D. E. KEMPSTER.

MACHINE FOR FEEDING AND CUTTING FLEXIBLE MATERIAL.

APPLICATION FILED APR. 29, 1910.

999,372. **Patented Aug. 1, 1911.**

4 SHEETS—SHEET 1.

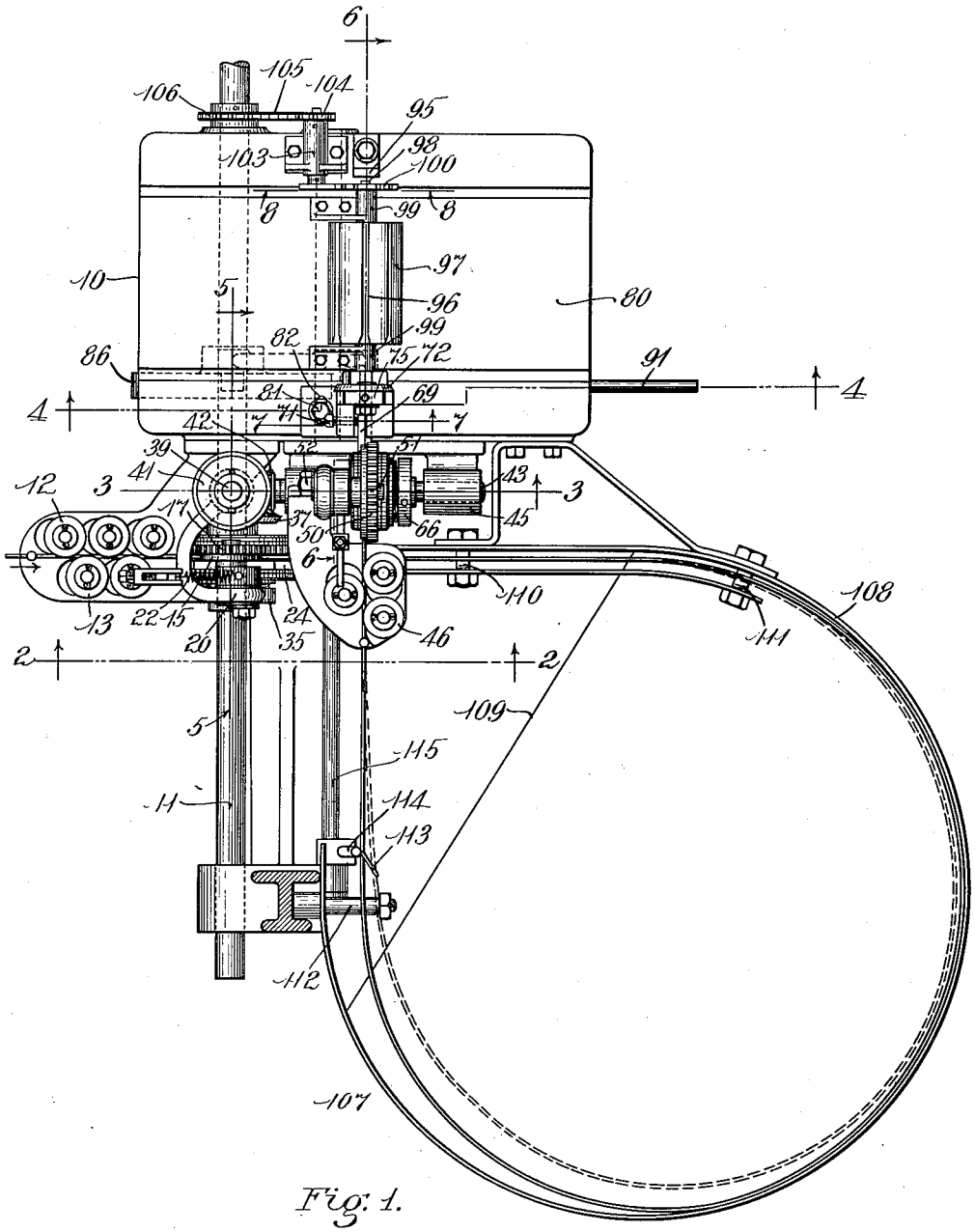

Fig. 1.

Witnesses.
Franklin E. Low
Leonard A Powell

Inventor:
Daniel E. Kempster.
by his attorney,
Charles S. Gooding.

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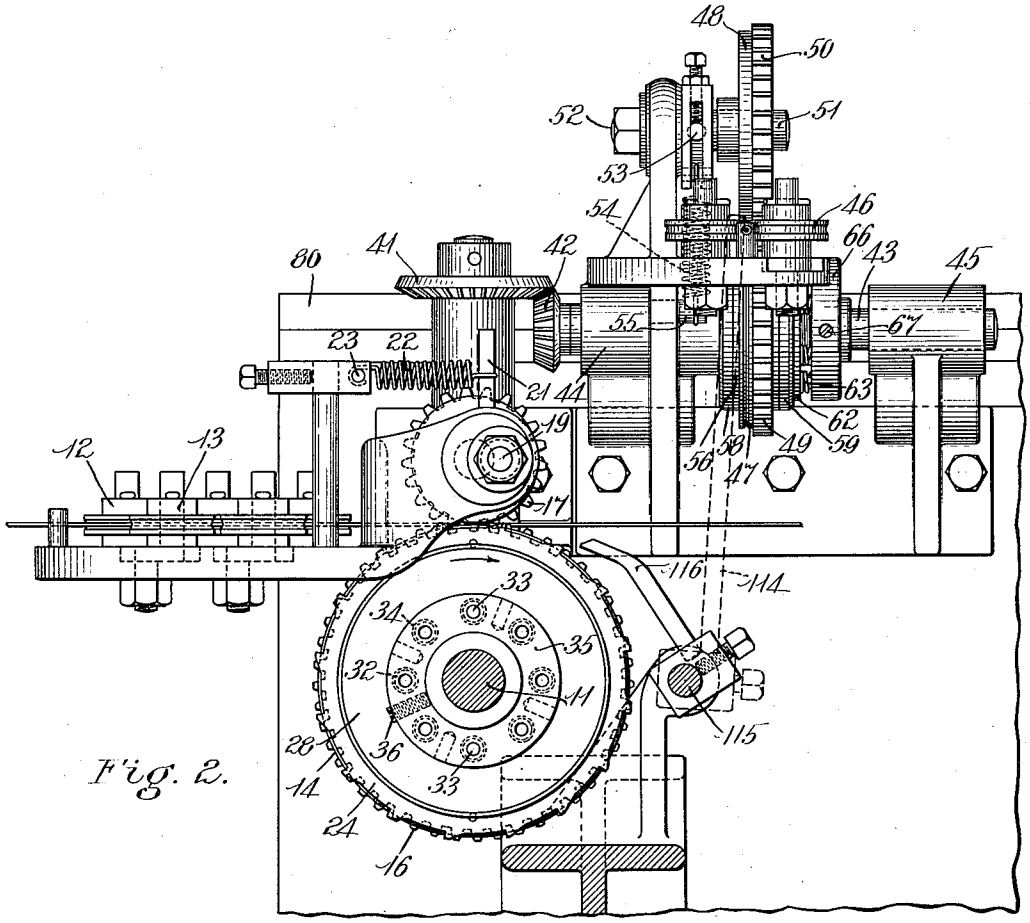

Fig. 2.

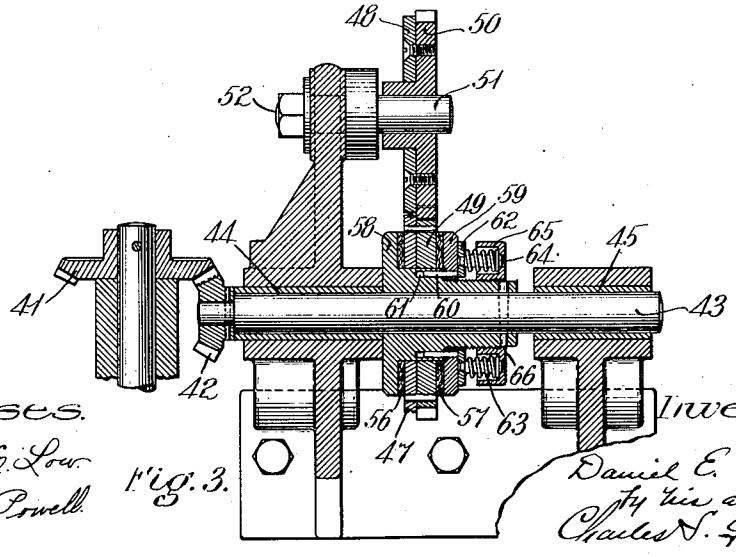

Fig. 3.

Witnesses.
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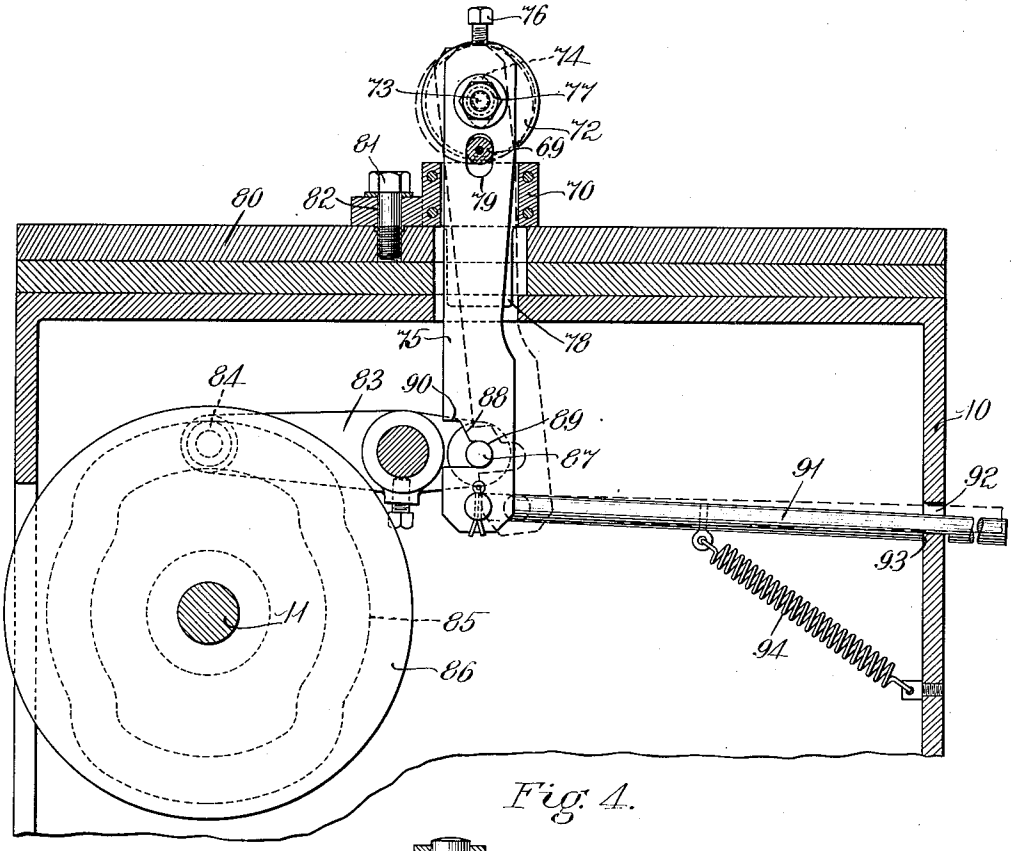

Fig. 4.

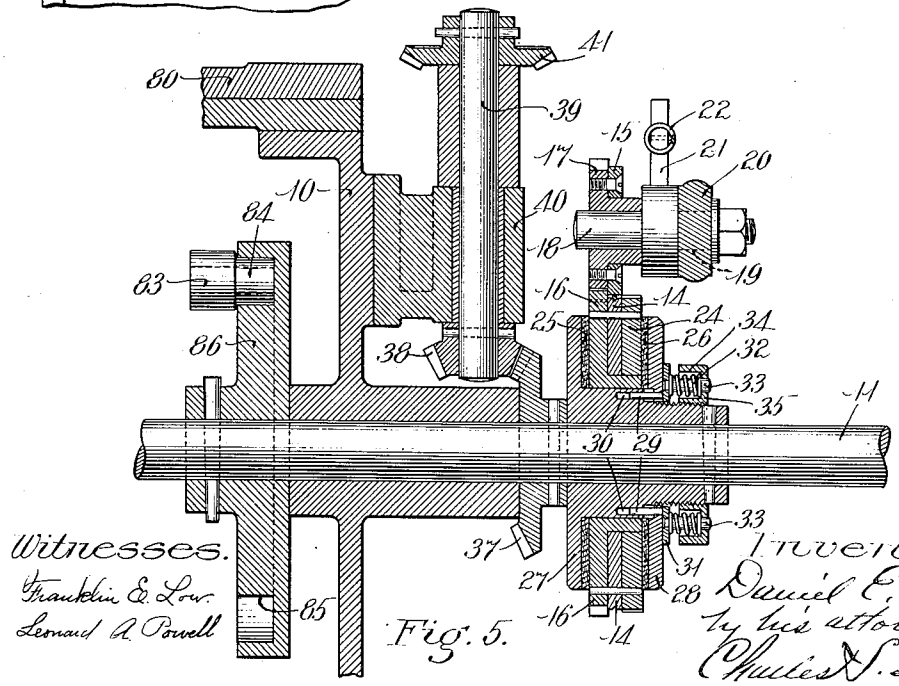

Fig. 5.

Witnesses.
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4 SHEETS—SHEET 4.

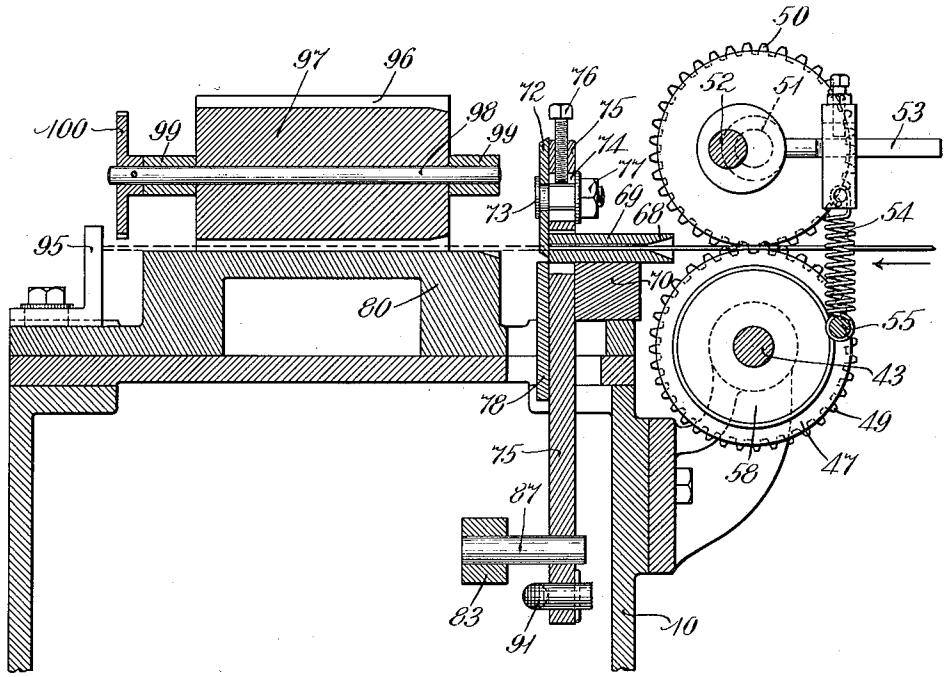

Fig. 6.

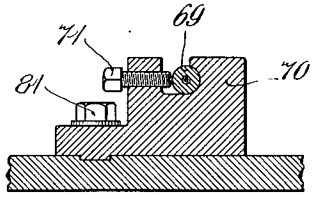

Fig. 7.

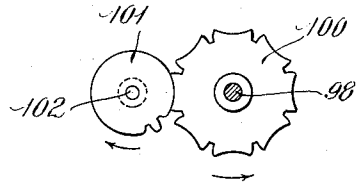

Fig. 8.

Witnesses.
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UNITED STATES PATENT OFFICE.

DANIEL E. KEMPSTER, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO SAMUEL R. UPHAM, OF BOSTON, MASSACHUSETTS.

MACHINE FOR FEEDING AND CUTTING FLEXIBLE MATERIAL.

999,372. Specification of Letters Patent. Patented Aug. 1, 1911.

Application filed April 29, 1910. Serial No. 558,374.

To all whom it may concern:

Be it known that I, DANIEL E. KEMPSTER, a citizen of the United States, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Machines for Feeding and Cutting Flexible Material, of which the following is a specification.

This invention relates to improvements in machines for feeding and cutting flexible material of various kinds such, for example, as wire, and while the present embodiment of my invention is particularly adapted to feed and cut wire it will be understood that my invention is not limited to the feeding and cutting of wire.

In feeding wire and other flexible material from reels and other sources of supply at high speed, trouble is often experienced due to slipping of the feed mechanism owing to the effort required to overcome the inertia of the stationary reel and coil of material thereon as well as the resistance due to the straightening rolls employed for straightening the wire, and again when the feeding mechanism ceases to operate, trouble is experienced owing to the overtravel of the rotating reel. These troubles lead to inaccurate feeding of the material and it is the object of my invention to overcome this difficulty, and to this end I employ two distinct feeding mechanisms, acting on the material at two points respectively in its length, these mechanisms being so constructed and related to each other that one feeds the material in accurate lengths to the cutter, while the other draws the material from the reel or other source of supply and acts to maintain at all times a supply of slack material between the two feeding mechanisms so that the second feeding mechanism, to which the material passes, easily draws the necessary length of the material from said slack without slipping and, consequently the material is cut into accurate lengths. One of these mechanisms acts to impart an intermittent feed to the material at regular intervals, while the other mechanism has a more or less irregular intermittent feeding movement and is under the control of the slack material or coil between the two feeding mechanisms so that the expansion and contraction of the slack material or coil acts through suitable controlling means to render inactive at intervals the feeding mechanism to which the material first passes from the reel or other source of supply.

The invention consists in the novel features of construction and in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims.

Referring to the drawings: Figure 1 is a plan of a machine for feeding and cutting wire embodying my invention. Fig. 2 is an enlarged sectional view taken on line 2—2 of Fig. 1. Fig. 3 is an enlarged sectional view taken on line 3—3 of Fig. 1. Fig. 4 is an enlarged sectional view taken on the irregular line 4—4 of Fig. 1. Fig. 5 is an enlarged sectional view taken on line 5—5 of Fig. 1, looking toward the right. Fig. 6 is an enlarged sectional view taken on the irregular line 6—6 of Fig. 1, looking toward the right. Fig. 7 is an enlarged sectional view taken on line 7—7 of Fig. 1. Fig. 8 is an enlarged sectional view taken on line 8—8 of Fig. 1.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 10 is the frame of the machine on which is journaled a main driving shaft 11 in suitable bearings. Journaled on the frame 10 are two series of straightening rolls 12 and 13 (see Figs. 1 and 2), between which the wire passes as it comes from the reel or other source of supply, not shown. The wire as it comes from these feed rolls passes between two feed wheels 14 and 15 (see Figs. 2 and 5), the former of which is preferably grooved, as shown, to prevent lateral displacement of the wire.

Secured to the feed wheel 14 is a gear 16 meshing with a gear 17 secured to the feed wheel 15 so that when the feed wheel 14 is rotated, the feed wheel 15 is positively rotated in unison therewith. The feed wheel 15 and its driving gear 17 is journaled on a stud 18 having an eccentric shank 19 pivoted to rock in a suitable bearing 20 on the frame of the machine, and to this stud is secured an upwardly projecting arm 21 to which is connected one end of a helical extension spring 22, the other end of said spring being connected to a pin 23 fixed in any suitable manner upon the frame. This spring constantly urges the feed wheel 15 toward the feed wheel 14 and thus tends at all times to

maintain said feed wheels in driving engagement with the wire which passes therebetween. If at any time it be desired to stop the feed of wire at that point, the stud 18 may be rocked manually by grasping the arm 21 and lifting the feed wheel 15 out of contact with the wire.

Secured to the feed wheel 14 is a ratchet 24, the purpose of which will be hereinafter explained, said ratchet together with said feed wheel and the gear 16 constituting in effect a single rotating body, on one side of which is located a suitable friction washer 25 and on the other side of which is located a suitable friction washer 26, the washer 25 bearing against a friction disk 27 secured to the driving shaft 11 and the washer 26 bearing against a friction ring 28 slidably, but non-rotatably connected to said disk by two pins 29 secured to said ring and extending into holes 30 provided in the hub of said disk.

A ring 31 bearing against the ring 28 is yieldingly held thereagainst by a series of helical compression springs 32, respectively, surrounding pins 33 secured to the ring 31, said springs being located, respectively, in pockets 34 formed in a collar 35 having screw-threaded engagement with the hub of the disk 27. By rotating the collar 35 on the hub of the disk 27 to the right or to the left, the tension of the springs 32 may be varied, thus determining the frictional engagement between the friction washers 25 and 26 and the faces against which they bear. The collar 35 is maintained in its proper adjustment by a set screw 36 having screw-threaded engagement therewith (see Fig. 2) and bearing against the hub of said disk. By the mechanism just described, which will be hereinafter referred to as the first feeding mechanism, when the driving shaft 11 is rotated, the feed wheels 14 and 15 are frictionally driven.

Secured to the driving shaft 11 is a bevel gear 37 (see Fig. 5) meshing into a bevel pinion 38 secured to a vertical shaft 39 journaled in a suitable bearing 40 on the frame of the machine, said shaft having secured to its upper end a bevel gear 41 (see Figs. 2 and 3) meshing into a bevel pinion 42 secured to a horizontal shaft 43 journaled in suitable bearings 44 and 45 on the frame of the machine.

The wire after passing between the feed wheels 14 and 15 passes between a set of straightening rolls 46 (see Fig. 1) and thence between two feed wheels 47 and 48 (see Figs. 3 and 6). Preferably the two sets of feed wheels are arranged with their directions of feed transversely of each other, since by this arrangement they may be placed very close to each other and the machine is therefore more compact. Between the feed wheels 14 and 15 and the feed wheels 47 and 48, the wire is slack and preferably in the form of a loop, as shown in Fig. 1, so that the first feed wheels feed wire to this loop and the second feed wheels feed wire from this loop, the loop constituting a supply for the second feed wheels to draw from.

Secured to the feed wheel 47 is a gear 49 (see Figs. 3 and 6) meshing into a gear 50 secured to the feed wheel 48 so that said feed wheels are positively rotated in unison. The feed wheel 48 and its gear 49 are journaled on a stud 51 having an eccentric shank 52 pivoted in a suitable bearing on the frame of the machine. Projecting from this stud is an arm 53 (see Fig. 6) to which is connected in any suitable manner one end of a helical extension spring 54, the other end of said spring being secured to a fixed pin 55. This spring tends at all times to draw the feed wheel 48 toward the feed wheel 47 and thus tends to maintain the peripheries of said feed wheels in driving contact with the wire which passes therebetween. The feed wheel 48, however, may be manually disengaged from the wire by grasping the arm 53 and lifting the same against the tension of the spring 54, thus rocking the stud 51 about the axis of its eccentric shank 52.

The feed wheel 47 is preferably grooved, as shown, to prevent lateral displacement of the wire. The feed wheel 47 and its gear 49 constitute in effect a single rotating body on one side of which is located a friction washer 56 and on the other side of which is located a friction washer 57, the former bearing against a friction disk 58 secured to the shaft 43 and the latter bearing against a friction ring 59. The friction disk 58 and friction ring 59 are slidably, but non-rotatably connected to each other by a plurality of pins 60 secured to said ring and projecting into holes 61 formed in the hub of said disk.

A ring 62 bearing against the friction ring 59 is yieldingly held thereagainst by a series of helical compression springs 63, respectively, surrounding pins 64 secured to the ring 62, said springs being located, respectively, in pockets 65 formed in a collar 66 having screw-threaded engagement with the hub of the friction disk 58. This collar serves as a means of adjusting the tension of the springs 63 to vary the frictional driving effect which is exerted upon the feed wheel 47 and gear 49, such adjustment being accomplished by rotating said collar in the proper direction, after which said collar is held in fixed position by a set screw 67 (see Fig. 2) having screw-threaded engagement therewith and bearing against the hub of the friction disk 58.

By the mechanism just described, which will be hereinafter referred to as the second feeding mechanism, the feed wheels 47 and

48 are frictionally driven from the shaft 43 and the wire is fed from the loop hereinbefore referred to into a tapered throat 68 of a tube 69 constituting a wire guide, (see Figs. 1 and 6). This wire guide is adjustably held in a bracket 70 by means of a set screw 71 bearing against said guide, whereby said guide may be adjusted longitudinally thereof toward and away from a cutter 72 coöperating therewith. This cutter preferably consists of a disk mounted upon a stud 73 extending through a slot 74 provided with a cutter actuator 75, (see Figs. 4 and 6) there being provided a set screw 76 bearing against the upper side of said stud and adjustably limiting the upward movement of said stud in said slot.

The cutter 72 is clamped against the adjacent face of the cutter actuator 75 by a nut 77 having screw-threaded engagement with said stud. By loosening this nut when the cutter becomes dulled at any point on its periphery, said cutter may be rotated to bring a sharper point on the periphery into coöperative relation with the wire guide 69. In this way, the necessity of frequent removal of the cutter for the purpose of sharpening the same is avoided.

The cutter actuator 75 is guided in suitable ways in the bracket 70 and held in place therein by a cap plate 78 (see Fig. 6) and said cutter actuator is also capable of a certain amount of rocking movement since it is provided with a slot 79 through which the wire guide 69 passes (see Fig. 4), said wire guide thus constituting a pivot about which the actuator is capable of being rocked, as will be evident from an inspection of Fig. 4.

The bracket 70, together with the parts just described supported thereon, is adjustably secured to a table or platen 80 by means of a screw 81 passing through a slot 82 provided in said bracket, whereby said bracket is capable of being adjusted longitudinally of the line of travel of the wire.

The cutter actuator 75 is reciprocated vertically at proper intervals by a cam lever 83 having journaled thereon a cam roll 84 located in a groove 85 provided in a cam 86 secured to the driving shaft 11, said lever having secured thereto a stud 87 projecting into an irregularly shaped recess 88 provided in the cutter actuator 75. This recess has a narrow portion 89 in which the stud 87 is normally located, said stud having a close fit therein so that normally when the cam 86 is rotated a vertical reciprocatory motion is imparted to the cutter actuator 75 by the stud 87. The recess 88 has a relatively wide portion 90 equal to or greater in vertical dimension than the vertical travel of the stud 87 so that if the cutter actuator 75 be swung from the position shown in full lines in Fig. 4 to the position shown in dotted lines therein, said stud will play freely to and fro in said wide portion 90 without imparting any motion to said actuator.

In order that the cutter actuator may be moved at will into its inoperative position, there is provided a rod 91 pivotally connected thereto and extending through a hole 92 provided in the frame of the machine, said rod being provided with a notch 93 normally engaging the frame, as shown in Fig. 4, whereby the cutter actuator 75 is normally retained in driving connection with the stud 87. A helical extension spring 94 is connected at one end to the rod 91 and at its other end to the frame of the machine, this spring serving to carry the cutter actuator 75 out of operative connection with the stud 87 when the rod 91 is manually lifted into the position shown in dotted lines in Fig. 4.

Referring now to Figs. 1 and 6, it will be noted that when the cutter 72 is raised, the wire is fed across the platen 80 against a stop 95 which is preferably adjustable longitudinally of the line of travel of the wire. As the wire is fed across the platen against this stop, it passes through one of a series of longitudinal grooves 96 provided in a carrier 97 of cylindrical form secured to a shaft 98 journaled in suitable bearings 99. An intermittent rotary movement is imparted to this carrier by a pair of suitable intermittent gears 100 and 101, the former being secured to the shaft 98 and the latter being secured to a shaft 102 journaled in a suitable bearing 103. This shaft may be driven in any suitable manner, as by means of a sprocket wheel 104 connected by a chain 105 to a sprocket wheel 106 secured to the main driving shaft 11, it being understood that the ratio of the gearing just described is such as to impart the necessary motion to the carrier 97 in proper time with relation to the motion of the cutter 72.

I will now proceed to describe the support for the wire loop and the means operated by said loop for controlling the first feeding mechanism according to the expansion and contraction of said loop.

The wire loop is located in a suitable casing 107 consisting of a lateral wall 108 bent in an arc of a circle and a horizontally disposed plate 109 secured at its edges to said wall and this casing is secured in any suitable manner to the frame of the machine. The wire loop passes across and rests upon studs 110, 111 and 112 which constitute a part of the means for securing the casing to the frame. The wire passes through an eye 113 formed on or secured to an arm 114 secured to a rock shaft 115 mounted to rock in suitable bearings on the frame of the machine, said rock shaft having also secured thereto a pawl 116 (see Fig. 2) which is

adapted to coöperate with the ratchet 24. When the wire loop expands from the position shown in dotted lines in Fig. 1 to the position shown in full lines therein, it acts through the arm 114 and rock shaft 115 to carry the pawl 116 into engagement with the ratchet 24, thereby locking the feed wheel 14 against rotation.

The general operation of the machine is as follows: Assuming that the cutter 72 is lifted, the feed wheels 47 and 48 feed the wire from the guide 69 underneath said cutter and across the platen 80 into contact with the stop 95, whereupon further movement of said wire being impossible, the feeding movement imparted thereto by the feed wheels 47 and 48 ceases, since the friction washers 56 and 57 commence to slip as soon as the stop 95 resists further movement of the wire. The cutter 72 then descends and severs the wire, thus leaving a piece which is carried away from the point of cutting by the carrier 97, thus bringing another groove 96 into the line of travel of the wire. The cutter 72 having severed the wire remains in its lowered position and acts as a stop to resist feeding movement of the wire at that point. In the meantime, the first feeding mechanism has been feeding wire to the loop and thus increasing the size thereof and when said loop has expanded to a certain extent, it acts, as hereinbefore described, to carry the pawl 116 into engagement with the ratchet 24, thus locking the feed wheels 14 and 15 and consequently arresting momentarily the feeding movement of the wire at that point. The cutter 72 then rises and its restraint upon the end of the wire having been removed, the feed wheels 47 and 48 at once feed the wire forward into contact with the stop 95 and the cutting operation is repeated as before. Thus it will be understood that the cutter 72 constitutes in effect a part of the feeding mechanism, since it controls the feed of the wire by the feed wheels 47 and 48 and owing to the intermittent motion of said cutter at regular intervals a regular intermittent motion is imparted to the wire at that point. The other feeding mechanism, however, imparts a more or less irregular motion to the wire in accordance with the fluctuations in the size of the loop, since its action is controlled by the expansion and contraction of said loop.

In practice, the machine is driven at a very high rate of speed and the pawl 116 plays to and fro with great rapidity and engages with and disengages from the ratchet 24 some times with a regular movement and sometimes in a more or less irregular fashion, since the load on the first feeding mechanism is both heavy and variable and there is apt to be more or less slipping in the first feeding mechanism and consequent irregular feeding. Thus it will be apparent that if the first feeding mechanism should occasionally slip owing to such momentary overload the pawl 116 will not engage with the ratchet 24 at regular intervals and in practice its action, as before stated, is sometimes regular and sometimes is more or less irregular or in other words its feeding movement is indeterminate. Since the second feeding mechanism draws its supply from the loop, it has to overcome only the resistance of the rolls 46 and is thus enabled to impart a predeterminate feeding movement to the wire to feed the wire in accurate lengths for operation of the cutter, this being a result which was heretofore a matter of considerable difficulty where wire was being fed at high speed from a reel or other source of supply.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. A device for feeding flexible material having, in combination, mechanism for imparting a predeterminate intermittent feed to the material at one point, other mechanism for imparting an indeterminate intermittent feed to said material at another point to feed the same to the said first-named mechanism, and instrumentalities for regulating the amount of wire fed by said indeterminate intermittent feed mechanism.

2. A device for feeding flexible material having, in combination, two distinct intermittently acting feeding mechanisms for operating respectively upon the material at two different points in its length, and regulating means operated by the material between said points for controlling the amount of material fed by one of said mechanisms.

3. A device for feeding flexible material having, in combination, two distinct intermittently acting feeding mechanisms so constructed and timed relatively to each other as to form a loop of material therebetween, a support for said loop, and a regulating device for controlling the operation of one of said mechanisms, said regulating device being operated by the expansion and contraction of said loop.

4. A device for feeding flexible material having, in combination, mechanism for imparting a predeterminate intermittent feeding movement to the material at one point in its length, other mechanism for imparting an indeterminate intermittent feeding movement to said material at another point in its length, and means for regulating the length of material fed by said predeterminate intermittent feeding mechanism.

5. A device for feeding flexible material having, in combination, mechanism for imparting a predeterminate intermittent feeding movement to the material at one point in its length, other mechanism for imparting an indeterminate intermittent feeding move-

ment to said material at another point in its length, and means for regulating the length of material fed by said indeterminate intermittent feeding mechanism.

6. A device for feeding flexible material having, in combination, two distinct intermittently acting feeding mechanisms so constructed and timed relatively to each other as to provide a supply of slack material therebetween, one of said mechanisms being adapted to impart an indeterminate intermittent feed to said material and the other being adapted to impart a predeterminate intermittent feed thereto, means to regulate the length of material fed by said predeterminate intermittent feeding mechanism, and means to regulate the length of material fed by said indeterminate feeding mechanism.

7. A device for feeding flexible material having, in combination, two distinct intermittently acting feeding mechanisms so constructed and timed relatively to each other as to provide a supply of slack material therebetween, one of said mechanisms being adapted to impart an indeterminate intermittent feed to said material and the other being adapted to impart a predeterminate intermittent feed thereto, means to support and guide said slack material from one of said feeding mechanisms to the other, and means for throwing said predeterminate intermittent feed out of operation.

8. A device for feeding flexible material having, in combination, two distinct intermittently acting feeding mechanisms so constructed and timed relatively to each other as to provide a supply of slack material therebetween, one of said mechanisms being adapted to impart an indeterminate intermittent feed to said material and the other being adapted to impart a predeterminate intermittent feed thereto, means to support and guide said slack material from one of said feeding mechanisms to the other, and a locking device acting to stop the operation of said indeterminate intermittent wire feeding mechanism at irregular intervals, said locking device being operated automatically by the action of said slack material between said feeding mechanisms.

9. A device for feeding flexible material having, in combination, frictional feeding mechanism acting upon the material at one point in its length, other frictional feeding mechanism acting upon said material at another point in its length, means acting intermittently to resist the feeding movement imparted to said material by the first-named mechanism, and means acting intermittently to resist the feeding movement imparted to said material by the second-named mechanism.

10. A device for feeding flexible material having, in combination, two distinct frictional feeding mechanisms acting, respectively, upon the material at two different points in its length, means acting intermittently to resist the feeding movement imparted to said material by one of said mechanisms, whereby a supply of slack material is formed between said mechanisms, and means controlled by said slack material and acting to intermittently resist the feeding movement imparted to said material by the other of said mechanisms.

11. A device for feeding flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, means acting intermittently to stop the feeding movement imparted to said material by one of said mechanisms whereby a supply of slack material is formed between said mechanisms, and means controlled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms.

12. A device for feeding flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, means intermittently engaging the advancing end of said material and acting to stop the feeding movement imparted to said material by one of said mechanisms whereby a supply of slack material is formed between said mechanisms, and means controlled by the action of said slack material and acting intermittently to render the other of said mechanisms inoperative as to feeding said material.

13. A device for feeding flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, each of said mechanisms embodying two members having frictional driving engagement with each other, means acting intermittently to stop the feeding movement imparted to said material by one of said mechanisms whereby a supply of slack material is formed between said mechanisms, and means controlled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms.

14. A device for feeding flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, each of said mechanisms embodying two members and means normally acting to retain said members in driving connection with each other, means acting intermittently to stop the feeding movement imparted to said material by one of said mechanisms whereby a supply of slack material is formed between said mechanisms, and means con-

trolled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms.

15. A device for feeding and cutting flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, cutting means acting intermittently to and fro across the path of said material to sever a piece from the same and hold said material against the action of one of said mechanisms, such stopping of said material acting to form a supply of slack material between said mechanisms, and means controlled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms.

16. A device for feeding and cutting flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, cutting means acting intermittently to and fro across the path of said material to sever a piece from the same and hold said material against the action of one of said mechanisms, such stopping of said material acting to form a supply of slack material between said mechanisms, means controlled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms, and means whereby the operation of said cutting means may be discontinued at will.

17. A device for feeding and cutting flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, cutting means acting intermittently to and fro across the path of said material to sever a piece from the same and hold said material against the action of one of said mechanisms, such stopping of said material acting to form a supply of slack material between said mechanisms, means controlled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms, and means to carry the severed pieces of said material away from the point of cutting.

18. A device for feeding and cutting flexible material having, in combination, two distinct feeding mechanisms acting, respectively, on the material at two different points in its length, cutting means acting intermittently to and fro across the path of said material to sever a piece from the same and hold said material against the action of one of said mechanisms, such stopping of said material acting to form a supply of slack material between said mechanisms, means controlled by the action of said slack material and acting intermittently to stop the feeding movement imparted to said material by the other of said mechanisms, a carrier to receive the severed pieces of said material, and means to impart an intermittent movement to said carrier to carry said pieces successively away from the point of cutting.

19. A device for feeding flexible material having, in combination, two distinct feeding mechanisms for operating respectively upon the material at two points in its length, and means under the control of the material between said points for regulating the rate of feed imparted to said material by one of said mechanisms.

In testimony where. I have hereunto set my hand in presence of two subscribing witnesses.

DANIEL E. KEMPSTER.

Witnesses:
CHARLES S. GOODING,
LOUIS A. JONES.