2 Sheets—Sheet 1.

C. CARR & J. W. BICKNELL.

Machine for Uniting Paper.

No. 215,505. **Patented May 20, 1879.**

Fig. 1.

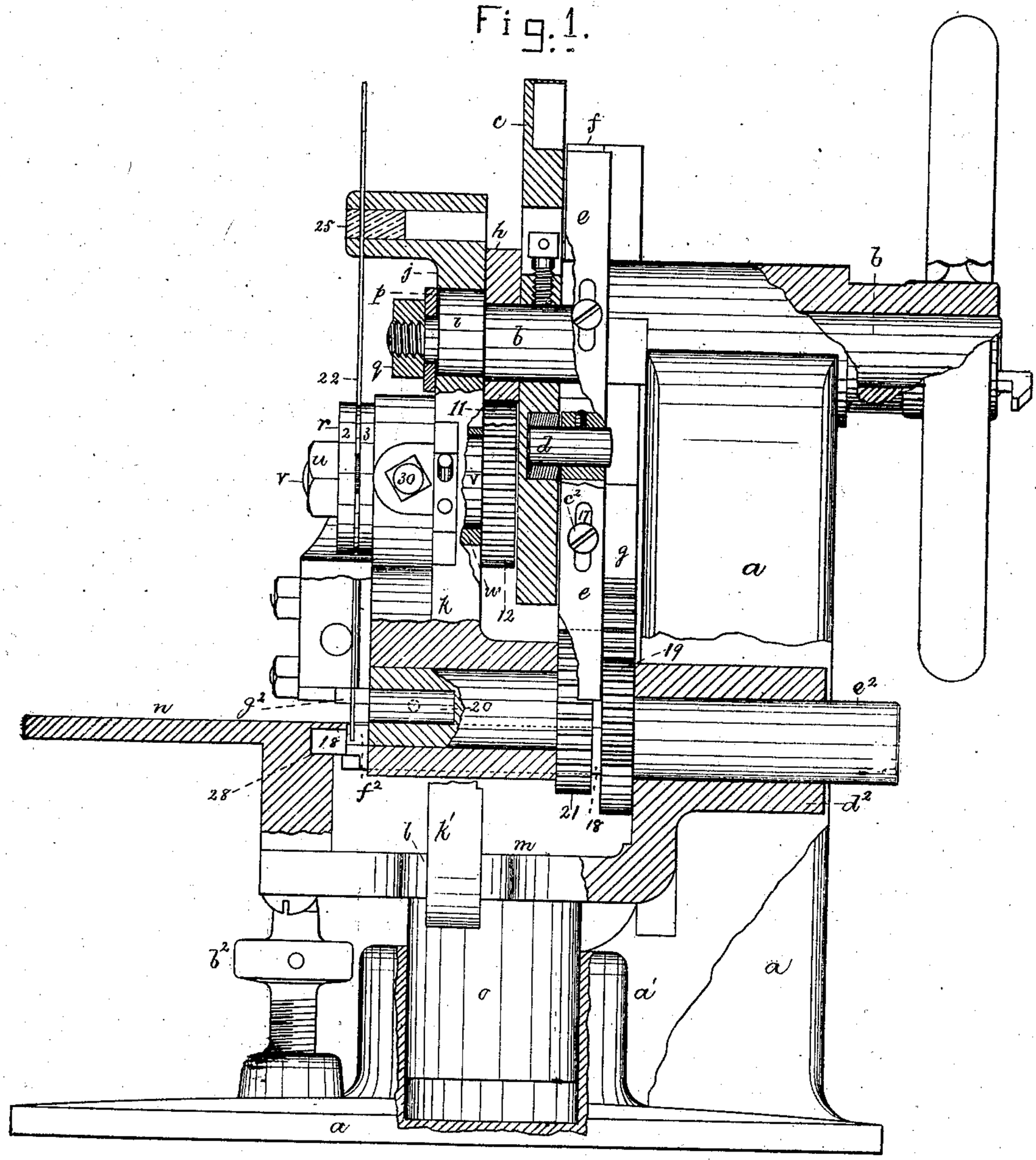
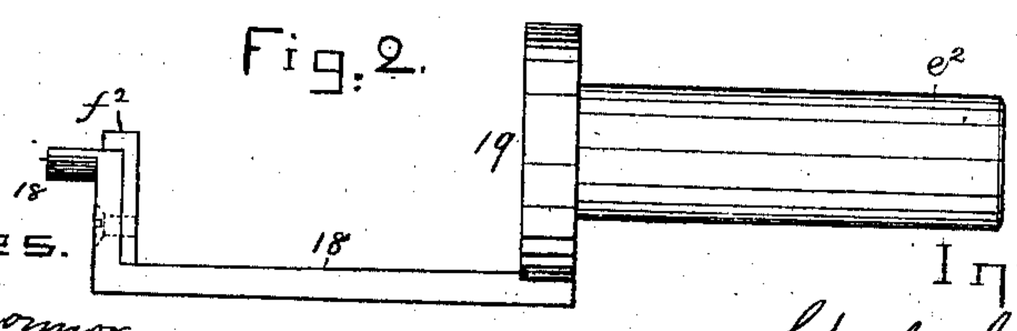


Fig. 2.



Witnesses.
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by Crosby & Gregory Attys

2 Sheets—Sheet 2.

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Fig. 8.

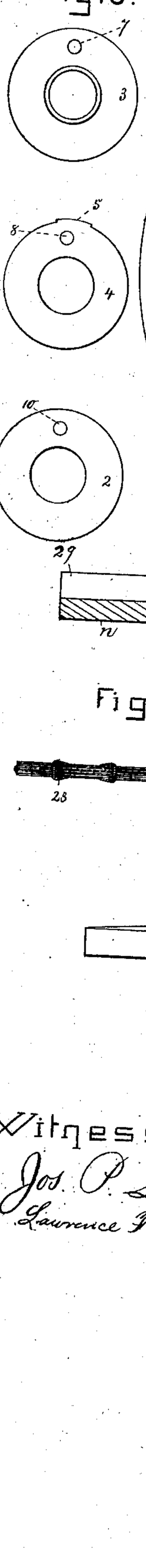


Fig. 9.

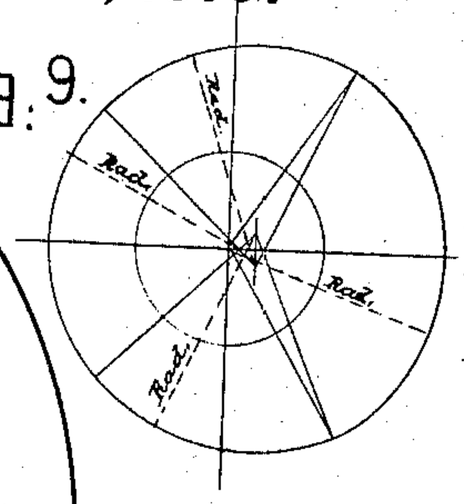


Fig. 6.

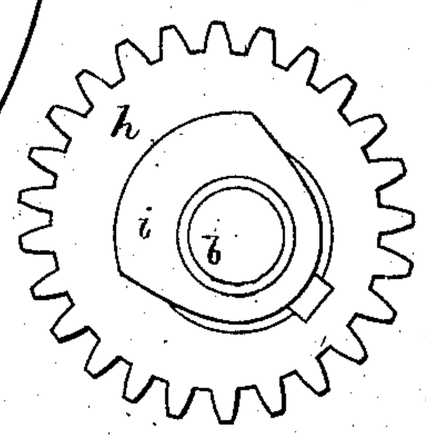
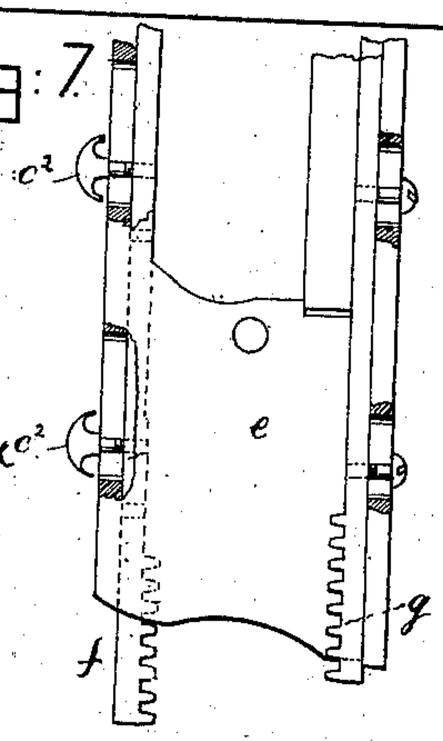


Fig. 3.

Fig. 4.

Fig. 5

Fig. 7



Witnesses.

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by Crosby & Gregory

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UNITED STATES PATENT OFFICE.

CHARLES CARR AND JAMES W. BICKNELL, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR UNITING PAPER.

Specification forming part of Letters Patent No. **215,505**, dated May 20, 1879; application filed February 28, 1879.

To all whom it may concern:

Be it known that we, CHAS. CARR and JAMES W. BICKNELL, both of Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Machines for Uniting Paper, &c., of which the following description, in connection with the accompanying drawings, is a specification.

This invention relates to mechanism for stitching or uniting paper, leather, or other material by means of metallic fastenings.

In this invention flattened or other wire proceeding from a coil suitably supported is automatically driven for the desired distance through the layers of material to be united, after which it is cut off at any desired length from the upper side of the said material, and the ends of said piece of wire, both above and below the said material, are then bent closely against the said material, securely fastening it together.

The length of the wire for each fastening is made uniform, and so as to accord with the thickness of the material to be united, by means of a feed-disk the acting face of which is of a length substantially equal to the thickness of the material plus the length of the bent-over portions of the fastening above and below the material, said feed-disk being readily put in position or removed from the feeding devices.

In this machine we can unite the thinnest books or pamphlets or the thickest magazines.

Figure 1 represents, in side elevation and partial section, one of our wire-stitching machines, the right-hand side of the nose being omitted. Fig. 2 is a detail of the under former removed from the machine; Fig. 3, a vertical section of Fig. 1, taken through the feeding devices and nose. Fig. 4 shows several thicknesses of material united by our fastenings. Fig. 5 is a detail, showing the upper and under formers in different positions; Fig. 6, a detail of the cam and cam-gear, to be hereinafter referred to; Fig. 7, a detail, chiefly to show the slide-bar and its rack-bars; and Fig. 8, details of one of the feeding-wheels. Fig. 9 is a detail of the cam-gear before being provided with gear-teeth, the full lines meeting at angles at the four several centers from which the gear is described, and the dotted lines indicating the radii of different lengths.

The frame *a* of the machine, of suitable shape to hold the working parts, has at its upper portion the main shaft *b*, which carries a cam-grooved disk, *c*, that receives a friction roller or stud, *d*, on a slide-bar, *e*, having adjustably attached to it two rack-bars, *f g*, to reciprocate the said slide and rack-bars, and cause them, at the proper time, to actuate the formers, to be hereinafter described. Upon the main shaft *b* is a cam-shaped toothed gear, *h*, and next to it a cam, *i*. This cam *i* is embraced by a yoke, *j*, at the top of a movable frame, *k*, having lugs *k'* fitted into suitable guideways *l* in an adjustable bed, *m*, which is provided with a stem or part, *o*, fitted to a portion, *a'*, of the frame, and at its upper end the said frame *k* is supported at one side by the face of the cam-gear, and at its other side by a washer or plate, *p*, held in place by a nut, *q*, at the end of shaft *b*. This cam *i* raises and lowers the frame *k*, having upon it the tension device 25 for the wire, the feeding mechanism, and the upper former.

The feeding mechanism is composed of, preferably, a milled wheel, *s*, on a shaft, *t*, and a wheel composed, preferably, of two rings, 2 3, and an interposed feeding-disk, 4, having, preferably, a serrated feeding projection, 5, in length substantially equal to the length of the fastening to be made, or to the thickness of the material to be united, plus the length of the fastening which it is desired to turn or bend over, above, and below the said material. These feeding-disks will consequently have feeding projections 5 of greater or less length, according to the work to be done upon the machine, a number of said disks accompanying each machine. The said disk is herein shown held in place between the rings 2 3 by means of a pin, 7, which enters a hole, 8, in the disk, and a hole, 10, in ring 2, a suitable pinching-nut, *u*, holding the said rings and disk upon shaft *v*. This shaft *v* is supported in an eccentric bearing or ring, *w*, (shown in dotted lines, Fig. 3, and in section, Fig. 1,) the said bearing being provided with a handle, *x*, to turn it, so as to move the shaft

v toward or from shaft t, to adapt the feeding-surfaces to the thickness of the wire to be driven.

Shaft t has a gear, 11, one edge of which is shown in Fig. 3, and a portion of it in Fig. 1 by breaking away the top of the gear 12 on shaft v. The gears 11 12 mesh together, so as to rotate shafts t v at the same speed, and gear 11 is engaged and driven by the teeth of the cam-gear h. The teeth of this cam-shaped gear will always remain in engagement with the teeth of gear 11, notwithstanding the fact that cam i acts to lower the frame k just before driving each fastening, so as to cause the nose 14 15 to bear upon and firmly hold the material, 16, to be united.

Although we prefer to use the separable feeding-disk, it is obvious that the wire may be engaged and moved forward by means of a single wheel annularly grooved about but a portion of its periphery, so as to leave a projecting surface like the projection 5, to engage the wire at each rotation of the shaft v.

We also desire to state that a set of feeding-wheels having a step-by-step rotation for the proper distance might be employed, and be moved by a pawl and ratchet.

The supporting-surface n, upon which the material 16 rests, is connected with the bed m, and it and the bed are together adjustable vertically by an elevating-screw, b^2, and may be confined in adjusted position by means of a locking device, a^2. (Shown as a bolt, see Fig. 3.)

When the supporting-surface is to be raised or lowered to receive thin or thick material, the set-screws c^2, which connect the racks f g with the slide e, are loosened, permitting the racks to move, with the pinions engaged by them, without rotating the said pinions.

The table m has a bearing, d^2, (see Fig. 1,) which receives the shaft c^2, that operates the lower former, f^2, which projects from the end of a bent arm, 18, connected with the gear 19, which is engaged and reciprocated for part of a revolution by the rack-bar g, said construction of the arm permitting the former, f^2, carried by it to be brought in correct position underneath the material, and directly in line with the upper former, g^2, at the end of shaft 20, supported in the frame k, and having upon its rear end a pinion, 21, which is engaged and reciprocated by the rack-bar f.

In Fig. 1 the material, 16, to be united is omitted to avoid confusion of parts; but the said figure shows the lower end of the wire 22 in the position it will occupy after being driven through the material and below the support n, leaving the lower end of the wire projected far enough below the support to furnish sufficient wire to form a bent portion, 23, (see Fig. 4,) of the desired length. At this time the nose 14 15 will act to hold the material 16 firmly upon the support n.

The upper corner, x', of the upper former, g^2, (see Figs. 3 and 5,) rests against the wire, and is sharpened and shaped to form a cutter, by which to sever the wire after it shall have been driven for the proper distance through the material 16.

Assuming the wire as in Fig. 3, and through the material 16, the slide e and rack-bars f g are depressed, and the shafts e^2 and 20 are rotated, causing the upper and lower formers to be moved, as herein shown, in the same direction, they occupying successively the positions shown in Fig. 5.

The former g^2 at its start severs the wire at a distance above the material, leaving a separate wire-fastening through and in the material 16, and the subsequent movements of the upper and lower formers, g^2 f^2, bend the said short pieces of wire over, above, and below the material, as shown in Figs. 4 and 5, setting its ends down firmly in contact with the material, and holding the "settle" of the said material.

In Fig. 4 we have shown a second set of fastenings driven through the material, and bent in an opposite direction to the first set driven therein, the second set being driven while the material was the other side up. One set of fastenings is, however, deemed sufficient.

The tension device is shown as a plug, 25, of india-rubber; but instead of it other well-known tension devices may be employed, such as disks or plates.

The second member of the wire-cutter is a steel block, 26, placed in the half 15 of the nose, and made adjustable by means of the cutter-adjusting device. (Shown as a taper-pointed screw, 27.)

At the rear side of the supporting-surface n is a curved recess, 28, which serves as a bearing-surface for the end of arm 18 when the under former is bending the wire, it preventing the said former from being pressed or forced away from the under side of the material.

The rear side of the support n has a ledge or guiding-surface, 29, against which the edges of the material being united rest and are guided. In practice this ledge will be made adjustable in any proper or usual way, and the wire-receiving grooves in the nose will be of a width and thickness to suit the shape of the wire being driven, and to so hold it that the wire will not buckle or cripple in the said groove.

The bearing w is held in adjusted position by screw 30. The under former is made of steel, and removable from arm 18. The wire used is sufficiently stiff to drive without crippling.

The shaft 20, in operation, is more or less out of line with shaft e^2, and their relative positions are changed at each partial rotation.

We are fully aware that numerous machines have been made to make and to drive metallic staples through paper, leather, and other materials, after which the ends of the staples have been clinched.

It will be noticed that the wire is positively driven through the material by the action of the feeding devices, and this is one of the essential features of our invention.

We claim—

1. In a machine to unite two or more thicknesses of paper or other flexible material, feeding mechanism to drive the end of a wire through the material, a supporting-surface for the material, a cutting mechanism to sever the wire after it is driven through the said material, and formers, substantially such as described, above and below the material, to bend the severed portion of the wire over upon and toward the upper and under sides of the material, all substantially as described.

2. The under former, located below the unyielding support for the material, combined with the sliding frame and its attached upper former, and cutter and nose, the cutter severing the wire while in the material, and the formers above and below the material bending the projecting ends of the severed wire against the upper and lower sides of the material, substantially as described.

3. The reciprocating frame and its attached wire-feeding mechanism, shafts *t v*, and their pinions, combined with the cam-shaped gear, to operate substantially as described.

4. In a rotary feeding mechanism for feeding a piece of wire, a roller and a feeding projection, 5, situated in a groove of the roller, the projection being adapted to engage and feed the wire for a distance substantially equal to the length of the wire desired to properly enter and fasten the material, combined with an opposed roller, all substantially as described.

5. The adjustable bed and its attached work-support and bearing d^2, combined with the shaft e^2 and lower former, substantially as and for the purpose described.

6. In a machine for uniting two or more thicknesses of flexible material by means of wire, the vertically-adjustable shaft e^2 and the lower former, combined with the slide-bar and the rack-bar *g*, adjustable thereon, substantially as and for the purpose described.

7. The rotary former g^2, provided with a cutting-edge, *x*, combined with a second cutting member, 26, to operate as and for the purpose set forth.

8. In a machine for driving a straight wire through the material, as described, the under former, having its operating-shaft fixed in position with relation to the support for the material, combined with the upper former, having its operating-shaft fixed in position with relation to the pressing or holding-down nose, and with mechanism, substantially as described, to change the distance between the nose and support, to alternately clamp and release the material being united together, substantially as described.

9. The wire-feeding mechanism, in combination with an eccentric bearing, operated as specified, to adapt the feeding-wheels to wires of different sizes, substantially as shown.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES CARR.
JAMES W. BICKNELL.

Witnesses:
G. W. GREGORY,
N. E. WHITNEY.