Jan. 1, 1935. C. B. PALUCKI 1,986,356

WIRE SECTIONING MECHANISM AND METHOD

Filed July 12, 1932 3 Sheets-Sheet 1

Fig.1.

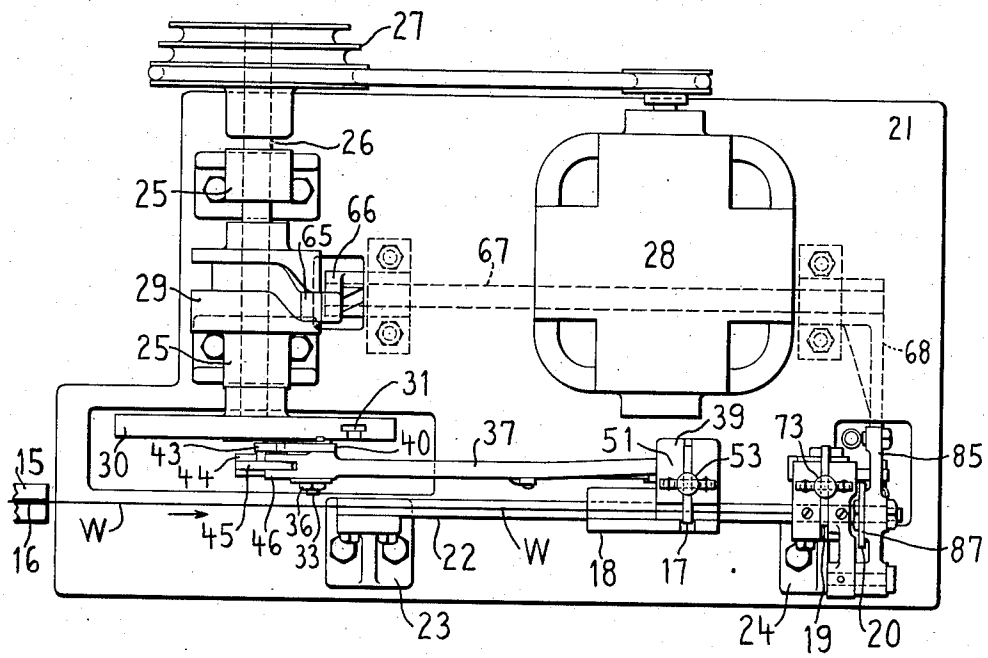
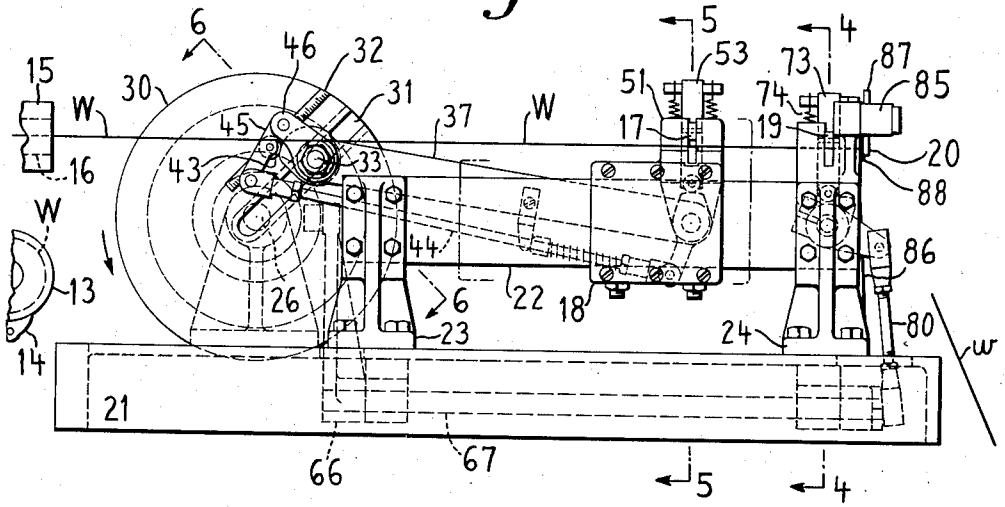


Fig.2.



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Filed July 12, 1932 3 Sheets-Sheet 2

Fig.3.

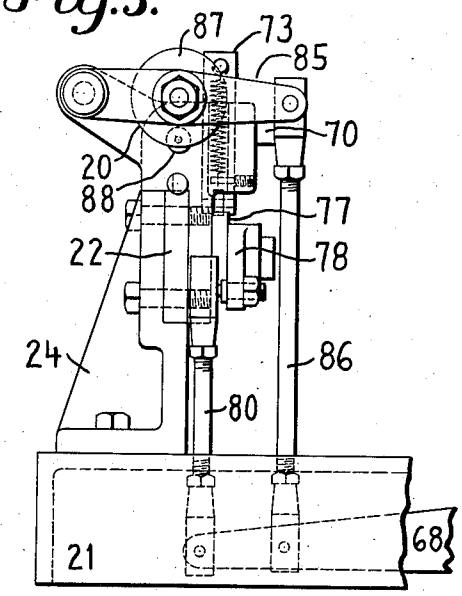


Fig.4.

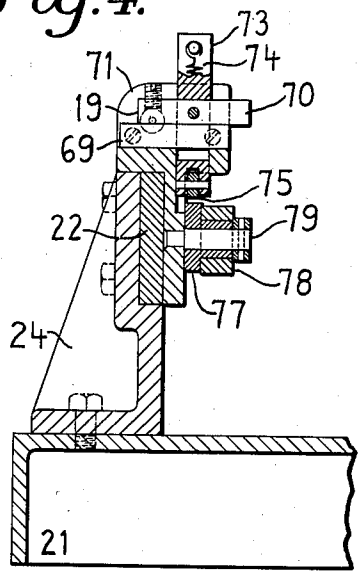


Fig.5.

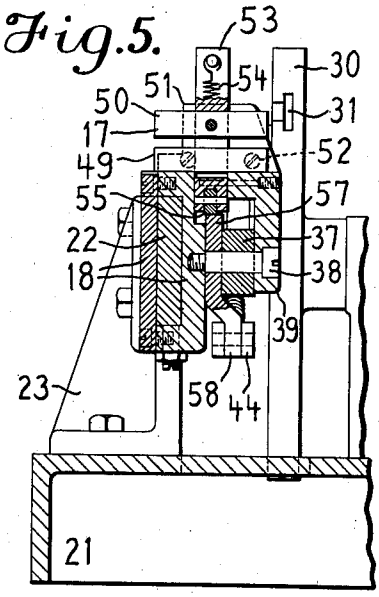
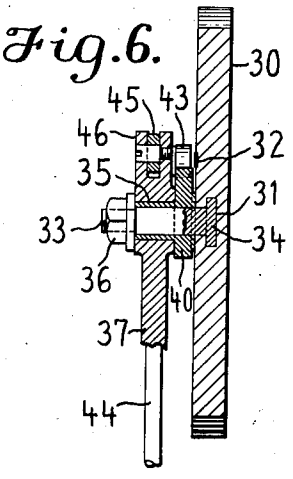


Fig.6.



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Filed July 12, 1932 3 Sheets-Sheet 3

Fig.7.

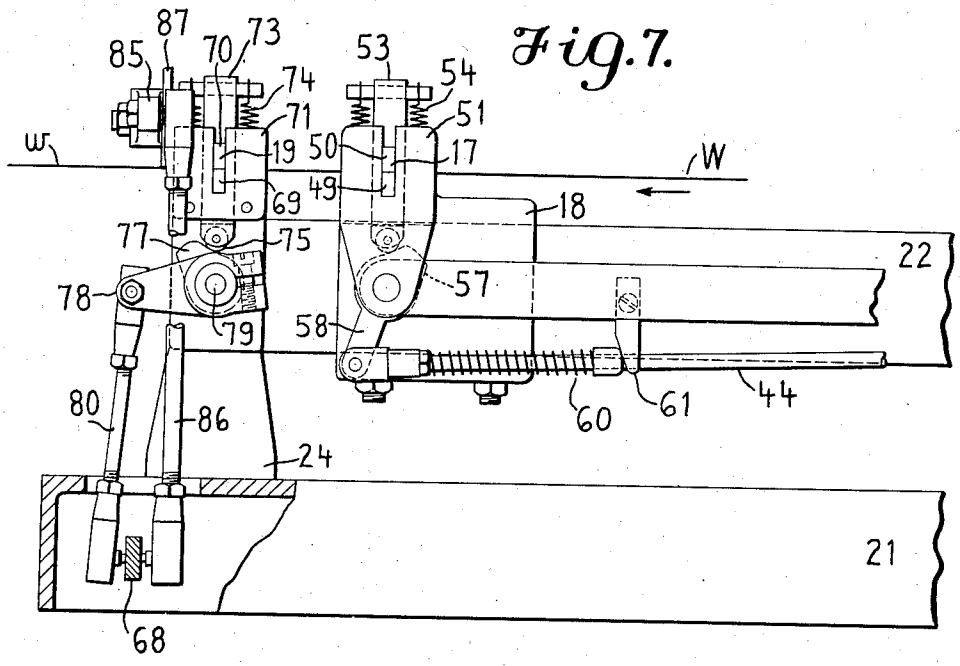


Fig.8.

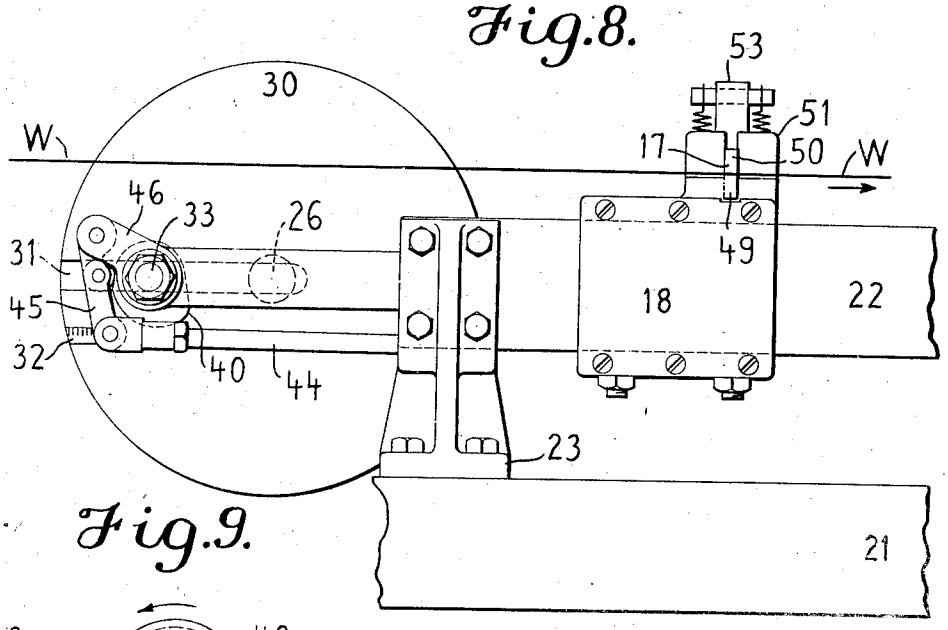
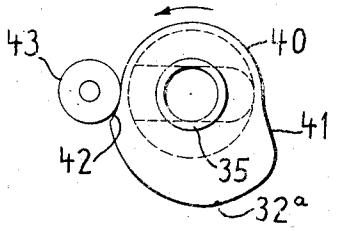


Fig.9.



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UNITED STATES PATENT OFFICE

1,986,356

WIRE SECTIONING MECHANISM AND METHOD

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Application July 12, 1932, Serial No. 622,037

11 Claims. (Cl. 140—130)

This invention is a novel wire sectioning mechanism and method, having particular reference to an apparatus or device for feeding or advancing wire in step by step manner and severing the same into sections or predetermined lengths of wire, for various purposes. In using the term wire it is intended to include strips, ribbons or other elongated supply material requiring to be cut up or sectioned into short lengths.

While the mechanism hereof is adapted to a wide range of utility, a particular field is the feeding and severing of wires into sections for the production of individual filaments for incandescent lamp or other electrical purposes. The machine as designed, constructed and herein illustrated was specifically intended for the sectioning or severing into suitable lengths of filament wire of the coil type consisting typically of a very fine tungsten wire wound helically upon a less fine supporting or temporary wire or mandrel of bronze, steel or other material which is adapted subsequently to be removed to leave the helical tungsten filament in condition for embodiment in a lamp. In this and other embodiments the feeding and severing operations of the invention will preferably be preceded by the straightening of the wire or filament material under tension and under the softening action of heat, for example by passing the supply wire from a tension or resistance device through a groove in an electrically heated bar of nichrome or other suitable metal while under tension. Following the feeding and severing operation hereof the short sections or lengths of wire, of the helically wound type, may be subjected to a chemical or other action to dissolve out or remove the mandrel wire from the helical filament itself, and thereafter to suitable cleansing or other actions, according to well known practice, before mounting the filament in the lamp.

The general object of the present invention is to afford a mechanism for feeding and severing sections or lengths of wire which will be efficient and accurate in operation and rapid in output. Further objects include the exact and uniform intermittent feeding of the supply wire between severing actions, the delicate handling of the wire during feeding and severing, and a clean cutting action in severing successive actions. A further object is to provide for ready adjustment of feed to deliver wire sections of varying lengths, with accompanying adjustments to coordinate therewith.

Further objects and advantages will be explained in the hereinafter following description of an illustrative embodiment of the invention or will be understood by those conversant with the subject. To the attainment of the objects and advantages referred to the present invention consists in the novel wire sectioning or feeding and severing mechanism or apparatus, and the novel features of method, operation combination, arrangement and construction herein illustrated or described.

In the accompanying drawings Figure 1 is a top plan view of a wire sectioning machine embodying the present invention.

Fig. 2 is a front elevation of such machine.

Fig. 3, on a larger scale, is a right elevation of the parts appearing at the right-front corner of the machine.

Fig. 4 is a transverse section looking from the right taken on the line 4—4 of Fig. 2.

Fig. 5 is a transverse section looking from the right taken on the line 5—5 of Fig. 2.

Fig. 6 is an inclined section of certain parts taken on the line 6—6 of Fig. 2.

Fig. 7 is a partial rear elevation, partly broken away, showing the mechanism at the right end of the machine, but in a different stage of movement or cycle from Figs. 1 to 6, namely with the feed at the advanced dead center.

Fig. 8 is a front elevation of the left end of the machine, with the parts in a different stage of position, namely with the feed at the retracted dead center.

Fig. 9 is a detached front elevation of the cam and follower which operate the feeding gripper.

To picture the delicacy and required accuracy of the sectioning operation a typical case may be described for the manufacture of coiled filaments. The actual tungsten or filament wire itself may be almost invisibly fine, namely .0005 inch diameter, and this may be wound in helical fashion with suitably spaced convolutions upon a bronze mandrel wire of .0025 inch diameter. An indefinitely long supply of this compound wire is received by the feeding means after being straightened by the application of softening heat under tension, which at the same time anneals the helix wire, and may be intermittently fed for a distance of say 55 millimeters at each step, and severed, for subsequent treatment in the production of a filament adapted to be used in a 15 watt lamp operating at 120 volts. In producing this product the machine may operate for example at about two rotations or cycles per second so as to produce about 7200 filaments per hour. These several items of dimension and other data may be widely

varied according to practical conditions in any particular production.

Referring first to the supply wire W and the operations along its path of advance, there is shown, preceding the feeding and severing means, an elongated heat softening device 15, which may be preceded or accompanied by a tension or drag means, such as a friction shoe 14 bearing upon the reel or spool 13 from which the supply wire is drawn. The wire W passes from its supply reel under the resisting drag or tension and thence through the heating device 15, which raises the temperature of the wire to a point where it is somewhat softened, sufficiently to destroy its springiness or render it in condition to be straightened. The heating device may consist of an elongated bar 16 of resistance metal having a groove to receive the wire and being substantially surrounded by an insulating or asbestos casing. The wire passing step by step through the heating device is drawn tight and kept straightened by the joint action of the tension drag means and the pulling or feeding means, so that as the wire issues from the heating device and cools down it is in a straight condition suitable for subsequent feeding, holding, severing and discharge, and for subsequent operations.

Beyond the heating means the wire W travels straightly to an intermittent feeding means comprising preferably a feeding gripper 17 mounted on a carriage 18 reciprocable along the path of wire travel. Beyond the feeding gripper is a holding gripper 19 which is preferably stationarily mounted and which holds the wire near its advanced end while the feeding gripper, having released the wire, is returning for a new stroke. Immediately beyond the holding gripper is a severing or shearing device 20, preferably stationarily mounted, operating to cut off each advanced portion of wire and discharge it as a severed product or section *w* into a suitable receptacle or chute. These essential operative instruments, the feeding gripper, the holding gripper and the severing device are arranged in straight alinement with the direction or path of travel of wire and are operated in coordination by the mechanism to be described. The reciprocating gripper 17 simultaneously pulls the wire from the supply and straightens and pushes it through the open holding gripper 19. If required, a collapsible guide could be inserted between the two grippers, to support the stretch of wire during the pushing action, but ordinarily the straightening of the wire obviates this requirement and dispenses with such guide.

The entire mechanism may be mounted on a hollow cast iron base 21 above which is supported a guide bar 22 on which the carriage 18 reciprocates like a crosshead, the guide being supported at its left end by a bracket 23 upstanding from the base and at its right end by a bracket 24 which supports also the holding gripper and severing device. Near the left end of the base are a pair of upstanding brackets or bearings 25 giving support to a transverse operating shaft 26 rotated by power through a driving pulley 27 by belt from motor 28 and carrying a cam 29 from which motion is transmitted for the operation of the holding gripper and severing device. The shaft 26 is preferably at right angles to the line of travel of the wire and at its front end carries a disk or crank 30 through which the motions are transmitted for the reciprocation of the carriage and the operation of the feeding gripper. The single shaft thus operates timed connections for effecting the four movements of the mechanism, namely reciprocating the carriage over a distance equal to the length of the desired wire sections, and at the advanced dead center position causing the opening of the feeding gripper and simultaneous closing of the holding gripper and at its retracted dead center reversing the grippers and during the retraction of the feeding gripper, while the wire is held by the holding gripper, operating the severing device.

Referring next to the reciprocation of the carriage, this is effected with a crosshead motion from the crank disk 30, which for this purpose is formed with a radial guide or slot 31 and constituting an effective crank arm or web. The disk is shown as carrying adjacent or parallel to the slot a scale or index 32 graduated to give a reading showing the length of the throw and therefore the length of the severed products, in conjunction with an index mark 32^a placed for convenience on the gripper cam 40 to be referred to.

Adjustable in the undercut crank guide or slot 31 is shown a crank pin or stud 33, with an enlargement or foot 34 running in the slot 31 and having flat side edges preventing rotation therein. In front of the disk a sleeve 35 or spacing member surrounds the stud, and in front of the sleeve is shown a washer against which bears a holding nut 36, which tightens the entire assemblage and may be loosened to shift the stud radially in the slot. The pitman 37 which reciprocates the carriage 18 turns on the flange sleeve 35 and is thereby driven by the crank, the other end of the pitman engaging a pin 38 arranged at the rear side of the carriage, extending between the carriage body and a rear extension 39. According to the adjustment of the crank stud in the radial guide the carriage will reciprocate through a predeterminable distance. The sleeve 35 may be integral with the cam 40 to be described, both held against rotation in the stud 33.

Referring next to the timed connections for opening and closing the feeding gripper, these commence with a cam 40 operated by the shaft 26 and having connections to the gripper. This cam and connections manifestly must be adjustable to accord with changes in position or throw of the carriage. The shaft operated cam for this purpose is shown as radially adjustable on the disk 30 between varying eccentric positions. This is very effectively and conveniently accomplished by mounting the cam 40 as shown upon the same crank pin or stud that operates the pitman, so that when the stud is shifted radially to change the feed then the cam will be simultaneously shifted so that the connections to the gripper will retain their proper relative condition. Although the cam is mounted eccentrically, instead of at the center of the disk, it nevertheless is effectively rotated by the shaft and communicates its predetermined timing to the operation of the gripper.

The construction of the shaft cam 40 to operate the gripper may be as follows. It is shown as mounted between pitman 37 and the disk 30 on the flattened part of the stud 33, so that the cam is held against relative rotation. The cam periphery is formed with two concentric portions or dwells and between them an eccentric portion or rise 41 operating to open the gripper and a corresponding eccentric portion or drop 42 allowing the closing of the gripper. The cam operates directly upon a follower or roll 43 which may be mounted in various ways to communicate the

cam motion and timing to the connecting rod 44 which extends parallel to the pitman 37. For example the follower 43 may be mounted on a short cam lever 45, one end of which is pivoted to an extension 46 of the pitman and the other end to the left extremity of the connecting rod 44, although a simple cam yoke at the end of the rod would serve an equivalent purpose.

Referring next to the construction of the feeding gripper 17, this consists essentially of a lower jaw 49 and an upper jaw 50, both set transversely to the feed and accommodated in the kerf or slot of an upward extension 51 of the carriage 18. The under jaw 49 is rigidly secured by pins 52 to the carriage while the upper jaw 50 is mounted on a vertically movable plunger 53 to which the jaw is fixedly pinned. The plunger is slotted to accommodate the upper jaw and the slot is extended downwardly to accommodate the fixed under jaw. The plunger is shown with a cross bar at the top for the connection of springs 54 to pull down upon and close the gripper. By this arrangement the closing force is predetermined and can not be excessive so as to injure the wire. The plunger at its lower end carries a roll 55 by which it may be lifted under the timing of the shaft cam 40. This construction of gripper is substantially duplicated in the holding gripper 19.

The operation of the connecting rod 44 by the eccentrically positioned shaft cam 40 has already been described. The operation of the gripper by the connecting rod will now be described. A cam 57 is shown mounted loosely on the pin 38 extending between the carriage and its rear extension 39, which forms the wrist pin or connection for the pitman. The cam 57 is arranged to lift the plunger by bearing upwardly on its roll 55, to open the feeding gripper, and the cam has a downwardly extending arm 58 directly connected with and rocked by the connecting rod 44. While the cam 57 may have a timing action, it is not necessarily a cam, and acts substantially as a bell crank lever to lift the plunger and upper jaw, and allow them to descend, the timing being determined by the shaft cam 40 which actuates the connecting rod. In order to hold the follower 43 to the cam 40 the connecting rod is shown as surrounded by a spring 60 bearing rightwardly on the rod and abutting leftwardly on an abutment 61 extending downwardly from the pitman 37.

The relatively simple connections described afford the entire operation and timing of the carriage reciprocation and the feeding gripper opening and closing. Adjustment of throw, and length of severed product, is readily made by merely loosening the nut 36, shifting the crank pin or stud 33 along the slot or guide 31 and tightening the nut, an index 32^a being applied to the cam 40 for setting the adjustment along the scale 32. While this readjustment may be made at any convenient rotary position of the crank or disk 30, for purposes of explanation, it may be assumed to be made when the parts are at either extreme or dead center position, for example at the left or retracted dead center position. See Figs. 8 and 9. If at this time the nut is loosened and the stud is shifted leftward and the nut is tightened, this will bodily shift to the left the pitman 37, the connecting rod 44, the carriage 18 with the gripper 17 and the cam 40 which operates the gripper, this entire group of elements being thus shifted leftward relatively to the shaft. The radius or crank throw being increased the carriage reciprocation will be lengthened at both ends of its stroke. The simultaneous shift of the cam 40 with the crank pin retains the proper coordination of the connecting rod and connections to the gripper. Thereby the throw is changed and the proper timing is retained throughout. No adjustment has to be made of the connecting rod on its connections to the gripper. It will be noted that the gripper opening and closing occur at the dead center points, by reason of the fact that the cam eccentric portions 41 and 42 are located to operate at the extreme left and right dead centers; so that any lack of coordination between the pitman and connecting rod at other portions of the cycle are of no effect on the essential actions of the mechanism.

The foot or inner end 34 of the crank pin 33, adjustable along the radial guide or groove 31, may be considered as a sliding carrier or slideblock, adjustable radially on the crank disk 30 and carrying two distinct parts, namely the crank pin or stud 33 and the cam or timing device 40. While it is preferred to locate the pin and the cam at the same radial point on the disk, this is not necessary, since the mounting of both of them upon the slideblock insures that they will be correspondingly adjusted when the slideblock is adjusted in its radial guideway. Preferably the stud and cam are placed on the same radius, so that when at dead center the adjusting shift of the slideblock will not alter the relation between the pin and the cam or between the carriage and gripper operated therefrom respectively.

Referring next to the holding gripper and severing device actuation, the shaft cam 29 is shown engaged by a follower 65 mounted at the top end of a vertical rock arm 66 attached to a rock shaft 67 extending longitudinally beneath the base plate, the right end of the shaft having a frontwardly extending rock arm 68, from which latter rock arm are taken the motions for both the holding gripper and shearing device.

The holding gripper 19, having a fixed relation to the severing device, and both being preferably in stationary position, may be constructed similarly to the feeding gripper; having a lower jaw 69 and a movable upper jaw 70 both mounted within a kerfed extension 71 of the bracket 24. The upper jaw 70 is carried on a plunger 73 slidable within the extension 71, and springs 74 pull down to effect the closing of the gripper. The lower end 75 of the plunger, or a roller 75 thereon, is shown engaged by a cam 77 operating to lift and open the gripper. This cam operates as a bell crank lever, having a rightward arm 78 and mounted on a fixed axle or stud 79. The extremity of the arm 78 is connected by a link 80 to the front rock arm 68 below the bed plate, so that the timing of the cam 28 is communicated for the opening and closing of the holding gripper. The link 80 is shown having screw sections for adjusting its length, thereby to change the operation of the cam 77 in order to coordinate exactly the closing and opening of the gripper with the opening and closing of the feeding gripper; and the link 80 is shown as having universal connecting pivots or joints at both its upper and lower ends on account of the motions in different planes of the arms 78 and 68 which it connects. When the feeding gripper has reached its advanced dead center and opens, it releases the wire the instant the upper jaw starts to rise, and the holding gripper is timed so that its closing terminates, its upper jaw engaging the wire, at substantially the

same instant that the feeding gripper releases the wire, so that the wire is always positively held by one or the other of the grippers and yet is not held by both of them sufficiently long to cause any possible distortion of the wire.

The shearing or severing device is shown as comprising the following elements. Mounted on the extension 71 is a shear lever 85, its extremity being connected by a universally jointed adjustable link 86 with the rock arm 68, which thereby lifts and lowers the shear lever. On the shear lever is shown a shear disk 87 which descends at each operation to sever the projecting end of wire; and the shear disk is rotatable manually or otherwise from time to time to present a new cutting surface. Cooperating therewith is a fixed shear member or bushing 88 having a small perforation through which the wire is fed and from which it projects. Both of the shearing members are of hard cutting metal. The lower or perforated member may be rotatable to bring a new part of its periphery to the under side, so as to renew the edge, and this bushing may be readily replaceable, or can be machined off to renew its cutting edge.

The timed coordination of the reciprocating carriage, the feeding gripper, the holding gripper and the shearing device have been sufficiently indicated, and the shaft cams 28 and 40 are shown in contour to afford such operation. The feed is exactly uniform and readily changeable to fill varying orders. The feeding and severing actions are properly coordinated, although the timing might be changed. For example the shearing device is shown as operating immediately upon or after the closing of the holding gripper, thus utilizing the same motion of the rock arm 68 for both purposes, the gripper cam 77 having a dwell enabling the rocking motion to continue after the closing of the gripper, thus to effect the shearing action. By different arrangements however the shearing could be performed at any point of time after the closing of the holding gripper and before its reopening, so long as the shearing disk is retracted so as not to stand in the way of the succeeding feed action.

Having thus described an illustrative embodiment showing the principles and attaining the objects of the present invention, it is hereby stated that it is not intended to limit the invention to features of combination, arrangement and construction except to the extent set forth in the appended claims.

What is claimed is:

1. In a wire sectioning mechanism the combination of a feeding gripper to which the wire passes from the supply, a reciprocating carriage for the feeding gripper, and means for severing the wire and holding its end after each feed; a rotary shaft having timed connections to the severing and holding means, and connections from the shaft to the carriage and feeding gripper, comprising a crank turning in a plane parallel to the carriage reciprocation, and having a pin eccentric to its axis, with a pitman from the crank pin to the carriage, and a cam in eccentric position on the crank, a cam follower, and a connecting rod from the follower to the feeding gripper to open and close it; said cam being relatively fixed on the crank but actually rotary by reason of the crank travel around its axis whereby to actuate the follower and connecting rod.

2. In a wire sectioning mechanism the combination of a feeding gripper to which the wire passes from the supply, a reciprocating carriage for the feeding gripper, and means for severing the wire and holding its end after each feed; a transverse shaft, drive means for turning said shaft and having timed connections to the severing and holding means, and connections from the shaft to the carriage and feeding gripper, comprising a crank, having a pin eccentric to the shaft, with a pitman from the crank pin to the carriage, and a cam in eccentric position on the crank, a cam follower, and a connecting rod from the follower to the feeding gripper to open and close it; said crank having means to adjust its throw to vary the length of severed sections of wire and correspondingly to adjust the eccentric position of the cam to coordinate the gripper operation therewith.

3. In a wire sectioning mechanism the combination of a reciprocating gripper carriage, a feeding gripper on the carriage through which the wire passes, an operating shaft, timed means for severing the wire and holding its end after each feed, and connections from the shaft to the carriage and feeding gripper, comprising a radial guide, a slideblock thereon having means to fix it in varying adjustments, a crank pin on said slideblock with a pitman from the crank pin to carriage, and a cam on said slideblock with a follower and connecting rod to the gripper; whereby adjustment of the slideblock varies the throw and feed while retaining coordinated relation of carriage and gripper operations.

4. Mechanism as in claim 3 and wherein the cam is mounted at substantially the same radial point as the crank pin.

5. In a wire sectioning mechanism the combination of a reciprocating gripper carriage, a feeding gripper on the carriage through which the wire passes, an operating shaft, and connections from the shaft to the carriage and feeding gripper, comprising a radial guide, a slideblock thereon having means to fix it in varying adjustments, a crank pin on said slideblock with a pitman from the crank pin to carriage, a cam on said slideblock, and a cam lever engaging the cam and having one part pivoted to the pitman and another part connected by rod to operate the gripper.

6. In an intermittent wire feeding mechanism, a carriage reciprocable along the feed line, a feeding gripper thereon openable and closeable, a shaft transverse to the feed line, a crank disk or cheek on the shaft with a radial guide, a slideblock movable along said radial guide, a crank pin on the slideblock with pitman connection to the carriage to reciprocate it, a timing device or cam also on the slideblock, with rod connection to the gripper to operate it.

7. An intermittent wire feeding mechanism comprising a feeding gripper, a crank having a member or block adjustable to different radial positions to vary the throw and feed, a connection from the crank to the gripper for bodily reciprocating the gripper through an adjustable travel, a cam or timing device carried on the said crank member or block, and a connection from such cam to the gripper for opening and closing it.

8. The method of straightening wire and sectioning it into short straight lengths, comprising subjecting the wire supply to friction drag, applying heat and softening a substantial extent of the wire beyond the drag point, dragging the wire intermittently through the drag and heating points thereby applying tension to straighten it under heat and feeding it to the desired length,

holding the wire straight between the drag point and the holding point after each feeding operation, and severing a length of straightened wire beyond the holding point after each pulling operation.

9. Mechanism for feeding wire from a supply and for severing it at regular intervals to produce short sections, namely of the type wherein is a reciprocating feed carriage carrying a wire gripper, a crank with pitman for reciprocating the carriage, and an operating device with connecting rod to close the feed gripper for each feed action and open it at the end thereof, and a wire severing means at a suitable position; said gripper operating device being located on said crank at an eccentric position adjacent to the pin of the crank, and with its gripper connecting rod substantially parallel to said pitman; whereby both the reciprocation and gripper operation are effected from the same crank with exact coordination and without conflict.

10. Mechanism as in claim 9 and wherein the crank pin is adjustable to change the crank throw and the gripper operating device and connecting rod are correspondingly adjustable on the crank; whereby the length of product may be varied and the opening and closing of the gripper coordinated therewith.

11. Mechanism as in claim 9 and wherein the crank carries a block adjustable outwardly or inwardly, with means to fix its adjustment, and said block carrying with it both the crank pin and the gripper operative device; whereby the gripper operation is automatically coordinated with all adjustments of reciprocation thereof.

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