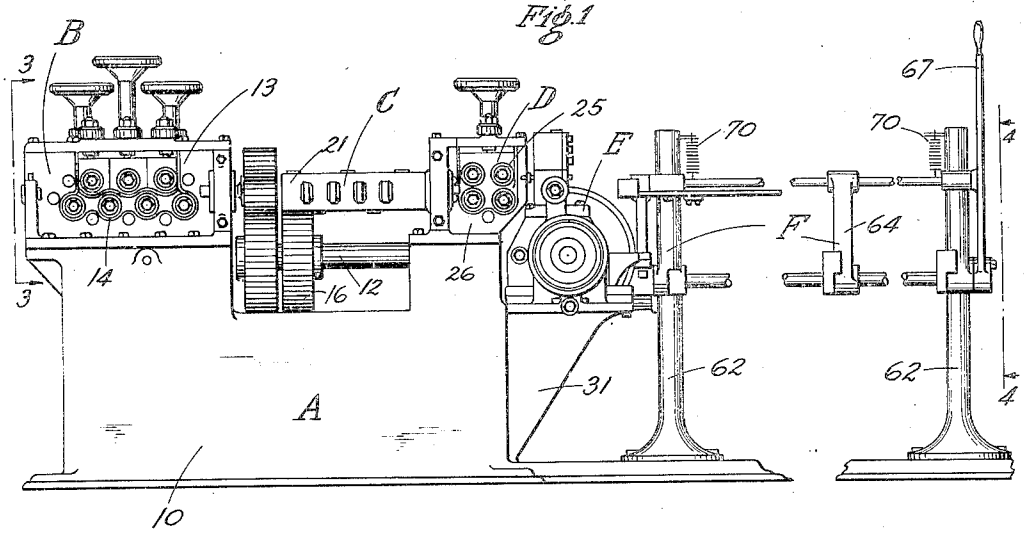
Dec. 15, 1931. K. W. HALLDEN 1,836,712

APPARATUS FOR SEVERING MOVING ARTICLES

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Fig. 1



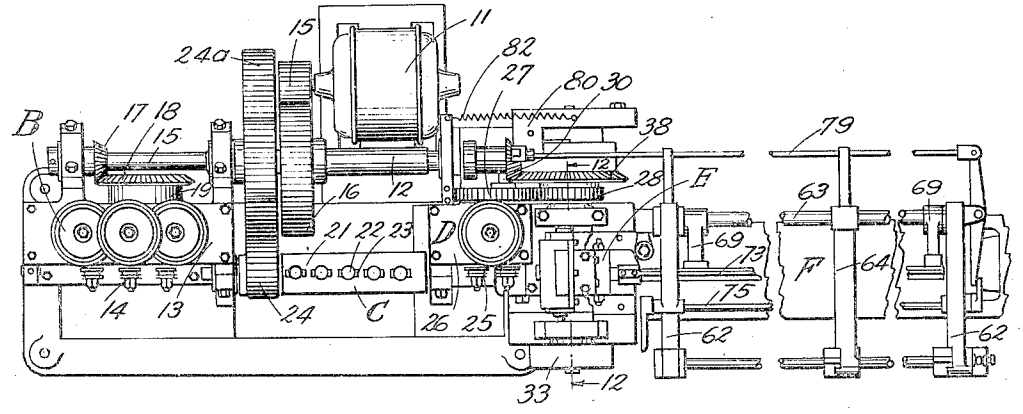


Fig. 2

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APPARATUS FOR SEVERING MOVING ARTICLES

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Fig. 3

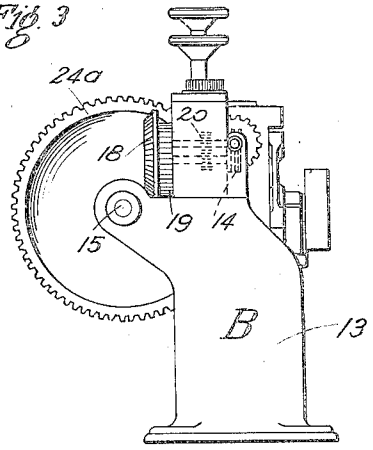


Fig. 4

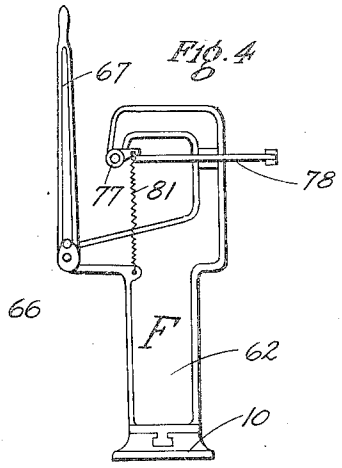


Fig. 6

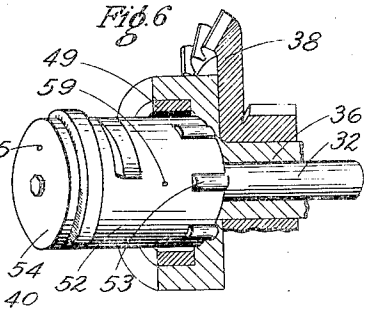


Fig. 5

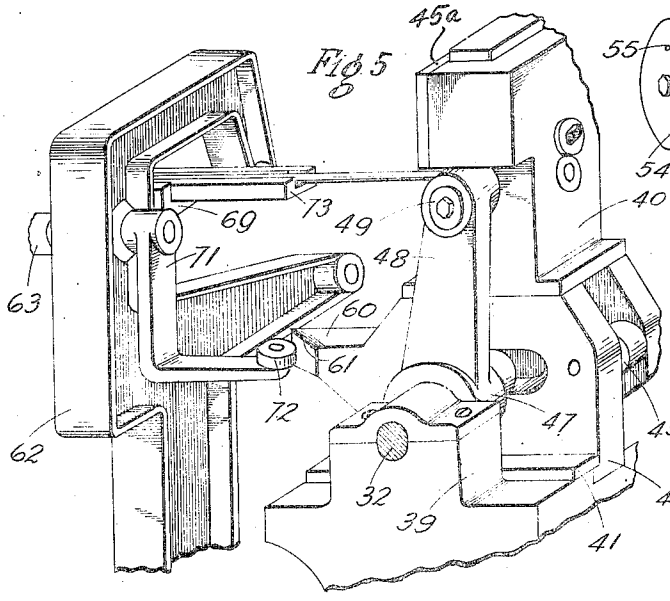


Fig. 7

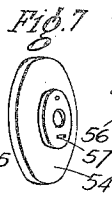
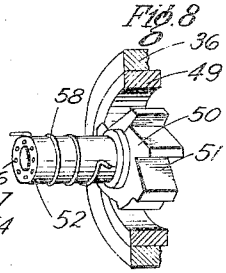


Fig. 8



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APPARATUS FOR SEVERING MOVING ARTICLES

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Fig. 9

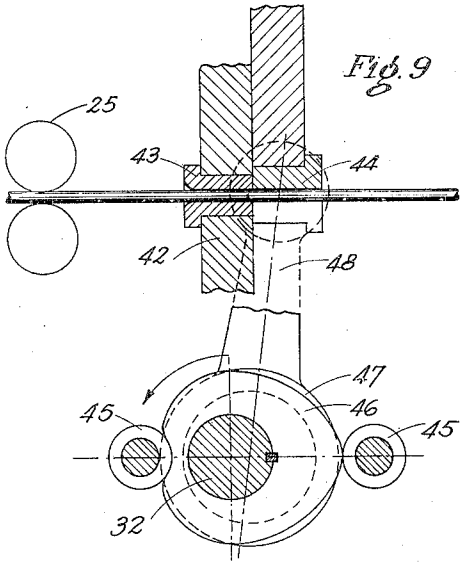


Fig. 11

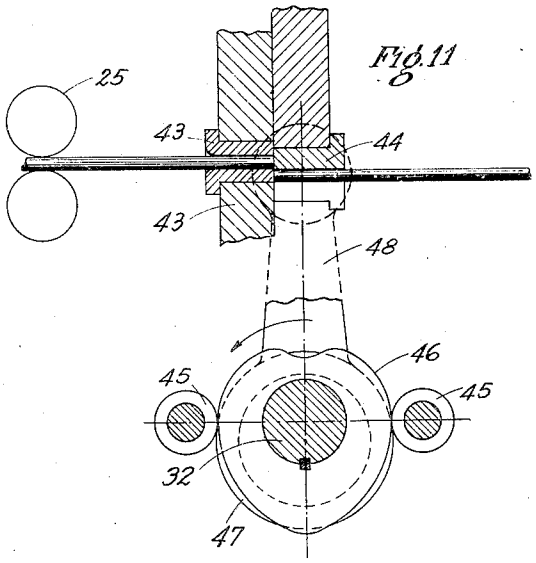
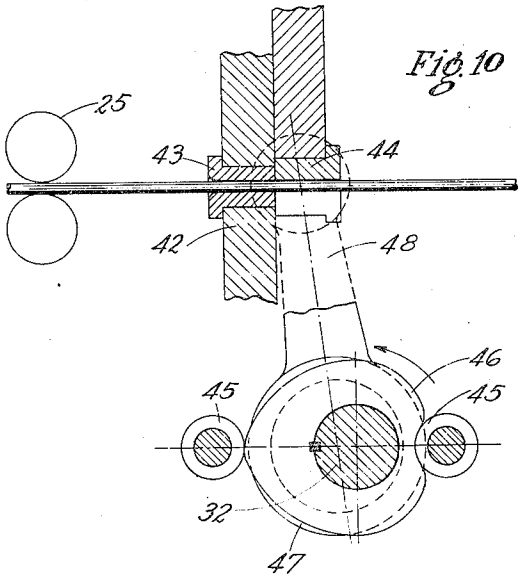


Fig. 10



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APPARATUS FOR SEVERING MOVING ARTICLES

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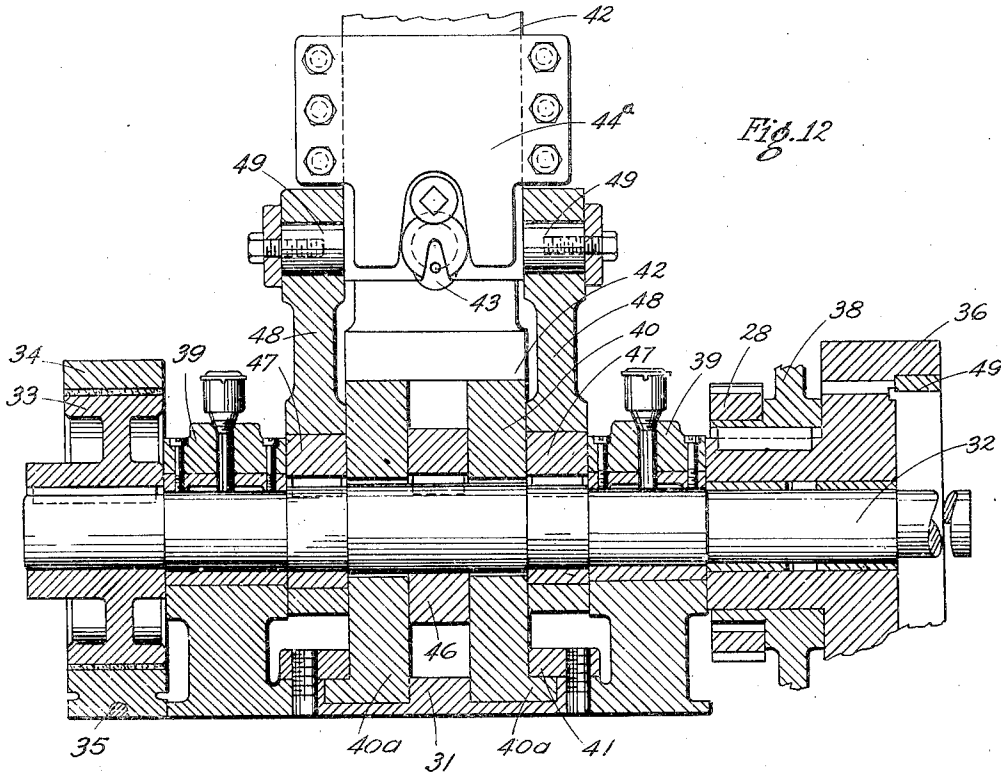


Fig. 12

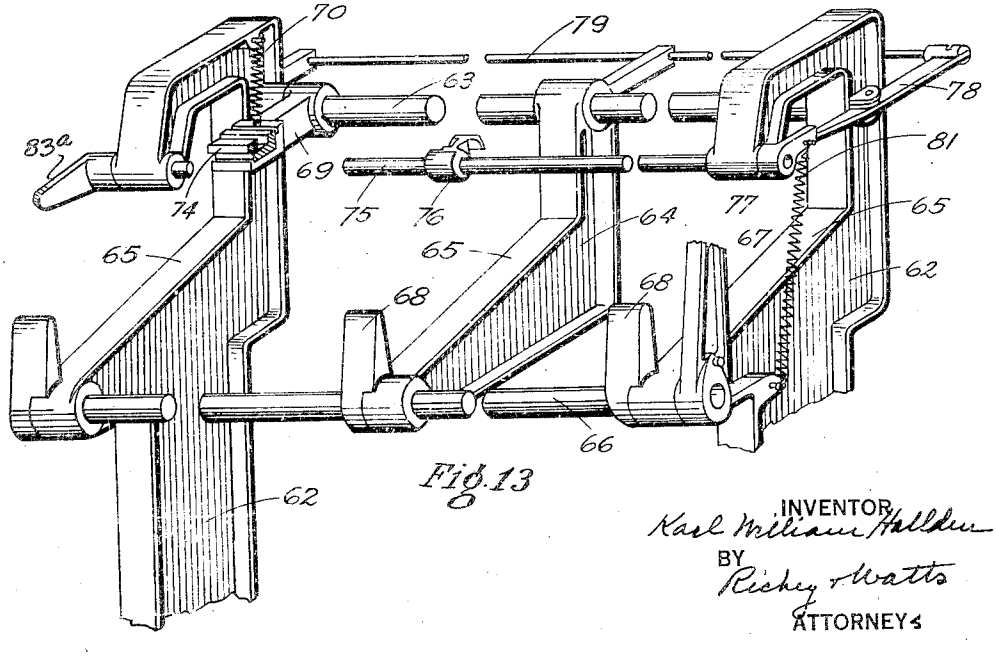


Fig. 13

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APPARATUS FOR SEVERING MOVING ARTICLES

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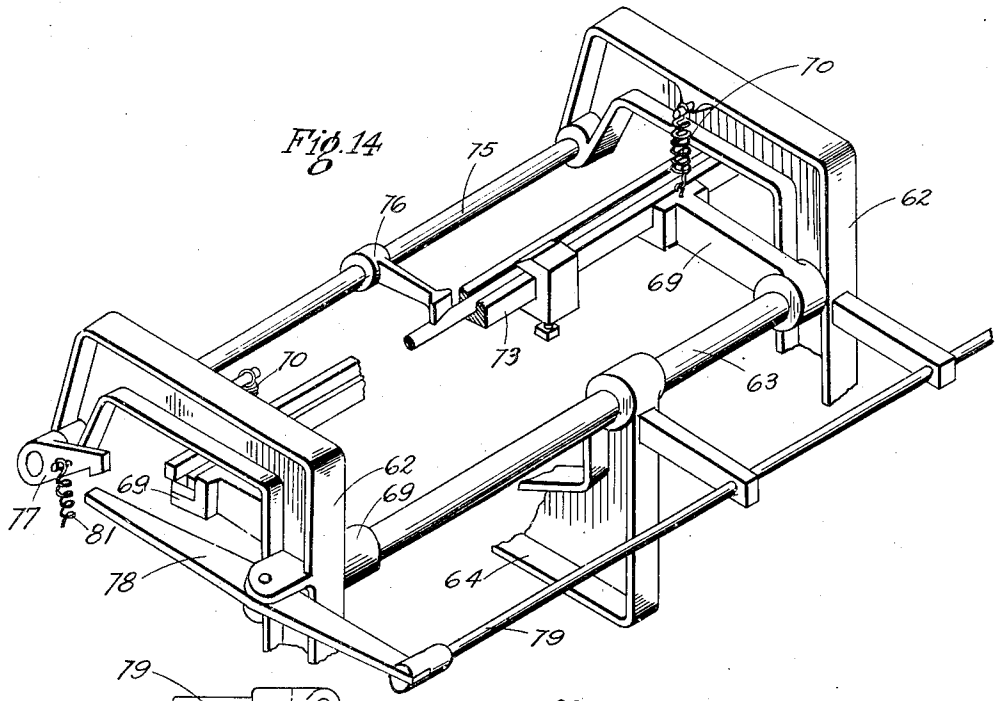


Fig. 14

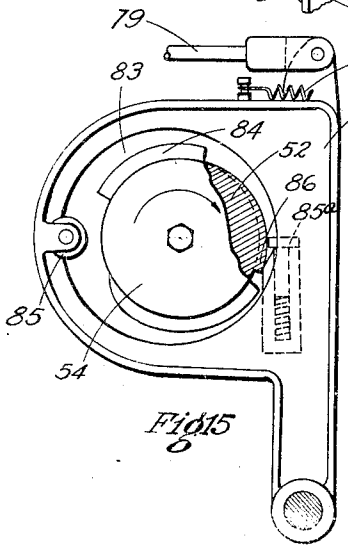


Fig. 15

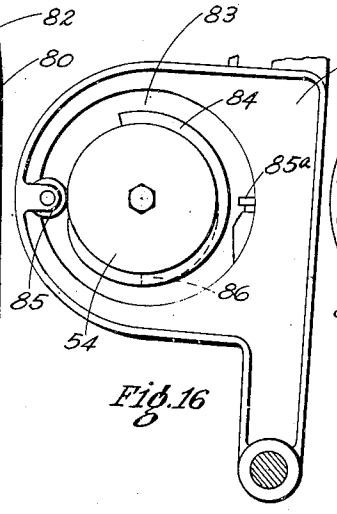


Fig. 16

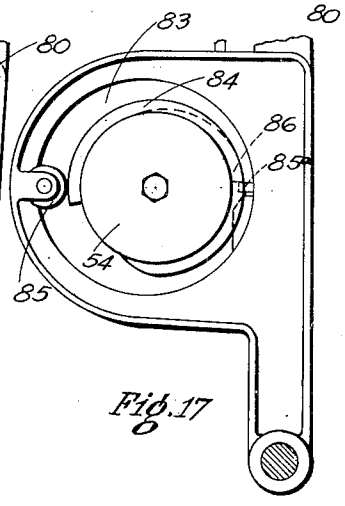


Fig. 17

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1,836,712

UNITED STATES PATENT OFFICE

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APPARATUS FOR SEVERING MOVING ARTICLES

Continuation of application Serial No. 197,856, filed June 10, 1927. This application filed April 21, 1928. Serial No. 271,715.

This invention relates to apparatus for severing moving articles. It is particularly concerned with apparatus which is capable of severing a moving article into pieces of substantially the same predetermined lengths; which exerts little or no material impedance to the movement of the moving article; which performs the severing operation without materially upsetting the article at the point of severance; which is mechanical in operation; which requires little or no hand labor or attention when in operation; which is simple to construct and positive in operation; which is adaptable to articles moving at practically any speed within the present commercial range of speed in the various fields of manufacture in which it is useful; and which is adaptable to sever articles moving at substantially any such speed into pieces having a minimum length of less than about a foot and an unlimited maximum length and to sever such an article into pieces of substantially uniform lengths.

My invention also contemplates certain new and useful devices for use with or as parts of severing devices embodying my invention, including mechanism for tripping the cut-off means, for actuating and stopping the cut-off means; for accurately measuring the pieces to be severed from an article; and for minimizing the shocks or stresses incident to stopping of the reciprocating members.

An important feature of my invention embodied in the device herein illustrated is that the article cutter is adapted to sever the article in the first-quarter revolution of its stroke; and both to sever the article and to move back out of the path of the article during the first-half revolution of the shaft. This is of great practical importance since it makes possible the doubling of speed of articles heretofore possible with the prior art cut-off devices, or the operation of devices embodying my invention at about half the speed of prior art devices on articles moving at a given speed.

Another important feature of my invention is that it may be embodied in apparatus having relatively small compact reciprocating parts which simplifies the problem of overcoming the inertia of such parts, and also having rotatable parts concentrically disposed on the one revolution shaft which results in a balanced relation of the rotating masses of such parts thereby making possible the use of such parts of relatively small size and simplifying the problem of overcoming the inertia of the rotating masses. Moreover, the assembly of the clutch and brake drum concentrically on the said shaft acts to balance or counteract the forces of the rotating masses of the cam and eccentrics.

Another important feature of my invention is that it may be embodied in apparatus including a positively and instantly acting clutch which is highly desirable where an article traveling at a high rate of speed is to be severed into substantially uniform lengths.

A further important feature of my invention resides in the fact that it contemplates apparatus which permits the rear end portion of the article being severed to move bodily with the cutter blade during the severing operation and without bending. This makes it possible to sever an article into substantially straight lengths as contrasted with lengths which are bent or given a permanent set due to the cutter forcing one end of the length down below the member or table which supports the length just prior to and during the severing operation.

Another result of this feature is that an article moving at a high speed may be cut into much shorter pieces than heretofore.

Another result of the slower operation of the cut-off device is that the problem of stopping the device after one revolution of the shaft is greatly simplified, and any waste material caused by repeated revolutions of the shaft before it can be stopped is avoided.

Another important practical feature of my invention is that it makes possible the construction of apparatus which will sever an article moving at high speed, for example, 65 feet per minute and more into pieces having a maximum variation in length of less than a small fraction of an inch.

There are, of course, many other advantages inherent in apparatus embodying my

invention which will readily appear to those skilled in the art from this specification.

While my invention is applicable to articles of a great variety of shapes and compositions, including wire rods, sheets and tubes, I have elected to disclose in this specification, for purposes of illustration only, an embodiment of my invention with necessary or desirable associated mechanism adapted to the severing of metal wire of the larger sizes. Other embodiments and adaptations of my invention and of various mechanism for use with or as a part of severing devices embodying my invention which are not claimed or shown in this application are disclosed and/or claimed in my copending applications.

In the drawings accompanying and forming a part of this specification:

Fig. 1 is a side elevation, and

Fig. 2 is a top plan view of one form of apparatus embodying my invention.

Fig. 3 is an end elevation taken substantially on line 3—3 of Fig. 1.

Fig. 4 is an end elevation taken on line 4—4 of Fig. 1.

Fig. 5 is a fragmentary enlarged perspective view of the cut-off mechanism and certain associated parts of Fig. 1.

Fig. 6 is an enlarged perspective view, partly in section, of the clutch mechanism.

Figs. 7 and 8 are enlarged perspective views, partly in section, of certain other parts of the clutch.

Figs. 9, 10 and 11 are vertical longitudinal sectional views taken approximately through the center of the cut-off device, showing the position of the parts thereof before, during and after the severing operation.

Fig. 12 is a fragmentary enlarged transverse sectional view taken through the cut-off mechanism and showing the shaft for actuating such mechanism in elevation.

Fig. 13 is a perspective fragmentary view of the mechanism for storing and operatively discharging articles severed by the cut-off mechanism and including parts of the tripping mechanism.

Fig. 14 is a fragmentary perspective view of the apparatus shown in Fig. 13 but taken from the opposite side thereof.

Figs. 15, 16 and 17 are elevational views, partly in section, showing parts of the tripping mechanism in various positions occupied thereby during the operation of the cut-off mechanism.

For convenience in description, I have elected to consider the device illustrated herein from the viewpoint of an observer looking toward the apparatus in the direction of approach to it by the moving article to be severed; and accordingly will hereinafter refer to the portion of the apparatus toward the oncoming article as being the forward end of the apparatus and where the severed articles are collected as the rear end of the apparatus. Further, in order to simplify the description of the apparatus of the drawings, I have elected to segregate various parts of the mechanism and will refer to these parts by reference characters A, B, C, D, E and F.

A designates the base which carries the part B which includes the preliminary article straightening rolls having fixed longitudinal axes, the part C which designates rotary finish straightening mechanism, the part D which includes the feed rolls for delivering the moving article to be severed; the part E for severing the moving article and the part F which designates the mechanism for receiving the severed articles.

It will be understood, however, that inasmuch as the invention claimed herein is primarily directed to the parts D, E and F, the parts B and C may be omitted, and a base corresponding to A, suitably designed for supporting the parts D and E may be substituted for the base A herein shown. Claims directed to the combination of parts B and C with the parts D, E and F are embodied in my copending application, Serial No. 545,923, filed June 22, 1931, on apparatus for severing a moving article, which constitutes a division of this application.

The base A is intended primarily as a support for the parts B, C, D and E and may consist of a hollow casting 10 suitably formed to support these parts and if desired, to carry the driving motor 11 and power line or shaft 12 for actuating any one of or all these parts B, C, D and E.

The part B comprises a suitable supporting member 13 carrying a plurality of rotatable suitably grooved rolls 14, certain of which may be adjusted with respect to the others to permit the application of any desired degree of bending force on a moving article passing between these rolls. By passing a metallic article between these rolls, kinks and bends are largely removed therefrom as is well known in the art. These rolls, 14, as illustrated are driven by motor 11 through gear 15 on the motor, gear 16 meshing therewith and keyed on shaft 12*a* and bevel gears 17 and 18 on shaft 15 and spindle 19 respectively and gears 20 on rolls 14.

The part C comprises a cylindrical housing 21 rotatably mounted in journals disposed at the forward end in the member 13 and at the rear end in a member of part D. This cylindrical member 21 is provided with a plurality of transversely adjustable, suitably grooved wire engaging guides 22 located in the openings 23 in the member 21. The member 21 may be rotated by any satisfactory means, such for example, as a pinion gear 24 keyed thereto at its forward end and meshing with a drive gear 24*a* keyed on the drive shaft 12. A metallic wire passing through the member

21 and engaging with the spaced guides 22 therein, which are preferably slightly staggered or out of true alignment lengthwise of member 21, will be substantially freed from slight kinks and bends and will issue from the rear end to the member 21 in a substantially straight condition.

The part D comprises one or more sets, in this case two sets of feed or pinch rolls 25 rotatably and adjustably mounted in a suitable supporting member 26 driven by gear 27 connected thereto and meshing with a gear 28 carried by the main shaft of the cut-off device in part E which is driven from bevel gear 30 keyed to shaft 12. The function of these rolls is to feed an article to be severed through the cut-off mechanism part E.

The cut-off mechanism part E (see Figs. 1, 2 and 5 to 12 inclusive) may be described as follows: A suitable supporting base 31 attached to the base 10 carries a single revolution rotatable shaft 32 having a fixed longitudinal axis. This shaft has keyed thereto at one end a brake drum 33, about which a brake band 34 is adjustably clamped which band is pivotally secured at 35 to the base 10. The shaft 32 carries at its other end a clutch housing 36 having keyed thereto a gear 28 and a bevel gear 38 meshing with a bevel pinion 30 keyed on the main drive shaft 12. The gear 28 meshes with gear 27 to drive the feed rolls 25.

Intermediate the bearings 39 of the shaft 32 is disposed a reciprocable carriage 40 having two spaced, parallel legs 40*a* slidably engaging the base 31 and retained on the base by slide strip 41. The legs 40*a* carry an upright body 42 provided with an opening 43 through which the moving wire to be severed may be passed and constituting the lower or vertically stationary blade of a shear. The upper or vertically movable blade 44 of such shear is disposed in the body 42 of the carriage to slide in a substantially vertical plane. As shown herein, the body 42 is cut away to receive the blade 44 and has a plate 45*a* secured thereto to retain the blade 44 in its recess in the body 42 and to guide the blade 44 in its reciprocating movement.

The carriage 40 is provided on opposite sides of the shaft 32 and between legs 40*a* with cam rollers 45 disposed to engage with a heart-shaped cam 46 keyed to the shaft. Eccentrics 47 are keyed to the shaft on either side of the carriage 40, and each one is provided with an eccentric strap 48 extending in the form of a connecting rod secured at its upper end pivotally to an extension 49 of the reciprocating blade 44.

A clutch of the positive roll-locking type includes the clutch housing 36 previously mentioned carrying an annulus 49 secured to its interior periphery; a disc 50 keyed to the shaft 32 and concentrically disposed within the annulus and provided on its edge with a plurality of notches 51, to receive the clutch rollers; and a basket 52 carrying a plurality of rollers 53 disposed between the annulus 49 and the disc 50, which rollers are positioned in the notches 51. A cap 54 for the basket is secured to the outer end of the shaft 32 and adjustably positioned with relation to the shaft by means of a dowel pin 55 which may be located in any one of several dowel pin recesses 56 in the end of the shaft 32. This cap is also provided with an opening 57 to receive the end of a coil spring 58 surrounding the shaft 32 and extending at its other end to a suitable opening 59 in the side wall of the basket.

The function of the adjustable cap is to regulate the tension of the spring 58 on the basket 52.

The carriage 40 extends rearwardly as at 60 and is faced off at 61 at an angle to engage with a roller carried by the part F.

Part F (see Figs. 1, 2, 5 and 13 to 17 inclusive), comprises a plurality of upright standards 62 suitably mounted on a slotted floor plate and spaced apart from but preferably secured to each other by means including a rod 63. If desired, one or more members 64 may be supported intermediate the standards 62. The standards and intermediate members are shaped as at 65 to receive and store pieces cut from the moving wire and may be unloaded onto a truck or the like by rotation of a shaft 66 carried by the standards 62 through a hand lever 67 keyed thereto; a plurality of fingers 68 also secured to shaft 66 and normally disposed in an upright position retain cut pieces of wire on the surface 65 until movement of the lever 67 rotates the shaft and turns the fingers down so that the pieces of wire on the surfaces 65 may be discharged therefrom. The rod 63 carries a plurality of arms 69 which support at their free ends a part of the trough like wire supporting structure in which the wire to be severed slides until it is severed by part E. These arms 69 are retained in the position shown in Figs. 13 and 14 by the springs 70 but are movable downwardly against these springs by rotation of the rod 63 to which they are keyed; a lever 71 also keyed to the shaft 63 carries a roller 72 which engages with the faced off portion 61 of the extension of carriage 40. When the carriage 40 moves rearwardly, surface 61 engages the rollers 72 and thereby rotates rod 63 and moves the part 73 of the trough downwardly, thus permitting the wire to be pushed downwardly by blade 44 without bending and to fall onto the inclined surfaces 65, standards 62 and intermediate members 64 when severed.

The remaining portion of the trough is formed by a side 74 normally resting upon the movable trough part 73 and carried by the standards 62. The standards also carry a

rod 75 rotatable therein and provided with an adjustable wire engaging member 76 normally disposed in the trough in the path of the oncoming wire to be severed. This rod 75 has secured thereto, at its rear end, a latch 77 engaging behind one end of a lever 78 pivoted to the rear standard 62 and carrying at its other end a rod 79 slidable in suitable guides and extending to the forward end of the part F where it is attached to a member in the form of a bracket 80 which is pivoted to base 10 in operative relation to the clutch basket 52. The latch is held in locking position by a spring 81 and the bracket and rod are urged in a forward direction by a spring 82. The rod may also be provided with a hand trip 83*a* if desired. The member 76 is slidably adjustable on the rod for any desired length of piece to be severed from the moving wire and serves when engaged by the end of the oncoming wire in the trough to rotate the rod 75 and lift the latch 77, thus permitting the spring 82 to move the bracket 80 forwardly about its pivot.

The bracket is cut away as at 83 to fit over the basket 52 and carries a roller 85 at the rear side of this opening which engages with a cam 84 on the outer surface of the basket 52. This roller engages the cam 84 after the basket starts rotating and restores the bracket to its initial position and maintains it in such position until the severed wire is discharged from the trough and until latch 77 engages behind lever 78.

The bracket carries in the forward side, and projecting into the opening, a spring-pressed pawl 85*a* for engagement with a suitable projection 86 on the outside of the basket 52.

The operation of the apparatus described hereinabove may be briefly summarized as follows:

Continuously moving wire to be severed into pieces of substantially uniform length are passed between the rotating rolls part B, where the larger kinks and bends are smoothed out and then through the rotating member 21 of part C, where the smaller kinks and bends are removed and then passes therefrom between the feed rollers 25 of part D and through the opening 43 in carriage 40, thence along the trough in which it engages with and lifts the length determined member 76 therein. As this member is lifted by the wire, the latch 77 releases the lever 78 and the spring 82 turns the bracket 80 about its pivot, thus withdrawing the pawl 85 from the projection on the basket and permitting the spring 58 to rotate the basket 52 and operatively connect the annulus 49 and the disc 50. The shaft 32 is thereupon rotated, with a coincident movement of the carriage 40 rearwardly at the speed of the moving wire. The shaft 32 simultaneously rotates the eccentrics 47 and moves the blade 44 of the shear downwardly in the carriage 40, the blade severing the wire in the first-quarter revolution of the shaft 32 and being returned out of the path of the oncoming wire during the next quarter of the revolution of the shaft. When the shaft 32 has completed its first half revolution, the carriage 40 is stopped and during the next half revolution it is returned forwardly to its starting point. The shaft is stopped at the end of one revolution by the pawl 85 which has been returned to its initial position, and which disengages the rollers from between the annulus and disc by preventing further rotation of the basket. After the wire has been severed, the faced off surface 61 of extension 60 of the carriage 40 opens the trough and discharges the cut pieces of wire on the inclined surfaces of the standards and the springs 81 close the trough when the extension 60 moves forwardly.

It will be noted that the carriage 40 moves with and at the same speed of the wire during the severing operation, thereby insuring that the severed end of the wire will not be upset in the severing operation which is a feature of great commercial value, particularly in connection with automatic screw machines and the like where a variation in diameter of the severed ends of the wire is not permissible.

It will be further noted that the actual severing operation is completed in the first quarter revolution of the shaft 32 and that the blade is retracted from the path of the oncoming wire at the end of the first-half revolution of the shaft. This is a feature of great commercial importance because it enables pieces of shorter length or articles moving at a higher speed to be severed, or a speed of the rotation of the shaft 32 to be less than is possible with a moving blade where the full rotation of the shaft is required to bring the moving blade through and retract it from the path of the moving article. Also that the moving blade is travelling at its maximum speed toward the article at the time it strikes the article. It will also be noted that the blade 44 travels in a substantially elliptical orbit which has its major axis in a horizontal plane.

It will be noted that cams 46 are substantially heart shaped. By reason of this fact, the carriage is moved along the line of travel of the moving article at a substantially uniform rate of speed, which speed is the same as that of the moving article. The only noticeable variations in speed of movement of the carriage occur at either end of the stroke of the carriage, but during the entire cutting operation, that is, during the entire time the cutter is in engagement with the moving article, the carriage is moving at a uniform speed and at the same speed as the moving article.

Although I have described my invention herein with particular reference to wire cutting apparatus, I have done so merely for the purpose of clearly disclosing my invention and not with the intention that my invention shall be limited to the particular details or construction of the apparatus so set forth. The scope of my invention is disclosed in what is claimed.

This application is a continuation of my copending application Serial No. 197,856, filed June 10, 1927.

I claim:

1. Apparatus for severing a moving article which comprises a single-revolution shaft having a fixed longitudinal axis, an article cutter movable around a substantially elliptical orbit, and means for driving the cutter around its orbit, said means including a connecting rod pivotally secured directly to the cutter and an eccentric carried by the shaft and rotatably journaled in the connecting rod.

2. Apparatus for severing a moving article which comprises a base, a carriage slidably engaging the base, a cutter reciprocable in the carriage, a transverse shaft journalled in the base and disposed intermediate the ends of the carriage and above the base engaging portion thereof, carriage reciprocating means on said shaft, a pivoted link connection between the shaft and cutter, and means disposed near the ends of the carriage and engageable with the carriage-reciprocating means to cause effective operation of the latter.

3. Apparatus for severing a moving article which comprises a carriage, a single-revolution shaft disposed intermediate the ends of the carriage and having a fixed longitudinal axis, an article cutter movable around an orbit, and means carried by the shaft for driving the cutter around its orbit, said means including a connection between the shaft and cutter adapted to move the cutter forward with a moving article at a uniform speed during the entire cutting action of the cutter.

4. Apparatus for severing a moving article which comprises a carriage, a single revolution shaft having a fixed longitudinal axis, an article cutter movable around an orbit, and means carried by the shaft for driving the cutter around its orbit, said means including a connection between the shaft and cutter adapted to move the cutter forward with a moving article at a uniform speed which, during the entire cutting operation, is the same as the speed of travel of the moving article to be cut.

5. Apparatus for severing a moving article which comprises a single revolution shaft having a fixed longitudinal axis, an article cutter movable around an orbit and means carried by the shaft for driving the cutter around its orbit, said means including a connection between the shaft and cutter adapted to move the cutter with a moving article to be cut and at a uniform speed which, during the entire cutting operation, is the same as the speed of travel of the moving article.

6. Apparatus for severing a moving article which comprises a base having journaled therein a rotatable shaft, a heart cam secured to the said shaft, a carriage having a portion slidably mounted on the base below the shaft and disposed closely adjacent to the side of the cam, cam followers carried by the carriage and engageable with the cam, an article cutting blade slidably mounted in the carriage above the shaft, means pivotally joined to the blade and operatively associated with the shaft for reciprocating the blade in the carriage during reciprocation of the carriage, and means for selectively and periodically rotating the shaft through one complete revolution.

7. In severing apparatus, the combination, with a shaft, of a cutter element operatively connected to the shaft and operable in cycles of reciprocatory movement, the operative connections between the cutter and shaft being effective to cause a complete cycle of operation of the cutter upon one revolution of the shaft, a carriage member on which the cutter element is mounted, and a cam carried by the shaft and directly engaging the carriage member to reciprocate the latter incident to a rotation of the shaft.

8. Apparatus for severing moving material, comprising, in combination, a rotatable shaft, cam means on the shaft, a carriage directly engaging the cam means at opposite sides of the latter, said shaft being disposed intermediate the ends of said carriage, a cutter element on the carriage, apparatus for moving material past the carriage, and means for rotating the shaft at periodic intervals to cause a forward movement of the carriage at the same speed at which the material to be cut is moving.

9. Severing apparatus of the class described, comprising, in combination, a single revolution shaft, a carriage, a cutter element on the carriage, a cam means on the shaft for causing effective operations of the cutter element, and another cam on the shaft directly engaging the carriage at substantially opposite points to effect reciprocatory movements of the latter incident to a single rotation of the shaft.

10. The combination of a flying shear movable with the article to be cut, a constantly actuated driving means including a roll-locking clutch connecting the shear to the driving means for moving the shear at a speed which, during the entire cutting operation, is uniform and is the same as the speed of the moving article.

11. Apparatus for severing a moving article which comprises a fixed base having a pair of spaced bearings, a shaft having one end journalled in one of said bearings, said shaft being journalled in the other of said bearings, means for periodically rotating the shaft including a clutch part carried by the shaft at the end thereof opposite said first mentioned end, a carriage movable relative to the base, an article cutter guided by the carriage, means carried by the said shaft between said bearings for reciprocating the carriage at a uniform speed during the actual cutting of a moving article and other means carried by the shaft between said bearings for operating the cutter in synchronism with the reciprocating carriage.

12. The combination of a flying shear movable with an article to be cut, a constantly actuated driving means, a rotatable shaft having a fixed longitudinal axis and carrying a heart-shaped cam, and means including a roll-locking clutch connecting the driving means to the said shaft for actuating the shear.

13. Apparatus for severing a moving article which comprises a single revolution shaft having a fixed longitudinal axis, an article cutter movable in an orbit, and means connected to and driven by the shaft for driving the cutter around its orbit including a cam and an eccentric for respectively imparting mutually perpendicular components of the orbital motion to said cutter.

14. Apparatus for severing a moving article comprising a single-revolution shaft having a fixed longitudinal axis, an article cutter movable in an orbit, a cam carried by said shaft for imparting to said cutter a compcent of its orbital movement in the direction of movement of the moving article and an eccentric carried by said shaft for imparting to said cutter a component of its orbital movement perpendicular to said first mentioned component.

15. Apparatus for severing a moving article which comprises a single-revolution shaft having a fixed longitudinal axis, an article cutter movable around an orbit, a cam carried by said shaft for moving said article cutter in the direction of movement of the moving article at a uniform rate of speed equal to the rate of speed of the moving article and an eccentric carried by said shaft for moving the cutter in a direction perpendicular to the direction of travel of the article and of movement of the moving article, said cam and said eccentric co-operating to move said cutter about its orbit.

16. Apparatus for severing a moving article which comprises a rotating shaft having a fixed longitudinal axis, a cutter movable around an orbit, and means including a cam and an eccentric carried by the shaft and driving said cutter, one imparting a horizontal component and the other a vertical component of the orbital movement of said cutter.

17. Apparatus for severing moving material comprising a base, a carriage slidably mounted on said base for straight line movement parallel to the line of travel of the moving material, a cutter on said carriage, a rotatable shaft journalled in said base, cam means on said shaft for reciprocating said carriage and for moving the same during a portion of its travel at a uniform rate of speed equal to the rate of speed of the moving material, and means driven by said shaft for operating said cutter to sever said material arranged to complete the severing operation during the uniform movement of said carriage.

18. Apparatus for severing a moving article comprising a cutter mechanism mounted for transverse and parallel movements relative to the travel of the article, a shaft mechanism operative to project the cutter mechanism into the path of travel of the moving article, said mechanism including fast and loose clutch members on the shaft, a trip mechanism operative to engage the clutch members to effect the operation of cutter projecting mechanism, and an independent stop device adapted to be engaged with the loose clutch members to render the same inoperative.

In testimony whereof I hereunto affix my signature this 5th day of April, 1928.

KARL W. HALLDEN.