2 Sheets—Sheet 1.

E. I. BRADDOCK.

WIRE BENDING MACHINE.

No. 180,745. Patented Aug. 8, 1876.

Fig. 1.

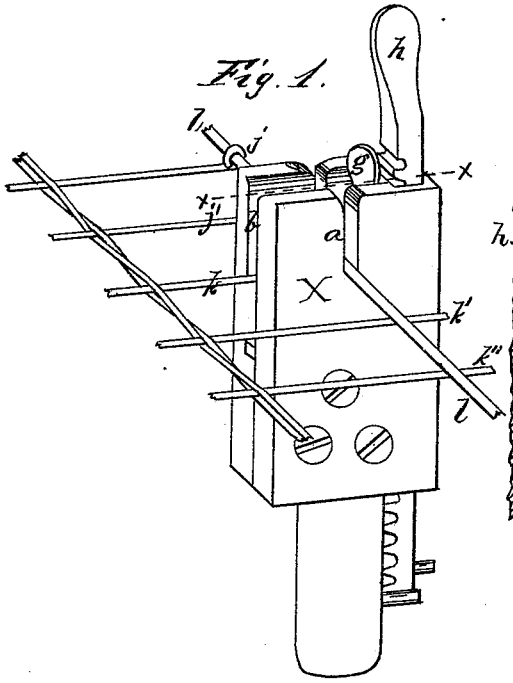

Fig. 2.

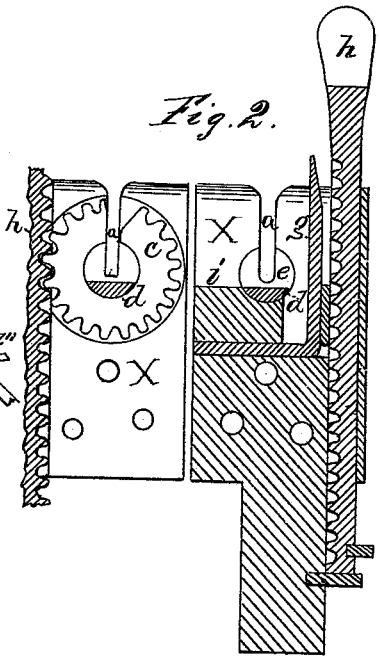

Fig. 3.

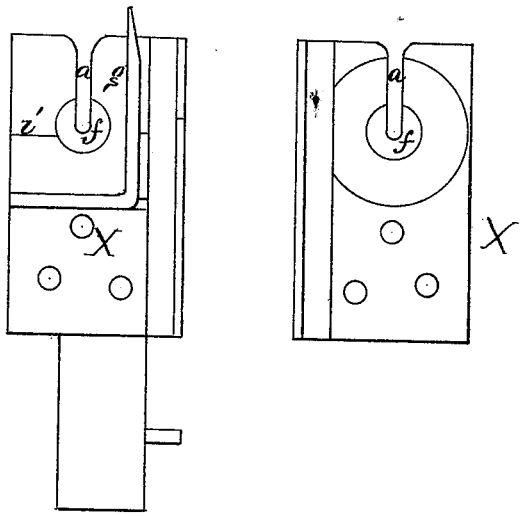

Fig. 4.

Fig 5.

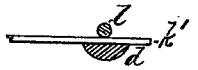

Fig. 6.

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2 Sheets—Sheet 2.

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WIRE BENDING MACHINE.

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Fig. 7.

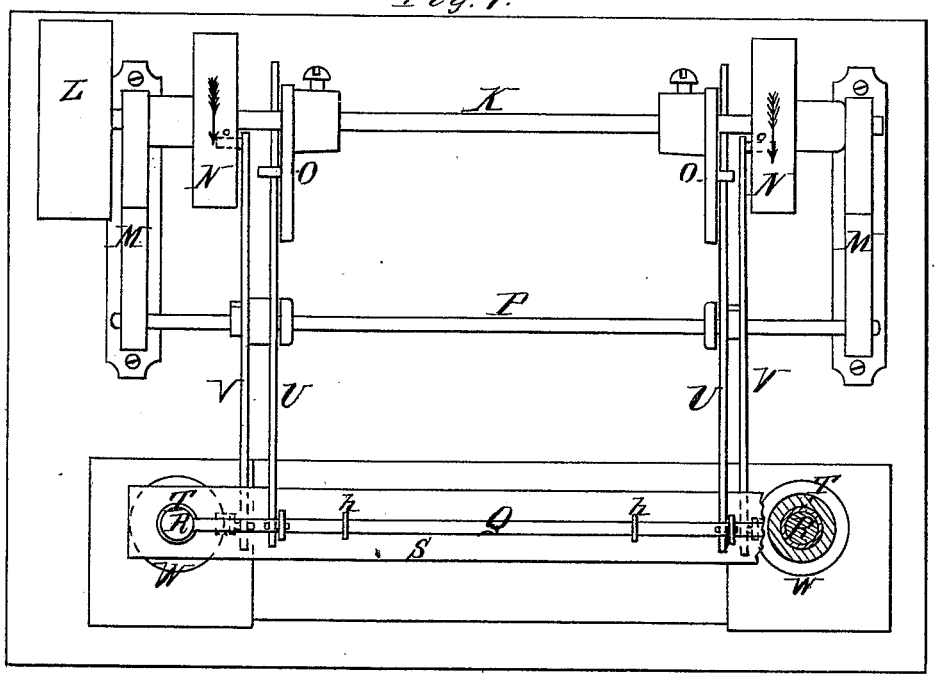


Fig. 8.

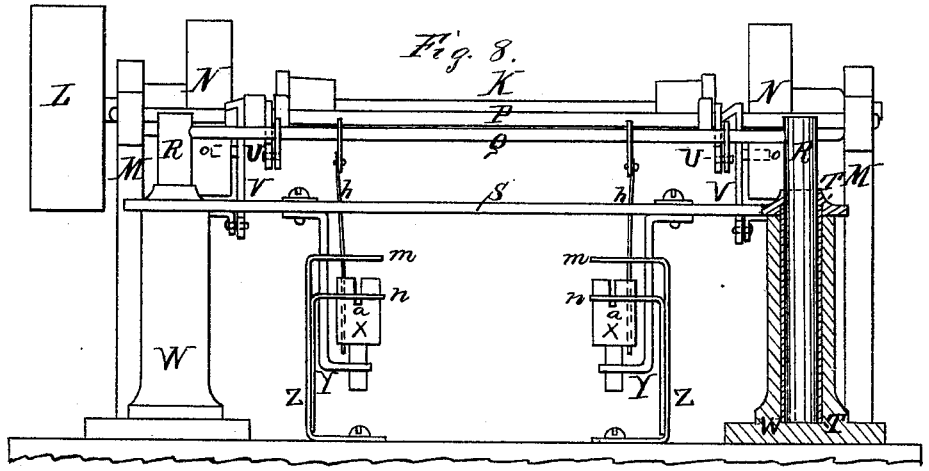
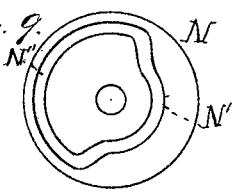


Fig. 9.



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UNITED STATES PATENT OFFICE.

EDWARD I. BRADDOCK, OF MONTAGUE, ASSIGNOR TO SAMUEL SEWALL, JR., OF SAME PLACE, AND GEORGE A. MARDEN, OF LOWELL, MASS.

IMPROVEMENT IN WIRE-BENDING MACHINES.

Specification forming part of Letters Patent No. **180,745**, dated August 8, 1876; application filed July 6, 1876.

To all whom it may concern:

Be it known that I, EDWARD I. BRADDOCK, of Montague, in the county of Franklin and State of Massachusetts, have invented new and useful Improvements in Machinery for Bending and Clinching the Ends of Wires around Cross-Wires, of which the following is a specification:

The invention relates to machinery especially adapted to operate upon the ends of the woof-wires of wire-cloth to bend them around and slightly embed them in a marginal wire, whereby such cloth is fitted for the manufacture of a great variety of articles, and may be considered in two divisions—viz., first, the mechanism which operates directly upon the ends of the wires; second, the machinery by which this bending and clinching mechanism is actuated.

The invention, so far as it relates to the bending and clinching mechanism, consists in, first, a jaw provided with the means of partial revolution, and which, as it revolves, bends the ends of the wires over and around the cross or marginal wire, and slightly embeds them into its surface, so that they are firmly held in place; second, the combination of the bending and clinching jaw and its slotted case or holder, as hereinafter described; third, a guide, by means of which the length of the ends of the wires which are to be bent over is regulated.

In the accompanying drawings, which form a part of this specification, Figure 1 is a view, in perspective, of the bending and clinching device with a piece of wire-cloth, showing the wires before and after they have passed the device. Fig. 2 shows vertical sections of the case on the line *x x* of Fig. 1, showing the toothed wheel and the bending-jaw and rack and guide in section. Fig. 3 shows views of the interior of the case when the toothed wheel has been removed. Fig. 4 is a front view of the toothed wheel, showing its journals and the bending and clinching jaw upon its axis. Fig. 5 is a sectional view of the bending and clinching jaw, the marginal wire, and the woof-wire in position before the end of the woof-wire is bent over the marginal wire by the revolution of the jaw. Fig. 6 is also a sectional view of the same parts when the end of the woof-wire has been bent over and tightly clinched down upon or into the surface of the marginal wire by the partial revolution of the jaw.

In the drawings, *a* represents the slot extending through the walls of the case for the insertion of the marginal wire; *b*, the slot in the case at right angles to the slot *a* for the insertion of the woof-wire; *c*, the toothed wheel; *d*, the bending and clinching jaw; *e e*, journals of the wheel *c*; *f f*, bearings or journal-boxes; *g*, adjustable guide; *h*, movable rack geared with the wheel *c*; *i*, ledge or shelf, on which the woof-wire rests; *j j'*, ends of the woof-wires after being bent; *k k'*, the same before being bent; *l*, marginal wires.

The slot *a* should extend entirely through the walls of the case, so as to permit the free passage of the marginal wire, and its bottom should be on a plane somewhat higher than the bottom of the slot *b*, inasmuch as the marginal wire is to rest upon and pass over the woof-wire where they cross each other. The slots *a* and *b* cross each other or intersect nearly at the longitudinal center of the jaw *d*.

A desirable construction and arrangement of the bending and clinching jaw are upon the axis of a toothed wheel, as shown in Figs. 2 and 4 of the drawings, the jaw being formed by cutting away or by casting the axis so that it shall be a trifle less than one-half of the cylindrical axis of the wheel. This construction enables it, when it revolves over the marginal wire as a center, to leave a space between the face of the jaw and the marginal wire, which is to be filled by the end of the woof-wire.

When the jaw *d* is formed upon the axis of a wheel, as above described, the wheel and its journals must be slotted radially, so that when the jaw is in position for operating upon the wires the slots through the walls of the case and through the wheel and its journals shall all conform to each other, so that the marginal wire can be fed through the device.

The guide *g* is capable of adjustment, so as to leave a greater or less space between it and the jaw *d* for the purpose of regulating the length of the ends of the woof-wires, so that

when turned over upon a marginal wire of any desired diameter they shall terminate at the proper point. This adjustment may be effected by a set-screw, or any other convenient device.

The operation of this mechanism can be more readily understood by the following description, and by reference to Figs. 1, 5, and 6 of the drawings.

In Fig. 1, the wires *j* and *j'* are represented as having passed through the device, and been bent over upon the marginal wire *l*—the wire *k* as being operated on, and the wires *k' k''* as being in the proper relation to the wire *l*—for insertion in their slots. The first or leading woof-wire *j* of the cloth is inserted in the slot *b*, and pushed forward till its end abuts against the face of the guide *g*, which has been properly adjusted. The marginal wire *l* is then inserted in the slot *a*, till it crosses the wire *j* at the desired point of union. This will take place over the center of the jaw *d*, as shown in Fig. 5. The wire *l*, being firmly held down upon the bottom of its slot, and also upon the wire *j*, the jaw *d* is revolved over toward the marginal wire, and, as the end of the wire *j* rests upon the face of the jaw, it is carried over with it, and bent around the wire *l*, as shown in Fig. 6 of the drawings. The jaw *d* is revolved through the intervention of the wheel *c*, which in turn is revolved by raising the rack *h*, into which the wheel gears.

When the jaw *d* is properly adjusted and shaped to conform to the diameter of the wires used, the ends of the woof-wires may not only be bent closely around the marginal wire, but be embedded or pressed into the surface thereof, and all liability of the woof-wires slipping from their places obviated.

When one of the woof-wires has been bent over the marginal wire, the wires are lifted bodily out of their slots, and the piece of cloth or wire frame-work pushed forward in the direction of the length of the marginal wire, and the next woof-wire of the series inserted in the slot *b*, the marginal wire at the same time dropping to the bottom of its slot *a*, and the operation of bending and clinching repeated.

The invention, so far as it relates to the machinery by which the bending and clinching device above described, or a set of the same, so as to work upon opposite edges of the cloth at the same time, is operated, is fully illustrated by the accompanying drawings, Sheet II, in which—

Fig. 7 is a plan view of the machine, one of the hollow standards being broken off to show its interior construction and arrangement of parts. Fig. 8 is a front elevation of the same, one of the hollow standards being in section. Fig. 9 is a side or plan view of one of the cam-grooved wheels.

In these drawings, K represents the shaft mounted upon the frame M M, the driving-wheel L being attached to the shaft. N N are cam-grooved wheels, adjustable on the shaft by set-screws, and revolving with it. O O are cams, also adjusted to the shaft and revolving with it. P is a cross-bar, the ends of of which rest in the frame M M. Q is a cross-bar mounted upon the movable pieces R R, to which are attached the racks *h h*, which revolve the wheels *c c* in the bending and clinching devices. S is a cross-bar, which supports the bending and clinching devices, its ends being attached to the cylindrical tubes T T. U U are levers, one end of each being attached to the cross-bar Q by a linked connection, while their opposite ends are so constructed and arranged as to be operated upon by the cams O O. V V are also levers, one end of each being attached to the cross-bar S, while their opposite ends work through the projections *o o* in the cam-grooved wheels N N.

W W are hollow standards or guides for the tubes T T, which carry the cross-bar S; and the tubes T T in turn serve as guides for the parts or pieces R R, which carry the cross-bar Q. X X are the bending and clinching devices, whose construction and operation have been fully described in the first part of this specification. Y Y are adjustable hangers which support the devices X X. Z Z are adjustable standards fixed in the bed-plate, and provided with fingers or projections *m m* and *n n*.

The hangers Y Y are adjustable in slots in the cross-bar S by means of set-screws. This adjustability enables the devices X X to be located at such distances apart as to accommodate cloth of varying widths when the opposite edges of the same are to be operated upon simultaneously. The space between the two devices is spanned by the woof-wires of the cloth, which enter their slots *b b*, while the marginal wires pass at right angles and enter the slots *a a*.

It can be readily seen that the hangers Y Y can be turned one-half way round, or the devices X X can be turned in their hangers so as to bring the slots *b b* to the front, and in such case the racks *h h* must be arranged to turn with the devices X X. This construction will be found convenient when it is desired to operate only on one side of the cloth.

The standards Z Z are adjustable in a slot in the bed-plate, so that the projecting fingers *m m* and *n n* shall retain the same relative position to the devices X X.

The two sets of levers U U and V V have their fulcra at the cross-bar P. The levers V V may be rigidly attached to the cross-bar P, and the cross-bar constructed to rock upon its bearings in the frame M M, when the lever-arms rise and fall; but the levers U U must be loosely attached to this cross-bar P, so that when their arms rise and fall the cross-bar shall remain stationary and no motion be communicated to the levers V V. This is accomplished by passing the cross-bar through the levers U U and allowing the levers to rock upon it.

The cam-grooves in the wheels N N conform

in shape nearly to the arcs of two semicircles of unequal diameter, whose semi-circumferences are so connected as to form two sharp inclines, as illustrated in Fig. 9.

As the levers V V are operated by means of the projections *o o* working in the cam-grooves, it results that they will be held stationary during the entire revolution of the wheels N N, except when the ends of the levers are carried up and down by the passage of these projections up and down the inclinations of the grooves.

The successive steps in the operation of the machine, and the results thereof, are as follows, viz.: First, to raise the bending and clinching devices X X, so that the inserted wires will be forced to the bottoms of their respective slots and held in that position by the projecting fingers *m m*, while the ends of the woof-wires are being operated upon by the revolving jaw to bend and clinch them over the marginal wire; second, after the wires have been forced to the bottoms of their respective slots, to raise the racks *h h* for the purpose of revolving the bending and clinching jaws; third, to restore the parts to their first position.

The bending and clinching devices X X, being firmly attached to the cross-bar S, are raised and lowered with it. The ends of this cross-bar are rigidly attached to the cylindrical tubes T T, which are free to move up and down in the fixed hollow standards W W.

The ends of the levers V V, being also attached to the cross-bar S, give it an upward and downward motion whenever the opposite ends of such levers are raised or depressed. This upward movement of the cross-bar S will take place once during each revolution of the wheels N N, viz., when the projections *o o* pass up the inclines N′ of the cam-grooves. The projecting fingers *m m*, before the devices X X are raised, are in position sufficiently above the top of such devices to permit the wires to be readily inserted in the slots. When the devices X X are raised, the wires are received into the slots, the stationary projecting fingers holding them during the upward movement of devices. As soon as the devices X X have been raised to their full limit, the cams O O, being properly adjusted on the shaft to effect this result, begin to bear down the ends of the levers U U, which causes the opposite ends of such levers and the cross-bar Q, to which they are attached, to rise. The upward movement of the cross-bar Q lifts the racks *h h*, which revolve the wheels into which they gear, and they in turn communicate their motion to the bending and clinching jaws, constructed upon their axes. The cross-bar should be raised high enough to lift the racks sufficiently to carry the bending-jaws through about one hundred and eighty degrees of revolution.

The construction and arrangement of the cams O O, and the ends of the levers upon which they operate, are such that as soon as the cross-bar Q has reached its limit of elevation, the cams cease to operate upon the levers, and the cross-bar Q, weighted by the pieces R R, falls and carries the racks *h h* to their original position in the devices X X, and reverses the revolution of the wheels and the bending-jaws which operate within them. While the racks *h h* have been lifted up and returned to their places, and the ends of the woof-wires bent over, the cross-bar S and the devices X X have been held stationary, the projections *o o* of the levers V V working during this time in the arc-shaped portion N″ of the cam-grooves of the wheels N N. As soon, however, as by the revolution of these wheels the projections reach the inclines in the grooves, the cross-bar S drops to its original position, carrying with it the bending and clinching devices X X, the cross-bar Q, and the racks *h h*. When the devices X X drop, the fingers *n n*, whose position has been directly beneath the marginal wires during the operation of bending, will carry the wires up the slots and release the work. The next woof-wire of the series is at once placed over its slots before the devices X X begin to be lifted, and the operation repeated, as above described, the ends of a single woof-wire being turned and clinched over the marginal wires at each revolution of the shaft.

What is claimed as new is—

1. A partially-revolving jaw, for the purpose of bending and clinching the ends of wires over a cross or marginal wire, substantially as described.

2. In combination with a partially-revolving jaw, a case or holder, containing such jaw, and slotted for the reception of the wires, arranged at right angles to each other, substantially as and for the purpose set forth.

3. In combination with a radially-slotted wheel, a jaw, formed upon the axis of such wheel, and partaking of its revolution, substantially as and for the purpose set forh.

4. In combination with the partially-revolving jaw, the adjustable guide *g′*, to regulate the length of the ends of the wires to be bent over, substantially as and for the purpose set forth.

5. The combination of the bending and clinching devices X X, or either of them, and the movable cross-bar S, substantially as and for the purpose described.

6. The combination of the bending and clinching devices X X and the movable cross-bar Q, substantially as and for the purpose described.

7. The combination of the bending and clinching devices X X and the projecting fingers *m m* and *n n*, substantially as and for the purpose described.

8. The combination of the levers V V, the cross-bar S, and the cam-grooved wheels N N, for the purpose of raising and lowering the bending and clinching devices X X, substantially as and for the purpose described.

9. The combination of the levers U U, the cross-bar Q, and the cams O O, for the pur-

pose of lifting the racks *h h*, substantially as and for the purpose described.

10. The combination of the bending and clinching devices X X and the adjustable hangers Y Y, substantially as and for the purpose described.

11. In combination with the fixed hollow standards W W, the movable tubes T T, and the movable pieces R R, substantially as and for the purpose described.

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