

No. 672,353.

Patented Apr. 16, 1901.

N. E. BROWN.
BOX STAPLING MACHINE.

(Application filed Oct. 16, 1900.)

(No Model.)

3 Sheets—Sheet 1.

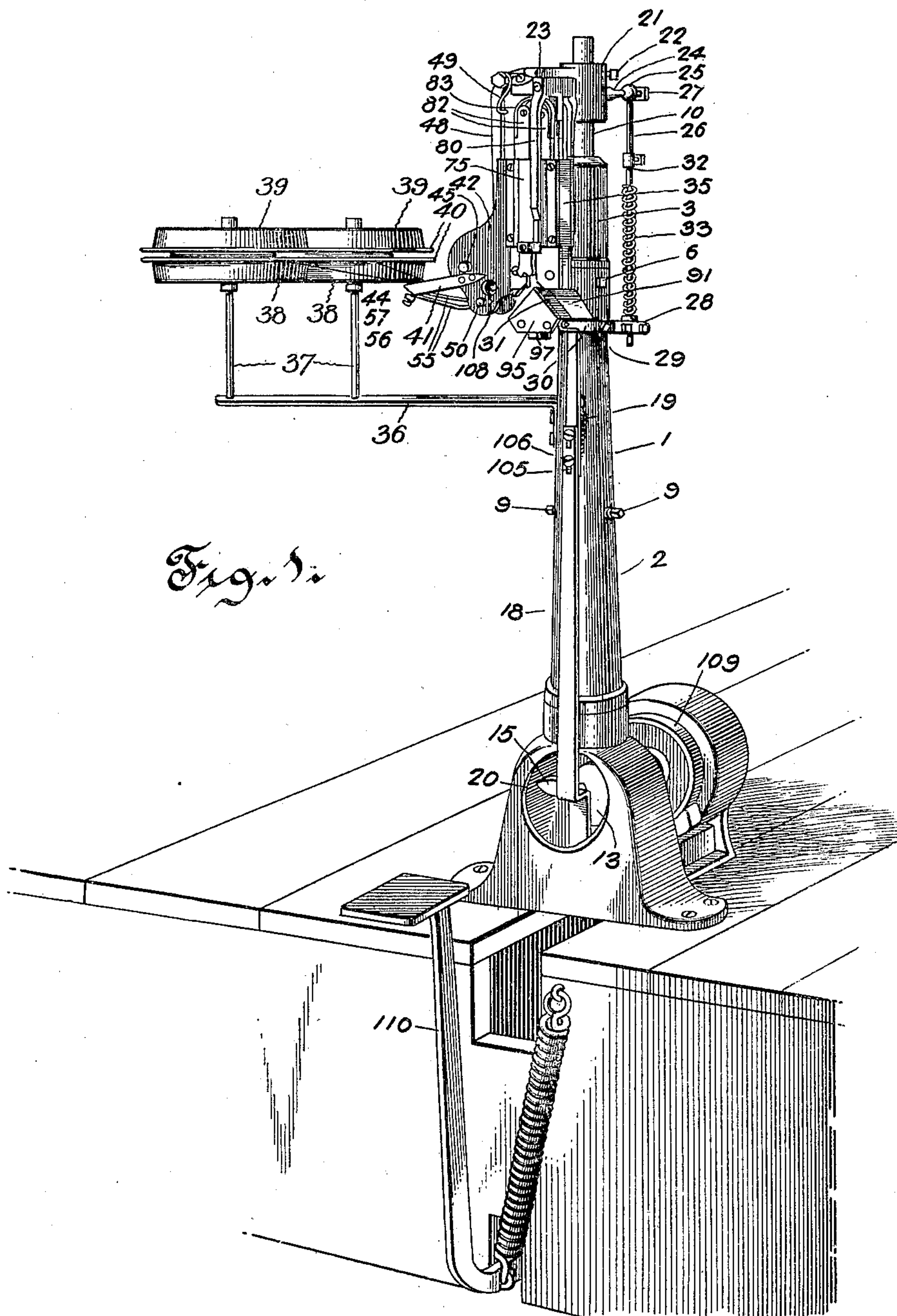


Fig. 1.

Witnesses

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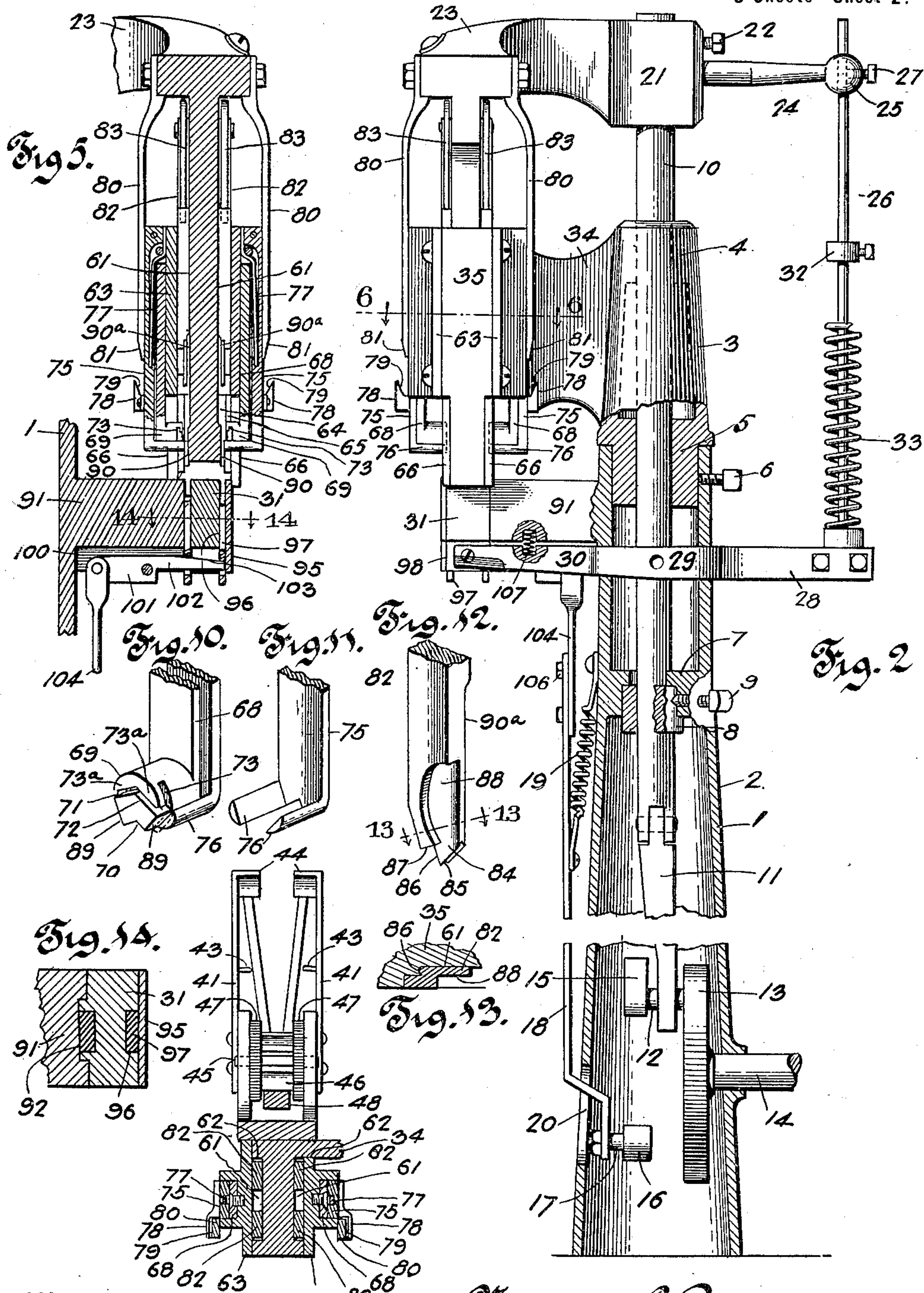
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3 Sheets—Sheet 2.



Witnesses

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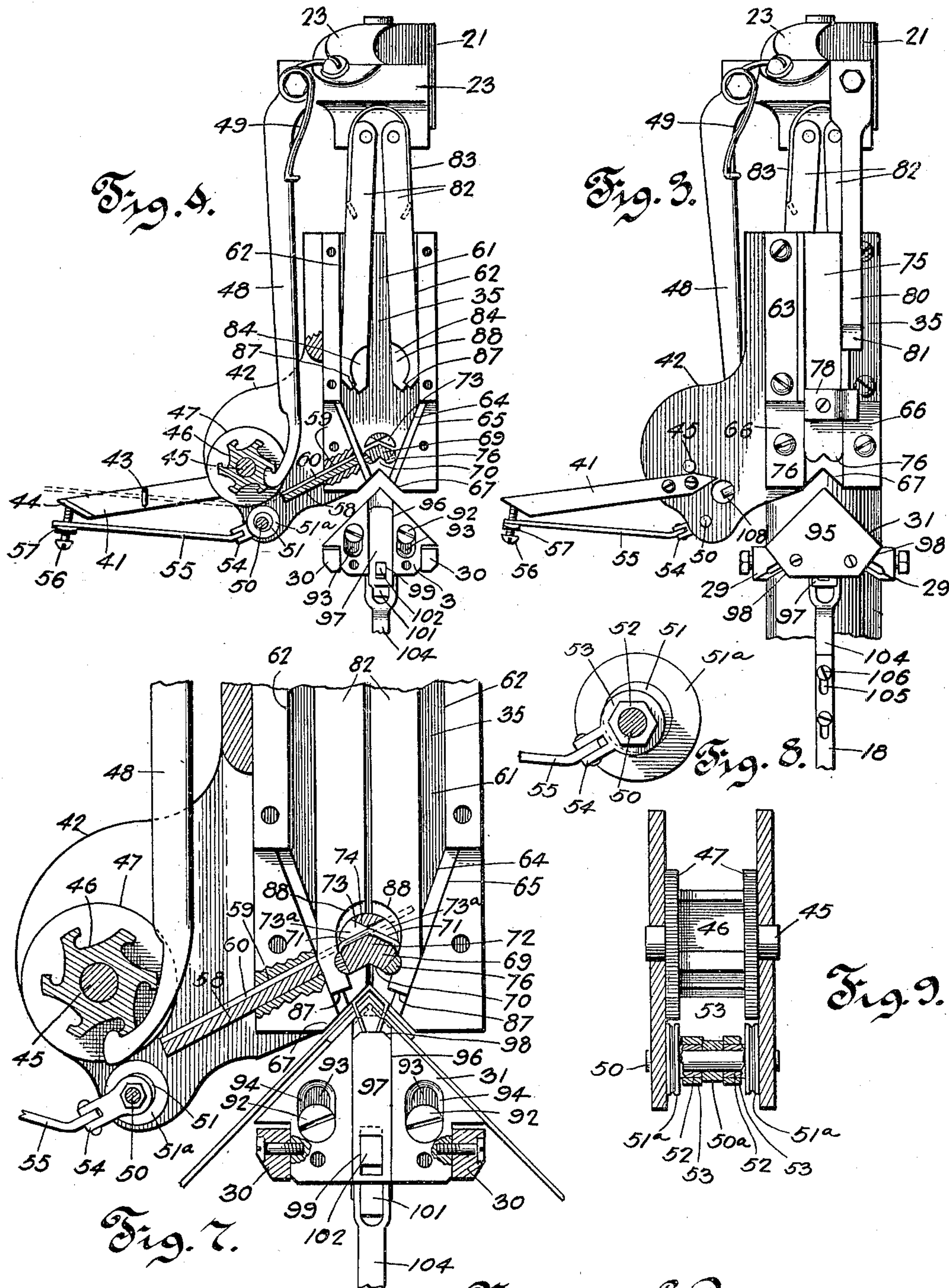
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(Application filed Oct. 10, 1900.)

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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

NORMAN E. BROWN, OF ST. JOSEPH, MICHIGAN.

BOX-STAPLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 672,353, dated April 16, 1901.

Application filed October 16, 1900. Serial No. 33,261. (No model.)

To all whom it may concern:

Be it known that I, NORMAN E. BROWN, a citizen of the United States, residing at St. Joseph, in the county of Berrien and State of Michigan, have invented a new and useful Box-Stapling Machine, of which the following is a specification.

This invention relates to machines for stapling boxes, box-covers, or any similar device having angular or approximately angular corners or parts to be joined; and the object of the same is to simplify the construction of such machines and increase the efficiency thereof, to the end that the various and necessary operations of the machine for the production of work of the most approved character may be accomplished through the employment of the fewest possible parts and the least complex motions, conducing to durability, lightness, and freedom from noise; together with smoothness and rapidity of running and easiness of operation.

The invention consists, primarily, in a novel form for each of the wire-feeding, wire-cutting, staple-forming, and staple-driving mechanisms and whereby the staple forming and driving operations may be carried on in a substantial simultaneous manner as distinguished from intermittent operations as heretofore pursued for accomplishing a similar end.

The invention further consists in the construction and arrangement of the several parts generally and particularly operatively contributing to full and partial steps in arriving at the result sought and subject to a wide range of modification within the purview of the invention.

In the drawings, Figure 1 is a perspective view of a machine embodying the features of the invention and shown partially broken away. Fig. 2 is a sectional side elevation of the improved machine. Fig. 3 is a front elevation of the upper portion of the machine. Fig. 4 is a sectional elevation of the upper portion of the machine looking toward the front thereof and showing parts removed. Fig. 5 is a transverse vertical section through the upper portion of the machine and particularly showing the staple formers and strippers therefor. Fig. 6 is a section on the line 6 6, Fig. 2, with the wire-feeding mechanism added.

Fig. 7 is an enlarged sectional elevation of a portion of the wire-feeding, staple-forming, and cutting and driving mechanisms, the work-support, and clencher, showing the manner of setting a staple in the work. Fig. 8 is an enlarged sectional elevation of a portion of the wire-feeding mechanism. Fig. 9 is a horizontal section through a portion of the wire-feeding mechanism. Fig. 10 is a detail perspective view of a portion of the staple former and stripper. Fig. 11 is a detail perspective view of a portion of the staple-stripper. Fig. 12 is a detail perspective view of a portion of the combined wire cutter and driver. Fig. 13 is a detail sectional view of a portion of one of the drivers and its lower bending and cutting shoulder and the one side portion of the way therefor. Fig. 14 is a horizontal section on the line 14 14, Fig. 5.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a tubular standard having its lower terminal disposed on a hollow pedestal 2, which may be an enlargement of the said standard or a separate structure, as may be desired and found most convenient in manufacture or production. The standard 1 is formed as clearly shown in Fig. 2 and includes an upper section 3, gradually reduced toward its upper terminal and provided with upper and lower cross-sectional thickened portions 4 and 5, each having a central bore in vertical alinement with that of the other, the lower extremity of the said section being also reduced and fitted in the upper end of the main portion of the standard and held in fixed position by a set bolt or screw 6. In the main portion of the standard, at a suitable distance below the upper end of the same, an inner annular support 7 is formed and bored out from the lower end thereof upward to provide a seat for the removable reception of a bearing-collar 8, which is held in place by diametrically-disposed set-screws 9 and has a central bore in vertical alinement with those of the thickened portions 4 and 5. The collar and thickened portions 4 and 5 are arranged in the manner set forth to provide bearings for a vertically-reciprocable plunger 10, which is normally ex-

tended above the upper end of the section 3 and held steady in its operating movements by the particular construction described and prevented from having lateral irregular movement through the influence of the mechanism below directly connected thereto and which will be presently set forth. To the lower end of the plunger 10 the upper end of a crank-rod 11 is movably attached and runs from a crank-pin 12, eccentrically mounted on and projecting inwardly from a crank-disk 13 on a driving-shaft 14, extending horizontally or otherwise from the lower portion of the standard and actuated either by power or manually, as may be desired, and in accordance with the weight and resistance of the machine as an entirety and the work it is to perform. On the free end of the crank-pin 12 a wiper-cam 15 is securely fixed, and in its plane of rotation, at a point below the plane of the shaft 14, is a roller 16 on the inwardly-projecting end of a pin or bolt 17, fixed in the lower end or extremity of a connecting bar or rod 18, extending upwardly exterior of the front of the standard and having a spring 19 secured thereto and to a portion of the standard to retract the said connecting bar or rod to normal position. The said lower end or extremity of the bar or rod is deflected inwardly and works in a slot 20 in the lower portion of the pedestal, and when the wiper-cam contacts with the roller 16 it forces the connecting bar or rod downwardly against the action of the spring 19 for a period lasting until the clearance of said cam from the roller, and after the cam has passed the roller the said spring immediately returns the bar or rod 18 to its normal position and the parts carried thereby, which will be more fully referred to in subsequent descriptive matter.

Adjustably secured on the upper extremity of the plunger 10 is a head 21, which is held in fixed position after adjustment by a set-screw 22, and projecting from the front of said head is a supporting-arm 23, having an outer laterally deflected or curved end for holding and operating the main working parts of the improved machine. From the opposite or rear side of the head 21 a slide-arm 24 projects and is provided with a terminal slide-socket 25, in which a slide-rod 26 is rigidly secured by a set-screw 27. The said slide-rod is vertically disposed and extends downwardly to and is freely movable through the rear end of a rock-lever 28, having an intermediate yoke 29 fulcrumed on the standard and front legs 30, spaced apart a suitable distance for terminal attachment to opposite sides of the work-support or anvil 31, the outer lower portions of the said legs at their attached terminals being beveled inwardly to avoid interference with the application of the work to the support or anvil. At a predetermined elevation on the said slide-rod a collar 32 is secured by a set-screw, and surrounding the said rod below the collar is a helical spring 33, which has its lower termi-

nal suitably held on the rear end of the rock-lever 28, and the head, slide-rod, and plunger descend for a short period before the collar 32 contacts with the upper terminal of the spring 33 in order to permit the wire staple forming and driving mechanism to assume a certain position and the work rested on the support or anvil 31 to be brought up into proper position before the final staple-driving operation and without jamming or pressing the work with too much force from beneath, the slide-rod continuing downwardly against the action of the said spring 33 with the head and plunger in completing the work of staple forming and setting. During the said initial movement of the plunger in a downward direction the wiper-cam 15 is drawing nearer to the roller 16, so as to be in operative proximity at the proper moment to actuate the rod or bar 18, which is connected to and controls the operation of the clenching devices in a manner which will be hereinafter set forth.

Extending forwardly from section 3 of the standard is a web 34, having an outer head 35, with suitable grooves, seats, and other devices for the guidance and operative disposition of the several mechanisms hereinafter set forth. On one side of the said head 35 the wire-feeding mechanism is located, and as the present machine is shown with two sets of staple forming and driving devices, so as to simultaneously drive two staples through the work on the support or anvil 31 and clench said staples from beneath the work, it will be necessary to employ wire-feeding mechanism of double form. At this time and in this particular connection it will be understood that it is preferable for expeditious setting of the staples that two sets of staple-drivers, staple-formers, and clenchers, or even more, be employed, all of similar construction and one set a duplication of the other; but it is obviously apparent that one set of each of the said devices could be practically used for many purposes, and it is intended at times to construct the machines with only one set of each of the necessary instrumentalities. The wire-feeding mechanism comprises a horizontal support 36, extending outwardly from the standard at a proper elevation and having outer upright spindles 37, each at the same elevation, provided with a dished holder 38, arranged horizontally and forming a support for a coil of wire, which is fitted over the spindle thereabove to freely rotate. On each spindle over the wire coil a similar dished holder 39 is disposed to keep the coil in place and readily removable to replenish the supply of wire, and in the operation of these two sets of wire-holding devices they act as reels, both holders having inner parallel flanges 40, with a feeding-space between them. From the said reels the wire runs to feeding-arms 41, rigidly secured at their inner ends to the front and rear sides of a lateral projection 42 of the head 35, the

said arms being spaced apart from each other and having inner guide-eyes 43 and outer angularly-inturned ends 44. Two feeding-throats for the wire are formed in the projection 42, as clearly shown by Fig. 9, and comprise a shaft 45, with a ratchet-wheel 46 fast thereon, and feeding-disks 47, of greater diameter than the said wheel, secured to and rotatable with the opposite ends of the latter.

The ratchet-wheel is operated by a depending pawl 48, pivoted at its upper end to the arm 23 of the head 21 and having a spring 49 bearing upon the same to hold it in working position relatively to the ratchet-wheel.

Below the shaft 45 a pin 50 is held in the lateral projection 42 and provided with opposite hexagonal heads 52, with connected eccentrics 51, having collars 53 on the said heads, grooved feeding-disks 51^a being located on the eccentrics in operative proximity to the disks 47, the wire passing between the said disks and having proper lengths thereof fed inwardly by the ratchet-wheel to the staple forming and driving mechanism in timed relation to the operation of the latter mechanism. In initially threading the wire into the machine means for changing the position of some of the parts must be employed to permit said initial threading to be unobstructedly pursued. Therefore arms 54 extend outwardly from the collars 53 and have their free ends bifurcated to pivotally receive the inner ends of spring-retainers 55, with holding-screws 56 adjustably mounted in their outer ends and secured in adjusted position by set-nuts 57. The free ends of the said screws normally bear against the inturned outer terminals or ends 44 of the arms 41 when the feeding devices are arranged for an automatic mechanical feed of the wires, as shown by Figs. 3 and 4; but when it is desired to initially insert the wires in the throats the retainers 55 have their outer ends or the screws in the latter released from contact with the inturned ends 44 of the arms 41 and swung laterally and alternately lifted up through the open space between the arms to thereby throw the eccentrics 51 and disks 51^a unitedly over and enlarge the space between the latter disks and the disks 47 for the insertion of the wire ends without difficulty or obstruction. When the retainers are in the position shown by Figs. 3 and 4, the disks will be prevented from having the least movement and be always maintained in proper working relation to the disks 47, so that the operation of the ratchet-wheel may be effective. The throats are continued by steel feed-rods 58, which are removably mounted in inclined openings 59, drilled in the head 35 at an upward inclination, the said rods having their outer ends adjacent to the feed-space between the disks 47 and 53 and their upper portions milled out to form seat-grooves 60 to receive the wires, and said grooves, conjointly with the upper portions of the openings 59, provide means for the easy

feed of the wires, but prevent slack lateral movement thereof, which would defeat the positive shearing cut desired in the severance of the lengths for the formation of the staples. The front and rear sides of the head 35 are formed with guide-recesses 61, with upper parallel side walls 62, having elongated inwardly-projecting cover-plates 63 removably secured thereto, and lower inwardly-converging walls 64 of double or stepped construction to provide inner staple-receiving ways having the walls concaved to a suitable extent and nearer each other than outer square cutter-guiding walls 65, at which the inner terminals of the openings 59 and rods 58 are located. The inner ends of the said rods are milled off square for cutting purposes and may be removed at any time for sharpening. Over the said lower inwardly-converged walls other cover-plates 66 are removably fitted and have their inner edges, together with those of the plates 63, extending toward each other a distance sufficient to prevent the moving parts inward therefrom and working in the guide-recesses 61 from having outward play or movement. The lower end of the head 35 is formed with an angular recess 67 of inverted-V-shaped form to permit the work-support or anvil 31, which is of complementary contour at its upper portion, to move closely upward thereinto, and all the parts around the lower end of said head are cut away to give a clearance for easy manipulation of the work and avoid the least obstruction to the operation of setting the staples or injury to the work.

Rigidly secured to the front and rear sides of the head 35 are staple-forming devices comprising vertically-disposed shanks 68, to which the fastening devices are applied, and inwardly-extending substantially cylindrical staple-forming heads 69. (Clearly shown by Fig. 10.) The lower portions of the said heads are formed with inverted-V-shaped recesses 70, so as to avoid interference with the work that is brought in proximity thereto by the work-support or anvil 31, and with transverse slots 71 in the upper portions, which open through the free ends and also of inverted-V-shaped form to provide an anvil 72 of corresponding form or contour. The slots 71 have vertical extensions 73, with upper inwardly and downwardly inclined walls 74, whereby openings are formed through the heads having an upward inclination similar to that of the rods 58 and openings 59 and coinciding at one side with the latter, so that when the wires are inserted they will be projected through the staple-forming heads in the manner shown by dotted lines in Fig. 7. In operative relation to the staple-forming devices are staple-strippers, one for each forming device and comprising shanks 75, pivotally connected at their upper extremities to the upper portions of the head 35 and located outside the said staple-forming devices. These strippers each have a pair of right-angular stripping-fingers 76 at the lower ends

of the shanks 75, which are spaced apart and normally bear against the lower portions of the heads 69 and extend inward a short distance beyond the latter. To hold the strippers in normal position and to cause them to automatically assume said position, springs 77 are secured to the head 35 and bear on the said shanks 75, and the function of the said strippers is to push the completed staples out of the heads 69 and hold them in the recesses 61 between the inner staple-receiving ways thereof in position for driving and setting. To completely open the staple-receiving ways, it is necessary to provide means for moving the stripping-fingers 76 outwardly in order to let the driving devices pass downwardly to their full extent or stroke, and for this purpose each of the shanks 75, at a short distance above the plane of the heads 69 of the forming devices, is provided with an arm 78, extending to one side thereof and formed with an upper inwardly-beveled edge 79, the said arms being located in the path of movement of spreading-legs 80, sliding close to the edges of the shanks 75, from which the arms 78 project, and carried by the end of the arm 23 of the head 21. The lower ends of the said legs have outer inwardly and downwardly directed bevels 81 to engage the beveled edges 79 of the arms 78, and thereby draw the said shanks 75 outwardly a sufficient distance to move the fingers 76 and clear the inner staple-receiving ways.

To the outer end of the arm 23 opposite pairs of drivers 82 are pivoted at their upper ends and extend downwardly into the recesses 61 and normally held spread apart to have their outer edges closely follow the walls of the ways by bow-springs 83, extending over the upper ends thereof and having the arms of the same secured in the outer edges of the said drivers to equally exert an outward tension on each driver of a pair in reverse directions. The drivers 82 may be made of a single piece of material in each instance or two pieces fastened together, and comprise in their organization lower driving-terminals 84, having lower upwardly and inwardly inclined grooved edges 85 to provide seats for the staples driven or set and outer convex edge portions 86 to fit in the concavities of the walls of the staple-receiving ways. A suitable distance above the terminal 84 of each driver a combined squared cutting and bending shoulder 87 is provided and projecting outwardly a greater distance than the adjacent side edge of the terminal to contact with either of the guiding-walls 65. The opposite shoulders 87 of each pair of legs perform a bending operation relatively to the staple, and one shoulder also acts as a cutter by moving close to the inner terminals of the rods 58 and openings 59 to sever the wire length for each staple just after the terminals 84 start to force the completed staple previously made down to the work for setting. The shoulders 87

are also inwardly and upwardly inclined, and the outer edges have an upward and outward bevel to permit their movement downwardly between the walls 65 to render the operation of the same effective, and just inside of the said shoulders 87 segmental cavities 88 are provided to permit the driver extremities or terminals to descend to their full extent by having the ends of the heads 69 fit thereinto, and thereby also effectually complete the formation of the staples. To facilitate this operation of staple formation, the portions of the heads 69 opposite each other and below the slots 71 are formed with an inward bevel, as at 89, so as to cause the legs of the staple to be bent inwardly at the proper angle for setting, as clearly shown by Fig. 7, and against these inward bevels the stripping-fingers work, as also clearly shown. The vertical extensions 73 of the slots 71 are also covered by depending lips 73^a, provided by the formation of said slots and extensions, and thus a positively - operating staple-forming mechanism is produced which is simple and effective in its construction and operation. One of the most important advantages of the improved construction, in view of other machines for a similar purpose as heretofore constructed, resides in locating the springs 83 outside and over the upper ends of the pairs of drivers, because in pairs of drivers having the springs interposed between the inner edges as heretofore adopted in other machines the springs in the latter construction would become easily broken and sprained or jammed, and the parts of the machine outside of the plane of the drivers had to be removed in order to reach and replace the injured or broken springs, whereas the present arrangement of the springs is not conducive to breakage, and in the event that they become injured or misplaced they can be easily reached for replacement by others or a readjustment of the same ones. It is also required in driving a staple made of wire having a small gage, as in this instance, that it be held very closely to prevent bending or crushing the same, especially by rapid driving and setting strokes, and also that the drivers primarily contact with the same directly in the central vertical plane thereof, and with this necessity of construction in view the lower portions of the recesses 61 are made with less inward extent or depth than the major upper portions of the same by forming opposite shoulders 90 on the lower portion of the head 35, as clearly shown by Fig. 5, and continuing the thickness of the said portion of the head downwardly equal to the distance between the said shoulders. The inner lower portions of the drivers are also formed with elongated recesses 90^a by milling them out to thereby correspondingly reduce the driving-terminals of the drivers for a length sufficient to carry the driving operation into effect in the manner just set forth

without impairing the strength of the said drivers by a reduction in thickness throughout their entire length.

Extending outwardly from the front portion of the standard 1, immediately below the joint with section 3, is a casting or web 91, in the form of a horizontal arm having a triangular cross-sectional contour and provided with a groove 92 in its outer end, in which a corresponding tenon on the inner end of the work-support or anvil has free vertical movement, the said support or anvil also being triangular in cross-section, with its apex normally coinciding with that of the said arm 91 in order to form a rest for a box or analogous device while driving a staple into the corner portion thereof, near the bottom of the same, and also accommodate boxes or similar devices having varying depths while stapling any portions of the corners thereof or any other angular parts of the same. The devices for raising and lowering the work-support or anvil have been heretofore explained, and to hold said support or anvil in movable relation to the end of the arm two headed studs 92 are used and extend horizontally in parallel planes through slots 93, formed on the support or anvil and having outer marginal recesses 94 to receive the heads of the studs to provide a flush fitting and permit an outer cover-plate 95 to be secured over the outer end of the said support or anvil to form an inclosure for a vertical slot or guideway 96 for the outer vertically-reciprocable clencher 97, having the upper corners cut off at a bevel, as at 98, and the lower extremity thereof formed with a transverse slot 99. The inner portion of the work-support or anvil is constructed with a similar vertical slot or guideway for the operative reception of a second similar clencher simultaneously actuated with the outer one and precisely the same in form as the latter with a lower slot. The under portion of the arm 91 is constructed with a recess 100, extending longitudinally thereof and coinciding with a lower slot in the work-support or anvil, and in the said recess a rock-arm 101 is fulcrumed and has an outer reduced end 102, with an upper downwardly and outwardly inclined edge 103, the said end loosely projecting through the slots of the clenchers and the upper inclined edge thereof compensating for the difference in throw of the end and acting to cause the clenchers to be raised equally. It will be understood that the outer end of the rock-arm 101 will have a greater throw than the portion thereof that engages the rear clencher, and to compensate for this difference the outer clencher is made slightly shorter than the said rear clencher, as clearly shown in Fig. 5. When only one clencher is used, this particular construction is unnecessary, though the same form of rock-arm may be used for actuating a single clencher. To the rear end of the rock-arm the upper end of a link 104 is pivotally attached and at its lower extremity ad-

justably secured to the upper end of the bar or rod 18, the latter having slots 105 therein to receive adjusting-screws or analogous devices 106, carried by the link 104.

In the operation of the rocking lever 28 the weight on the rear end will have a tendency to throw the legs 30 uppermost when the parts are restored to normal position, and if means were not provided to overcome this difficulty the work-support or anvil 31 would be correspondingly raised; but to overcome this auxiliary springs 107 are mounted in seats in the opposite lower side portions of the arm 91 and in the adjacent upper edge portions of the legs 30 of said lever and tend to normally press the said legs downwardly when free to so act, and thereby overcome any weight action on the rear end of the said lever.

To facilitate the initial disposition of the wires in the machine, the projection 42 of the head 35 has front and rear sight-openings 108 formed therein in line with the outer ends of the rods 58, so that the latter may be clearly seen by the operator and the wires properly guided thereinto.

As clearly shown by Fig. 1, the machine is capable under a simple arrangement of being controlled as to its movement by a clutch 109, operated by a spring-actuated foot-treadle 110, within convenient reaching distance of the operator. It will also be seen that the work-support or anvil is composed of two parts, the one, 31, being movable and the other, 91, rigidly fixed, and thus the part of the work to be stapled can be brought up to the stapling devices and the entire box, cover, or other device is also given a stable position when applied previous to the stapling operation. By the use of a fixed section and a movable section in the work-support or anvil structure an exceptional advantage is gained by reason of the capability of supporting deep work or boxes or baskets having extended sides in a positive manner and so that the angular portions thereof may be accurately placed on the said support. This structure also gives a clearance to the work not directly operated on and permits it to be slipped over the support and adjusted to a nicety without liability of crushing or breaking and accommodating any size of work. Moreover, to successfully carry out the stapling operation it is only necessary to elevate that portion of the work to be stapled, and the extra weight and resistance incident to raising the entire support and confining said operation to a comparatively small portion thereof relieves the machine and reduces the expenditure of applied power usually required for said operation. It will also be now understood from the foregoing description that all the contributory mechanisms have an accurate timed operative movement, so that the desired operation of the same individually will be effected to accurately and positively accomplish the result sought and avoid straining the several mechanisms or

injuring the work. The head 21 and the parts in intimate relation thereto can also be adjusted to compensate for wear of the devices actuated thereby or to regulate the machine for operation on various thicknesses of stock, and by adjusting the rod or bar 18 and the link 104 relatively to each other the stroke of the clencher can also be changed at will, and the distance between the roller 16 and the wiper-cam 15 can be varied to accelerate or slow up the stroke of the said rod or bar and the link. If the parts working in the head 35 should become slightly disarranged, they can be easily reached for adjustment, and in the event that the drivers and correlative mechanism on one side of the head should become impaired to such an extent as to be unfit for further use they can be removed from the machine and the opposite side drivers alone used, this capability obviously being a material advantage in this class of machines.

In the operation of the machine the ratchet-wheel 46 by a single upstroke of the arm 23 of the head 21 forces the wires inwardly through the rods 58 and openings 59 into the heads 69 a sufficient distance to provide proper lengths in the heads for forming the staples. By observing the dotted lines in Fig. 7 it will be seen that the wires when inserted automatically, as just set forth, each rest on one side of the anvil 72 of the head and contact also with the one upper inclined wall 74 of the extension 73 at the opposite side of the head, the free end of the wire projecting beyond into the recess 61. Presuming that one staple has been previously formed on each side of the head by the steps which will now be set forth and that the work has been properly placed on the work-support or anvil, including the movable portion 31 thereof and the fixed part 91, the drivers 82 descend through the recesses 61 and remain diverged and bear against the opposite straight walls 62 until they begin to enter the lower downwardly and inwardly converged double-stepped ways 64. It will be understood from the foregoing description that the previously-formed staples will at this time be held by the stripper-fingers in the path of the driver-terminals 84 and continue to be so held until the lower beveled ends of the legs 80 come into contact with the arms 78 to gradually draw the strippers 75 and the fingers 76 outwardly and clear or release the staples for driving. This release of the staples and engagement of the parts for producing this result takes place just about the time the drivers contact with the heads of the staple, and by the descent of the drivers for this operation the upwardly-projecting free ends of the wires for forming the new staples will have been bent down, as shown by Fig. 7, by the shoulders 87 on that side in each instance, it being understood from the foregoing description that the shoulders 87 are in a higher vertical plane than the driving-terminals 84. The staples are

started toward the work through the lower contracted portions of the ways therefor by the lower driving-terminals 84 of the drivers slightly before the shoulders 87 opposite those that have made the preliminary staple-bends contact with the wires where they project from the inner ends of the rods 58 and openings 59, so that the completion of the staples may always be carried on at a time when the staples being driven have reached a certain depression in the ways therefor to allow a timed relative position of portions of the drivers over the heads 69. When the free ends of the wires have been bent down on the anvils of the heads 69, as shown by Fig. 4, the shoulders 87 opposite to those that have been utilized in forming the said bends will have just reached the points where a severance of the wires takes place and a shear cut results, both sets of shoulders then continuing down and bending the staple-legs downwardly against the inward bevels 89 of the heads 69. The drivers continue downwardly until the driving-terminals 84 have reached the full limit of their downward stroke, and at said point of the operation the united segmental cavities 88 of the pairs of drivers will embrace the inner ends of the heads 69, as shown by Fig. 7. When the parts have arrived at the position just set forth, the staples will be fully driven through the work which has been properly elevated during the descent of the drivers by the mechanism heretofore explained acting on the rocking lever 28, and just at the moment the staples are fully driven through the work the clencher 97 are raised and upset the projecting ends of the staple-legs against the then under surface of the work. As soon as the clenching operation has been completed the cam 15 will have just cleared the roller 16, and the latter then being unrestricted the spring 19 will restore the rod or bar 18 and the link 104 to normal position, and at the same time the drivers will rise and clear the heads 69 and the legs 80 become disengaged from the arms 78, when the springs 77 will be free to act on the strippers 75, forcing the latter inwardly and causing the fingers 76 to push the staples that have just been formed out of the slots 71 of the said heads 69 into position in the reduced staple-guideways for driving by the subsequent descent of the drivers. This operation will be continued as long as the machine is kept in motion and the supply of wire lasts, and it will be understood that the legs of the staples are gradually contracted by the drivers proportionate to the gradual decrease of the ways therefor in a transverse direction toward the bottom of the head 35. The inwardly-converged staple-legs are driven through the work in the position shown by Fig. 7, and their angle is such relatively to the ends of the clencher that their inturning will be positively assured and without liability to irregular or false clenching.

The simple arrangement of combined instrumentalities in the improved form of machine operating in the simple and effective manner set forth tends to produce a material
 5 advance in the art of stapling-machines and a more expeditious means for stapling boxes, baskets, and other devices. It is also obvious that the particular form of the work-support set forth may be changed to suit different
 10 contours of work or stock, such change only involving mechanical skill, without departing from the principle of the invention.

Having thus described the invention, what is claimed as new is—

15 1. In a stapling-machine, the combination of a support having a recess therein, drivers having lower driving-terminals and cutting and bending shoulders in vertical planes above the said terminals, wire-feeding de-
 20 vices, a staple-former in the path of movement of said drivers, and means for holding the work and clenching the staples.

2. In a stapling-machine, the combination of a support having a recess therein with a
 25 lower reduction, drivers having lower reduced driving-terminals and bending and cutting shoulders in vertical planes above the said terminals, a staple-former in the path of movement of said drivers, wire-feeding de-
 30 vices, a staple-stripper, and means for holding the work and clenching the staples.

3. In a stapling-machine, the combination of a support having a recess therein with a
 35 lower reduction in depth, drivers having lower reduced driving-terminals and bending and cutting shoulders in vertical planes above the said terminals and projecting outwardly beyond the latter, an inwardly-extending staple-former in the path of movement of the
 40 said drivers, wire-feeding devices, and means for holding the work and clenching the staples.

4. In a stapling-machine, the combination of a support having a recess therein with a
 45 lower staple-way contracted toward its lower end, drivers having lower reduced driving-terminals and bending and cutting shoulders in vertical planes above the said terminals and partially projecting beyond the side edges
 5 of said terminals, wire-feeding devices, a staple-former in the path of movement of the said drivers, and means for holding the work and clenching the staples.

5. A pair of drivers for a wire-stapling machine having lower upwardly and inwardly
 55 inclined driving-terminals and angular cutting and bending shoulders in vertical planes above the said driving-terminals, and supporting means for the drivers.

60 6. Pairs of unitedly-acting drivers for a stapling-machine having lower driving-terminals and cutting and bending shoulders in vertical planes above the said terminals having a reverse inward and downward inclina-
 65 tion, and supporting means for the drivers.

7. Pairs of unitedly-acting drivers for a stapling-machine having lower driving-ter-

minals and cutting and bending shoulders in vertical planes above the same extended beyond the side edges of said terminals, and
 70 supporting means for the drivers.

8. Pairs of unitedly-acting drivers for a stapling-machine having lower driving-ter-
 minals and cutting and bending shoulders in vertical planes above said terminals and pro-
 75 jecting outwardly from one side of the latter and beyond the side edges of the same, and supporting means for the drivers.

9. Pairs of unitedly-acting drivers for a stapling-machine having lower driving-ter-
 80 minals and cutting and bending shoulders in vertical planes above said terminals, cavities being formed inside the shoulders, and a rigidly-fixed staple-former with an inwardly-projecting portion to which wire is fed and
 85 over a part of which the cavities are disposed during the downward movement of the latter, and supporting means for the drivers.

10. Pairs of unitedly-acting drivers for a
 90 stapling-machine having lower driving-terminals and cutting and bending shoulders in vertical planes above said terminals, supporting means for the drivers, a rigidly-fixed staple-former with an inwardly-projecting por-
 95 tion to which wire is fed and over which portions of the drivers are disposed during their downward movement, and a movable stripper coacting with the said former to push the staple into the path of the driving-termi-
 100 nals.

11. In a stapling-machine, drivers having lower driving-terminals and wire cutting and bending devices, a rigidly-fixed staple-former having a part thereof extended inwardly and
 105 engaged by portions of the said drivers, and automatically-operating wire-feeding mechanism.

12. In a stapling-machine, the combination of drivers having lower driving-terminals and
 110 cutting and bending devices in vertical planes above the said terminals, a rigidly-fixed staple-former having a part thereof extended inwardly and engaged by portions of the said drivers, and a movable stripper having fingers
 115 for pushing the completed staple from the former.

13. In a stapling-machine, the combination of drivers having lower driving-terminals and cutting and bending devices in vertical planes
 120 above the said terminals, a rigidly-fixed staple-former having a part thereof extended inwardly and engaged by portions of the said drivers, a movable stripper coacting with the said former to push the completed staple
 125 therefrom, wire-feeding mechanism, and means for moving the stripper out of the way of the drivers.

14. In a stapling-machine, the combination of a support, drivers having vertical recipro-
 130 cation in said support and provided with cutting and bending shoulders in vertical planes above the lower terminals of the same, the latter having a recess therein with a lower re-

duced staple-way, a staple-former rigidly fixed on a portion of the support and having a lower inwardly-projecting head provided with a slot, the said head having its innermost portion located at the outer limit of the way, and strippers movably held in coacting relation to the said head and normally projected inwardly beyond the innermost end of the head to push the staple from the latter and hold it in the path of movement of the drivers.

15. In a stapling-machine, the combination of a support, drivers having vertical reciprocation in the said support, a rigidly-fixed staple-former having an inwardly-extending slotted portion, and upwardly-inclined sides below the latter, means for removing the completed staple from the former, and means for feeding wire to said former at an upward angle of inclination, the length of wire for the formation of the staple being severed and bent by parts of the drivers.

16. In a stapling-machine, the combination of a support, drivers having reciprocation in said support, a rigidly-fixed staple-former having an inwardly-projecting slotted portion in the path of movement of said drivers, means for feeding wire to said former at an upward angle of inclination, the length of wire for the formation of the staple being severed and bent by parts of the drivers, and a stripping device having inwardly-projecting angular fingers movable over portions of the said staple-former.

17. In a stapling-machine, the combination of a support, drivers having reciprocation in said support, a rigidly-fixed staple-former having an inwardly-projecting portion with an inverted-V-shaped slot therein, and also with an upper slot for extension therethrough of the staple-wire, and means for feeding wire to said projecting portion of the former at an upward angle of inclination, the length of wire for the formation of the staple being severed and bent by parts of the drivers.

18. In a stapling-machine, the combination of a support, drivers having a reciprocation in said support, a rigidly-fixed staple-forming device having an inverted-V-shaped slot in a portion of the same provided with a vertical extension having upper downwardly and inwardly inclined walls, and means for feeding wire to said slotted portion of the former at an upward angle of inclination, the length of wire for the formation of the staple being severed and bent by parts of the drivers.

19. In a stapling-machine, the combination of a support, drivers having reciprocation in said support, a rigidly-fixed staple-former having an inwardly-projecting slotted portion to receive the wire and outer lower inwardly-inclined side portions, means for feeding wire to said projecting slotted portion of the former at an upward angle of inclination, the length of wire for the formation of the staple being severed and bent by parts of the

drivers, and an automatically-movable stripping device coacting with the said former and having angular extensions movable over the lower inclined sides of said slotted portion of the former.

20. In a stapling-machine, the combination of a support, drivers having reciprocation in said support, a rigidly-fixed staple-former having an inwardly-projecting head formed with an inverted-V-shaped slot opening out from the inner end thereof and provided with an outer vertical extension having upper opposite wall portions reversely inclined inwardly and downwardly, the opposite lower side portions of said head being straight and inclined inwardly and downwardly, means for feeding wire to the slot of said head at an upward angle of inclination, the length of wire for the formation of the staple being severed and bent by portions of said drivers, and an automatically-movable stripping device coacting with the said former and having angular extensions movable over the lower inclined sides of said slotted portion of the head.

21. A staple-former for a stapling-machine for coaction with suitable driving devices consisting of a shank adapted to be rigidly fixed and having a lower angularly-disposed head with an inverted-V-shaped slot therein having an extension at the outer portion of the same.

22. A stapling-machine having a staple-former for coaction with suitable driving devices consisting of a rigidly-supported head having a slot therein capable of receiving a straight portion of wire at an upward angle of inclination, the base-wall of the slot being in the form of an inverted-V-shaped anvil over which the wire is given the proper form, the upper wall of said slot being inclined downwardly from opposite sides reversely to the angles of the said base-wall.

23. A stapling-machine having a staple-former for coaction with suitable driving devices consisting of a rigidly-supported head having a slot therein capable of receiving a straight portion of wire at an upward angle of inclination, the base-wall of the slot being in the form of an inverted-V-shaped anvil over which the wire is bent and the sides below the slot straight and inclined inwardly, the upper wall of said slot being inclined downwardly from opposite sides reversely to the angles of the said base-wall.

24. A stapling-machine having a staple-former for coaction with suitable driving devices, consisting of a rigidly-supported head having a wire-feeding means, a stripping attachment having separated stripping projections coacting with the opposite sides of the lower portion of said head to push the completed staple from the head and provided with a shank pivoted at its upper extremity and having an arm at the outer side with an upper beveled edge, said projections being

normally pressed inwardly and movable outwardly from said head, and a depending reciprocating spreading-leg having a lower reduced end to engage the beveled edge of said arm.

25. In a stapling-machine, the combination of a support having a lateral projection at one side forming means for holding wire-feeding devices in the outer portion thereof, the side of the support inward from the outer edge of the said projection having an upwardly-inclined opening therein, wire-feeding devices, a staple-former having an upwardly-inclined slot opening out adjacent to and in the same angular plane as the said opening, a rod mounted in the said opening and having a groove in the upper portion thereof which forms with the upper part of the wall of said opening a contracted guide-way for the wire, the rod being continued away from the side of the support which it enters at the same inclination to the wire-feeding devices held by the outer portion of the projection, and staple driving and clenching devices.

26. In a stapling-machine, the combination of a support having a recess with lower stepped walls converging toward the lower extremity of the said support, staple driving, and forming devices located in the said recess, and having lower driving-terminals and cutting and bending shoulders in vertical planes above said terminals and respectively engaging the inner and outer walls and a wire-feeding mechanism.

27. In a stapling-machine, the combination of a vertically-movable plunger having an upper head, a support having a projection at one side and a recess therein, staple driving and forming devices in the said recess, and wire-feeding mechanism including a guiding device for the wire, a movable eccentric carrying a disk, and a ratchet-wheel, a pawl depending from and reciprocated by said head and engaging said ratchet, the ratchet-wheel having a disk to coact with the disk on the eccentric.

28. In a stapling-machine, the combination of a support having a lateral projection with a sight-opening therein, staple driving and forming devices in the support, and wire-feeding mechanism including a grooved rod having the outer end in direct alinement with the said sight-opening.

29. In a stapling-machine, the combination of a support having staple driving and forming devices therein, wire-feeding mechanism for the staple-forming devices consisting of ratchet-and-pawl mechanism including a disk, a disk and eccentric below the latter disk and having a yielding retainer in pivotal relation thereto provided with an outer holding device, an arm with an inturned outer end, and a holding device for wire, the wire being fed through a portion of the arm.

30. In a stapling-machine, the combination of a standard having a rigidly-fixed work-holder section, a vertically-movable work-holder section on the outer extremity of the former fixed section, staple forming, driving and clenching devices, and means for operating the several parts.

31. In a stapling-machine, the combination of a vertically-reciprocating plunger having a head at the upper extremity thereof, a standard having a support comprising a fixed work-holding section and a vertically-movable work-holding section or anvil, a horizontally-disposed rocking lever having legs attached to said movable section or anvil, staple forming driving and clenching devices, and mechanism for actuating the said clenching devices and connected to said rocking lever for timed operation with the latter, said mechanism including a connection between the head of the plunger and the outer end of the lever and located above the said lever.

32. In a stapling-machine, the combination of a standard having a vertically-movable work-holding anvil or section, a rocking lever fulcrumed on the standard and having legs attached to said anvil or section, staple forming, driving and clenching devices, a plunger for operating the driving devices, a member connected to the plunger and movable through the rear portion of the said lever and having a stop device thereon, and a resilient device on the rear end of the lever through which the said member also moves.

33. In a stapling-machine, the combination of a standard having a vertically-movable work-holding anvil or section, a rocking lever fulcrumed on the standard and having legs attached to said anvil or section, staple forming, driving and clenching devices, a vertically-reciprocable plunger having a head adjustably mounted thereon to which the driving devices are attached, a rod attached to the head in an adjustable manner and movable through the rear portion of the lever, a stop device adjustable on the said rod, and a spring supported on the rear end of the lever around the rod.

34. In a stapling-machine, the combination of a work-support, staple forming, and driving devices, a staple-clencher movable through the work-support, a rock-arm engaging said clencher, driving mechanism including a vertically-reciprocating plunger and a crank-disk connected to the lower end of the plunger and having a wiper-cam in eccentric relation thereto, and a connecting rod or bar attached to the said rock-arm and provided with a lower terminal device for contact with the said cam.

35. In a stapling-machine, the combination of a front and rear double complement of staple driving and forming devices, a movable work-support or anvil having slots there-through, a pair of clenchers in the said sup-

port or anvil, a rock-arm having an outer
reduced end extending loosely through the
said clenchers and also formed with an upper
downwardly and outwardly inclined edge,
5 and means for operating said arm to unitedly
actuate the clenchers.

In testimony that I claim the foregoing as

my own I have hereto affixed my signature in
the presence of two witnesses.

NORMAN E. BROWN.

Witnesses:

CHAS. S. HYER,

FRANK S. APPLEMAN.