(No Model.) 3 Sheets—Sheet 1.

L. W. CONNELL.

MACHINE FOR MANUFACTURING WIRE FENCE STAYS.

No. 355,863. Patented Jan. 11, 1887.

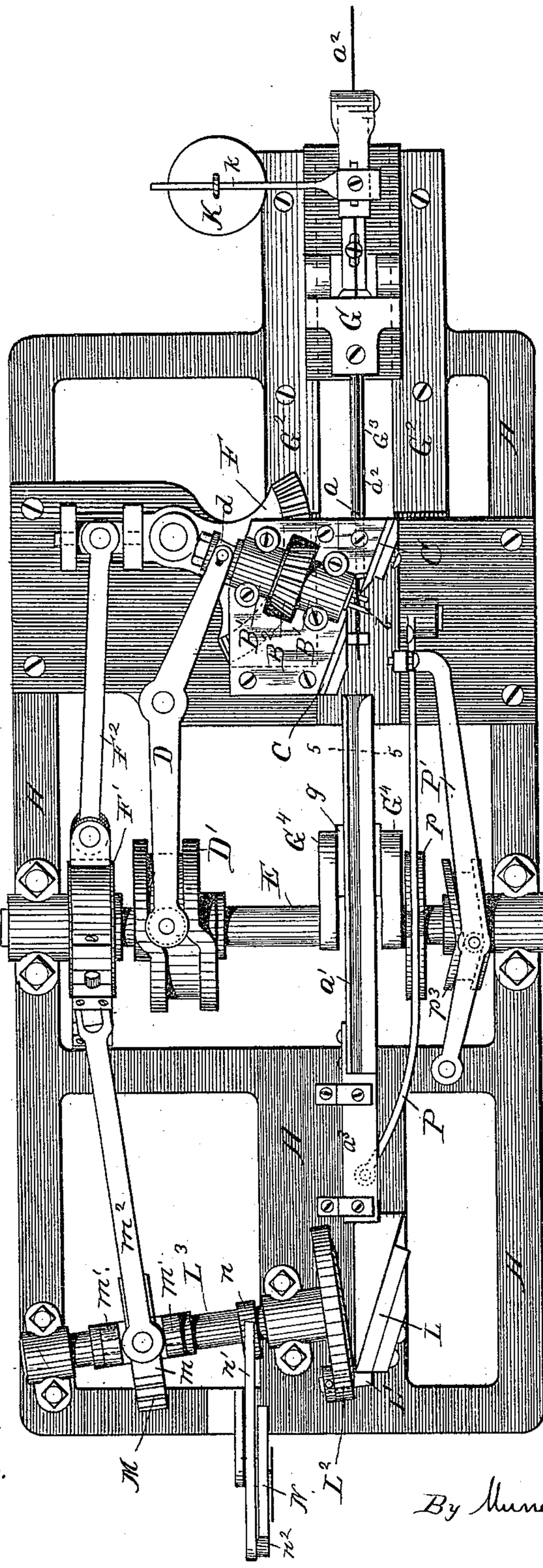


Fig. 1.

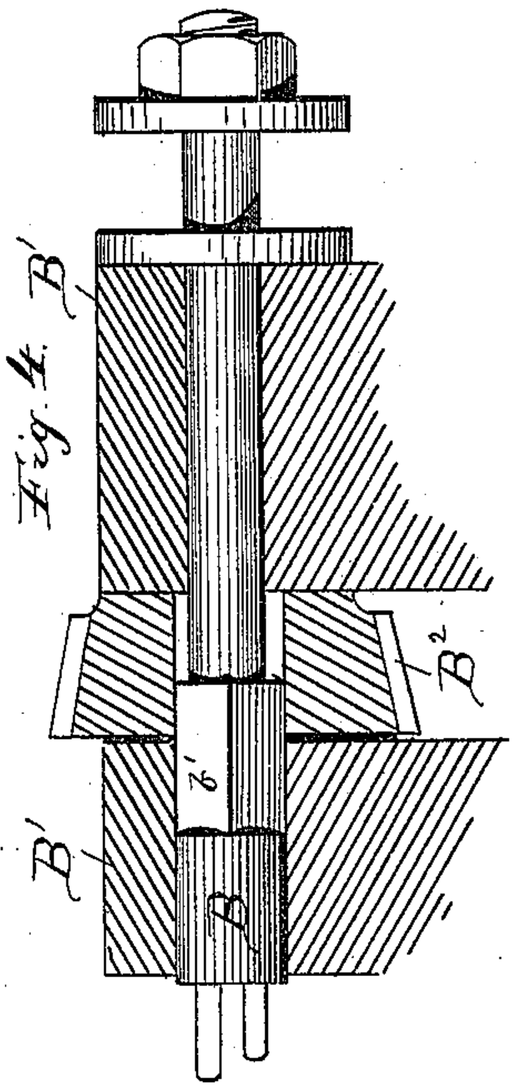


Fig. 4.

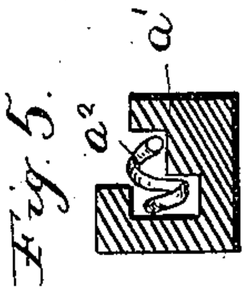


Fig. 5.

Witnesses:
Lew. E. Curtis.
H. M. Munday.

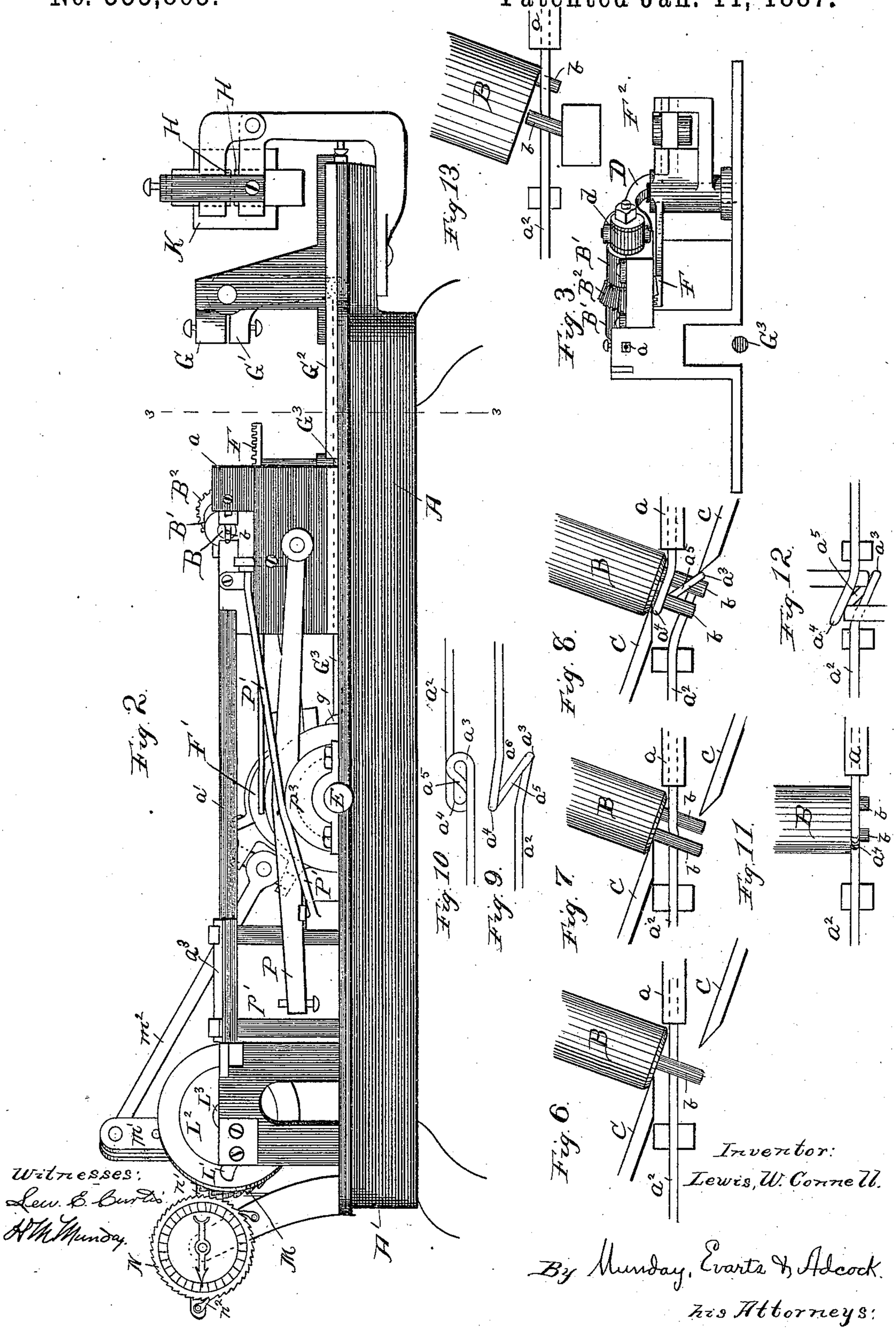
Inventor:
Lewis W. Connell
By Munday, Evarts & Adcock
his Attorneys:

(No Model.) 3 Sheets—Sheet 2.

L. W. CONNELL.

MACHINE FOR MANUFACTURING WIRE FENCE STAYS.

No. 355,863. Patented Jan. 11, 1887.



N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 3 Sheets—Sheet 3.

L. W. CONNELL.

MACHINE FOR MANUFACTURING WIRE FENCE STAYS.

No. 355,863. Patented Jan. 11, 1887.

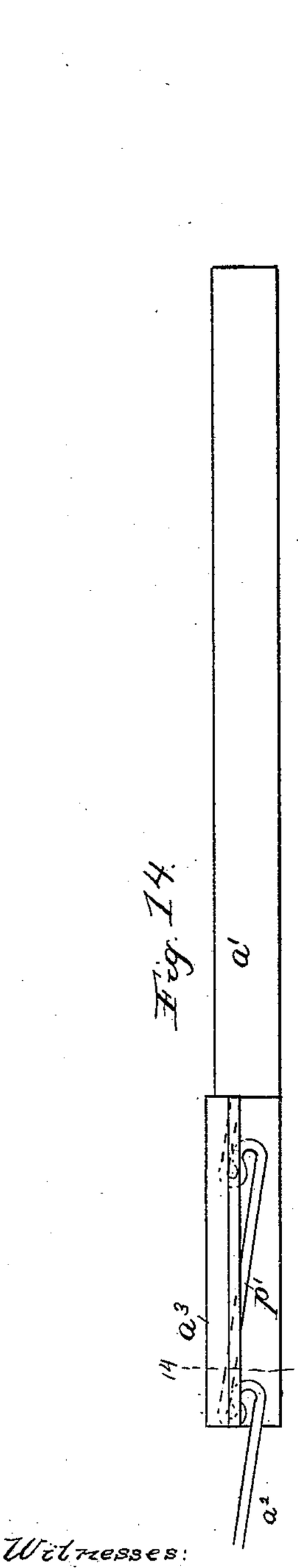
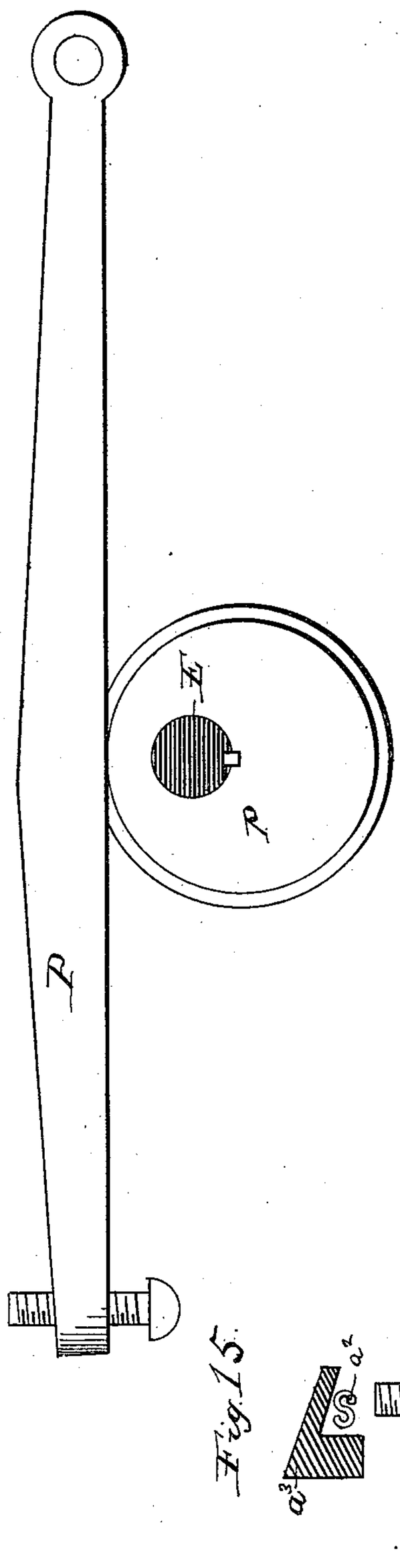


Fig. 14.



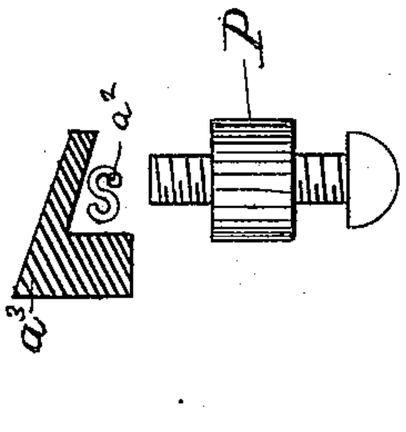


Fig. 15.

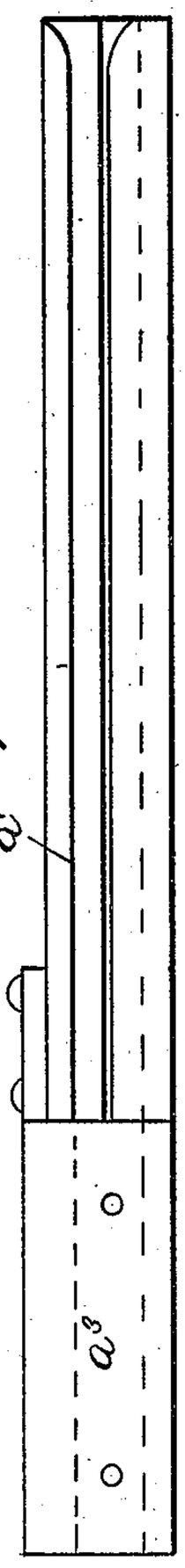


Fig. 16.

Witnesses:
Lew. E. Curtis.
H. W. Munday.

Inventor:
Lewis W. Connell.
By Munday Evarts & Adcock
His Attorneys:

UNITED STATES PATENT OFFICE.

LEWIS W. CONNELL, OF JOLIET, ILLINOIS, ASSIGNOR TO HIMSELF AND FRANCIS H. CONNELL, OF SAME PLACE.

MACHINE FOR MANUFACTURING WIRE-FENCE STAYS.

SPECIFICATION forming part of Letters Patent No. 355,863, dated January 11, 1887.

Application filed September 18, 1886. Serial No. 213,864. (No model.)

To all whom it may concern:

Be it known that I, LEWIS W. CONNELL, a citizen of the United States, residing in Joliet, in the county of Will and State of Illinois, have invented a new and useful Improvement in Machines for Manufacturing Wire-Fence Stays, of which the following is a specification.

My invention relates to machines for manufacturing wire stays having a series of loops or eyes for holding and supporting the wires of wire fences at the proper distances apart.

The object of my invention is to provide an automatic machine of a simple and cheap construction for manufacturing wire stays, and more particularly for manufacturing the wire stay shown and described in my previous application, No. 203,173, filed May 24, 1886. My said wire stay is provided with a series of compound wire hook-eyes or open and closed loops, formed by oblique bends or folds in the stay-wire, inclined in two directions at about right angles to each other, so that when the stay is turned on its axis in one position it may be hooked over the fence-wires laterally, and when rotated on its axis into another position it is locked immovably on the fence-wires. I have discovered that these compound open and closed loops may be formed in a very simple manner—that is to say, by means of a coiler or rotary shaft inclined at an angle to the direction of the stay-wire, and having two coiling-pins adapted to fit astride the stay-wire as it is fed along in its guides, the inclined coiling-pins serving, as the coiler is rotated, both to form the two opposite loops and to simultaneously incline or separate them laterally. After the compound open and closed loops are thus formed, the coiling-shaft is reciprocated endwise to withdraw it from the loops. Guides or strippers projecting in against the coiling-fingers or near them, and above the loops or bends in the stay-wire, serve to hold the stay-wire in position and to strip the loops from the coiling fingers or pins as the same are withdrawn. As the stay-wire is fed forward the completed stays are automatically severed therefrom by a pair of knives. The movable knife may preferably be a rotary one. A counting device is combined with the machine to register the number of stays produced.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, Figure 1 is a plan view of a machine embodying my invention. Fig. 2 is a side elevation. Fig. 3 is a vertical cross-section on line 3 3 of Fig. 2. Fig. 4 is a longitudinal section showing the inclined coiler. Fig. 5 is a cross-section of the guide on line 5 5 of Fig. 1. Figs. 6, 7, and 8 are detail plan views of the coiling-fingers, illustrating the operation. Figs. 9 and 10 are plan and side elevations of the stay-wire as produced by the machine; and Figs. 11, 12, and 13 illustrate modifications. Fig. 14 is a detail elevation illustrating the operation of one of the straightening-levers. Fig. 15 is a cross-section on line 14 14 of Fig. 14, and Fig. 16 is a detail plan view of the stay-wire guide.

In said drawings, A represents the frame of the machine; *a*, the longitudinal guide for the stay-wire preceding the coiler, and *a'* the similar guide for the wire after the compound open and closed loops are formed therein. This latter guide should be in cross-section, about as shown in Fig. 5, to correspond to an end view of the loops.

B is a reciprocating inclined coiler head or shaft, having a pair of coiling-fingers, *b b*, in its end adapted to fit astride the stay-wire a^2. The shaft B is mounted in suitable bearings, B', on the frame of the machine, inclined to the direction of the stay-wire or its guides *a a'* at an angle preferably of about sixty or seventy degrees.

B^2 is the gear by which the shaft B is rotated. It fits upon the square portion *b'* of the shaft, so that said shaft may fit loosely in the pinion and be freely reciprocated through the same.

C C are a pair of guides or strippers projecting at right angles to the shaft B, near or against the coiling-fingers *b b* when the same are turned into the position shown in Figs. 1, 7, 8. These strippers serve to hold the loops or coils when the coiling-fingers are being withdrawn from the completed loops. One of the coiling-fingers, the one which forms the outside loop, a^3, may preferably be somewhat longer than the one which forms the inside loop, a^4, as indicated in Fig. 8.

The shaft B is reciprocated by means of a

lever, D, pivoted on the frame of the machine and having a slotted connection at one end with a collar, *d*, on the shaft B, and operated by a cam, D′, on the driving-shaft E. The inclined coiler is rotated by a segment, F, meshing with the gear B^2 on the shaft B, which segment is oscillated back and forth by an eccentric, F′, on the driving-shaft E through a link, F^2, pivoted to the end of the segment-lever. The stay-wire is intermittingly fed forward from its reel by means of a reciprocating feed device or pair of clamps, G G′, the rigid one of which, G, reciprocates in suitable guides, G^2, on the frame of the machine, while the pivoted jaw G′ should have an adjustable connection with the pitman-rod G^3. The pitman-rod is actuated by a crank, G^4, on the driving-shaft E. When the feed device is pulled forward by the pitman-rod, the first operation is to close the jaw G′ upon the stay-wire, and then to feed the same forward, and when the pitman-rod makes its reverse movement its first effect is to open the jaw G′. The construction of this feed device is well known to those skilled in the art, and, if preferred, any other suitable feed mechanism may be substituted as an equivalent.

H H are a pair of straightening and tension dies for straightening the stay-wire as it is fed forward from its reel and putting the requisite tension upon the same.

K is an adjustable weight on the lever *k*, for adjusting the tension on the straightening-dies. This tension and straightening device is also of an old and familiar construction and need not be further described, and any other well known or equivalent tension device may be employed in combination with the other elements of my machine.

L is the stationary knife, which is mounted in the frame of the machine, and L′ is the movable knife, which may preferably be secured to a rotary disk, L^2, secured on the shaft L^3, journaled on the frame of the machine. The shaft L^3 is rotated intermittingly by means of a ratchet, M, thereon, operated by a pawl, *m*, pivoted to a vibrating arm, *m′*, one end of which is pivoted on the shaft L, and the other end of which is connected by a link, m^2, with the eccentric F′ on the driving-shaft E, by which it is operated.

N is a toothed counting-wheel, operated from the knife-shaft L^3 by means of a cam, *n*, thereon and a pawl-lever, *n′*, carrying a pawl, n^2, which engages the teeth of the counting-wheel. As the stays are conveniently handled in bundles of fifty, I prefer to provide the counting-wheel with fifty teeth.

As the stay is sometimes somewhat bent or curved by the operation of the coiler, I provide a pair of straightening-levers, P P′, both of which are pivoted to the frame of the machine and operated one by an eccentric, *p*, on the driving-shaft to strike a vertical blow against the stay-wire at *p′*, and the other by a grooved cam, p^2, to strike a horizontal blow against the stay-wire. The stay-wire is supported by wire guides or supports on each side of the points where the straightening-levers P P′ strike or press against the same. By means of these two hammers at right angles to each other the stay-wire is straightened.

The guide *a′* for the stay-wire, after the loops or folds are formed therein, has no bottom plate at the point *p′*, where the lever or hammer P strikes or presses against the stay-wire, but is provided with a top or cap plate at this point to support the wire when acted upon by the vertically-moving hammer or lever P. As shown in Fig. 13, the loops formed in the stay-wire rest against the top plate of the guide, and the lever P strikes against the wire at a point intermediate between the loops, thus straightening the same. The movement imparted to the lever P by its actuating-cam is just sufficient to straighten the wire. The other straightening-lever, P′, which strikes a horizontal blow against the stay-wire, operates in a similar manner. The stay-wire is supported on each side of the point where the lever P′ presses against the wire on one side by the stay-wire guide *a′*, and at the other by the coiler and coiling-fingers.

By inclining the coiling-shaft at an angle to the stay-wire or its guides the portion of the fold a^5 between the two folds or loops a^3 a^4 is inclined, as shown in Fig. 9, by the action of the coiling-fingers themselves. These loops a^3 a^4 may, however, if preferred, be first formed in the same plane with each other by means of a pair of coiling-fingers on a shaft at right angles to the direction of the stay-wire, and then the loops a^3 a^4 separated or thrown into different planes by a separate device—as, for example, a pair of transverse punches or dies moving in opposite directions, one against the loop a^3 and the other against the loop a^4. This modification or equivalent form of my invention is illustrated in Figs. 11 and 12.

In operation, the reciprocating two-fingered coiler is moved astride the stay-wire, as indicated in Fig. 6, and then rotated about three-fourths of a revolution, thus forming the double loops a^3 a^4, as shown at Fig. 9. The coiler is then withdrawn, the strippers C C serving to hold the loops in place. The reverse movement of the segment F then revolves the coiler back to its original position, in readiness to be again moved forward astride the stay-wire, when this operation is repeated. Ordinarily I provide each stay with about twelve of these compound open and closed loops, and to every twelve revolutions of the main shaft the knife-shaft makes one revolution and severs the stay.

While the preferable mode of practicing my invention is as I have shown and described, it should also be observed that my invention may be embodied in working form by employing a stationary or non-reciprocating coiler and giving the strippers a reciprocating movement to separate or remove the loops from the coiling-fingers. The coiling-fingers are preferably secured rigidly to the coiling head or shaft; but as an equivalent construction the

coiling pins or fingers may alone be made to reciprocate while the coiling head or shaft itself in which they are mounted has no reciprocating movement.

By employing two strippers, C C, as shown, both the loops a^3 a^4 are securely held while the coiling-pins are being withdrawn, and both loops will be perfectly formed. By omitting the outer stripper C, for example, the tendency will be to close up the opening a^6 or draw the loop a^3 up against the body of the stay-wire, and thus form but a single perfect loop. As but one of the two loops a^3 a^4 are ordinarily used in applying the stay to the fence-wires, it is of course not essential that both the loops should be perfectly formed, and, if desired, one of the strippers may be omitted.

Some of the advantages of my invention may be had without mounting both the coiling pins or fingers upon the rotary shaft or coiling-head—that is to say, one of the two coiling-pins may be a stationary pin on the frame of the machine, around which the other coiling-pin revolves, thus forming the two loops. Fig. 13 illustrates the operation of the invention when embodied in form with one rotary and one stationary coiling-pin.

I hereby disclaim as not of my invention the devices shown and described in Patent No. 286,511, granted October 9, 1883, to T. A. Weber, and in Patent No. 345,104, granted July 6, 1886, to C. B. Brainard. In the stay made by my machine, and which my machine is designed to make, the loops formed in the stay-wire are deflected into different planes from each other or from the stay-wire, and the means for effecting this part or function of the complete operation is an important and material element in the combination of devices by which my complete stay is automatically made.

I claim—

1. In a wire-stay machine, the combination, with a wire-feed device for feeding the stay-wire forward, of a pair of knives for severing the stays and an inclined coiling head or shaft provided with a pair of coiling-fingers adapted to fit astride the stay-wire, substantially as specified.

2. The combination, in a wire-stay machine, with a stripper, of a reciprocating coiling-head provided with a pair of coiling-fingers adapted to fit astride the stay-wire and means for deflecting the loops of the stay into different planes, substantially as specified.

3. The combination, with guides for the stay-wire, of an inclined coiler having a pair of coiling-fingers adapted to fit astride the stay-wire, substantially as specified.

4. The combination, with stay-wire guide *a*, of stay-wire guide *a'*, having a groove or way conforming to the loops in the stay-wire, and a coiler having a pair of coiling-fingers adapted to fit astride the stay-wire, and means for deflecting the loops of the stay into different planes, substantially as specified.

5. The combination, with suitable guides for the stay-wire, of a reciprocating coiling-head having a pair of coiling fingers or pins adapted to fit astride the stay-wire and means for deflecting the loops of the stay into different planes, substantially as specified.

6. The combination, with suitable guides for the stay-wire, of a reciprocating coiling-head having a pair of coiling fingers or pins adapted to fit astride the stay-wire, a stripper or device for holding the loops of the stay as the coiling-fingers are withdrawn, and means for deflecting the loops of the stay into different planes, substantially as specified.

7. The combination, with an inclined reciprocating coiling-head having a pair of coiling fingers or pins adapted to fit astride the stay-wire, of suitable guides for the stay-wire and a hammer or vibrating lever for straightening the stay-wire, substantially as specified.

8. The combination, with an inclined reciprocating coiling-head having a pair of coiling fingers or pins adapted to fit astride the stay-wire, of suitable guides for the stay-wire and a pair of hammers or vibrating levers at right angles to each other for straightening the stay-wire, substantially as specified.

9. In a wire stay machine, the combination, with a wire-feed device for feeding the stay-wire forward, of a pair of knives for severing the stays, and an inclined coiling head or shaft provided with a pair of coiling-fingers adapted to fit astride the stay-wire, and a pair of straightening and tension dies, substantially as specified.

10. In a wire-stay machine, the combination, with a wire-feed device for feeding the stay-wire forward, of a pair of knives for severing the stays, and an inclined coiling head or shaft provided with a pair of coiling-fingers adapted to fit astride the stay-wire, and a counting-wheel, substantially as specified.

11. The combination, in a wire-stay machine, of two coiling-pins, one at least of which is rotary, and means for removing the loops from the coiling-pins, and means for deflecting the loops of the stay into different planes, substantially as specified.

12. The combination, with suitable guides for the stay-wire, of a reciprocating coiling-head, two coiling pins or fingers adapted to fit astride the stay-wire, mechanism such as described for reciprocating the coiling-head to bring said pins astride the stay-wire and retract the same from the completed loops, mechanism for revolving the coiling-head, and means for deflecting the loops of the stay into different planes, substantially as specified.

13. The combination, with suitable guides for the stay-wire, of a reciprocating coiling-head, two coiling pins or fingers adapted to fit astride the stay-wire, mechanism such as described for reciprocating the coiling-head to bring said pins astride the stay-wire and retract the same from the completed loops, mechanism for revolving the coiling-head, and a pair of strippers, C C, substantially as specified.

14. The combination, with suitable guides for the stay-wire, of a reciprocating coiling-head, two coiling pins or fingers adapted to fit astride the stay-wire, mechanism such as described for reciprocating the coiling-head to bring said pins astride the stay-wire and retract the same from the completed loops, mechanism for revolving the coiling-head, a pair of knives for severing the stays from the stay-wire, and means for deflecting the loops of the stay into different planes, substantially as specified.

15. The combination, with suitable guides for the stay-wire, of a reciprocating coiling-head, two coiling pins or fingers adapted to fit astride the stay-wire, mechanism such as described for reciprocating the coiling-head to bring said pins astride the stay-wire and retract the same from the completed loops, mechanism for revolving the coiling-head, a pair of knives for severing the stays from the stay-wire, a counting-wheel, and means for deflecting the loops of the stay into different planes, substantially as specified.

16. The combination of guides *a a'* with inclined coiler-shaft B, pins *b b*, strippers C C, gear B^2, segment F, shaft E, eccentric F', link F^2, cam D', lever D, and collar *d*, substantially as specified.

17. The combination of guides *a a'* with inclined coiler-shaft B, pins *b b*, strippers C C, gear B^2, segment F, shaft E, eccentric F', link F^2, cam D', lever D, collar *d*, knives L L', disk L^2, shaft L^3, ratchet M, pawl *m*, arm *m'*, and link m^2, connected with said eccentric F', substantially as specified.

18. The combination of guides *a a'* with inclined coiler-shaft B, pins *b b*, strippers C C, gear B^2, segment F, shaft E, eccentric F', link F^2, cam D', lever D, collar *d*, knives L L', disk L^2, shaft L^3, ratchet M, pawl *m*, arm *m'*, link m^2, connected with said eccentric F', counting-wheel N, cam *n*, lever *n'*, and pawl n^2, substantially as specified.

19. The combination, with suitable guides for the stay-wire, of a wire-feed device, an inclined reciprocating coiler-shaft, a pair of coiling-pins, and a stripper, substantially as specified.

20. The combination, with suitable guides for the stay-wire, of a wire-feed device, an inclined reciprocating coiler-shaft, a pair of coiling-pins, a stripper, and wire-straightening levers or hammers, substantially as specified.

LEWIS W. CONNELL.

Witnesses:
H. M. MUNDAY,
LEW. E. CURTIS.