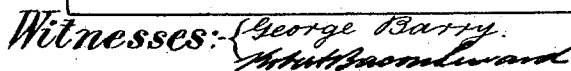


5 Sheets—Sheet 1.

C. L. STURTEVANT, Administrator of W. GREAVES, Deceased.

No. 515,315.

Patented Feb. 20, 1894.



THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.)

5 Sheets—Sheet 2.

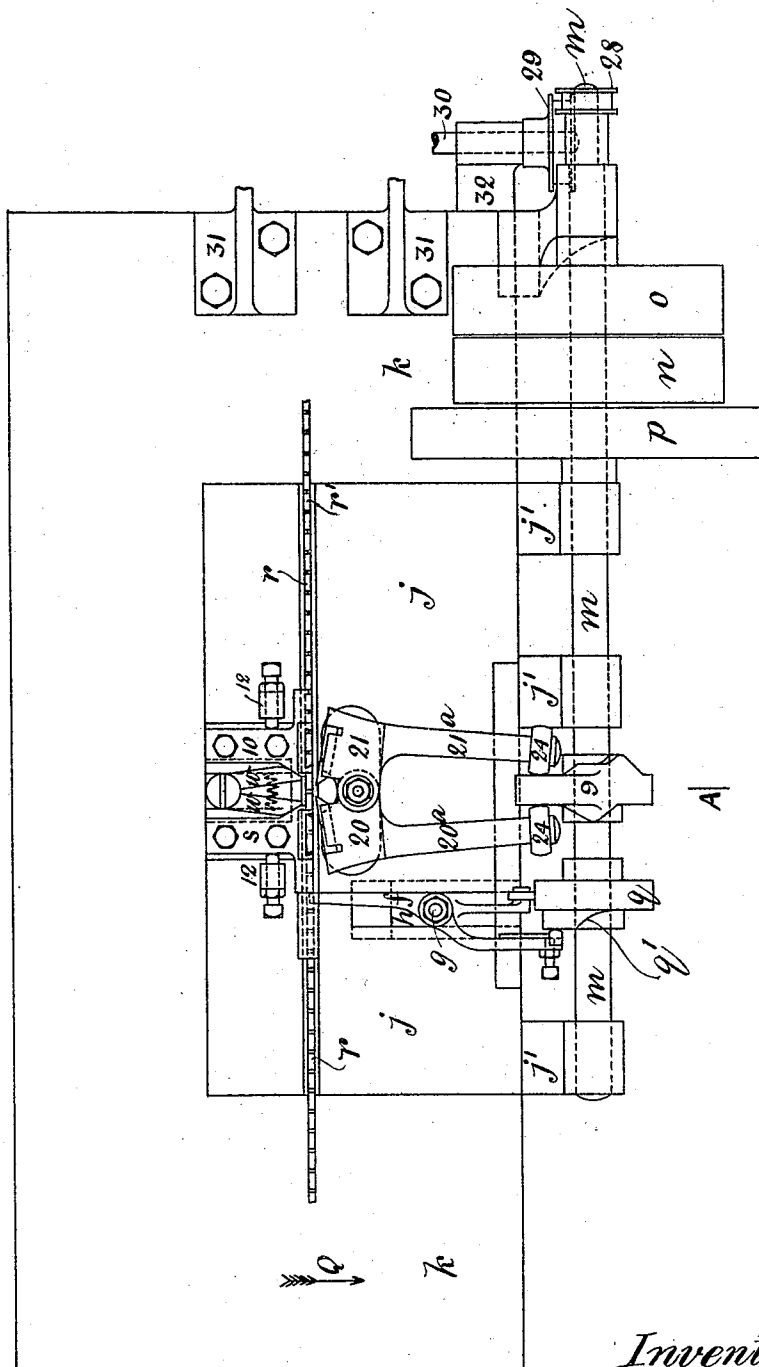
W. GREAVES & J. WARDLE.

C. L. STURTEVANT, Administrator of W. GREAVES, Deceased.

MACHINERY FOR OPERATING ON CONJOINED STAPLES FOR
CARDING ENGINES.

No. 515,315.

Patented Feb. 20, 1894.



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5 Sheets—Sheet 3.

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MACHINERY FOR OPERATING ON CONJOINED STAPLES FOR
CARDING ENGINES.

No. 515,315.

Patented Feb. 20, 1894.

Fig. 11.

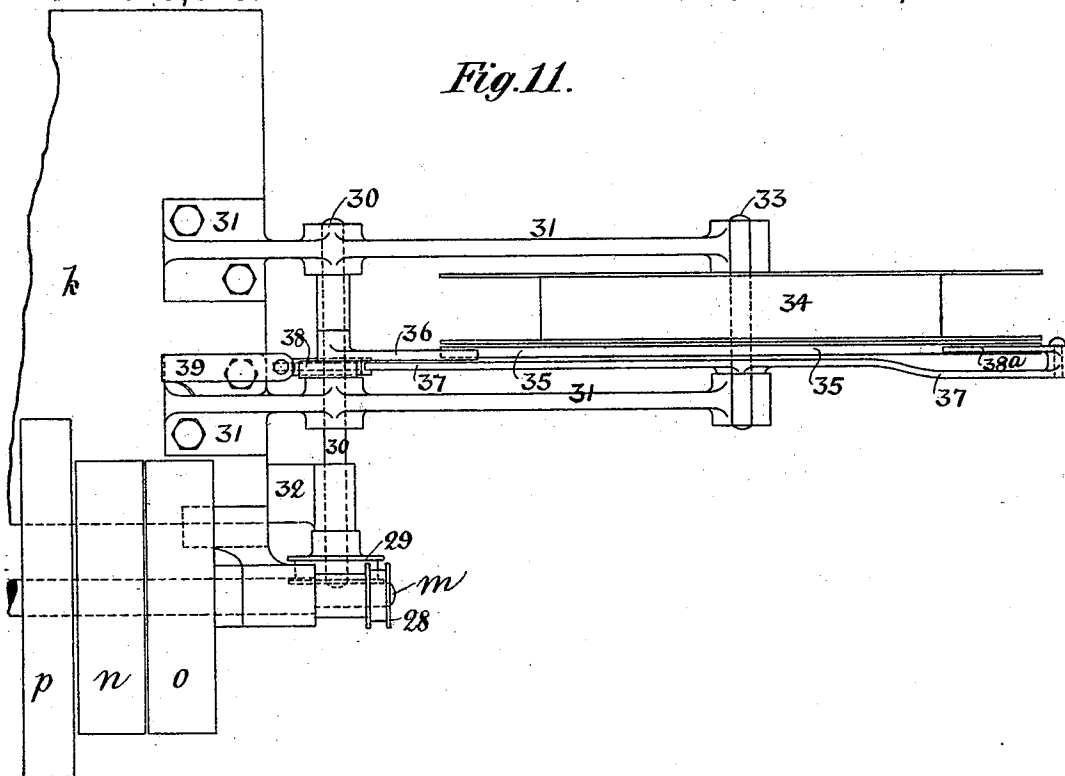
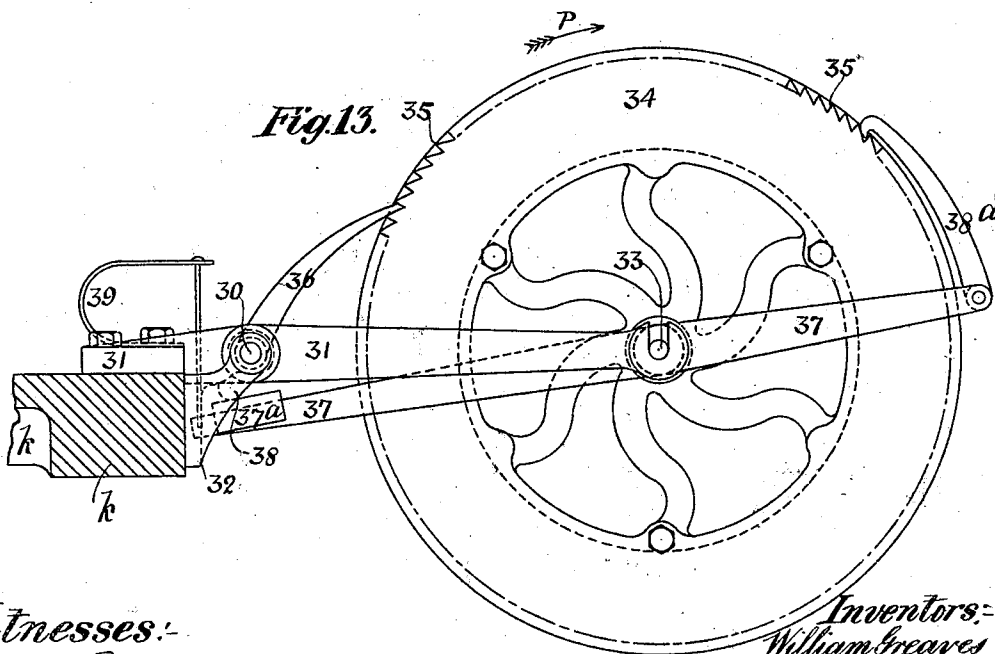


Fig.13.



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(No Model.)

5 Sheets—Sheet 5.

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MACHINERY FOR OPERATING ON CONJOINED STAPLES FOR
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Fig. 15.

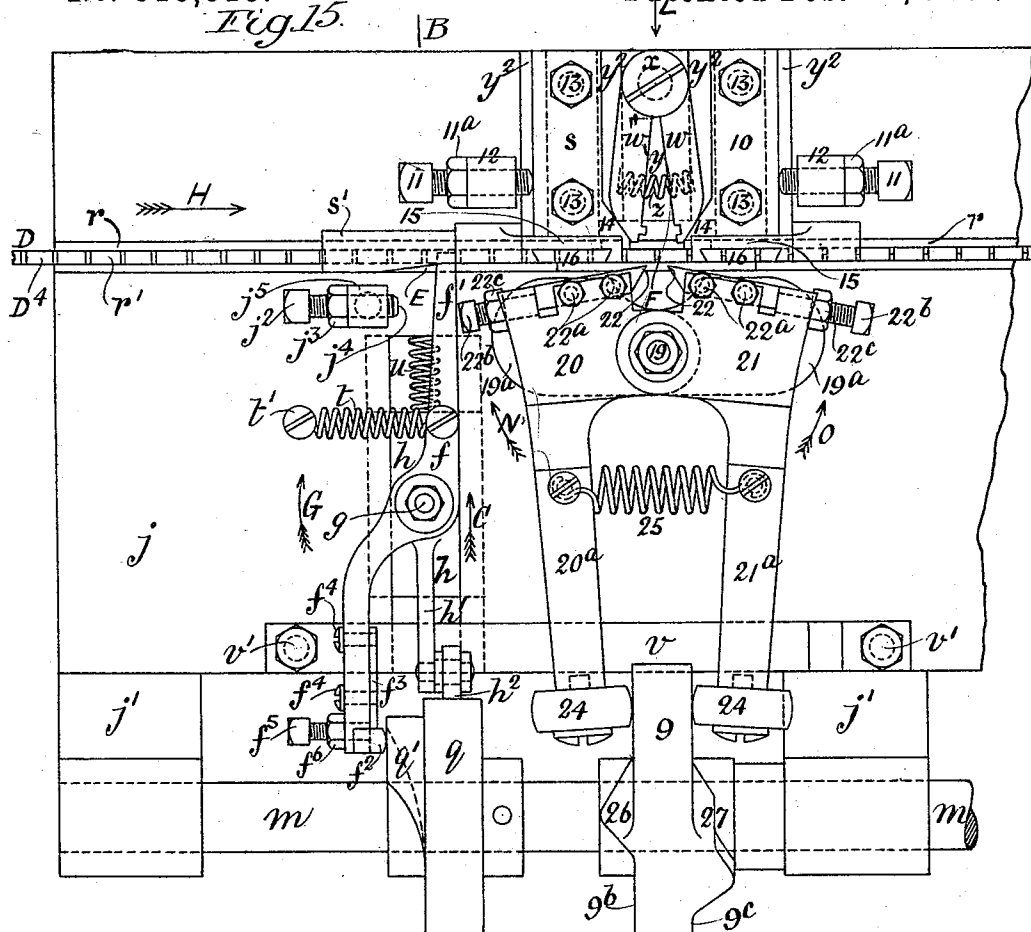
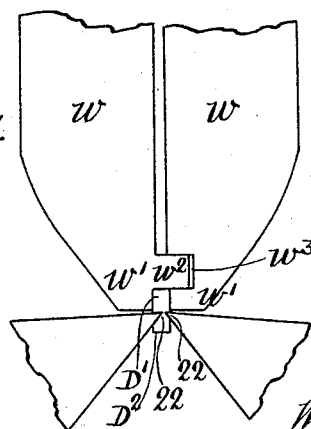
 $\mathcal{B}$

Fig.17.



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UNITED STATES PATENT OFFICE.

WILLIAM GREAVES AND JOSEPH WARDLE, OF OLDHAM, ENGLAND; CHARLES L. STURTEVANT ADMINISTRATOR OF SAID GREAVES, DECEASED; SAID STURTEVANT, ADMINISTRATOR, ASSIGNOR TO PLATT BROTHERS & CO., LIMITED, OF SAME PLACE.

MACHINERY FOR OPERATING ON CONJOINED STAPLES FOR CARDING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 515,315, dated February 20, 1894.

Application filed November 10, 1892. Serial No. 451,500. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM GREAVES, foreman, and JOSEPH WARDLE, machinist, of Hartford Old Works, Oldham, in the county of Lancaster, England, have invented certain new and useful improvements in machinery or apparatus for performing a certain operation upon conjoined staples for securing tops or cards to the metal flats used or employed in carding-engines, of which the following is a specification.

Our invention consists in a machine for performing a certain operation upon conjoined staples for securing the "tops" or "cards" to the metal "flats" used or employed in carding-engines in order to enable such conjoined staples to secure the edges of the foundations or backs of the "tops" or "cards" close to the edges of the metal "flats" instead of as hitherto leaving the edges of the foundations or backs exposed and liable to be chafed and roughened while the flats are in use, such conjoined staples being the subject of our application for United States Patent, Serial No. 450,492, filed October 31, 1892.

In order that our invention may be more readily understood we will first describe the said conjoined staples and then proceed to describe the machine in which the present invention consists.

In the accompanying drawings, Figure 1 is a side view and Fig. 2 an end view of a portion of a continuity of conjoined staples as hitherto employed for securing the "tops" or "cards" to the metal "flats" used or employed in carding-engines. Fig. 3 is an end view, and Fig. 4 a side view of a portion of a continuity of conjoined staples for the preparation of which the machine forming the subject of the present application is intended, and Fig. 5 is a side view, Fig. 6 a plan, and Fig. 7 a cross section illustrating the manner in which lengths of a continuity of conjoined staples made according to our said improvements are employed to secure the "cards" or "tops" to metal "flats." Fig. 8 is a side view, and Fig. 9 an end view of a portion of a continuity of conjoined staples prepared for being operated upon by the machine to

be hereinafter described. Figs. 10 and 11 together form a plan, and Figs. 12 and 13, together, a side view of a machine constructed according to our invention for the purpose of enabling our improvements in conjoined staples to be carried into effect. Fig. 14 is a cross section of the said machine taken on the plane indicated by the lines A A of Figs. 10 and 12, and drawn upon a larger scale. Fig. 15 is a plan drawn upon a larger scale than Figs. 10, 11, 12 and 13, showing certain parts more clearly than Fig. 10. Fig. 16 is a cross section taken on the plane indicated by the line B B, of Fig. 15, and Fig. 17 is a plan showing certain parts upon a scale much larger than that upon which they are shown in Fig. 15, in order that the construction and action of such parts may be more fully understood. Fig. 18 is a cross section, and Fig. 19 a partial front view of a portion of the machine aforesaid, showing an alternative manner of accomplishing the "feeding" or moving forward of the continuity of conjoined staples to be operated upon. Fig. 20 is a view of certain parts shown detached for convenience of illustration. The conjoined staples hitherto in use for securing "cards" or "tops" to metal "flats" and illustrated in Figs. 1 and 2 of the accompanying drawings are formed of wire, and the prongs or legs (a) of such conjoined staples are of the same width as the parts (b) by which one "prong" or "leg" (a) is connected to the next. It therefore follows that when conjoined staples of the form above described and illustrated in Figs. 1 and 2 are used to secure the "top" or "card" to a metal "flat" by being inserted and clinched in holes formed through the said metal "flat," portions of the "foundation" or "back" of the "top" or "card" project beyond the conjoined staples, and although the "top" or "card" is securely held to the metal body of the "flat" the edges of the "foundation" or "back" of such "top" or "card" are not held close to the metal body of the "flat," and are liable to be chafed or roughened while the "flat" is in use.

In the improvement in regard to which we have made separate application for Letters

Patent the objections or defects above described are remedied by the conjoined staples being made to hold the edges of the "foundation" or "back" of the "tops" or "cards" close to the edges of the metal bodies of the "flats" to which they are applied while at the same time the prongs or legs of the conjoined staples are passed through holes in the metal bodies of the "flats" in such manner that the "tops" or "cards" will be securely held upon the "flats." According to the said improvements, we employ for securing "tops" or "cards" to metal "flats" used in carding-engines, metal wire bent into the form of a continuity of conjoined staples, but we make such conjoined staples of a form which is an improvement upon that illustrated in Figs. 1 and 2 of the accompanying drawings, and in so doing we employ a metal wire rolled, of such width that when bent into the form of a series of conjoined staples and inserted in the usual way in order to secure the "tops" or "cards" to the "flats" one of the edges of each of the series of conjoined staples inserted into each flat will be level or flush, or in the same plane with the adjacent planed edge of such flat.

In order that the "legs" or "prongs" of the conjoined staples may be inserted into the holes formed in the "flats" we reduce the width of such "legs" or "prongs" by removing portions from the said "legs" or "prongs" in the manner indicated in Figs. 3 and 4 of the accompanying drawings, which show that the "legs" or "prongs" (c) of the conjoined staples are of less width than the parts (d) by which one "leg" or "prong" (c) is connected to the next.

In Figs. 5, 6 and 7, which illustrate the manner in which lengths of a continuity of conjoined staples having the said improvements applied to them are employed to secure the "cards" or "tops" to "flats" it is shown that while the "legs" or "prongs" (c) of the continuity of conjoined staples are sufficiently narrow to be passed through holes formed in the "foundation" or "back" of the "card" or "top" to be applied to a metal "flat" and in the metal "flat" itself and "clined" at their ends (c') so as to be securely retained in the holes formed in the metal "flat" (e), the parts (d) connecting the "legs" or "prongs" (c) of the continuity of conjoined staples extend so far as to be level with, "flush" with, or in the same plane as the adjacent planed edge of the metal body of the "flat." Thus when the superfluous parts of the "foundation" or "back" of the "card" or "top" have been cut away in the usual manner, such "foundation" or "back" will nowhere project beyond the continuity of conjoined staples at either edge of the "flat," and as is indicated in Fig. 6 the parts (d) which connect the legs or "prongs" (c) of the continuity of conjoined staples to one another, will present a practically continuous strip of metal along each edge of the flat so as to pre-

serve the edges of the "foundation" or "back" of the "top" or "card" from being chafed or roughened while the flat is in use, and cause the "flats" to present clean and neat edges.

Our present invention consists in a machine or apparatus by means of which the "legs" or "prongs" of the continuity of conjoined staples may be reduced in width for the purpose above described by portions being cut, nipped or pinched therefrom.

The machine or apparatus constructed according to our invention comprises, first, means by which each of the legs or prongs of a continuity of conjoined staples may be brought in turn into position for having a portion nipped, cut or pinched therefrom. For this purpose we provide a guide, groove or slide, in which the continuity of conjoined staples to be operated upon is placed, and employ a pusher or lever which we so operate by means of suitable cams, cranks or eccentrics or other suitable means that at the required times it will advance into engagement with the continuity of conjoined staples and move such continuity of conjoined staples in the required direction and to the required extent by acting upon one of the legs or prongs of such continuity or conjoined staples and then withdraw from the said continuity of conjoined staples and return to the position which it first occupied in readiness for performing a similar series of operations, in which series of operations it will act upon the next leg or prong of the continuity of conjoined staples. In some cases instead of causing the pusher or lever above mentioned to advance and retire in the manner above mentioned we cause such pusher or lever to oscillate upon a suitable pivot, or in suitable bearings, and provide the said pusher or lever with a pawl which when moved in one direction will pass into engagement with a prong or "leg" of the continuity of conjoined staples, and push or move it into position for having a portion cut, nipped or pinched therefrom. In the accompanying drawings *f* is the pusher or lever, which when arranged in the manner illustrated in Figs. 10, 12, 15 and 16, to which we will first refer, is mounted upon a stud *g* secured in a carriage or slide *h* mounted between suitable *V* guides formed in a table *j* secured to a suitable bed plate *k*. In brackets *j'* secured to the table *j* is mounted a shaft *m* upon which is mounted a pulley *n* by means of which motion may be imparted to the working parts of the machine. Upon the shaft *m* are also mounted a loose pulley *o* and a fly wheel *p*. From the carriage or slide *h* projects an arm *h'* upon which is mounted a bowl *h²* by means of which a cam *q* mounted upon the shaft *m* and made of suitable shape forces the carriage or slide *h* at the required times in the direction indicated by the arrow *C* through a distance such that the end *f'* of the pusher or lever *f* will pass into engagement with the

continuity of conjoined staples D to be operated upon. To the table *j* is secured a guide *r* in which is formed a groove or channel *r'* by which the continuity of conjoined staples D being operated upon is guided on its way to and from the parts by which it is operated upon. From the guide *r* parts are removed at E and F in order that the pusher or lever *f* and certain parts to be hereinafter mentioned may be able to act upon the continuity of conjoined staples passing along or resting in the guide *r* and in order that the said continuity of conjoined staples may be kept in position in the guide *r* a part *s'* projecting from a guide *s* which will hereinafter be more particularly mentioned, extends over the groove or channel *r'* in the guide *r*. At the side of the cam *q* is formed a projecting part or cam face *q'* of suitable shape which acts at suitable times in the revolution of the shaft *m* against a part *f²* projecting from a plate *f³* secured by means of screws *f⁴* to the pusher or lever *f* and thus at such times turns the pusher or lever *f* in the direction indicated by the arrow G. To the pusher or lever *f* is connected one end of a spring *t* which is connected at its other end to a stud or screw *t'* secured in the table *j* and tends to turn the pusher or lever *f* in the direction opposite to that indicated by the arrow G. A spring *u* secured in position in any suitable manner presses at one end against the end of the recess in the table *j* in which the slide or carriage *h* is mounted, and at the other end against the slide or carriage *h* and tends to force the slide or carriage *h* in the direction opposite to that indicated by the arrow C either against the cam *q* or against a plate *v* secured by set screws *v' v'* to the table *j*. In the table *j* is secured a stud *j⁵* through which passes a screw *j²* capable of being secured in position in the stud *j⁵* by means of the lock nut *j³*. The end *j⁴* of the screw *j²* acts as a stop to limit the movement of the pusher or lever *f* in the direction opposite to that indicated by the arrow G. At a certain time in each revolution of the shaft *m* the cam *q* will act against the bowl *h²* and push the slide or carriage *h* in the direction indicated by the arrow C and cause the end *f'* of the pusher or lever *f* to pass through the opening formed for the purpose in the side of the guide *r* and into the space between two of the legs or prongs of the continuity of conjoined staples to be operated upon. While the slide or carriage *h* is pushed forward in the direction indicated by the arrow C by the cam *q* the projecting part or face-cam *q'* at the side of the cam *q* acts upon the projecting part *f²* upon the plate *f³* upon the pusher or lever *f* and turns such pusher or lever *f* in the direction indicated by the arrow G so that such pusher or lever *f* will cause the continuity of conjoined staples D being operated upon to be moved in the direction indicated by the arrow H through a space equal to the distance between one leg or prong and the one next to it. By means

of the cams *q* and *q'* and pusher or lever *f* the continuity of conjoined staples D is thus caused to advance, one leg or prong at a time, to the mechanism to be hereinafter described by which the portions to be removed from it are severed. The plate *f³* may be adjusted in relation to the pusher or lever *f* by means of the screws *f⁴* and the set screw *f⁵* which is secured in position in the pusher or lever *f* by means of a lock nut *f⁶*. A simpler form of the above described means for causing the continuity of conjoined staples D being operated upon to be advanced so that the legs or prongs of such continuity of conjoined staples D will be successively presented to the mechanism by which portions are removed from such legs or prongs is illustrated in Figs. 18 and 19. In the arrangement shown in Figs. 18 and 19 the pusher or lever *f* is mounted upon a stud *g* which is secured in the table *j* instead of being secured in a slide moved upon such table *j* by means of a cam *q* and consequently such pusher or lever *f* is capable only of being oscillated upon the stud *g* by means of a projecting part or cam face *q'* upon the disk or cam *q* secured upon the shaft *m*. The projecting part or cam face *q'* acts in conjunction with a part *f²* upon a plate *f³* secured and adjusted upon one end of the pusher or lever *f* in a manner similar to that above described in reference to Figs. 10, 12, 15 and 16. In the other end of the pusher or lever *f* is secured a stud *f⁷* upon which is mounted a pawl *f⁸* the end *f⁹* of which acts upon one of the legs or prongs of the continuity of conjoined staples D being operated upon each time that the pusher or lever *f* is oscillated in the direction indicated by the arrow G by the projection or cam face *q'* and so pushes the said continuity of conjoined staples D in the direction indicated by the arrow H through a space equal to the distance between two adjacent legs or prongs of the continuity of conjoined staples D. When the pusher or lever *f* is oscillated in the direction opposite to that indicated by the arrow G the pawl *f⁸* slides or moves over the leg or prong of the continuity of conjoined staples D with which it comes in contact and does not move such continuity of conjoined staples D. In order to insure that whenever the pusher or lever *f* is oscillated in the direction indicated by the arrow G the pawl *f⁸* shall become engaged with a leg or prong of the continuity of conjoined staples D and move the said continuity of conjoined staples D in the direction indicated by the arrow H a spring *f¹⁰* secured upon the pusher or lever *f* by means of the nut *f¹¹* by means of which the stud *f⁷* is secured in position in the lever *f* is caused to press slightly upon the upper surface of the pawl *f⁸* so as to tend to turn such pawl *f⁸* in the direction indicated by the arrow J. When the arrangement illustrated in Figs. 18 and 19 is employed, the guide *r* and the parts by means of which the continuity of conjoined staples D being operated

upon is retained in proper position must be so formed and arranged that the pawl f^s may be able to act upon the continuity of conjoined staples when the pusher or lever f is oscillated in the direction indicated by the arrow G.

The machine or apparatus constructed according to our invention comprises secondly, arrangements of guides and holders for seizing and moving the legs or prongs of the conjoined staples into position to have portions pinched, nipped or cut therefrom, and holding the said prongs or teeth in position while portions are pinched, nipped or cut therefrom, and arrangements by means of which the said guides and holders are caused to advance, guide, hold, retire from, and release, the legs or prongs of the continuity of conjoined staples. For these purposes we provide jaws, which are hinged together, or mounted upon a suitable slide or part moved by means of a crank, cam or eccentric, acting by means of a suitable lever or rod or levers or rods, and when moved in one direction are caused to approach each other by sliding in contact with inclined guides or by the action of suitable links and on being moved in the opposite direction are caused by a spring or other suitable means to separate. While moving in the direction in which they are caused to approach each other the jaws above mentioned seize a leg or prong of the continuity of conjoined staples being operated upon and push or move such leg or prong into position and hold it so that it can be operated upon by the pinchers, nippers or cutters to be hereinafter described, and hold the said leg or prong in such position for the required time. When the required portion has been cut, nipped or pinched off the leg or prong, the jaws aforesaid are caused to release the said leg or prong and move back to their original position whence they are moved in a manner similar to that above described, to act upon the leg or prong to be next operated upon. The cams, cranks, or eccentrics are so arranged and disposed in relation to the means by which the lever or pusher referred to under the first head of this description of our invention is operated, and to the mechanism to be described under the third head of this description of our invention that the movements of the guides or holders above described will take place at the times required. In the accompanying drawings ww are the jaws above described. The jaws ww are mounted upon a stud x secured in a slide y mounted in suitable guides y^2 secured to the table j by means of set screws 13. A spring z mounted at each end in a hole or recess formed in each of the jaws w tends to press the jaws ww apart from each other. To the slide y are secured projecting parts y' in which is secured a stud or pin y^3 which is embraced by jaws formed upon the end of one arm 2^a of a lever 2 mounted upon a pin 3 secured in jaws 4^a formed upon a stud 4 secured in one of the vertical sup-

ports of the table j . The lever 2 is provided with another arm 2^b to which at its end is secured by screws 5 a plate 6 which may be adjusted in relation to the arm 2^b by means of the screws 5 and a set screw 7 which is provided with a lock nut 7^a . A spring 8 which abuts at one end against the arm 2^b of the lever 2 and at the other end against the support k upon which the table j is mounted tends to turn the lever 2 in a direction opposite to that indicated by the arrow K. In conjunction with the plate 6 acts the edge or periphery 9^a of a cam 9 mounted upon the shaft m . The edge or periphery 9^a of the cam 9 is made of such form that during each revolution of the shaft m , the lever 2 shall be moved at the time required in the direction indicated by the arrow K into a certain position, and be kept in such position for the required period. The movements of the jaws ww are performed between guides s and 10, each of which is adjusted into position upon the guides y^2 upon the table j by means of a set screw 11 which passes through a stud 12 secured in the table j and is provided with a lock nut 11^a . Each of the guides s and 10 may be secured to the table j by set screws 13 after being adjusted into position by means of the set screw 11 employed in conjunction with it, and each of such guides s and 10 is provided with a part 14 which is so formed that its surface is so inclined to the path in which the slide y is moved by means of the cam 9 that when the slide y is moved in the direction indicated by the arrow L the curved inclined surface formed upon the jaw w adjacent to such guide s or 10 will arrive against and pass along the part 14 of the said guide s or 10 so that the parts $w'w'$ of the jaws ww will be caused to approach each other while continuing to move in the direction indicated by the arrow L and seize and hold that one of the legs or prongs of the continuity of conjoined staples D which is opposite to the space between the parts $w'w'$ of the jaws ww when they are moved in the direction indicated by the arrow L. In order that the distance to which the legs or prongs to be held by the jaws ww may pass between such jaws ww , may be regulated, a projection w^2 is formed upon one of such jaws ww so that such projection w^2 by arriving against each leg or prong to be held by the jaws ww will prevent such leg or prong from passing farther between such jaws ww and in order that the projection w^2 may not prevent the jaws ww from being pressed together to the extent necessary for the legs or prongs, to be operated upon, to be securely held, a notch w^3 is formed in the other jaw w to receive the projection w^2 . It is very important that the legs or prongs when ready to be seized and held by the jaws ww shall be in proper position as regards their distance from the bottom of the groove r' . We therefore form upon the ends of the guides s and 10 V guides 15, 15, and mount in such V

guides 15, 15, blocks 16, 16, each of which as is indicated in Fig. 20 is provided at its upper end with a plate 17 to which is connected one end of a spiral spring 18 connected at its other end to the guide 15 in which the said block 16 is mounted. The springs 18 tend to draw the blocks 16 in the direction indicated by the arrow M and cause them to press upon the points of the legs or prongs of the continuity of conjoined staples D resting in the guide *r* and keep such continuity of conjoined staples D in contact with the bottom of the groove or channel *r'* formed in the guide *r*. At a certain part of each revolution of the shaft *m* the edge or periphery 9^a of the cam 9 will act upon the lever 2 and turn it in the direction indicated by the arrow K so as to move the slide *y* and jaws *w w* in the direction indicated by the arrow L. Before the extremities *w' w'* of the jaws *w w* arrive in line with the groove or channel *r'* formed in the guide *r* the pusher or lever *h* will have been caused to place one of the legs or prongs of the continuity of conjoined staples D resting in the said guide *r* into a position in which the jaws *w w* will advance, one at each side of it so that it will be nipped or held by such jaws *w w* when they are pressed together by being caused to move against the inclined part 14, 14, of the guides *s* and 10. The projection *w²* formed on one of the jaws *w w* by acting upon the leg or prong embraced by the jaws *w w* will press such leg or prong forward in the direction indicated by the arrow L so that such leg or prong will be placed in position for being acted upon by the pinchers, nippers, or cutters to be hereinafter described. After the said leg or prong has been acted upon by the pinchers, nippers, or cutters aforesaid the further revolution of the cam 9 will allow the lever 2 to be moved in the direction opposite to that indicated by the arrow K by the spring 8 so that the said leg or prong will be released by the jaws *w w*.

The machine or apparatus constructed according to our invention comprises thirdly, means for cutting, nipping or pinching from the legs or prongs of the continuity of conjoined staples the portions which are required to be removed therefrom. For this purpose we provide pinchers, nippers or cutters consisting in jaws which are provided with cutting edges of suitable form and are mounted upon a pivot or pivots or upon or in suitable guides and operated by means of a suitable cam, crank or eccentric, or cams, cranks, or eccentrics and a spring or springs. We prefer to so operate the said jaws that the cutting edge with which one of such jaws is provided will never come into contact with the cutting edge with which the other of such jaws is provided. In order that the parts to be pinched, nipped or cut from each leg or prong to be operated upon may be cleanly and completely removed therefrom we prefer that while the cutting edges of the said jaws are caused to commence to act upon a leg or prong at the same time, the cutting edge of one of the said jaws shall be passed through more than half of the thickness of the leg or prong being operated upon and then withdrawn while the cutting edge upon the other of the said jaws is in turn passed through more than half of the said leg or prong. After the jaws aforesaid have been moved to cut, pinch or nip from a leg or prong of the continuity of conjoined staples the portion required to be removed therefrom the jaws aforesaid are so moved that the cutting edge with which one of such jaws is provided is moved away from the cutting edge upon the other of such jaws so that the portion removed from the leg or prong operated upon will be released. The cam, crank or eccentric or cams, cranks or eccentrics above mentioned in the description of this part of our invention is or are so arranged and disposed that the movements of the jaws operated thereby will bear the requisite relations to the movements of the pusher or lever and the guides and holders described in reference to the first and second heads of this description of our invention. A stud 19 passes through a block 19^a inserted in a recess formed in the table *j* and also passes through the table *j* being secured therein by means of a nut 19^b. Upon the stud 19 are mounted two jaws 20, 21, each of which bears upon the block 19^a and is provided with a cutting edge 22 formed upon a part secured to such jaw by means of screws 22^a and adjusted into position thereon by means of the set screw 22^b, which is provided with a lock nut 22^c. Upon each of the jaws 20, 21 is mounted a bowl or roller 24. The bowls or rollers 24 bear against the sides of the cam 9 there being one of the bowls or rollers 24 at each side of the cam 9. A spring 25 is connected at one end to the jaw 20 and at the other end to the jaw 21 and tends to draw the arms 20^a, 21^a of the jaws 20, 21, together, and so separate the cutting edges 22, 22, with which such jaws 20 21 are provided. Upon the faces 9^b, 9^c, of the cam 9 are formed projections or cam surfaces 26, 27. The projection or cam surface 26 acts upon the bowl 24 which is mounted on the jaw 20, once during each revolution of the shaft *m* and causes such jaw 20 to turn in the direction indicated by the arrow N and so causes the cutting edge 22 upon such jaw 20 to act upon the leg or prong of the continuity of conjoined staples D being operated upon which may be presented to it. When the revolution of the shaft *m* causes the projection or cam surface 26 to pass out of contact with the bowl or roller 24 upon the jaw 20 the spring 25 will cause the jaw 20 to turn in the direction opposite to that indicated by the arrow N and so cause the cutting edge 22 upon the said jaw 20 to be removed from the prong or leg upon which it has operated. In like manner the projection or cam surface 27 acts upon the bowl or roller 24 which is mounted upon the

jaw 21 once during each revolution of the shaft *m* and causes the jaw 21 to be turned in the direction indicated by the arrow O so that the cutting edge 22 upon such jaw 21 will be caused to act upon the leg or prong of the continuity of conjoined staples D being operated upon which is presented to it and when the revolution of the shaft *m* causes the projection or cam surface 27 to pass out of contact with the bowl or roller 24 upon the jaw 21 the spring 25 will cause the jaw 21 to turn in the direction opposite to that indicated by the arrow O and so cause the cutting edge 22 upon the said jaw 21 to be removed from the prong or leg upon which it has operated. In order that the portion which it is required to remove from each prong or leg of the continuity of conjoined staples being operated upon may be completely severed therefrom, we so form the projections or cam surfaces 26, 27 that the cutting edge 22 upon each of the jaws 20, 21 will be caused to pass more than half way through each leg or prong operated upon and in order that the cutting edge 22 upon the jaw 21 may never come into contact with the cutting edge 22 upon the jaw 20 we so form the projection or cam surface 26 and the projection or cam surface 27 and so place them in relation to each other that while the cutting edges 22 upon both of the jaws 20, 21 commence to act together upon the prong or leg of the continuity of conjoined staples D being operated upon the cutting edge 22 upon the jaw 20 will be partially withdrawn from the leg or prong upon which it has been caused to operate before the cutting edge 22 upon the jaw 21 is so far advanced into the said leg or prong as to pass within the limits of the stroke of the cutting edge 22 upon the jaw 20. The diagram Fig. 17 serves to show the manner in which the cutting edges 22 upon the jaws 20, 21, by their two-fold motion completely sever from the continuity of conjoined staples D being operated upon the portions to be removed from the prongs or legs of such continuity of conjoined staples D. In Fig. 17 it is shown that the cutting edge 22 upon the jaw 20 is caused to pass more than half way through the prong or leg D' being operated upon while the cutting edge 22 upon the jaw 21 is only caused to enter the said prong or leg D'. As the cutting edge 22 upon the jaw 20 is withdrawn from the prong or leg D' being operated upon the cutting edge 22 upon the jaw 21 is in turn caused to pass more than half way through the said prong or leg D'. The cuts made in the said prong or leg D' by the two cutting edges 22 being thus caused to communicate, the portion D² to be removed from such prong or leg D' will be completely severed therefrom. Upon the shaft *m* is mounted a pulley 28 which by means of a band which is not shown in the drawings and a pulley 29 communicates rotary motion to a shaft 30 mounted in bearings formed in brackets 31, 32 secured to the bed *k* upon

which the table *j* is mounted. In the brackets 31 is mounted a shaft 33 which is free to revolve in the said brackets 31. Upon the shaft 33 is mounted a drum 34 on which the continuity of conjoined staples D being operated upon may be wound after a length of such continuity of conjoined staples D sufficient to extend from the place where the prongs or teeth are operated upon to the winding drum 34, has been operated upon. The winding drum 34 is provided with a ratchet wheel 35 into which engages a pawl 36 which is mounted loosely upon the shaft 30 and serves to prevent the ratchet wheel 35 from being turned in a direction opposite to that indicated by the arrow P. A lever 37 is mounted loosely upon the shaft 33 upon which the winding drum 34 is mounted, and upon such lever 37 is mounted a pawl 38^a. When the lever 37 is turned in the direction opposite to that indicated by the arrow P the pawl 38^a passes over the teeth of the ratchet wheel 35 without acting thereon, but when such lever 37 is turned in the direction indicated by the arrow P the pawl 38^a passes into engagement with the teeth of the ratchet wheel 35. Upon the shaft 30 is mounted a projection or cam 38 which in each revolution of the shaft 30 acts upon a projection 37^a upon the lever 37 and turns it in the direction opposite to that indicated by the arrow P. The lever 37 is connected to one end of a spring 39 which is secured to one of the brackets 31 secured to the bed *k* and tends to turn the lever 37 in the direction indicated by the arrow P and so to turn the ratchet wheel 35 and drum 34 in the direction indicated by the arrow P.

Having thus described the construction and arrangement of the machine constructed according to our invention, we will now proceed to describe the manner in which the said machine is caused to operate upon the continuity of conjoined staples from the prongs or legs of which portions are to be removed for the purpose above described. As the cutting edges 22, 22 with which the jaws 20, 21 are provided, will only make a cut in the direction of the height of each leg or prong operated upon, they cannot be employed to entirely sever from each leg or prong operated upon, the portion to be removed therefrom. In order therefore to enable the cut made by the cutting edges 22 in each leg or prong to completely sever from each leg or prong the portion to be removed therefrom, we cause a cut or nick D³ to be formed near the root of each leg or prong where it is intended that the portion to be removed from such leg or prong shall terminate as is indicated in Figs. 8 and 9. We find that the cut or nick D³ in each leg or prong may very conveniently be formed by passing the continuity of conjoined staples to be operated upon through a fixed guide into a space in which projects a portion of the circumference of a circular saw mounted and driven in any manner which may be suit-

able. When any desired length of a continuity of conjoined staples with a nick or cut formed in each leg or prong has been prepared and it is desired to remove from each leg or prong thereof the portion which is to be removed therefrom, the said length of the continuity of conjoined staples is coiled upon a drum or otherwise arranged so as to be capable of being passed to the machine above described and illustrated in the accompanying drawings, and drawn forward thereby without becoming twisted or otherwise injured. Then one end of the said length of the continuity of conjoined staples is passed into the groove or channel r' of the guide r in such position that the portions D^4 by which each prong or leg of the continuity of conjoined staples is connected to the prongs or legs adjacent to it will be in contact with the bottom of the said groove or channel r' and that the nick or cut D^3 formed in each leg or prong of the said continuity of conjoined staples will, while such leg or prong is passing along the groove or channel r' , be directed in the direction indicated by the arrow Q toward the front of the machine as is clearly indicated in Figs. 10 and 15. Then the said end of the continuity of conjoined staples is passed along the groove or channel r' until one leg or prong of such continuity of conjoined staples has been placed in a position such that the pusher or lever f of the pawl f^8 carried thereby in case the arrangement of pusher or lever f illustrated in Figs. 18 and 19 is employed can pass into engagement with the said leg or prong. Rotary motion is then communicated to the shaft m and the pusher or lever f is caused to move the continuity of conjoined staples D aforesaid forward in the direction indicated by the arrow H , one leg or prong at a time. As soon as a leg or prong of the said continuity of conjoined staples has been placed opposite to the space between the jaws $w w$ the action of the cam 9 will cause the jaws $w w$ to advance and embrace such leg or prong, and causing such jaws $w w$ to be pressed together by the inclined parts 14, 14 of the guides s and 10 will also press the said leg or prong forward in the direction indicated by the arrow L so that it will project to the required extent across the paths of the cutting edges 22, 22 provided upon the jaws 20, 21. When the jaws $w w$ have been caused to hold a leg or prong of the continuity of conjoined staples D the pusher or lever f is by the cam q allowed to be moved by the action of the springs $u t$ provided for the purpose, into position to act upon the leg or prong next to that upon which it last acted. While the leg or prong aforesaid is held and pressed forward by the jaws $w w$ as above described, the projecting parts or cam surfaces 26, 27 upon the cam 9 will act upon the jaws 20 and 21 so that the cutting edge 22 upon the jaw 20 will pass through more than half of the thickness of the prong or leg held by the jaws $w w$ and the cutting edge 22 upon the jaw 21 will

just enter such prong or leg and as the jaw 20 is allowed by the projecting part or cam surface 26 upon the cam 9 to be turned by the spring 25 in the direction opposite to that indicated by the arrow N the projecting part or cam surface 27 upon the cam 9 will further act upon the jaw 21 and cause the cutting edge 22 provided upon such jaw 21 to also pass through more than half of the thickness of the leg or prong held by the jaws $w w$ and so completely sever from the said leg or prong the portion which it is desired shall be removed therefrom, for the purpose of carrying our above described improvements in conjoined staples into effect. After the said portion has been removed from the said leg or prong, the jaw 21 will be allowed by the projecting part or cam surface 27 upon the cam 9 to be turned by the spring 25 in the direction opposite to that indicated by the arrow O so that the cutting edge 22 upon the said jaw 21 will be withdrawn from the leg or prong which has been operated upon. The continued revolution of the cam 9 then allows the spring 8 to turn the lever 2 in the direction opposite to that indicated by the arrow K and move the jaws $w w$ in the direction opposite to that indicated by the arrow L so that the spring z will be allowed to cause such jaws $w w$ to release the prong or leg which has been operated upon. Then the continued revolution of the cam q will cause the pusher or lever f to move another leg or prong of the continuity of conjoined staples D into position to be operated upon in a manner similar to that above described and, afterward, the above described series of operations is continued until all or nearly all of the prongs or legs of the prepared length of the continuity of conjoined staples have been operated upon or until the pusher or lever f is unable to further act upon the said continuity of conjoined staples. When the portion of the continuity of conjoined staples upon the legs or prongs of which the cutting edges 22 upon the jaws 20, 21 have acted is sufficiently long to extend to the drum 34 the end of such continuity of conjoined staples is connected to the said drum 34 and the revolution of the shaft 30 causing the cam 38 to turn the lever 37 in the direction opposite to that indicated by the arrow P and then allowing the spring 39 to turn such lever 37 in the direction indicated by the arrow P the continuity of conjoined staples will be wound upon the drum 34 as it is released by the jaws $w w$ and pushed forward by the pusher or lever f .

It is obvious that many of the details of the machine above described are susceptible of variation for instance, the pusher or lever f may be arranged and caused to act either in the manner illustrated in Figs. 10, 12, 15, and 16 or in the manner illustrated in Figs. 18 and 19. The arrangement of pusher or lever f illustrated in Figs. 18 and 19 is preferable to that illustrated in Figs. 10, 12, 15

and 16 for the reason that the pawl f^8 illustrated in Figs. 18 and 19 may very readily be caused to act upon that leg or prong of the continuity of conjoined staples which is next to be held by the jaws $w w$ and thus slight irregularities in the distances between the legs or prongs of the continuity of conjoined staples are prevented from causing inaccuracy in the placing of the legs or prongs to be operated upon.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a machine for reducing in width the legs or prongs of conjoined staples, the combination of a guide r to receive the continuity of the conjoined staples being operated upon, a pusher or lever f and a pivot g for supporting the same and a cam q and spring t for turning the same for advancing the conjoined staples one leg or prong at a time, jaws $w w$ and a block y and stud x for supporting the same and cam 9 for operating the jaws $w w$ and guides s and 10 provided with inclined surfaces 14, 14 for guiding the said jaws while seizing and holding the leg or prong to be operated upon, jaws 20, 21 each provided with a cutting edge 22, and side cams 26 and 27 for operating the jaws 20 and 21, all constructed, arranged, employed and operating substantially in the manner hereinbefore described.

2. In a machine or apparatus for reducing in width the legs or prongs of conjoined staples, the hereinbefore described means for causing the continuity of the conjoined staples being operated upon to be advanced one prong or leg at a time, said means consisting in the combination of a pusher or lever f , a pivot g for supporting the said lever or pusher, a cam q and a spring t for turning the said lever or pusher, a longitudinally moving part h carrying the said pivot and a cam q and a spring u for producing the longitudinal move-

ment of the said part h , substantially in the manner hereinbefore described.

3. In a machine or apparatus for reducing in width the legs or prongs of conjoined staples, the hereinbefore described means for causing the continuity of the conjoined staples being operated upon to be advanced one prong or leg at a time, which means consist in a lever f provided with a finger or pawl f^8 a pivot g for supporting said lever, a cam q and a spring t for turning said lever on said pivot and a spring f^{10} for producing the engagement of said finger or pawl f^8 with the continuity of the conjoined staples when the said lever and pawl move in one direction all in combination substantially as described.

4. In a machine or apparatus for reducing in width the legs or prongs of conjoined staples, the hereinbefore described means for seizing and moving the legs or prongs of the continuity of the conjoined staples being operated upon, into position to have portions pinched, nipped or cut therefrom and holding the said legs or prongs in position while portions are pinched, nipped or cut therefrom, which means consist in the jaws $w w$, the slide y and a stud x secured therein upon which the said jaws are mounted, the guides s and 10 provided with inclined surfaces (14) (14) for guiding said jaws, the lever 2 for moving said slide, and the cam 9 and spring 8 for moving the said lever, all in combination substantially in the manner hereinbefore described.

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