March 22, 1932. H. E. FRENETTE 1,850,666

MACHINE FOR MAKING WIRE CLIPS

Filed March 8, 1930 5 Sheets-Sheet 1

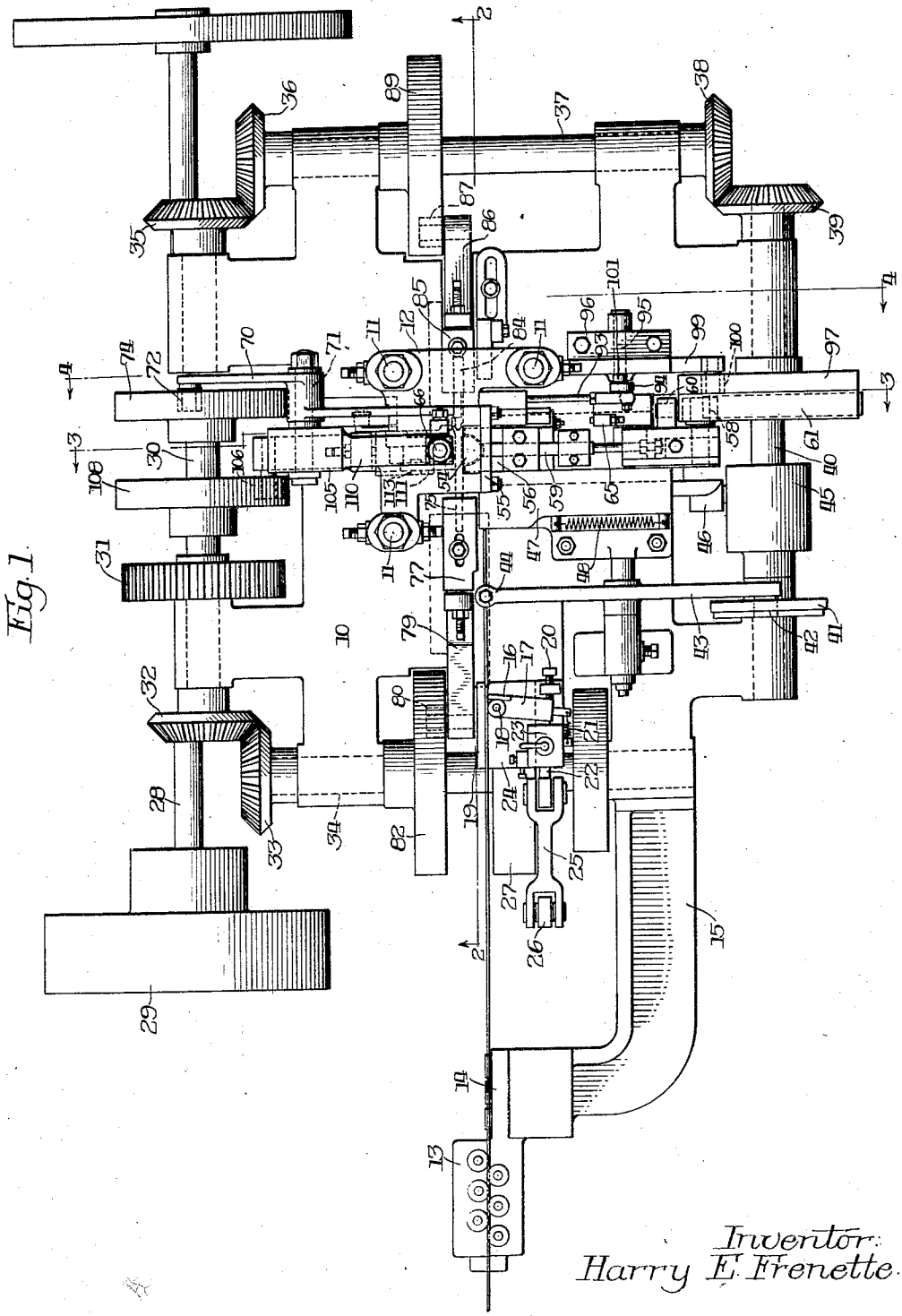


Fig. 1.

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MACHINE FOR MAKING WIRE CLIPS

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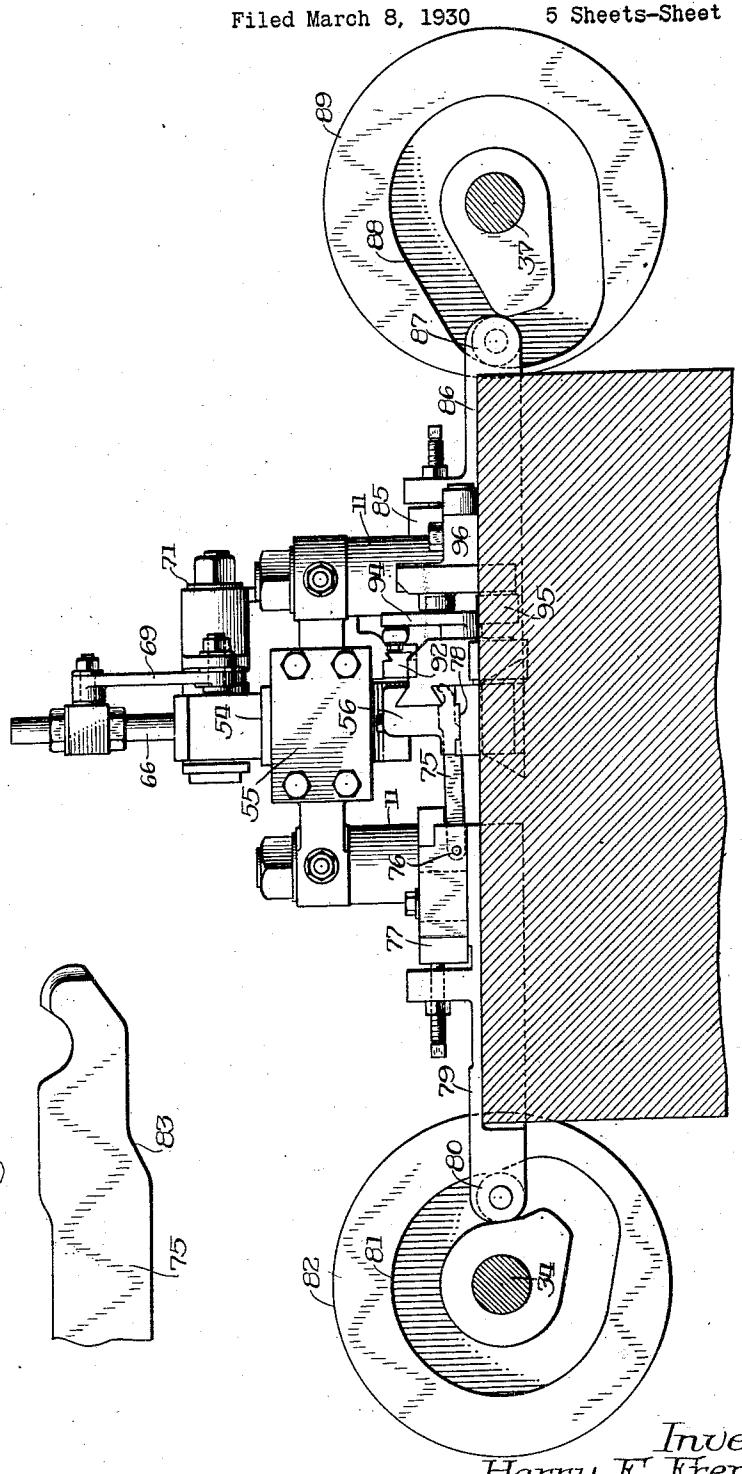


Fig. 2.

Fig. 6

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MACHINE FOR MAKING WIRE CLIPS

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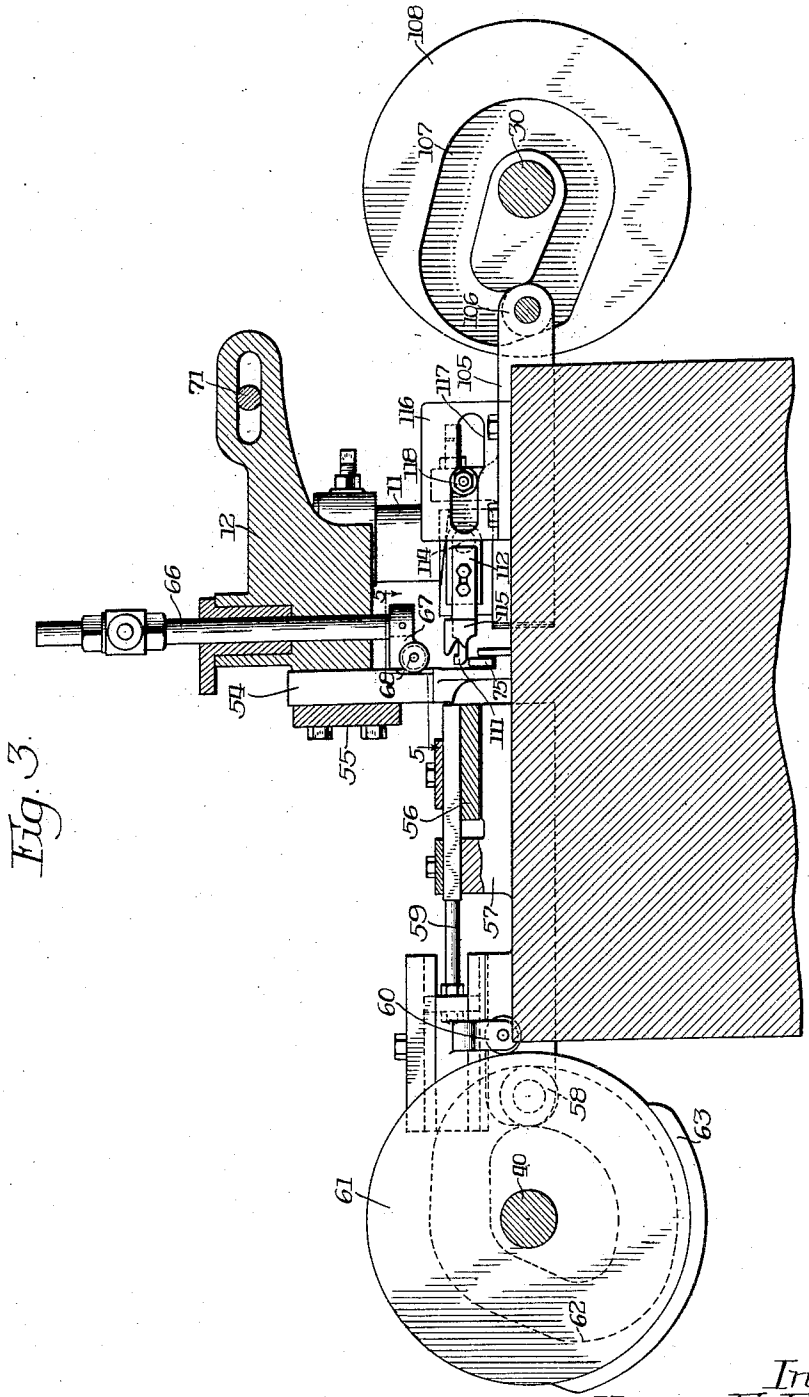


Fig. 3.

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MACHINE FOR MAKING WIRE CLIPS

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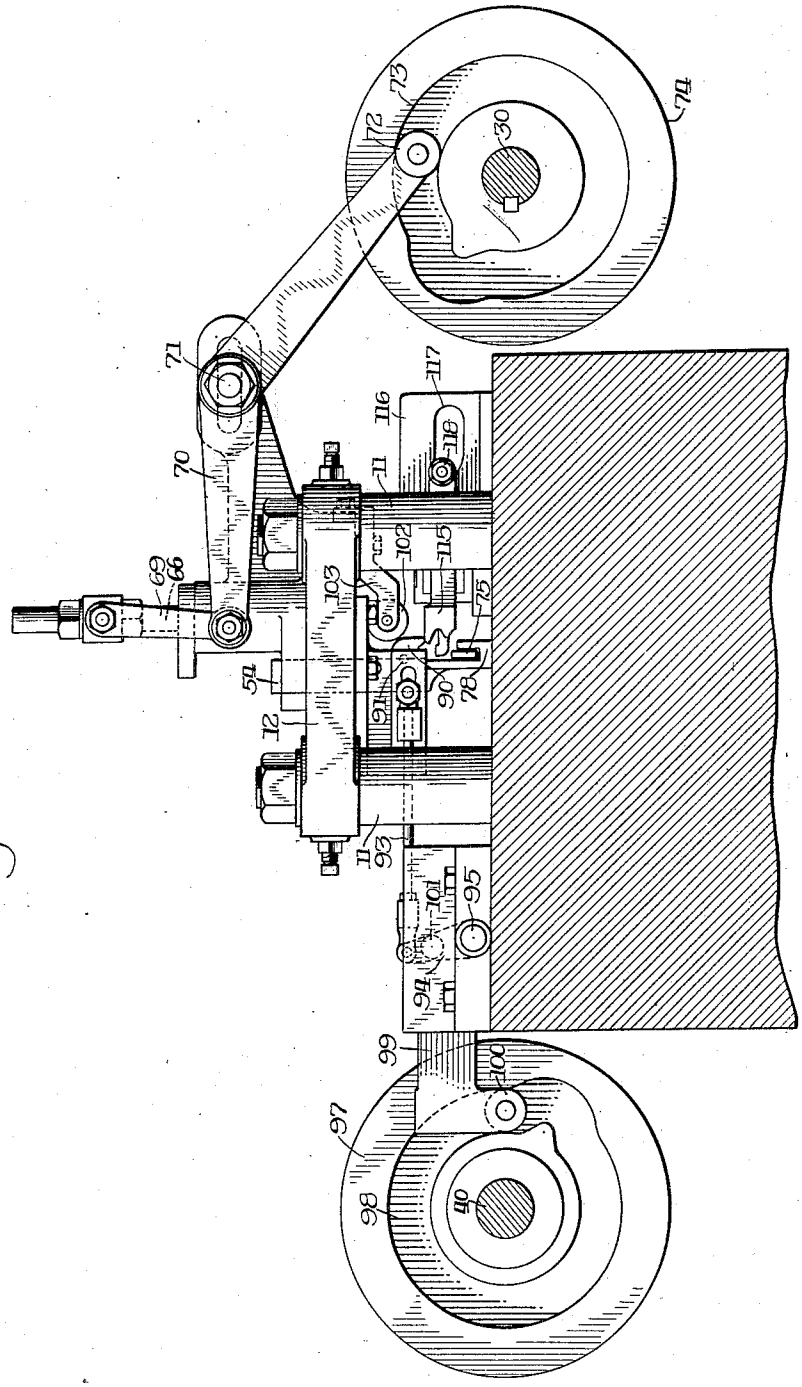


Fig 4.

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Fig. 9.



Fig. 7.

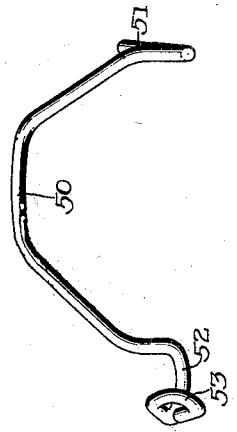


Fig. 10.

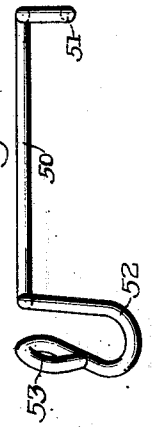


Fig. 8.

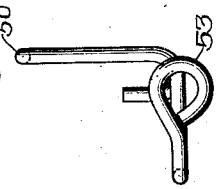


Fig. 5.

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UNITED STATES PATENT OFFICE

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MACHINE FOR MAKING WIRE CLIPS

Application filed March 8, 1930. Serial No. 434,233.

The invention relates generally to the art of making wire clips, and more particularly to an improved machine for bending or twisting wire or similar metal elements into desired shapes.

Machines have heretofore been developed for bending and twisting wires, such machines including what is commonly known as the four-slide machine, having plungers or slides reciprocating in relation to the work from four different directions. In some instances, however, such as in the manufacture of post attaching clips having a twisted end portion, it is impossible to make this twist with such type of machines.

The formation of post attaching clips is frequently accomplished by forming loops on the ends of the body portion thereof in two or three places at angles to each other from a single strip of wire. The wire is given a series of successive bending operations by forming tools or pusher members acting upon the piece of wire while held in a single form, so that when the successive operations have been performed, a predetermined form of clip is made in a single machine and without the necessity of transferring the device from one set of dies to another.

The present invention provides improved means and ways of forming such clips and performing similar wire twisting and bending operations.

In the drawings, which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a plan view of the machine constructed in accordance with the present invention.

Figure 2 is a vertical section taken along line 2—2 of Figure 1.

Figure 3 is a vertical section taken along line 3—3 of Figure 1.

Figure 4 is a vertical section taken along line 4—4 of Figure 1.

Figure 5 is a horizontal section taken on an enlarged scale showing the stationary die and forming die in operative position.

Figure 6 is a fragmentary section on enlarged scale showing one of the forming tools.

Figure 7 is a plan view of a clip made by the machine.

Figure 8 is a side view of the same.

Figure 9 is a side view looking towards the left of Figure 7.

Figure 10 is a front elevation of the clip as shown in Figure 7.

The machine is supported upon a base 10, which in turn is supported from the floor by any suitable legs not shown. Supported from the base 10 by legs 11 is a table 12. The horizontal wire straightening rolls 13 and the vertical wire straightening rolls 14 are carried on a laterally extending bracket 15. The wire feeding mechanism comprises a jaw 16, which is carried by an arm 17 rotated about the pivot 18. This jaw grips the wire against the backing plate 19. The arm 17 is limited in movement by adjustable stud 20 and is drawn away from the stud by the spring 21. The cam plunger 22 is housed within a bearing 23 carried upon a block 24. The plunger 22 is conected to a link 25 which in turn has connection to a bell crank lever 26. The bell crank lever 26, operated by any suitable form of mechanism, causes the block 24 to have reciprocating movements upon a slide 27. Upon movement of the plunger 22 to its forward direction, the jaw 16 will grip the wire against the backing plate 19 and cause the wire to be fed to the machine as the block 24 is simultaneously moved in its forward direction.

The main drive shaft 28 is driven through a pulley 29 and power is transmitted from the shaft 28 to the cross shaft 30 by means of a gear meshing with a gear 31. The shaft 30 carries a bevel gear 32 meshing with a bevel gear 33 on shaft 34. The shaft 30 at its other end carries a bevel gear 35 meshing with a bevel gear 36 on shaft 37. In like manner the shaft 37 at its other end carries a bevel gear 38 meshing with a bevel gear 39 on shaft 40. It is thus seen that the base 10 is provided with rotating shafts upon all of its four sides.

The shaft 40 carries a cam 41 upon which rides a cam roller 42, carried by one end of a rocker arm 43. The other end of the rocker arm carries a gripper 44 adapted to grip and

hold in set position the wire at those intervals when the cam 41 engages the roller 42 to cause the arm to rock.

For cutting the wire into the various lengths as desired, the shaft 40 is provided with a cam 45, which has engagement against a roller 42 for forcing inward a cutter slide 47 against the action of spring 48. Inward movement of slide 47 functions to sever the wire after the desired length has been fed into the machine by the feeding mechanism described.

Before proceeding with an explanation of the various forming tools, their nature and operation can best be understood by reference to Figures 7 and 10, inclusive, which discloses the formation of the clip made by the machine. The clip comprises a body portion 50 having on its right hand side, as viewed in Figure 7, a loop 51. On the other side of the body portion is formed a large loop 52 which depends from the body portion and which loop is also provided with a second loop 53 at substantially right angles thereto.

The mechanism for forming the body portion of the clip comprises a stationary die 54, Figure 3, securely held in position in the table 12 by means of a holding plate 55 and a forming die 56 adapted to have contacting engagement against the stationary die 54. The forming die 56 is secured to a slide 57 which is provided with a roller 58. Also operatively associated with the forming die is a holding member 59 which serves to securely hold the wire in place upon the stationary die 54. The holding member is also provided with a roller 60. For operating the forming die 56 as well as the holding member 59 the shaft 40 is provided with a cam 61, which is formed with a cam race 62 and a cam surface 63. As the roller 58 has engagement within the cam race 62, the slide 57 is given its required reciprocating movements while the holding member 59 is actuated by engagement of the cam surface 63 with the roller 60. For purposes to be presently described, the forming die 56, as shown in Figure 5, is provided with a pin 64 which has frictional sliding movement therein and upon rearward movement of the forming die is adapted to be engaged by a stop 65.

For forming the depending ends on the body portion 50 of the wire clip prior to the formation of the loops, the table 12 is provided with a vertical reciprocating slide 66, Figure 3, having secured to its lower end a plate 67 upon which is journaled a plurality of rollers 68. The upper end of the slide 66 is pivotally secured to a link 69 having engagement with one end of a rocker arm 70. The rocker arm is adjustably pivoted to the table 12 at 71 and is adapted to have the roller 72 at its other end engaged within a cam race 73 provided in the cam 74, mounted on the horizontal shaft 30. The cam race 73 is of such formation as to give movements to the rocker arm 70 so as to cause vertical reciprocating movement of the slide 66.

The second operation upon the clip is a formation of the loop portion 52. This is formed by a forming tool 75, Figure 2, having pivotal engagement at 76 with a block 77. The forming tool 75 is adapted to ride within a groove 78 provided in the lower end of the stationary die 54, while the block 77 is adjustably secured upon a slide 79. For actuating the slide a roller 80 has engagement within the cam race 81 provided in the cam 82, which in turn is mounted upon shaft 34. By forward reciprocating movement being imparted to the slide 79 and thus the block 77 secured thereto, the forming tool 75 will be given a forward and upward movement by reason of the cam surface 83 formed on its lower side, which is adapted to have engagement against a pin or suitable member provided for the purpose in the groove 78.

For the formation of the right angle loop 53, several operations are required, one of which is a provision of locating a forming pin in proper position for bending the wire thereon. The forming pin 84, Figures 1 and 5, is secured to a block 85 which in turn is mounted upon a reciprocating slide 86. For actuating the slide the same is provided with a roller 87 on its outer end having engagement within a cam race 88 provided in the cam 89, which in turn is mounted upon shaft 37.

In connection with the forming pin 84, a forming tool 90 is employed, as shown in Figure 4. The forming tool is pivoted at 91 to a slide 92 adapted to be actuated by reason of a horizontal rod 93. The rod 93 is pivoted to the upper end of an arm 94, which arm in turn has pivotal engagement at 95 to a block 96 securely mounted on the base 10. The cam 97 having the cam race 98 therein serves to actuate the arm 94, as the slide 99 has the roller 100 operating within the cam race 98 and is in turn pivoted to the arm 94 at 101. The movements thus imparted to the rod 93 will cause the forming tool 90 to have a forward movement whereupon the upper portion of the tool will engage the roller 102 pivoted to a bracket 103, secured to the table 12. As the forming tool 90 was itself pivoted at 91, its engagement with the roller 102 will cause a quick downward movement to be imparted to the forming tool, which movement is for the purpose of bending the wire around the forming pin 84 to substantially complete the formation of the loop 53.

By reference to Figures 9 and 10 it will be noted that the loop 51 on one side of the clip is open, while the loop 53 is substantially closed against a portion of the loop 52. The mechanism for performing this last operation comprises a slide 105, Figure 3, provided with roller 106 operating within a cam race

107 provided in the cam 108, which in turn is mounted upon the shaft 30. The slide 105 has adjustably secured to it a block 110 on which are pivotally mounted at either side thereof, forming tools 111 and 112 respectively. The tool 111 pivoted to the block at 113, serves to bend the right hand end of the clip as shown in Figure 7 into the loop designated 51.

The forming tool 112 is pivoted to the block 110 at 114 and has a V formation 115 provided on its outer end for bending the wire as described. It is necessary for this particular bending purpose to give the end 115 of the forming tool a movement in a downward direction as it is caused to move in a forward direction, thus forming the closed end of the loop 53. For this purpose a profile plate 116 is provided secured to the base 10, and having a particular formation of cam slot 117 therein. A roller 118 secured to the forming tool 112 is adapted to ride within this cam slot thus giving the rear end of the forming tool an upward movement to cause the downward movement of the V formation 115.

In the use of the apparatus, wire is fed from any suitable wire holder through the straightening rollers 13 and 14 and through the feeding mechanism until its end abuts the cutting slide 47. When the parts assume the proper position under power supplied through the power shaft and several counter shafts described, the wire will be positively gripped by the jaw 16 and fed forward past the stationary die 54 by the forward reciprocating movement of the block 24 upon the slide 27. This forward movement of the block 24 is sufficient to feed the desired length of wire to form the clip. Just prior to the rearward movement of block 24 the gripper 44 is actuated which serves to hold the wire in fed position.

The next operation of the machine is accomplished by the holding member 59, Figure 3, which holds the wire in engagement against the stationary die 54 by reason of the cam surface 63 engaging a roller 60. Substantially simultaneous with engagement of the holding arm 59 with the wire, the cutter slide 47 is actuated by the cam 45 to sever the wire into the length desired. Immediately subsequent to this operation the forming die 56 is actuated through engagement of the roller 58 with the cam race 62. This movement is such as to force the forming die in a forward direction towards the stationary die 54 thus bending the length of wire around the die to form the body portion 50 as shown in Figure 7. It will be realized of course that with the wire thus bent around the die the ends thereof will extend horizontally therefrom.

The next operation is to bend these ends of the wire in a downward direction which is accomplished by the vertical reciprocating slide 66 through means of the rollers 68. With both ends of the wire now bent at substantially right angles to the body portion, the next operation is accomplished through the forming tool 75. This tool is actuated by engagement of the roller 80, Figure 2, with the cam race 81 which imparts to it a forward movement, while by reason of the formation 83 on the bottom portion of the forming tool, it is caused to have an upward movement. The resultant of these two movements is such that the forming tool 75 bends the left hand end of the clip, as shown in Figure 7, into the loop 52. The mechanism serving as the forming pin around which the loop 52 is formed comprises the pin 64 located in the forming die 56, Figure 5 and is adapted to have frictional sliding engagement therein. It is necessary that this pin be forced in a direction so that its depending end is flush with the surface of the forming die 56 since at the completion of all the bending operations, it is desirable to have the clip drop from the machine. The pin 64, however, is again forced into its forward position, since upon the rearward movement of the forming die the pin engages against its stop 65.

The next operations to form the loop 53 are substantially simultaneous and comprise actuation of the rod 93, Figure 4, by reason of the roller 100 running in the cam race 98. The forward movement thus imparted to the forming tool 90 causes it to engage roller 102, thus giving the forming tool a downward movement. Previous to this operation, however, it is necessary for the forming pin 84 to be located in its proper position, which is accomplished by reason of roller 87 running within the cam race 88. It is thus seen that the actuation of these parts serves to present the forming pin 84 in a position whereupon the forward and downward movement of the forming tool 90 serves to bend around the pin the wire, forming substantially thereby the loop 53.

The last operations upon the clip are performed by the forming tools 111 and 112, which tools are pivotally secured to the block 110. By actuation of the roller 106 within the cam race 107 the tool 111 is given a forward movement to form the loop 51. The tool 112 is likewise given a forward movement and simultaneously therewith a downward movement by reason of the cam slot 117 within which the roller 118 is adapted to slide. This forward and downward movement of the forming tool 112 serves to complete the formation of the loop 53, causing it to close against a portion of the wire of loop 52 and also serves to drive inwardly the pin 64. From the beginning of the formation of the clip by bending same around stationary

die 54, the holding member 59 remains in engagement with the wire serving to hold it against stationary die. Immediately upon a completion of the last operation as described, the holding member is withdrawn and simultaneous with this movement the forming die 56 is likewise withdrawn. The cam races on the various cams as described are such formation that they also serve to withdraw the forming tools which they actuate so that the clip is free to drop from machine.

While the machine has been shown and described as forming one particular form of wire clip, it is obviously capable of a wide range of wire twisting and bending operations. Any suitable variations in the contour of the fixed and movable die and likewise the forming tools may be made to accommodate it to the desired use. It is therefore contemplated that such changes and modifications will come within the spirit and scope of the appended claims.

I claim:

1. In a metal working machine, a fixed die, a holding member for holding a strip of wire on said fixed die, a reciprocating die for bending said wire on the fixed die while so held, a vertical reciprocating member for bending the ends of said wire in a downward direction, and forming tools adapted to be actuate in sequence for forming loops on the bent ends of said wire.

2. In a metal working machine, a fixed die, a holding member cooperating therewith, a reciprocating die for bending a piece of wire on said fixed die while held by said member, a vertical reciprocating member for bending downward the ends of said wire, and other reciprocating means for forming the bent ends into loops.

3. In a wire bending machine, a fixed die, means for bending a piece of wire around the die, vertical reciprocating means for bending downward projecting ends of said wire, a plurality of forming pins, and forming tools cooperating with said pins for bending the ends of said wire thereon to form loops.

4. In a wire bending machine, a fixed die, means for bending a piece of wire around the die, vertical reciprocating means for bending downward projecting ends of said wire, forming pins, forming tools cooperating with said pins for bending one end of said wire thereon to form loops, and other means for forming a single loop on the other end of said wire.

5. In a wire bending machine, a fixed die, a holding member, means for reciprocating said member towards and away from said die, a forming die, other means for reciprocating said forming die towards and away from said fixed die, forming pins, and forming tools cooperating therewith for the purposes described.

6. In a wire bending machine, a fixed die, a holding member, a reciprocating die, means for presenting said member and die to said fixed die substantially simultaneously, a vertical reciprocating member for operation upon a piece of wire subsequent to the operation performed by the forming die, a plurality of reciprocating slides, certain of said slides presenting into position in relation to the fixed die a forming pin, and other of said slides presenting into position forming tools.

7. In a wire bending machine, a fixed die, a holding member, a reciprocating die, means for presenting said member and die to said fixed die substantially simultaneously, a vertical reciprocating member for operation upon a piece of wire subsequent to the operation performed by the forming die, a plurality of reciprocating slides, a forming pin mounted on one of said slides, forming tools mounted on the other of said slides, and cam means for reciprocating said slides in sequence.

8. In a wire bending machine, dies for giving the initial bend, means movable at right angles thereto for bending the ends of the material at right angles to the initial bend, reciprocating means for presenting forming pins into position, and forming tools cooperating with said pins for forming loops on the right angle portions.

9. In a wire bending machine, dies for giving the initial bend, means movable at right angles thereto for bending the ends of the material at right angles to the initial bend, forming pins, means presenting said pins into position with one of said right angle portions, forming tools cooperating with said pins for bending said right angle portion into a plurality of loops, and another forming tool for bending the other right angle portion into an open loop.

10. In a wire bending machine, dies for giving the initial bend, means movable at right angles thereto for bending the ends of the wire at right angles to the initial bend comprising a vertically reciprocating slide with rollers on the slide for engaging the wire, a plurality of horizontally reciprocating slides presenting forming pins in position, and forming tools adapted to be operated in sequence for bending the wire around said pins to form loops.

11. In a wire bending machine, dies for giving the initial bend, means movable at right angles thereto for bending the ends of the wire at right angles to the initial bend comprising a vertically reciprocating slide with rollers on the slide for engaging the wire, a plurality of horizontally reciprocating slides presenting forming pins in position, other slides having reciprocating movement for actuating forming tools, said tools cooperating with the pins for forming a plurality of loops on one of the right angled portions of said wire.

12. In a wire bending machine. dies for

giving the initial bend, means movable at right angles thereto for bending the ends of the wire at right angles to the initial bend comprising a vertically reciprocating slide with rollers on the slide for engaging the wire, a plurality of horizontally reciprocating slides presenting forming pins in position, other slides having reciprocating movement for actuating forming tools, a profile plate associated with one of the tools to cause the same to have a forward and downward movement, said tools cooperating with the pins for forming a plurality of loops at substantially right angles to each other.

13. In a wire bending machine, a fixed die, means for bending a piece of wire around the die, vertical reciprocating means for bending downward projecting ends of said wire, a plurality of forming pins, a plurality of reciprocating slides, forming tools certain of which are pivoted to one of said slides, and means cooperating therewith for giving to said pivoted tools a forward and downward movement, whereby loops are formed on the projecting ends of the wire.

14. In a wire bending machine, a fixed die, means for bending a piece of wire around the die, vertical reciprocating means for bending downward projecting ends of said wire, a plurality of forming pins, a plurality of reciprocating slides, certain of said slides actuating forming pins, other of said slides actuating forming tools, said tools and pins cooperating to form a plurality of loops on one projecting end, and a single loop on the other end of the wire.

Signed at Duluth, Minnesota, this 24 day of February, 1930.

HARRY E. FRENETTE.