

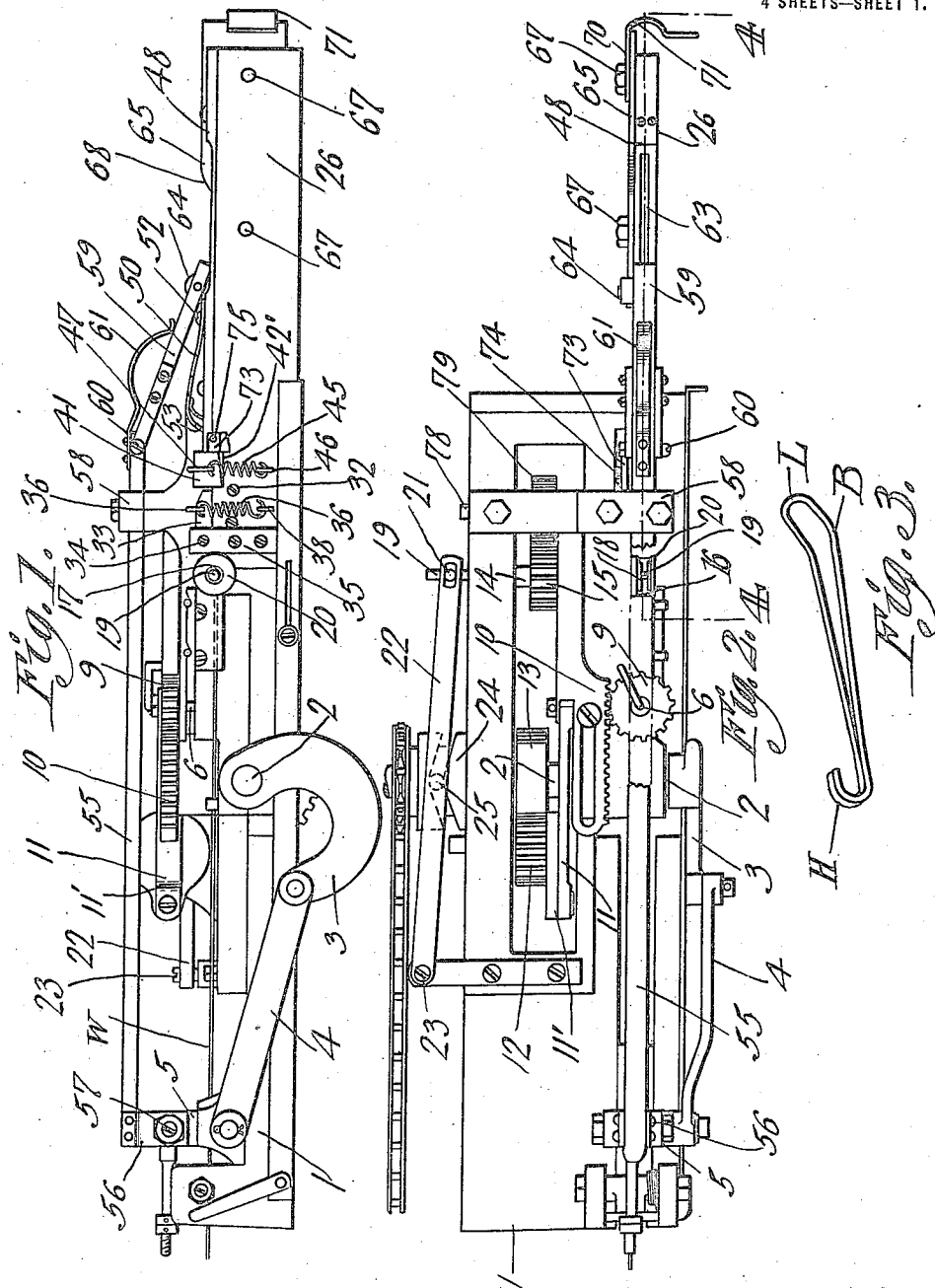
G. B. SMITH.  
WIRE LINK MACHINE.

APPLICATION FILED SEPT. 12, 1917, RENEWED SEPT. 23, 1921.

1,419,476.

Patented June 13, 1922.

4 SHEETS—SHEET 1.



Witnesses

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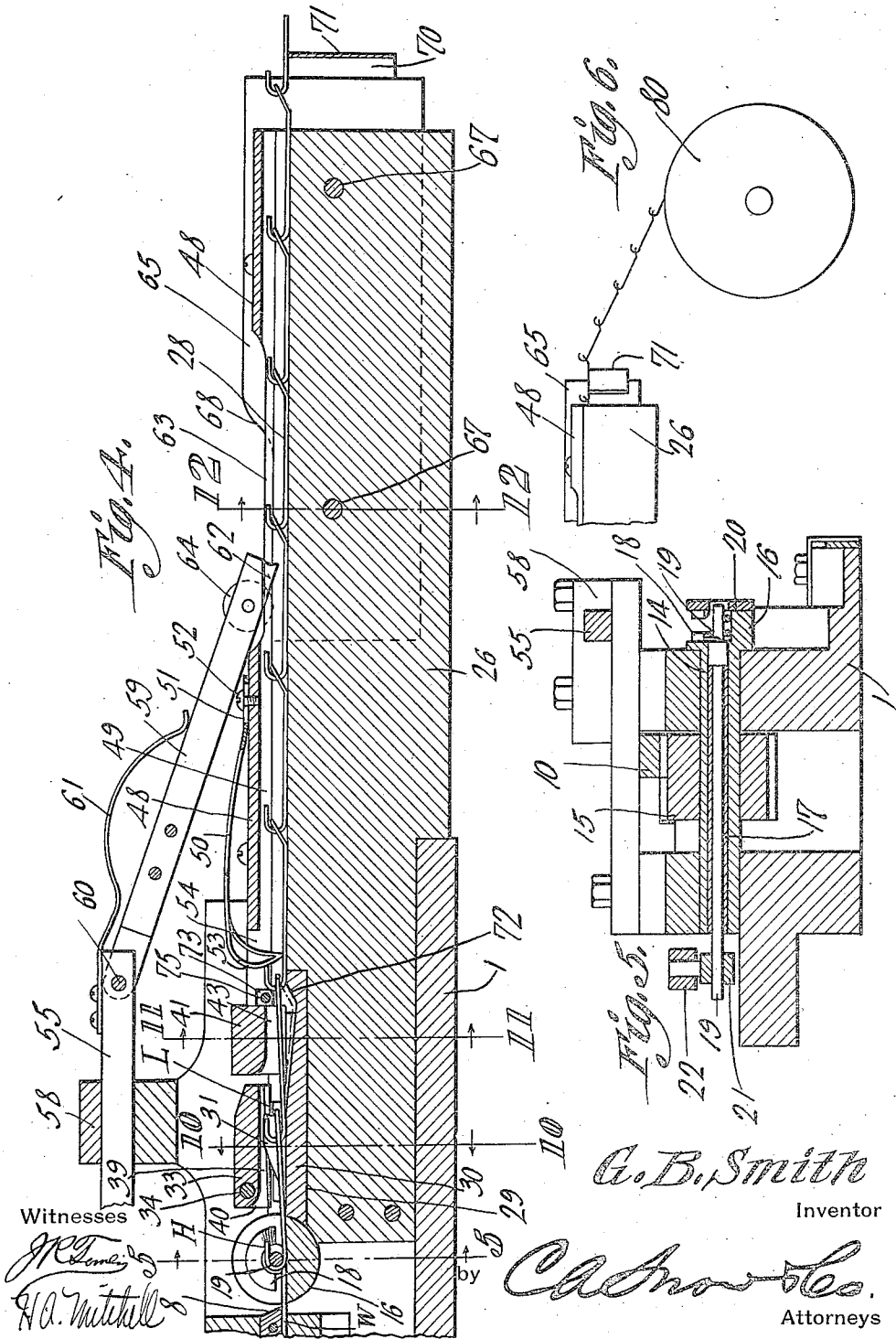
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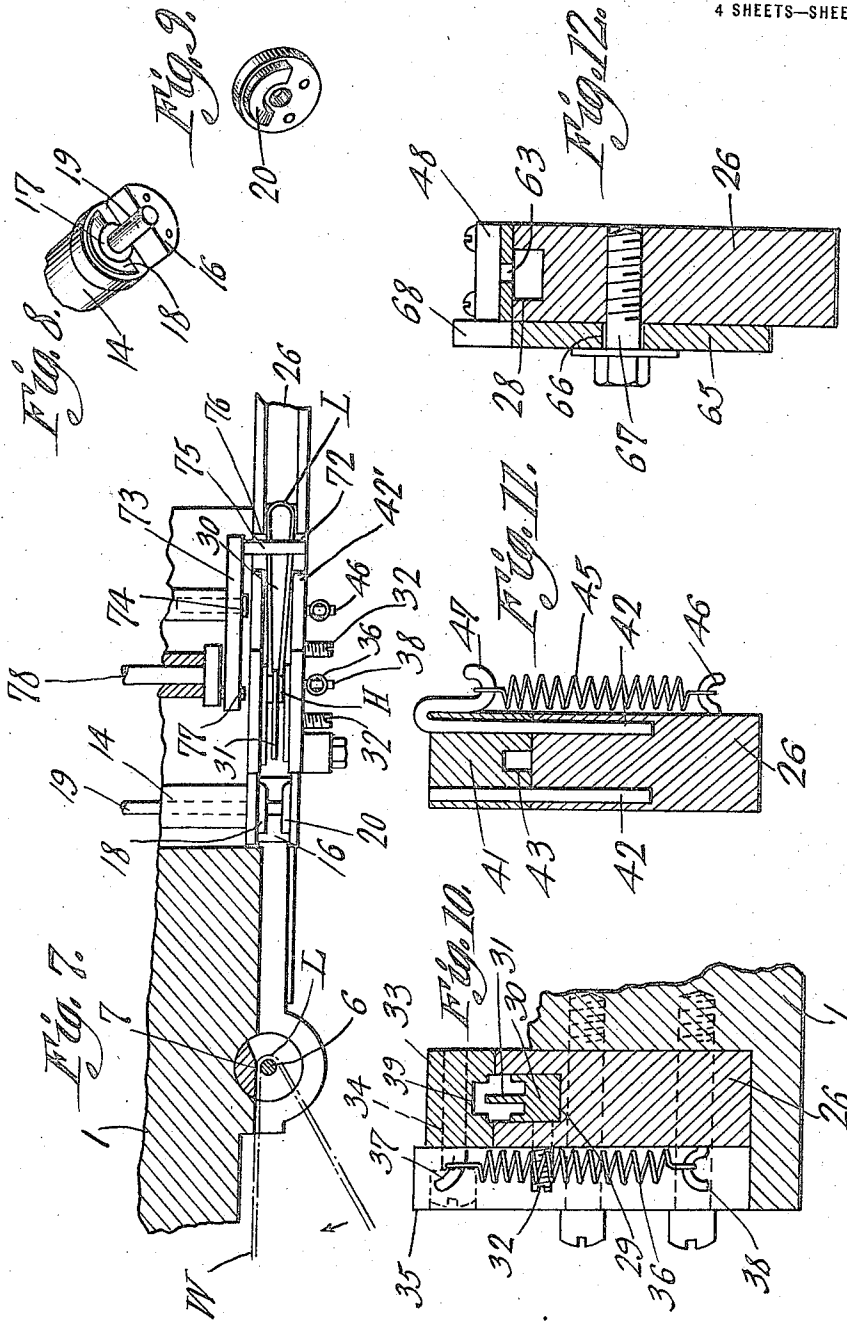
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Witnesses

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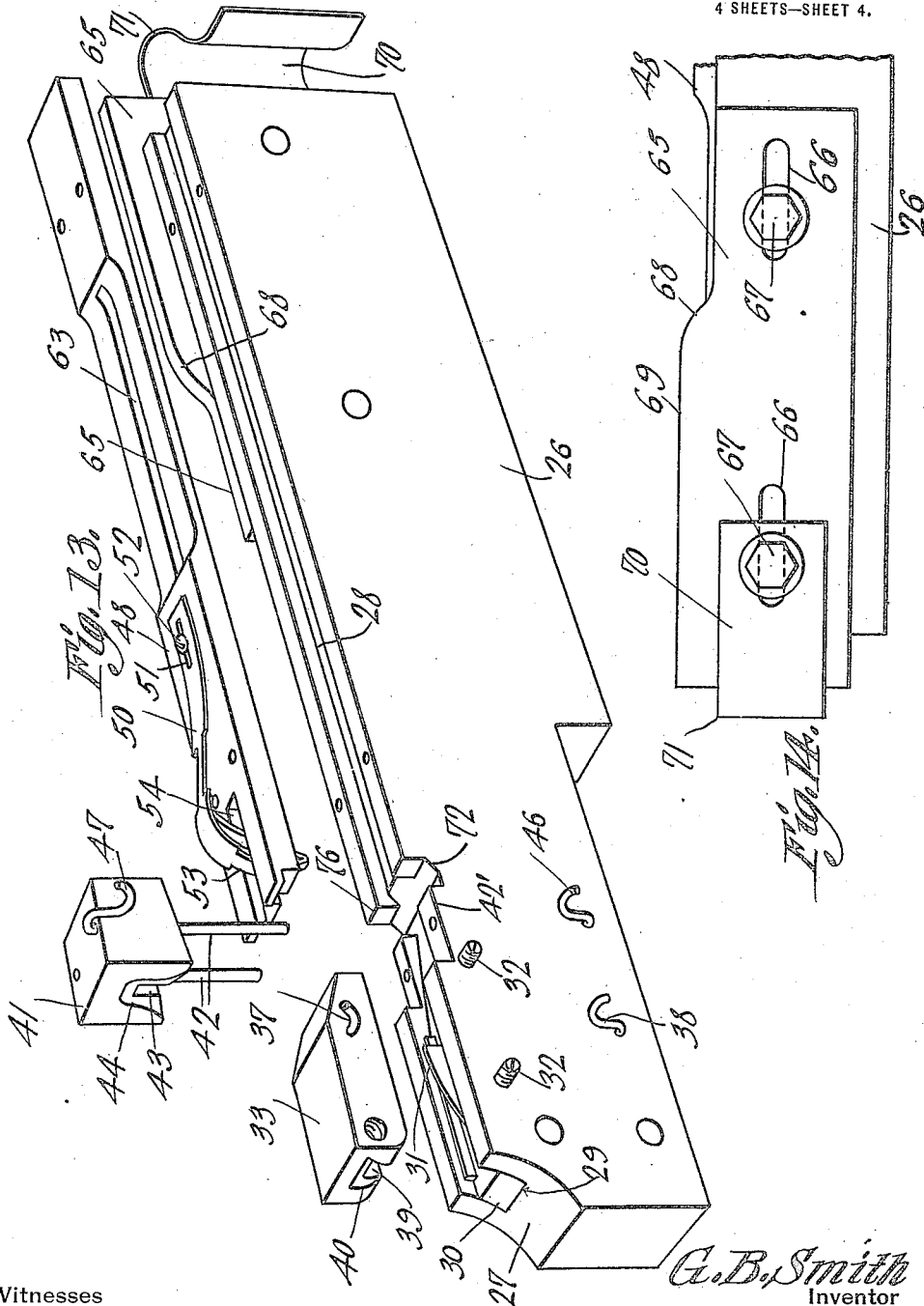
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Witnesses

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# UNITED STATES PATENT OFFICE.

GARY B. SMITH, OF CHICAGO, ILLINOIS.

## WIRE-LINK MACHINE.

1,419,476.

Specification of Letters Patent. Patented June 13, 1922.

Application filed September 12, 1917, Serial No. 190,973. Renewed September 23, 1921. Serial No. 502,689.

*To all whom it may concern:*

Be it known that I, GARY B. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Wire-Link Machine, of which the following is a specification.

The present invention relates to a machine for making and assembling wire links, such as are used in bed spring fabric, the present invention being an improvement over the machine for making cross tie links disclosed in my Patent #1,116,506, granted November 10, 1914.

It is the object of the invention to provide in addition to the link forming mechanism, means for assembling the links into a chain as the links are delivered.

The invention also includes means for feeding the links of the chain, and novel means for bending the links whereby they are arranged to interlock as disclosed in my co-pending application for patent on cross tie chain fabric for bed springs, Serial #149,941, filed February 20, 1917.

A further object of the invention is to improve the machine so that the hooked terminals of the links are pressed together, and the links permitted to pass longitudinally from the hook-forming means to the assembling means.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a side elevation of the machine.

Figure 2 is a plan view thereof.

Figure 3 is a perspective view of one of the links formed by the machine.

Figure 4 is an enlarged longitudinal section taken on the line 4—4 of Figure 2.

Figure 5 is a cross section on the line 5—5 of Figure 4.

Figure 6 is a fragmental elevation illustrating the reel for winding up the chain.

Figure 7 is a fragmental plan view of the machine showing the bending and assembling means.

Figure 8 is a fragmental perspective view of the hook forming or bending means, portions being broken away and shown in dotted lines.

Figure 9 is a perspective view of the cam removed from the device shown in Figure 8.

Figures 10, 11 and 12 are cross sections on the respective lines 10—10, 11—11, and 12—12 of Figure 4.

Figure 13 is a perspective view of the attachment, showing the parts thereof separated, parts being removed.

Figure 14 is a fragmental elevation of the delivery portion of the attachment showing the releasing cam for the chain feeder.

The machine, with the exception of the attachment hereinafter referred to, is quite similar to the machine disclosed in Patent #1,116,506, above referred to, so that a

brief description thereof will suffice. This machine embodies a base or frame 1 of suitable construction carrying a transverse drive shaft 2 provided with a crank arm 3 connected by a link 4 with a reciprocatory wire

feeder 5 mounted on the frame. This feeder 5 serves to grip the wire and advance it to the bending means, as fully disclosed in said patent. The feeder 5 is reciprocated

intermittently to intermittently advance the wire past a loop-forming pin or shaft 6 and oscillatory bender 7 movable around said pin or shaft. The wire is also advanced by the feeder 5 past a shear blade or cutter 8

to the hook-forming or bending means. The bender 7 is operated by a pinion or gear 9 carried thereby and meshing with a rack bar 10 slidable longitudinally on the frame and connected by a link 11 with a

crank 11' secured to a pinion 12 journaled on the frame meshing with a mutilated pinion 13 secured on the drive shaft 2. Thus, during the rotation of the drive shaft 2, the feeder 5 is reciprocated and the rack 10 is also reciprocated in proper timed

relation, to oscillate the bender 7 properly.

The hook-forming or bending means embodies a tubular rock shaft 14 journaled in the frame having a pinion 15 secured thereon meshing with the rack 10, whereby the rock shaft 14 is oscillated during the oscillation of the pinion 9 and bender 7. The rock shaft 14 is provided at one end adjacent to the cutter 8, with a segment-shaped bender 16 one end of which provides a shear blade

or cutter movable past the cutter 8 to sever the wire. A tubular stem 17 is fitted within

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the rock shaft 14 and is provided at one end with a cam 18 above the bender 16 and abutting the end of the shaft 14, a pin or rod 19 is slidable in the tubular stem 17 of the cam 18, and a cam 20 complementing the cam 18, is secured to the bender 16, the two cams confronting one another and being carried by the bender 16 and rock shaft 14. The rod 19 is slid back and forth by means of a cross head 21 secured thereto at that end opposite the bender 16, said cross head pivotally engaging a lever 22 near one end, which has its other end fulcrumed, as at 23, to the frame. A cam 24 secured on the drive shaft 2 engages a pin 25 carried by the lever 22 for oscillating said lever in proper timed relation. This means for bending the hooks is slightly different from the corresponding bending means disclosed in said patent, in view of the provision of the cams 18 and 20, and the sliding rod 19, the operation of which will be described hereinafter.

Coming to the attachment, which serves to assemble or connect the links together and to bend them to bring the loops at an obtuse angle, the same embodies an elongated longitudinal guide 26 attached to the frame 1 and having one end formed, as at 27, to fit close adjacent to the bender 16. The guide 26 has a longitudinal groove 28 in its upper surface for the movement of the links therein. The forward end of the guide 26 is provided with a recess or depression 29 extending from the cutaway portion 27, and an elongated block 30 is seated in the recess 29 for longitudinal adjustment, and is provided with an upstanding longitudinal web cam 31, the upper edge of which is inclined rearwardly. The block 30 is held in adjusted position by means of set screws 32 carried by the guide 26 to bear against said block. A pressure block or member 33 is mounted above the cam or incline 31, the forward end of the block 33 being pivoted, as at 34, to an upstanding bracket or bar 35 secured to the guide near its forward end. The block 33 is swung downwardly under tension by means of a coiled wire retractile spring 36 having its ends engaging hooks 37 and 38 carried by the block 33 and guide 26, respectively. The block 33 has a lower longitudinal groove 39 for the passage of the hooks of the links, and said block has a cam surface 40 surrounding the forward end of the groove 39 to direct the hooks into said groove.

The second pressure block or member 41 is disposed immediately in rear of the block 33, and is provided with a pair of depending pins 42 slidable in the guide 26 to guide the block 41 for vertical movement, the guide 26 being cut away, as at 42', to accommodate the block 41. The block 41 has a lower longitudinal groove 43 for the passage of the

hooks of the links, and the block has a cam surface 44 at the forward end of the groove 43 for directing the hooks into the groove as the links are moved rearwardly. A coiled wire retractile spring 45 serves to move the block 41 downwardly, said spring having its ends engaged with hooks 46 and 47 carried by the guides 26 and block 41, respectively. The hooks 47 preferably constitute an extension of one of the pins 42. The function of the pressure blocks 43 and 41 will be understood when the operation of the machine is described.

An elongated cap 48 is secured on the guide 26 in rear of the block 41, and is provided with a lower longitudinal groove 49 for the passage of the hooks of the links. A forwardly extending leaf spring 50 is secured adjustably on the cap 48, the basal end of the spring having a longitudinal slot 51 through which a clamping screw 52 extends to engage the cap 48. By loosening the screw 52, said spring can be adjusted longitudinally, and the front end of the spring has a downwardly curved yieldable stop 53 extending through a slot 54 in the forward end of the cap 48 and entering the groove 28 of the guide.

The link or chain feeder embodies a longitudinal bar 55 having at its forward end, a depending fork or portion 56 straddling the upper portion of the feeder 5 and engaging a pin or bolt 57 thereof, whereby the bar 55 will be reciprocated with the wire feeder 5. The bar 55 slides through a guide 58 secured upon the frame, and a rearwardly extending dog 59 is pivoted, as at 60, to the rear end of the bar 55 and its rear free end is movable on the cap 48, said dog being pressed downwardly yieldably by means of a leaf spring 61 secured on the bar 55 and bearing on said dog at its free end. The free end of the dog has a web 62 working in a longitudinal slot 63 with which the cap 48 is provided, said web 62 being adapted to engage the links for feeding them rearwardly in the guide 26. A roller or wheel 64 is carried by the dog 59 to roll on a cam plate 65 at one side of the guide 26, said cam plate having longitudinal slots 66 slidably engaging clamping bolts 67 carried by said guide. Said bolts, when tightened, hold the plate 65 in its adjusted position, and said plate can be adjusted by loosening the bolts. The plate 65 has a cam 68 leading to a raised edge 69, the edge of the plate in front of the cam 68 being flush with the upper surface of the guide 26. Thus, when the bar 55 is moved rearwardly, the web 62 can work in the slot 63, until the roller 64 moves up the cam 68, which will raise the dog 59 to remove it from the chain link, thereby stopping the rearward movement of said chain.

A plate 70 is pivotally engaged with the rearmost bolt 67 in overlapping relation

with the plate 65, and has a terminal 71 bent transversely across the rear end of the guide 26, to support the links where they are delivered from the guide 26. The plate 70 can be adjusted to raise and lower the guide portion 71 thereof, as desired.

The attachment also serves to bend the links between the ends thereof, and for this purpose, the guide 26 is provided with a depression 72 in the groove 28 in rear of the cam 31 and below the block 41. A lever 73 is fulcrumed, as at 74, between its ends to the frame at one side of the guide 26 and one arm has a transversely projecting pin 75 working in a cut away portion or opening 76 in the corresponding side of the guide 26 above the die depression 72. The other arm of the lever 73 is connected to a crank 77 of a rock shaft 78 which has a pinion 79 meshing with the oscillating pinion 15.

The chain which passes from the machine is preferably wound around a reel 80, as suggested in Figure 6, and said wheel can be rotated in any suitable manner to wind said chain thereon.

The operation of the improved machine is as follows:

During the rotation of the shaft 2, the feeder 5 is reciprocated, and during its rearward movement, it grips the wire W and feeds said wire rearwardly past the pin 6, cutter 8 and bender 16. After the wire is thus fed rearwardly, the bending means now come into operation due to the movement of the rack 10 by the crank 11'. The rearward movement of the rack 10, following the rearward movement of the feeder 5, results in the pinions 9, 15 and 79 being oscillated. The oscillation of the pinion 15 oscillates the cutter and bender 16, the same turning clockwise, as seen in Figure 4, whereby to shear or sever the wire W at the cutter 8, and at this time, the oscillation of the bender 7 (clockwise, as seen in Figure 7) serves to bend the terminal of the wire back around the pin 6, as seen in Figure 7, to form the loop L. During the looping or doubling of the wire by the bender 7, the bender 16 forms a hook on the link, and the bending pin 75 bends the next link in rear, as will hereinafter more fully appear, the successive steps in the formation of a link being described as such, for sake of clearness. The rack 10 is returned by the crank 11', thus returning the bending means back to initial position, the feeder 5 having returned in the meantime. The feeder 5 is now moved rearwardly again, and in doing so, will move the doubled portion and loop L rearwardly away from the pin 6 and across the bender 16, which is in lowermost position, to bring the terminal of the wire just slightly past the cutter 8 resting on the bender 16. This rearward movement of the wire also serves to move loop L with the

wire over the cam 31 to assemble the links. This rearward movement of the wire therefore serves to move the doubled portion and loop to the bender 16 and cam 31 from the pin 6, and then when the bending means are again brought into operation, the bender 16 in rotating will cut the wire, thereby severing the doubled portion, which provides the link, and at the same time, the new terminal of the wire is bent back by the bender 7 as before. The link just cut has its terminals resting on the bender 16, said link having been moved under the projecting rod 19, and during the movement of the bender 16, after cutting the wire, said bender, in turning, will bend the terminals of the link over the rod 19 into a hook H. During the turning of the bender 16, the cams 18 and 20 in turning therewith serve to press the terminals of the links tightly together. Then, during the return of the bending means, the cam 24 swings the lever 22, so as to retract the rod 19 from the hook bending means, thus removing the rod from the hook H just formed, and permitting said link to move rearwardly in the guide 26. As described above, the loop L, when moved rearwardly, passes over the cam 31, which serves to raise said loop over the hook H of the preceding link, the pressure block 33 having the groove 39 for the passage of the hooks H, but said groove is narrower than the loops L, whereby a loop in passing over the cam 31, will raise the block 33, causing said loop to be depressed around the cam 31 in rear of the corresponding hook H when the loop is moved beyond the rear end of the cam 31. This serves to move said loop in rear of the hook of the preceding link, and the links are thus assembled or interengaged in succession as they are being formed. Consequently, when the feeder 5 is moved rearwardly to feed the wire W, the bar 55 is also moved rearwardly to move the dog 59 from its forward to its rear position. The web 62 of the dog in moving in the slot 63 will abut or contact with the hook H of one link, and the dog in moving rearwardly will, therefore, move the chain rearwardly in the groove 28 of the guide 26, and the last link formed will have its loop L engaged by the hook H of the preceding link, thereby pulling the last link past the cam 31 which projects upwardly within said link, due to the movement of the loop of the link over said cam to surround it. During the rearward movement of the dog 59, the pin or rod 19 is retracted, thus permitting the last link to move away from the hook-bending means. Before the wire is cut, the partially completed link is moved rearwardly with the wire, by the feeder 5, and after the link is severed by the cutter 8, it is pulled rearwardly with the chain by the feeder or dog 59, which moves the chain the

length of one link during each operation. The last link is, therefore, moved rearwardly under the pressure block 41 and over the die depression or cavity 72, the groove 43 being sufficiently wide for the passage of the hooks H, but not being wide enough for the passage of the loops L. The block 41 will, therefore, rest on the link and hold it down on the guide 26, with the two portions of the hook at opposite sides of the cam 31 for the movement of the next loop L thereover, as above described. The pressure block 41 holds the link firmly in place, and the corresponding hook H in advance is brought against the yieldable stop 53, which serves to stop movement of the chain at the desired position, according to the adjustment of the spring 50. At the same time, the roller 64 reaches and moves up the cam 68, which serves to raise the dog out of engagement with the chain, so that said dog can move rearwardly further without moving the chain more than the length of one link, the movement of the feeder 5 being slightly more than twice the length of one link, in order to feed a sufficient length of wire to the bending means. The doubling of the wire and the formation of the hooks serve to make the link less than one-half the length of the wire stock, as will be obvious. Therefore, the movement of the chain feeder being the same as the wire feeder, the cam 68 and corresponding means are provided to render the chain feeder inoperative after having moved the chain the length of one link. During the bending operation, when the bender 16 has turned, the pinion 15 in meshing with the pinion 79, will turn the crank 77 and oscillate the lever 73, whereby to depress the bending pin 75. This pin in being moved downwardly will engage the link and bend it downwardly into the depression 72, thereby bending the link between its ends, so that the loop L will be disposed at an obtuse angle to interlock with the corresponding hook in the completed bed spring fabric, as disclosed in the above mentioned application. The several steps in the formation of each link are carried out simultaneously with the successive links, it being readily understood that when the wire is cut and doubled to form the loop, the piece of the wire thus cut loose provides a link in which the hook is then bent, said link having been moved to engage the hook of the preceding link, and said preceding link being bent by the pin 75. All three bending operations are therefore simultaneous, the links being fed rearwardly for said operations in succession. The chain delivered from the machine is preferably wound on a reel 80.

Having thus described the invention, what is claimed as new is:

1. In a machine of the character described,

means for feeding a chain of links having hooks connecting them, a cam past which said hooks are moved, and means for feeding a new link past said cam to engage the last hook of the chain, said cam moving the new link over said hook.

2. In a machine of the character described, means for feeding a chain of doubled wire links having loops and hooks at opposite ends connecting said links, means for feeding a new link having a loop, and a cam to project within the last link of the chain and arranged to guide the loop of the new link over the hook of said last chain link.

3. In a machine of the character described, means for feeding a chain of doubled wire links having loops and hooks at opposite ends connecting said links, means for feeding a new link having a loop, a cam to project within the last link of the chain and arranged to guide the loop of the new link over the hook of said last chain link, and yieldable means for pressing the loop of the new link around said cam and hook.

4. In a machine of the character described, a guide for a chain of links having hooks connecting them, means for feeding said chain in said guide, a cam past which the hook of the last chain link is movable, yieldable means for holding said last chain link within the guide adjacent to said cam, means for feeding a new link over said cam to engage the hook of said last chain link, and yieldable means for moving the new link into place to be engaged by said hook of the last chain link.

5. In a machine of the character described, a guide for a chain of links having hooks connecting them, means for feeding said chain in said guide, a cam past which the hook of the last chain link is movable, yieldable means for holding said last chain link within the guide adjacent to said cam, means for feeding a new link over said cam to engage the hook of said last chain link, yieldable means for moving the new link into place to be engaged by said hook of the last chain link, said feeding means being operable to advance the chain step by step, and a yieldable stop for the chain to stop the last link with its hook in place adjacent to said cam.

6. In a machine of the character described, a guide for links having a die depression, means for feeding the links in the guide over said depression, and means for depressing the links into said depression to bend them between their ends.

7. In a machine of the character described, a guide for a chain of links, said guide having a die depression over which the links are movable in succession, means for feeding the chain step by step, means for stopping the chain when a link extends across said depression, means for yieldably hold-



ing the link in place across said depression, and means for moving the link into said depression to bend it intermediate its ends.

8. In a machine of the character described, a reciprocatory chain feeder embodying a movable chain engaging dog, and an adjustable cam to move said dog out of engagement with the chain after moving a certain distance.

9. In a machine of the character described, a chain guide, a reciprocatory member, a dog pivoted to said member and engageable with the chain to feed it in said guide, and a cam, said dog having a portion engageable with said cam to disengage the dog from the chain when said dog has moved a certain distance.

10. In a machine of the character described, a feeder for feeding a wire with a doubled terminal, means for guiding the loop of said terminal over the hook of a previously formed link to form a chain, means for feeding the chain, and means for severing said doubled portion and bending the same to form a hook.

11. In a machine of the character described, a guide for a chain of links having loops and hooks engaging them, a wire feeder for feeding a doubled terminal of said wire to the guide, a cam past which the links are movable and arranged to guide the loop of said doubled terminal over the last hook of the chain to be engaged thereby, means for feeding the chain in said guide, and means for severing the wire to detach said doubled terminal and for bending it into a hook to form a new link for the chain.

12. In a machine of the character described, a guide for a chain of links having loops and hooks engaging them, a reciprocatory wire feeder for feeding a wire having a doubled terminal portion to said guide, a

cam within the guide for guiding the loop of said doubled portion over the last hook of the chain, means for severing the wire to detach said double portion and for bending the terminals of said double portion into a hook to form a new link for the chain, a chain feeder movable with the wire feeder for feeding the chain simultaneously, means for disengaging the chain feeder from the chain to limit the movement of said chain to the length of one link, and means for limiting the movement of the chain when the hook of the last link is brought properly adjacent to said cam.

13. In a machine of the character described, means for feeding a chain of links each having a hook at one end and a loop at its opposite end engaging the hook of the companion link, means for feeding a new link to the rear end of said chain, and means for deflecting the last link of the chain and new links laterally relatively to one another so that the adjacent hook and loop of such links will pass one another to engage each other when the chain is fed.

14. In a machine of the character described means for feeding a chain of links each having a hook at its rear end and a loop at its forward end engaging the hook of the link ahead, means for feeding a new link with its loop forward to the rear end of said chain, and means for deflecting said loop of the new link to one side to pass over the last hook of the chain to be engaged thereby when the chain is fed.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GARY B. SMITH.

Witnesses:

R. M. SMITH,  
L. M. SWARTZ.