H. J. HICK.

WIRE COILING MACHINE.

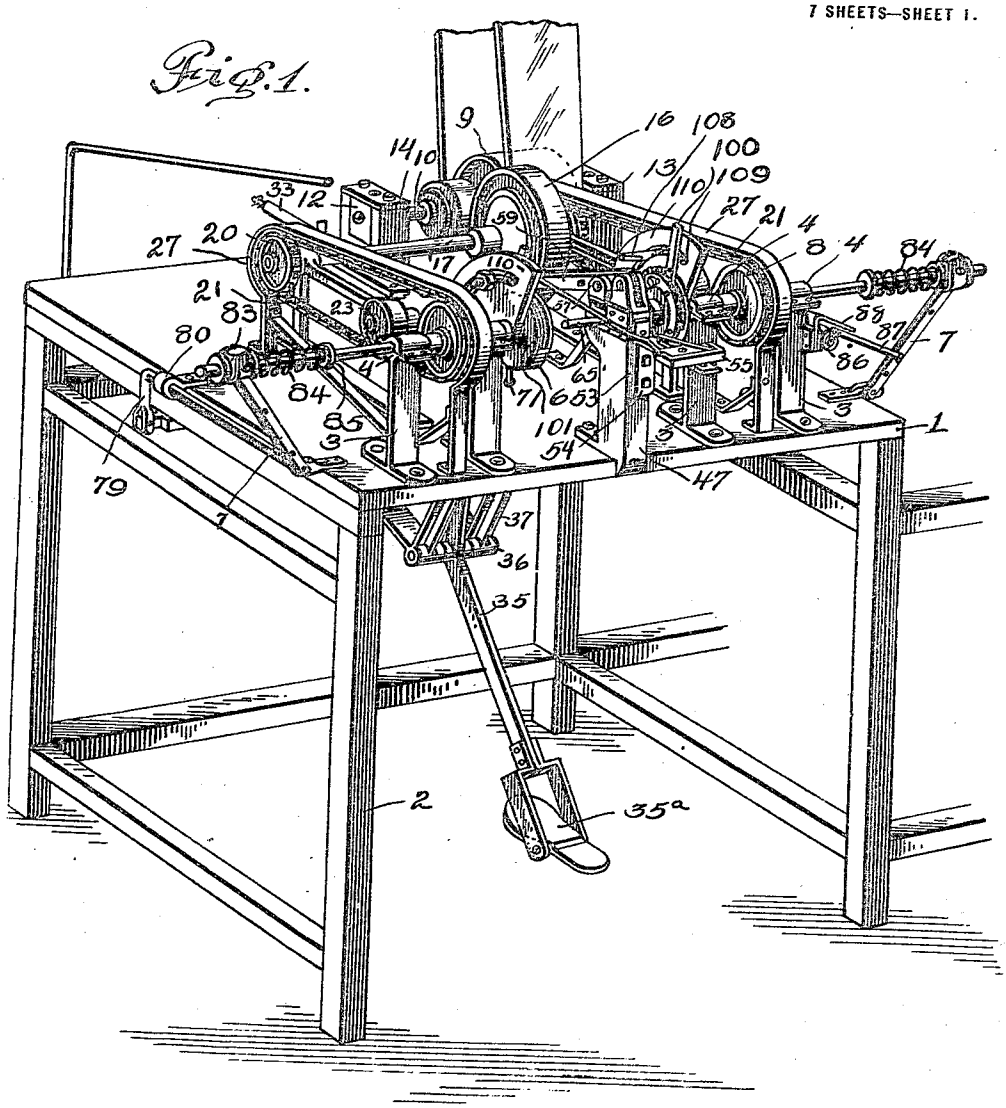
APPLICATION FILED JULY 2, 1915.

1,192,631.

Patented July 25, 1916.

7 SHEETS—SHEET 1.

Fig. 1.




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7 SHEETS—SHEET 2.

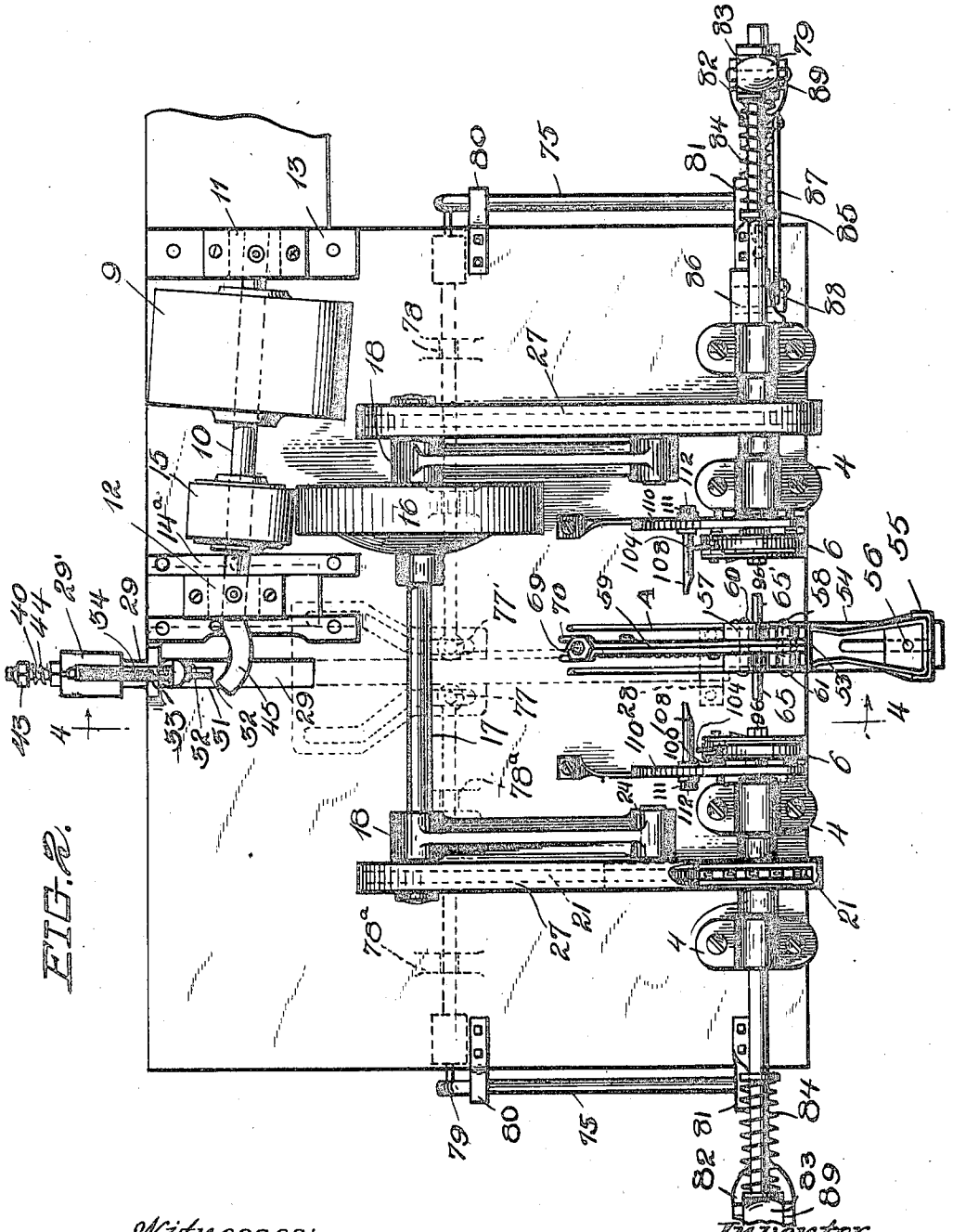


FIG. 2.

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7 SHEETS—SHEET 3.

FIG. 3.

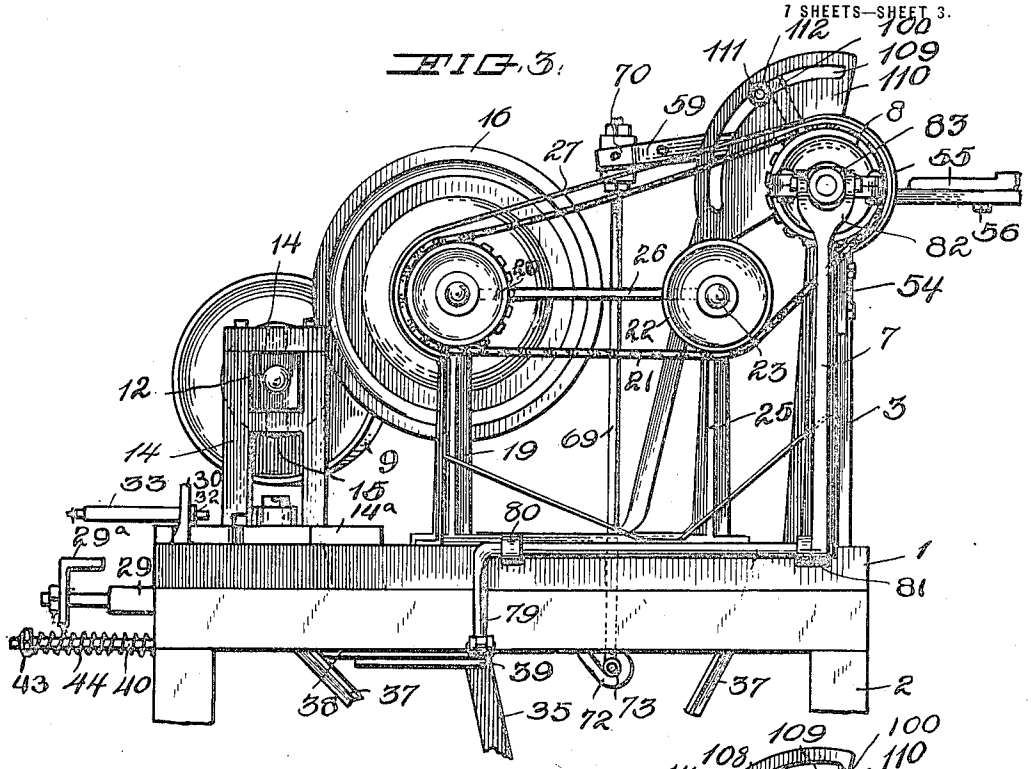
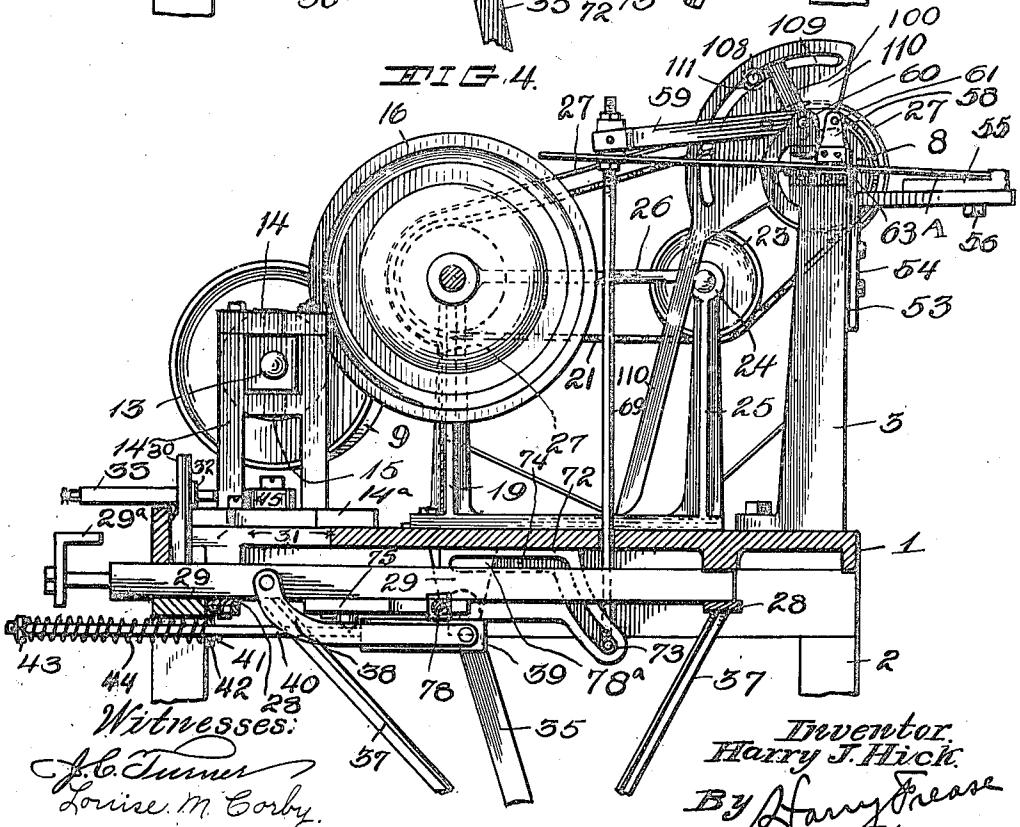



FIG. 4.




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7 SHEETS—SHEET 4.

FIG. 5.

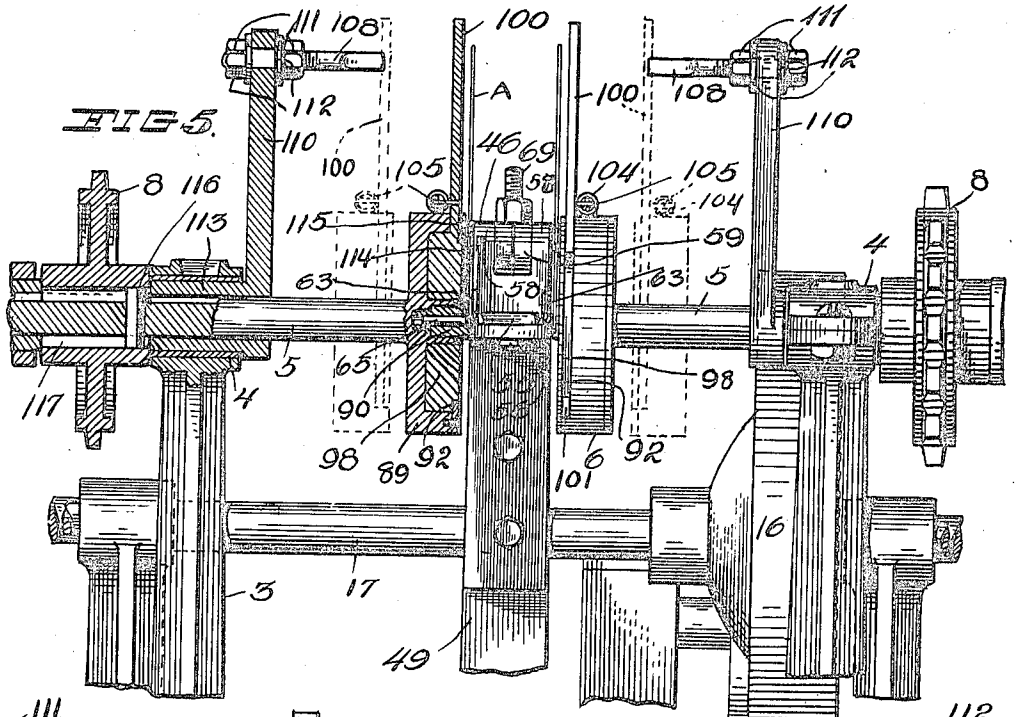
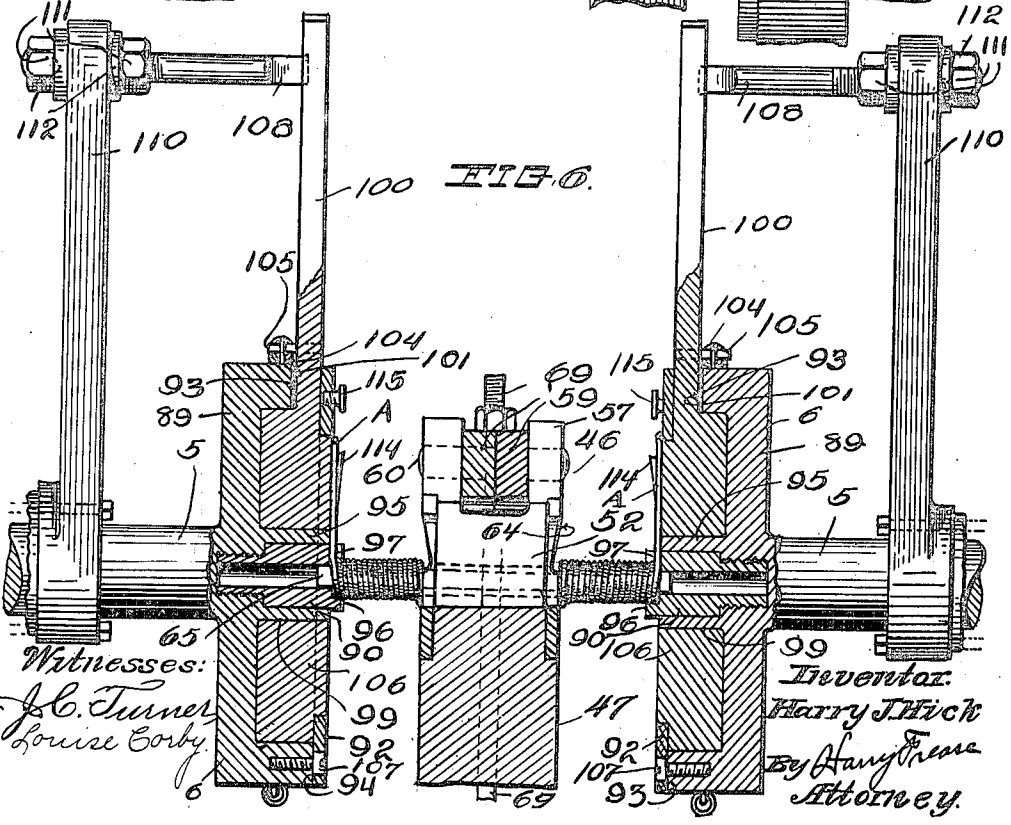



FIG. 6.




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WIRE COILING MACHINE.

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7 SHEETS—SHEET 5.

Fig. 8.

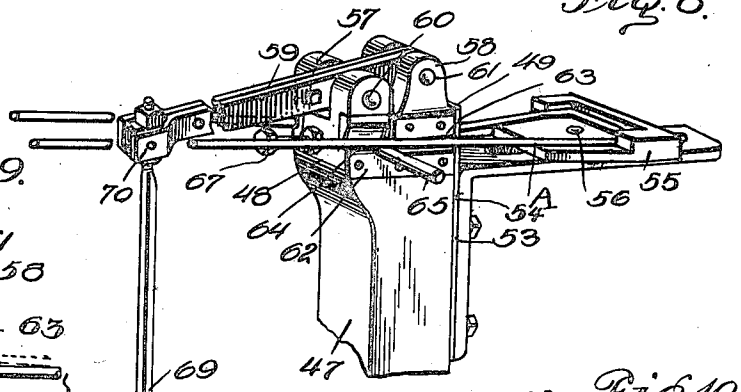



Fig. 9.

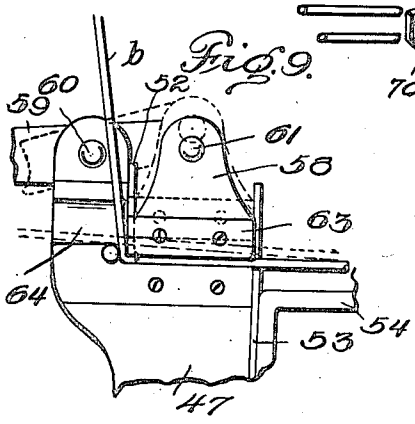
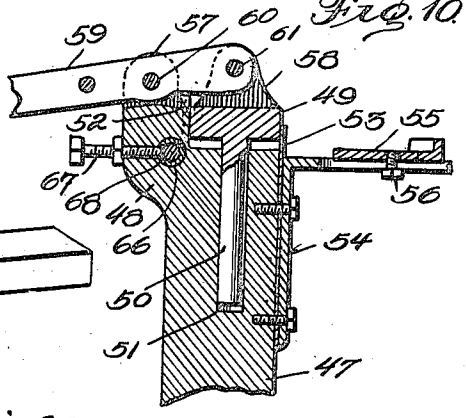



Fig. 10.



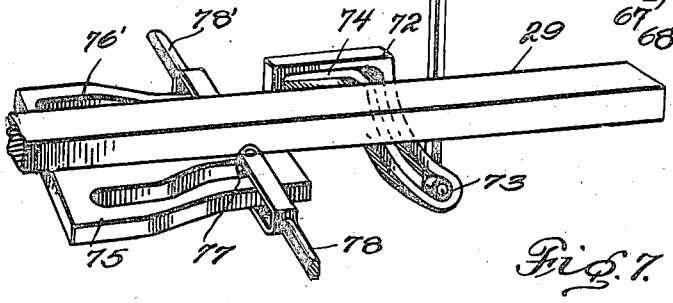
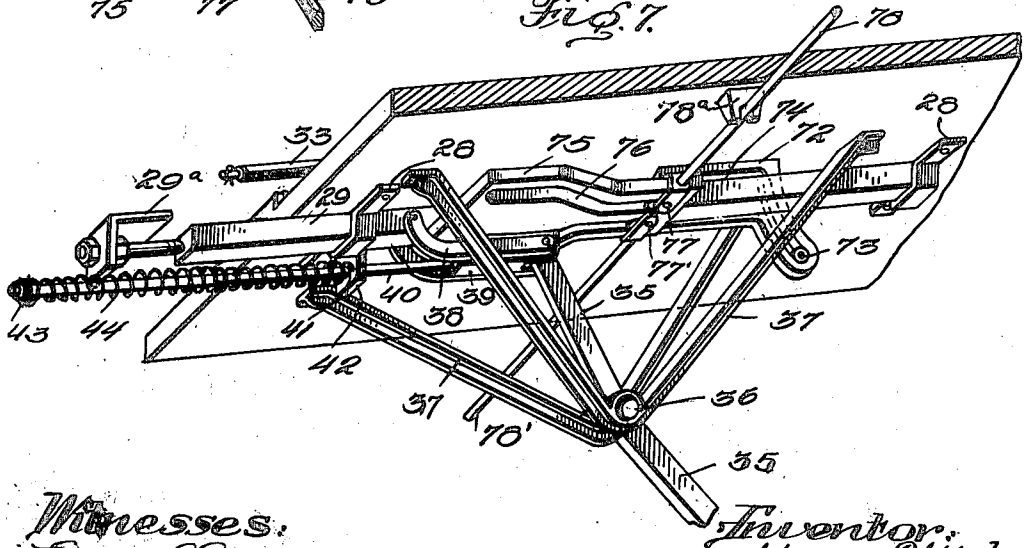




Fig. 7.




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7 SHEETS—SHEET 6.

Fig. 11.

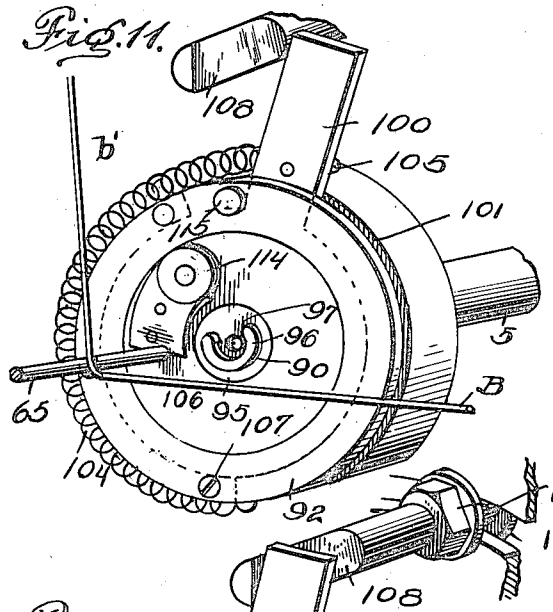



Fig. 12.

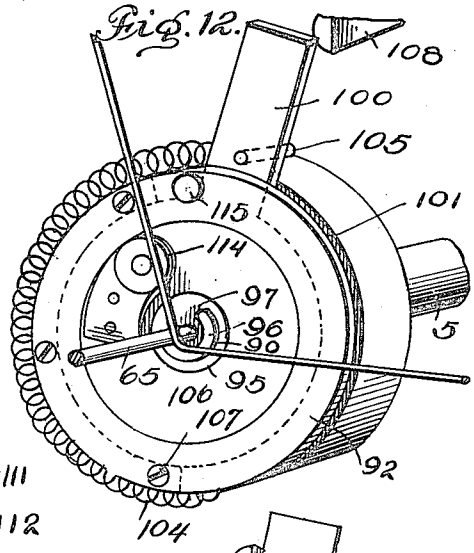



Fig. 13.

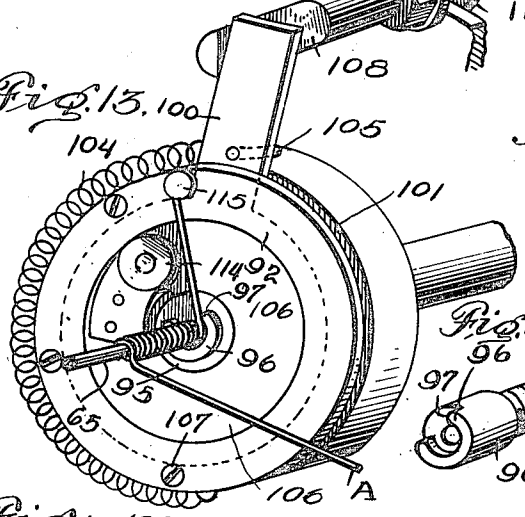



Fig. 18.




Fig. 14.

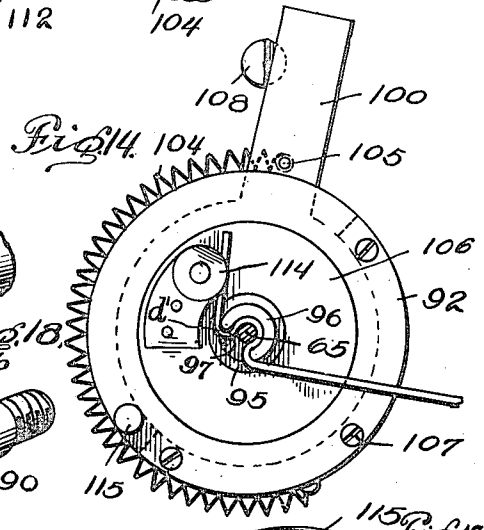



Fig. 15.

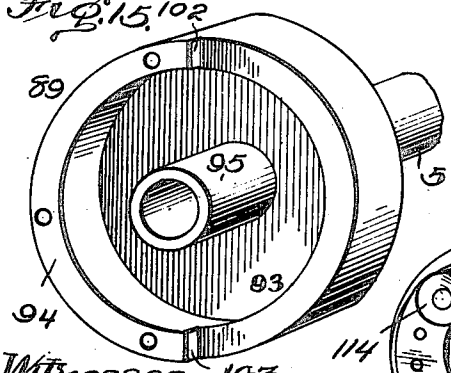



Fig. 16.

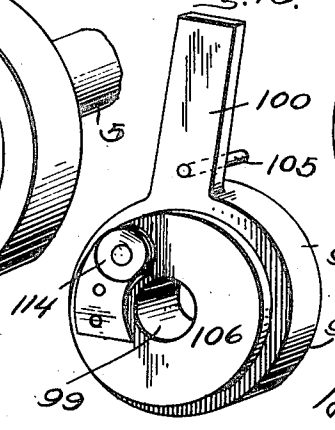
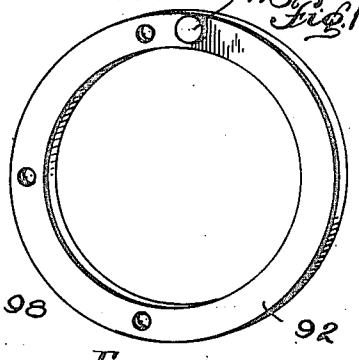



Fig. 17.




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APPLICATION FILED JULY 2, 1915.

1,192,631.

Patented July 25, 1916.

7 SHEETS—SHEET 7.

FIG. 22.

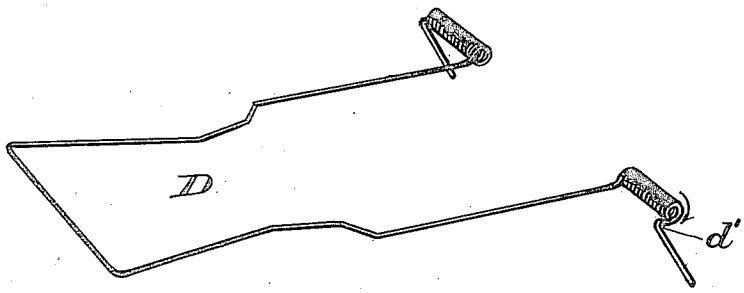



FIG. 21.

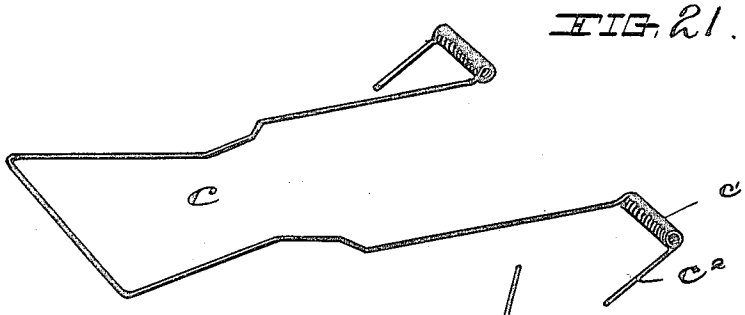



FIG. 20.

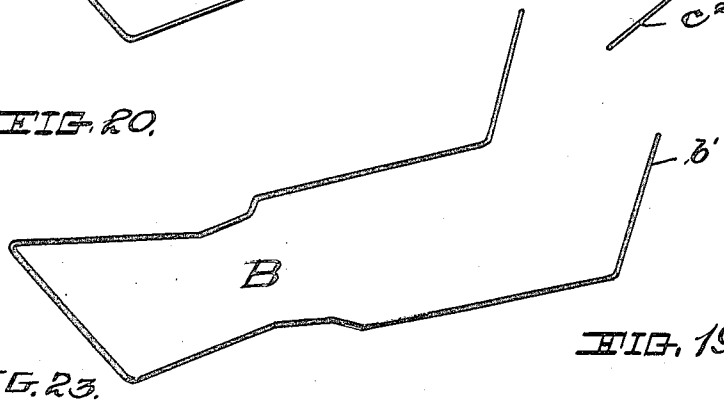



FIG. 19

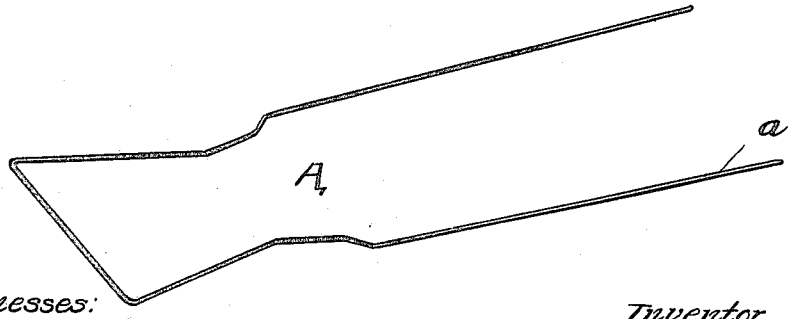
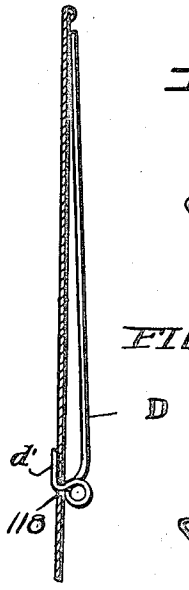



FIG. 23.




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# UNITED STATES PATENT OFFICE.

HARRY J. HICK, OF ALLIANCE, OHIO, ASSIGNOR TO THE McCASKEY REGISTER COMPANY, (INCORPORATED IN 1914,) OF ALLIANCE, OHIO, A CORPORATION OF OHIO.

## WIRE-COILING MACHINE.

1,192,631. Specification of Letters Patent. Patented July 25, 1916.

Application filed July 2, 1915. Serial No. 37,704.

*To all whom it may concern:*

Be it known that I, HARRY J. HICK, a citizen of the United States, residing at Alliance, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Wire-Coiling Machines, of which the following is a specification.

The invention relates to a machine for forming laterally extending coils on the legs of spring wire clips, for use in clamping sales bills and other papers against a flat holding plate. For making a preferred form of such clips, a rectangular bend is first made in each leg, so that the free ends will stand substantially perpendicular to the plane of the legs; from which bend the laterally extending coils are formed at one side of the plane of the legs; after which the free ends are reversely bent to a plane substantially tangent to the cylindric coils, thus forming fingers which may be passed through apertures in the holding plate to secure the spring clip thereto.

The object of the present invention, is to provide a machine which will automatically make the rectangular bends, the desired number of coils, and the reverse bends in both legs of a U-shaped wire blank, so that the completed spring clips can be made from such blanks without other manual labor than the feeding and removal of the blanks from the machine; and a machine embodying one form of the invention, together with views of the spring clip at the different stages of its formation, is illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a perspective view of the machine as a whole; Fig. 2, a plan view of the same; Fig. 3, a side elevation of the same; Fig. 4, an elevation section of same on line 4—4, Fig. 2; Fig. 5, a front elevation, partly in section, of the holding and twisting heads, and adjacent parts showing the relation of the parts when the rectangular bend is made in the legs of the clip and before the lateral coils are formed thereon; Fig. 6, a similar enlarged view of the holding and twisting heads, showing the completed coils and the fingers in position for being reversely bent; Fig. 7, an under side perspective view of the machine table, showing certain actuating mechanism; Fig. 8, a fragmentary perspective view of the clamping head, showing the method of making the rectangular bend in the wire legs; Fig. 9, a fragmentary side elevation of the same showing the initial position of the clamping head in dotted lines, and the holding position in full lines; Fig. 10, a fragmentary central sectional view of the clamping head; Fig. 11, an inner side perspective view of the right-hand twisting head, showing the corresponding mandrel and the bent wire leg before the twisting head is engaged therewith; Fig. 12, a similar view showing the twisting head in position for engagement with the bent wire leg; Fig. 13, a similar view, showing the wire coiled on the mandrel, with the twisting head in position for making the reverse bend of the free finger; Fig. 14, a similar view showing the wire finger reversely bent by the twisting head; Fig. 15, a detached perspective view of the body of the twisting head; Fig. 16, a detached perspective view of the reverse bending lever of the twisting head; Fig. 17, a detached perspective view of the retaining face ring of the twisting head; Fig. 18, a detached perspective view of the axial die or cylinder of the twisting head; Fig. 19, a detached perspective view of the wire blank; Fig. 20, a similar view showing the first rectangular bend of the wire legs; Fig. 21, a similar view showing the lateral coils formed on the wire legs; Fig. 22, a similar view showing the free end fingers reversely bent on the outer ends of the coils; and Fig. 23, a sectional view showing the method of securing the spring clips to a holding plate.

Similar numerals refer to similar parts throughout the drawings.

The machine is preferably mounted upon the table 1, supported by the legs 2, upon which table are secured the standards 3, having the journal bearings 4 on their upper ends for the twisting shafts 5, which shafts have the twisting heads 6 mounted on their inner ends, the shifting levers 7 pivotally connected with their outer ends, and the gear wheels 8 feathered thereon between the journal bearings which carry the respective shafts; there being a pair of twisting shafts and heads located in axial alinement with each other, one on each side of the machine, and each shaft being mounted on at least two standards 3 and journal bearings 4.

The power pulley 9 may be driven by a belt from a suitable source of power, and is secured on the power shaft 10 having its outer end mounted in the pivoted bearing 11, and its inner end mounted in the shifting bearing 12, which bearings are carried by the standards 13 and 14, the standard 14 being slidably mounted in guideways 14ª on the table. The friction pulley 15 is also secured on the power shaft 10, and is adapted to impinge the periphery of the friction disk 16, secured on the countershaft 17, journaled in the bearings 18 of the standards 19; upon which countershafts are also secured the gear wheels 20, which drive the gear wheels 8 on the twisting shafts by means of the belts or chains 21, which are adapted to ride under the idle wheels 22, having their spindles 23 journaled in the bearings 24, on the standards 25, said standards being each connected at its upper end to the upper end of standard 19 by means of a brace 26. Chain guards 27 are preferably provided around the chain 21, said guards being extended around over the gear wheels 8 and 20, and suitably secured at each end to the table.

Slidably mounted on the under side of the table 1, in guides 28 is an operating bar 29, near one end of which is mounted an upright post 30 which is adapted to operate in a guideway 31 in the table 1. In the upper end of said upright post 30 is mounted an impacting pin 32, said pin being adapted to slide in a cylindrical bearing 33 secured to said post, a spring 34 being provided in said bearing in order to cushion the impacting pin 32 in the operation of the machine.

The operating bar 29 is adapted to be operated in the guides 28 by means of a lever 35 pivotally mounted in bearings 36 supported below the table 1 by means of a plurality of supporting bars 37 suitably secured to the under side of the table, said lever being connected at its upper end to the bar 29 by means of a pair of bent links 38; a pedal 35ª being provided on the lower end of the lever by means of which the operating bar may be drawn forward by the foot of the operator.

Means are provided for normally holding the operating bar 29 in its rearward or inoperative position, as shown in Figs. 4 and 7, comprising a block 39 pivoted between the links 38, to which is suitably secured a shaft 40 adapted to operate in a bearing 41 provided in an angle plate 42 secured to the under side of the table 1, said shaft having a nut 43 on its free end between which and the angle plate 42 a compression spring 44 operates to yieldingly hold said lever, and, through the links 38, the operating bar out of operative position; a stop 29ª being adjustably secured to the rear end of the operating bar to limit its forward movement by abutting against the end of the table 1.

The bearing 12 is adapted to be shifted to swing the power shaft 10 by means of an arm 45 extending through and pivoted to the bearing, said arm being pivoted at one end to one of the guide ways 14ª, the other end of said arm extending beyond the bearing 12 into the path of the impacting pin 32, so that when the lever 35 is actuated the operating arm 29 is drawn forward and the pin 32 impacts the arm 45, thereby swinging the friction pulley 15 into contact with the friction disk 16 to drive the twisting heads 6.

The wire clamping head 46 on the upper end of the standard 47 is interposed midway between the twisting heads 6 and comprises a stationary jaw 48 and a movable jaw 49, the movable jaw being mounted on the stationary jaw and having a depending guide pin 50 adapted to slide in a guideway 51 provided in the stationary jaw 48; said stationary jaw having a pair of guide plates 52 and 53 thereon adapted to maintain said movable jaw in its proper position with respect to the stationary jaw; a seat for the U-shaped wire blanks being provided on the stationary jaw by means of an angle plate 54 secured thereto having a U-shaped plate 55 mounted thereon, said plate being adjustably secured to the angle plate 54 by means of a bolt 56, or the like, in order to regulate the length of the legs of the clip to be formed.

The stationary jaw 48 is provided with a yoke 57 at its upper end formed on one side of its center, and the movable jaw 49 is provided with a yoke 58 on its upper end in alinement with the yoke 57; said yokes being adapted to receive an operating lever 59 pivoted to their upper ends by means of pivot pins 60 and 61, the pivot pin 60 of the yoke 57 acting as a fulcrum for said lever. The stationary jaw is provided with an angular face plate 62 on each side thereof and the movable jaw has a face plate 63 on its opposite sides adapted to coöperate with the angular plate 62 when the lever 59 is operated to clamp a wire blank placed upon the plate 55, the plate 62 on the stationary jaw having a beveled notch 64 therein for receiving one of the legs of the wire blank to permit it to lie between and be clamped by the jaws 48 and 49. In order to permit the operation of the lever 59, the guide plate 52 on the stationary jaw has a portion of its upper edge cut away as shown in Fig. 6.

A pair of mandrels 65 and 65′ around which the coils of the clip are adapted to be formed are provided by passing a rod through a tube 66 in the stationary jaw, such rod being of sufficient length to permit it to project beyond the sides of the jaws to form the mandrels, a set-screw 67 being pro-

vided in the stationary jaw adapted to pass through a slot 68 in the tube to hold the rod in its proper position.

In order that the coils when formed will be to one side of the plane of the legs, the mandrels are located slightly above the face of the stationary jaw and adjacent to the side of the movable jaw so that when the wire blank is in position and the movable jaw is operated downward to clamp it, the free ends thereof are bent upward by the mandrels as shown in Fig. 9, substantially at right angles to the body of the clip proper, in which position they are gripped by the twisting heads and carried around the mandrels. During this operation the upturned ends of the blank are bent outward slightly by their engagement with the beveled face of the notch 64 in the plate 62, in which position they may be readily engaged by the twisting heads 6, as will be later described.

The operating lever 59 of the clamping head 46 is adapted to be operated by means of the pedal 35ª of the lever 35, said means comprising a controlling link 69 suitably connected at its upper end to the bifurcated end 70 of the operating lever 59 adapted to limit the lateral swinging movement thereof and extending through a slot 71 in the table 1, being connected at its lower end to an angular block 72 by means of a guide pin 73 adapted to travel in a guideway 74 in said block, said block being suitably secured to one side of the operating bar 29. The guideway 74 is so formed that when the operating bar 29 is drawn forward by the actuating lever 35, the guide pin 73 traveling in the guideway will raise the link 69, the lever 59 operating the movable jaw to clamp the wire blank and bend it upon the mandrels 65 and 65′ as above set forth.

The twisting heads 6 are simultaneously drawn into operative engagement with the upturned ends of the clip by means comprising a guide block 75 suitably secured to the under side of the operating bar 29 in the space formed by the bent links 38 between the top of the lever 35 and said bar, said block having a pair of rearwardly diverging guideways 76 and 76′ therein in which guide pins or rollers 77 and 77′ mounted on the inner ends of a pair of links 78 and 78′ are adapted to travel. The links 78 and 78′ are each adapted to slide in a pair of guide bearings 78ª and are connected at their outer ends to a bell-crank lever 79 (Fig. 3) mounted in bearings 80 and 81 on the ends of the table 1, said bell-crank lever being rigidly connected to the shifting lever 7 bifurcated at its upper end to form a yoke 82 in which a bearing block 83 for the end of the twisting shaft 5 is pivotally mounted. A compression spring 84 is provided between said bearing block and a collar 85 on the shaft to hold the twisting heads into engagement with the free ends of the clip held by the clamping head 46 during the formation of the coils. If desired, a register 86 may be provided on the table below one of the twisting shafts 5 as shown in Figs. 1 and 2, for registering the number of clips made, said register being adapted to be operated by means of a link 87 connected at one end to the shifting lever 7 and at its other end to the register operating lever 88.

The twisting heads 6 mounted on the inner ends of the twisting shafts 5, comprise a body 89, a twisting die 90, a reverse bending lever 91 and a retaining face ring 92. The body 89 of the twisting head is located at the end of the twisting shaft and is preferably formed integral therewith. Said body comprises a disk 93 having a peripheral flange 94 extending outwardly therefrom adapted to receive the reverse bending lever 91, and a hollow stem 95 extending beyond the face of the disk to form a bearing for the reverse bending lever and receive the twisting die 90. The twisting die or cylinder 90 is screwed or otherwise rigidly secured in the hollow stem 95 of the body 89 and is provided with a peripheral flange 96, a portion of which is cut away to form a stop 97 adapted to engage the upturned ends of the wire blanks in the formation of the spring coils of the clips. The reverse bending lever 91 comprises a circular body portion 98 having a central aperture 99 therein, adapted to bear on the stem 95, and an arm 100 extending radially from said body portion; the peripheral flange 94 of the body 89 being cut away to form a slot 101 between the face ring and the body in which said arm is adapted to slide, the ends of the slot forming a pair of substantially diametrically opposite stops 102 and 103 on the body arranged to engage the arm 100 to limit the movement of the body in either direction with reference to said arm for a purpose to be later described; a spring 104 secured at one end to the body 89 and at its other end to a pin 105 on the arm 100 tending to maintain the arm against the stop 102. The body portion of the lever 91 is provided with a raised face portion 106 adapted to fit within the face ring 92 and lie flush with the face thereof, said ring being secured to the peripheral flange 94 of the body 89, by means of screws 107, for maintaining the parts in assembled position.

In order to regulate the number of turns in the coils and to operate the reverse bending lever, a stop pin 108 for the arm 100 of the reverse bending lever is adjustably supported adjacent each of the twisting heads 6 in a circular slot 109 formed in the upper end of a standard 110, said slot forming an arc of a circle having its center coaxial with the center of the twisting shaft. The pin

108 is secured in position in the slot 109 between a pair of nuts 111 and washers 112. It will be evident that by this construction the length of the pin projecting from the standard may be varied by operating the nuts 111. For the purpose of bracing the standard 110, a journal bushing 113 is preferably provided on its outer side adapted to be inserted in the bearing 4 of the innermost standard 3.

In the operation of the machine the wire blank A is placed upon the seat 55 and over the mandrels 65 and 65′, the operator depresses the pedal 35ª drawing the operating bar 29 forward, thus raising the link 69, actuating the jaw 49 to clamp the wire between it and the stationary jaw 48, and forming the upwardly bent ends $b'$ upon the mandrels. The forward movement of the operating bar 29 also throws the impacting pin 32 into engagement with the abutting arm 45 of the power shaft 10, and the friction pulley 15 into engagement with the friction disk 16, which in turn drives the twisting heads 6 by means of the gear wheels 20, chains 21 and gear wheels 8. At the same time, the bell-crank levers 79 are swung to operate the shifting levers 7 by means of the links 78 and 78′ actuated by the guide block 75, the shifting levers moving the twisting heads into engagement with each of the upturned ends $b'$ of the clip, which ends ride up over a cam notch 114 on the face 106 of the disk of the reverse bending lever, into engagement with a pin 115 provided on the retaining ring 92 of the twisting head and also into engagement with the stop 97 on the twisting die 90, by which means the ends of the clip are held during the formation of the coils, the twisting heads automatically traveling outward against the pressure of the springs 84. When the predetermined number of turns have been made on the coils, the arms 100 of the reverse bending levers strike the stop pins 108, thereby stopping the rotation of the reverse bending levers 91, the bodies of the twisting heads and the twisting dies continuing to rotate against the action of the springs 104 until the stops 103 of the twisting bodies strike the arms 100 of the levers 91; the free ends $c^2$ remaining after the formation of the coils $c'$ of the clip C, being reduced in length, escape past the pins 115, and the twisting dies, as they continue to rotate, acting against the cam notches 114 in the reverse bending levers form the reverse bends $d'$ of the finished clip D.

Referring to the relative positions of the free ends of the wire in Figs. 14 and 22, it will be understood that when the clip is released from the clamping and twisting heads by releasing the pedal 35ª, on account of the tension of the coils, the ends of the clip will be drawn back a slight distance, to the position shown in Fig. 22.

It will be understood that the impacting pin 32 and guide blocks 72 and 75 are so arranged on the operating bar 29, with respect to the abutting arm 45, and links 69 and 78 and 78′, that the clamping head, twisting heads, and shifting levers will be actuated substantially simultaneously by a single operation of the lever 35 drawing the operating bar forward.

After the formation of the reverse bends $d'$ by the twisting die acting against the notch 114 in the reverse bending lever, which has been stopped in its rotation with the twisting heads by the stop pin 108, the operator of the machine releases the pedal 35ª thereby permitting the spring 44 to draw the operating bar rearward, throwing the machine out of operation. The torque on the twisting shaft 5 having ceased, the spring 104 pulls the body 89 back to its initial position, thus enabling the operator to remove the finished clip from the machine and place another blank in position for another operation. It will be evident that in order to permit the twisting shafts 5 to be shifted endwise in the bearings 3, the gear wheels 8 are feathered on the shafts by means of a pin 116 inserted through and projecting beyond the shaft, the ends of which pin are adapted to slide in keyways 117 provided in the journal bearing of the gear wheel.

When positioning the clip on the leaf of a filing appliance, as shown in Fig. 23, the ends $d'$ are rotated in the direction of the arrow in Fig. 22 toward the upper end of the clip and beyond the plane of the legs, against the tension of the coils, and inserted through an aperture 118 in the leaf, in which it is firmly held in position for use.

I claim:

1. A wire coiling machine including a wire clamping head having a mandrel on each side thereof, a pair of wire twisting heads including reverse bending levers and twisting dies, twisting shafts upon which said heads are mounted, means for rotating said shafts, shifting levers for shifting said heads into engagement with the free ends of a wire blank held by said clamping head to grip them for rotation around said mandrels with the heads, and means for stopping said reverse bending lever and the free ends of the wire when a predetermined number of turns have been made, the twisting die continuing to rotate for substantially a half revolution to form reverse bends in the free ends of the wire.

2. In a wire coiling machine, a wire clamping head, a mandrel located on each side of said head, a pair of twisting heads, twisting shafts upon which said heads are

mounted, means for rotating said shafts, shifting levers for shifting said twisting heads into engagement with the free ends of a wire blank held by said clamping head to form coils thereon around said mandrels, means for stopping the free ends of the wire when a predetermined number of turns have been made, the twisting heads continuing to rotate, and means for stopping the twisting heads when they have rotated substantially a half revolution for the formation of reverse bends in said wire.

3. In a wire coiling machine, means for holding a wire blank, a mandrel on each side thereof, twisting heads for coiling the free ends of said wire blank on said mandrels each comprising a twisting shaft, a twisting die rigidly mounted in said shaft, a body having a pair of substantially diametrically opposite stops thereon, a reverse bending lever rotatably mounted in said body having a radially extending arm thereon, a retaining ring on the body for said reverse bending lever, a spring normally holding the arm of said reverse bending lever against one of said stops on the body, a pin on the retaining ring, and a cam notch on the reverse bending lever; means for rotating said twisting shafts, means for shifting said twisting heads into engagement with the free ends of the wire blank, said free ends of the wire blank being held between said pin and cam notch during the formation of the coils, means for stopping the rotation of the arm of the reverse bending lever when a predetermined number of turns have been made, the twisting die and body continuing to rotate until the other one of the stops on the body engages said arm to form a reverse bend in the free end of the wire blank.

4. In a wire coiling machine, a wire clamping head having a mandrel on each side thereof, twisting heads including a twisting die for coiling the free ends of a wire blank on said mandrels, a reverse bending lever rotatably mounted in each of said heads having a cam notch therein, means for stopping the rotation of said levers relative to the twisting heads when a predetermined number of turns have been made on the coils, the free ends of the wire engaging with said notch, whereby reverse bends are formed in the free ends of the wire blank by the continued rotation of the twisting die, and a stop on the twisting heads adapted to engage with the reverse bending levers for stopping the heads when the reverse bends have been formed.

5. In a wire coiling machine, a table, a wire clamping head having a mandrel on each side thereof, operating means for said clamping head, twisting heads, twisting shafts upon which said heads are mounted, means for driving said twisting shafts, a power shaft having a friction pulley thereon adapted to be swung into engagement with said driving means, shifting levers for said shifting heads, means for operating said shifting levers, an operating bar slidably mounted on the table, adapted to substantially simultaneously actuate the clamping-head-operating means, shift the friction pulley into engagement with the driving means for the twisting shafts, and actuate the means for operating the shifting levers to shift the twisting heads into engagement with the free ends of a wire blank held by said clamping head for the formation of coils thereon around said mandrels.

6. In a wire coiling machine, a clamping head having laterally extending mandrels thereon adapted to form a rectangular bend in the legs of a wire blank, a pair of twisting heads for coiling the free ends of said blank around said mandrels, means for shifting said heads into engagement with said free ends of the blank, and means for substantially simultaneously operating said clamping head, twisting heads and shifting means.

7. In a wire coiling machine, a clamping head having laterally extending mandrels thereon adapted to form an upturned rectangular bend in the legs of a wire blank, a pair of twisting heads, means for rotating said twisting heads, shifting levers for shifting said twisting heads into engagement with the upturned ends of the legs to form coils thereon around said mandrels at one side of the plane of the legs, and means for stopping the rotation of the twisting heads when a predetermined number of turns have been made.

8. In a wire coiling machine, a clamping head having laterally extending mandrels thereon adapted to form an upturned rectangular bend in the legs of a wire blank, a pair of twisting heads, means for rotating said twisting heads, shifting levers for shifting said twisting heads into engagement with the upturned ends of the legs to form coils thereon around said mandrels, a reverse bending lever rotatably mounted in the twisting heads engaging with the free ends of the blank adapted to be stopped from rotation with said heads when a predetermined number of turns have been formed thereby, the continued rotation of the twisting heads forming a reverse bend in the free ends of the wire remaining after the formation of the coils, and means for stopping the rotation of the twisting heads after the formation of said reverse bends.

9. In a wire coiling machine, means for holding a wire blank, means for forming coils on the free ends of said blank including wire twisting heads, means for rotating said twisting heads comprising a friction disk,

and a driving pulley adapted to be swung into engagement with said friction disk to drive it, and means for substantially simultaneously operating said wire-holding means and said coil-forming means.

10. In a wire coiling machine, means for holding a wire blank, and means for forming coils on the free ends of said blank, including wire twisting means, means for rotating said wire twisting means comprising a friction disk, a power shaft having a driving pulley thereon adapted to be swung into and out of engagement with said friction disk, a shifting bearing for the swinging end of said power shaft, an abutting arm on said shifting bearing, an operating bar, an impacting pin mounted on said bar, and means for actuating said operating bar to move the impacting pin into engagement with said abutting arm for swinging said driving pulley into engagement with said friction disk.

11. In a wire coiling machine, means for holding a wire blank, a pair of mandrels, a pair of twisting heads, twisting shafts upon which said heads are mounted, means for driving said twisting shafts comprising a friction disk, a shaft upon which said disk is mounted, a chain gear between each of the twisting shafts and the friction-disk shaft, a power shaft mounted at one end in a pivoted bearing and at its other end in a shifting bearing, a friction pulley mounted on said shaft, and means for shifting said shifting bearing to swing the friction pulley into engagement with the friction disk; means for shifting said twisting heads into engagement with the free ends of the wire blank to form coils thereon around said mandrels, and means for stopping the rotation of the twisting heads when a predetermined number of turns have been made.

12. In a wire coiling machine, a wire clamping head having a stationary jaw, a movable jaw slidably mounted in said stationary jaw, a mandrel on each side of said head located slightly above the face of the stationary jaw, a lever pivoted at one end to the movable jaw and fulcrumed on the stationary jaw, means for operating said lever to move the movable jaw into clamping engagement with the stationary jaw, whereby the free ends of a wire blank held between them are given an upward substantially rectangular bend, and means for coiling the said free ends of the blank around said mandrels.

13. In a wire coiling machine, a wire clamping head having a stationary jaw and a movable jaw, a mandrel on each side of said head located slightly above the face of the stationary jaw, a lever connected to said jaws, means for operating said lever to move the movable jaw into clamping engagement with the stationary jaw whereby the free ends of a wire blank held between them are given an upright substantially rectangular bend, and means for coiling the free ends of said wire blank on said mandrels.

14. In a wire coiling machine, a wire clamping head having a stationary jaw and a movable jaw, and a mandrel on each side of said head located slightly above the face of the stationary jaw, a lever connected to said jaws, means for operating said lever to move the movable jaw into clamping engagement with the stationary jaw whereby the free ends of a wire blank held between them are given an upright substantially rectangular bend, said means comprising a link connected at one end to said lever, a guide block having an angular guide-way therein, in which the other end of said link is adapted to travel, an operating bar to which said guide block is connected, and means for operating said operating bar; and means for coiling the free ends of said wire blank on said mandrels.

15. In a wire coiling machine, a wire clamping head having a stationary jaw and a movable jaw, a mandrel on each side of said head, an adjustable seat on said head for supporting a wire blank, the free ends of which rest on said mandrels, a lever connected to said jaws, means for operating said lever to move the movable jaw into clamping engagement with the legs of said blank, and means for coiling the free ends of the wire blank on said mandrels.

16. In a wire coiling machine, means for holding a wire blank, and means for forming coils on the free ends of said blank, including a pair of twisting shafts having twisting heads on their inner ends and bearing blocks on their outer ends, means for simultaneously shifting said heads into operative engagement with said blank comprising a lever pivotally connected at its upper end to each of said bearing blocks, a collar on each of said shafts, a spring between said bearing blocks and collars operating to permit said shafts to travel outward during the formation of the coils while the levers are held in operative position, a bell-crank lever rigidly connected to the lower ends of each of said levers, a link pivotally connected to each of said bell-crank levers, a guide block having a pair of rearwardly diverging guideways therein, said links having guide pins on their inner ends adapted to travel in said guideways, and means for moving said guide block forward, whereby the links and levers will operate to move the twisting shafts inward.

17. In a wire coiling machine, means for holding a wire blank, means for forming

coils on the free ends of said blank including wire twisting means, an operating bar, a guide block on said bar having a pair of diverging guideways therein, and means operated by said guideways in the movement of said operating bar to shift the twisting means into operative engagement with the wire blank.

18. In a wire coiling machine, a clamping head having a pair of mandrels thereon, adapted to form upturned rectangular bends in the legs of a wire blank, a pair of twisting heads, friction-driven means for rotating said twisting heads, means for shifting said heads into engagement with the upturned ends of the wire blank to form coils thereon around said mandrels, and means for stopping the rotation of the twisting heads when a predetermined number of turns have been made.

19. In a wire coiling machine, means for holding a wire blank, means for forming coils on the free ends of said blank, friction driving means for operating said coil-forming means, and means for automatically limiting the number of turns on said coils.

20. In a wire coiling machine, means for holding a wire blank, means for forming coils on the free ends of said blank, friction driving means for operating said coil-forming means, means for automatically limiting the number of turns on said coils, and means for forming reverse bends in the free ends of the wire after the formation of the coils.

21. In a wire coiling machine, a wire clamping head adapted to form upturned rectangular bends in the legs of a wire blank, means for forming coils on the upturned portions of the blank, means for limiting the number of turns on said coils, and means for forming reverse bends in the free ends of the wire after the formation of the coils.

22. In a wire coiling machine, a wire clamping head adapted to form upturned rectangular bends in the legs of a wire blank, means for forming coils on the upturned portions of the blank, the turns of said coils being made in a direction away from the body of the blank, means for limiting the number of turns on said coils, and means for forming reverse bends in the free ends of the wire after the formation of the coils.

23. In a wire coiling machine, means for holding a wire blank, means for forming coils on the free ends of said blank including a pair of twisting heads yieldingly held in engagement with said blank during the formation of the coils, and means for forming reverse bends in the free ends of the wire after the formation of the coils.

24. In a wire coiling machine, a wire clamping head adapted to form upturned rectangular bends in the legs of a wire blank, means for forming coils on the upturned ends of said blank to one side of the plane of its legs, including a pair of friction-driven twisting heads yieldingly held in engagement with the free ends of the blank during the formation of the coils, and means for forming reverse bends in the free ends of the wire after the forming of the coils.

25. In a wire coiling machine, means for holding a wire blank, means for forming coils on the free ends of said blank including a pair of twisting heads yieldingly held in engagement with said blank during the formation of the coils, and having a reverse bending lever rotatably mounted therein, friction-driven means for rotating said twisting heads, means for stopping the rotation of the reverse bending levers when a predetermined number of turns have been made on the coils to form reverse bends in the free ends of the wire, and means for stopping the twisting heads after the formation of the reverse bends.

26. In a wire coiling machine, means for holding a wire blank, means for forming coils on the free ends of said blank, friction-driven means for operating said coil-forming means, means for automatically limiting the number of turns on said coils, means for forming reverse bends in the free ends of the wire after the formation of the coils, and means for returning the machine to its initial position after the formation of the reverse bends.

27. A wire coiling machine having in combination a wire clamping head including a stationary jaw and a movable jaw, a mandrel on the stationary jaw upon which the end of a wire blank is adapted to rest; and means for operating the movable jaw into engagement with the wire blank to clamp it.

28. A wire coiling machine having in combination a wire clamping head including a stationary jaw and a movable jaw, a mandrel on the stationary jaw upon which the end of a wire blank is adapted to rest; and means for operating the movable jaw into engagement with the wire blank to clamp it, said mandrel being so positioned with reference to the stationary jaw as to form an upturned rectangular bend in the wire blank during the clamping operation.

29. A wire coiling machine, having in combination a coil twisting head including a body, a twisting die rigidly mounted in the body, a reverse bending lever loosely mounted in the body and rotatable therein substantially a half revolution, and a spring normally holding said lever against rotation; and means for holding the lever from rotation with the heads at the completion of

the formation of the coil, there being a stop on the lever adapted to engage with the free end of the wire, whereby a reverse bend is formed in the wire by the die as it continues to rotate.

30. In a wire coiling machine, means for forming coils with a predetermined number of turns on the free ends of a wire blank, and means coördinated therewith for forming reverse bends in the blank after the formation of the coils.

31. In a wire coiling machine, means for forming coils with a predetermined number of turns, on the free ends of a wire blank and at one side of the plane of its legs, and means coördinated therewith for forming reverse bends in the blank after the formation of the coils.

32. A wire coiling machine including means for holding a U-shaped wire blank, means for forming coils on the free ends of said blank at one side of the plane thereof, and means for forming reverse bends in the blank after the formation of the coils.

33. A wire coiling machine including means for holding a U-shaped wire blank, means for forming coils on the free ends of said blank, and means for forming reverse bends in the blank after the formation of the coils.

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