(No Model.) 3 Sheets—Sheet 1.

J. ADT.

MACHINE FOR AUTOMATICALLY FORMING RINGS FROM WIRE.

No. 359,416. Patented Mar. 15, 1887.

Fig. 1

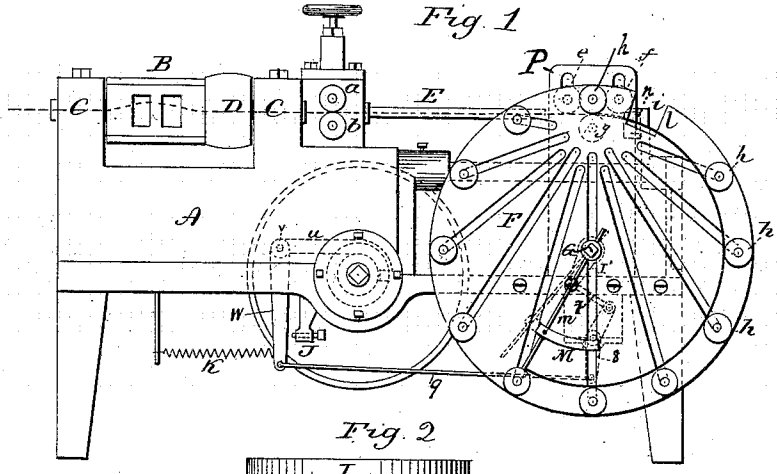


Fig. 2

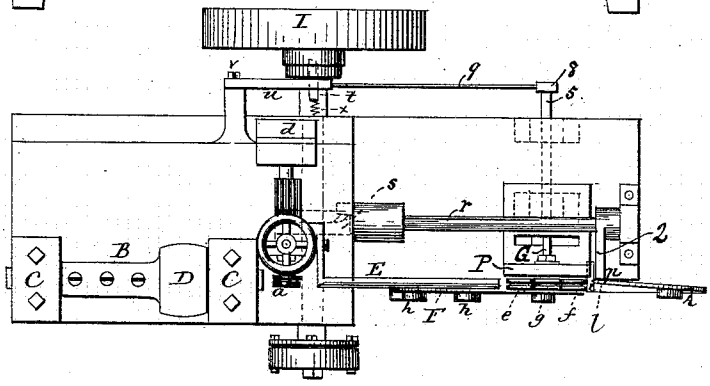


Fig. 10

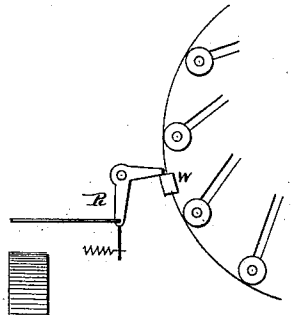


Fig. 8.

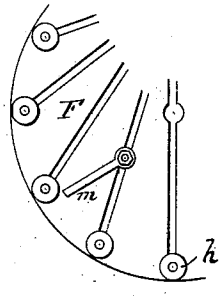
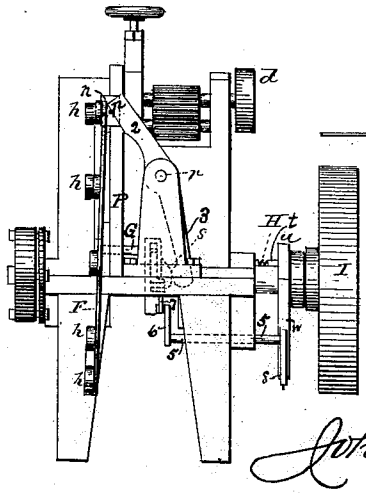


Fig. 3



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

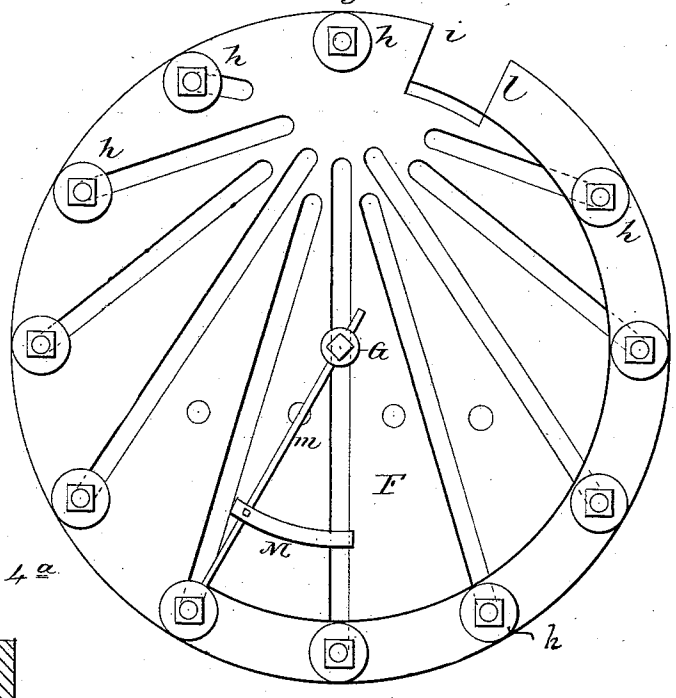


Fig. 4 a.

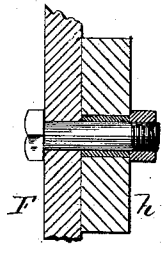


Fig. 5

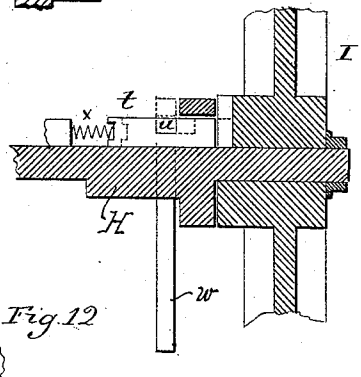


Fig. 6

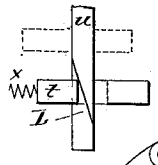


Fig. 7

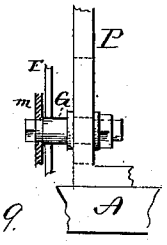


Fig. 9.

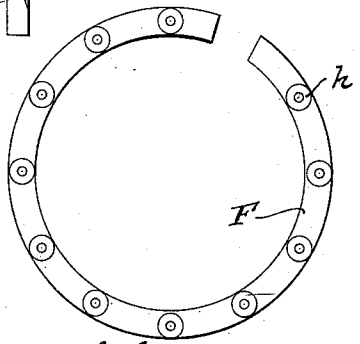


Fig. 11

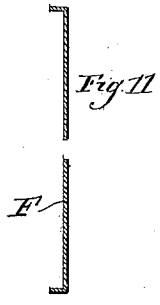
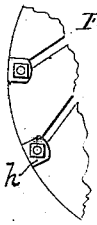


Fig. 12



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MACHINE FOR AUTOMATICALLY FORMING RINGS FROM WIRE.

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Fig. 13

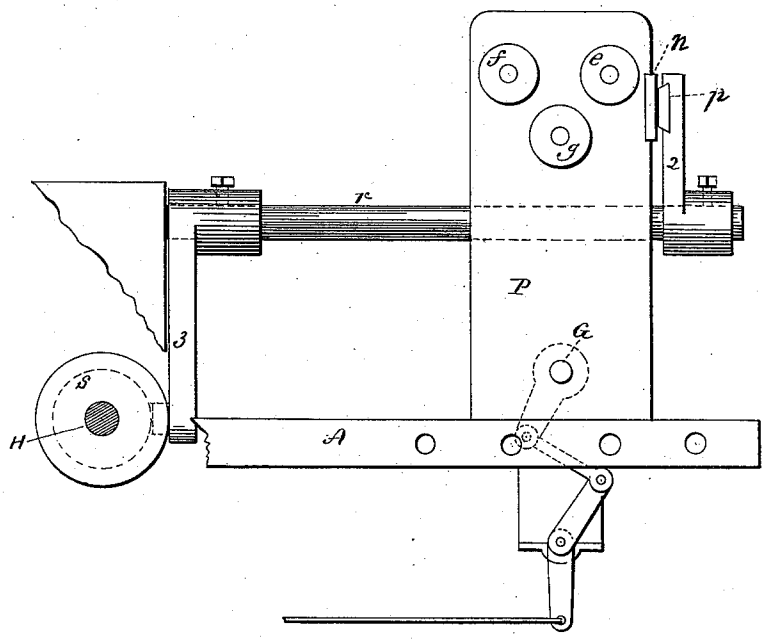
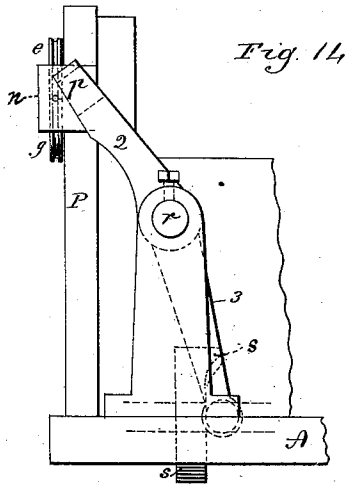


Fig. 14



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UNITED STATES PATENT OFFICE.

JOHN ADT, OF NEW HAVEN, CONNECTICUT.

MACHINE FOR AUTOMATICALLY FORMING RINGS FROM WIRE.

SPECIFICATION forming part of Letters Patent No. 359,416, dated March 15, 1887.

Application filed October 4, 1886. Serial No. 215,203. (No model.)

To all whom it may concern:

Be it known that I, JOHN ADT, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Machines for Automatically Forming Rings or Segments from Wire; and I do hereby declare the following, when taken in connection with 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 front view of a machine complete embodying my invention; Fig. 2, a top or plan view of the same; Fig. 3, an end view looking from the right; Fig. 4, a face view of the disk enlarged; Fig. 4ª, a section through one of the guide-rollers, illustrating its method of adjustment; Figs. 5 and 6, detached views illustrating the clutching mechanism; Fig. 7, a vertical section through the upright P; Figs. 8, 9, 10, and 11, modifications; Fig. 12, a modification in the guide; Fig. 13, a front view of the disk end of the machine, the disk removed, showing the cutters; Fig. 14, an end view of Fig. 13, looking from the right, these last two figures considerably enlarged for clearness of illustration.

This invention relates to an improvement in machines for forming rings or parts of rings from wire, such as used in various manufactures, particularly in tinware, in which rings are formed from wire to be inclosed in the edge of tin vessels, or made in segments for like inclosure in other parts of tinware, or to be used as bails for pails and vessels of various characters.

In the formation of rings or segments to be introduced into parts of tinware as a band or support it is necessary that they shall be cut to a precise length—that is, in the case of a ring—so that the two ends will exactly meet.

In machines as heretofore constructed the wire has been forced or drawn into the machine and bent to the required curvature, the cutting being performed by a cam, or its equivalent, acting at a predetermined time with relation to the time of the rolls or feeding device, which force or draw the wire into the machine, so that if, perchance, the feeding device slips upon the wire, the length of wire cut will be short of that required, and naturally there will be more or less slip between the feed-rolls and the wire, and a certain allowance must be made for such slipping. If a greater extent of slip is produced than calculation was made for, the length cut is too short. On the contrary, if less slip occurs than is provided for, then the piece of wire cut will be too long, so that under any circumstances there is a very considerable degree of uncertainty as to the length cut and a very considerable variation in the actual lengths cut.

The object of my invention is to obviate this difficulty in producing the rings or segments of a precise length; and to accomplish this object I employ the wire itself as the means for determining the length to be cut, and so that until the end of the wire reaches a predetermined point the cutting device cannot have come into operation, but must come into operation when that point is reached.

The accompanying drawings represent the embodiment of my invention in a practical machine.

A represents the bed, which is supported upon suitable legs, and on which the operative mechanism is arranged.

B is a straightener, represented as of a common revolving character, supported in bearings C C, and to which power is applied to produce rapid revolution through a pulley, D, the wire passing longitudinally through the straightener in a curved path, as indicated in broken lines, Fig. 1. This is a common and well-known straightener, and does not require particular description, and if other known straighteners are preferred they may be substituted therefor.

The two feed-rolls *a b* are arranged one above another, their peripheries being in axial line with the straightener and the peripheries grooved, so as to firmly embrace the wire which is to pass between them. These rolls are caused to revolve by the application of power to a pulley, *d*, on the shaft of one of the rolls, the two rolls being geared together, as seen in Fig. 3. This feeding device is also a common and well-known feed, and for it other known feeds may be substituted.

The wire is drawn through the straightener

and passes into a guide-tube, E, which tube leads the wire to the bending-rolls *e*, *f*, and *g*, this being a common arrangement of rolls for bending, the rolls being made adjustable, so that as the wire is forced between them they will produce in the straight wire the requisite curvature.

F is a circular disk fixed to the bed of the machine. It stands in a vertical plane just outside the line of the wire fed into the machine, and so that the wire so fed into the machine will pass in rear of the plate. The upper edge of the plate is slightly above the line of wire, as indicated in Fig. 1. On the face of this disk a circular guide is formed, and of which the line of wire is a tangent.

Preferably, this guide is composed of a series of anti-friction rollers, *h*. (Shown enlarged in Fig. 4.) The position of the rollers *h* on the disk is such that the circle within the rollers corresponds substantially to the external diameter of the curve to be produced in the wire by the bending device.

The disk is arranged with relation to the benders as shown, so that the wire, as it comes from the benders, will pass through an opening in the disk, as at *i*, inside the first roller, and be guided to the next, and so on throughout the full extent of the bend, the wire being indicated in solid black line.

That the advancing wire may complete a full circle and make more than one revolution, if it should be desirable, the disk is twisted at the entering-point *i*, so as to bring the opposite side, *l*, of the opening into a plane inside of the entering-point, and, as indicated in Fig. 2, so that as the wire passes around within the rollers, when the full circle is completed, the end will still pass on within the rollers, but outside of the next convolution. Thus the end of the wire may pass to a point beyond the entrance.

To adapt the circular guide to different diameter of curve the rollers are each arranged in a slot, the several slots converging toward the bending device, as shown, and the rollers are made adjustable in the said grooves, as indicated in Fig. 4ª, so that they may be moved inward to reduce the curve. The disk is preferably made stationary upon the machine. At the center of the circular guide on the disk is a shaft, G, from which an arm, *m*, extends radially to the inner line of the guide, and so that the advancing wire may strike the outer end of the said arm *m*, and then, under the further advance of the wire, the arm will be turned, say, as indicated in broken lines, Fig. 1, communicating a rotative movement to the shaft G. This movement of the arm or stop *m*, I employ as a means for applying the cut. The cutters consist of a stationary cutter, *n*, arranged at the opening *o* in the disk, and preferably at the point where the wire enters the disk.

The movable cutter *p* is formed on or made fast to an arm, 2, which extends upward from a rock-shaft, *r*, and into a position to work with the stationary cutter *n*. (See Figs. 3, 13, and 14.) From the rock-shaft *r* a second arm, 3, extends downward, and is operated upon by a cam, *s*, on the shaft H, (see Fig. 3,) which imparts a swinging movement to the arm 3 in one direction, and a spring arranged in the usual manner, but not shown, returns the arm 3 upon the cam, and so that under the revolution of the said cam a rocking movement is imparted to the rock-shaft and a second vibratory movement to the cutter-arm 2, and so that the wire fed into the machine passes between the stationary cutter *n* and the movable cutter *p*, and the said cutters, acting at the proper time, will cut off the required length of wire.

On the shaft H is a loose pulley, I, to which power is applied, and between the pulley and the shaft is a clutch, adapted to engage the pulley and shaft, or to release one from the other, as the case may be, and I prefer for this clutch substantially the same clutch which is employed in power-presses for the purpose of stopping the press when the slide is in its extreme up position. On the end of the shaft H, opposite the pulley I, a collar is represented, but which is of no importance in this application. This clutch consists of a bolt, *t*, arranged parallel with the axis of the shaft, and so that its nose may enter a corresponding notch in the hub of the driving-pulley, as seen in Fig. 2, and engage the pulley and shaft; but when the bolt is withdrawn from its engagement with the pulley, then the pulley may continue its revolution without effect upon the shaft.

The bolt *t* is held out of engagement by one arm, *u*, of a lever hung upon a fulcrum, *v*, so that when the bolt is withdrawn the arm *u* drops into a notch in the back of the bolt, as seen in Fig. 5, and will thus prevent the engagement between the pulley and shaft.

On the shaft G is an arm, I′, (seen in broken lines, Figs. 1 and 13,) which oscillates with the shaft G under the action of the arm *m*. Below the shaft G is a rock-shaft, 5, on which is an arm, 6, connected to the arm I′ by a rod, 7. On the shaft 5 is a second arm, 8, from which a rod, 9, extends to an arm, *w*, which depends from the arm *u*, the said arms *u* and *w* forming the clutch-lever, and so that as the shaft G oscillates or turns in one direction the arm *u* will be raised, and turned in the opposite direction the arm *u* will be depressed, and when the arm *u* is raised from its engagement with the bolt the bolt is free to be forced toward the pulley by means of a spring, *x*.

A stop, J, is provided, against which the arm *w* will strike when it has been drawn sufficiently far to disengage the bolt, whereupon the pulley engaging the shaft causes the cutters to instantly act and sever the wire. The wire being thus cut, its power upon the arm *m* is removed, and the piece cut falls from the disk, leaving the arm *m* free to return, say, under the action of a spring, K, applied to the arm *w*, as seen in Fig. 1. After the cut has thus been made, the bolt is withdrawn and the

pulley left free to revolve and the wire to again pass into the disk, as before, until such time as it has turned the stop or arm *m* to apply the cutter, and, so continuing, successive segments will be cut of precisely the same length so long as the stop remains in the position to which it is set.

The withdrawal of the bolt may be made by the foot of the operator, as sometimes used in power-presses, or may be automatic, as it is also frequently applied in power-presses. I will, however, briefly describe the automatic withdrawal which I employ. Upon the under side of the arm *u* is a shoulder, L, inclined to the path of the revolving shaft, and so that as the arm *u* drops after the cut is made the incline will stand in the path of the notch in the back of the bolt, and so that in the next revolution, as the bolt approaches the arm *u*, which drops under the action of the spring K, the notch in the bolt will pass onto the incline on the under side of the arm *u*, as seen in Fig. 6. Such incline, acting as a cam, will withdraw the bolt, as indicated in broken lines, Fig. 6. This particular construction of automatic clutch, however, constitutes no part of my invention.

The arm *m* is adjusted to the position required to determine the length of the segment. If it be required to produce a full ring, the arm is turned to a position so that its movement will be arrested at a point slightly beyond the point of cutting—that is, so far beyond as the reaction of the wire will open or expand the ring—and that the two cuts may just abut together. The stop position under any circumstances will depend to a considerable extent upon the natural elasticity of the wire. If it be considerably elastic, then its opening capacity will be greater than when less elastic. Consequently in the more elastic wire a greater allowance is necessary. This elastic capacity of the wire may also determine the internal diameter of the guide. For illustration, if the diameter required for the wire be ten inches and the elastic capacity of the wire be one-fourth of an inch, then the internal diameter of the guide may be, say, nine and three-fourths inches.

To support the arm *m* and allow it to freely follow the spiral plane of the disk, and to avoid interference with the several slots in which the rollers are arranged, I provide it with a shoe, M, which will drag upon the face of the disk.

To adapt the machine for various sizes of curve, the shaft G should be made adjustable vertically. To this end it is supported in a bearing adjustable in a slot in an upright, P, on the bed, and, as seen in Fig. 7, this slot coinciding with the vertical slot in the disk in which one of the rollers is adjusted, as seen in Fig. 4.

Instead of making the disk fixed and the stop to move concentric with the disk, the disk itself may constitute the stop by making it fast to the shaft G and permitting it to rotate with the shaft. In this case the stop will be made fast to the disk—say by adjustably fixing it in one of the slots—as indicated in Fig. 8, and so that the rotative movement which I have described as imparted to the arm by the advancing wire will be imparted to the disk, and so soon as the wire is cut the disk will be returned in the same manner as I have described for the returning of the stop.

I have described the disk F as substantially a complete disk, and this I prefer; but it may be in the form of a ring, as seen in Fig. 9, with the rollers fixed thereon as the circular guide; but, practically, this is the disk which I have described. I therefore do not wish to be understood by the term "disk" as limiting the invention to the complete disk, but by that term "disk" to embrace any substantial equivalent therefor.

I have represented the disk as in a spiral plane, in order that the end of the advancing wire may pass outside of the run of the wire in the beginning of another convolution; but in machines where less than a complete ring is required this spiral character may be omitted.

While I prefer the series of rollers arranged in the circular path which I have described as the guide for the wire, this guide may be in the form of a flange around the disk, as seen in Fig. 11, the internal diameter of which corresponds substantially to the external diameter of the ring or segment which is to be formed, there being the same opening at one point for the entrance of the wire within the guide. I therefore do not wish to be understood as limiting the invention to a circular concentric guide of a specific construction.

In illustrating the connection between the power, cutter, and stop, whereby the advancing wire striking the stop engages the power with the cutter, and the return of the stop disengages the power, I have shown a common and well-known mechanism, and as operated by a rotative movement at the axis of the disk; but I do not wish to be understood as limited to this mechanism, as the engaging and disengaging may be otherwise performed—say, as seen in Fig. 10, by arranging a slide on the disk, as indicated at W, Fig. 10, which will be guided by the edge of the disk and adapted to move under the advancing wire, and so as to strike a lever, R, which is in connection with the clutch mechanism, and so that by the simple sliding movement of the stop the power will be connected and the slide returned under the action of the spring as the power is disengaged.

While I prefer to employ the adjustable rollers as the guide, the guide may be made in adjustable segments, as seen in Fig. 12.

I claim—

1. The combination of a wire-feeding and a wire-bending device, substantially such as described, with a disk having a curved guide thereon, the internal diameter of which corresponds substantially to the curve produced by the said bending device, the center of said curved guide coinciding substantially with

the center of the curve produced by the bending device, a stop within said curved guide and in the path of the advancing end of the wire, a wire-cutter, mechanism, substantially such as described, to operate said cutter, a clutch between said cutter and the power, the said clutch being adapted to engage and disengage the power from mechanism between said stop and said clutch, substantially as described, whereby the movement of said stop under the advancing movement of the wire will engage the power with the said cutter at a predetermined time.

2. The combination of a wire-feeding and a wire-bending device, substantially such as described, a disk, a series of guides on said disk, the said guides together forming a circular guide, the center of which corresponds to the center of the curve produced by said bending device, the circle within the said guide corresponding substantially to the curve produced by the said bending device, a wire-cutting device, mechanism, substantially such as described, to impart operative movement to said cutting device at a predetermined time, a shaft concentric with the circle of said guide, an arm extending from said shaft toward said guide and in the path of the end of the advancing wire, a clutch adapted to engage and disengage the power, with mechanism between the said stop and the said clutch, substantially as described, whereby the movement of the said stop under the advancing movement of the wire will engage the power with said cutting device at predetermined times.

3. The combination of a wire-feeding and wire-bending device, substantially such as described, a disk, a series of guides on said disk, the said guides together forming a circular guide, the center of which corresponds to the center of the curve produced by the said bending device, the circle within the said guide corresponding substantially to the curve produced by the said bending device, the said disk constructed with converging slots, in which the said guides are respectively arranged and whereby the guiding-circle may be adjusted, a wire-cutting device, mechanism, substantially such as described, to impart operative movement to said cutting device at a predetermined time, a shaft concentric with the circle of said guide, an arm extending from said shaft toward said guide and in the path of the end of the advancing wire, a clutch adapted to engage and disengage the power, with mechanism between the said stop and the said clutch, substantially as described, whereby the movement of the said stop under the advancing movement of the wire will engage the power with said cutting device at such predetermined time.

4. The combination of a wire-feeding and a wire-bending device, substantially such as described, with a disk, the center of which is concentric with the center of the curve produced by said bending device, a circular guide on said disk, the internal diameter of which corresponds substantially to the diameter of the curve produced by said bending device, the said disk presenting a spiral plane inside said guide, a stop inside said guide in the path of the advancing wire, a cutter adapted to cut the wire, a clutch adapted to engage and disengage the power and cutter, and mechanism, substantially such as described, between said stop and clutch, whereby the movement of said stop under the advancing movement of the wire will engage the power with said cutter at a predetermined time.

5. The combination of a wire-feeding and a wire-bending device, substantially such as described, with a disk, the plane of which is substantially parallel with the wire fed to said disk, a circular guide on said disk, the internal diameter of which corresponds substantially to the diameter of the curve produced by said bending device, the said disk presenting a spiral plane inside said guide, a shaft concentric with said disk, an arm extending from said shaft into the path of the advancing wire inside said guide, a cutter adapted to cut the wire so passing into the disk, a clutch adapted to engage and disengage the power and cutter, mechanism, substantially such as described, between said stop and clutch, whereby the movement of said stop under the advancing movement of the wire will engage the power with said cutters at a predetermined time.

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