

Nov. 4, 1930.

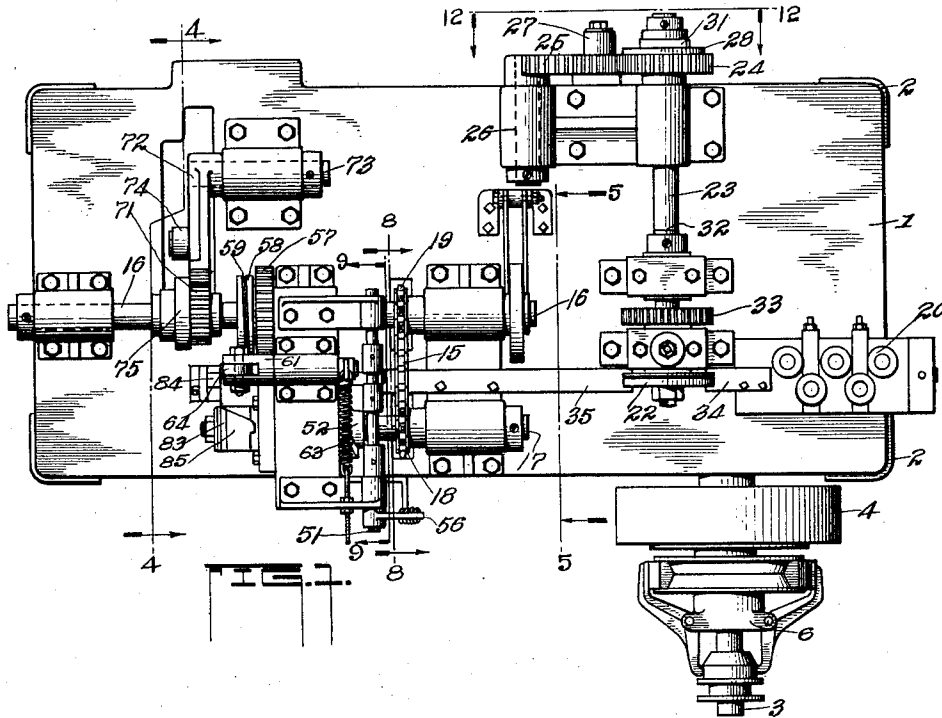
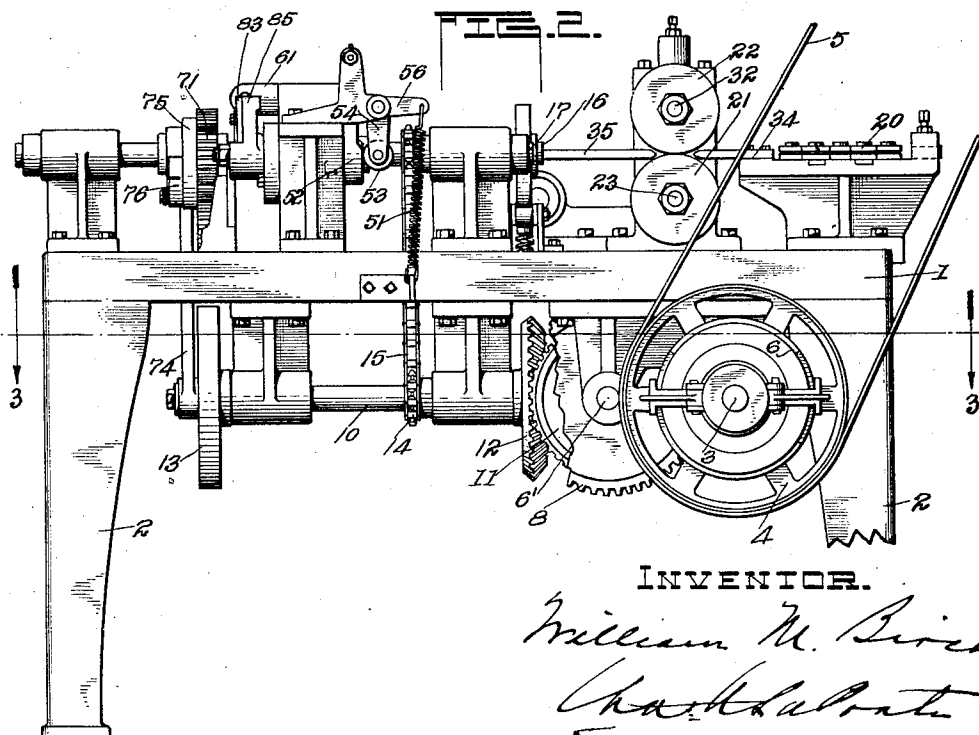
W. M. BIRCH

1,780,374

WIREWORKING MACHINE

Filed March 28, 1929

6 Sheets-Sheet 1



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Nov. 4, 1930.

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1,780,374

WIREWORKING MACHINE

Filed March 28, 1929

6 Sheets-Sheet 2

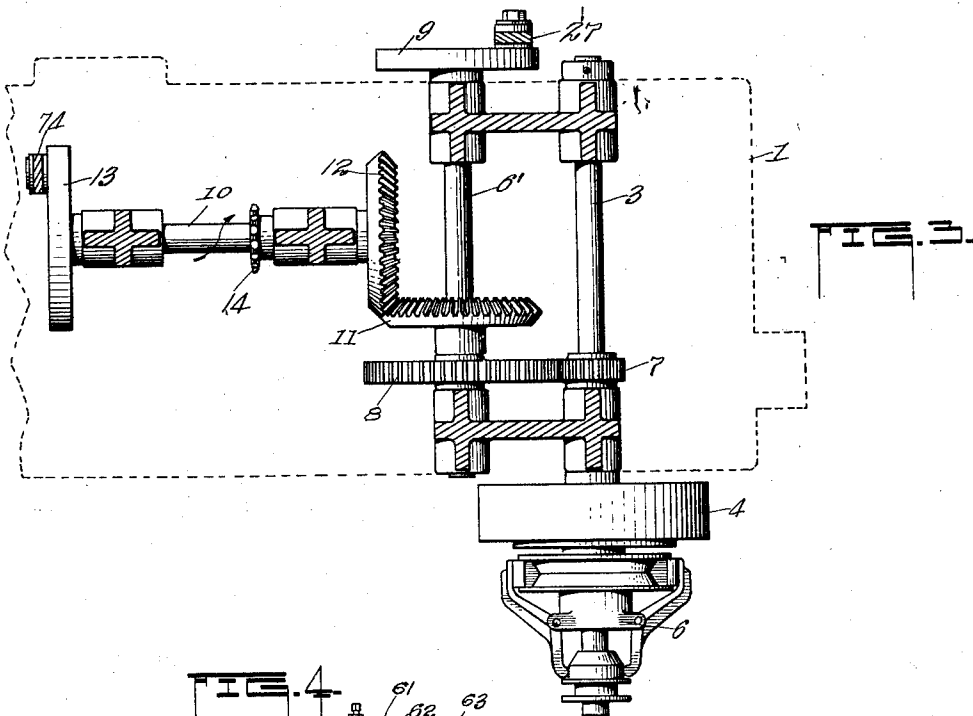


FIG. 3.

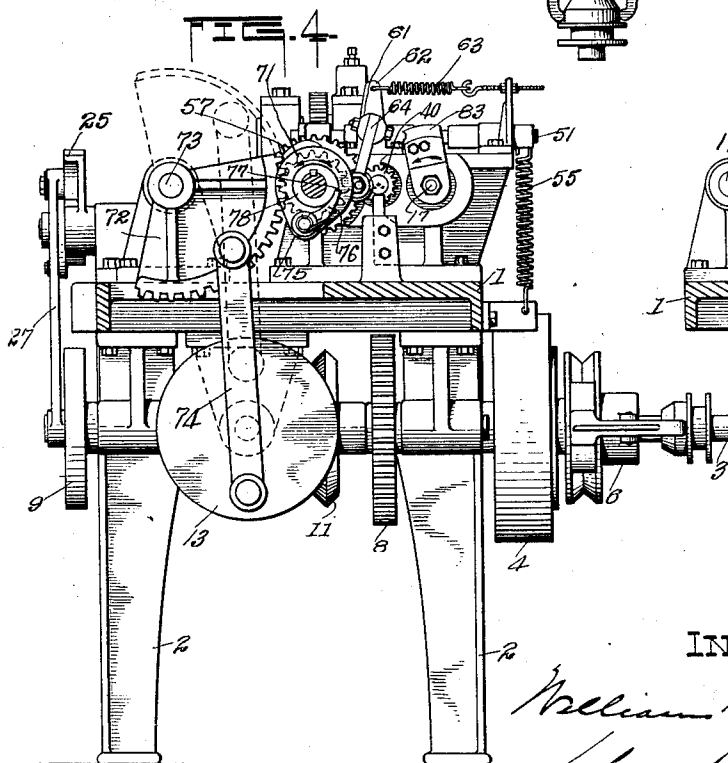


FIG. 4.

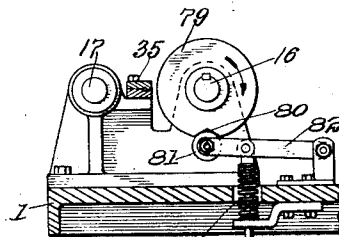


FIG. 5.

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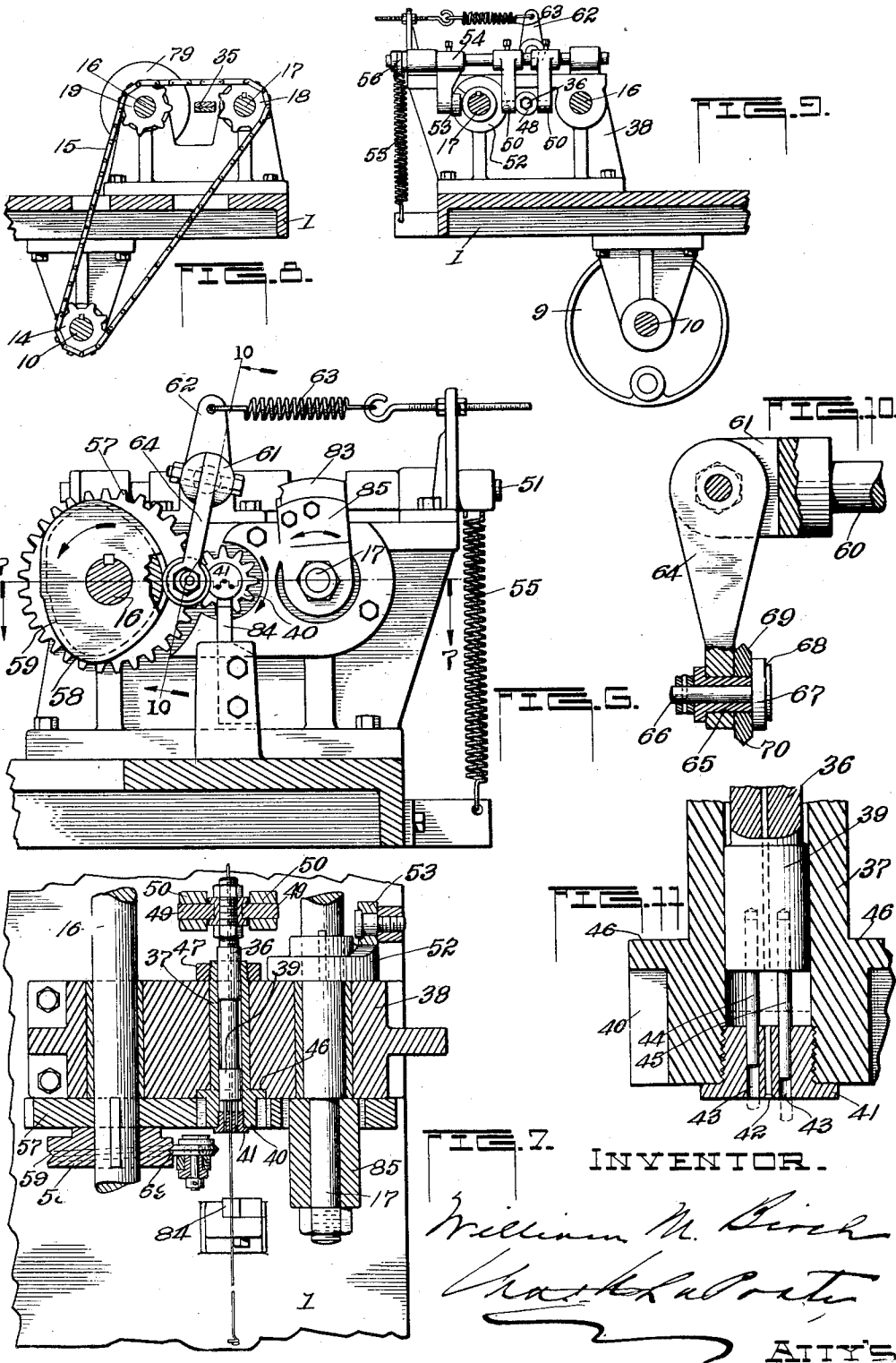
W. M. BIRCH

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WIREWORKING MACHINE

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6 Sheets-Sheet 3



Nov. 4, 1930.

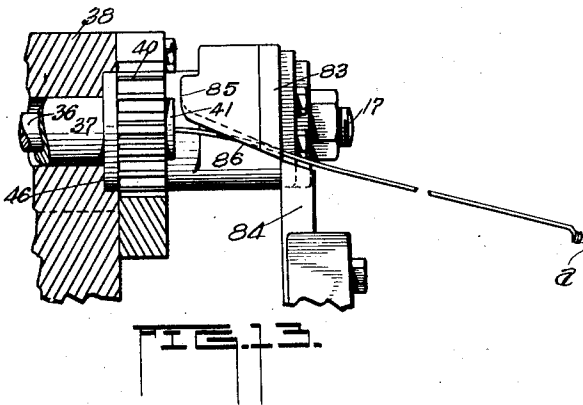
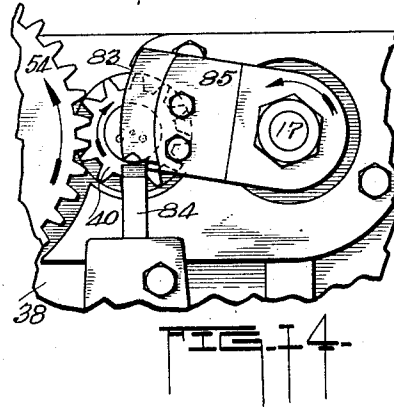
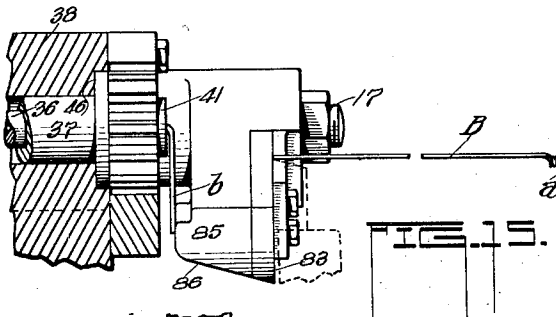
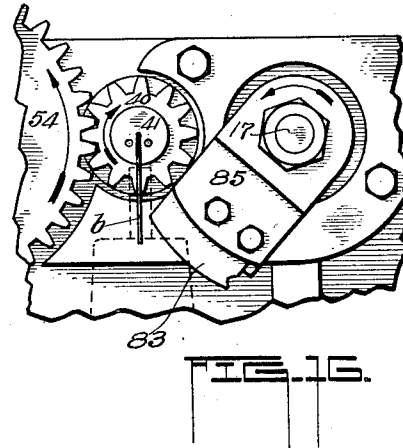
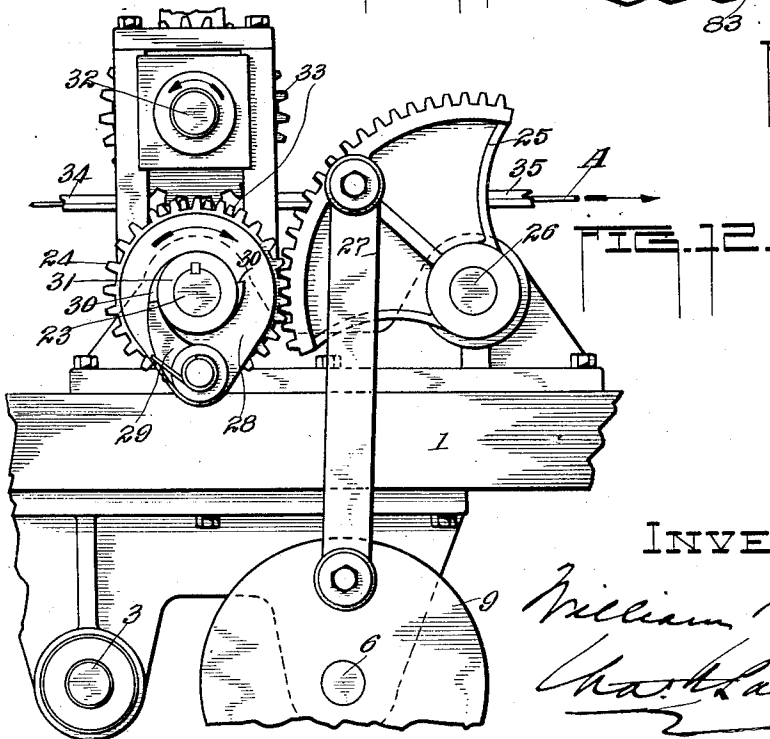
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WIREWORKING MACHINE

Filed March 28, 1929

6 Sheets-Sheet 4



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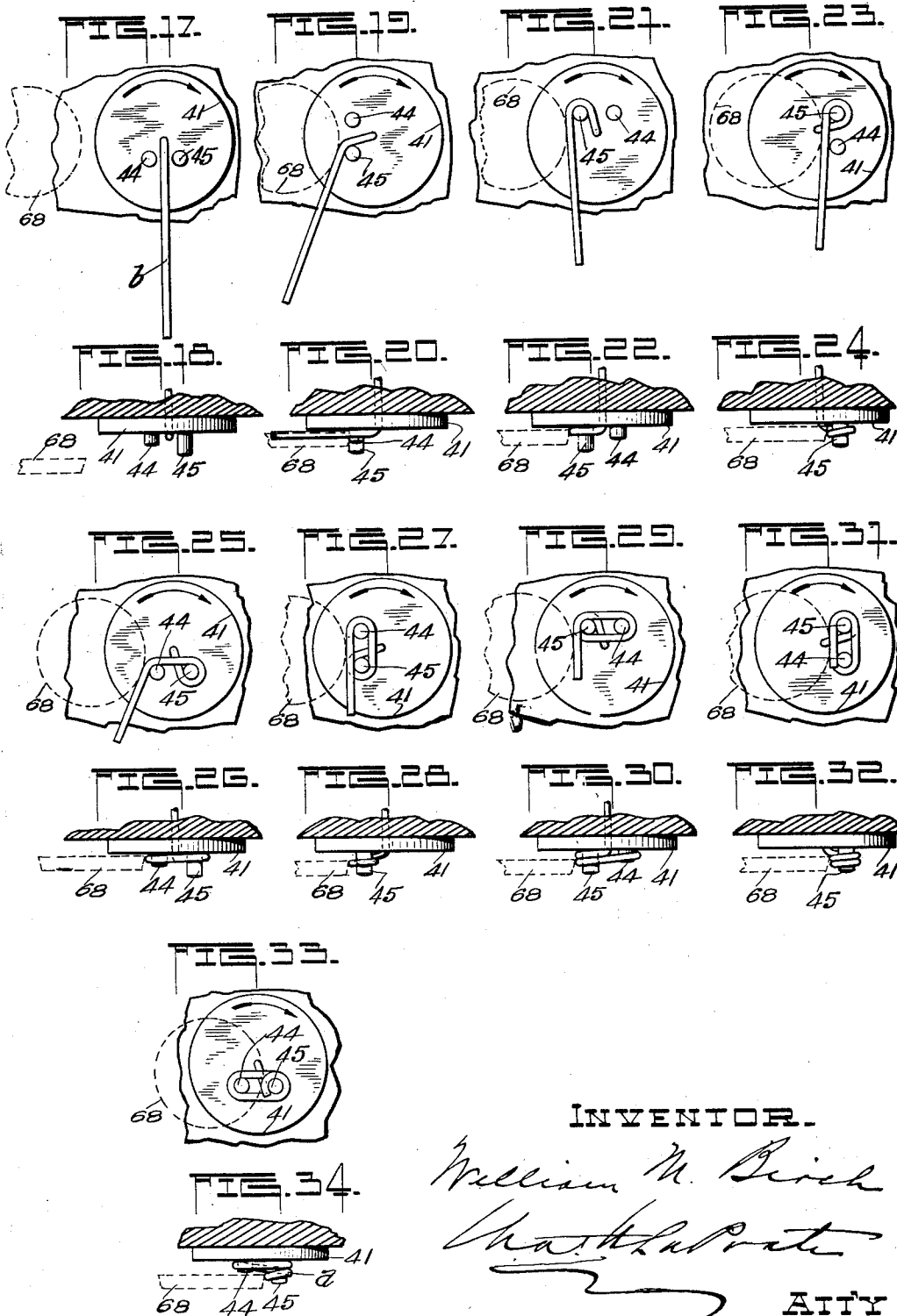
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1,780,374

WIREWORKING MACHINE

Filed March 28, 1929

6 Sheets-Sheet 5



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1,780,374

WIREWORKING MACHINE

Filed March 28, 1929

6 Sheets-Sheet 6

FIG. 39.

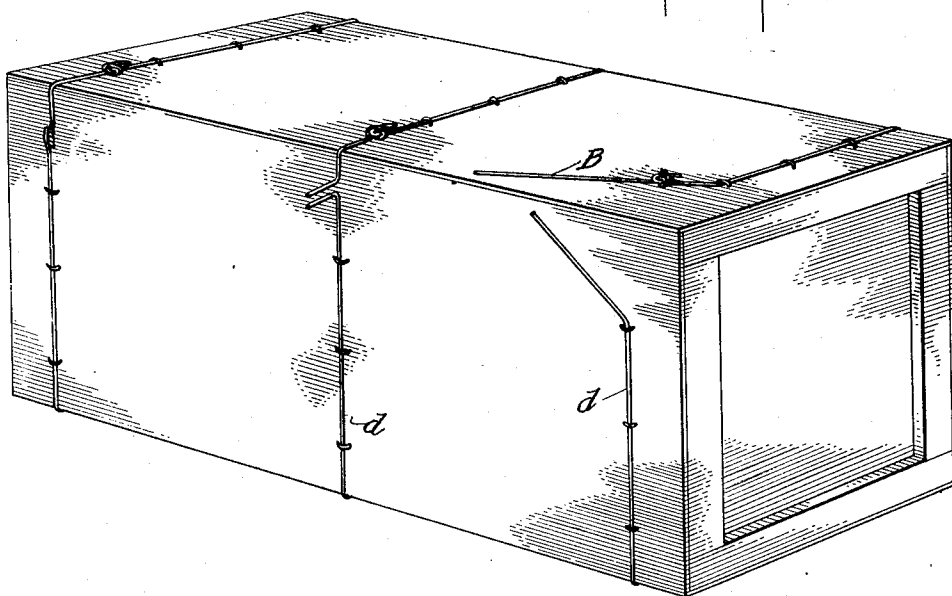


FIG. 36.

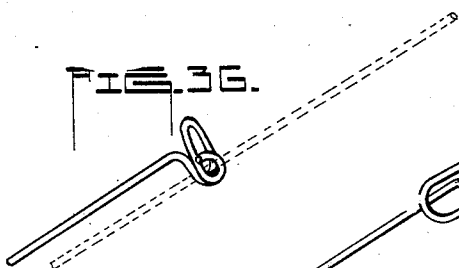


FIG. 37.

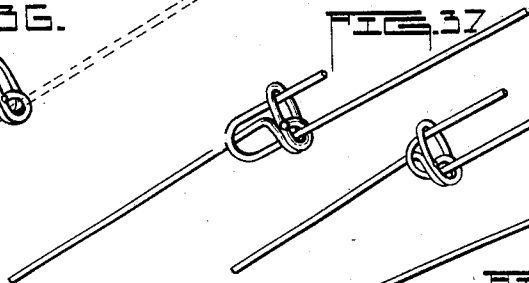


FIG. 38.

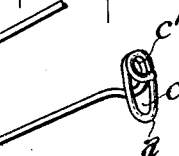
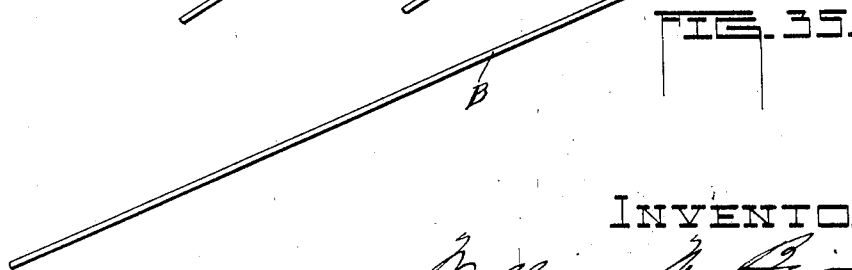


FIG. 35.



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# UNITED STATES PATENT OFFICE

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## WIREWORKING MACHINE

Application filed March 28, 1929. Serial No. 350,645.

This invention has reference to a wire working machine and it has for its principal object to provide an automatic machine for the manufacture of wire splices which, when used, will permit the reuse of wire bound boxes or other receptacles reinforced or bound with wire; such splices being used with the free ends of the wires of such a box or receptacle to rebind and to secure the box or receptacle.

port therefor and as the same would appear on the line 10—10, Fig. 6, looking in the direction of the arrows;

Fig. 11 is a detail in section showing the looping end of the twister head;

Fig. 12 is an enlarged detail or spot view showing the wire feeding means and operating means therefor as the same would appear on line 12—12, Fig. 1;

Figs. 13 and 14 are side and face views, respectively, showing in detail the cutter mechanism in the position at the moment of cutting a formed splicer wire from a wire length;

Figs. 15 and 16 are views somewhat similar to Figs. 13 and 14, respectively, the movable cutter having moved past its cutting position and formed the first bend in that portion of the end of a wire length which subsequently becomes the looped portion of the splicer wire;

Figs. 17 to 34, both inclusive, show in series and in pairs, in elevation and in plan, as for instance Figs. 17 and 18—Figs. 19 and 20—Figs. 21 and 22—respectively, etc., the successive steps in the continuous operation of the twister head and wire laying device during the formation of and completion of the splicing wire, the wire laying device being shown in dotted lines;

Fig. 35 is a perspective view of a splicing wire, such as may be made on my wire working machine;

Figs. 36 to 38 both inclusive show the steps in the method of attachment of the splicing wire to one end of one of the box wires, and

Fig. 39 is a perspective view of a wire bound box to which splicer wires have been applied showing the various operations.

Like characters of reference denote corresponding parts thruout the figures.

A bed-plate 1, above and below which are mounted and journaled certain operative parts of the mechanism, is supported on legs 2.

Operative parts are actuated by and receive power from and thru a main drive shaft 3, on one end of which is loosely carried a pulley-wheel 4 belted to any suitable source of power thru a belt 5, a clutch means 6 on

Such a splicing wire as is proposed to be manufactured by my wire working machine forms the subject matter of Letters Patent to A. L. Roebuck, No. 1,650,741, dated November 29, 1927, to which attention is directed for the uses and purposes of such a splice.

That the invention may be more fully understood, reference is had to the accompanying drawings forming part of this description, illustrating a preferred embodiment of the invention, in which:—

Fig. 1 is a plan view of a machine, on a somewhat reduced scale, which embodies my invention;

Fig. 2 shows in elevation, one side of the machine;

Fig. 3 is a cross-section, in plan, showing certain driving parts and as the same would appear, if taken on the line 3—3, Fig. 2;

Fig. 4 is an elevation, partly in section, as the same would appear if taken on the line 4—4, Fig. 1;

Fig. 5 is a detail or spot view in elevation and in section showing a certain locking means and as the same would appear if taken on the line 5—5, Fig. 1;

Fig. 6 is a detail or spot view, in elevation and section of certain parts appearing in Fig. 4;

Fig. 7 is a cross-section in plan as the same would appear if taken on the line 7—7, Fig. 6;

Fig. 8 is a detail or spot view, in elevation and section, as the same would appear if taken on the line 8—8, Fig. 1;

Fig. 9 is a detail or spot view, in elevation and section as the same would appear if taken on the line 9—9, Fig. 1;

Fig. 10 is an enlarged detail view in section showing the wire laying device and sup-

said shaft 3 adapted for clutching and de-clutching the pulley-wheel 4 with said shaft.

A counter-shaft 6' receives its power and is operated from the driving shaft 3, thru gearing 7 and 8 and on one end of said shaft 6' is carried a crank-disk 9, see Figs. 3 and 12, arranged to impart an intermittent feeding movement to wire feeding mechanism, to be described for feeding a feed wire from which the formed splicing wires are severed. The driving and counter-shafts are in spaced parallel relation below and transverse to the bed-plate 1, see Fig. 3.

Disposed longitudinally of and below the bed-plate 1 is a crank-shaft 10 which receives its power from and is geared to the counter-shaft 6' by means of the mitre-gears 11 and 12 and on one end of said shaft 10 is carried a crank-disk 13, see Figs. 3 and 4, arranged to impart an intermittent movement to certain gearing, to be described, for imparting rotative movement to a cam-shaft 16 and to a twister head, also to be described. Also secured to said crank-shaft 10 is a sprocket-wheel 14, see Figs. 3 and 8, arranged to operate a sprocket-chain 15, which in turn operates a cutter-shaft 17 thru engagement of a sprocket-wheel 18 carried by said cutter-shaft, the said chain 15 carried over a sprocket-wheel 19 loose on the cam-shaft 16. The cam and cutter-shafts are journaled above the bed-plate 1, as shown.

The wire straightener 20, Figs. 1 and 2, is not unlike devices of like character used in wire working machines generally and the same is mounted on top of the bed-plate 1 in association with coacting wire feeding wheels 21 and 22, of the usual structure. The wheel 21 is carried on the driving shaft 23 on which is loosely carried a gear wheel 24 in mesh with and operated by a toothed segment 25 on a short shaft 26 and to said segment 25 is pivotally connected one end of an arm or bar 27, the opposite end of which has a pivotal connection with the crank-disk 9. The rotation of the disk 9 imparts a reciprocal movement to the arm or bar 27, which in turn imparts alternate oscillation to the toothed segment 25 which in turn imparts rotative movement to the gear 24. To the gear 24 is secured a plate 28 and said plate carries a pawl 29 yieldingly urged into contact with diametrically located teeth 30 on a collar 31 keyed to the driving shaft 23. The ratio of gear 24 to the segment 25 and the disposition of the teeth 30 is such, that the driving shaft 23 is caused to make one half revolution to each down stroke of the segment 25, altho this may be changed as practice may dictate. The feed wheel 22 is carried on a driver-shaft 32 and the said driving and driver-shafts 23 and 32 are geared together thru gearing 33, whereby the feed wheels 21 and 22 are positively actuated. The feed wire leaving the straightener 20 passes thru

a guide 34 and from the feed wheels the feed wire passes thru a guide 35 to and thru the twister head 36.

The twister comprises an elongated body which is reciprocally and rotatively carried in a tubular sleeve 37 journaled in a bearing member 38 and said twister has bearing portions 39 in said sleeve, see Figs. 7 and 11. The sleeve at its forward end is formed or provided with a gear pinion 40 and in the front face and axially of the pinion there is screwed into the sleeve a removable head 41 provided with an axial opening 42 therethru, thru which the feed wire which passes thru the twister, also passes, and arranged in said head 41 and disposed on opposite sides of the opening 42 and offset thereto are guide openings 43 into and thru which are reciprocally movable, wire looping or coiling pins 44 and 45 which are secured in the forward end of the twister body 39, best seen in Fig. 11. The pins 44 and 45 are of different lengths, to function, in a manner to be described and as best illustrated in Figs. 17 to 34, both inclusive. The sleeve 37 is shouldered at its forward end in the bearing member 38, as at 46, see Fig. 7, and at its rear end has threaded thereon the nut 47 and such structure prevents endwise movement of said sleeve but permits its removal, as will be understood. The rear or wire entrance end of the twister 36 has adjustably held thereon a grooved collar 48, in the groove of which act pins 49 connected with rocker arms 50 which are adjustably secured to a rock-shaft 51 suitably journaled for oscillation on the bearing member 38, see Fig. 9. The rock-shaft is cam actuated to cause the rocker-arms to be moved to retract the twister 36 and pins 44 and 45 to inoperative position and a spring acts to move said twister and pins forward to operative positions. This is accomplished by the following means:—There is secured to the cutter-shaft 17, see Figs. 7 and 9, a cam 52 against which acts a roller 53 carried by an arm 54 adjustably secured to the rock-shaft 51, so it will be apparent that as the cutter-shaft 17 is rotated, the cam 52 will oscillate the arm 54 and rock the shaft 51, and the rocker-arms 50 being oscillated thereby will slide or retract the twister-head 36, and such movement is against the resistance of a spring 55, see Figs. 2, 4, 6 and 9, one end connected to the machine frame and the other end connected to an arm 56 secured to the rock-shaft 51, so that as the cam 52 moves out of action the spring 55 will act to move the twister head to its forward and operative position, the pins 44 and 45 being projected thru the head 41 into the looping position seen in Figs. 17 to 34, both inclusive.

The twister 36 and its sleeve 37 are intermittently operated from the cam-shaft 16 through a gear wheel 57 secured thereto and in mesh with the pinion 40 on the sleeve 37,

see Figs. 6 and 7. Also secured to said shaft 16 and preferably next adjacent the gear wheel 57 is a cam-disk 58. Such disk has approximately the peripheral contour shown in Fig. 6, whereby to impart oscillatory movement to a certain wire laying device, in a direction transverse to the axis of the twister 36, and in the periphery of said disk and circumscribing the same there is formed or provided a preferably V-shaped groove 59, see Fig. 7, and said groove has a sinuous formation, whereby to impart to said wire laying device simultaneous with the oscillatory movement transverse to the axis of the twister, a limited movement axially of the twister, which said movements of the wire laying device, in coaction with the looping pins 44 and 45 of the twister will result in the formation of the looped end on the spliced wire, substantially as shown in Figs. 17 to 34, both inclusive. Such wire laying device comprises a spindle 60 journaled on the machine frame in a manner to permit it to have a rockable motion in its bearing and one end is forked, as at 61, and to its opposite end is connected an arm 62, to which is connected one end of a spring 63, the opposite end being connected to a frame part, see Figs. 1 and 6, and pivoted within and depending from the forked end 61 of said spindle 60 is a rocker-arm 64 thru the lower end of which protrudes a flanged bushing or sleeve 65 in which is journaled a short spindle 66 to one end of which is connected a shoulder wire engaging head 67, the head being shouldered so as to form or provide an annular tapered wire seat 68. Between the head 67 and the body of the rocker-arm 64 and rotatable on the bushing or sleeve 65, is a disk 69, the periphery of which is oppositely tapered or V shaped, as shown at 70, see particularly Fig. 10. The tapered periphery of said disk 69 conforms to the V shaped groove 59 in the periphery of the cam-disk 58 and is operatively seated therein, as shown in Figs. 6 and 7, whereby, as the cam-disk is rotated the disk 69 is moved transversely of the axis of the twister 36, while at the same time moved axially of the twister, such movement being permitted by the rockable movement of the spindle 60 and the oscillatory movement of the rock-arm 64, which carries the disk 69 and the head 67. While the cam 58 controls the movement of the disk 69 and head 67, the spring 63 acts to hold the disk 69 in coaction with the cam 58.

The cam-shaft 16 is adapted to be intermittently rotated and this is accomplished in the following manner:—On the cam-shaft 16 there is loosely carried a gear wheel 71 in mesh with and operated by a toothed segment 72 on a short shaft 73 and to said segment 72 is pivotally connected one end of an arm or bar 74, the opposite end of which has a pivotal connection with the crank-disk 13,

such parts being best illustrated in Figs. 1 and 4. The rotation of the disk 13 imparts a reciprocal movement to the arm or bar 74, which in turn imparts alternate oscillation to the toothed segment 72 which in turn imparts rotative movement to the gear 71. To the gear 71 is secured a plate 75 and said plate carries a pawl 76 yieldingly urged into contact with a tooth 77 on a collar 78 keyed to the cam-shaft 16. The arrangement of the operative parts for the cam-shaft 16 is such that with each down stroke of the segment 72 the cam-shaft is caused to make one revolution, altho this may be changed as practice may dictate.

In the timing of the several operative parts controlling the wire laying device, it is desirable during each alternate stroke of the segment 72 to lock or hold the cam-shaft 16 preparatory to its next and successive operations. On the rear end of said cam-shaft 16, see Figs. 1 and 5, a disk 79 is secured, in the periphery of which, at a predetermined point, there is provided a notch 80 into which enters, at each complete rotation of the shaft 16, a locking roller 81 carried on the end of a pivoted arm 82 with a spring 83 operative to urge the roller against the periphery of the disk 79 to insure its seating itself into the notch 80 and lock or hold the shaft 16 at the end of each complete revolution.

The cutter shaft 17 is adapted to be continuously rotated and it has secured thereto on its forward end, corresponding to the operative end of the twister 36, a cutter member 83 which is adapted, during its rotation to coact with a stationary cutter member 84 mounted on the bed-plate 1, see Figs. 1 and 13 to 16, both inclusive. The cutter members 83 and 84 are operative a predetermined distance forward of the operative end of the twister 36, as best seen in the last mentioned figures, and said movable cutter member 83 forms a facing for and is associated with a wire deflector and shaper 85. The active portion of the deflector and shaper is inclined downwardly and away from the operative end of the twister 36, as shown at 86, see particularly Fig. 13, and at its outer end portion terminates in the movable cutter 83, so that as the deflector and shaper and cutter are rotated by the cutter-shaft 17, the deflector and shaper engaging the feed wire will depress it in the manner seen in Fig. 13 and during such depressing action, the cutters 83 and 84 act to sever a formed splicer wire from the feed wire and the depressor and shaper during its continued movement forms the initial bend in the end of the feed wire, see Fig. 15, preparatory to the formation of the looped or coiled end on the completed splicer wire, see Fig. 35.

In the operation of the machine a feed wire A is threaded thru the straightener 20, thence between the feed rollers 21 and 22 by

means of which said wire is alternately projected and fed through the twister 36. Assuming that the end of the feed wire has been looped or coiled to produce the looped and coiled head or end *a* thereon, see Figs. 13, 15 and 35, and the wire fed or projected to provide the length of splicer wire *B*, see Fig. 35, the depressor and deflector 85 and associated cutter 83 move to the position seen in Fig. 13 and the depressor and deflector caused to depress the wire length and simultaneously sever the formed length *B* from the feed wire. The depressor and deflector continues on and bends the initial bend *b* in the feed wire *A*, projecting thru the operative end of the twister 36. The pins 44 and 45 in the twister then being projected into looping or coiling position, the parts assume a position, such as shown in Figs. 17 and 18, with the head 67 of the wire laying device, shown in dotted lines having a relation with the twister, as shown in said Figs. 17 and 18. The successive steps in the operation of these parts, by means of which the looped head or end *a* is formed, being illustrated in Figs. 19 to 34, both inclusive. At this point it is pointed out that the ratio between the gear wheel 57 on the cam-shaft 16 and the gear pinion 40 operative with the twister 36 is such that the twister 36 is caused to make three revolutions to one revolution of the cam-shaft 16 and it is during two complete revolutions of the twister that the head *a* on the end of the feed wire *A*, is formed from the initial bent portion *b*, previously described. During such formation of the head *a* by and on the pins 44 and 45 in the twister, the cam 58 operates on the disk 69, with the assistance of the spring 63, to move the head 67 into engagement with the initial bent portion *b* of the wire and cause a seating of such bent portion of the wire *b* into the grooved seat 68 on the head and thereby insures the laying of the bent portion of the wire *b* against the pins 44 and 45 and to permit the coiling or looping of the wire into the form of the elongated or oval head *a*, which, as shown, has the opening therethru divided into a pair of eyes *c* and *c'* adapted for the connection therewith of a binding wire *d*, substantially as shown in Figs. 36 to 39, both inclusive, and in the manner shown and described in the A. L. Roebuck patent previously referred to.

While I have elected to show the use of the machine as being designed especially to make "Roebuck" splicer, it is to be pointed out that a head on the end of a wire, such as may be made by my machine, may have many and various uses and it is, therefore, contemplated that articles may be made not strictly limited for use as splicers.

It will be obvious that my invention is susceptible of modification, and I do not wish to be restricted to the precise construction

shown and described, except as defined in the appended claims.

What I claim is:—

1. In a wire working machine, a looping means, means to feed a wire to said looping means, said looping means operative to shape the end of the wire into an elongated looped head having a pair of eyes, and means coacting with said looping means to assist in the formation of said head.

2. In a wire working machine, a looping means, means to feed a feed wire to said looping means, said looping means operative to shape the end of the feed wire into an elongated looped head having a pair of eyes, means coacting with said looping means to assist in the formation of said head, said feeding means operative on the formation of a head on the wire to project the wire a predetermined distance, and means to sever the headed length of wire from said feed wire and to initially bend the end of the feed wire.

3. In a wire working machine, a rotatable twister, means to feed a wire thru the twister, means on the twister adapted to coil the end of the wire on itself to produce a head having a pair of eyes, and means coacting with said coiling means to assist in the formation of said head.

4. In a wire working machine, a rotatable twister, means to feed a wire thru the twister, means on the twister adapted to coil the end of the wire on itself to produce a head having a pair of eyes, and means coacting with said coiling means to assist in the formation of said head, said last mentioned means adapted to have movement, during the coiling operation, transversely to and axially of said twister.

5. In a wire working machine, a rotatable twister, means to feed a feed wire thru the twister, means on the twister adapted to coil the end of the wire on itself to produce a head having a pair of eyes, means coacting with said coiling means to assist in the formation of said head, said feeding means operative on the formation of a head on the wire to project the wire a predetermined distance, and means to sever the headed length of wire from the feed wire and to initially bend the end of the feed wire into engaging position by said coiling means.

6. In a wire working machine, the combination of a rotatable twister having a wire opening therethru, coiling means on the twister comprising a pair of coiling pins diametrically disposed one on either side of said wire opening, means to feed a wire thru the opening in said twister, said coiling pins operative on the end of the wire to coil it into the form of a head having a pair of eyes, and means coacting with said pins to assist in the formation of said head.

7. In a wire working machine, the combination of a rotatable twister having a wire

opening therethru, coiling means on the twister comprising a pair of coiling pins diametrically disposed one on either side of said wire opening, means to feed a wire thru the opening in said twister, said coiling pins operative on the end of the wire to coil it into the form of a head having a pair of eyes, and means coacting with said pins and engaging said wire to assist in the formation of said head, said engaging means adapted, during the coiling operation, to simultaneously move transversely to and axially of said twister.

8. In a wire working machine, the combination of a rotatable twister having a wire opening therethru, coiling means on the twister comprising a pair of coiling pins diametrically disposed one on either side of said wire opening, means to feed a feed wire thru the opening in said twister, said coiling pins operative on the end of the feed wire to coil it into the form of a head having a pair of eyes, means coacting with said pins to assist in the formation of said head, said feeding means operative on the formation of a head on the wire to project the wire a predetermined distance, and means to sever the headed length of wire from the feed wire and to initially bend the end of the feed wire into engaging position by said coiling pins.

9. In a wire working machine, the combination of a reciprocal and rotatable twister having a wire opening axially therethru, coiling means on one end of the twister comprising a pair of coiling pins diametrically disposed one on either side of said wire opening, means to intermittently project the feed wire thru the twister a predetermined distance, said coiling pins operative alternatively with the feeding means to coil the end of the feed wire into the form of a head having a pair of eyes, means coacting with the coiling pins to assist in the formation of said head, and a combined cutter and shaper operative to sever a headed length of wire from the feed wire and to initially bend the free end of the feed wire into engaging position by said coiling pins.

10. In a wire working machine, the combination of a rotatable twister having an axial wire opening therethru, a pair of coiling pins connected with the head of the twister and disposed diametrically opposite one on either side said wire opening, means to project and retract said pins to operative and inoperative positions, means to feed a feed wire thru the twisters, said pins operative to coil the end of the feed wire thereabout in the form of a head having a pair of eyes, a cutter shaft on one side of said twister, a wire laying device on the opposite side of said twister and coactive with the pins in the formation of a wire head on the feed wire, a cutter revoluble with said cutter shaft, and a stationary cutter coacting with said revoluble cutter to sever a headed wire section from said feed wire,

11. In a wire working machine, the combination of a rotatable twister having an axial wire opening therethru, a pair of coiling pins connected with the head of the twister and disposed diametrically opposite one on either side said wire opening, means to project and retract said pins to operative and inoperative positions, means to feed a feed wire thru the twisters, said pins operative to coil the end of the feed wire thereabout in the form of a head having a pair of eyes, a cutter shaft on one side of said head, a cutter revoluble therewith and having its wire cutting portion operative a short distance in front of the twister, a stationary cutter coacting with said revoluble cutter to sever a headed wire section from said feed wire, a cam shaft on the opposite side of said twister, a cam thereon, and a wire laying device between the twister and said cam shaft and operative by the cam to be moved transversely to and axially of the twister and to coact with the coiling pins in the formation of the wire head.

12. In a wire working machine, the combination with a support, of a sleeve journaled therein provided with a centering head having a wire opening and coiling pin receiving openings one on either side said wire opening, a twister revoluble with said sleeve and reciprocal therein and having an opening therethru and coiling pins adapted to be projected without the pin receiving openings in said centering head, means to project a feed wire thru said twister and said centering head, said pins operative, on being projected, to coil the end of the feed wire thereabout into a head having a pair of eyes, means to rotate said sleeve and said twister, a wire laying device coactive with said pins in the formation of said head, a cutter shaft and cutters operative to sever a headed wire section from the feed wire, and means operated by said cutter shaft to reciprocate said twister.

13. In a wire working machine, the combination with a support, of a sleeve journaled therein provided with a centering head having a wire opening and coiling pin receiving openings one on either side said wire opening, a twister revoluble with said sleeve and reciprocal therein and having an opening therethru and coiling pins adapted to be projected without the pin receiving openings in said centering head, means to project a feed wire thru said twister and said centering head, said pins operative, on being projected, to coil the end of the feed wire thereabout into a head having a pair of eyes, a cutter shaft, a cutter revoluble therewith and operative to sever a headed wire section from the feed wire, means associated with said cutter and operative immediately following the cutting action to form an initial bend in the severed end of the feed wire,

and means operated by said cutter shaft to reciprocate said twister.

14. In a wire working machine, the combination of a revoluble twister having a pair of spaced coiling pins of different lengths, means for feeding a feed wire between said pins, said pins operative to coil an end of said wire thereabout in the form of a head having a pair of wires, means to rotate said twister, a wire laying device coactive with said pins in the formation of said head, means to move said wire laying device transversely to and axially of the twister, and means to sever a headed section of wire from said feed wire.

15. In a wire working machine, the combination of a revoluble twister having a pair of spaced coiling pins of different lengths, means for feeding a feed wire between said pins, said pins operative to coil an end of said wire thereabout in the form of a head having a pair of wires, means to rotate said twister, a wire laying device coactive with said pins and movable transversely toward and from the shortest of said pins and also axially of the twister comprising a head arranged for contact with the end of the feed wire, a pivoted support for said wire laying device, a cam member to impart movement to said wire laying device, and means to sever a headed section of wire from said feed wire.

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