(No Model.) 6 Sheets—Sheet 1.

J. CHANTRELL.

STAPLE FORMING, SETTING, AND CLINCHING MACHINE.

No. 407,431. Patented July 23, 1889.

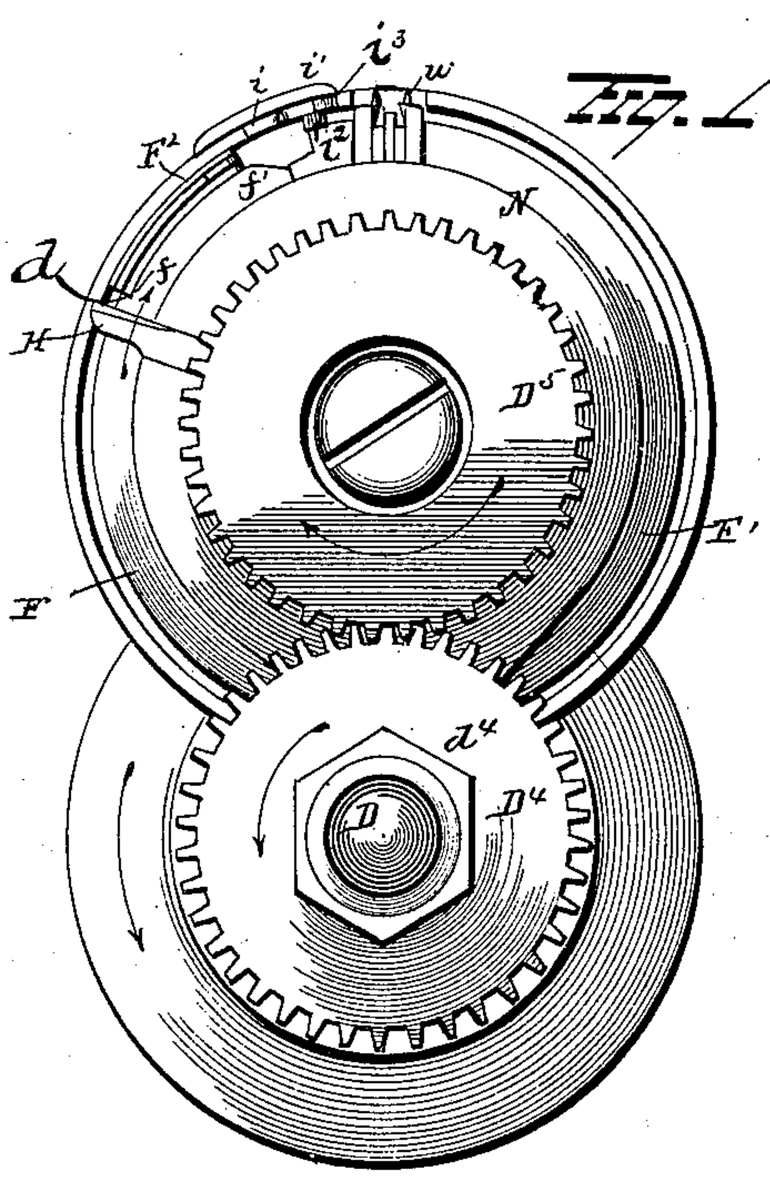

Fig. 1.

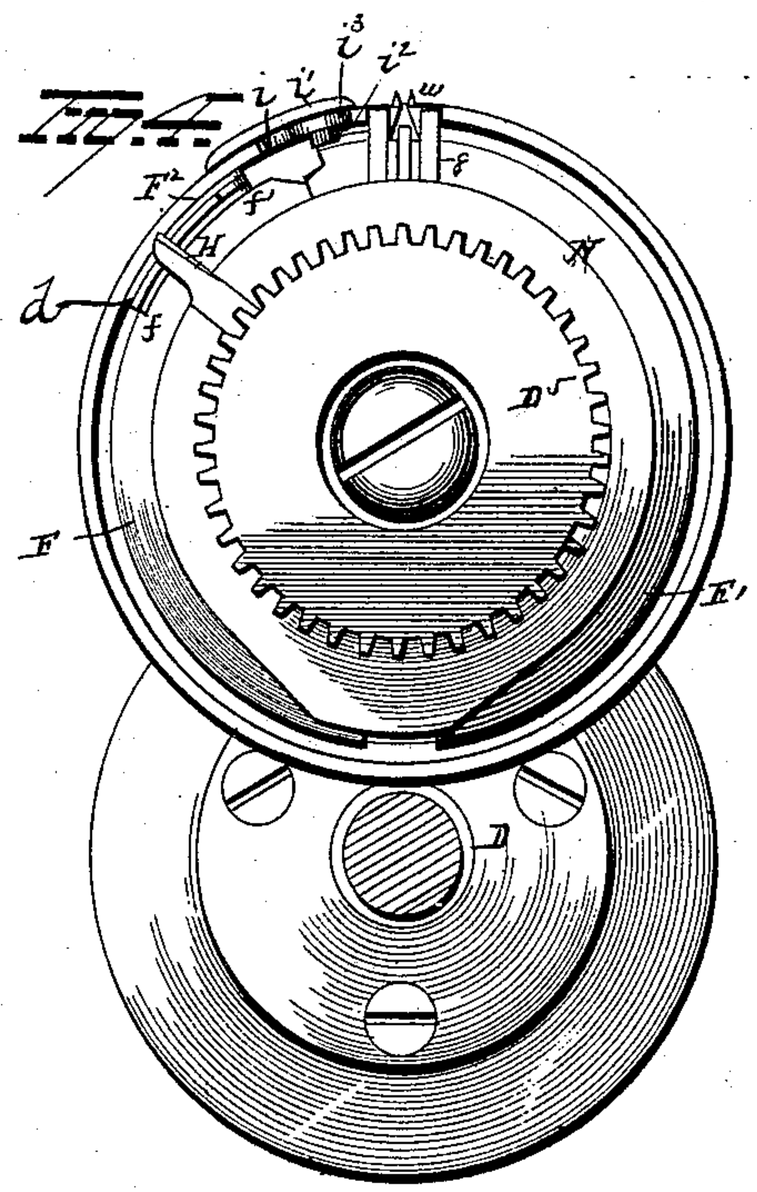

Fig. 2.

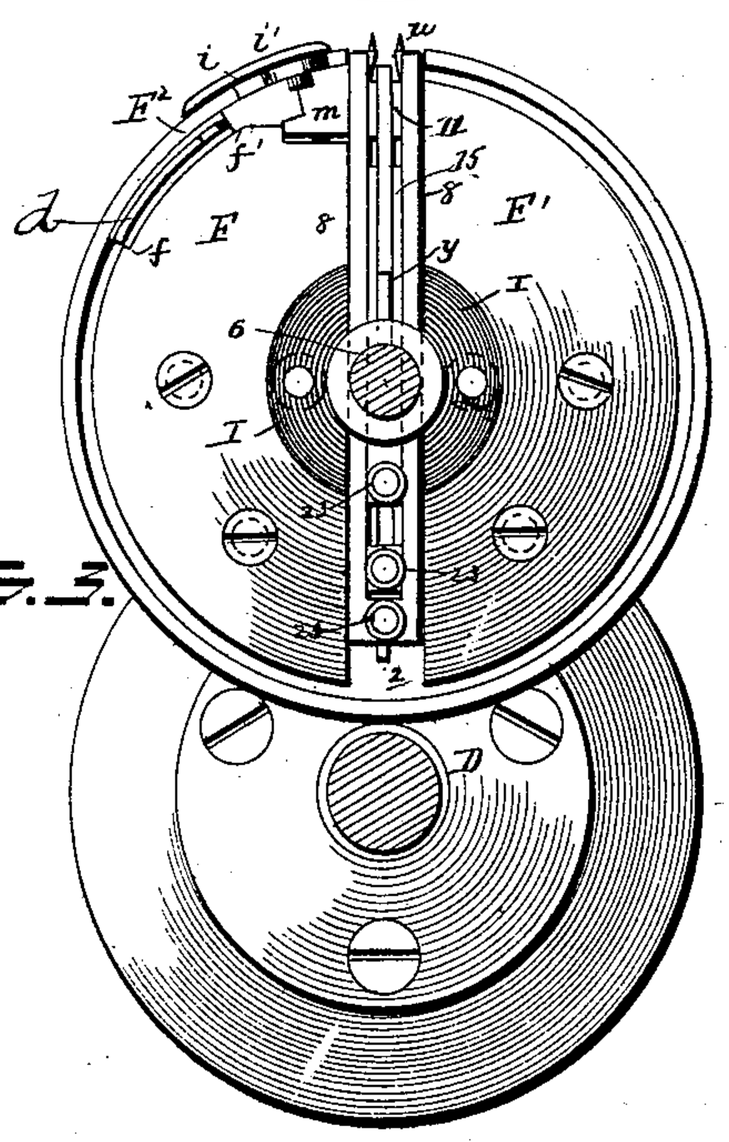

Fig. 3.

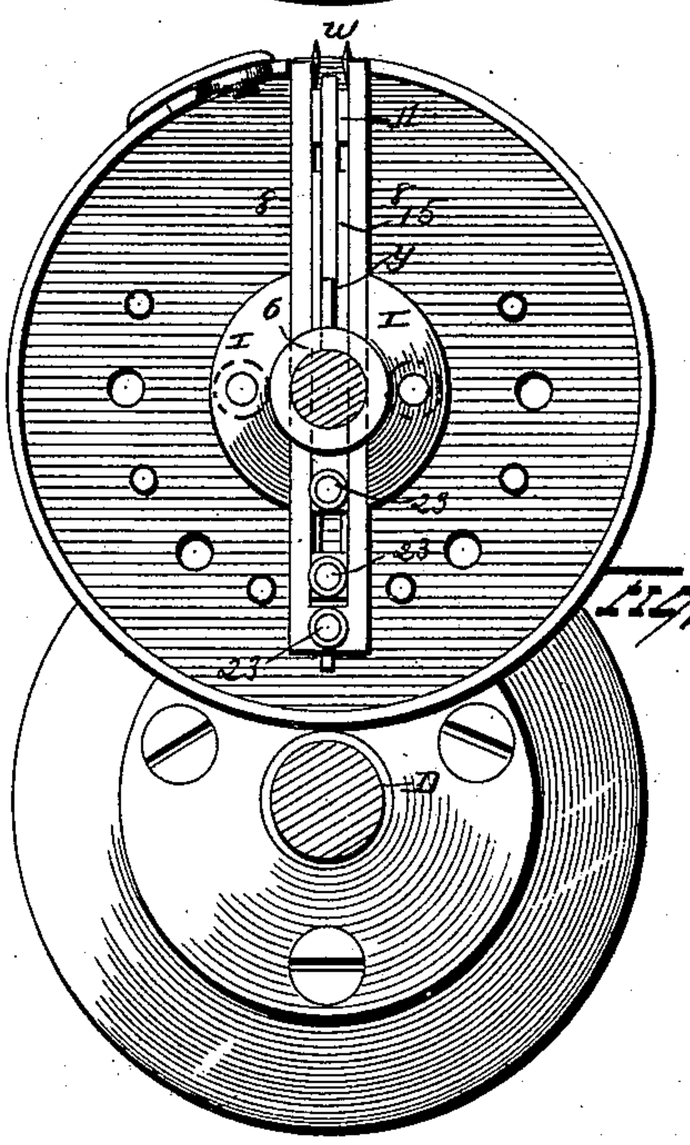

Fig. 4.

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(No Model.) 6 Sheets—Sheet 2.

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No. 407,431. Patented July 23, 1889.

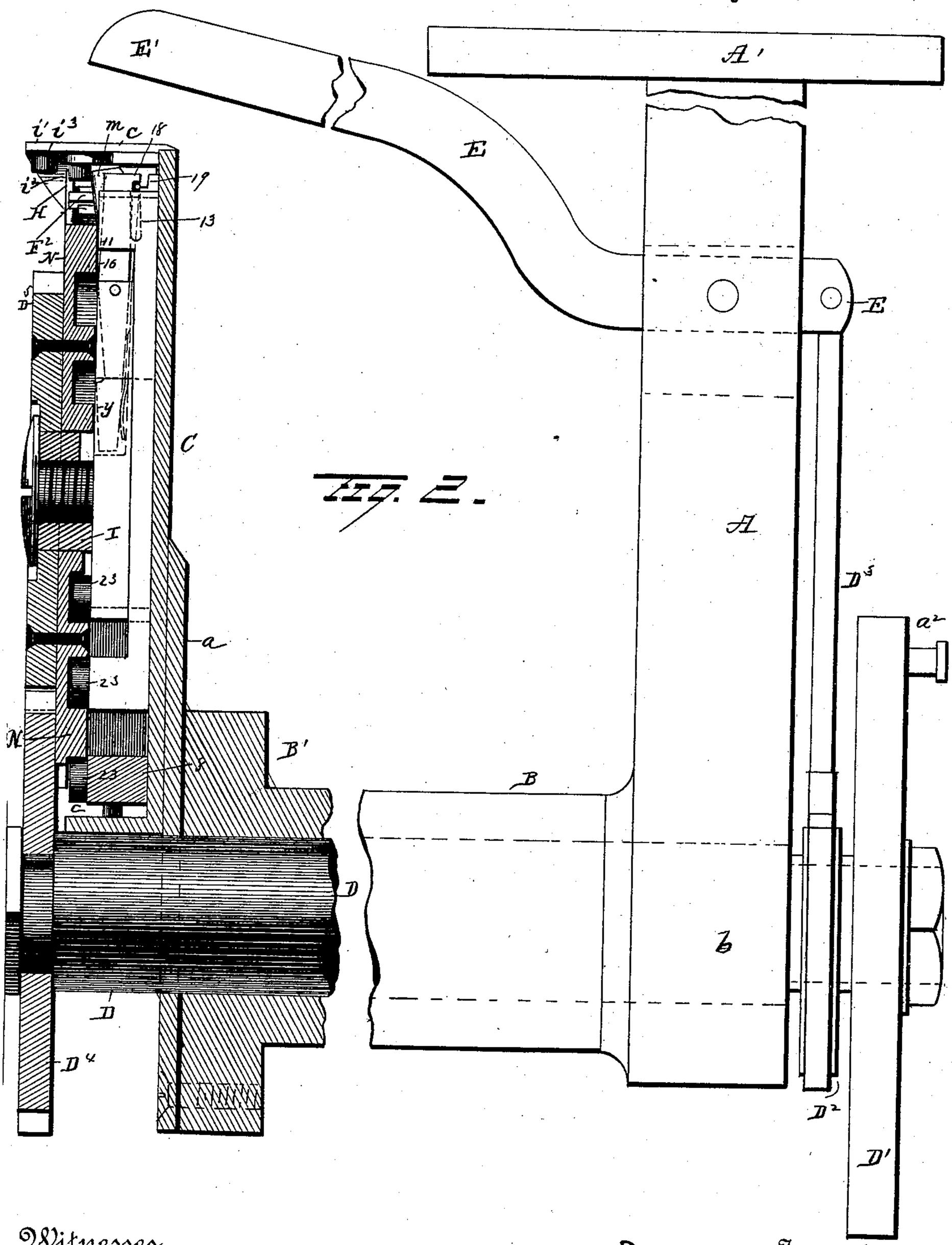

Fig. 2.

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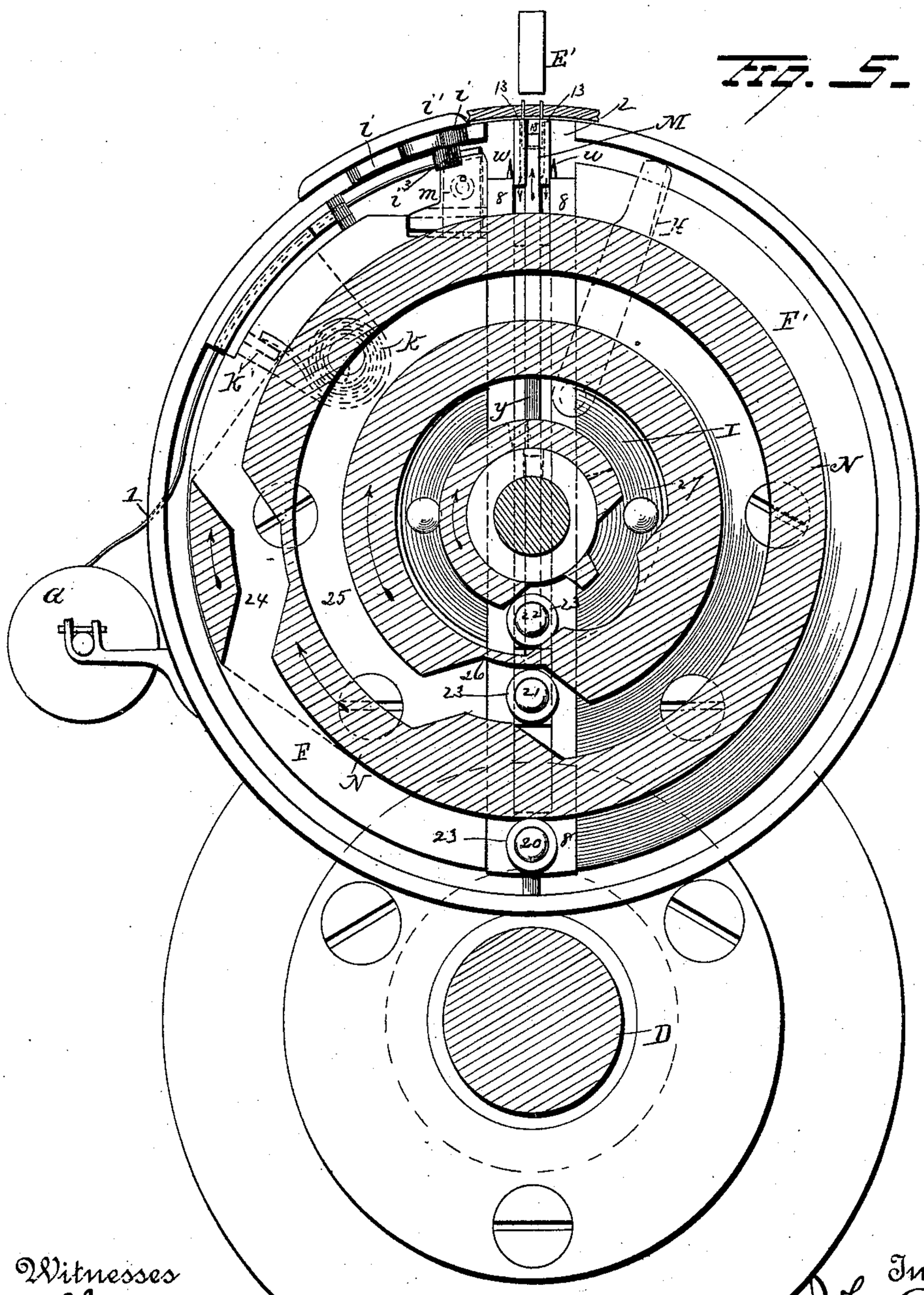
STAPLE FORMING, SETTING, AND CLINCHING MACHINE.

No. 407,431. Patented July 23, 1889.

FIG. 5.



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(No Model.) 6 Sheets—Sheet 4.

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STAPLE FORMING, SETTING, AND CLINCHING MACHINE.

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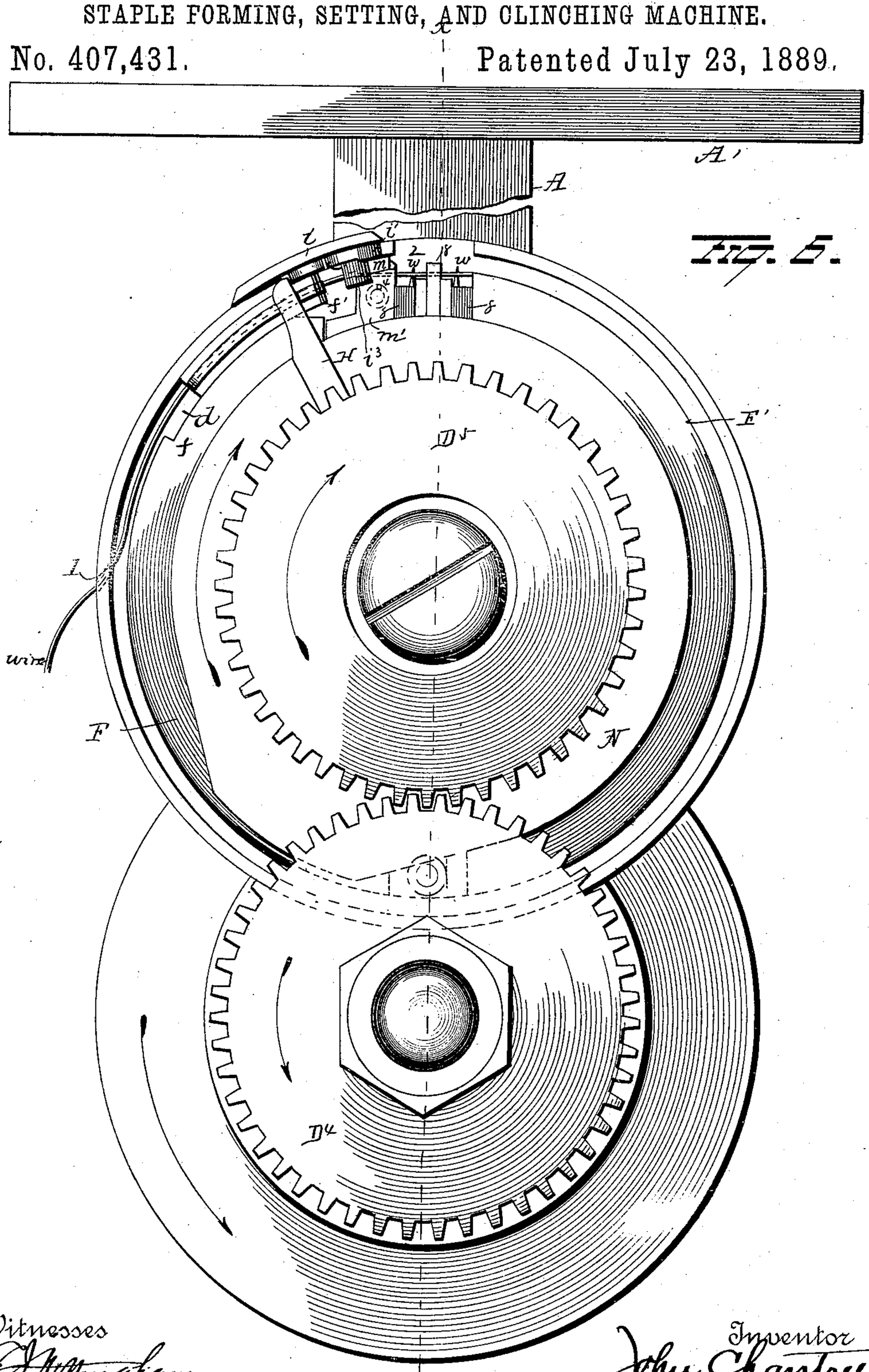

FIG. 5.

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(No Model.) 6 Sheets—Sheet 5.

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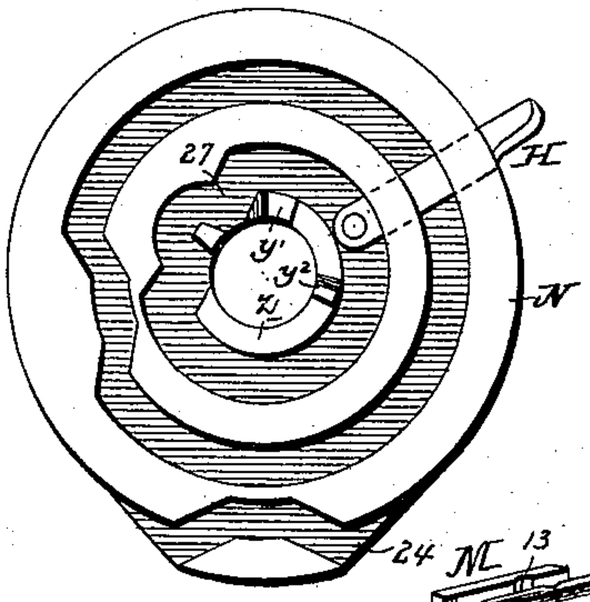
STAPLE FORMING, SETTING, AND CLINCHING MACHINE.

No. 407,431. Patented July 23, 1889.

Fig. 8.



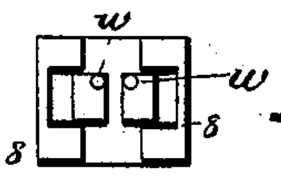


Fig. 12.

Fig. 9.

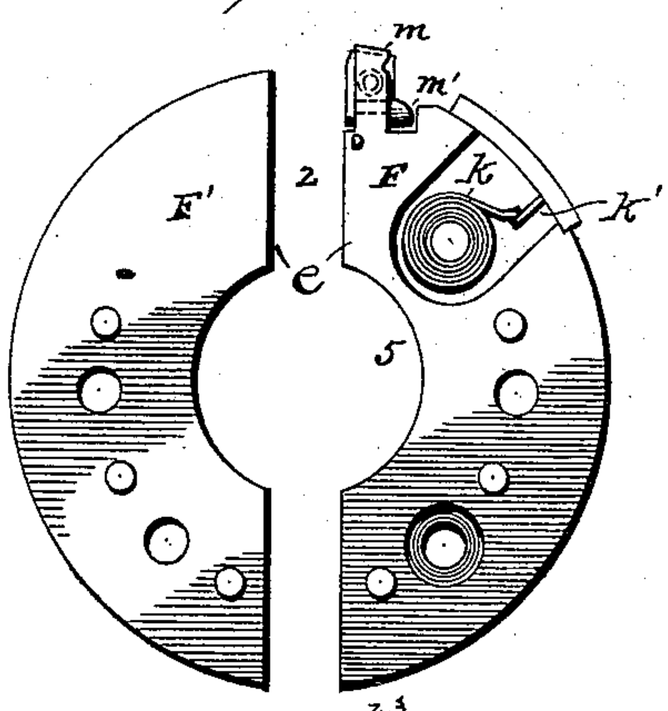


Fig. 15.

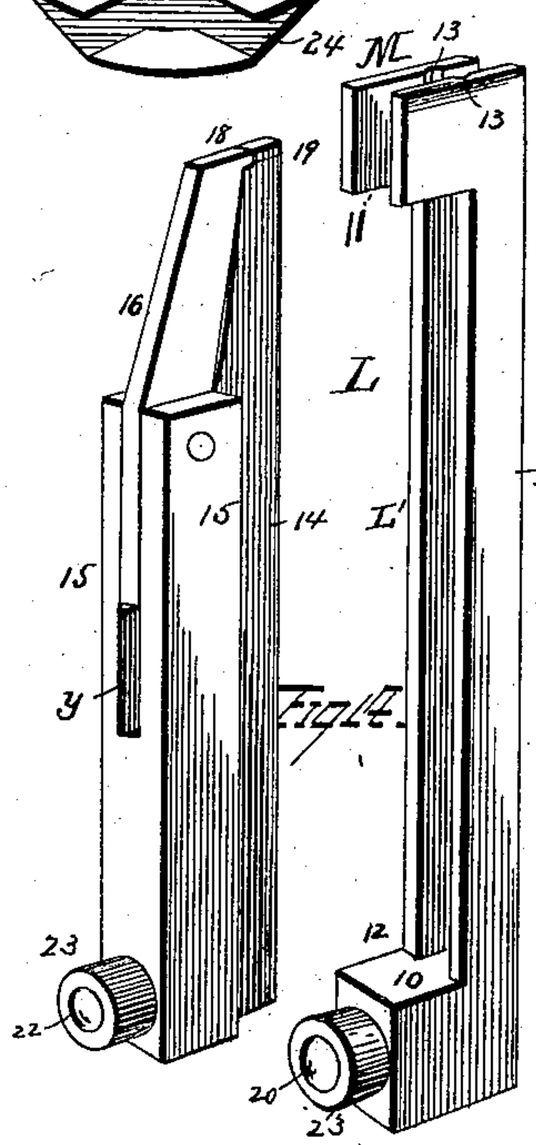


Fig. 14.

Fig. 12.

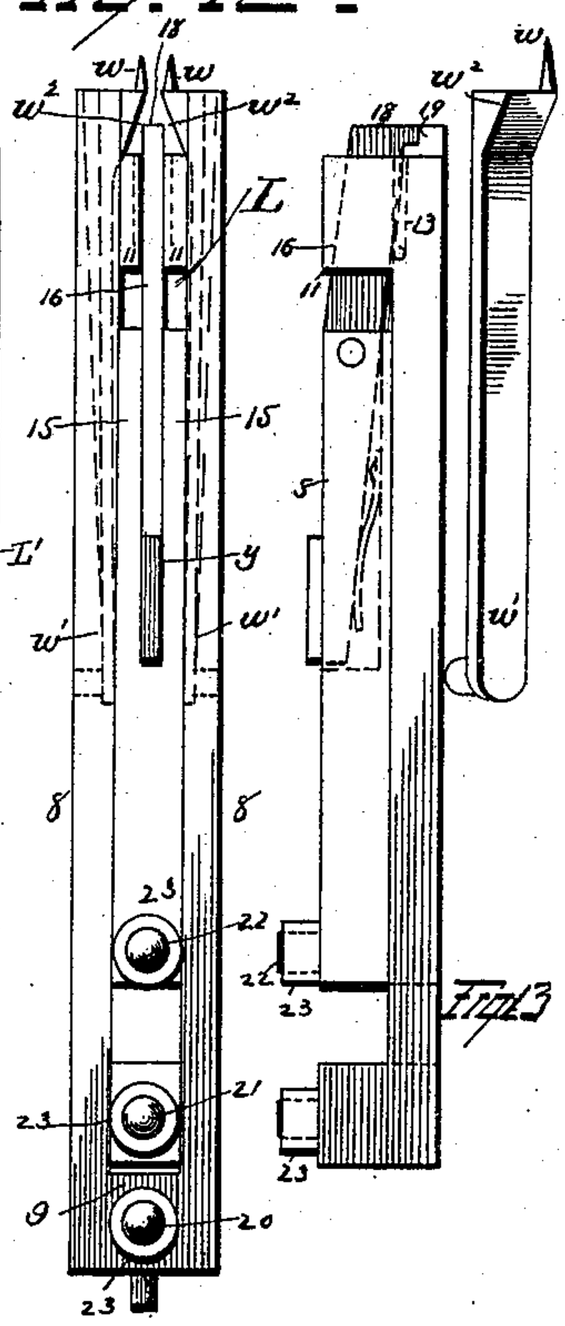


Fig. 13.

Fig. 10.

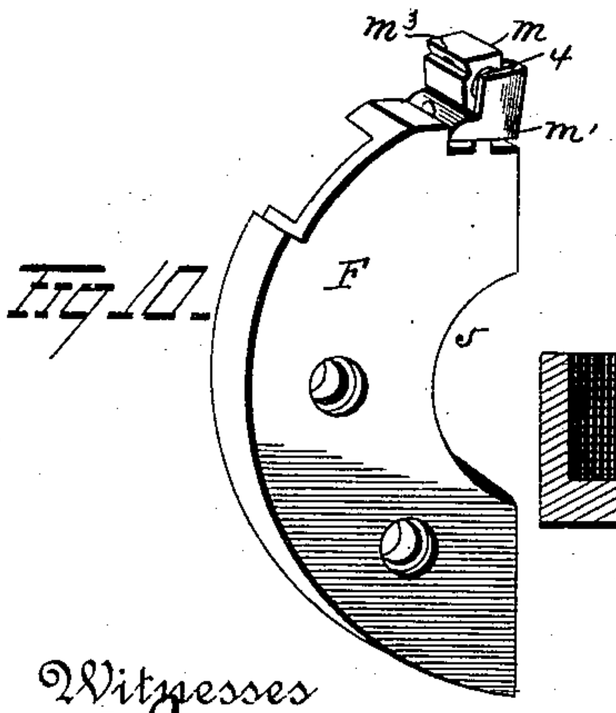
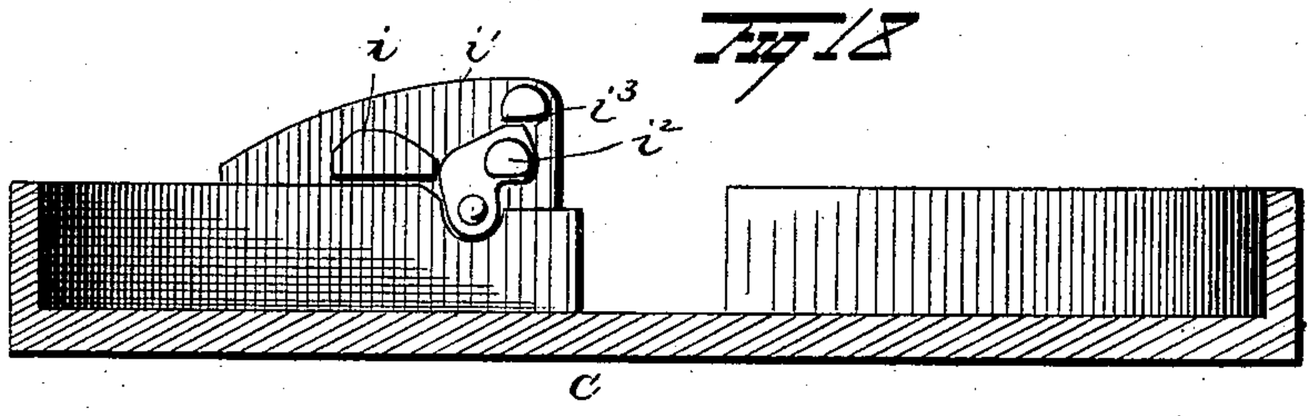


Fig. 18.



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(No Model.) 6 Sheets—Sheet 6.

J. CHANTRELL.

STAPLE FORMING, SETTING, AND CLINCHING MACHINE.

No. 407,431. Patented July 23, 1889.

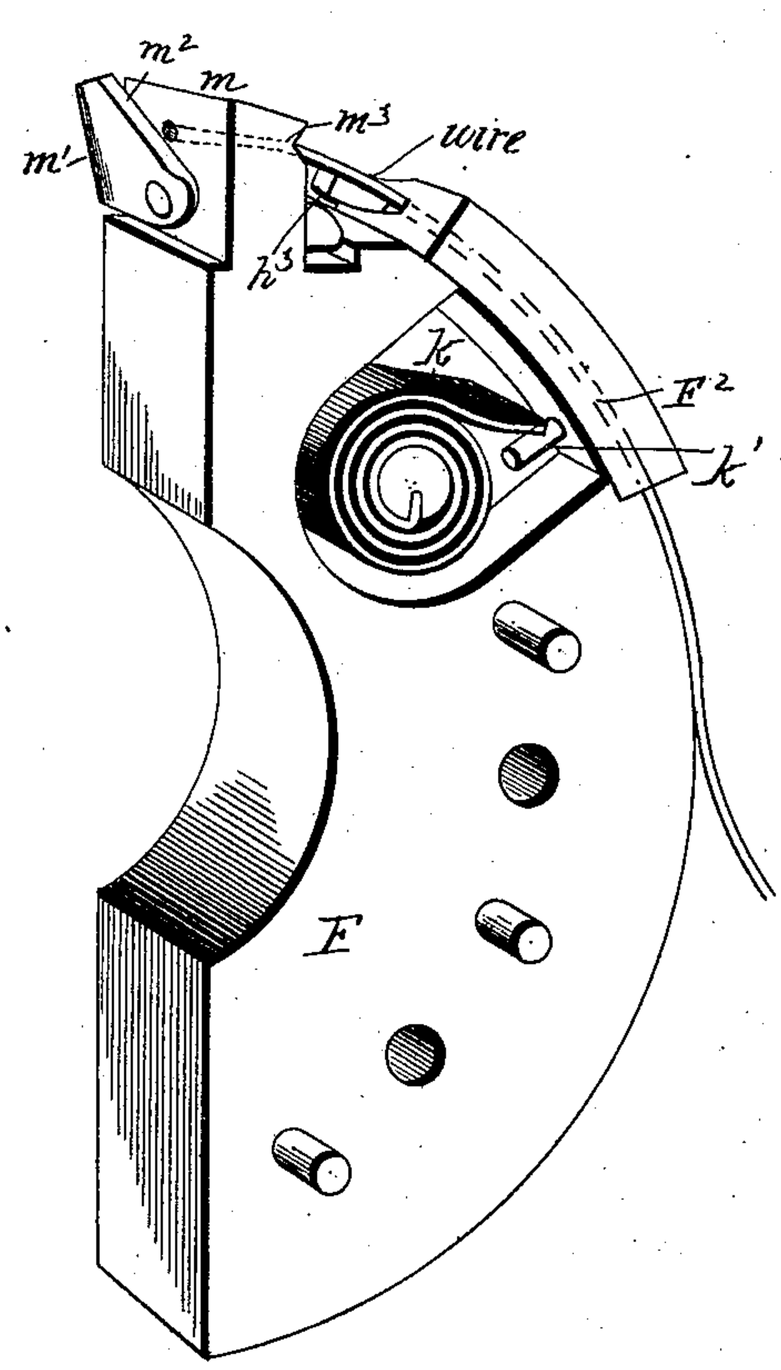
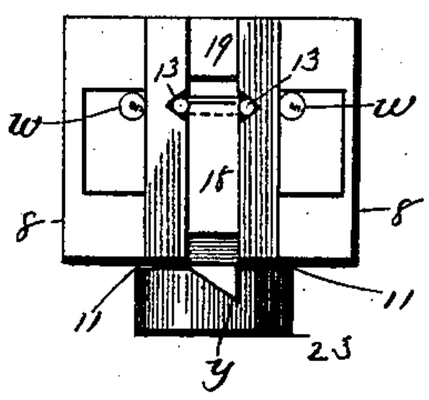


FIG. 1.

FIG. 16.



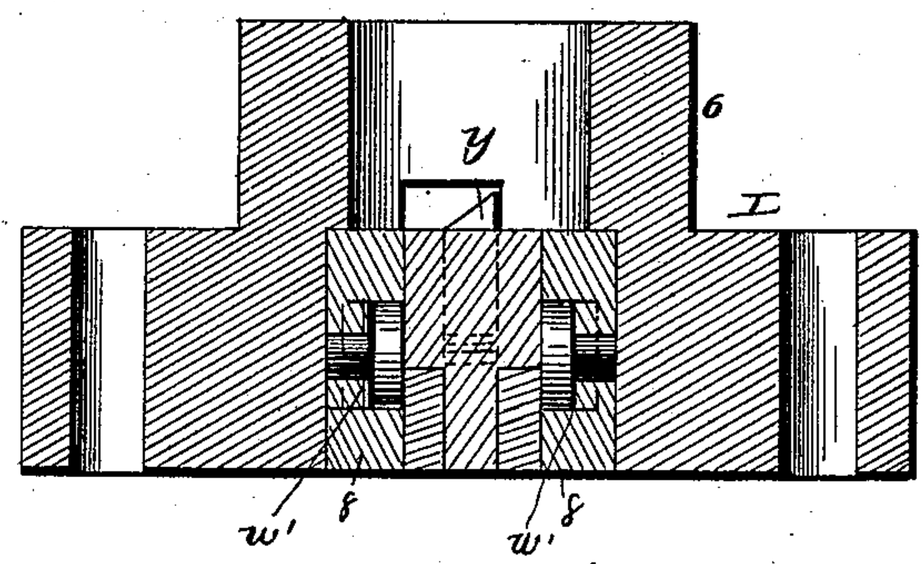


FIG. 17.

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UNITED STATES PATENT OFFICE.

JOHN CHANTRELL, OF READING, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO EDWIN B. WÏEGAND, OF SAME PLACE.

STAPLE FORMING, SETTING, AND CLINCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 407,431, dated July 23, 1889.

Application filed July 24, 1888. Serial No. 280,901. (No model.)

To all whom it may concern:

Be it known that I, JOHN CHANTRELL, a resident of Reading, in the county of Berks and State of Pennsylvania, have invented certain new and useful Improvements in Staple Forming, Setting, and Clinching 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 appertains to make and use the same.

My invention relates to an improvement in staple forming, driving, and clinching machines, the object being to provide a compact and efficient device which will automatically feed wire from a continuous roll, cut it off at a proper length, bend the wire into a staple, perforate the material to receive the parallel legs of the staple, and insert and clinch the staple in two or more adjacent pieces of material to be joined, these several steps being executed successively and automatically.

A further object is to produce a staple forming and clinching machine which may be operated by manual or other power, and which will be adapted to form, insert, and clinch wire staples in a row at spaced intervals to join two or more pieces of yielding fabric together.

To effect the objects enumerated my invention consists in the construction of parts and their combination and arrangement to produce a complete device, which will be specifically described in the annexed specification and pointed out in the claims.

Referring to the drawings making a part of this specification, Figure 1 is a front elevation of the supported machine adjusted to commence the perforation of the fabric that is to be joined. Fig. 2 is a side elevation, in section, of the device, taken on the vertical center line *x x*. (See Fig. 6.) Fig. 3 is a front elevation with the cam-plate removed. Fig. 4 is a front elevation of the machine, the working parts being adjusted as they are when the fabric has been perforated, the awls being at the extremity of their upward movement. Fig. 5 is a front elevation with the working mechanism adjusted with a wire staple formed and inserted in the fabric, with top plate of cam-plate removed. Fig. 6 is a front view of the device, having its parts adjusted in position assumed when the wire is being fed to form staple. Fig. 7 is a front view of the machine with the cam-plate removed and driving gear-wheel removed. Fig. 8 represents a rear face view of the cam-plate, with the sliding parts that are driven by it shown in place. Figs. 9, 10, and 11 represent views of the segments F F′. Figs. 12, 13, 14, 16, and 17 are views of the detached sliding bars and wire clamps that constitute the staple forming, setting, and clinching mechanism. Fig. 15 is an enlarged detached view of the wire-feeding device. Fig. 18 is a section of the casing.

A is a depending bracket-arm which supports the entire staple forming and setting mechanism, said arm having flanges A′ formed on its upper end to allow it to be firmly attached to a bench or other convenient fixed point.

The arm A is of proper length to admit material that is to be operated upon between the working mechanism and the bench-board to which said arm is affixed, and upon its lower end a horizontal sleeve or axially-perforated box B is secured at right angles to the depending arm A, said box projecting forward sufficiently to afford needed room between the mechanism attached to its outer end and the arm that supports it.

The sleeve or box B is enlarged at its forward end B′ to produce a hub thereon, which is designed to afford support to a circular recessed casing C, that is provided with a flange *a*, by which it is attached to the end face of the hub in any proper manner, screws being preferred.

The shaft D is inserted within the bore of the box B. It has a running fit therein and projects at each end of the box. On the rear end of the shaft a driving crank-disk D′ is mounted and secured. There is sufficient space left between the hub of the crank-disk D′ and the adjacent face of the enlargement *b* on the lower end of the arm A to receive an eccentric D^2, which has its strap attached to a connecting-rod D^3, that is pivotally secured at its upper end to the lever E, which latter is pivoted to vibrate in a vertical slot formed in the body of the arm A

at a proper point. The use of this lever will be fully explained in its proper place.

The casing C is recessed to produce a circular cavity, leaving a thin rimmed edge *c* remaining, this excavation being formed on the front side of the casing, thus adapting it to receive and support mechanism which will now be described.

As indicated in the statement of objects, there are several distinct operations performed in this machine as an entirety, and coacting mechanism embodied to effect each separate step in the forming, setting, and clinching of a staple is located in compact space within the casing C. To afford proper sliding support to the staple forming and clinching device two segments F F′ of a flat plate ring are secured by screws within the recessed casing C. These are of such a proportionate diameter thereto that a circular groove *d* is formed between the annular rim *c* and the rounded edges of the plates F F′, said groove being intended to afford a raceway for the wire-feeding shuttle F², that is made to slide a proper distance in the same, as will be further explained.

Between the parallel straight edges *e* of the plates F F′ a suitable space 2 intervenes for the reception of the staple bending and clinching devices, as well as the piercing-awls, which perforate the material in which the staples are to be inserted and affixed by clinching the ends of their limbs, and the rim *c* of the casing C is cut away to afford an opening of a width equal to the slot 2, formed between the plates F F′, as just stated.

The plate F, which is preferably located on the left side of the machine as viewed from the front, is cut away on its peripheral edge near the top corner from *f* to *f*″ a sufficient distance to accommodate the shuttle F², which consists of a curved block of metal the sides of which conform to the curvature of the groove *d*, in which it slides freely. A slot *d*′, parallel to the sides, is cut downwardly from the upper face of the block, producing parallel curved walls *g*, with an intervening space that receives a bent clamping-dog *h*, which is pivoted to vibrate between these walls. The pivot of the clamping-dog *h* is so located that a short limb *h*′ and a longer limb *h*² are produced. The first-named limb *h*′ is nearest the terminal *f*′ of the groove *d*, in which the shuttle F² slides, and its lower edge should impinge on the bottom of the slot *d*′ when the end of the limb *h*′ is depressed. The limb *h*² is long enough to reach to the end of the shuttle-case, and its upper edge is cut on a slope or inclined plane that gradually rises from the end to the shoulder *h*³, where a slight elevation is formed from this shoulder to the forward end of the limb *h*′. The shoulder *h*³ being located above the pivot of the clamping-dog *h*, it is evident that if it is engaged by a bar or other rigid moving piece that slides on the incline of the same until the shoulder is depressed, the lower edge of the limb *h*′ of the dog will have contact with wire which may be introduced between it and the bottom surface of the slot in the shuttle-case.

The wire for forming the staple is wound on the revoluble reel G, which is fastened to the side of the shaft-box B. The end of the wire is inserted through the perforation 1 in the side of the rim *c*, and then between the clamping-dog *h* and the shuttle-case. As will be explained in proper sequence, the shuttle F² is moved forward by the spring-bar H, that receives motion from the shaft D. Said bar, engaging the shoulder *h*³, moves the shuttle forward in its groove until released by the elevation of the bar, when its end engages the sloping abutment *i*, which projects inwardly from the curved bracket-plate *i*′, that is secured to the rim *c* of the casing C, as shown, and it is evident that the pressure of the spring-bar H will depress the short limb of the clamping-dog *h* and cause it to bite upon the wire strand to move it forward. In order to retract the shuttle after it has been released at the termination of its forward movement, a volute spring *k* is secured in an excavation made in the segmental plate F to receive it. The free end of this spring engages a stud *k*′, that extends toward it from the inner side of the shuttle-case. Thus the spring is uncoiled when the shuttle is moved forward, and its retractile force drives shuttle F² back till it strikes the shoulder *f* of the slot, in which it slides when the shuttle is released from the spring-bar H.

The wire-cutting device that severs a proper length of wire which has been projected through it is placed between the abutment *i* and the adjacent edge of the slideway 2, formed between the plates F F′. It consists of a block *m*, which is secured to the corner of the plate F, and has a jaw *m*′ hinged to vibrate on the block, so that its inclined cutting-edge *m*², when vibrated, will bear closely against the side of the block and cut the wire strand that is fed forward by the shuttle, said wire entering the hole *m*³, drilled through the block *m* in alignment with the lower face of the groove *d* in the shuttle-case. The pivoted jaw *m*′ is actuated by a spring 4, that is compressed when the jaw is depressed to cut the wire, and by its resilience throws the jaw to its normal position when pressure on the jaw is removed. On the curved bracket-plate *i*′, near the abutment *i*, a small projecting finger *i*² is pivoted, so as to lie above the jaw *m*′ and have engagement therewith when the spring-bar H is moved over it and presses on the top surface of the finger *i*², a stud *i*³ projecting from the bracket-plate *i*′, above the pivoted finger *i*², to enforce such an action. Within the central circular recess 5 a hub-plate I is seated, which is provided with a projecting hub or boss 6, that is of a diameter to engage the cam-plate N. The hub-plate I is slotted through its center from its inner face of a width equal to that of the guide-slot 2, and is held in place to align its slot there-

with by screws inserted through the casing C. Within the slot 2, as a guideway, the fabric-piercing awls, the staple-bending jaws, and the wire-holding clamps are located, all being actuated in harmony to produce a staple, insert it in yielding fabric, and clinch it by the revolution of a cam-plate that is provided with cam-grooves which engage these different parts of the combined device, so as to actuate them at proper instants relatively to effect the desired result.

The two outer guide-bars 8 are held spaced apart a proper distance and parallel to each other by a cross-bar 9, which is placed at the lower end of these spaced and joined bars, that answer the twofold purpose of guides for a staple-former that slides between the bars and a carrier for two piercing-awls *w*, which project from the upper ends of plate-springs *w'*, these latter being located in recesses formed on the inner surface of the guide-bars 8, of sufficient depth to permit a proper embedding of the plate-springs therein. The plate-springs *w'* are duplicates of each other and have inwardly-sloping inclines w^2 formed near their upper ends, in which the awls *w* are fastened to project therefrom a suitable length to pierce fabric which is to be joined by the staples as they are formed and clinched.

Between the guide-bars 8, and having a neat sliding fit therewith, the staple-former L is inserted. This is made of two strips L', that are held parallel and spaced a proper distance apart by a block or short plate 10, affixed between them at their lower ends to permit a free sliding movement between them of the gripping-tongs M, as will presently be described.

The strips L' are cut away on their top edges to reduce their height, thus producing square offsets or shoulders 11 12 near each end of the strips that act as slide-bars. The portions of said strips that project above the upper shoulder 11 constitute the staple-former, and to this end their inner surfaces are grooved longitudinally, as at 13. These grooves commence at a point near the upper offset shoulder 11 and extend parallel to each other to the terminals of each strip end, they being intended to receive the wire staple-legs as the ends of the strips bend the wire blank into staple form. This will be more fully detailed when the operation of the machine is explained.

Within the space intervening between the two strips L' of the staple-former L the staple-gripping tongs M is adapted to slide when actuated by proper means. The rear jaw 14 of said clamp is constructed with offset portions 15, that overhang the sides of the jaw, and are thus made to rest and slide on the outer surface of the reduced portions of the strips L' of the staple-former L, this movement being between the shoulders 11 12, cut on said strips, as has been explained. It will be seen that the length of the overhanging parts 15 is such proportionately to that of the strips between the shoulders that a limited endwise movement of the wire-clamping jaws 14 16 of the gripping-tongs M is allowed. The overhanging pieces 15 of the rear jaw 14, from their attachment upon the upper edge of the rear portion of said jaw, afford a space between them of sufficient length and width to receive the outer jaw 16, which is pivoted therein, to vibrate, its projecting limb or gripping end 18 having a lip 19 formed on the extremity thereof, which projects from the edge and mates a notch cut on the adjacent edge of the rear jaw 14, the use of which will be made apparent.

On the front surface of the guide-bars 8, staple-former L, and connected gripping-tongs M, near the lower ends of the same, projecting studs 20 21 22 are respectively affixed, these studs being of suitable diameter and height to receive loose anti-friction collars 23, which enter grooves made in the adjacent face of the cam-plate N, said plate being perforated centrally to engage the projecting hub 6 of the plate I and revolve on it as a bearing. Of the grooves just mentioned the outer one 24 is cut in cam form to receive the stud 20, which is on the end of the guide-bars 8, this groove being intended to give a quick thrusting-movement to the awls *w* and retract them immediately, this motion being effected once in the revolution of the cam-plate N. The next groove 25 receives the stud 21, and has a cam 26 formed at about ninety degrees distance from the cam 24, said cam 26 giving an upward movement of the staple-former at a proper instant of time to bend a length of wire which has been fed forward and cut off. The third cam-groove 27, in which the stud 22 is located, gives a reciprocal vertical movement to the staple-gripping clamp M, the outer jaw of which is provided with a lip or short beveled flange *y*, which is formed on its lower end so as to be successively brought into contact with the two sloping and projecting abutments *y' y²*, formed on the concentric rib *z*, which is adjacent to the end of the hub 6, so that at each revolution of the cam-plate N the jaws of the clamp M will be opened twice at proper instants of time that are harmonious with the reciprocal movement vertically of these jaws by the action of the cam 27.

At a proper point between the abutments *y' y²* the radial spring-bar H is fastened, which projects from the peripheral edge of the cam-plate N to engage the shuttle-case and wire-cutter, as has been previously explained, this spring-bar being sufficiently elastic to spring outwardly, but having proper rigidity edgewise.

It should be hero mentioned that the hole drilled in the block *m* of the wire-cutter to receive the staple-wire that is fed forward by the clamping-jaw of the shuttle F^2 is directly opposite the notch formed on the rear jaw 14 of the staple-clamp M, so that the staple-blank

which is fed through this hole lies within the open jaws 14 16 of said staple-clamp, the ends of the blank, when it is severed from the coil, extending an equal distance on each side of the jaws to form staple-legs of equal length.

On the front end of the driving-shaft D the spur-pinion D^4 is mounted, which is held in place by a jam-nut d^4 or other means, this pinion having meshing engagement with the mating gear-wheel D^5, that is attached to the outer surface of the cam-plate N, so that a revolution of the shaft D will rotate the cam-plate.

The lever E, which has been previously mentioned as being pivoted to vibrate on the arm A, has a clinching-anvil E′ formed on its free end, that is given a position immediately above the staple-gripping clamp M. It is so timed by the adjustment of the eccentric D^2, which vibrates it, that it will be in an elevated position when the other working parts are adjusted to receive the material in which staples are to be set. To the pin a^2 of the crank-disk D′ a pitman may be loosely secured at its upper end, the lower end of the same being attached to a treadle that may be operated by the foot of the operator, or a pulley may be substituted for the crank-disk D′ and other than manual power be employed to drive the machine, in an obvious manner.

The staple forming and setting device herein described is applicable for many different purposes, but the immediate use contemplated is to secure the sweat-bands of hats or caps in place on the bodies of such head-coverings.

In use the staple-machine being adjusted to receive a hat-body it is placed upon the casing C, as a table, with the rim of the hat projecting rearwardly below the clinching-anvil E′, the sweat-band being temporarily held in place by pins or other means. A partial revolution of the cam-plate will first project upwardly above the rim c of the casing C. The two awls w when retracted are spread apart by the inclines w^2, and as they are forced upwardly during the first part of the stroke of the guide-bars on which they are mounted the springs w' will as they pass the ends of the staple-former L be drawn together by their tension, so that they will stand parallel and thus hold the awls similarly, to be thrust through the fabric by the completion of the upward stroke effected by the cam-groove 24, with which the stud on the guide-bars 8 is engaged. As soon as the awls have pierced the fabric, they will be drawn down by the cam-groove 24, that has projected them. The spring-bar H is now engaging the clamping-dog h of the shuttle F^2 and has reached the shoulder h^3 on the same, the other parts being still in retracted position. The continuation of revoluble movement of the cam-plate N will now cause the dog h to bite on the staple-wire, which has been introduced below it in the shuttle-case, and as the spring-bar H moves onward the shuttle will move in its circular track and carry the wire along with it. When the shuttle has made its stroke and been released by the engagement of the actuating spring-bar H with the sloping abutment i that raises it and allows the volute spring k to retract the shuttle-case, the clamping-dog h will loosen its hold on the wire instantly, and the next revolution of the cam-plate N will again repeat the clamping operation and move the wire across the space above the staple-clamp M and through its open jaws, they being at this time held open by the contact of the lip y with the abutment y', which is of sufficient proportionate length to retain the jaws 14 17 in open adjustment while the wire is being fed forward to furnish a staple-blank. As soon as the staple-blank is in the position named, the wire-cutter will instantly sever the wire, and at the same instant the jaws of the staple-clamp M will be closed by action of a spring that enforces the closure of the outer pivoted jaw 17 of said clamp when in normal position, or unacted upon by the abutments y' y^2 of the cam-plate N. Coincident with the closure of the jaws 14 17 of the staple-clamp M, the grooved plates of the staple-former L will be upwardly moved by its respective groove of the cam-plate, the parallel channels cut in the upper ends of this staple-former engaging the body of the wire staple-blank, and instantly bending it into staple form, the bend or loop of the staple being held in the notched jaw of the staple-clamp M. The parallel plates of the staple-former L are now in close contact with the material into which the staple is to be inserted, and to prevent displacement it should be stated that the clinching-anvil E′ is lowered by action of the eccentric D^2 to press on the goods, so that this fabric is held between the staple-former L and the anvil E′ at this stage of the operation. The staple is now elevated and driven into the pierced holes made by the awls by the upward movement of the staple-clamp M, the actuating-cam of which comes into operation at this time. When the staple has been fully inserted, its ends are forced in contact with the face of the anvil E′, which may be slightly channeled to bend the limbs of the staple inwardly or turn them toward each other. The staple-former L is now drawn down and the clamping-jaws 14 17 opened for an instant. At the same time these jaws are lowered sufficiently to withdraw them from the inserted and partially-clinched staple. The cam-groove which actuated the staple-clamp M is so formed that it repeats the upward movement of the staple-clamp after the jaws of the same have released the staple, as stated. These jaws now close, and the staple-clamp M becomes a hammer-bar which abuts forcibly against the bow end of the staple and, coacting with the anvil E′, clinches the staple securely in the sweat-cloth and hat-body to unite these pieces firmly together.

It is apparent that the operation of form-

ing, inserting, and clinching any number of staples may be rapidly and successively effected by moving the fabric properly to space them, and causing a revolution of the cam-plate N, as hereinbefore explained.

Many slight changes might be made in the form and arrangement of parts composing this machine and yet be within the legitimate scope and spirit of my invention; hence I do not desire to be restricted to the exact form and combination of parts herein shown, but,

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a staple forming, setting, and clinching machine, the combination, with a casing, of piercing-awls, a staple-former, and a staple-clamp, the several parts being constructed and arranged to reciprocate in a single slot, and adapted to pierce the fabric and form and set the staples, substantially as set forth.

2. In a staple forming, setting, and clinching machine, the combination, with a casing having a slot, of a pair of awls adapted to slide in the slot on guide-bars, a staple-former that is located between the awls and their supporting-bars, and a staple-clamp that slides between the strips of the staple-former, substantially as set forth.

3. In a staple forming, setting, and clinching machine, the combination, with a casing having a slot, staple forming, setting, and clinching mechanism located in this slot and adapted to slide therein, of a wire-feeding device and a wire-cutting device that coact together and also with the staple forming, setting, and clinching devices to automatically form a staple of wire, set it in fabric, and clinch it there, substantially as set forth.

4. In a staple forming, setting, and clinching machine, the combination, with a casing and a support therefor, of staple forming, setting, and clinching devices located in a slot of the casing so as to slide in it, staple-wire-feeding mechanism and a wire-cutting device, also supported on the casing, and means to operate these devices and mechanical parts in harmonious relation to each other, so as to feed a blank of wire, sever it from a roll, form it into a staple, pierce holes in fabric to receive it, set it in these holes, and clinch it there, substantially as set forth.

5. In a staple forming, setting, and clinching machine, the combination, with a pair of awls mounted on guide-bars to reciprocate and pierce fabric, and an adequate support for these guide-bars that will permit them to slide vertically, of a staple-forming device, which is adapted to slide between the guide-bars that carry the awls and bend a staple into proper form to enter the pierced holes, substantially as set forth.

6. In a staple forming, setting, and clinching machine, the combination, with a casing, of guide-bars supported to slide in this casing and awls that are spring-mounted on the guide-bars and adapted to be spread apart by pressure and return to normal position when the cause of divergence is removed, substantially as set forth.

7. In a staple forming, setting, and clinching machine, the combination, with a casing properly supported to receive fabric on its upper peripheral surface, of a wire-feeding device, a wire-cutting mechanism, a staple-former, a staple-clamp, two piercing-awls, and a staple-clinching device, all adapted to be moved in proper time with regard to each other, to feed a piece of wire, cut it off the proper length, bend it, pierce fabric, insert the bent staple in the fabric, and clinch it, substantially as set forth.

8. In a staple forming, setting, and clinching machine, the combination, with two guide-bars, of two plate-springs having inclines formed on their adjacent faces near their free ends, and two awls secured in these free ends, substantially as set forth.

9. In a staple forming, setting, and clinching machine, the combination, with a casing and two guide-bars, of two plate-springs, an awl affixed in the free end of each spring, inclines formed on the adjacent faces of the plate-springs near their free ends, and a staple-former that is located between the guide-bars, the ends of which engage the inclines and spread the awls apart when the guide-bars are retracted, substantially as set forth.

10. In a staple forming, setting, and clinching machine, the combination, with a wire-feeding device that may reciprocate on the edge of a circular casing, a wire-cutting device that severs the proper length of wire for a staple, and means to move these devices harmoniously, of two guide-bars, two plate-springs located in recesses of the guide-bars, each spring having an inclined surface formed near its free end to engage a staple-former and be spread apart, a staple-former which slides between the guide-bars, and a clamping device that slides within the side plates of the staple-former, all operated by a cam-plate, substantially as set forth.

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

JOHN CHANTRELL.

Witnesses:
JOHN H. REILEY,
STEPHEN M. MEREDITH.