

(No Model.)

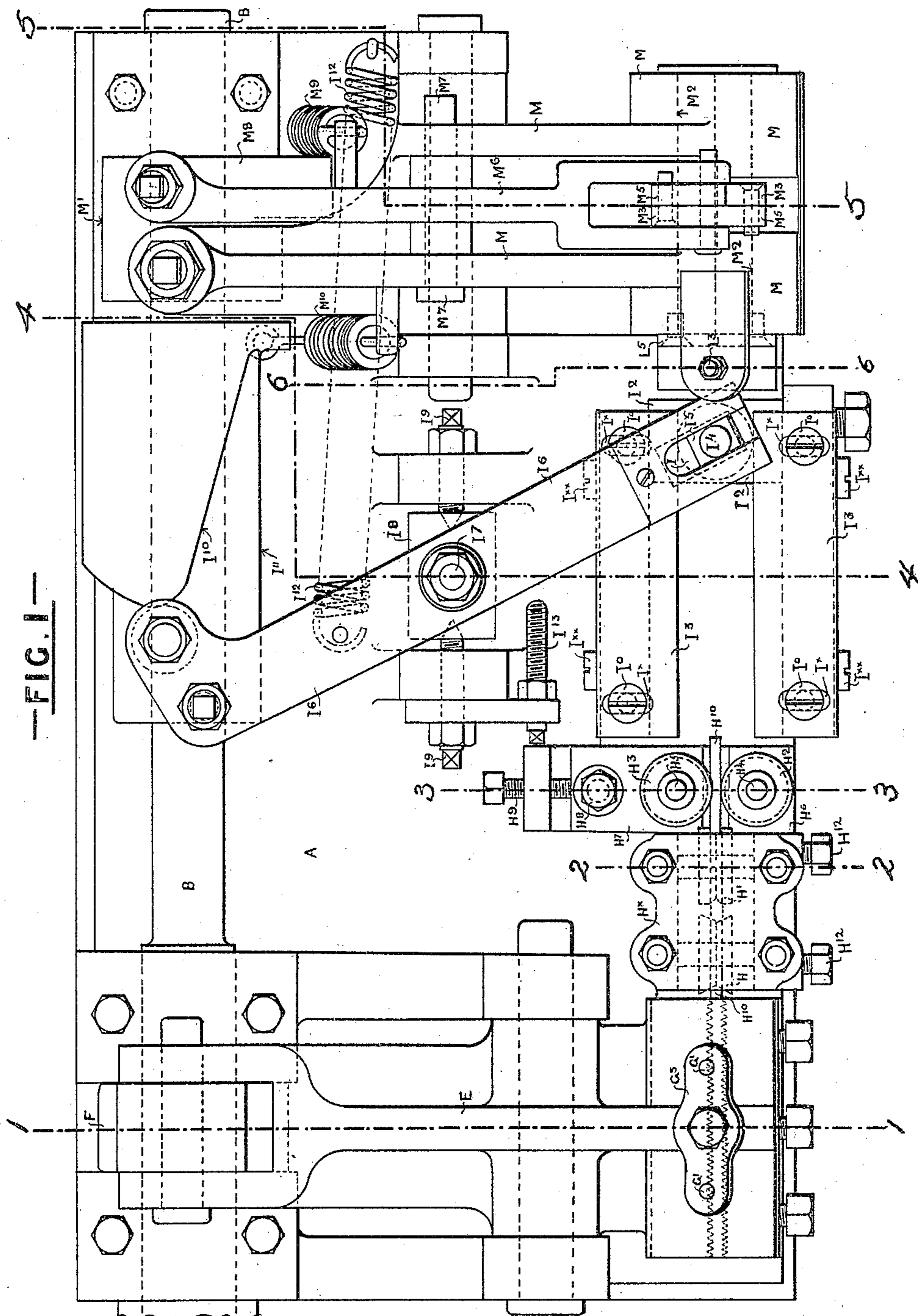
3 Sheets—Sheet 1.

H. CAMPBELL.

MACHINE FOR SECURING THE CORNERS OF BOXES.

No. 427,670.

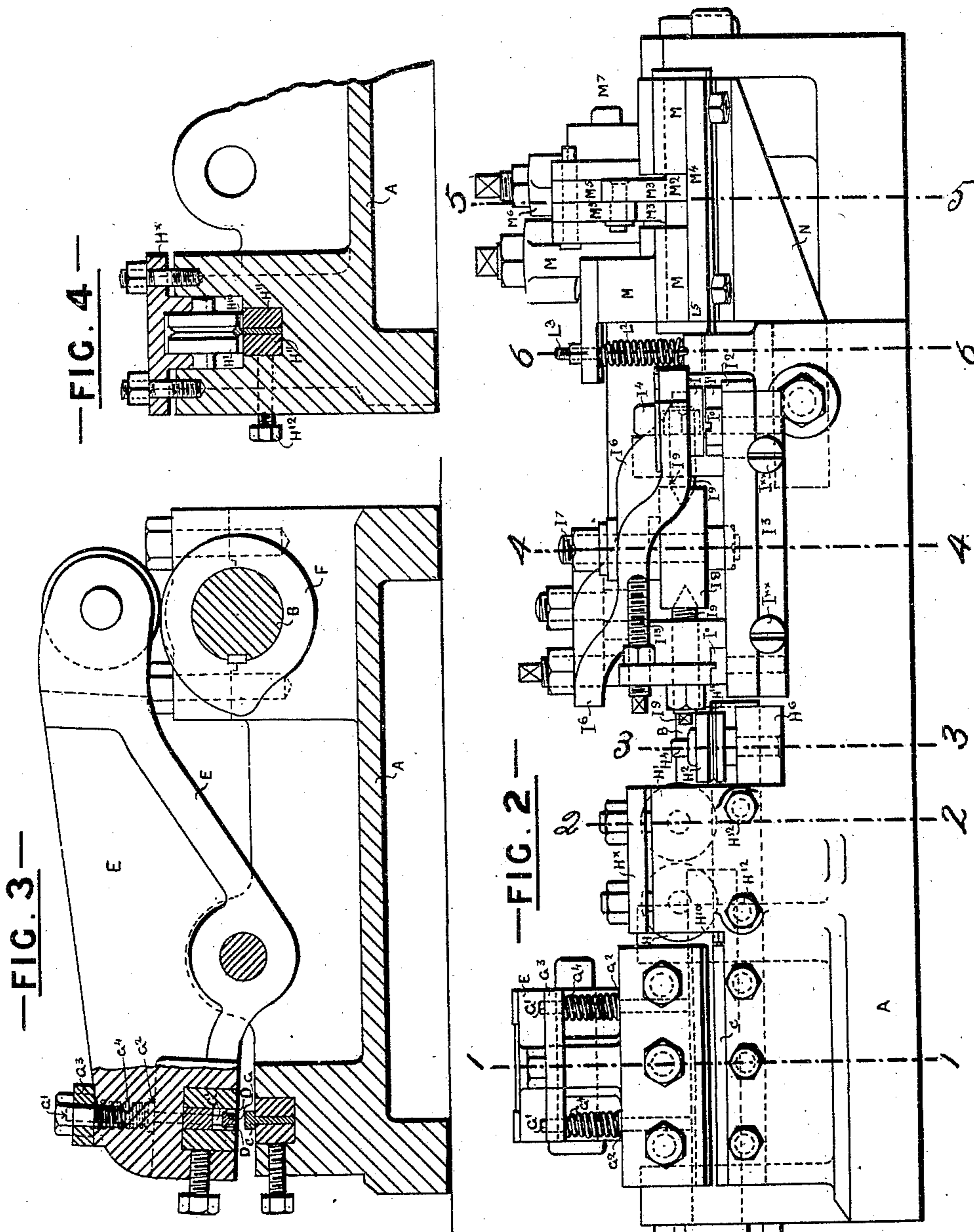
Patented May 13, 1890.



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MACHINE FOR SECURING THE CORNERS OF BOXES.  
No. 427,670. Patented May 13, 1890.



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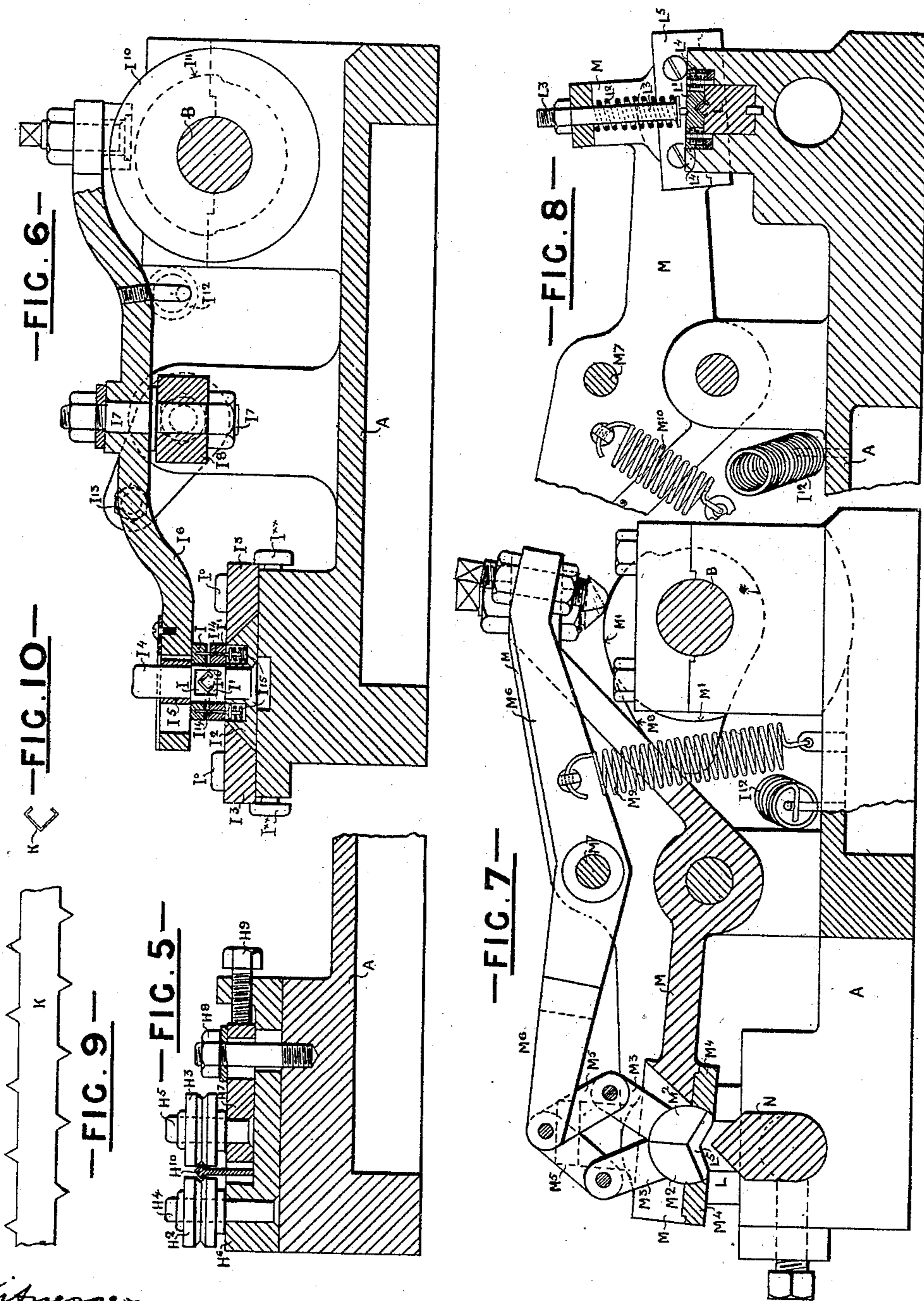
3 Sheets—Sheet 3.

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MACHINE FOR SECURING THE CORNERS OF BOXES.

No. 427,670.

Patented May 13, 1890.



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# UNITED STATES PATENT OFFICE.

HENRY CAMPBELL, OF LONDON, ENGLAND.

## MACHINE FOR SECURING THE CORNERS OF BOXES.

SPECIFICATION forming part of Letters Patent No. 427,670, dated May 13, 1890.

Application filed June 20, 1887. Serial No. 241,941. (No model.) Patented in England January 19, 1887, No. 848; in France June 7, 1887, No. 184,078; in Belgium June 9, 1887, No. 77,767; in Germany June 11, 1887, No. 43,316; in Italy June 30, 1887, No. 21,867/219; in Canada July 18, 1887, No. 27,189; in Victoria July 19, 1887, No. 5,184; in New South Wales August 2, 1887, No. 38; in Spain November 9, 1887, No. 7,118; in Norway January 16, 1888, No. 838, and in Austria-Hungary June 5, 1888, No. 15,037, and No. 23,198.

*To all whom it may concern:*

Be it known that I, HENRY CAMPBELL, engineer, a citizen of the United States of America, at present residing at 115 Cannon Street, in the city of London and Kingdom of Great Britain, have invented certain new and useful Improvements in Machines for Securing the Corners of Boxes, (which have been patented in Great Britain by Letters Patent dated January 19, 1887, No. 848; in France by Letters Patent dated June 7, 1887, No. 184,078; in Belgium by Letters Patent dated June 9, 1887, No. 77,767; in Germany by Letters Patent dated June 11, 1887, No. 43,316; in Austria-Hungary by Letters Patent dated June 5, 1888, No. 15,037/23,198; in Italy by Letters Patent dated June 30, 1887, No. 21,867/219; in Spain by Letters Patent dated November 9, 1887, No. 7,118; in Canada by Letters Patent dated July 18, 1887, No. 27,189; in Victoria by Letters Patent dated July 19, 1887, No. 5,184; in New South Wales by Letters Patent dated August 2, 1887, No. 38, and in Norway dated January 16, 1888, No. 838,) of which the following is a specification.

The object of my invention is to produce machinery capable of performing all the operations of cutting out the angle-clamps, bending them longitudinally into the required shape, cutting them to length, and applying them when so cut out, bent, and cut to length to the corners of the boxes, whereby a very considerable economy will be effected not only of hand-labor, but in the number and cost of machines to perform a specified quantity of work.

My improved machinery is illustrated in the drawings hereto annexed, in which—

Figure 1 is a plan; Fig. 2, a front elevation; Figs. 3, 4, 5, 6, 7, and 8, transverse sectional elevations on lines 1 1, 2 2, 3 3, 4 4, 5 5, and 6 6, respectively of Figs. 1 and 2. Fig. 9 represents a strip of metal as cut out by the machine to form an angle-clamp, and Fig. 10 shows an end view of such strip of metal when bent to form an angle-clamp.

Similar letters of reference relate to like parts in all the figures.

On a bed-plate A, I mount in suitable bearings a revolving shaft B, carrying a series of cams, which shaft I shall hereinafter call the "cam-shaft." At one end of the bed-plate A, I place a punching or cutting-out device consisting of a suitable fixed bottom die or cutter C, of a shape suitable for cutting the edges of a strip of metal into claws of the desired form, as illustrated to a larger scale in Fig. 9, for example, and of a corresponding upper movable matrix or cutters D D, the latter being fixed on and operated by a lever E, or other suitable mechanical device actuated by a cam F on the cam-shaft B. In order to prevent the portion of the strip of metal cut out by these cutters from being retained in and carried up by the matrix or cutter D, a stripper-bar G is placed in the matrix or cutter D. Two rods G' G', with shoulders or collars G<sup>2</sup> G<sup>2</sup>, are secured at their lower ends in the said bar G, and, passing up through holes in the lever E, are guided at their upper ends by a cross-head G<sup>3</sup>, secured to the said lever.

G<sup>4</sup> G<sup>4</sup> are springs bearing against the under side of the cross-head G<sup>3</sup> and on the upper side of the collars G<sup>2</sup> G<sup>2</sup>, tending always to press the rods G' G' and the stripper-bar G downward, so as to force the strip out of the matrix D and prevent its retention therein.

Next in order on the bed-plate A, I arrange a series of rollers H H' H<sup>2</sup> H<sup>3</sup> for the purpose of bending and shaping the strip of metal cut out in the above-mentioned cutting-out device into the necessary angular forms to serve as clamps. The rollers H and H' turn in horizontal bearings in the cap H<sup>x</sup>, as shown clearly in Fig. 4, and the rollers H<sup>2</sup> and H<sup>3</sup> on vertical pins H<sup>4</sup> and H<sup>5</sup>, respectively, as shown in Fig. 5. The pin H<sup>4</sup> is fixed in a sole-plate H<sup>6</sup>, the pin H<sup>5</sup> in a piece H<sup>7</sup>, adapted to slide on the piece H<sup>6</sup>, and both H<sup>6</sup> and H<sup>7</sup> are secured to the bed-plate A by a stud and nut H<sup>8</sup>, passing through slots in the pieces H<sup>6</sup> and H<sup>7</sup>. By this means the rollers

H<sup>2</sup> and H<sup>3</sup> can be adjusted to or from each other or to and from the center line, as may be required, the adjusting-screw H<sup>9</sup> serving to make the adjustment of the roller H<sup>3</sup> toward the roller H<sup>2</sup>.

H<sup>10</sup> is a former or mandrel, the upper part of which has the shape the inside of the clamp is intended to have. It is secured in place between the packing-pieces H<sup>11</sup> by the set-screws H<sup>12</sup>. (See Fig. 4.)

The roller H is grooved on its periphery, so as to commence the bending longitudinally in the middle to the required angle of the strip of metal leaving the cutting-out devices. The roller H' is grooved in a similar manner, but so as to complete the longitudinal bending of the body of the strip to the required angle. The rollers H<sup>2</sup> H<sup>3</sup> are grooved on their peripheries, so as to bend the claws at the edges of the strip of metal inward to the proper angle, the mandrel H<sup>10</sup> co-operating with the rollers H, H', H<sup>2</sup>, and H<sup>3</sup> to impart the required shape—such as that shown in Fig. 10, for example—to the clamps, preparatory to their being applied to the corners of the boxes.

Next after the above-described bending-rollers I arrange on the bed-plate A a feeding device composed of a pair of gripping-jaws I I', mounted on a carriage I<sup>2</sup>, adapted to slide to and fro longitudinally between dovetail guides I<sup>3</sup> on the bed-plate A. These jaws are adapted to receive and grasp between them the bent metallic clamp-strip K. The carriage I<sup>2</sup> has secured to it a pin I<sup>4</sup>, the upper end of which takes into a sliding bush I<sup>5</sup> in a slot in one end of a feeding-lever I<sup>6</sup>, which is capable of being oscillated horizontally on the fulcrum-pin I<sup>7</sup>, fixed to or formed on the piece I<sup>8</sup> by the cam I<sup>10</sup> on the cam-shaft B to the extent necessary for feeding forward a length of clamp-strip, and vertically by the rocking of the fulcrum-pin I<sup>7</sup> and the piece I<sup>8</sup> on the center screws I<sup>9</sup> to a limited extent by the cam I<sup>11</sup>, sufficient to allow the upper gripping-jaw I to grasp and release the clamp-strip between it and the lower jaw I' at the proper time. The stroke of the feed-lever I<sup>6</sup> may be adjusted to give the necessary traverse to the feeding devices to suit the various lengths of angle-clamps by increasing or decreasing the backward stroke of the lever under the action of the spring I<sup>12</sup> by varying the length of the stop-finger I<sup>13</sup> by its screw-adjustment. The jaws I and I' are steel washers threaded onto the pin I<sup>4</sup>, and having grooves or recesses cut across them corresponding to the shape, above and below, of the bent metallic clamp-strip K. The lower washer I' bears upon the upper surface of the carriage I<sup>2</sup>, and the washer I is pressed upward against the under side of the lever I<sup>6</sup> by means of the pins I<sup>14</sup>, acted on by the springs I<sup>15</sup>. A hole I<sup>16</sup> through the pin I<sup>4</sup> allows of the passage through the latter of the metallic strip K. It will now be understood that when the front end of the feed-lever

I<sup>6</sup> is pressed down by the action of the cam I<sup>11</sup> the washer I is pressed downward, grasping the metallic strip K between itself and the washer I', and that when the front end of the feed-lever I<sup>6</sup> is released by the cam I<sup>11</sup> the springs I<sup>15</sup> press up the washer I, releasing the metallic strip K. It will be further understood that the forward horizontal oscillation of the lever I<sup>6</sup> by the action of the cam I<sup>10</sup> while the washer or jaws I I' are closed together, acting through the pin I<sup>4</sup>, causes the carriage I<sup>2</sup>, and with it the grasping devices, to slide longitudinally forward, carrying the metallic strip with it, and that the backward horizontal oscillation of the lever I<sup>6</sup>, effected by the action of the spring I<sup>12</sup> while the washers or jaws I I' are open, causes the carriage I<sup>2</sup>, and with it the grasping devices, to slide longitudinally backward (without moving the metallic strip) into a position to take a fresh grasp of the said strip at a new point of its length.

After the feed mechanism is a die L L', through which the bent or shaped clamp-strip is pushed by the feed-jaws. The lower part L of this die forms the fixed cutting-edge of a pair of shears, by which the clamp-strip is cut off to the required length. It is shaped to the form of the under side of the bent strip. The upper part L' of the die is shaped to fit the upper side of the bent strip, and is held down in place when a length of strip to form a clamp is being sheared off by a spring L<sup>2</sup>, acting on a pin L<sup>3</sup>, carried by the shearing-lever M, and is pressed upward by springs L<sup>4</sup> while the bent strip is being pushed forward, so as to give plenty of room for the passage of the strip through the die. The other cutting-edge L<sup>5</sup> of the shears is formed on or secured to one side of the front end of the lever M, which lever serves at the same time as a presser for forcing the angle-clamps onto the corners of the boxes. This latter lever M, which may be called the "shearing" and "pressing" lever, is placed at the end of the bed-plate A opposite to that at which the cutting-out devices are placed, and is actuated by an appropriate cam M' on the cam-shaft B. Below the front end of the lever M is fixed an anvil N, the upper edge of which corresponds to the angle of the box-corner, and the pressing-lever M may in some cases have merely a groove in its end corresponding to and fitting over the edge of the anvil for the purpose of pressing the clamps into the box-corners; or it may be fitted with the supplementary closing or pressing devices illustrated in sectional elevation in Fig. 7 of the drawings. These devices consist as follows: Two jaws M<sup>2</sup>, each formed of a cylindrical segment, are fitted into a cylindrical cavity bored in the front end of the lever M. These jaws have each an arm M<sup>3</sup>, projecting upward through a slot in the lever M. The segmental jaws M<sup>2</sup> are held in place in the cylindrical cavity by keep-plates M<sup>4</sup>. M<sup>5</sup> are links pin-jointed at one end to the arms M<sup>3</sup> and at the

other end to the front end of a lever  $M^6$ , which turns on a fulcrum  $M^7$  on the lever  $M$  itself. The rear end of the lever  $M^6$  is acted upon by a cam  $M^8$  on the cam-shaft B. It will now be understood that when the cam  $M^8$  has operated on the lever  $M$  so as to lower its front end, and thereby effect the cutting off of a length of clamp-strip, the jaws  $M^2$  are also lowered, following up the clamp-strip so cut off, and the cam  $M^8$  then acts on the lever  $M^6$ , so as to press the front end of the latter downward. The links  $M^5$  act upon the arms  $M^3$  after the manner of a toggle-joint, turning the segmental jaws  $M^2$  in their cylindrical cavity, so that their lower radial faces turn to a right or any other angle corresponding to that of the box-corner to be operated upon and drive the claws of the clamp into the box-corner as required. When the cam  $M^8$  releases the lever  $M^6$ , the spring  $M^9$  returns it and the jaws  $M^2$  to their normal positions, and when the cam  $M^7$  releases the lever  $M$  the spring  $M^{10}$  returns it and the jaws  $M^2$  into the position shown in the drawings.

The action of the machinery or apparatus is as follows: The strip of metal from which the angle-clamps are to be made is preferably continuous, and is fed into the machine over the lower or fixed die of the cutting-out mechanism between the bending and shaping rollers, and into the grasp of the feeding-jaws. The cam-shaft B is now caused to make a revolution. The cam F actuates the lever E. The matrix or cutter D is thereby forced down over the die C, cutting out from the strip of metal the spaces between the claws, as illustrated in Fig. 9, for example. The feed-lever  $I^6$  is then oscillated horizontally by the cam-surface  $I^{10}$  a distance equal to the length of a finished angle-clamp, the cam-surface  $I^{11}$  having previously acted on the said lever so as to close the jaw I vertically onto the strip of metal, so as to grasp and hold it firmly between itself and the lower jaw  $I'$ , as before described. The strip of metal is thereby drawn an equal distance between the bending and shaping rollers and the former or mandrel  $H^{10}$ , whereby the strip of metal is bent bodily to its required angular form and its claws bent under at the proper angle, as illustrated in Fig. 10, for example. The cam-surface  $I^{11}$  now releases the lever  $I^6$  vertically and the upper jaw is released from the strip of metal, which then remains stationary, while the spring  $I^{12}$  draws the rear end of the lever  $I^6$  horizontally, so as to return the feeding-jaws backward ready to take a fresh grip of the strip. As the feed mechanism draws the cut-out and bent strip of metal through, it pushes the leading end through the cutting-off die  $L L'$  and over the anvil N; but in the meantime an operative will have inserted the corner of a box between the anvil N and the length of angle-clamp projected over the latter. The shearing and pressing lever M is now actuated by the cam  $M^7$ , its front end descends, the shear-

ing edges L and  $L^5$  cut off the length of angle-clamp, the beveled front edge of the shear  $L^5$  pushes the cut-off angle-clamp forward under the jaws  $M^2$ , and the cam  $M^8$  then actuates the lever  $M^6$ , which causes the segmental jaws  $M^2$  to turn in their cylindrical cavity, pressing the claws of the clamp into the box-corner and clinching them on the anvil N. The box-corner thus provided with a clamp is then removed from the anvil N, another corner is placed thereon, the cam-shaft again rotated, and the same operations repeated, and so on continuously. Thus it will be seen that at each revolution of the cam-shaft B five different operations are performed on four different portions of the strip of metal—that is to say, one finished part of the strip, comprising an angle-clamp, is cut off and applied to a box-corner; another part of the strip, comprising the material for a second angle-clamp, is fed forward through the cutting-off die; a third part of the strip, comprising the material for a third angle-clamp, is bent to the required form, and a fourth part of the strip, comprising the material for a fourth angle-clamp, is cut out to the required shape.

All parts of the machine that require to be altered to suit different sizes or characters of angle-clamps are preferably made interchangeable, or otherwise adjustable, so that one machine may be made to perform a considerable variety of work.

In the machinery above described the cam-shaft and its cams have to make a complete revolution to perform a complete set of operations. It is obvious, however, that the cams may be so shaped and the mechanism actuated by them so arranged that the complete set of operations may be performed by a partial rotation forward and backward of the cam-shaft. Rotary or reciprocating-rotary motion may be imparted to the cam-shaft by any suitable means—such as a crank-handle—applied either direct thereto, or through the medium of toothed gearing, or by means of a treadle operated by the foot acting through suitable levers, links, gearing, &c., or otherwise by mechanical power of any kind.

I would have it understood that I do not confine myself to the precise arrangements and details hereinbefore described and illustrated in the drawings, as they may be varied without departing from the nature of my invention.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. The improved machinery for the manufacture and application of angle-clamps for uniting the corners of card-board and other boxes, consisting of the cutters C D, lever E, and cam F for cutting out and shaping the claws on the edges of a strip of metal, the rollers H,  $H'$ ,  $H^2$ , and  $H^3$ , and the mandrel  $H^{10}$  for bending the said strip of metal longi-

itudinally and the claws at the edges thereof inward, the sliding carriage I<sup>2</sup>, the gripping devices I I', the lever I<sup>6</sup>, oscillating horizontally and vertically, the cams I<sup>10</sup> I<sup>11</sup>, and the springs I<sup>12</sup> and I<sup>15</sup> for feeding or drawing forward the strip of metal a distance equal to the length of a finished angle-clamp, the dies L L', and the cutting-edge or shear L<sup>5</sup>, secured to the lever M for shearing off the angle-clamps to length, and the anvil N, the lever M, provided with an angular groove in its front end corresponding to the said anvil, the cams M' M<sup>8</sup>, and the springs M<sup>9</sup> M<sup>10</sup> for applying the finished angle-clamps to the corners of boxes, all arranged, combined, and operating substantially as hereinbefore described, and illustrated in the drawings hereto annexed.

2. In machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, the cutters C D, lever E, and cam F for cutting out or shaping the claws on the edges of a strip of metal, the rollers H, H', H<sup>2</sup>, and H<sup>3</sup>, and the mandrel H<sup>10</sup> for bending the said strip of metal longitudinally and the claws at the edges thereof inward, the sliding carriage I<sup>2</sup>, the gripping device I I', the lever I<sup>6</sup>, oscillating horizontally and vertically, the cams I<sup>10</sup> I<sup>11</sup>, and the springs I<sup>12</sup> and I<sup>15</sup> for feeding or drawing forward the strip of metal a distance equal to the length of a finished angle-clamp, and the dies L L', the cutting-edge or shear L<sup>5</sup>, the lever M, the cam M', and the spring M<sup>10</sup> for shearing off the angle-clamps to length, all arranged, combined, and operating substantially as hereinbefore described, and illustrated in the drawings hereto annexed.

3. In the machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, the cutters C D, lever E, and cam F for cutting out and shaping the claws on the edges of a strip of metal, the rollers H, H', H<sup>2</sup>, and H<sup>3</sup>, and the mandrel H<sup>10</sup> for bending the said strip longitudinally and the claws of the edges thereof inward, and the sliding carriage I<sup>2</sup>, the gripping devices I I', the lever I<sup>6</sup>, oscillating horizontally, the cams I<sup>10</sup> I<sup>11</sup>, and the springs I<sup>12</sup> I<sup>15</sup> for feeding or drawing forward the strip of metal, all arranged, combined, and operating substantially as hereinbefore described.

4. In machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, the rollers H, H', H<sup>2</sup>, and H<sup>3</sup>, and the mandrels H<sup>10</sup> for bending or shaping to the desired form a strip of metal previously cut out with claws on its edges, the sliding carriage I<sup>2</sup>, the gripping devices I I', the lever I<sup>6</sup>, oscillating horizontally and vertically, the cams I<sup>10</sup> and I<sup>11</sup>, and the springs I<sup>12</sup> and I<sup>15</sup> for feeding or drawing forward the strip of metal a distance equal to the length of a finished angle-clamp, the dies L L', and the cutting-edge or shear L<sup>5</sup>, secured to the lever M for shearing off the angle-clamps to length, and the anvil N, the lever M, provided with an angu-

lar groove in its front end corresponding to the said anvil, the cams M' M<sup>8</sup>, and the springs M<sup>9</sup> M<sup>10</sup> for applying the finished angle-clamps to the corners of boxes, all arranged, combined, and operating substantially as hereinbefore described, and illustrated in the drawings hereto annexed.

5. In machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, the rollers H, H', H<sup>2</sup>, and H<sup>3</sup>, and the mandrel H<sup>10</sup> for bending or shaping a strip of metal previously cut out with claws on its edges, the sliding carriage I<sup>2</sup>, the gripping devices I I', the lever I<sup>6</sup>, oscillating horizontally and vertically, the cams I<sup>10</sup> and I<sup>11</sup>, and the springs I<sup>12</sup> I<sup>15</sup> for feeding or drawing forward the strip of metal a distance equal to the length of a finished angle-clamp, and the dies L L', the cutting-edge or shear L<sup>5</sup>, the lever M, the cam M', and the spring M<sup>10</sup> for shearing off the angle-clamps to length, all arranged, combined, and operating substantially as hereinbefore described, and illustrated in the drawings hereto annexed.

6. In machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, the sliding carriage I<sup>2</sup>, the gripping devices I I', the lever I<sup>6</sup>, oscillating horizontally and vertically, the cams I<sup>10</sup> I<sup>11</sup>, and the springs I<sup>12</sup> I<sup>15</sup> for feeding or drawing forward a strip of metal previously cut out with claws on its edges and bent or shaped to the desired form a distance equal to the length of a finished angle-clamp, the dies L L', the cutting-edge or shear L<sup>5</sup>, the lever M, the cam M', and the spring M<sup>10</sup> for shearing off the angle-clamps to length, and the anvil N, the lever M, provided with a pair of jaws M<sup>2</sup>, and a second lever M<sup>6</sup>, actuating the said jaws, the cams M' M<sup>8</sup>, and the springs M<sup>9</sup> M<sup>10</sup> for applying the finished angle-clamps to the corners of boxes, all arranged, combined, and operating substantially as hereinbefore described, and illustrated in the drawings hereto annexed.

7. In machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, the sliding carriage I<sup>2</sup>, the gripping devices I I', the lever I<sup>6</sup>, oscillating horizontally and vertically, the cams I<sup>10</sup> I<sup>11</sup>, and the springs I<sup>12</sup> I<sup>15</sup> for feeding or drawing forward a strip of metal previously cut out with claws on its edges and bent or shaped to the desired form a distance equal to the length of a finished angle-clamp, and the dies L L', the cutting-edge or shear L<sup>5</sup>, the lever M, the cam M', and the spring M<sup>10</sup> for shearing off the angle-clamps to length, all arranged, combined, and operating substantially as hereinbefore described, and illustrated in the drawings hereto annexed.

8. In machinery for the manufacture of angle-clamps for uniting the corners of cardboard and other boxes, mechanism for feeding or drawing forward the strip of metal, consisting of grasping devices I I', carried by

a reciprocating sliding carriage I<sup>2</sup>, and a lever I<sup>6</sup>, oscillated horizontally on the fulcrum-pin I<sup>7</sup> by the cam I<sup>10</sup> and spring I<sup>12</sup> for effecting the reciprocating motion of the carriage, and  
5 oscillated vertically on the fulcrum-screws I<sup>9</sup> by the cam I<sup>11</sup> and spring I<sup>15</sup> for closing and opening the grasping devices, as hereinbefore described, and illustrated in the drawings hereto annexed.

10 9. In machinery or apparatus for applying angle-clamps to the corners of card-board and other boxes, the mechanism for pressing the claws of the clamps into the corners of the boxes consisting of a pair of jaws M<sup>2</sup> M<sup>2</sup>, op-  
15 posed to an anvil N and carried on the end

of a lever M, operated by a cam M' and spring M<sup>10</sup>, the said jaws being actuated by arms M<sup>3</sup>, links M<sup>5</sup>, and lever M<sup>6</sup>, operated by a cam M<sup>8</sup> and spring M<sup>9</sup>, as hereinbefore described, and illustrated in the drawings hereto 20 annexed.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

HENRY CAMPBELL.

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