

H. W. PUTNAM.

WIRE BENDING MACHINES FOR BALE-TIES.

No. 178,027.

Patented May 30, 1876.

Fig. 3.

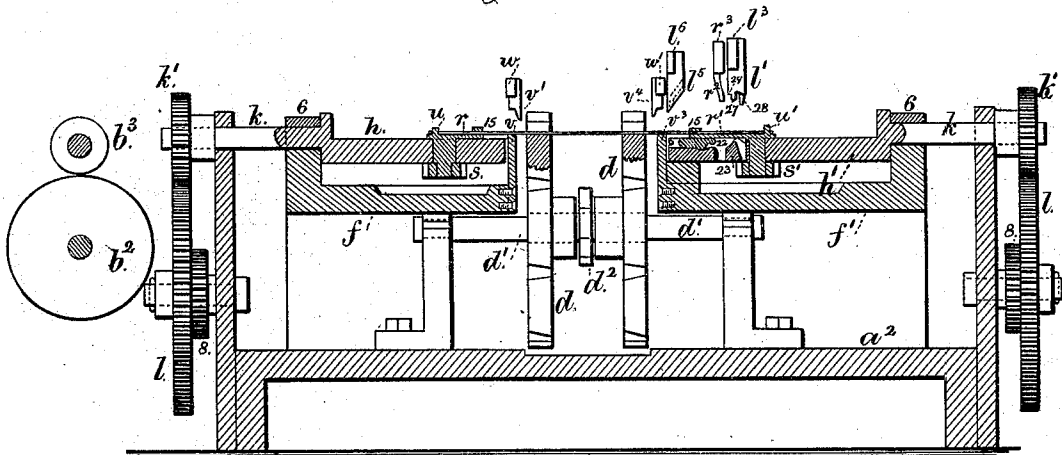
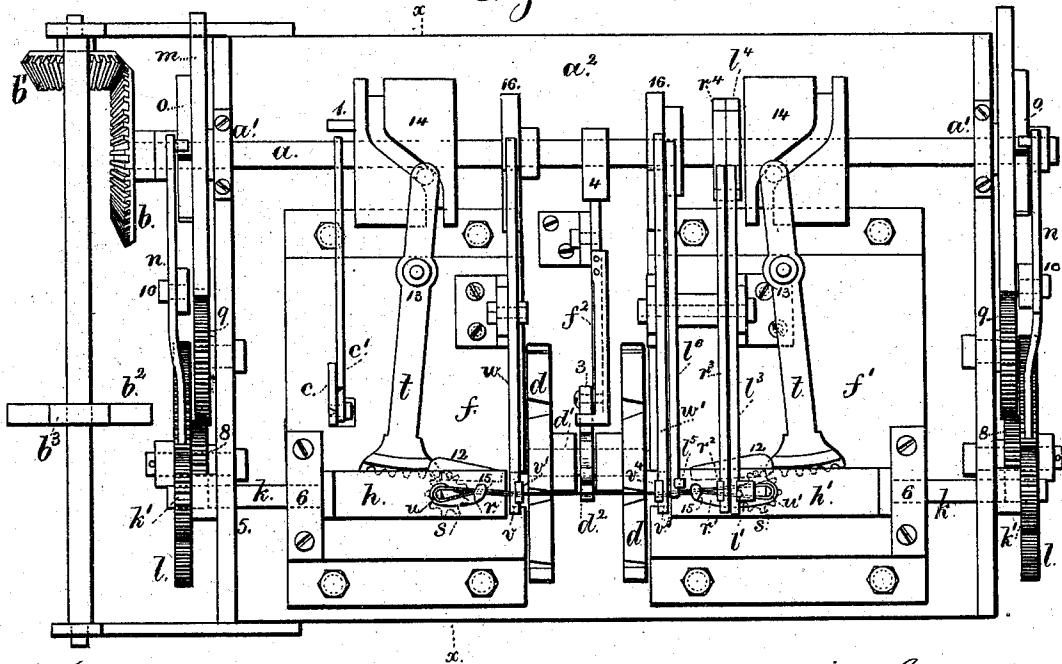


Fig. 1.



Witnesses

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Fig. 2.

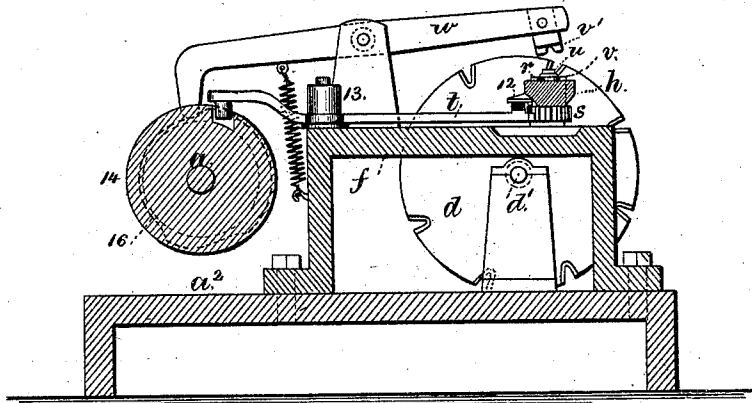
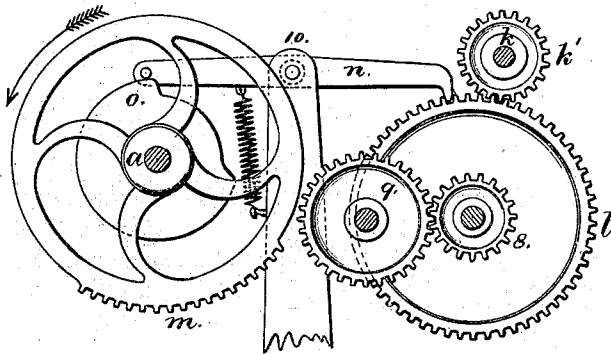


Fig. 4.



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Fig. 8.



Fig. 10.



Fig. 9.



Fig. 11.

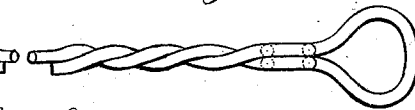


Fig. 12.

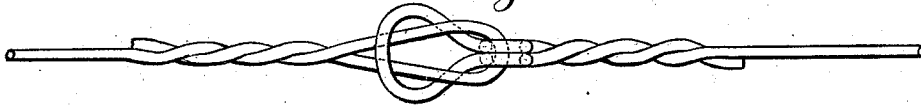


Fig. 5.

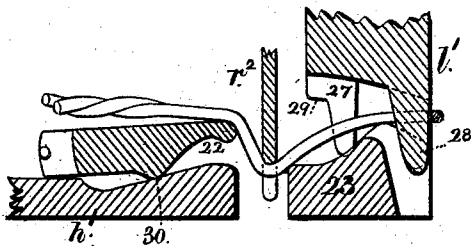


Fig. 6.

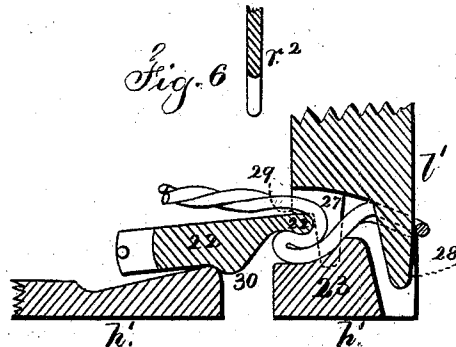
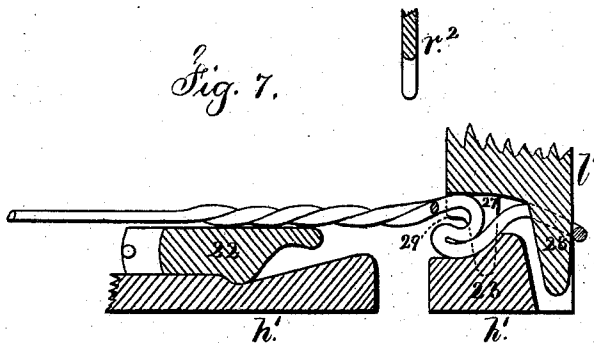


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY W. PUTNAM, OF BENNINGTON, VERMONT.

IMPROVEMENT IN WIRE-BENDING MACHINES FOR BALE-TIES.

Specification forming part of Letters Patent No. 178,027, dated May 30, 1876; application filed February 25, 1876.

To all whom it may concern :

Be it known that I, HENRY W. PUTNAM, of Bennington, in the county of Bennington, and State of Vermont, have invented an Improvement in Wire Bending and Twisting Machines for Making Bale-Ties, &c., of which the following is a specification :

The object of this invention is to bend a loop upon the end of a wire, and twist the wire together, to form one end of a bale-tie or similar article; also, to bend a loop, twist the wire, and bend up a hook in the loop of the wire, to form the other end of the bale-tie. Some portions of this machine may be used separately, but the object of the invention is to cut off the wire at the proper length and form a complete tie at one operation, and with this object in view the parts of the machine are positionable to adapt it to various lengths of wire.

In the drawing, Figure 1 is a plan of the machine complete. Fig. 2 is a vertical section at the line *x x*. Fig. 3 is a section longitudinally of the twisting-dies. Fig. 4 is an elevation of the gearing that actuates the twisting-dies; and Figs. 5, 6, and 7, are diagrams in larger size, illustrating the shape and operation of the dies that form part of the loop into a hook.

The actuating-shaft *a* is in the bearings *a*¹, upon a bed, *a*², and it is driven by any suitable power. At one end there is a gear-wheel, *b*, and bevel-pinion *b*¹ to the shaft of the roller *b*² that feeds in the wire, and this wheel *b* is without teeth in a portion of its face, so that the feed motion may remain inactive during a portion of the other movements. By leaving off a greater or less number of teeth, the movement of the feed-rollers and the length of wire fed will be regulated. The roller *b*³ presses upon the wire to carry it through the plate *c*, which forms one blade of the cutter, the moving blade *c*¹ being drawn back by a cam, *1*, upon the shaft *a*, to allow the wire to be run in the proper distance to a gage or otherwise; then the shear is moved the other way by the cam, and cuts off the wire, and prevents the further movement of the wire until the shear draws back again. The wire is straightened before entering this machine; and hence it is run through the notches in the wheels *d* that

are in line with it. These notches are beveled to allow the wire to pass easily, and there are two or more of these guide-wheels *d* upon a shaft, *d*¹, according to the length of the wire that is to be bent into loops at its ends; and I remark that the shaft *a* is to be of sufficient length to retain upon its ends the respective gears that operate the twisting-jaws, so that the beds *f* and *f*¹, carrying the respective bending and twisting devices, can be properly placed according to the length of the wire to be operated upon, the cams upon the shaft *a* being moved to suit the positions of the other parts. There is a ratchet-wheel, *d*², upon the shaft *d*¹, having as many teeth as there are notches in the guide-wheels, and by means of the lever *f*², and pawl 3, acted upon by the cam 4, the guide-wheel *d*, and the wires carried by it, are brought around to the bending and twisting jaws, and then the finished bale is delivered from the machine by the further movement of the guide-wheels, as another wire is brought to place for being bent.

In Figs. 8 and 9 the loop and twisted end of the bale-wire are represented; and in Figs. 10 and 11, the loop, the hook, and the twist are shown.

I will first describe the means for twisting the end to form the loop, Figs. 8 and 9. A jaw, *h*, is mounted at the end of a shaft, *k*, set in bearings 5 and 6. At the end of the shaft *k* is a pinion, *k*¹, gearing to the wheel *l*, and the pinions 8 and 9 receive motion from the segmental wheel *m*. There is a lock-lever, *n*, upon the fulcrum 10, acted upon by the cam *o*, which lever *n* takes into the proper teeth of the wheel *l*, to hold the same. This lever *n* is disengaged by the cam *o* from the wheel *l*, when it is being revolved by the segmental gearing. This locking-lever may operate with the teeth of the pinion, or with a notched disk upon the shaft *k*.

Upon the jaw *h* is a bending-arm, *r*, upon a vertical shaft that passes through the jaw *h*, and is provided with a pinion, *s*, that is held by a spring-pawl, 12, that is attached at one end to the under side of the jaw *h*, and there is a lever, *t*, upon a fulcrum, 13, that is acted upon by the cam 14 upon the shaft *a*, and at the end of the lever is an incline to lift the spring-pawl, and teeth to revolve the bending-

arm *r*, said teeth gearing into the pinion *s*; but the incline at the end of the lever acts to raise the spring-pawl before the teeth come into gear, so as to unlock the bending-arm before it is revolved. The reverse movement leaves the bending-arm locked by the pawl 12 taking into the pinion *s*.

As the guide-wheels *d* bring the wire around it is laid upon the surface of the arm *r* against a stud, *u*. The arm *r* is now made to describe rather more than a half-circle, and the forked end 15 of this arm takes the wire and carries its free end around the stud *u*, bending such wire into a loop, and bringing the free end of the wire up against the side of the main portion of the wire, and the jaw or fork 15 is of a size to receive the wires side by side, but the opening of the jaw is only a width slightly more than the diameter of the wire.

At the end of the jaw *h* is the rest *v*, and upon this the two portions of the wire lie, and the die *v*¹ and lever *w* are brought down by the cam 16 to hold the body of the wire and the end as they lie side by side upon the rest *v*. The die *v*¹ is forked at the end so as to draw the wires together, and the surface of the die that presses upon the end of the wire should be roughened.

The teeth at the end of the lever *t* have now cleared the pinion *s*, and said pinion and its arm are held by the spring-pawl 12. The jaw *h* is now revolved by the gearing aforesaid, and the wires are twisted together to form the loop, as in Figs. 8 and 9, the twist being made between the fork at the end of the arm and the clamping-jaws *v w*.

The jaw *h* makes two or more complete revolutions, so that it is stopped in a level position, where the pinion *s* is in a position to be acted upon by the teeth at the end of the lever *t* upon the return movement thereof. It is to be understood that the motion given to the lever *t* is sufficient to carry it beyond the path in which the pinion moves when it is locked by the pawl 12, and revolves with the jaw *h*.

The arm *r* is turned back out of the way of the twisted loop by the lever *t*, and the parts are again ready for another wire.

The stud *u* is not central over the shaft of the arm *r*, so that while the wire is being twisted the stud is toward the end of the loop, and when the arm *r* is swung back out of the way the stud *u* moves away from the end of the loop sufficiently to liberate said loop.

The parts already described are to be used alone where a loop is to be bent only on one end of the wire, and if the wire was straightened and cut off into lengths in a separate machine the cutting device would be left out of this machine.

When the wire is to have a similar loop at the other end to that shown in Figs. 10 and 11, it is only necessary that the same parts as have already been described be applied in reverse positions upon the bed *f*¹; but as this machine is especially intended to make the loop, Figs. 8 and 9, at one end of the wire,

and the loop and hook, Figs. 10 and 11, at the other end of the wire, it is necessary to employ the same parts with the jaw *h'* that have been described in connection with the twisting-jaw *h*, and to add other parts to the same.

The wire is laid upon the arm *r*¹, and swept around the stud *u'* by the fork 15, and the two parts of the wire are held by the rest *v*³ die *v*⁴ and lever *w'*, forming a holding-jaw, and the wire is twisted by the jaw *h'* being revolved by the gearing, as aforesaid, and after the jaw *h'* has ceased to revolve, and the arm *r*¹ has been turned back out of the way, a forked bending-die, *r*², is brought down by a lever, *r*³, and cam *r*⁴, and the wires of the loop are brought together by the forked end of the twisting-die, and carried down by such die *r*², bending the wire over the edge of the slide 22, between that and the stationary die 23 in *h'*. The three-pronged die *l'* is now brought down, the two prongs 27 27 guide the bend of the hook, and the prong 28 enters the loop, while the slide 22 is moved endwise, and after the entire movement is given to the slide 22 the three-pronged die *l'* receives a still further downward movement, so that the end of the hook is bent into the form shown by the shoulders 29 pressing upon the upper surface of the slide 22 at each side of the wire, and causing the rib at the under side of the slide 22 to bend the curve of the hook. At the time the curved end of the hook is bent the second rib 30 upon the under side of the slide 22 is unsupported, as seen in Fig. 6; hence the said slide 22 is free to be pushed down by the shoulders of the die *l'*.

The three-pronged die is of one or more pieces, and is actuated by the lever *l'* and cam *l*⁴, the cam being shaped to give the aforesaid movements, and the slide 22 is actuated by the wedge *l*⁵ upon the lever *l*⁶, that is driven in between the end of the slide 22 and the bearing *v*³. The slide 22 is now drawn back as the lever *l*⁶ rises, there being a groove in the side of the wedge receiving a pin upon the slide 22. The bender *l'* is then again brought down by its cam and lever to press the twisted portion of the wire toward the point of the hook, and close the hook slightly. This is important, for were it not done the hook would be too wide open to bind the wire of the loop at the other end of the tie, as such loop is hooked into it. The slide 22 as it draws back drops down slightly to allow of this last bending operation, there being a projection, 30, that runs upon the bottom of the jaw *h'*, and passes down an incline, as in Fig. 7, to allow of this movement.

In twisting the wire at both ends simultaneously the wire is slightly shortened. This draws the loops tightly and renders them uniform in shape; but, if necessary, springs may be used around the shafts *k* of the jaws *h h'*, acting against collars upon the shafts, so that there may be a slight endwise-yielding motion to the entire jaw, or the studs *u* may

be mounted so as to yield slightly as the wire is twisted. The springs return the parts to their proper positions after the wire has been relieved of strain upon the studs.

I do not claim the hook bent into the form shown in Figs. 10 and 11, to receive the loop of the bale-tie, as this was made before my invention.

It is to be understood that the end of the wire remains in the hole in the plate *c*, and that the rollers cannot project the said wire through that hole until the blade *c* is moved back, and that the wire is cut off against the side of the hole when the cam 1 moves the blade forward again.

I claim as my invention—

1. In a machine for bending and twisting wire, the combination of a bending-arm, a stud around which the wire is bent, a holding-jaw, to retain the wire as the two parts lie side by side, and a revolving jaw that twists the wire together, substantially as set forth.

2. In the wire-bending machine, the bending-arm *r*, with a forked end, 15, for bending the wire and holding the two parts of such wire while it is being twisted, in combination with the jaw *h*, and gearing for revolving the same, to form the loop, substantially as set forth.

3. In the wire-twisting machine, the stud *u* upon the arm *r*, placed eccentric to the shaft upon which the arm swings, relieving the strain upon the loop as the arm swings, in combination with gearing for turning such arm thereby back from the twisted loop, as set forth.

4. The combination, with the arm *r*, of the pinion *s*, spring-pawl 12, actuating-lever *t*, and jaw *h*, substantially as set forth.

5. The shear *c* and feeding-rollers *b*² *b*³, in combination with the segmental gearing *b*, and the holding and twisting jaws, and gearing connecting the parts, substantially as specified, to feed, cut off, and twist the wire, as set forth.

6. The notched guide-wheels *d*, moved progressively by a ratchet and pawl, in combination with the bending and twisting jaws, substantially as specified, for bending the loop and twisting the wire.

7. The combination, in a wire-bending ma-

chine, of the guide-wheels *d*, for carrying the wire, with two sets of bending and twisting jaws for simultaneously bending both ends of the wire, and then twisting the wire together, as set forth.

8. The die 22, in combination with the bending-die *r*², die 23, and loop-forming mechanism, to bend such loop into a hook after it has been twisted, as set forth.

9. The three-pronged die *l*, in combination with the sliding die 22 and actuating mechanism, substantially as set forth.

10. The wedge *l*⁵ and its actuating-lever *l*⁶, in combination with the sliding die 22, dies 23 and *l*, substantially as set forth.

11. The combination, with the sliding die 22 and stationary die 23, of the die *l* and shoulders 29, that press the die 22 downward to form the curved end of the hook, as set forth.

12. The sliding die 22, with the projection 30, to allow the same to drop after it is drawn back, in combination with the dies *l* and 23, and bender *r*², that press the twisted wire toward the point of the hook, as set forth.

13. The combination, with the revolving jaw *h* and mechanism for twisting the wire, of a stop to hold the twisting-jaw in the position of rest, substantially, as set forth.

14. The bending-die *r*², made as a fork at the end, to draw the wires of the loop together and bend the same, in combination with the dies that bend the wire into the hook, substantially as set forth.

15. The holding-die *v*¹, made as a fork, to draw the parts of the wire together, in combination with the stationary rest *v*, substantially as set forth.

16. In a wire-bending machine, the combination of two bending and twisting jaws with their actuating devices and adjustable beds for adapting the machine to different lengths of wires, and simultaneously operating at both ends of wires, as set forth.

Signed by me this 12th day of February, A. D. 1876.

HENRY W. PUTNAM.

Witnesses:

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CHAS. H. SMITH.