No. 819,622. PATENTED MAY 1, 1906.

O. H. WATKINS & C. F. SKELLENGER.

# WIRE WORKING MACHINE.

APPLICATION FILED DEC. 28, 1904.

3 SHEETS—SHEET 1.

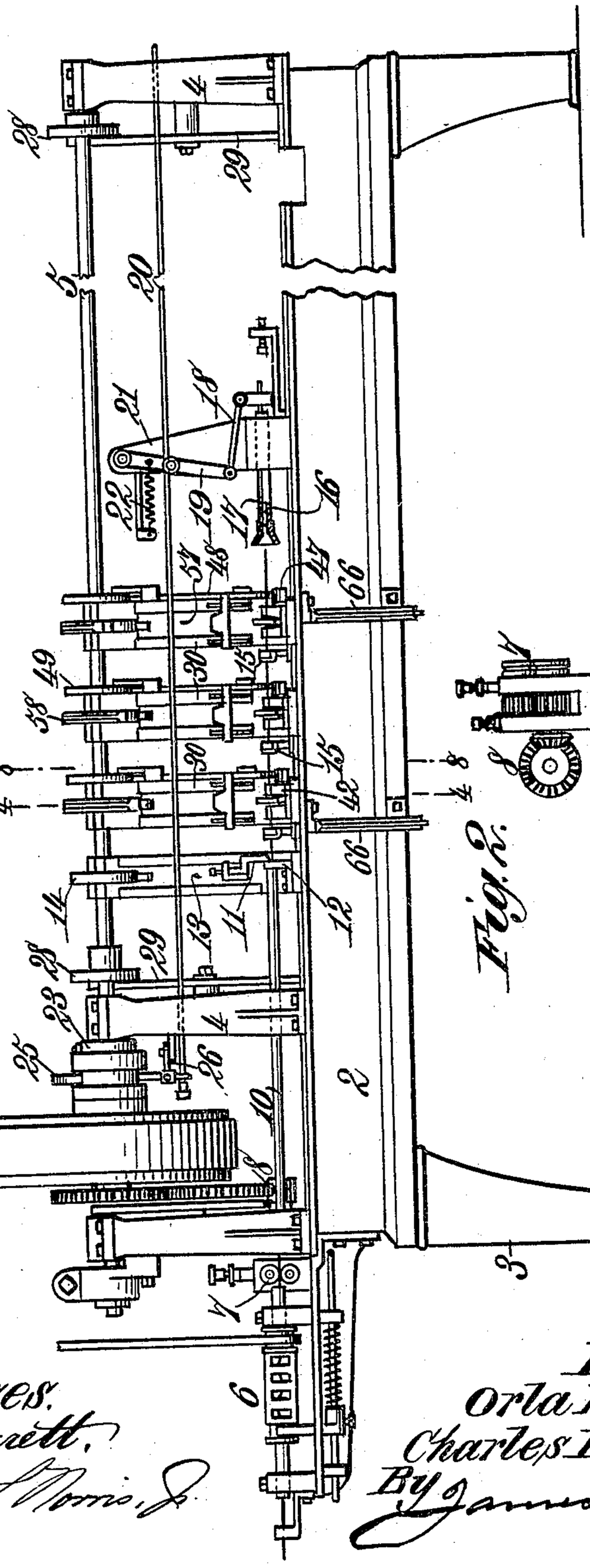

Fig. 1.



Fig. 2.

Fig. 3.

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3 SHEETS—SHEET 2.

Fig. 6.

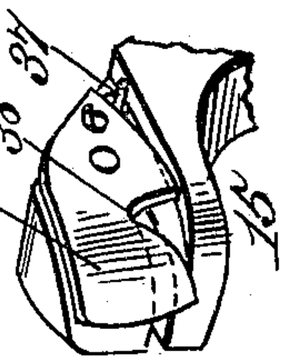
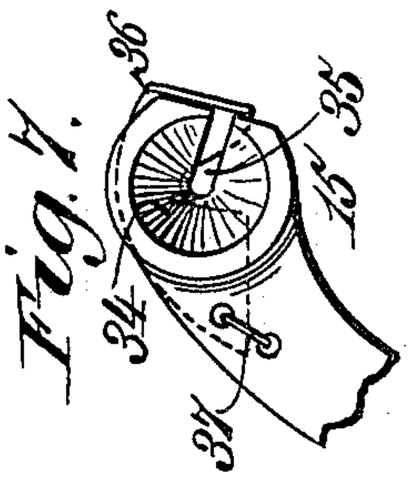



Fig. 7.



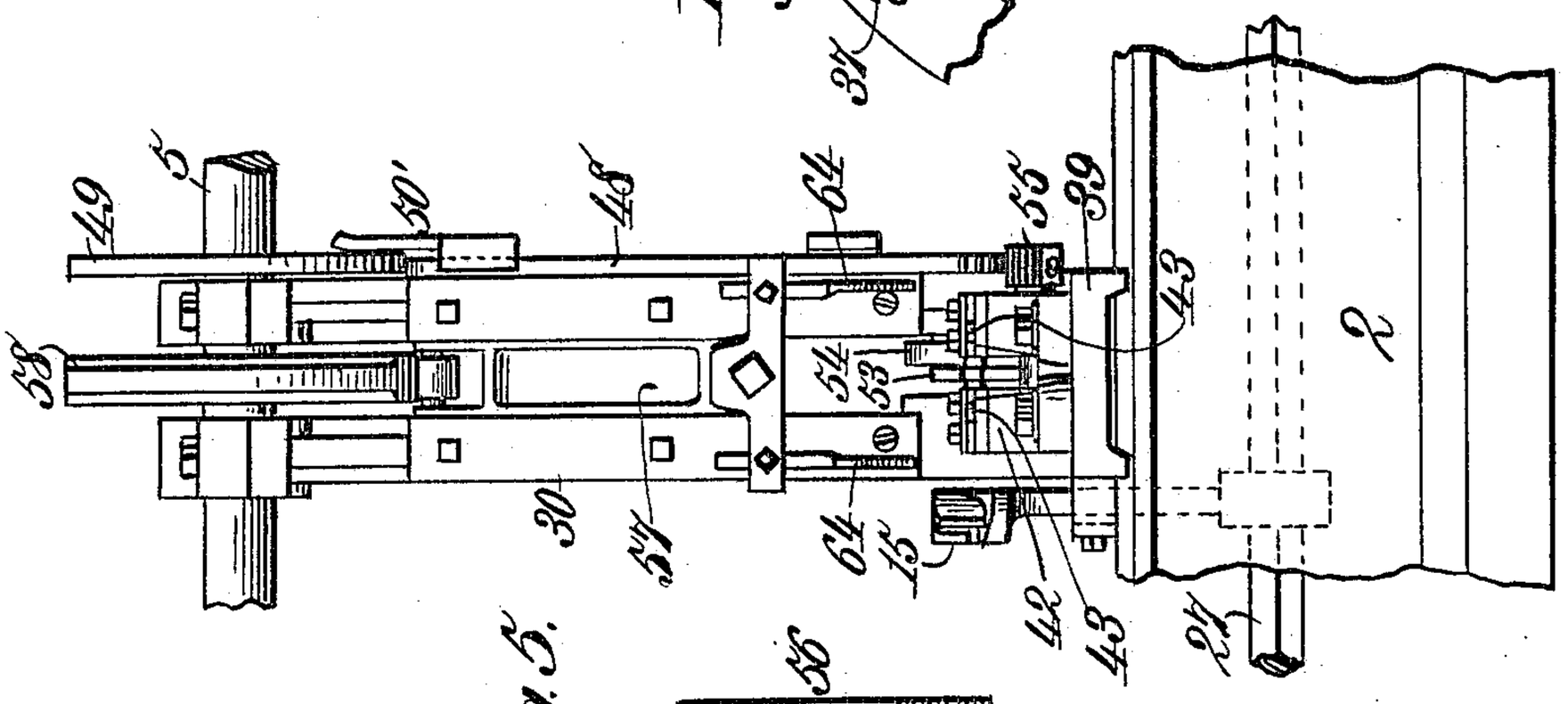




Fig. 5.

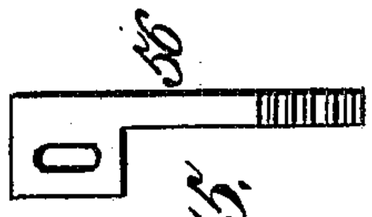



Fig. 15.

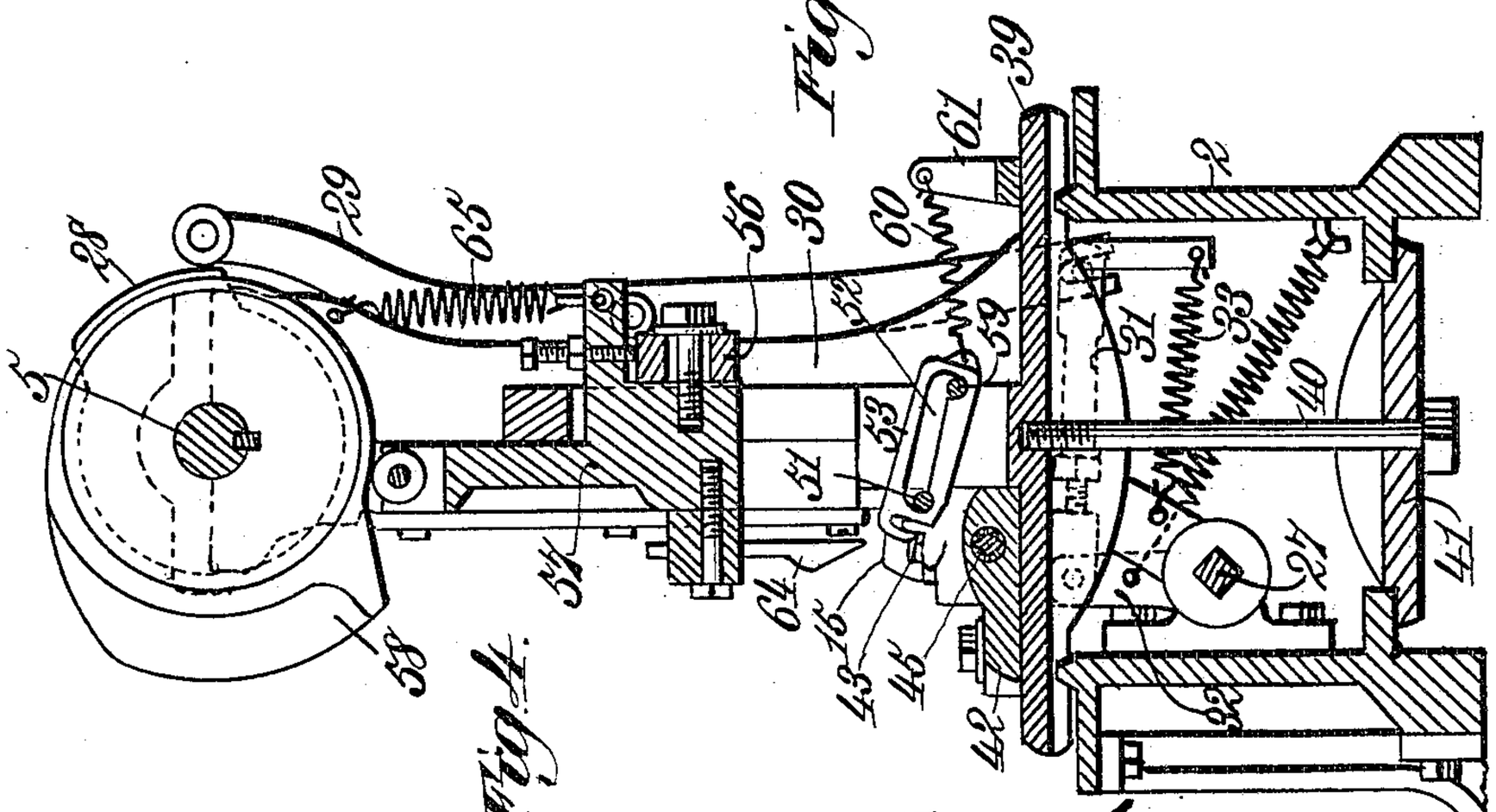



Fig. 14.

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3 SHEETS—SHEET 3.

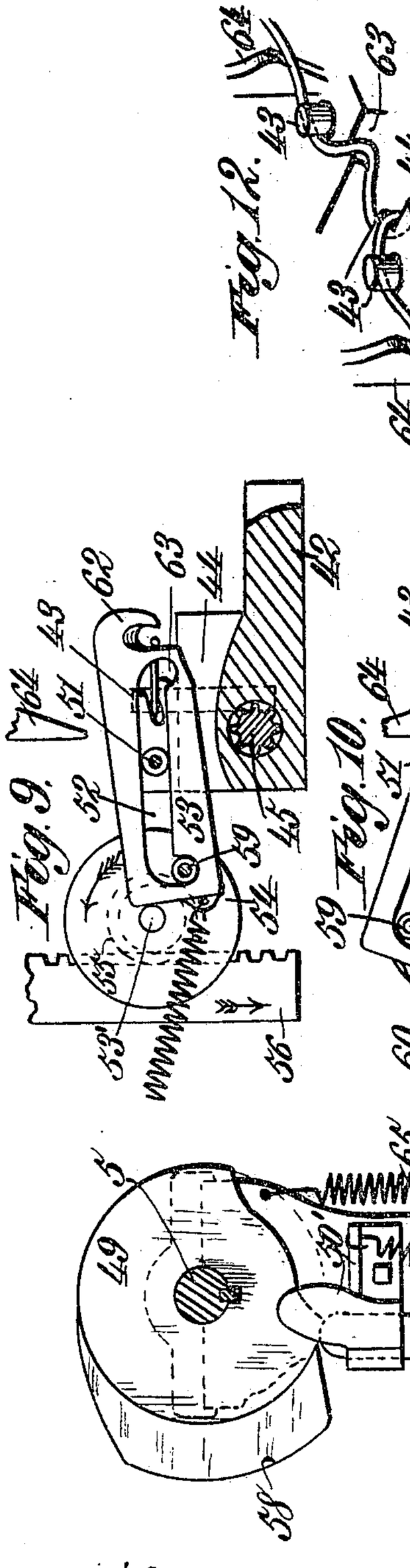


Fig. 9.

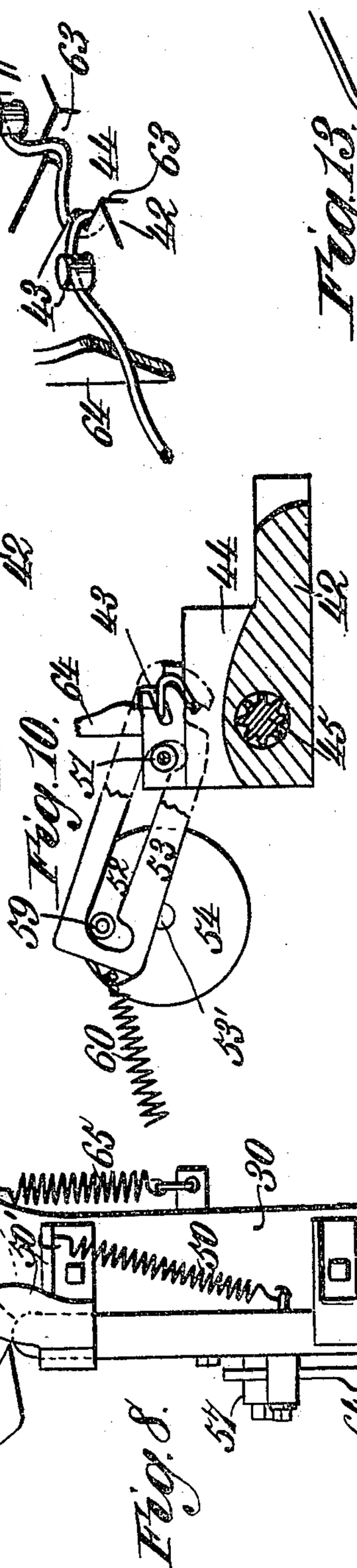


Fig. 10.

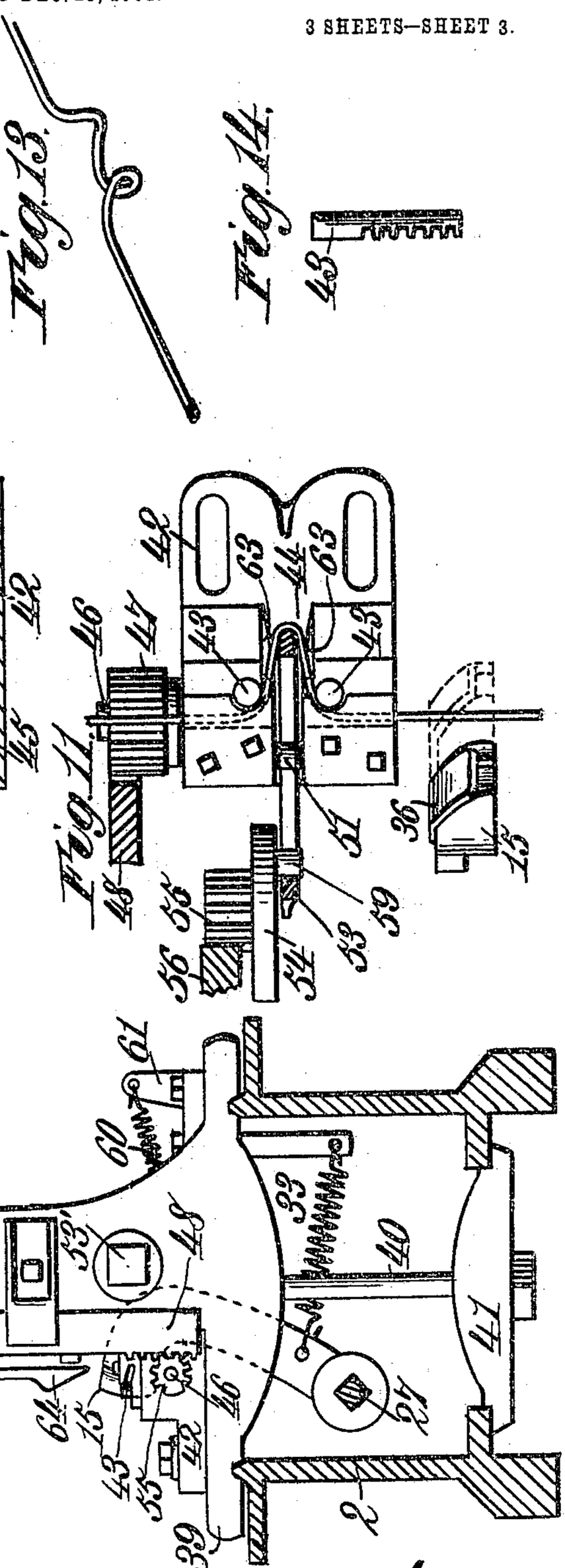


Fig. 11.




Fig. 12.



Fig. 13.




Fig. 14.




Fig. 8.

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# UNITED STATES PATENT OFFICE.

ORLA H. WATKINS AND CHARLES F. SKELLENGER, OF CLINTON, IOWA, ASSIGNORS TO BENJAMIN F. WINDSOR, OF KENOSHA, WISCONSIN.

## WIRE-WORKING MACHINE.

No. 819,622. Specification of Letters Patent. Patented May 1, 1906.

Application filed December 28, 1904. Serial No. 238,684.

*To all whom it may concern:*

Be it known that we, ORLA H. WATKINS and CHARLES F. SKELLENGER, citizens of the United States, residing at Clinton, in the county of Clinton and State of Iowa, have invented new and useful Improvements in Wire-Working Machines, of which the following is a specification.

This invention relates to a wire-working machine, and while the machine may be employed for various purposes it is adapted especially for the formation of crimps in wires or rods to be used in the make-up of springs for beds and other articles of furniture.

In the drawings accompanying and forming a part of this specification we have illustrated a convenient organization capable of carrying out the objects of the invention and which we will set forth in detail in the following description; but we do not limit ourselves to the disclosure thus made, for certain variations may be adopted within the scope of our claims succeeding said description.

By the machine we are enabled to form crimps in an accurate, rapid, and otherwise satisfactory manner in a blank, which blank may consist of a previously cut length of wire.

Referring to said drawings, Figure 1 is a front elevation of a machine involving our invention. Fig. 2 is a detail in elevation of a pair of feed-rolls and certain adjacent parts. Fig. 3 is a perspective view of an intermittently-operative shaft carrying cams for effecting the successive action of the crimping mechanisms. Fig. 4 is a vertical sectional elevation, the section being taken on the line 4 4 of Fig. 1. Fig. 5 is a front elevation of a crimp-forming mechanism. Fig. 6 is a perspective view of a combined guide and ejector. Fig. 7 is an elevation of the same. Fig. 8 is a sectional elevation, the section being taken on the line 8 8 of Fig. 1. Figs. 9 and 10 are sectional elevations of the principal parts of a crimping mechanism. Fig. 11 is a top plan view of the parts shown in the two preceding figures and also showing a combined ejector and guide. Fig. 12 is a perspective view of a portion of a block and certain adjunctive devices. Fig. 13 is a perspective view of a portion of the crimped wire. Figs. 14 and 15 are detail views of two rack-bars.

Certain of the figures are upon an enlarged scale.

Like characters refer to like parts throughout the different views.

The framework for supporting the different parts of the machine may be of any suitable character and is represented as including in its construction a bed 2, from what might be considered the head and tail ends of which suitable legs, as 3, depend. From the opposite ends of the bed, on the upper side thereof, the standards 4 rise, said standards having in their tops bearings for supporting the shaft 5, which shaft is intermittently thrown into action in order to effect the operation in succession of certain crimping mechanisms.

In a contemporaneously-pending application filed December 28, 1904, Serial No. 238,683, the wire from which a blank of predetermined length is to be severed is carried from a reel (not shown) through a straightening device, (denoted in a general way by 6.) This straightening device is a familiar one in the art of wire-working, and hence a detailed description of the same is not necessary. After the wire leaves the straightening device it is led through the feed-rolls 7, arranged in superposed order, and the lower one of which is connected by gearing (denoted in a general way by 8) with the driver 9, shown as a pulley, connected by belting with a suitable motor. (Not shown.) The driver or pulley 9 is continuously operative and runs loose on the shaft 5. From this it will be apparent that the lower feed-roll 7 is likewise continuously rotative by reason of its connection by gearing with said driver. The driver 9 is intermittently thrown into operative relation with the shaft 5 in order to impart to said shaft one complete rotation, during which complete rotation the advance end of the wire is separated from the remainder thereof to form a blank and during which said blank is crimped and thereafter positively ejected from the machine or away from the crimping mechanism.

The wire after it passes the feed-rolls 7 enters the guide-tube 10, and emerging from the latter it passes the upper and lower cutting members 11 and 12, respectively, the lower cutting member being represented as stationary, while the upper one is carried upon a slide 13, coöperative with a cam 14 on the

shaft 5, which cam, like certain other cams also on said shaft, is splined thereto. After the extreme forward end of the wire passes by the cutting mechanism it is threaded through the working portions of certain guide members, (denoted in a general way by 15 and hereinafter more particularly described.) The wire is then fed forward until it can strike the forward end of the controlling-rod 16, housed in the tube 17 and longitudinally reciprocative therein. The forward end of the tube 17 is of conical or bell form in order to properly effect the guiding of the free end of the wire against the head end of the rod 16. The opposite end of said rod is connected by a link 18 with the rock-lever 19, clamped to a suitably-guided longitudinally-extending rod 20. The lever 19 is fulcrumed at its upper end on a post 21, rising from the bed 2, and connected to said lever is a coiled pull-spring 22, said spring being also connected to an arm on the lever-supporting post, whereby the rod 16, through the intermediate parts, is held in its advanced position.

A clutch-sleeve 23 is fastened rigidly to the shaft 5 and carries a spring-controlled bolt 24, normally held retracted by a latch or detent 25. The head end of the longitudinally-disposed rod 20 is connected to a suitably-mounted lever 26, adapted to engage intermittently the lower end of the detent 25 in order to lift the opposite end of said detent to effect the release of the bolt 24, whereby the latter can be sprung into engagement with the driving-pulley 9. It will be understood that when the free end of the moving wire strikes the rod 16 the latter is thrust toward the tail end of the machine, whereby the detent 25, through the intermediate parts, is operated in a manner to effect the release of the bolt 24 to permit said bolt to engage the driving-pulley 9, thereby operatively connecting said driving-pulley with the shaft 5, and consequently causing the rotation of said shaft. After the detent 25 has been operated to release the bolt it returns to its original position to effect the retraction of said bolt.

We have described in a general way certain common mechanisms which are more fully set forth in a contemporaneously-pending application hereinbefore referred to. We have adopted this course for the reason that no claim is made to the features thus far generally described.

The guide devices 15, to which reference has hereinbefore been made and which are shown in detail in Figs. 6 and 7 and also in other figures—for example, Figs. 4, 5, and 8—consist of arms of substantially angular shape rigidly united to the rock-shaft 27, mounted within the chambered bed 2. The normal position of the guides is shown in Fig. 4, in which position they are positively maintained by cams, as 28, on the shaft 5. The cams engage the upper ends of levers 29, fulcrumed between their ends on the standards 4. The lower ends of said levers are united to links, as 31, connected at their forward ends with the upper ends of the arms 32, also rigidly fastened to said rock-shaft 27. Coiled pull-springs (each denoted by 33) are connected with the arms 15 and 32, respectively.

The effective portions of the cams 28 by engaging the upper ends of the levers 29 maintain the several guide members 15 in their normal positions or as illustrated, for example, in Fig. 4. When the working portions of said cams pass off the levers, the latter are free to strike the releasing-faces of the cams, at which point the springs 33 become instantly effective for swinging the guide members 15 rearward, in which position they are maintained until the effective portions of said cams engage the upper ends of the levers and impart an opposite movement thereto, and hence to the guide members, the latter on their return movement being given a forward movement or toward the left in said Fig. 4. Each cam 28, it will be apparent, therefore, involves portions of different radii, the portion of greater radius constituting the effective portion thereof or the means for resetting the guide members and for maintaining them in their normal positions.

The leading end of the wire is successively passed through the cone-shaped passages 34 (see Fig. 7, for example) in the heads of the guide members or arms 15. These heads have slots, as 35, open at their outer ends and their inner ends being coincident with the axes of the cone-passages 34. By reason of the conical formation of said passages the wire may be guided in a perfectly straight manner.

Upon one side of each guide-member head is a pivoted latch 36, normally maintained in its working relation by a spring, as 37, connected with said latch and also with the cooperative guide member. Each latch has in its under side a rounded notch or recess 38, between the opposing walls of which the wire is advanced. Normally what might be considered the forward wall of each notch 38, prevents lateral displacement of the wire, the latch being held in operative position to secure this result by means of the spring 37. The wire is advanced through the machine and through the successive guide members 15, and when its extreme forward end strikes the rod 16 the shaft 5 in the manner hereinbefore described is thrown into action. The initial thing that occurs is the severance of the wire by the action of the cutting members 11 and 12, the upper one of which is operated by the cam 14. As soon as the predetermined length of wire to constitute the blank is cut off from the remainder thereof the wire or feed thereof is momentarily arrested. After the blank is severed a crimp

or plurality of crimps is formed therein. In the present case the finished product possesses several crimps, and we will now describe in full a crimping mechanism, such description applying to the other crimping mechanisms.

It might be stated that in the present instance there is coöperative with each crimping mechanism a guide device, such as 15, which guide device, as will hereinafter appear, also constitutes an ejector for the finished product.

The standard 30 has a base 39 and constitutes an effective support for the different parts of the crimping mechanism. Said standard is adjustable longitudinally of the bed 2, its base for this purpose being slidable on the upper side of said bed and having a depending stem or bolt 40 extending through a perforation in the cross-bar 41, adapted to engage under suitable lugs within the bed. By tightening up the bolt the standard, and hence the base forming part thereof, may be maintained in an adjusted position. It will be understood that as the several standards 30 are adjustable the distance between the crimps can be regulated or the distance between the terminal crimps and the ends of the blank or finished product can be likewise regulated within the wish of the manufacturer.

Upon the upper face of the base 39 is a block 42, held rigidly in place in any desirable manner. The wire is fed along and in contact with the upper side of the block and to the rear of the pins 43 thereon. These pins are vertically movable in bores in the block 42, and their upper ends normally project beyond the upper surface of said block in order to constitute a coöperating pair of projections. Said pins 43 are situated at opposite sides of the slot 44, extending from the front to the rear in the block. The wire blank is forced between the two pins or projections in order to form a loop in said wire blank, the loop being subsequently bent upon itself to form the crimp represented in Fig. 13. Normally the pins or projections 43 occupy the position represented in Fig. 9. The pins or projections have teeth at their lower ends meshing with a pinion 45 on the shaft 46, (see Fig. 8, for example,) the block being chambered to receive the said pinion.

On the outer end of the shaft 46 is a mutilated gear 47, the teeth of which mesh with teeth on the lower end of the bar 48, suitably guided on the standard 30. The bar 48 is in its normal position in Fig. 8, during which time the two pins of course extend above the upper surface of the block 42. By thrusting the bar 48 upward the pins 43, through the intermediate parts, will be moved downward flush with or below the upper surface of the block 42, this operation occurring, as will hereinafter appear, after the blank has been crimped, so that the finished product can be ejected away from the crimping mechanism without hindrance from the coöperating pair of pins.

The actuating-cam for the bar 48 is denoted by 49, the upper end of the bar being upheld against the periphery of the cam by the coiled pull-spring 50, connected to said bar and also to the shank or body of the finger 50′, suitably fastened to the standard 30. The free portion of the finger is contiguous to the side face of the cam 49 and maintains the cam in proper relation with the upper end of the bar during the adjustment of the standard 30 and when the latter is in its adjusted position. The pressing-down face or the face of greater radius of the cam 49 is shown in Fig. 8 as engaging the upper end of the bar 48, whereby the two pins 43 will be maintained in their normal positions. When the cam has made about three-fourths of a rotation, the release portion thereof will be brought opposite the upper end of the bar 48, so that the pull-spring 50 can draw the bar 48 upward in order through the intermediate parts to thrust the pins 43 downward and carry them below the path of movement of the wire. The pins 43 are shown as cylindrical in order to assure the formation of a proper bend in the blank at the point where the loop thereof joins the body.

On one wall of the slot 44 is situated a projection 51, (illustrated as an antifriction-roll,) and which plays in the elongated slot 52 of the bending member 53, (illustrated as a plate,) said slot being slightly angularly disposed with respect to the bending member and having downward offsets at its front and rear, respectively, the purpose of which will be hereinafter apparent. A shaft 53′ is suitably supported upon the standard 30 and carries a disk 54 and a pinion 55, (see, for example, Figs 9, 10, and 11,) the pinion meshing with the teeth of the rack-bar 56, adjustably secured at its upper end to the vertically-reciprocative block or head 57, slidably supported by the standard 30 and operable by the cam 58 on the shaft 5.

The wrist-pin 59 on the disk 54 normally lies against the bottom of the rear lateral offset of the longitudinal slot 52, in which position it is maintained positively by the coiled pull-spring 60, connected to the lower rear end of the bending member 53 and also to the upper end of a post 61 to the rear of said bending member, which post is carried by the base or foot 39 of the standard. (See, for example, Fig. 4.) The spring 60 normally, therefore, stands at an angle. The forward end of the bending member 53 has a hook 62, adapted, when the bending member is tilted, to engage over the wire blank.

In Fig. 9 the bar 56 is shown by the arrows in the act of moving downward, the motion of the disk 54 being also indicated by an arrow.

On the initial movement of the disk the wrist-pin 59 served to thrust the bending member 53 in a forward direction. During such motion of the bending member the front end of the same engaged the previously cut blank at a point between the pair of coöperating pins 43 and carried an intermediate portion of the wire therewith and forwardly between and beyond the projections 43, as shown in Fig. 9 and also in Fig. 11, to form the loop in the wire. (Represented best in Fig. 11.) When the disk 54 moves a certain distance, the wrist-pin 59 will ride away from the bottom of the rear offset portion of the slot 52, so that the spring 60 becomes effective for elevating the rear end of the bending member 53 and lowering the hooked end thereof, so that the hook 62 can positively engage the bight of the loop in the wire, which occurs at about the time the wrist-pin 59 reaches a horizontal line intersecting the shaft 53′. Beyond this point the wrist-pin will impart an upward movement to the rear portion of the bending member and simultaneously a rearward endwise movement, so that the hooked end of the bending member will draw the bight of the loop downward and rearward and against the curved faces of the chamfers or recesses 63, formed in the opposite sides of the slot 44 at the forward end of said slot, thereby to bend the loop. In other words, the bending member has a combined endwise and tilting movement in forming a crimp, it being guided by the placing of the projection 51 in the longitudinal slot 52 of said bending member. Therefore the working or hooked end of the bending member has first a forward movement, then a downward movement, and finally a further downward and simultaneously a rearward movement on its working stroke. When such working stroke is completed, the parts will occupy the positions shown in Fig. 10. On the return stroke the procedure will be reversed, and during the same the hooked end of the bending device will be freed or released from the wire.

The spring 60 positively maintains the wrist-pin 59 in proper relation with the slot 52 and its rear offset during the advance and retractive motions of the disk 54. In Fig. 10 we have shown the wrist-pin 59 as occupying its extreme advanced position. As said wrist-pin returns to its original position it serves, aided by the spring 60, to return the bending member to its original position, said bending member initially on its return stroke being freed from the wire. The pull of the spring is successively upward and downward in order to assure the proper action of the parts in the manner set forth. The pin 59, it will be understood, only makes a partial revolution, and during its back-and-forth motion the working end of the bending member 53 will take a substantially elliptical direction.

It will be remembered that the block 57 has an upward and downward movement. This block is shown as provided with means for preventing distortion of the blank during the formation of a crimp, the means being of such a nature as to oppose the bending device or member 53, so that when the product is finished there will be present therein no kinks or undesirable and unnecessary bends. The means for preventing such distortion of the wire consists of the depending legs 64, the shanks of which are adjustably connected with the block or reciprocatory head 57. The lower ends of the legs are downwardly and inwardly beveled, the beveled faces being adapted to engage the wire blank on the rear side thereof during the crimping operation.

On the downward movement of the block 57 the working or beveled portions of the legs 64 are carried against the rear side of the wire, so as to oppose the thrust put upon the wire by the bending device 53. Immediately after the legs 64 occupy their working positions or at the time the beveled faces thereof engage the rear side of the blank the bending device becomes effective for forming the crimp in the blank. Normally, it will be understood, the legs are above the wire blank, and they are moved to such position immediately after a crimp has been formed. The upper end of the block 57 is normally held against the ineffective portion of the cam 58 by the coiled spring 65, connected to said block and also to the upper portion of the standard 30. Upon the rotation of the shaft 5 the effective portion of the cam 58 will press the block 57 downward and will maintain it in the downward position for a predetermined length of time. When the effective portion of the cam rides off the upper end of the block, the latter is returned to its original position by the force of the spring 65, which spring on the downward movement of the block was stretched. During the downward movement of said block the legs 64 are moved to their effective positions, and naturally the rack-bar 56 is moved downward in order to effect the rotation of the pinion 55, and hence the disk 54, whereby the said disk becomes effective, aided by the spring 60, for causing the movement of the bending device 53 to produce a crimp in the previously-cut length or blank of wire.

Just before the cam 58 presses the block 57 downward the effective portion of the cam 28 rides off the upper end of the lever 29, so that said upper end can be swung toward the left or in contact with the ineffective or releasing face of said cam 28 by the power of the two springs 33. When the upper portion of the lever is swung toward the left in Fig. 4, the guide member 15 is swung toward the right, and during this motion the forward curved face of the notch 38 will ride against the blank or wire, the consequence being that the latch is lifted and the blank is caused to

ride out of the slot 35 in the head of the guide member. The guide member is maintained in its backward position for a comparatively considerable length of time, for it will be evident that the effective portion of the cam 28 is of small extent. The instant that the latch 36 passes out of contact with the blank the latch is returned to its initial position by the power of the spring 37.

Just about the time that the crimp in the wire is formed the release portion of the cam 49 comes opposite to the upper end of the rack-bar 48, whereby the spring 50 becomes effective for drawing the rack-bar 48 upward and into the release-notch of said cam 49, whereby through the intermediate parts the pins 43 are drawn downward flush with or below the upper surface of the block 42. The cams 49 are so positioned that their release-notches simultaneously receive the several rack-bars 48 under the action of the springs 50, whereby all the pins 43—there being in the present case three sets of the same—will be down at the same time. The effective portions of the cams 58 are so positioned as to operate in sequence upon the coöperating blocks or heads 57, and the cams 28 are so related that all the guide members 15 will be in their backward positions at the same time. It will be remembered that these guide members have been described as serving also as ejectors for the crimped stock, and it will be understood that all the guide members occupy simultaneously their rearward positions, during which time the upper ends of the levers 29 are in contact with the let-off or releasing portion of the cams 28. When the cams 28 have nearly completed their rotation, the effective portions thereof simultaneously strike the upper ends of the levers 29 so as to force said upper ends toward the right, and thereby swing the guide members forward, or toward the left in Fig. 1, it being understood that at this time all the crimps have been formed in the wire or blank.

Shortly before the time the forward motion of the guide members is completed—and this motion is an accelerated one—the forward ends of the latches strike the crimped stock and forcibly move the same forward into a cradle, as 66, fastened in some suitable way to the forward side of the bed 2 and from which cradle the supply of crimped articles can be removed at desired intervals.

Briefly stated, the operation is as follows: The wire is fed from the reel through the machine, and when the leading end thereof strikes the rod 16 the latter by the moving wire is thrust toward the tail end of the machine to operatively connect the driving-pulley 9 with the shaft 5 by means of the clutch member 23, which, with the coöperating detent 25, is so related that the shaft 5 is caused to have one full turn. Initially the leading portion of the wire is cut off by the action of the knives 11 and 12, the upper one of which is operated by the cam 14 acting upon the upper cutter side 13. The cutting of the forward end of the wire to form a blank stops the feed of the wire by the feed-rolls 7, which have simply a frictional hold on the wire. When the wire is cut off, the crimps are successively formed in the cut length of wire in the manner hereinbefore described, and when said wire is crimped it is ejected from the crimping mechanism into the cradle 66.

We desire to state that we do not limit ourselves to the construction hereinbefore described, for the reason that certain obvious changes may be adopted within the scope of our claims and also that we employ certain terms in the present specification in their broad generic senses.

Having thus described our invention, what we claim is—

1. A wire-working machine having two faces, a device for forcing an intermediate portion of a wire blank between said faces to form a loop therein, and a second pair of faces against which the loop is pressed by said device to form a bend in the loop.

2. A wire-working machine having two faces, a device for forcing an intermediate portion of a wire blank between said faces to form a loop therein, and a second pair of faces against which the loop is pressed by said device to form a bend in the loop, one of said faces being movable with respect to the blank to carry the same free of the wire.

3. A wire-working machine having an endwise movable and tiltable bending device, a pair of faces between which the wire is forced on the endwise movement of said device, thereby to form a loop in the wire, and a second pair of faces against which the loop is pressed by said device on the tilting movement thereof, thereby to form a bend in the loop.

4. A wire-working machine having an endwise movable and tiltable bending device, a pair of faces between which the wire is forced on the endwise movement of said device, thereby to form a loop in the wire, and a second pair of faces against which the loop is pressed by said device on the tilting movement thereof, thereby to form a bend in the loop, and said first-mentioned pair of faces being arranged for movement relative to, and to free, the wire.

5. A wire-working machine having a slotted block, a pair of pins associated with said block and movable above and below the upper face of said block, and a bending device arranged to play in the slot in said block and to press an intermediate portion of a length of wire between said pins to form a loop therein.

6. A wire-working machine having a slotted block, a pair of pins associated with said block and movable above and below the upper face of said block, and a bending device

arranged to play in the slot in said block and to press an intermediate portion of a length of wire between said pins to form a loop therein, the walls of said slot having curved portions, and the bending device being arranged to press the loop against said curved faces to form a bend in said loop.

7. A wire-working machine having a slotted block, a pair of pins associated with said block, means to move in the slot in the block and to press an intermediate portion of the wire between said projections or pins to form a loop in the wire and means for subsequently bending the loop.

8. A wire-working machine having a slotted block, a pair of pins associated with said block, and a bending device arranged to move in the slot in the block and to press an intermediate portion of the wire between said projections or pins to form a loop in the wire, the walls of said slot having curved faces, and the said bending member being adapted to press the loop against said curved faces to form a bend in said loop.

9. A wire-working machine having two pins, a block having openings to receive the pins, the latter extending normally above the upper face of the block, means for pressing the intermediate portion of a wire blank between the pins to form a loop therein, means at opposite sides of the pins to prevent distortion of the blank during the formation of the loop, and means for operating upon the pins to bring their tops substantially flush with said block.

10. A wire-working machine having two faces, a device for forcing an intermediate portion of a wire blank between said faces to form a loop therein, a second pair of faces against which the loop is pressed by said device to form a bend in the loop, and means acting in opposition to said device to prevent distortion of the blank during the action of said device.

11. A wire-working machine having two faces, a device for forcing an intermediate portion of a wire blank between said faces to form a loop therein, and means normally out of contact with the wire and arranged to engage the same during the action of said device to prevent distortion of the wire during the bending operation.

12. A wire-working machine having crimping mechanism involving two coöperating members between which an intermediate portion of a wire blank is pressed, a member having wire-guiding means and arranged to act against the finished product in the direction to move it away from the crimping means, and means for freeing said members from the finished product.

13. A wire-working machine having crimping mechanism, a movable member having a guide-opening for the wire and an outlet-slot leading from said guide-opening, a latch carried by said movable member and arranged to normally hold the wire from movement through said slot, said latch being adapted, on the retractive movement of the said member, to be lifted by the wire to permit the same to pass out of said slot, and on the forward movement of said member to apply a force to the wire in a direction to move it away from the crimping mechanism.

14. A wire-working machine having crimping mechanism, a movable member having a guide-opening for the wire and an outlet-slot leading from said guide-opening, a latch carried by said movable member and arranged to normally hold the wire from movement through said slot, said latch being adapted, on the retractive movement of the said member, to be lifted by the wire to permit the same to pass out of said slot, and on the forward movement of said member to apply a force to the wire in a direction to move it away from the crimping mechanism, and means for positively holding the latch in its normal position.

15. A wire-working machine having crimping mechanism, a movable member having a guide-opening for the wire and an outlet-slot leading from said guide-opening, a latch carried by said movable member and arranged to normally hold the wire from movement through said slot, said latch being adapted, on the retractive movement of the said member, to be lifted by the wire to permit the same to pass out of said slot, and on the forward movement of said member to apply a force to the wire in a direction to move it away from the crimping position.

16. A wire-working machine having die mechanism to form a crimp in a wire blank, said die mechanism having a movable element, automatic mechanism to operate said movable element to free it from the wire after the formation of the crimp therein, and means for normally guiding the wire, said means being movably mounted and adapted on one movement, to free the wire, and on the other movement, to positively eject the crimped wire away from the die mechanism.

17. A wire-working machine having a slotted block, pins fitted in bores in the block and normally extending above the upper surface of the same, a bending device to normally force an intermediate portion of a wire blank between said pins to form a loop in the blank, and mechanism for positively lowering the pins to carry their tops substantially flush with the upper surface of said block and to free the same from the wire.

18. A wire-working machine having a slotted and bored block, pins fitted in the bores in the block, each having rack-teeth and each pin normally extending above the upper surface of said block, a pinion arranged to mesh with the teeth of said pins, a bending member arranged to work in the slot in the block

and to press an intermediate portion of a wire blank between said pins to form a loop in said wire, and means for actuating said pinion, after the formation of the loop, to free the same from the wire.

19. A wire-working machine having two faces, a reciprocatory block, a bending device, means operated by the said block for actuating the bending device in a direction to cause the same to force an intermediate portion of the wire blank between said faces to form a loop in said wire blank, and means carried by said block for engaging the wire, upon the action of the bending device, and serving to prevent distortion of the blank during such time.

20. A wire-working machine having a disk provided with a wrist-pin, a longitudinally-slotted bending device, the slot in which receives said pin, and the slot terminating at its opposite ends in offsets, a guide-pin extending into said slot, a spring to maintain the walls of the slot in working relation with said wrist-pin, means for imparting a back-and-forth partial rotation to said disk, to thereby cause the bending device to receive an endwise and tilting movement, a pair of faces between which the wire blank is forced by said bending device on the endwise movement thereof, said bending device having a hook at its working end to engage the wire, and a pair of faces against which the wire is pressed, on the tilting movement of said bending device.

21. A wire-working machine having a disk provided with a wrist-pin, a longitudinally-slotted bending device, the slot in which receives said pin, and the slot terminating at its opposite ends in offsets, a guide-pin extending into said slot, a spring to maintain the walls of the slot in working relation with said pin, means for imparting a back-and-forth partial rotation to said disk to thereby cause the bending device to receive an endwise and tilting movement, a slotted block, in the slot of which said guide-pin is mounted and in which said bending device is arranged for operation, pins associated with said block, and between which a wire blank is forced by said bending device on the endwise movement thereof, said bending device having a hook at its working end to engage the wire, and the slot having a pair of faces against which the wire is pressed on the tilting movement of said bending device.

22. A wire-working machine having a reciprocatory block, a disk provided with a wrist-pin, a longitudinally-slotted bending device, the slot of which receives said pin, and the slot terminating at its opposite ends in offsets, a guide-pin extending into the slot, a spring to maintain the walls of the slot in working relation with said wrist-pin, means connected with said reciprocatory block for imparting a back-and-forth partial rotation to said disk to thereby cause the bending device to receive an endwise and tilting movement, a slotted block, in the slot of which said bending device works and in which the guide-pin is mounted, a pair of pins associated with said block and between which the wire is pressed by said bending device on the end wise movement thereof, said bending device having a hook at its working end to engage the wire, and the slot in the block having a pair of faces against which the wire is pressed on the tilting movement of said bending device, and means connected with said block and positioned thereby to act against the wire in opposition to said bending device and to prevent distortion of said wire during the action of the bending device.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

ORLA H. WATKINS.
CHARLES F. SKELLENGER.

Witnesses:
AMES M. COOPER,
ANNA JANSSEN.