(No Model.) 4 Sheets—Sheet 1.

D. C. STOVER.

STAPLE FORMING MACHINE.

No. 301,839. Patented July 8, 1884.

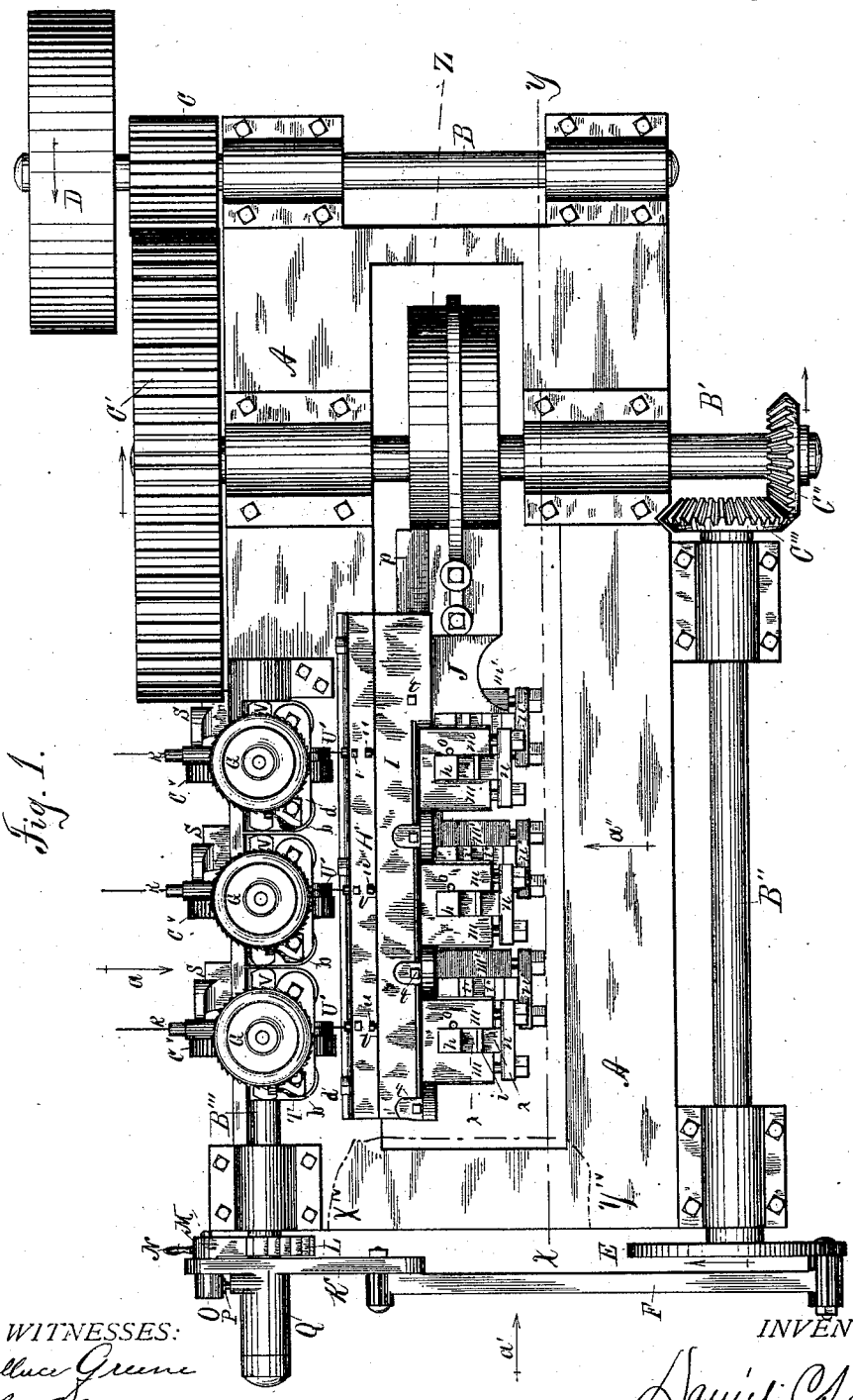


Fig. 1.

WITNESSES:
Wallace Greene
W. Dickerson

INVENTOR
Daniel C. Stover
by Robt. H. Wiles
ATTORNEY

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

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D. C. STOVER.

STAPLE FORMING MACHINE.

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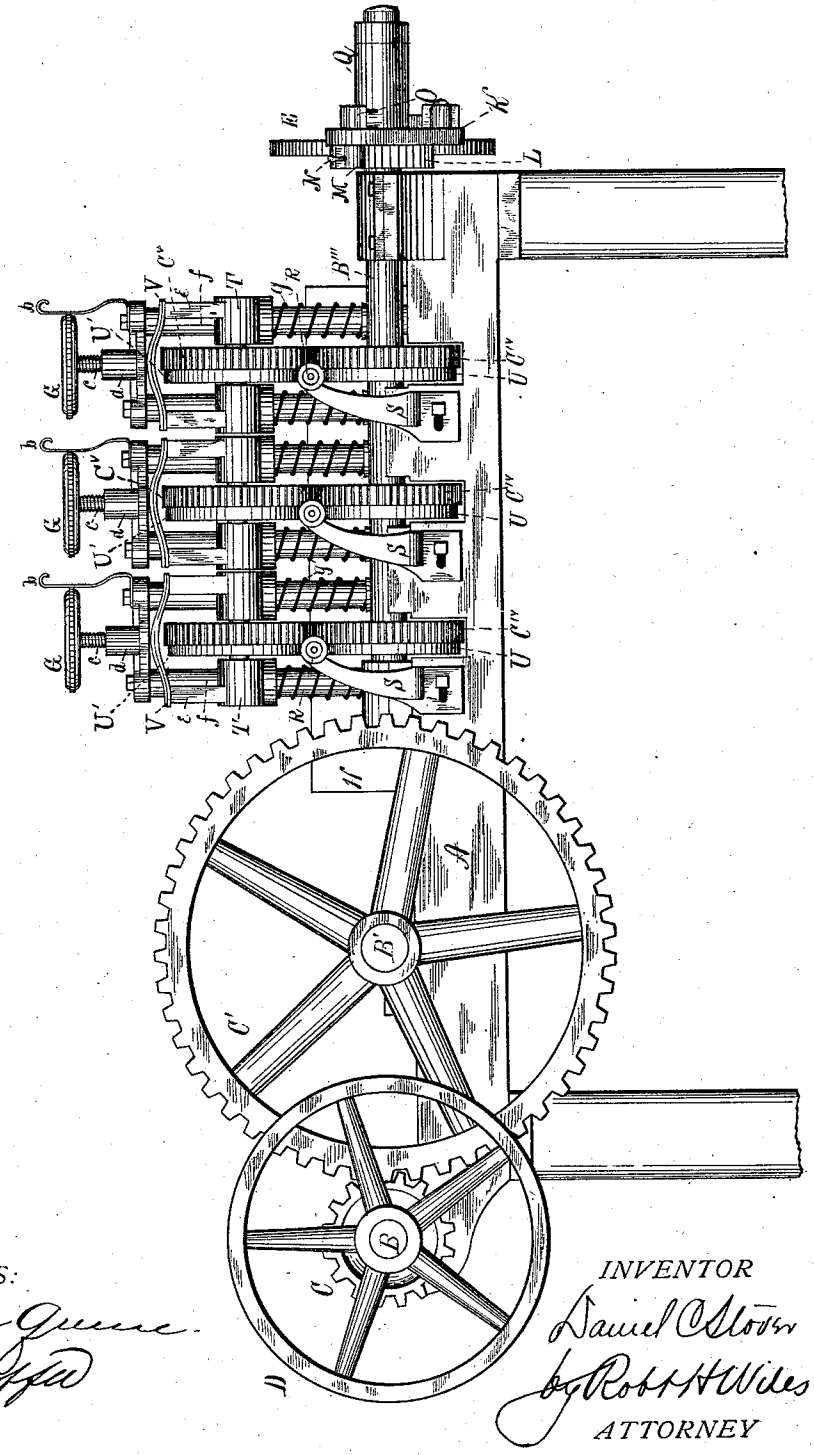


Fig. 2.

WITNESSES:

Wallace Quinn

W. B. Chapin

INVENTOR

Daniel C. Stover

by Robt. H. Wiles

ATTORNEY

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

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D. C. STOVER.

STAPLE FORMING MACHINE.

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Fig. 3.

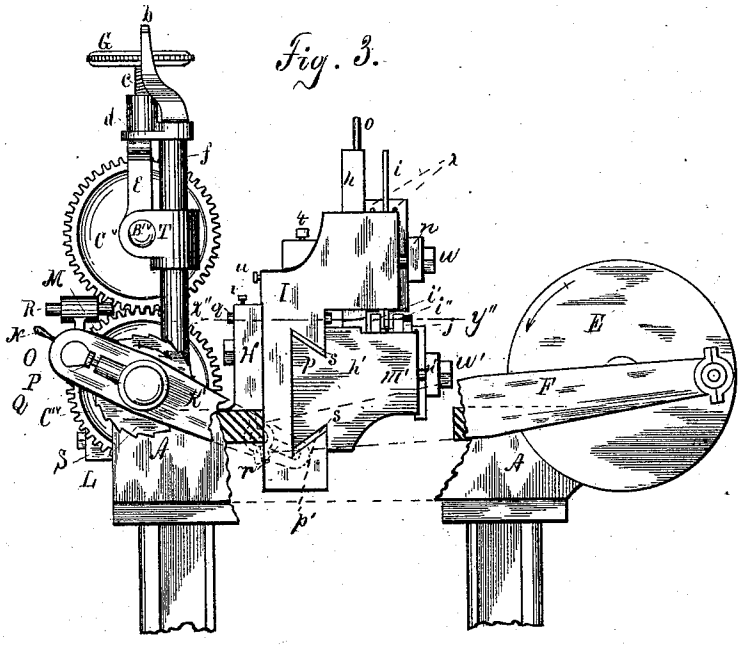


Fig. 6.

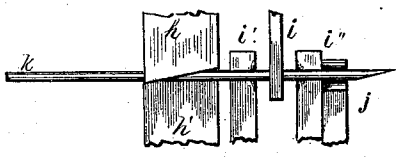


Fig. 7.

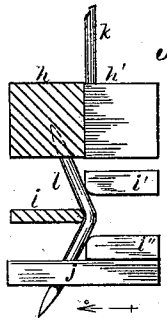


Fig. 8.

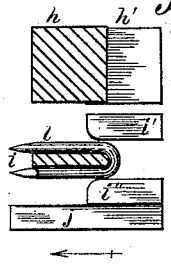
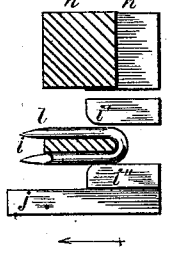


Fig. 9.



WITNESSES:

Wallace Greene

W. E. Clapp

INVENTOR

Daniel C. Stover

by Robt. H. Wiles

ATTORNEY

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

(No Model.) 4 Sheets—Sheet 4.

D. C. STOVER.

STAPLE FORMING MACHINE.

No. 301,839. Patented July 8, 1884.

Fig. 4.

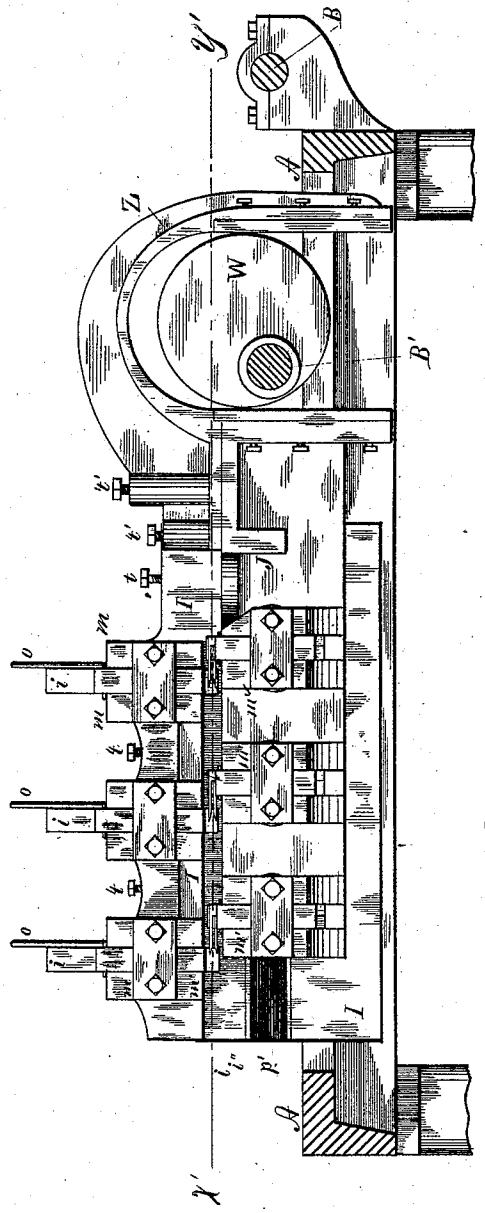


Fig. 11.



Fig. 10.

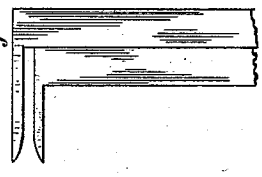
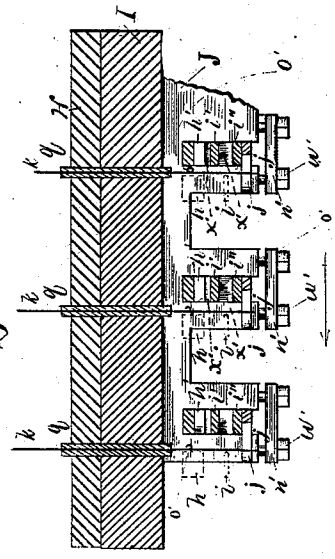


Fig. 5.



WITNESSES:

Wallace Greene.

W. B. Hapgood

INVENTOR

Daniel C. Stover

by Robt. H. Wiles

ATTORNEY

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

UNITED STATES PATENT OFFICE.

DANIEL C. STOVER, OF FREEPORT, ILLINOIS, ASSIGNOR TO THOMAS H. DODGE, OF WORCESTER, MASSACHUSETTS.

STAPLE-FORMING MACHINE.

SPECIFICATION forming part of Letters Patent No. 301,839, dated July 8, 1884.

Application filed December 13, 1883. (No model.)

To all whom it may concern:

Be it known that I, DANIEL C. STOVER, a resident of Freeport, in the county of Stephenson and State of Illinois, have invented certain new and useful Improvements in Staple-Forming Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention is an improved automatic staple-forming machine, in which a series of knives and benders attached to a reciprocally-sliding head co-operate with a corresponding series of knives and benders rigidly attached to the stationary bed of the machine, and thus cut and form staples from a number of wires at each forward movement of the sliding head. Each of the wires from which the staples are to be cut is provided with a suitably-arranged pair of feed-rolls; and the machine is so constructed that the wires are fed into the machine simultaneously, but the staples are cut and formed successively, as is hereinafter fully explained. The machine is fully described, explained, and claimed in the following specification, and shown in the accompanying drawings, in which—

Figure 1 is a plan of the entire machine; Fig. 2, a side elevation thereof, looking in the direction indicated by the arrow *a*, Fig. 1; Fig. 3, an end elevation thereof, looking in the direction indicated by the arrow *a'*, Fig. 1, the pitman F and crank K being partly broken away, and the end of the bed being broken away through lines x^{iv} y^{iv}, Fig. 1; Fig. 4, a side elevation of the machine, looking in the direction indicated by the arrow *a''*, Fig. 1, the side of the machine nearest the eye being cut away by a vertical plane passing through the line *x y*, Fig. 1; Fig. 5, a horizontal section of the machine through the line *x'' y''*, Fig. 3, showing the relative positions of the wires and the knives and benders; Fig. 6, a front elevation (same as Fig. 3) of a wire in position for cutting, and the knives and benders about to cut and form it; Figs. 7, 8, 9, views of successive positions of the staple and the parts which form it during the forming process; Fig. 10, a side elevation (same as Fig. 4) of a wire-guide, *j*, one of which receives each wire a moment before it is cut; and Fig. 11, an elevation of a rod, *o*, the concave end *o'* of which rests on the staple-wire near the inner end of the feed-tube *q*, and prevents upward motion of said wire.

In these views, A is the bed of the machine; B, the main shaft of the machine, extending across the end of the bed and journaled in suitable boxes; and B', a second shaft parallel with the shaft B, and adapted to communicate motion to the working parts of the machine. A pulley, D, mounted on the shaft B, receives its motion from a belt, and two engaging gear-wheels, C C', mounted on the shafts B B', respectively, cause the latter shaft to turn in a direction opposite to the direction of the rotation of the former. On the opposite end of the shaft B' from the gear-wheel C' is mounted a beveled gear, C'', which meshes with a similar gear, C''', mounted on a shaft, B'', extending along the side of the machine at right angles to the shaft B', and journaled in suitable boxes. A crank-plate, E, is mounted on the end of the shaft B'', and the rotation of the crank-plate imparts reciprocal motion to a pitman, F, the plate and pitman being connected by a suitable crank-pin attached to the plate and passing through one end of the pitman. The opposite end of the pitman is connected by a second crank-pin with a crank, K, which is mounted on a shaft, B''', parallel to the shaft B''. The crank K is formed integrally with a sleeve, Q, which rotates freely on the shaft B''' and affords a firm bearing for the crank thereon. The crank K extends both ways from the sleeve Q, and in the end opposite the crank-pin is pivoted a pawl, M, which engages with a ratchet-wheel, L, rigidly mounted on the shaft B''', just inside the crank K. The pivot connecting the pawl and crank passes through the latter, and its outer end is provided with a cam, O, having two flat faces. (See Fig. 3.) A pin, P, slides in a socket attached to the sleeve Q, and is pressed outward from the sleeve by a spring in the bottom of the socket. The head of the pin P is pressed against the cam O on the pivot of the pawl M, and serves to hold it in engagement with the ratchet-wheel L when the parts are in the po-

sition shown in Fig. 3. If, however, the handle N, formed integrally with the pawl M, be pressed downward from the position shown in Fig. 3, the pawl is raised from the ratchet-wheel, and if the downward motion of the handle be carried far enough the cam-face in contact with the head of the pin P is carried away from it, and the other cam-face takes its place. In that case the force of the spring under the pin P presses it upward against the cam in its new position, and this pressure holds the pawl out of engagement with the ratchet-wheel.

On the shaft B‴ are mounted at regular intervals a series of gear-wheels, C^{iv}, with each of which is formed integrally a feed-roll, U, (see Fig. 2,) and each of the gear-wheels engages with a similar gear-wheel, C^{v}, directly above it, each of the gear-wheels C^{v} being formed integrally with a feed-roll, U′, and being mounted on a short shaft journaled in bearings T, which are bored horizontally for said shafts, and vertically for stationary posts *f*, on which they slide. Under each of the bearings T is a coiled spring, *g*, coiled about the post *f*, and acting as a cushion for the bearing. Each of the bearings has an upwardly-extending rod, *e*, formed integrally with it, and each pair of said rods is capped by a cross-spring, V.

Directly over the spring V is a cross-bar rigidly bolted to and connecting the tops of the corresponding pair of posts, *f f*, and each cross-bar has on its upper surface an internally-screw-threaded boss, *d*, in which works a screw, *c*, provided with a hand-wheel, G, at its upper end, by means of which it is turned. By means of the screw *c* the spring V may be pressed downward until the feed-rolls are in absolute contact, if desired, the coiled springs *g* gradually yielding to the pressure; and when the reverse motion of the screw takes the downward pressure from the spring V the coiled springs force the bearings T upward and gradually increase the distance between the feed-rolls. The periphery of each wheel G is a ratchet, and is provided with a spring, *b*, adapted to engage the ratchet-teeth and prevent accidental reverse motion of the screw.

The motion of the shaft B‴, at each impulse which it receives from the crank K and pawl *m*, is in the direction indicated by the arrow on the face of the ratchet-wheel L, Fig. 3, and the motion of the feed-rolls C^{iv} C^{v} is evidently such as to force a wire placed between them across the machine—that is, from left to right in Fig. 3.

To the bed of the machine, outside the feeding mechanism, are fastened a series of arms, S, slotted for adjustment, and each provided at its upper end with a horizontal tube, R, for supporting one of the wires from which staples are to be cut and formed. These tubes are so placed as to be in line with the points of contact of the respective pairs of feed-rolls, and are adjusted laterally. Each tube is held in a suitable bearing formed integrally with the arm S, and may be removed at any time when worn out, or replaced by another of different caliber, when it is desired to change the size of wire from which staples are to be made. On the opposite side of the feed-rolls from the tubes R are a corresponding series of tubes, *q*, lying in line with tubes R, and passing through the portion of the bed which lies between them and the cutting and bending mechanism. (See Figs. 1, 3, and 5.) Each of the tubes *q* is held in place by a set-screw, *v*, and is removable, for the same purpose and in the same way as its corresponding tube, R. Each of the staple-wires is supported by one of the tubes R, passes between the corresponding feed-rolls, C^{iv} C^{v}, and through the corresponding tube, *q*, into position for cutting, as hereinafter set forth.

The bed A of the machine is a solid rim formed about a rectangular opening in the center, (see Fig. 1,) and having at the side of the opening next the feed-rolls a vertical flange, H, formed integrally with it. (See Fig. 3.)

To the inner face of the flange H is securely bolted a heavy stationary head, I, Figs. 1, 3, 4, to which are secured the stationary knives and benders. The inner portion of the head I, which overhangs the central opening in the bed, consists of a series of blocks, each composed of two parallel wings, *m m*, separated by a vertical slot of such width as to receive a stationary knife and bender. In each slot is placed, (see Figs. 1, 3,) first, a knife, *h*, next a spacing-block, *x*, then a thin bender, *i*, and, finally, a second block, *x*, the whole being held rigidly in place by a cross-bar, *n*, bolted to the inner faces of the wings *m m*, which form the block. By loosening the bolts which secure the cross-bars *n* the knives and benders *h i* may be raised or lowered, and by changing the spacing-blocks *x* the distance between each knife and its bender may be adjusted at will. Each staple-wire, when fed into the machine, lies horizontally beside and in contact with one of the stationary knives *h*, and the knife is cut off obliquely at the lower end, so as to cut the wire diagonally. (See Fig. 6.) Beside each knife is a rod, O, which passes vertically through the wing *m*, and rests on the staple-wire to prevent it from springing upward. (See Figs. 1, 11.)

In the inner face of the head I, below the stationary knives and benders, is a dovetail groove, *p*′, Figs. 3, 4, extending through the entire length of the head, and in this groove slides longitudinally a dovetail tongue or flange, *p*, which is formed integrally with and supports a sliding head, J, to which are attached a series of knives and benders that cooperate with the stationary knives and benders heretofore described. The sliding head J is bolted to a heavy hook, Z, Figs. 1, 4, within which rotates an eccentric, W, mounted on the shaft B′, the rotation of the shaft and eccentric imparting reciprocal sliding motion to the head. Between the faces of the tongue *p* and the faces of the groove *p*′, in which it slides,

are placed two steel plates, *s*, Fig. 3, and a series of bolts, *t*, Figs. 3, 4, serve to hold the plates in place, and also to tighten them to compensate for wear of the working surfaces. The portion of the sliding head J which lies under the blocks *m m* of the stationary head I consists of a series of blocks similar to those in the stationary head, each being composed of two wings, *m' m'*, separated by a vertical slot of such width as to receive a knife, a pair of benders, and a wire-guide, *j*. (See Figs. 1, 4, 5.) In each of said slots is placed, first, a knife, *h'*, beveled to correspond with a stationary knife, *h*, next a spacing-block, *x'*, next a bender, *i'*, then a second spacing-block, *x'*, next a second bender, *i''*, then a wire-guide, *j*, and, finally, a third block, *x'*, the whole being held firmly in place by a cross-bar, *n'*, bolted to the wings *m' m'*. The knives *h'* are so placed as to pass directly under the stationary knives *h*, respectively, and the spacing-blocks *x'* are so arranged that the two benders *i' i''* pass on either side of the stationary bender *i*. (See Figs. 3, 5, 6, 7, 8, 9.) The inner front corners of the benders *i' i''* and the rear edge of the stationary bender *i* are rounded to assist in forming the staple. The wire-guide *j*, heretofore referred to, consists of two L-shaped pieces of steel, placed one within the other, the horizontal limbs being slightly separated to form a slot for the reception of the end of the wire, and the inner faces of this slot being rounded at the front end. (See Fig. 10.) The staple-wire being fed in at right angles to the line of motion of the knives and benders, the guide *j* reaches it first, and the rounded jaws catch it and bring it back into the slot and into proper position for cutting, thus avoiding any difficulty which might arise from the bending of the wire up or down. The spaces between the knives *h'* of the sliding head J are slightly less than the spaces between the knives *h* of the stationary head I. The consequence is that the moving knives, with their accompanying benders, reach the stationary knives, not simultaneously, but successively.

In Fig. 5 (in which the full lines represent the parts attached to the sliding head, and the dotted lines show the positions of the stationary knives and benders) it will be seen that the right-hand set of moving parts are very nearly in contact with the stationary parts, with which they co-operate, that the space between the next pair is somewhat greater, and that the left-hand pair are separated by a still greater distance. Instead, therefore, of the knives cutting simultaneously, they cut in quick succession, one wire being completely severed and partly bent, however, before the next is reached. Fig. 6 shows the position of a staple-wire, in position for cutting, lying between the stationary and moving knives and benders, and within the guide *j*.

Figs. 7, 8, 9 show successive positions of a staple and the parts which form it. The successive steps shown and the positions of the staple-forming parts are those presented by the different sets of staple-forming parts at the same instant—that is, when the left-hand set of knives and benders is in the position shown in Fig. 7 the next set appears as shown in Fig. 8, and the third as shown in Fig. 9. All the moving parts are sliding in the direction indicated by the arrows in Figs. 7, 8, 9, and this motion continues until the moving benders have completely passed the stationary benders, when the staples are released and fall into any suitable receptacle. The sliding head then returns to the position shown in Figs. 1, 4, the feed-rolls feed forward the staple-wires, and the machine is ready to cut and form a new set of staples.

Having now described my invention and explained its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. In a staple-forming machine, the combination of a series of stationary knives and benders attached to the bed of the machine, an equal number of wire-feeding devices adapted to feed wires to said knives, respectively, a reciprocating head, and a corresponding series of knives and benders attached to said reciprocating head and adapted to co-operate with said stationary knives and benders, respectively, and cut and form staples from said wires.

2. In a staple-forming machine, the combination of a series of stationary knives and benders attached to the bed of the machine, a reciprocating head, a corresponding series of knives and benders attached to said reciprocating head and adapted to co-operate successively with said stationary knives and benders, and a corresponding series of wire-feeding devices adapted to feed wires to said cutting and forming devices.

3. In a wire-staple machine, the combination of a series of feeding devices for simultaneously advancing a number of wires, the stationary knives and benders, and the movable knives and benders arranged to act successively upon said wires, substantially as described.

4. The combination of the bed A, stationary head I, formed integrally therewith or rigidly attached thereto, and having the dovetail groove *p* in its face, head J, and tongue *p'*, formed integrally therewith and sliding in said groove *p*, a series of knives and benders attached to the stationary head I, and a corresponding series of knives and benders attached to the sliding head J, and eccentric W, for imparting reciprocal motion to said sliding head, substantially as shown and described, and for the purpose set forth.

5. The combination of the stationary knives and benders *h i*, attached to the bed of the machine, moving knives *h'*, adapted to co-operate with stationary knives *h*, moving benders *i' i''*, adapted to co-operate with said stationary benders *i*, and wire-guides *j*, all combined and operating substantially as shown and described, and for the purpose set forth.

6. The combination of the shaft B''', feed-

rolls U, and gear-wheels C^{iv}, mounted thereon, posts *f*, bearings T, sliding vertically thereon, a series of shafts journaled in said bearings, feed-rolls U′, and gear-wheels C^{v}, mounted on said shaft and engaging with feed-rolls U and gear-wheels C^{iv}, springs *g*, pressing upward against said bearings, and springs V, pressing downward thereon, and set-screw *c* and hand-wheel G, adapted to depress said spring, substantially as shown and described, and for the purpose set forth.

7. The combination of the gear-wheels C^{v} and their shafts, bearings T, posts *f*, springs *g* V, set-screw *c*, hand-wheels G, provided with ratchet-teeth in their periphery, and spring-pawls *b*, adapted to engage said ratchets, respectively, substantially as shown and described, and for the purpose set forth.

8. The combination of the feed-rolls U U′, supports S, detachable tubes R, and detachable tubes *q*, substantially as shown and described, and for the purpose set forth.

9. The combination of the shaft B‴, ratchet-wheel L, mounted thereon, vibratory crank K, pawl M, engaging with said ratchet-wheel, cam O, and spring-pin P, adapted to hold said pawl in or out of engagement with said ratchet-wheel, and handle N, attached to said pawl and adapted to rotate the same, and thereby change the relation of the cam O and pin P, substantially as shown and described, and for the purpose set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

DANIEL C. STOVER.

Witnesses:
WALLACE GREENE,
F. W. BRAINERD.