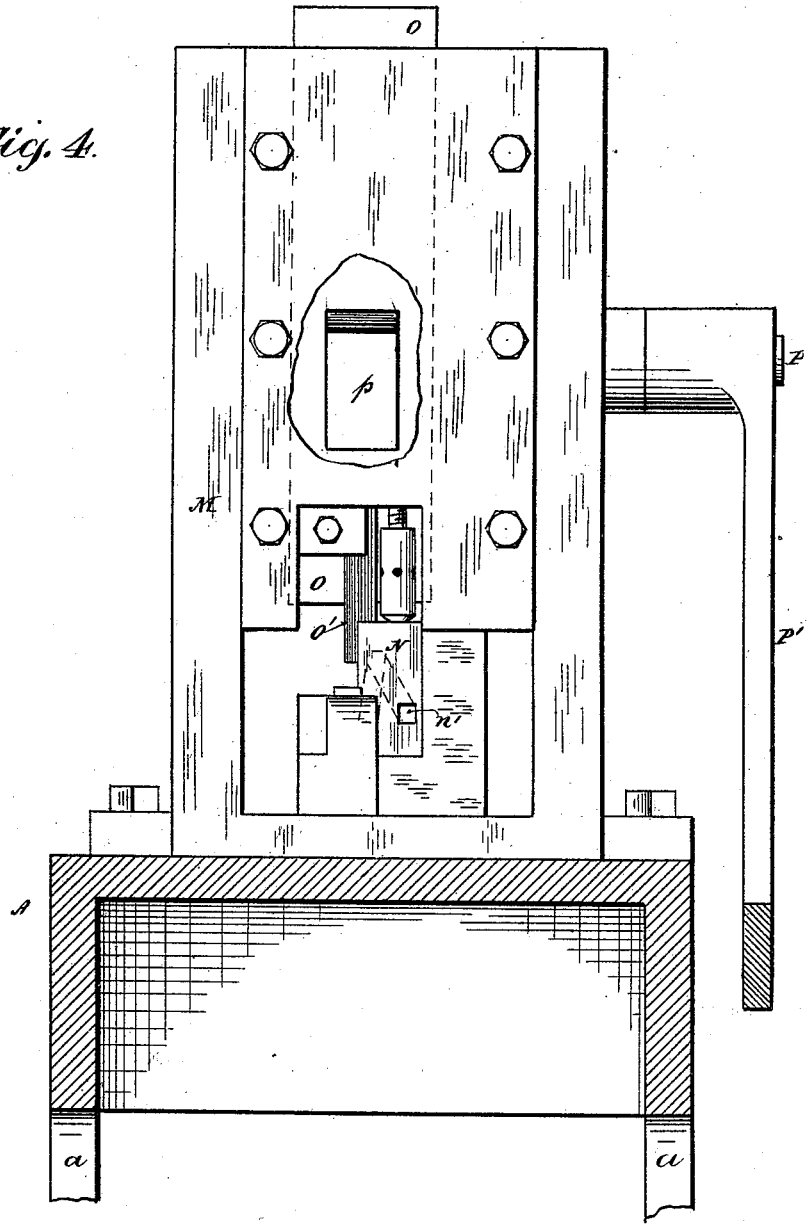
Fig. 4.



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UNITED STATES PATENT OFFICE.

HAYWARD A. HARVEY, OF ORANGE, NEW JERSEY.

MACHINE FOR MAKING SPIRAL WASHERS.

SPECIFICATION forming part of Letters Patent No. 420,557, dated February 4, 1890.

Application filed April 26, 1889. Serial No. 308,696. (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 Forced-Feed Spring-Coiling Machines, of which the following is a specification.

These improvements relate to so-called "forced-feed spring-coiling machines" for transforming a metallic rod or wire into a helix by forcing it forward through a path in which it is so guided as to assume a spiral form.

The first part of the invention embraces the employment of reciprocating feeding-jaws having a long bearing and exerting during their feeding movement a powerful grip upon the rod, by the use of which the rod may be forced forward step by step and transformed into a helix without being previously heated.

The second part of the invention embraces devices for severing the convolutions of the helix at prescribed intervals, thus adapting the machine for the manufacture of the well-known spiral washers each composed of a single convolution of a helix.

The accompanying drawings of a machine embodying the improvements are as follows:

Figure 1 is a top view. Fig. 2 is a front elevation with the principal portion of the main-shaft pinion represented as broken away for convenience of showing the parts behind it. Fig. 3 is a longitudinal vertical section taken through the plane indicated by the line *x x* on Fig. 1. Fig. 4 is a transverse vertical section taken through the plane indicated by the line *y y* on Fig. 3.

The machine consists of a substantial bed A, supported on stout legs *a a*, adapted to be bolted to the floor. The main shaft B, extending transversely across above the bed, is seated in bearings in the pillars C C′, and has affixed to it a pinion D, which is suitably heavy to serve as a balance-wheel, and is driven by the spur-wheel E, mounted upon the shaft E′, provided with the pulley E^2, to which power is applied to drive the machine. Between its bearings the main shaft is provided either with a crank or, preferably, with an eccentric F, as shown. The eccentric F, by means of its strap *f* and eccentric-rod *f′*, connected to the adjustable crank-pin *g*, imparts a greater or less range of rocking motion to the sway bar or lever G, according to the position in which the crank-pin *g* is adjusted in the radial slot G′. A link H connects the sway-bar G to the upper end of the upright arm of the bell-crank lever I, which is connected by the horizontal pivot I′ to the parallel standards J′ J′, erected upon the sliding carriage J, seated in suitable ways *j j*, formed in the bed A. The rearwardly-extending arm *i* of the bell-crank lever I is provided with a transverse pin *i′*, which by collision with seats *j j*, formed upon the tops of the standards J′ J′, limits the range of backward rocking motion of the upright arm of the bell-crank lever I, so that when such collision ensues the backward swing of the sway-bar G communicates a backward sliding motion to the carriage J. The forwardly-extending arm i^2 of the bell-crank lever has pivotally suspended upon it the swinging jaw K, the under face K′ of which is transversely serrated.

The jaw K has a small range of rocking motion upon the longitudinal axis afforded by its pivotal connection with the arm i^2 of the bell-crank lever. During the forward swing of the sway-bar G the upright arm of the bell-crank lever I is rocked forward, and the jaw K is thereby moved downward, thus swinging its serrated face into collision with the upper surface of the rod or wire L which is to be fed to the spiral-forming die.

The portion of the rod or wire L engaged by the face K′ of the swinging jaw K is supported beneath upon the serrated face of the fixed jaw *k*, mounted upon the top of the carriage J; hence during the forward swing of the sway-bar G the carriage J is forced forward, the rod or wire L being gripped with great rigidity and pushed forward endwise. A standard M, erected upon the bed A, affords a seat for the spiral-forming nut or die N, which may be simply a block of steel having formed transversely through it a cylindrical hole, in the wall of which there is formed a spiral groove *n* of the desired pitch. A passage *n′* extends tangentially from the inner end of the groove *n* toward and in a line with the rod or wire L, so that by the forward movement of the carriage the rod or wire L is forced endwise into the tangential

passage n', and thence around the spiral groove n, whereby it is made to issue from the die N in the form of a helix.

During the backward motion of the sway-bar G the rod or wire L is released from the grip of the jaws K k, and the opportunity thus afforded is taken advantage of to sever the convolutions of the helix successively. For this purpose the standard M is provided with a seat for the vertically-sliding carriage O, to the lower end of which is affixed the cutter O'. The necessary reciprocating motion is imparted to the carriage O by means of the rocking cam p, which is inserted through a slot in the carriage O, and is affixed to the rock-shaft P, seated in the journals formed in the standard M. The rock-shaft P is provided with a crank-arm P', which is connected by means of the pitman P^2 with the main-shaft crank B'. The relations of the several parts are such that when the jaw-carriage J is making its backward excursion the cutter-carriage is making its downward motion, thus carrying the cutter O' down between the two adjoining convolutions of the spiral and against the concave side of the spiral, the convex side of which immediately beneath the cutter is supported on the anvil O^2. The cutter has a sufficient range of downward motion to sever the rod, and thus cut off the completed convolution of the spiral, after which during the upward motion of the cutter the carriage J moves forward, the jaws K k grip the rod, and force into the die such a length of the rod or wire L as will suffice to form another convolution of the spiral.

The range of feeding motion of the carriage J is adjusted by raising or lowering the crank-pin g in the radial slot G' of the sway-bar G. The portion of the crank-pin g which extends through the slot G' is turned downward until its diameter is equal to the width of the said slot, and is thus provided with a shoulder g', which bears against one side of the sway-bar G. The turned-down portion of the crank-pin g extends transversely through the slot g' and through the washer g^2, and is screw-threaded to receive a nut g^3, by tightening which the crank-pin g is securely fastened in the position to which it may have been adjusted upon the sway-bar. The opposite end of the crank-pin projects through the perforated head f^2 of the eccentric-rod f, and is screw-threaded to receive the jam-nuts g^4 and g^5, by means of which the head f^2 is maintained in proper engagement with the crank-pin. In case it should be desired for any purpose to hold the jaw K up continuously while the machine is in motion, provision is made for locking the pin i' down upon its seats in the standards J' J'. This is effected by means of the lever screw-bolt j', the head of which bears upon the free end of the spring-bar j^2. By screwing down the bolt the free end of the spring-bar is made to press and hold the pin i' down in its seats, so that motion may be communicated to the carriage J in either direction without rocking the bell-crank lever I. By turning up the bolt j' the free end of the spring-bar is permitted to rise and clear the pin i', and thereafter during the forward excursion of the carriage J the upright arm of the bell-crank lever I is rocked forward and the jaw K pressed down upon the rod or wire L.

It will be seen that the greater the resistance opposed to the forward movement of the rod or wire L through the die the stronger will be the downward pressure of the jaw K upon the rod or wire resting upon the lower jaw k, so that in all cases the grip of the jaws will be rigid enough to hold the rod or wire firmly while pushing it forward into and through the spirally-curved path which the die presents.

The radial adjustability of the pivotal connection between the sway-bar G and the eccentric-rod F' affords means for readily varying the lengths of rod or wire which is forced through the die and made to acquire a spiral curvature during each forward stroke of the carriage J, so that at each forward stroke there may be formed a complete convolution of a helix, or either more or less than a complete convolution, as may be desired. It will also be seen that by removing the cutter O' or arresting its action the rod or wire L may by its step-by-step passage through the die be transformed into a continuous spiral of a greater or less number of complete convolutions.

What is claimed as the invention is—

1. In a machine for giving metallic rods or wires a spiral curvature, the combination, as herein set forth, of reciprocating feeding-jaws for intermittently gripping a rod or wire and forcing it forward endwise, with a die presenting a spirally-curved path for said rod or wire, whereby said rod or wire is made to acquire a spiral form when forced through said die by said feeding-jaws.

2. In a machine for giving metallic rods or wires a spiral curvature, a stationary die presenting a spirally-curved path, and feeding-jaws for gripping a metallic rod or wire and successively feeding prescribed lengths of said rod or wire endwise through said die, in combination with a cutter for cutting off the convolutions of said rod or wire after they issue from said die, and means, substantially as described, for operating said cutter in appropriate relation to the feeding motions of said feeding-jaws.

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