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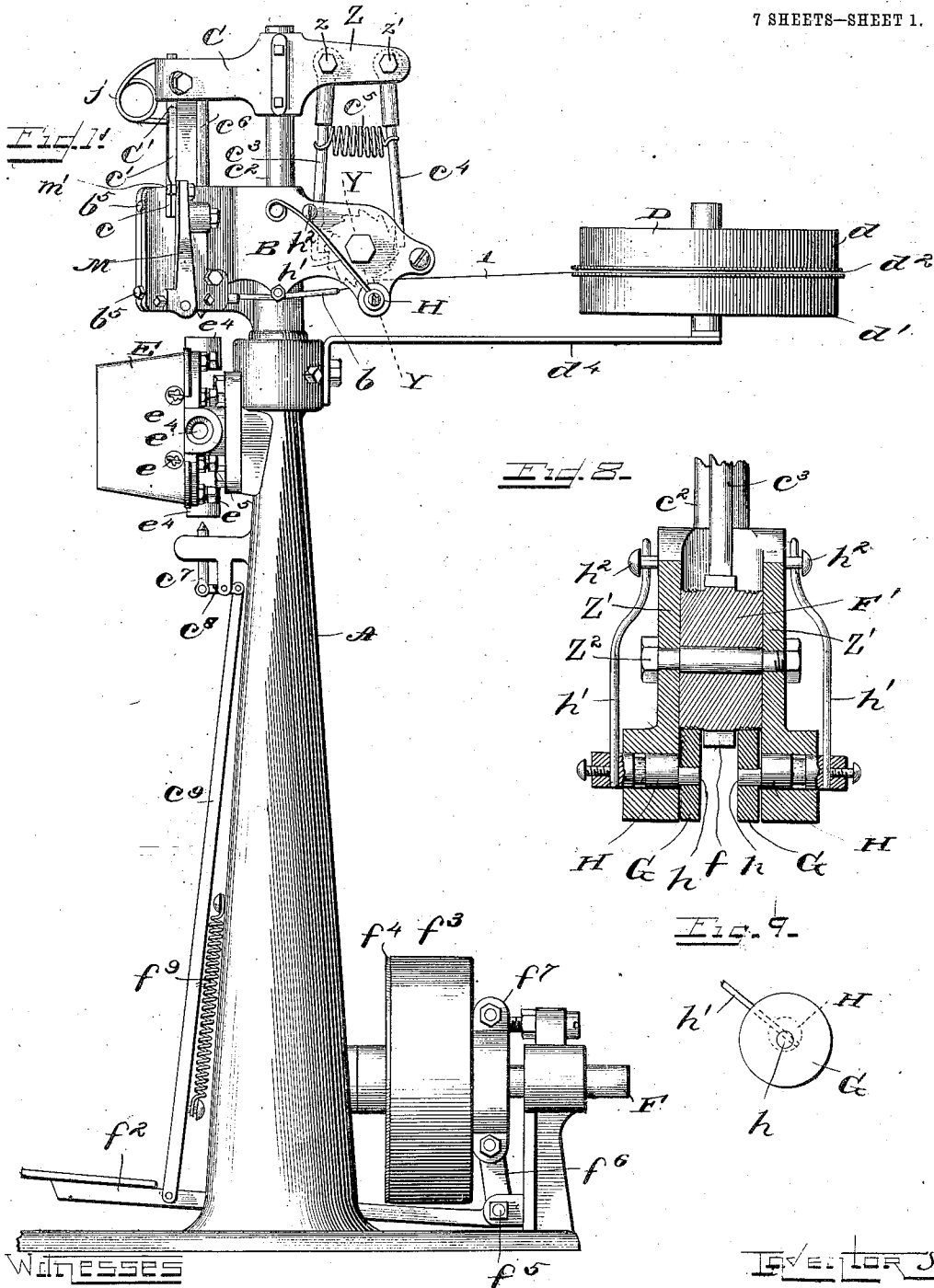
PATENTED AUG. 14, 1906.

W. H. RAY & E. CRAIG.

STAPLING MACHINE.

APPLICATION FILED NOV. 20, 1901.

7 SHEETS—SHEET 1.



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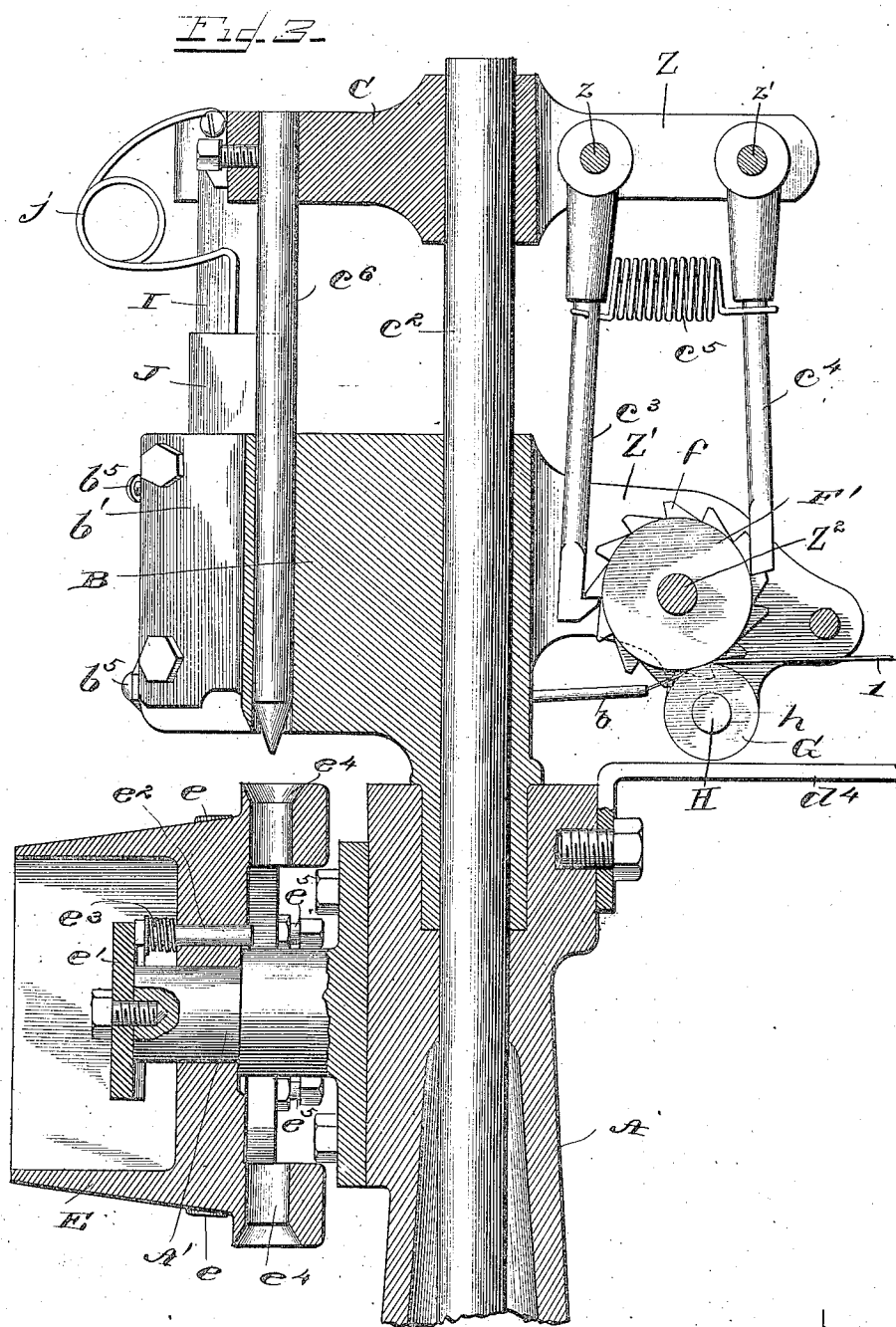
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7 SHEETS—SHEET 3.



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7 SHEETS—SHEET 4.

Fig. 4.

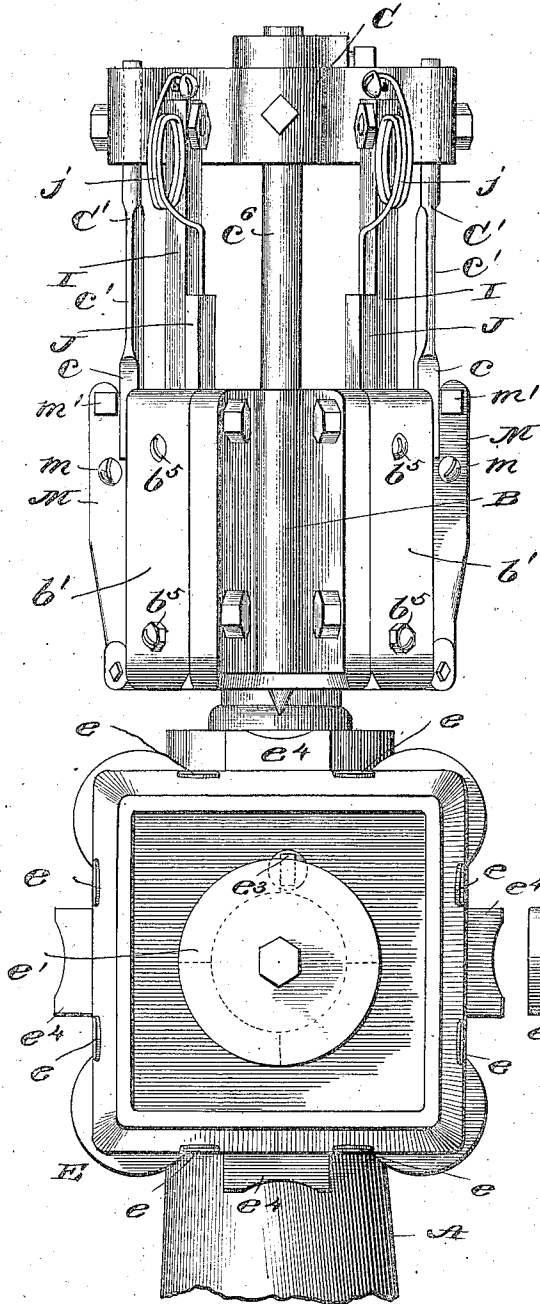


Fig. 5.

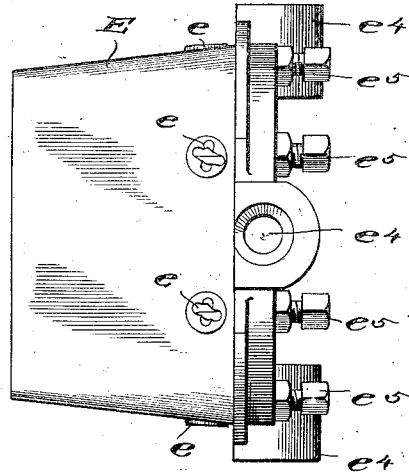
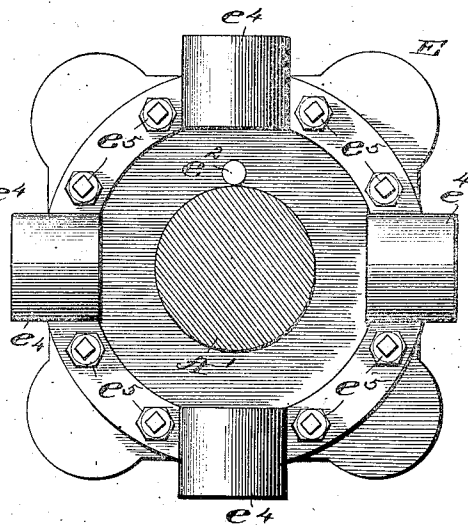


Fig. 6.



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Fig. 11.

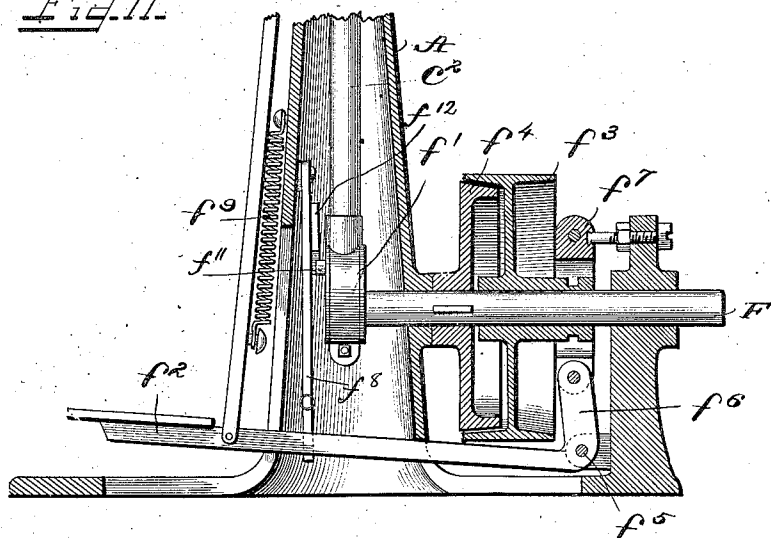


Fig. 12.

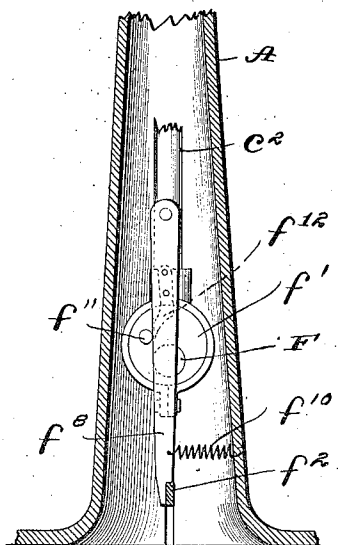
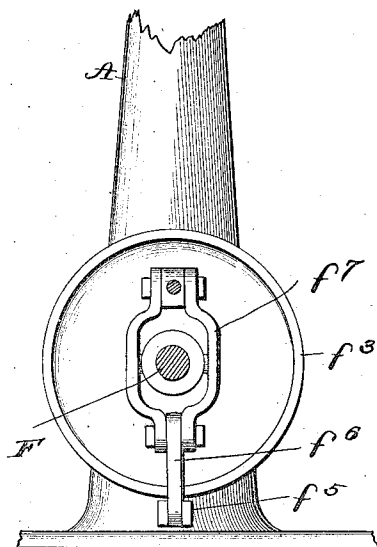


Fig. 13.



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Fig. 17-

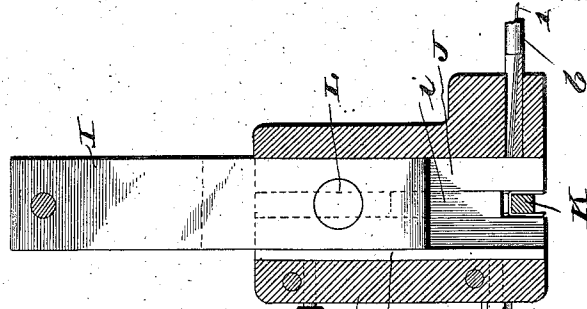


Fig. 18-

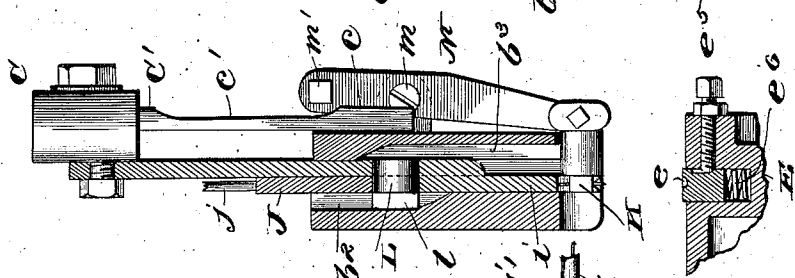


Fig. 15-

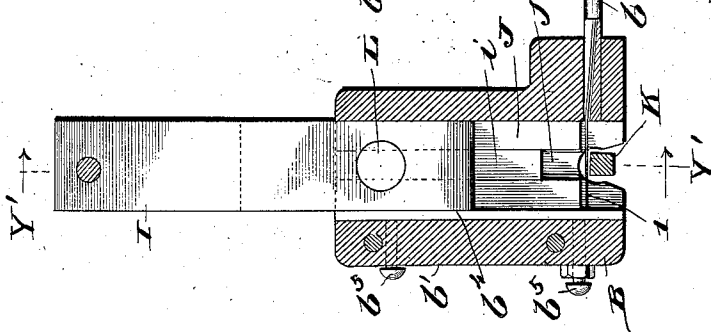


Fig. 14-

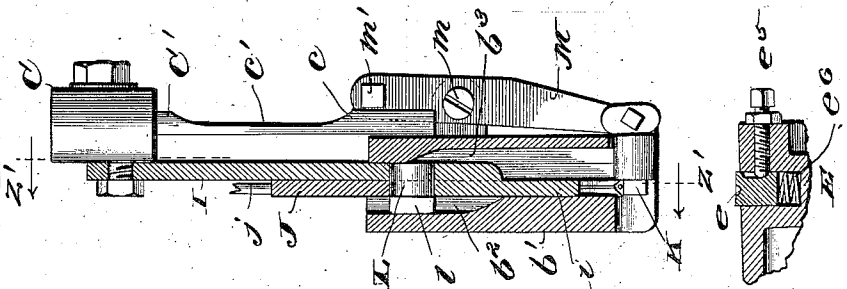
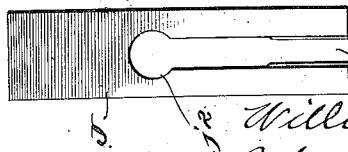


Fig. 22-



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Fig. 21.

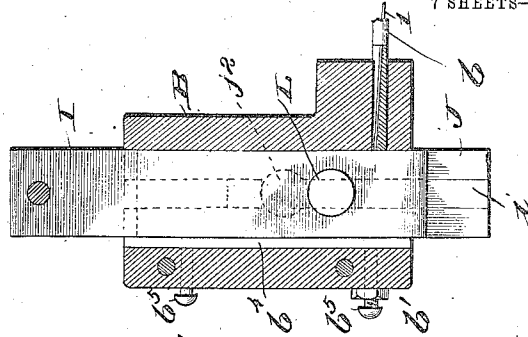


Fig. 20.

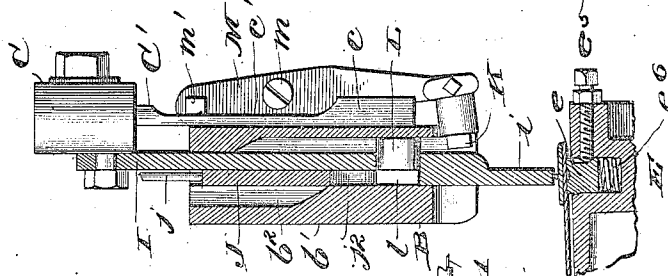


Fig. 19.

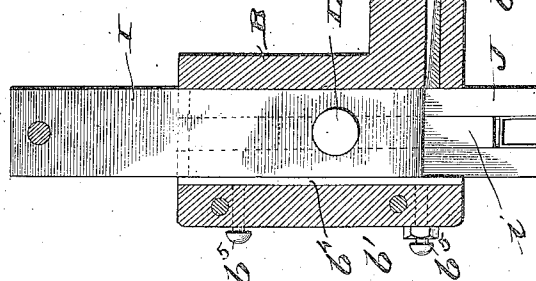


Fig. 18.

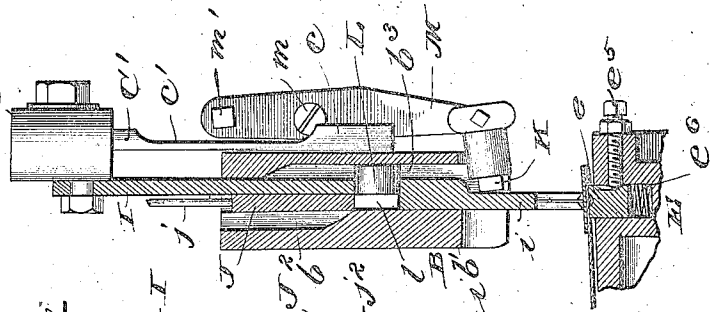
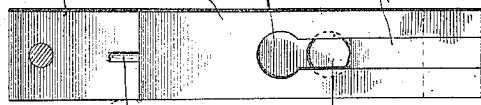


Fig. 22.



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UNITED STATES PATENT OFFICE.

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STAPLING-MACHINE.

No. 828,569.

Specification of Letters Patent.

Patented Aug. 14, 1906.

Application filed November 20, 1901. Serial No. 82,991.

To all whom it may concern:

Be it known that we, WILLIAM H. RAY and EDWARD CRAIG, citizens of the United States, residing at St. Joseph, county of Berrien, State of Michigan, have invented a certain new and useful Improvement in Stapling-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

Our invention relates to stapling-machines in general, but particularly to machines for stapling fruit boxes and baskets, and especially to machines capable of driving a plurality of staples.

Objects of our invention are to provide a simple, an easily-operated, and a highly-efficient stapling-machine; to simplify the operation of stapling fruit boxes or baskets; to provide improved means for forming and driving the staples; to provide improved means for feeding the wire; to insure accuracy and certainty in the forming and driving of the staples; to improve the arrangement and action of the loop-bars; to provide an improved rotary form for holding the box or basket; to provide means for automatically locking the form against rotation, and to provide certain details and features of improvement tending to render a machine of this character serviceable and thoroughly reliable.

To the attainment of the foregoing and other useful ends our invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a stapling-machine embodying the principles of our invention. Fig. 2 is a plan of the same. Fig. 3 is a vertical section on line $x x$ in Fig. 2. Fig. 4 is a front elevation of the upper portion of the machine. Fig. 5 is a top view of the rotary form. Fig. 6 is a rear view of the same. Fig. 7 is a detail view of the ratchet-wheel which locks the rotary form against back rotation. Fig. 8 is a section on line $Y Y$ in Fig. 1, illustrating the feed mechanism. Fig. 9 is a view of one of the lower feed-rolls. Fig. 10 is a vertical section through one of the reels for holding the wire. Fig. 11 is a vertical section of the lower portion of the machine, illustrating the clutch and locking mechanism. Fig. 12 is a vertical section of the

lower portion of the machine. Fig. 13 is a side elevation of the friction-gearing. Figs. 14 and 15 illustrate the mechanism for forming and driving the staples, the first being a section on line $Y' Y'$ in Fig. 15, the latter being a section on line $Z' Z'$ in Fig. 14 and the different parts being in position to cut and bend the wire into a staple. Figs. 16 and 17 are similar views showing the parts moved to a position in which the wire is bent into a staple over the loop-bar. Figs. 18 and 19 illustrate the parts in position to drive the staple into the basket. Figs. 20 and 21 show the staple driven into the basket. Fig. 22 is a view of the staple-former. Fig. 23 is a front view of the staple-former and the driver, the relative positions being the same as in Fig. 21. Fig. 24 is a perspective of the staple-former. Fig. 25 is a perspective of the driver.

As thus illustrated, our invention comprises in general an upright support or standard A, a stationary head B, a vertically-reciprocating head C, a couple of reels or spools D, a rotatable form E, and a rotary shaft F, the latter having suitable connection with the said reciprocating head. The stationary head B is mounted upon the upper end of the standard A, and its front portion overhangs the rotatable form E. The rear portion of the said stationary head is provided with the upper and lower feed-rolls, the upper roll F' being provided with ratchet-teeth f and the lower rolls G being mounted upon pins H. These pins are provided with short reduced inner end portions h , and the outer ends of said pins are provided with springs h' . By referring to Figs. 8 and 9 it will be seen that the said portions h are eccentric to the body portions of the pins—that is to say, that the axes of the pins are not coincident with the axes of the rolls which rotate upon the portions h —and consequently that by rotating said pins the lower rolls can be made to move to or from the roll F' , the springs h' , which engage the screws h^2 , tending to hold the rolls G against the under side of the upper roll F' . The wire from which the staples are formed is led in two parallel strands from two reels or spools D and passing from the feed-rolls is forced through guide-tubes b to the forward end of the head.

Our invention being what we term a "double-head" machine—that is to say, a machine capable of driving two staples at a time—the forward portions of the two heads are therefore made double, or, in other words, provided with duplicate mechanisms for forming and driving the staples. Depending from the forward portion of the reciprocating head C are a pair of drivers I, which reciprocate in boxes *b'*, formed at the forward end of the head B. The staple-formers J, which cooperate with the loop-bars K in forming the wire into suitable staples, are connected with the head C by means of springs *j*. These staple-formers lie flat against the drivers, are each provided with a slot *j'*, which terminates in a circular opening *j''*. Each driver is provided with a portion *i*, which slides in the slot *j'*, and each driver is also provided with an opening *i'*, corresponding to the opening *j''*. Each staple-former is locked to its adjacent driver by means of a pin L, which extends through the openings *j''* and *i'*. These pins are each formed with a flattened inner end portion *l*, adapted to slide in the slot *j'* in the staple-former, and during the reciprocation of the head C these pins have shuttle-like movements, caused by the grooves *b''* and *b'''*. The loop-bars K are removably secured to the lower ends of the levers M, the said levers being pivoted at *m* and provided at their upper ends with lugs *m'*.

The head C is shown at the limit of its up-stroke, and in this position the loop-bars are maintained in position beneath the wire *l* by the pawls C', which depend from the head C and which are each formed with a relatively thick portion *c* and a relatively thin portion *c'*. As will be observed, these pawls are so positioned that they slide up and down between the sides of the boxes *b'* and the lugs *m'*, the relatively thick portions *c* serving as wedges to crowd the upper ends of the levers M outward, so as to place the loop-bars in position to support the wire, and the relatively thin portions *c'*, permitting the said bars to swing back out of the path of the drivers. The two boxes *b'* *b'* are each provided with a plate *b''*, which bears against the driver and the staple-former and which serves as a means for taking up wear, the plate being backed by adjusting-screws *b'''*. The head C is mounted upon the upper end of the rod *c'*, which extends downwardly through the head B and the standard A and which is suitably connected at its lower end with an eccentric *f'* on the shaft F. The feed-roll F' is intermittingly rotated by the pawls *c''* and *c'''*, which depend from the rear portion of the head C and which engage the ratchet-teeth *f*, it being observed that with this double-pawl arrangement the feed-roll receives a partial rotation both on the up and the down stroke of the head. In this way the wire is

fed accurately and without danger of slipping. A coil-spring *c''* serves to keep the pawls in engagement with the teeth *f*.

The form E is adapted to hold the box or basket to be stapled and is arranged directly below the forward portion of the head B. This form is mounted upon an arbor A', which projects from the upper end of the standard A. In this way the form is supported for rotation about a horizontal axis, so as to permit the four sides of the basket to be successively brought into position for stapling. Each face or side of the form is provided with a pair of clench-blocks *e*, which are located at the points where the staples are driven through the basket, and upon which the staples are clenched by the pressure of the drivers. (See Fig. 20.) The form rotates to the right, and as a simple and effective device for preventing rotation in an opposite direction we mount a disk *e'* on the end of the arbor and provide the form with a pin *e''*, which is held in engagement with the teeth on the inner face of the disk by means of a spring *e'''*. These teeth are four in number, and the ratchet device thus provided enables the operator to properly position the form—that is to say, enables him to turn the form so as to successively bring its four sides or faces into a horizontal position beneath the driver. In order to prevent the form from turning during the clenching of the staples, we provide the said form with sockets *e''*, adapted to receive the locking-pin *c''*. This pin is carried by the head C, and each time the head descends the pin enters one of the said openings or sockets in the form. A second and similar pin *c'''* is arranged beneath the form. This second pin is also adapted to engage in the openings or sockets in the form and is operated by the foot-lever or treadle *f''* through the medium of the lever *c''* and the rod *c'''*. When the lever *f''* is depressed, the pin *c'''* enters a socket in the form. The clench-blocks *e* are preferably removable and are held in place by set-screws *e''*.

The reels or spools D may be of any suitable form and construction, but preferably consist of upper and lower members *d* and *d'*, the wire being wound upon the latter and the former serving as a cover. The relative formation of the two members is preferably such that the reel is provided with an annular peripheral slot *d''*, through which the wire is drawn from the interior of the spool. Each spool or reel is mounted for rotation upon an upright stud or arbor *d'''*, secured to the outer end of the bracket *d''*.

The pulley *f''* is loosely mounted upon the shaft F, while the friction-cone *f'''* is keyed or otherwise secured thereon. The foot-lever *f''* is fulcrumed at *f'''*, and its short arm *f''''* is connected with a collar or yoke *f''''*, which engages the hub of the pulley. With this arrangement a depression of the foot-lever will

cause the pulley to shift and engage the cone, thereby rotating the shaft F and causing the head C to reciprocate by reason of its connection with said shaft. It is desirable, however, that the rotation of the shaft be automatically interrupted, so as to stop the reciprocation of the head long enough to permit the operator to turn the form, and for this reason we provide a swinging latch f^8 , which has its lower end adapted to engage the lever f^2 . The lever f^2 is held normally raised by a spring f^9 , and a spring f^{10} holds the latch against the side of said lever. When depressed, the lever engages the notch in the lower end of the latch, and in this way the pulley is locked in engagement with the cone until the pin f^{11} on the eccentric-cam strikes the bevel f^{12} on the lever, and thereby forces the latter to one side. With this arrangement the operator can start the machine by pressing down the treadle or foot-lever, and when the head C has descended and the staples have been driven home and the head has regained its normal or elevated position the machine will then be automatically stopped in order to give the operator time to turn the form, the stoppages always occurring at a time when the head is at the limit of its upstroke. It will be seen, therefore, that in order to staple the four sides of an ordinary berry-basket it will be necessary to press the lever four times.

The operation of stapling a basket is as follows: The blanks and hoops are first adjusted in place upon the form, and the operator then depresses the foot-lever, thereby locking the form and starting the head C on its downward movement. The downward movement of the head causes the drivers and the staple-formers to descend in unison, being locked together by the pins L, and each former as it moves downward cuts off a length of wire and bends it into a staple over the loop-bar. (See Figs. 14 to 17, inclusive.) The drivers and staple-formers continuing to descend, each pin L is shifted by reason of its end striking the bevel at the end of groove b^2 , and this shuttle-like movement on the part of the pins operates to release the staple-formers from the drivers, the flattened portions of l the pins being now in position to slide downward in the slots j . The relative position of the drivers, staple-formers, and loop-bars at this point in the operation is substantially as shown in Figs. 18 and 19, from which it will be seen that the staple-formers are resting upon the hoop of the basket, that the drivers are in position to drive the staples into the basket, and that the loop-bars have been pushed out of the way by the descending drivers, the relatively thin portion c' of the pawls C permitting the levers M to swing out at their lower ends. Further downward movement on the part of the head will now cause the

drivers to descend to the full limit of their downward stroke, thereby forcing the staples home and clenching them on the clench-blocks e , it being observed that during this final downward movement on the part of the drivers the staple-formers remain stationary, and consequently that the springs j are compressed. Having reached the limit of its downstroke, the head now begins to rise. The upward movement of the head causes the drivers to rise also, the pressure of the springs j holding the staple-formers down until the pins L are brought opposite to the openings j^2 . At this juncture the bevel at the end of each groove b^3 forces the pin back into the said opening j^2 , and the drivers and staple-formers then rise together. It will also be seen that this return of the head to its normal position operates to return the loop-bars to their operative positions below the drivers, the relatively thick portion c of the pawls crowding the upper ends of the levers M outward. When the head reaches the limit of its upstroke, the machine is then automatically stopped by the automatic release of the clutch (previously described,) and the operator can then turn the form so as to present another side of the basket.

With further reference to the rotary form E, and clench-blocks e it will be observed that each of the latter is supported by a coil-spring e^1 . These springs are adapted to resist the pressure of the drivers to an extent sufficient to insure the clenching of the staples. In case, however, the stock or material is thicker than necessary the said springs would yield, and thereby prevent breakage. Such yielding on the part of the springs and the clench-blocks will also prevent the drivers from crushing or mutilating the stock in case the latter is, as stated, thicker than necessary. In other words, the springs thus arranged and applied enable the machine to automatically adjust itself with respect to variations in the thickness of the stock.

The pin L is in the nature of a locking device, alternately locking together the former and driver and unlocking them, and is, as previously explained, adapted and arranged for reciprocation in a guideway or passage extending transversely through said former and driver. It is therefore obvious that this feature of our invention is capable of more or less modification or change without departing from the spirit of our invention. For this reason we do not limit ourselves to the particular embodiment of our invention which we have shown and described, and by "an absolutely and relatively fixed axis for the rotary form" we mean an axis which is not only fixed with respect to the structure of the machine as a whole, but also relatively to the form itself.

As illustrated, it will be seen that the two pawls c^3 and c^4 are carried or pivotally mounted on the two parallel upper reciprocating portions Z of the reciprocating head C. The pawl c^3 is pivotally mounted at z , while the pawl c^4 is pivotally mounted at z' . With this arrangement the lower ends of the two pawls, together with the feed-rolls, are conveniently embraced between the stationary parallel portions Z' Z', it being observed that the upper of said feed-rolls is preferably mounted upon a removable bolt Z². In this way only the upper feed-roll F is positively actuated, the two lower and independently-mounted feed-rolls G being merely idler-rolls. Such being the case the lower rolls are advantageously and effectively adjusted or moved toward and away from the upper roll through the medium of the eccentric-pins H, as previously explained. It will be readily understood that it is of course desirable to thus adjust the rolls relatively to each other in order that the necessary degree of grip on the wire may be insured—that is to say, the degree of grip necessary for feeding the wire.

As the two sets of devices for driving the two staples are arranged at opposite sides of the axis of the form, it is evident that one set balances the pressure of the other and that each counteracts the tendency of the other to rotate the form—that is to say, the two lines of thrust exerted by the staple-drivers pass at opposite sides of the axis of relative rotation. The different sides of the form are preferably equidistant from its axis.

The springs h' are of course adapted to be flexed laterally, so as to disengage their held ends, and thereby relieve the eccentric-pins from spring tension and permit the rolls to separate, the arrangement also permitting ready removal of the different parts.

As shown more clearly in Fig. 4, the two arms M M are mounted on the outside of the machine and out of the paths of the drivers, so that each anvil or loop-bar can swing by gravity out of the path of its associated staple-driver and so that the staple formers and drivers are between the two arms upon which the loop-bars or anvils are mounted.

What we claim as our invention is—

1. A stapling-machine comprising a reciprocating head; a staple-driver rigidly connected with said head; a staple-former having a yielding connection with said head; a pin extending transversely through the staple-driver and staple-former for the purpose of normally locking the two together; and means for reciprocating said pin and thereby alternately locking and unlocking the staple-driver and staple-former against relative movement, said means being adapted to alternately engage opposite ends of said pin.

2. A stapling-machine comprising a staple-driver; a staple-former having a slot; a reciprocating pin for normally locking the staple-

driver and staple-former against relative shift; means for reciprocating the staple-driver and staple-former, cams adapted and arranged to alternately engage the opposite ends of said locking-pin; said pin being provided with a flattened or reduced end portion adapted to traverse said slot in the staple-former.

3. A stapling-machine comprising a reciprocating head; a staple-driver rigidly secured thereto; a staple-former having a yielding connection with said head; a reciprocating pin carried by said staple-driver and adapted to alternately engage and release the staple-former; oppositely-arranged cams for shifting said pin, and a suitable loop-bar cooperating with the staple-former.

4. A stapling-machine comprising a staple-former and staple-driver and a loop-bar associated to cooperate in forming and driving the staples; a locking device arranged for reciprocation in said staple-former and staple-driver; and means arranged at opposite sides of said staple-former and staple-driver and adapted to engage said locking device for the purpose of reciprocating the latter in such manner as to alternately lock the staple-former and staple-driver together and unlock them.

5. A stapling-machine comprising a staple-former and staple-driver arranged for relative movement and each provided with a transverse opening; a locking device adapted and arranged to reciprocate in said openings; and cams arranged to alternately engage the opposite ends of said locking device, so as to reciprocate the latter and thereby alternately lock the staple-former and staple-driver together and unlock them.

6. A stapling-machine comprising reciprocating instrumentalities for forming and driving the staples, said instrumentalities including a staple-former and staple-driver, and a reciprocating pin for normally locking the same against relative movement; power-driven mechanism by which said instrumentalities are reciprocated through the medium of suitable power-transmitting connections; stationary oppositely-arranged cams for reciprocating said pin; means for manually causing said power-driven mechanism to reciprocate the driving and forming instrumentalities; an automatic locking device for locking and maintaining the said mechanism in a condition to reciprocate the said instrumentalities; and means for automatically stopping such reciprocation at the end of the second or return stroke, whereby said pin is automatically brought to a condition of rest in its normal position.

7. A stapling-machine comprising a reciprocating head, said head having a staple-former and staple-driver, and a reciprocating pin for normally locking the same against relative movement; a rotary shaft by which

said head is reciprocated through the medium of suitable power-transmitting connections; oppositely-arranged cams for reciprocating said pin at right angles to its bodily movement; a pulley loosely mounted upon said shaft; a friction-cone secured to said shaft; means for shifting said pulley into engagement with said cone for the purpose of rotating said shaft and thereby reciprocating said head; a locking device which automatically locks the pulley in engagement with the cone; and means for automatically releasing the pulley at the end of a complete revolution, whereby said pin is automatically brought to a condition of rest in its normal position.

8. A stapling-machine comprising a reciprocating head having a staple-former and staple-driver, and a reciprocating pin for normally locking the same against relative movement; a rotary shaft by which said head is reciprocated through the medium of suitable power-transmitting connections; oppositely-arranged cams for reciprocating said pin at right angles to its bodily movement; a clutch on said shaft; a foot-lever for operating said clutch, so as to start and stop the machine; a latch for automatically locking the lever and thereby maintaining a reciprocation on the part of said head; and a projection carried by said shaft and arranged to strike the latch and thereby release the lever at the end of a complete revolution of the said shaft, and at the end of the upstroke of the said head, whereby said pin is automatically brought to a condition of rest in its normal position.

9. A stapling-machine comprising a loop-bar; a staple-former adapted to cooperate with said loop-bar in reducing the wire to staple form; a staple-driver adapted to drive the completed staples; the staple former and driver being mounted for relative sliding movement; a short pin mounted for reciprocation in the staple-driver; a cam for forcing said pin into engagement with the staple-former to lock the staple-driver and staple-former together during the operation of forming a staple; and another cam adapted to engage the other end of said pin and thereby permit the staple-driver to slide relative to the staple-former during the operation of driving the completed staple.

10. A stapling-machine comprising stapling mechanism; a pair of feed-rolls for feeding the wire; an eccentric-pin upon which one roll is mounted; and spring means applied to said eccentric-pin, and adapted to yieldingly

prevent the latter from rotating, and whereby one roll is yieldingly presented to the other, said spring means consisting of a flexible and resilient member having one end secured to the said eccentric-pin, and the other end detachably held, whereby said spring may be flexed or sprung laterally to disengage its held end and thereby relieve the eccentric-pin from spring tension and permit the rolls to separate, as described.

11. A stapling-machine comprising stapling mechanism; a pair of feed-rolls for feeding the wire; an eccentric-pin upon which one roll is mounted; a spring having one end secured to said eccentric-pin, and a stop adapted to engage the free end portion of said spring; whereby the said pin is yieldingly prevented from rotating, and one roll is yieldingly presented to the other, said spring being adapted to be sprung laterally to disengage its held end and thereby relieve the eccentric-pin from spring tension and permit the rolls to separate, as described.

12. In a machine of the class specified, the combination of a staple-former J, a staple-driver I, an anvil K, a lever M, means for securing the anvil to the lower end of said lever, a pivot *m* for said lever, located at one side of the driver to make the anvil swing by gravity out of the path of the said driver, a projection *m'* on the upper end of said lever, above the said pivot, and a cam-finger *C'* having a cam *c* and a depression *c'*, said cam adapted to engage the said projection on the upper end of the lever to swing the anvil into place relatively to the said former.

13. In a machine of the class specified, the combination of staple-formers, staple-drivers, means for operating the same, a pair of arms M M, one at each side of the machine, on the outside thereof, anvils or loop-bars on the lower ends of said arms, cam-fingers *C'* for engaging the upper ends of said arms, to positively move the anvils or loop-bars into the paths of the staple-drivers, pivots *m* for said arms, located outside of the staple-drivers to permit said anvils or loop-bars to swing by gravity out of the paths thereof, and suitable means for supporting the work and resisting the thrust of said staple-drivers when the staples are driven.

Signed by us at Chicago, Cook county, Illinois, this 9th day of November, 1901.

WILLIAM H. RAY.
EDWARD CRAIG.

Witnesses:

WM. F. BENNING,
EDWARD C. SHEPARD.