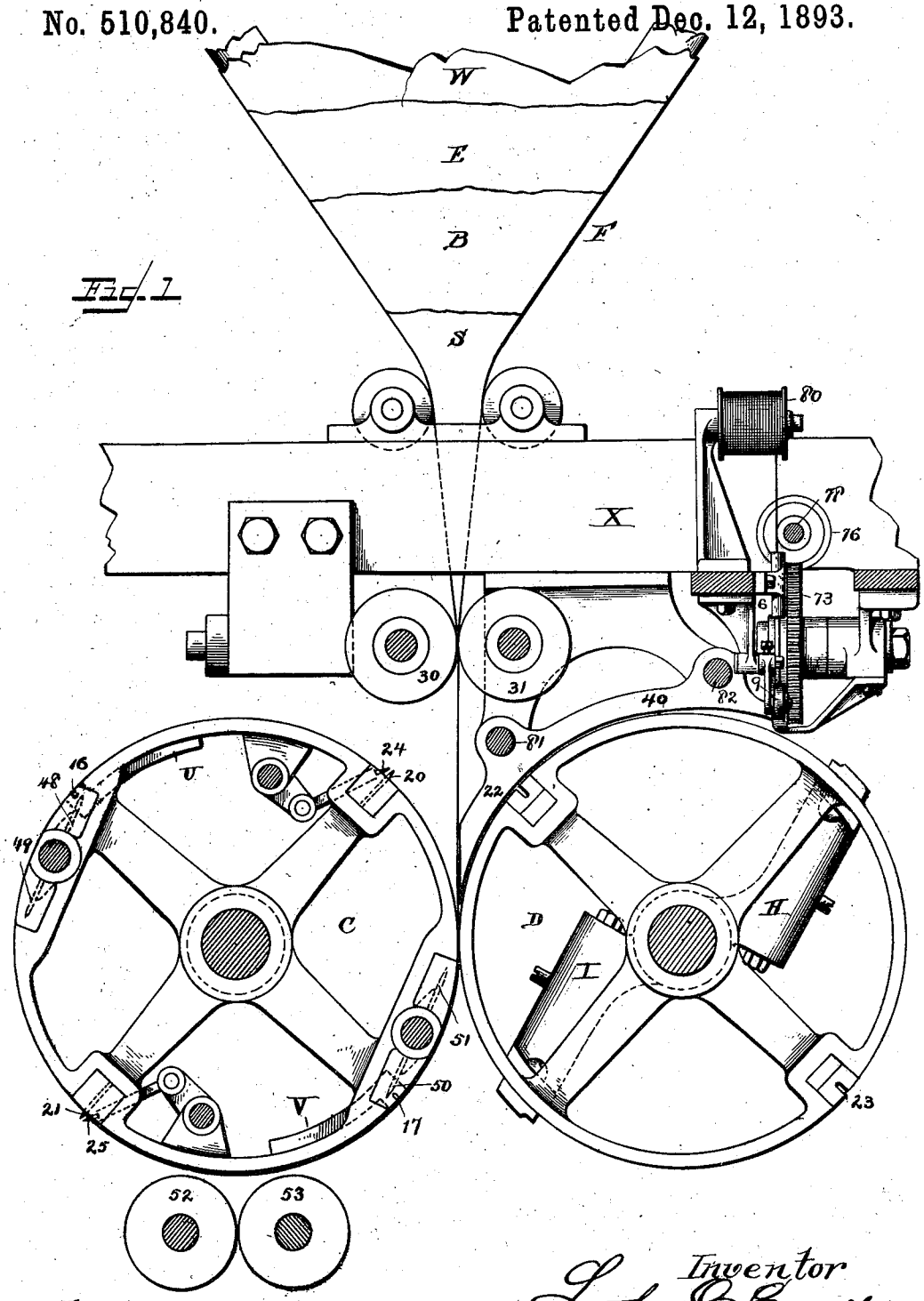
(No Model.) 5 Sheets—Sheet 1.

L. C. CROWELL.

FOLDING AND STAPLE BINDING DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 510,840. Patented Dec. 12, 1893.

Fig. 1.



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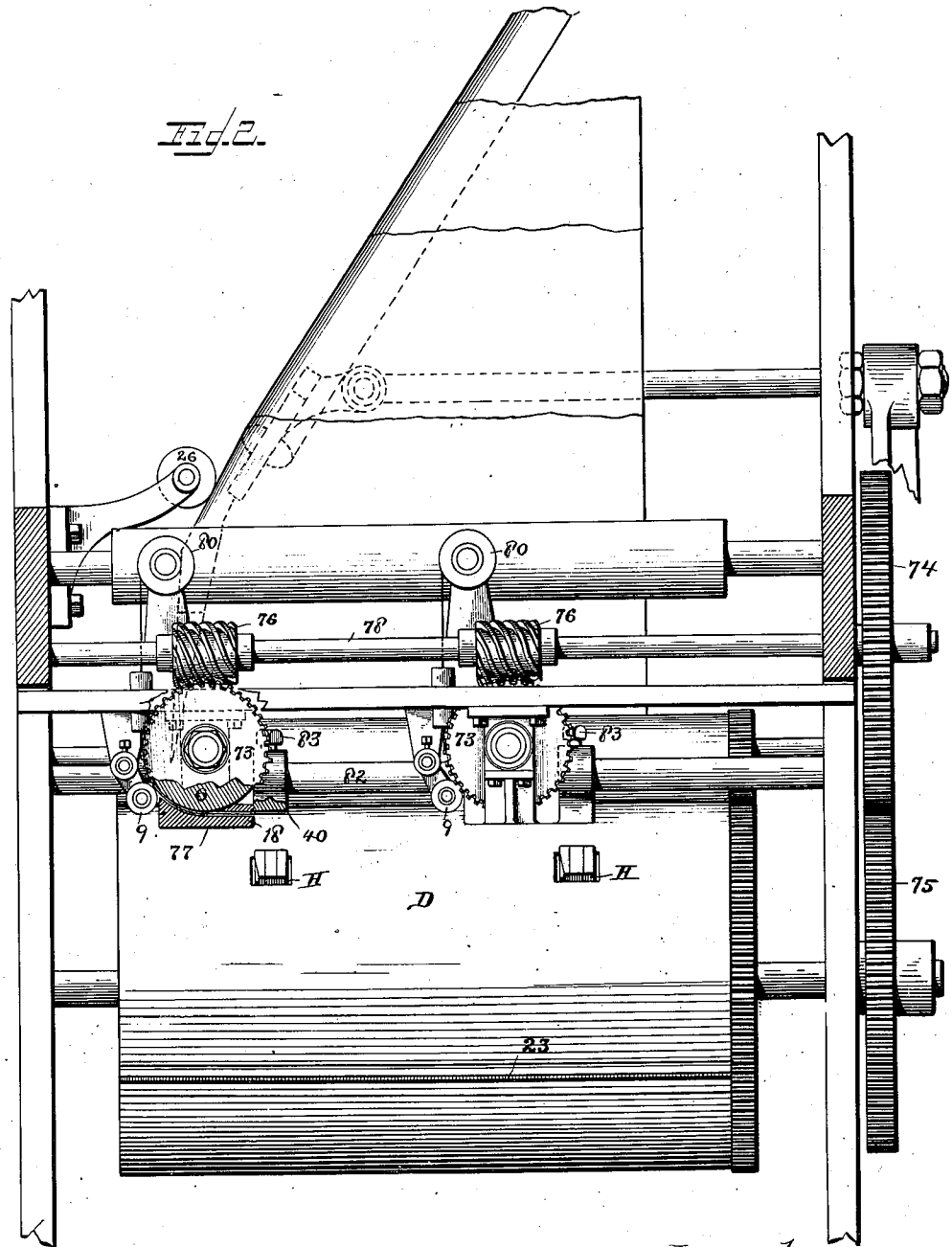
L. C. CROWELL.

FOLDING AND STAPLE BINDING DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 510,840. Patented Dec. 12, 1893.

Fig. 2.



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L. C. CROWELL.

FOLDING AND STAPLE BINDING DELIVERY MECHANISM FOR PRINTING MACHINES.

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Fig. 10.

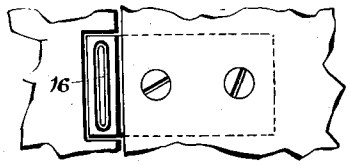


Fig. 8.

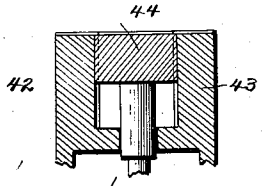


Fig. 9.

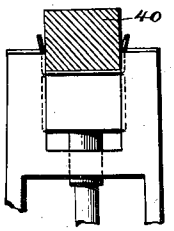


Fig. 5.

Fig. 7.

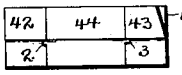


Fig. 6.

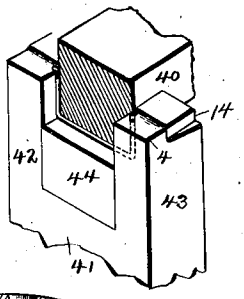


Fig. 4.

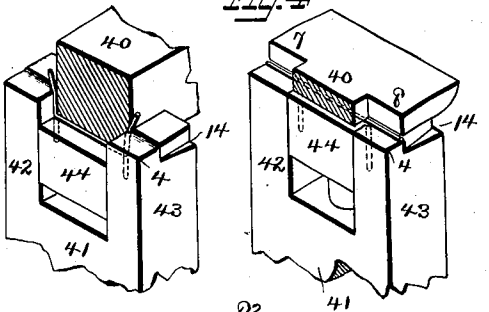
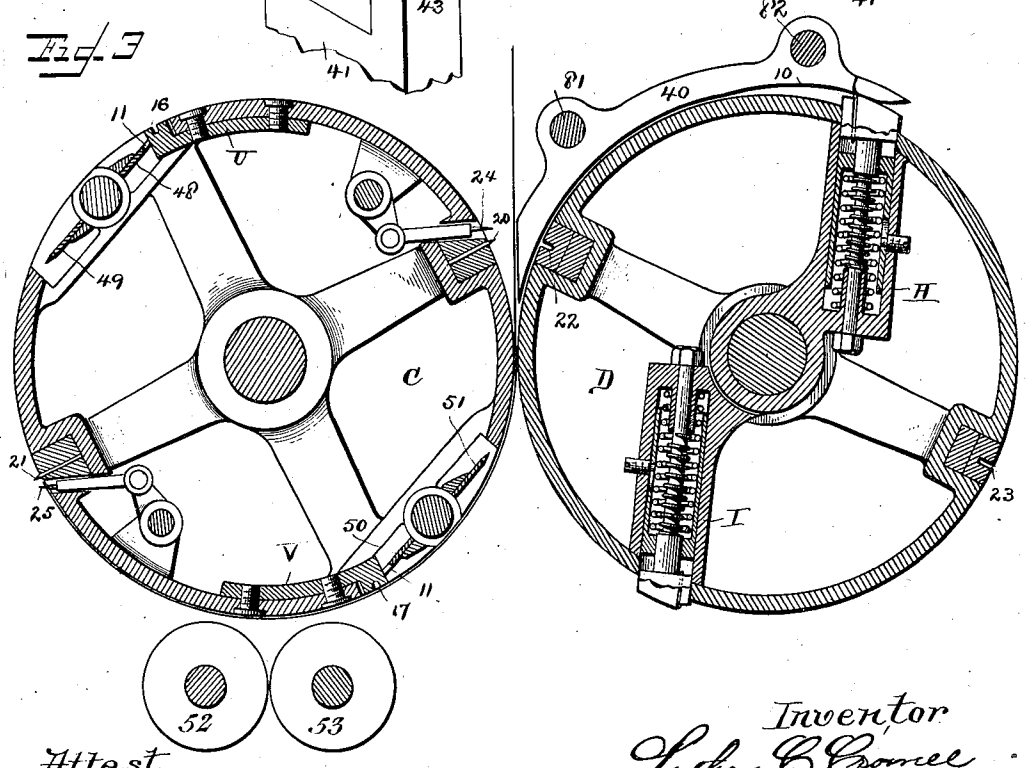


Fig. 3.



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L. C. CROWELL.

FOLDING AND STAPLE BINDING DELIVERY MECHANISM FOR PRINTING MACHINES.

No. 510,840. Patented Dec. 12, 1893.

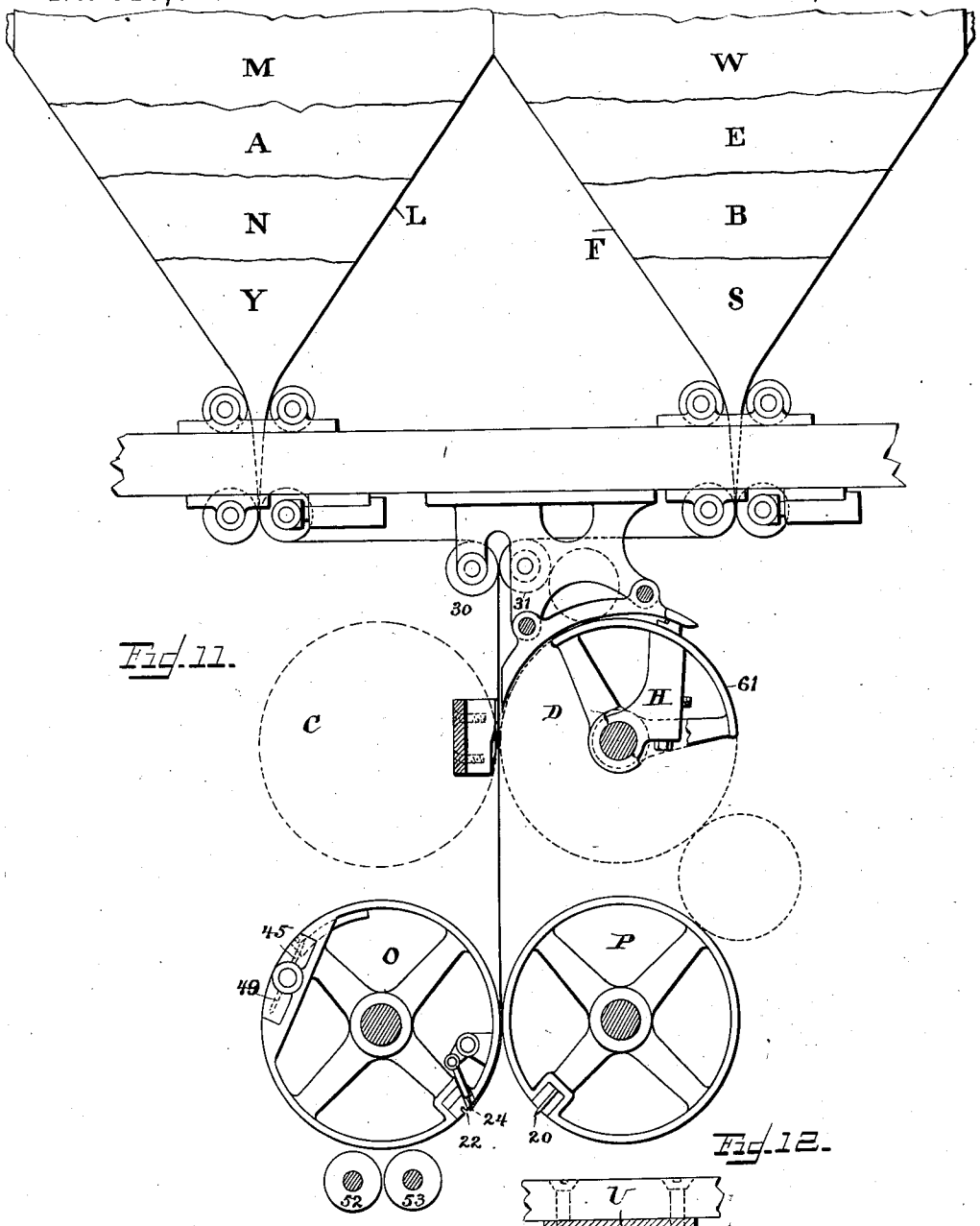

Fig. 11.

Fig. 12.

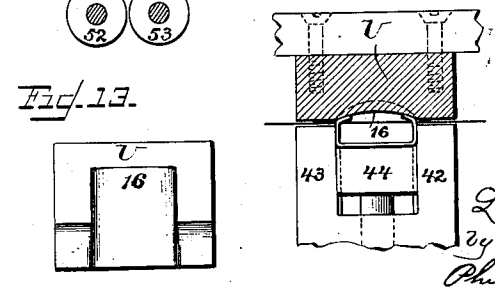

Fig. 13.

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(No Model.) 5 Sheets—Sheet 5.

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FOLDING AND STAPLE BINDING DELIVERY MECHANISM FOR PRINTING MACHINES.

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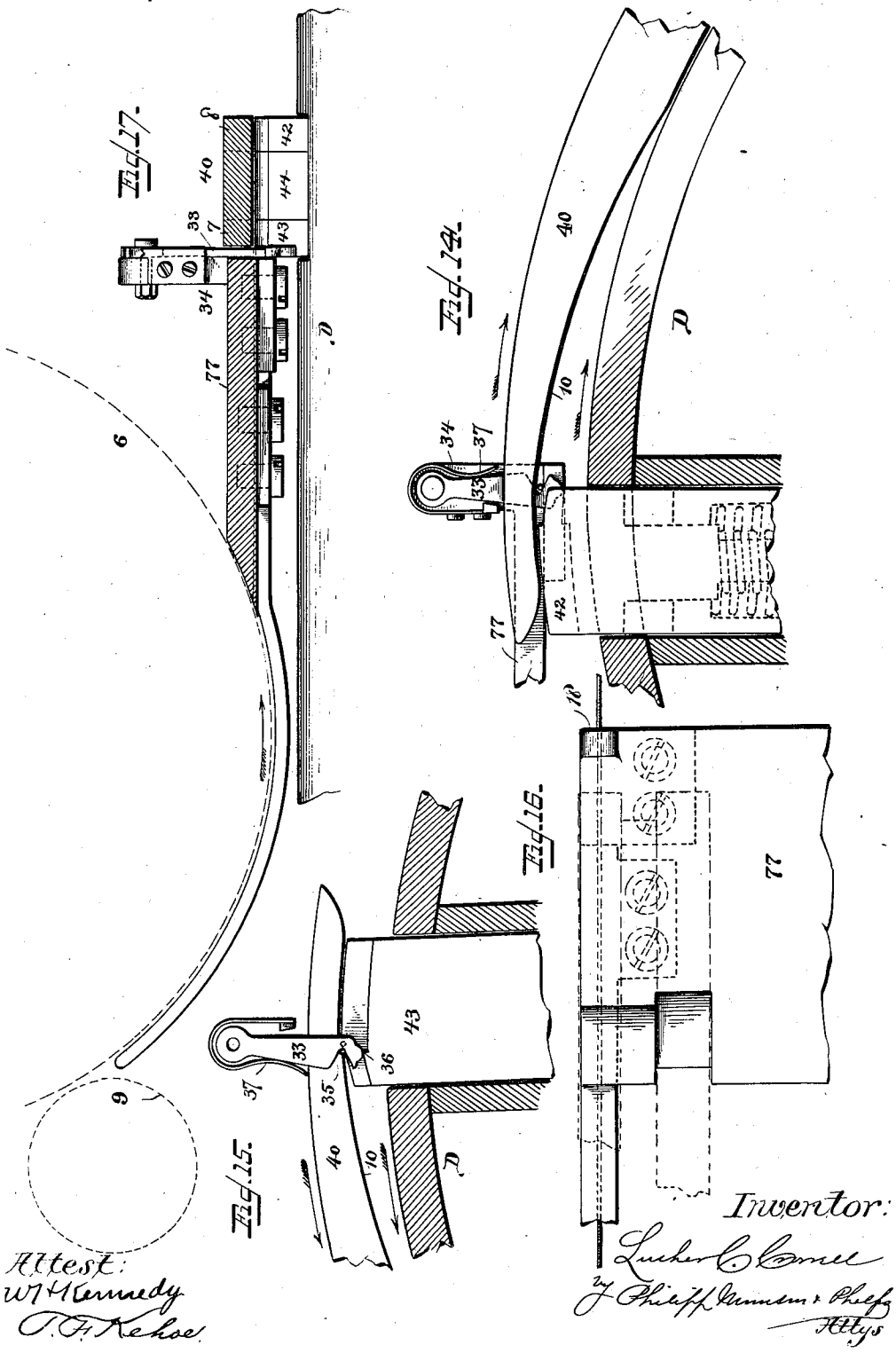

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UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR TO ROBERT HOE, STEPHEN D. TUCKER, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF NEW YORK, N. Y.

FOLDING AND STAPLE-BINDING DELIVERY MECHANISM FOR PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 510,840, dated December 12, 1893.

Application filed June 16, 1893. Serial No. 477,778. (No model.)

To all whom it may concern:

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Folding and Staple-Binding Delivery Mechanism for Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

These improvements relate primarily to stapling mechanism for binding together plicated webs or sheets delivered thereto preferably from any machine producing them, and especially from rapidly operating printing machines by which such webs or sheets are printed and rapidly delivered.

More particularly these improvements relate to that class of such stapling mechanisms in which the staple inserting means travel in the direction of the material to be stapled, and move to and from the inserting point—preferably rotatively—in the operation of carrying the staple into relative position to the material for its insertion therein, and co-operate with a clinching device in setting the staple in, on, or near, the ultimate binding line of plicated webs or sheets, thus producing a bound book-like product without necessitating that the moving material, shall be, even momentarily, brought to a state of rest, as is broadly set forth in my application, Serial No. 464,007, filed February 28, 1893.

Broadly stated, the invention consists in a stapling mechanism, the staple inserting means whereof embodies a tool that travels to and from the stapling point, preferably rotatively, and sweeps longitudinally while passing over an anvil in the operation of forming a wire length into a staple.

It also embraces in combination therewith, means causing said tool to travel onward, preferably rotatively, from the staple forming point in carrying the staple into position relative to the material for its insertion therein.

The invention also includes various other improvements, constructions, combinations of parts, mechanisms and devices, all of which are particularly hereinafter pointed out in the claims and explained in the course of the following detailed description of the mode in which the invention is or may be practically embodied and carried into effect, a ready understanding of which description and claims will be aided by reference to the accompanying drawings, in which—

Figure 1 is an end elevation of so much of the delivery mechanism of a printing machine as is requisite to illustrate these improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a sectional elevation of the rotative carriers or supports and the mechanisms, tools or devices, which they support. Figs. 4, 5 and 6 are perspeceive views partly in section of some of the stapling tools or devices in three positions of their operation. Fig. 7 is a face or end view, Fig. 8 is a sectional elevation, and Fig. 9 is a front elevation of such tools, the forming anvil being shown in section in the latter figure. Fig. 10 is a face view of the staple leg clinching device. Fig. 11 is an end elevation of so much of a delivery apparatus of a printing machine having stapling mechanisms connected with it, as is necessary to illustrate a modification of these improvements. Fig. 12 is an enlarged sectional elevation, and Fig. 13 an enlarged elevation showing more particularly the structure of the staple leg clinching device.

A modified structure of wire cutting mechanism is shown in Figs. 14 to 17 inclusive. Of these, Figs. 14 and 15 are respectively opposite side elevations, Fig. 16 is an under plan view, and Fig. 17 a sectional elevation. These improvements may be combined with any machine capable of rapidly delivering plicated sheets or webs to it, but as they are more particularly designed for use in combination with the delivery mechanisms of a web printing machine or machines, it may preliminarily be stated that such a printing machine may be of any rotary or other construction that rapidly delivers its printed product, and preferably such a machine as perfects the product by printing upon the opposite sides thereof, as for instance, the printing machine shown in my aforesaid application. Such a printing machine, in one of its more approved constructions, may include turning bars for associating sheets or webs

and will preferably embody a longitudinal folder as F, over which longitudinal folder the printed material is carried and plicated or given a longitudinal fold, as may be desired, which longitudinal folder may be constructed in any suitable manner, preferably substantially as is described in Patent No. 331,280. So, also, the printing mechanism may be a combination of several machines, all delivering their product over a roller or cylinder, either directly to the stapling mechanisms, or to one or more longitudinal folders. If the paper, printed upon in such a machine, is maintained in the form of a web until it passes over the longitudinal folder, it will act as its own carrier, as is well understood, suitable guiding rollers being provided for its onward passage. If, however, the paper operated upon is divided transversely into sheets before passing onto the longitudinal folder, it will be provided with a taped or other pathway for carrying the sheets onward. If from a double wide printing machine or machines, the sheet or sheets, web or webs, whether split or not, are transferred laterally one upon another by bars, there will be a plication by association. If the webs or sheets from two or more independent printing machines are brought together in passing over a roll or cylinder, there will also be plication by association. In either of the above cases the sheets or webs may be split by a slitter in order that the bound products may be cut at the heads.

In passing over a longitudinal folder of substantially the construction and operation shown in my previous patents, preferably such a one as is illustrated in my Patents Nos. 331,280 and 492,760, the webs or sheets will be folded or plicated longitudinally, and if there be a multiplicity of printing mechanisms delivering their webs or sheets to the longitudinal folder, there will be two or more such sheets or webs superimposed on the longitudinal folder, all of which will be simultaneously plicated by folding; if, however, there be arranged for co-operation with the longitudinal folder a slitter as 26 either arranged to slit the sheets or webs before, during or after their passage over said longitudinal folder, the sheet or sheets, or web or webs will be divided longitudinally, and hence be plicated by association, except where the slitter operates during or after the folding, when the plication will be partially or wholly by folding, as will be readily understood. When the material is run in the web, sheets will be formed by transverse severance, as is hereinafter described.

In the principal embodiment of the invention herein shown, the rotative carriers or supports which carry or support all of the traveling stapling mechanisms, tools or devices, are shown as cylinders C, D, which cylindrical form of carrier is, for some reasons, a preferable construction, as among other uses, it is sometimes desirable that a portion or all of their surfaces may act to carry the material onward. These cylinders or supports are geared together and to the other rotative mechanisms so that all concertedly rotate with appropriate speed, and they will preferably be geared with the printing machine so as to move therewith in co-operative precision. As shown in Figs. 1 to 3, these cylinders are of double size, that is, they have a circumference equal to the intended length of two sheets, which is sometimes preferable and especially where the sheets are small, and hence they are each provided with a duplication of mechanisms. Thus the carrier or support D is provided with two sets of staple inserting means oppositely arranged therein, the stocks for the holder or presenting tool 41 and the inserting tool or driver 44 of which are respectively marked H, H and I, I; and the carrier or support C is shown as provided with a corresponding number of staple leg clinching devices, which consist of metal blocks U, V, that are attached to the carrying cylinder or support C by means of screws, which blocks extend to the periphery of the cylinder and are provided with properly shaped grooves 16, 17 that are preferably inclined on all sides to adapt them to receive, and their bottoms are curved to capacitate them to appropriately turn the staple legs toward each other or bend them down onto the plicated webs or sheets.

Considered longitudinally there are shown two sets of staple inserting means and clinching devices, but any number of sets may be employed according as more or less staples are desired as binders.

For convenience and simplicity of the mechanisms the cylinder or support C also carries two cutting blades 20, 21 that respectively cooperate with cutting slots 22, 23 provided in the cylinder or support D; also with sets of sheet impaling pins 24, 25 which engage the leading ends of the plicated webs or sheets and carry the same onward within the range of action of folding mechanisms, which latter are rotative double folding blades 48, 49 and 50, 51 that co-operate with folding rollers 52, 53, and have portions removed as indicated at 11 to enable them to pass the stapling devices. From the delivery rollers 30, 31, through which the plicated material passes, it is led onward between the cylinders, carriers or supports C, D and in such onward passage, as will presently be described, its plies are united together by staples on transverse lines a sheet's distance apart, which lines are the ultimate binding lines of completed products. When the cylinders or carriers C D, are provided with devices therefor these sheet lengths are severed by transverse cuts through the co-operative action of the blades 20, 21 and slots 22, 23, and the leading ends of each set of sheets or webs from which they are to be severed, are held and carried onward by means of the impaling pins 24, 25, which withdraw at suitable intervals to permit a rearward movement of the leading portion of the sheets or

webs, necessary to the folding operation of doubling the stapled sheet lengths through the folding rollers 52, 53 by one of the blades 48, 49 or 50, 51, in like manner as is explained in the said application, Serial No. 464,007.

The formation of the staples from wire fed to the mechanism, tools or devices, their carriage or transfer to the staple inserting point of the material, their insertion therein, and the clinching down of their legs therein, while the material and the active tools or devices are moving onward in like directions, with an appropriate speed of travel suited to that at which the printing is performed and the material is delivered will now be explained.

The wire from which the staples are to be formed is delivered from spools, as 80, and carried within the range of action of the tools or mechanisms supported by and associated with carrier D, by means of a wire feeding mechanism attached to the frame X of the machine, and overhanging said carrier. There is a wire feeding mechanism for each set of the tools, mechanisms or devices, considered in their longitudinal arrangement in the cylinder, carrier or support D. Each consists of a pair of feeding rollers 6, 9, between which the wire passes and is frictionally driven forward from a reel or spool 80, and protruded through a tubular guide block 77 (supported by bracket 79) and its cutting die 18, so as to be projected within the range of rotative travel of the staple tools, mechanisms or devices supported by the carrier or support D. The larger roll 6, against which bears the roller 9, is fast upon and is driven by means of a worm wheel 73, that is rotated by a worm 76. The worms 76 are fast upon a shaft 78 which is so geared with the carrier D, by means of wheels 74, 75, that the feeding action of the rollers 6, 9 is capacitated during each half revolution of the cylinder, carrier or support D to deliver a staple length of wire through the die 18 of the guide block 77 and protrude the same across the pathway in which the staple tools in a stock, H or I of the carrier or support D rotatively travel, and beneath the forming anvil 40. See Fig. 2. The forward edge 4 of one arm 43 of the two armed traveling staple holder or presenting tool, acts as a shearing cutter in passing the cutting die 18 and severs a staple length of wire, which is thus detached while within the range of action of a forming anvil 40 which is preferably curved over the top of the carrier or support D and hung pendent from the framework. This anvil 40 has a width equal to the inside length of the crown or head of the staple to be formed, a thickness preferably at least equal to the length of the staple legs, an under curved surface, the forward or main portion of which is preferably coincident with the periphery of the cylinder or support D; and it is sustained in proper relation to the moving staple tools, devices or mechanisms, by means of rods 81, 82, that are secured to the framework, upon which it is made adjustable by means of set screws 83. It is additionally preferably widened at its rear end so as to form sidewise projections or wings 7, 8, that guide the incoming wire and provide a support for the entire wire length delivered beneath it, which support extends such a distance forward from its rear end as to fully cover the wire feeding point, as shown in Fig. 4. This widening is advantageous, but as it is not essential it is shown as omitted in Figs. 14 and 15. The rearward portion of the anvil 40 is shaped on its under side so as to form a wedge like pathway 10 or entrance beneath it for the rotatively moving staple tools or devices. The forward end of this anvil 40, where the staple progressively leaves it, is cut away so as to provide for the passage of the plicated material between the cylinders, carriers or supports C, D, and also to constitute this forward end of the anvil 40, a wedge like or continuously decreasing guide for the staple during its progressive insertion through the material and the clinching of its legs thereon; and preferably this wedge like guide will be continued downward so far that the traveling staple will leave its end at the moment when the clinching of the staple legs is complete.

Of the staple inserting means the holder or presenting tool and the inserting tool or driver, reciprocate in carrying stocks as H I which are shown as fast upon the shaft of the cylinder or support D and thus cause it to move therewith and rotatively carry the staple inserting means to and from the point where the staples are to be presented to and inserted into the material. The holder or presenting tool 41 is forked to provide two arms 42, 43 between which slides the inserting tool or driver 44 and the forward edge 4 of the arm 43 acts as a shearing cutter in cooperation with the outer or mouth end of the wire guiding slot or die 18 of the block 77, and hence in passing the same acts as a shear to sever a staple length of wire, which is thus detached while within the range of action of the forming anvil 40. The side of the arm 43, immediately rearward of the cutting edge 4, is removed in angular form as at 14 to provide space for the outward movement of the new wire length while the holder or presenting tool 41 is passing the wire feeding point. The inserting tool or driver 44 is provided on each side with a vertical outwardly projecting rib which ribs slide in corresponding guiding channels 2, 3, cut into the inner walls of the arms 42, 43 of the holder or presenting tool, the special function of which structure is to provide staple receiving channels for the staple legs during their formation, their retention during their transport or carriage, their guidance during their insertion, delivery, and incidentally these channels form a guideway for a sliding inserting tool or driver when one is used. In this example the two arms 42, 43 of the holder or presenting tool 41 project from a hollow shank that slides to a slight extent

in the carrying stock H or I, in which it is seated upon a spring within said shank that bears upon the foot of the stock and constantly presses it outward; and the inserting tool or driver 44, embraced by the arms 42, 43 of the holder or presenting tool 41, not only slides in the guiding channels, but is provided with a shaft like stem the upper end of which plays in a central guide slot in the hollow shank of the holder and the inner end of which plays in a similar guide slot cut through a collar projecting inwardly from and through the base or inner head of the stock H or I, outside of which base or head this stem is screw threaded and provided with a nut for adjusting the extent of its outward throw; and this tool or holder 44 is constantly pressed outward to hold a staple protruded, cause the inserting of the same, and it is capacitated to be retracted during the inserting operation and thus enabled to assume a position to aid in the formation of a new staple, by means of a spiral spring that is coiled about its stem and made to bear at one end upon a shoulder on said stem and at the other upon a collar like support that is fast to and projects within the carrying stock H or I and encircles said stem. These parts of the arms 42, 43 of the holder or presenting tool 41 and that part of the inserting tool or driver 44, which are in advance of the wire bending or staple forming portion of them, are recessed or slightly beveled so as to admit of their unobstructed movement past the protruded wire, (see Fig. 3) but those parts of the holder and mandrel which are rearward of their wire bending or staple forming line, are extended outward so as to sweep, in their rotative travel, into the plane occupied by the protruded wire, the arms 42, 43 passing close to the under faces of the guiding wings 7, 8, of the anvil, and the inserting tool or driver 44, all passing close to the under face of the curved bending anvil 40. These parts thus come into contact with a staple length of the protruded wire, which wire length will, while momentarily supported between the outer faces of the arms of the moving holder or presenting tool, inserting tool or driver, and the under faces of the wings 7, 8, be severed by the action of the cutting edge 14 in passing the die 18 of the wire guiding block 77. This detached staple length of wire will then be carried onward in a circular pathway by the rotative traveling movement of the holder or presenting tool and inserting tool or driver. During this traveling or onward movement, the arms 42, 43, of the holder maintaining their position of outward protrusion by means of the efficient power of their supporting spring, will progressively overlap and travel close to the sides of the anvil 40 while the wedge like pathway or receiving end 10 of the curved forming anvil 40, will, as the wire length is carried over it, operate to press inwardly the central portion of the said wire length which has entered beneath it, thus forcing its central or crown portion and the inserting tool or driver beneath it, upon which it rests, within the guiding channels cut longitudinally into the facing sides of the arms 42, 43, of the holder. As the wedge like portion 10 of the curved anvil thus presses the wire length and inserting tool or driver inwardly, the central portion of said wire length, which is to constitute the crown or head of the staple, then held or clamped between the outer face of the inserting tool or driver and the inner face of the anvil, will, while remaining straight or horizontal, be carried bodily within the arms of the holder or presenting tool, during which operation the opposite ends of the wire length, which primarily rest over the ends of the arms 42, 43, will be forced into the longitudinal bending guiding channels 2, 3 in the inner faces of the arms of the holder, said wire ends being thus forced or bent outward or at right angles to the central crown or body portion of the wire length, to convert them into staple legs. In this operation, the arms 42, 43 act as bending arms and in conjunction with the forming anvil 40, these wire ends or staple legs will progressively descend into said channels until the thickest or that part of the anvil 40 which is nearest to the carrier D is reached, when the staple will have been formed, at which time it will be inclosed on all sides and be completed, as in Fig. 6, ready for insertion. The staple thus formed is seated within the holder or presenting tool with its head or crown resting upon the inserting tool or driver 44 and has its legs embraced in the channels 2, 3 of the arms 42, 43 of the holder and extending therefrom more or less according to the size and strength of the wire, which holder, as it moves rotatively from the wire receiving point to the point of insertion for the staple, acts as conveying or transferring means for the wire length and staple formed therefrom. According to the length of the protrusion of the arms of the holder beyond the periphery of the carrier D, they will, in approaching the setting point, come into contact with the plicated material as they traverse the wedge shaped exit end or forward termination of the forward end of the anvil, and the relation of parts is such (viz: the substantial radial arrangement of holders H, I,) that the staple legs are presented to or directed toward the stapling point or line of ultimate folding or binding of said material in such a plane that the insertion thereof will then be accomplished by a forward movement, substantially at right angles to the path of travel of the material, and as the material, the carriers C, D and the staple presenting and inserting tools or mechanisms they carry, then preferably all move concertedly onward to the actual staple setting point, which preferably is where the carriers C, D run nearest together, the ends of the arms 42, 43 of the holder or presenting tool 41 will press the material toward and

finally against the surface of the carrier C and, then, opposed by said surface, or the clinching die, said arms will in turn retire or be pressed rearwardly against the action of their spring, while the material runs onward between the carriers or supports C, D. The result of this is that the staple legs, which are progressively inserted through the material without dragging thereon, are entered into the clinching groove 16 or 17 and will be moved toward the carrier or support C until the crown or head of the staple is pressed against the material on one side and its legs are clinched against it on the other side. The clinched staple will then be carried wholly by the material in which it is inserted and clinched and the arms of the holder or presenting tool and also the inserting tool or driver will again be protruded or moved outward by the action of their springs, as the carriers or supports C and D move onward, and during their rotative travel these tools or devices will reassume their first described positions, and repeat the operations just described. The stapled material will be carried onward by the pins 24 or 25, be severed into sheet lengths by the cutters 21 or 20, and slots 22 or 23, and the associated stapled sheets will be folded in, on, or near, their stapled line of union, by the protrusion of a folding blade, 48, 49, 50 or 51, pressing each sheet on a transverse line into the nip of the rollers 52, 53, from which it may be finally delivered, all as if set forth in said application, Serial No. 464,007. The arms 42, 43 of the holder or presenting tool may be nicely fitted so as to run close to but not in wearing contact with the sides of the stationary anvil while acting as staple forming and carrying or transferring arms, and the inserting tool or driver 44 will, although it is pressed outward by the action of the spring upon which said tool or driver is seated, be protected from frictional wear on the anvil by reason of the interposition of the wire length that is acted upon and converted into a staple, each wire length instead of the tools thus receiving the frictional wear incident to its conversion into a staple and carriage to the inserting point; and, if the arms of the holder are closely fitted to the anvil they will be in like manner protected by the legs of the staple against any wearing action.

For convenience of illustration and a more ready understanding of the invention it has been hereinbefore described in connection with a single longitudinal folder F, and its staple tools, mechanism or devices, have been considered as supported by rotating carriers which are cylinders, and which are additionally supplied with cutting and folding mechanisms. These stapling mechanisms may, however, co-operate with two or more longitudinal folders as L, F. The rotative carrier for its staple forming, carrying, presenting and inserting operations may be any form of carrier suitable for supporting the tools, mechanisms or devices, and periodically moving the same to and from the setting point; and the clinching mechanism may have various constructions and be a stationary device, and the delivery of the stapled web may be to separate cutting and folding mechanisms. These modifications are shown in Fig. 11 where two longitudinal folders L, F, are illustrated each operating to fold one or more webs or sheets passed over them, as is indicated by the webs illustrated thereon and which are designated by M, A, N, Y, and W, E, B, S. Each of these longitudinal folders may be of any approved construction, that illustrated being in substantial accordance with the structure of longitudinal folder forming the subject-matter of United States Patent No. 331,280. As here shown, the stock or holder, as H, carrying the traveling tools, which are used in the forming, carrying or presenting and inserting of the staple, is supported to rotate on or with the shaft 60, a segment of a cylinder 61 being preferably connected therewith as a paper support during the operations of inserting and clinching, and this, although not essential, is desirable.

The staple clinching device against the face of which the staple legs are clinched, and over which they are moved after they are inserted into the paper, is fixed in place instead of being made to move. Its details of construction are more particularly shown in Figs. 12 and 13 where its curved clinching face 16 is shown to be continued downwardly so that the staple legs may move onward somewhat while undergoing the clinching operation and after they are completely clinched, without being obstructed in their onward passage with the paper, from which obstruction might result a stripping of the staple from the paper, or its distortion.

Only one mechanism for severing the stapled web longitudinally into sheet lengths and folding the same is shown. As its construction does not differ from that shown in Fig. 1, like parts are designated by corresponding letters and figures of reference, so that the former description of these devices may be read upon Fig. 11, and an understanding of the devices be had. It will now be understood that webs from either of the longitudinal folders may be continuously passed through these mechanisms, and be stapled on the run in, on, or along, their ultimate binding lines, as has heretofore been described, and that the webs once passed or threaded through the mechanisms, and within the control of the cutting and folding cylinders, will be regularly and uniformly moved onward so as to carry the webs between the cutting mechanisms whether or not the segment 61, be present, but as has been remarked this segment is preferable, and it is for the reason that during the staple inserting and clinching operations it is desirable to have at least one side of the material to be stapled firmly supported.

By the use of two or more longitudinal folders in connection with one stapling mech-

anism, it will be apparent that the products of many printing machines may be plicated by association in the web, and that thereafter many sets of associated webs may be additionally combined and stapled together as a single whole. A single web from each folder whether plicated by associating or folding may be additionally plicated by associating the webs from the two folders. Hence it results that printing machines with this improved delivery may be adapted to produce ultimate products composed of two sheets or of several sheets having one fold upon their binding line, or of packs of the latter suitably stapled together.

From the foregoing, it will be apparent from slight consideration, that where two or more printing mechanisms are employed, the association of their webs, whether split or not, either run directly together between rollers, or transferred laterally for association, will cause a plication suitable for the stapling operation. Although these illustrations have not included means for stapling the webs longitudinally, such are understood to be contained herein in like manner as so described in connection with my aforesaid application.

While any suitable wire feeding and wire length cutting mechanisms or devices may be employed, an approved means for cutting the staple lengths from the body of the wire is shown in Figs. 14 to 17. Instead of depending upon the shearing action of one side of one of the arms or holder or presenting tool in coaction with the mouth of the wire conduit or die 18, there is provided a separately acting cutter which is a swinging blade 33 pivoted to a standard 34, that is supported from the guide block 77. This cutter depends before the die 18 on the end of the guide block 77 so as to be in shearing contact therewith, and the side of the arm 43 of the holder or presenting tool 41 is recessed so as to enable it during its onward movement to pass the cutter 33. The cutter is provided near its lower extremity with an angular cutting jaw 35 through which the wire length is fed outward, and this recess is provided with a tappet 36 which, during such onward movement engages the lower end of the cutter and thus swings it forward and upward to cause its cutting jaw 35 to sever the wire length, a spring 37 operating to quickly retract the cutter into a position admitting the immediate outward feeding movement of the wire for the protrusion of a new staple length. The curved anvil 40 though shown herein as supported above and in a general sense coincident with the periphery of the carrier D, might be let into said carrier so as to extend within or protrude into the periphery thereof. This requires some modification of the parts, as will be apparent, but such a structure is not claimed herein, it being mentioned to indicate the scope of the invention embodied in this improved mechanism. A stationary anvil having an under surface curved may be set eccentrically with the periphery of the carrier D or curved pathway of the traveling staple holder or presenting tool and thus provide a guiding surface in the formation of the staple which is tantamount to providing the rearward or entrance end of said anvil with the wedge like formation 10.

A prominent or characteristic feature of the staple forming, and holding, carrying or presenting, and inserting or driving, tools or devices, is that the principal tools or devices shall travel from one point where the wire length is received to another point to which the staple, that is intermediately formed in connection with an anvil, shall be carried for insertion and be inserted into the material. This is shown as a rotary movement, but as the path of travel is an arc, it may be an oscillation, and such a travel may also be performed by what is known as a "four way motion" in connection with a straight anvil, and hence the term "traveling" used in connection with the tools is to be taken in a broad sense as including such motion or movement and indicating the broad scope of the claims.

The traveling holder or presenting tool operates as a staple forming tool while passing over a portion of the anvil, but it will be observed that that function of it ceases when that part of the anvil is reached which is its limit of projection toward said tool, and since the formation of the staple is then complete and it is held within the arms of the holder, it is practical to omit any forward extension of the anvil beyond it, since the staple will then be held in the arms of the holder or presenting tool in position for onward carriage and presentation to the material, by reason of the limit of the outward movement of the holder or presenting tool 41 that is determined by a stop screw which enters through the side of the stock H or I and has an extension that projects into an elongated slot in one side of its hollow shank, and also by reason of the limit of the outward movement of the driver or inserting tool 44, that is determined by the stop nut adjustable on the threaded inner end of its shaft like stem, which nut abuts against the inner end of the stock H or I; but it is preferable to extend the anvil as near as possible to the staple setting point.

It is to be observed from the foregoing description that the staple inserting means consists generally of a staple holder or presenting tool which holds or presents and sometimes guides the made staple so that its legs shall properly enter the material, and a tool or driver which acts to insert or compel the entrance of the staple into the material. It is to be understood, however, that the staple holding or presenting tool may also act as a tool or driver for inserting the staple into the material to be stapled, notwithstanding that in co-operation with a forming anvil it also performs the function of a bending tool in the operation of forming staples, and that it

additionally operates as the means for carrying the wire to the staple forming point and the staple to the point for its insertion into the material. In some constructions the separate and movable driver or inserting tool would be omitted, but its presence as shown is preferable since the retiring support for the staple crown is desirable during the formation of the staple in order to prevent its buckling or bowing.

The term "sweep longitudinally," as used in the claims with respect to the forming movement of the holder or presenting tool, means that said tool moves or travels longitudinally along over said anvil and at the same time carries with it the wire lengths the ends of which are thus progressively bent to form a staple as it is carried or swept onward by the tool.

By the term "curved anvil" as used in the claims, is meant an anvil, or similar part, cooperating with the staple holder or presenting tool having that face curved between which and the tool the crown of the staple is held during the staple forming operation; and, it may be during the carrying of the staple from the forming point to the setting point.

What is claimed is—

1. The combination, substantially as described, with means for feeding plicated webs or sheets onward, and an anvil, of a traveling holder or presenting tool sweeping longitudinally over said anvil to form a staple to carry it into position relative to the material for its insertion therein, and a staple leg clinching device.

2. The combination, substantially as described, with a longitudinal folder or folders for folding or plicating material, means for feeding the material onward, and an anvil, of a traveling holder or presenting tool sweeping longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein, and a staple leg clinching device.

3. The combination, substantially as described, with means for plicating sheets or webs, and a curved anvil, of a traveling staple holding or presenting tool sweeping rotatively over said anvil to form a staple, and carry it into position relative to the material for its insertion therein, and a staple leg clinching device moving relatively in co-operation therewith.

4. The combination, substantially as described, with a longitudinal folder or folders, and means for associating the material therefrom, of an anvil, a traveling tool and means causing it to sweep longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein, a coacting staple leg clinching device, and, means for advancing the material between said tool and clinching device.

5. In a staple forming mechanism, the combination, substantially as described, of an anvil, a traveling tool and means causing it to sweep longitudinally over said anvil in forming a staple.

6. In a stapling mechanism, the combination, substantially as described, of an anvil, a traveling tool and means causing it to sweep longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein.

7. In a stapling mechanism, the combination, substantially as described, of an anvil, a traveling tool sweeping longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein, with means for clinching the staple legs.

8. In a stapling mechanism, the combination, substantially as described, with means feeding the material onward, of an anvil, and a traveling tool sweeping longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein.

9. In a stapling mechanism, the combination, substantially as described, with means feeding the material onward, of an anvil, a traveling tool sweeping longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein, and, a staple leg clinching device.

10. In a staple forming mechanism, the combination, substantially as described, of a curved anvil, a traveling tool and means causing it to sweep rotatively over said anvil in forming a staple.

11. In a stapling mechanism, the combination, substantially as described, of a curved anvil, a traveling tool and means causing it to sweep rotatively over said anvil in forming a staple, and, in carrying the staple into position relative to the material for its insertion therein.

12. In a stapling mechanism, the combination, substantially as described, of a curved anvil, a traveling tool and means causing it to sweep rotatively over said anvil in forming a staple, and, in carrying the staple into position relative to the material for its insertion therein, with means for clinching the staple legs.

13. In a stapling mechanism, the combination, substantially as described, with means for feeding the material onward, of a curved anvil, a traveling tool, and means causing it to sweep rotatively over said anvil in forming a staple, and, in carrying the staple into position relatively to the material for its insertion therein.

14. In a stapling mechanism, the combination, substantially as described, with means for feeding the material onward, of a curved anvil, a traveling tool and means causing it to sweep rotatively over said anvil in forming a staple, and, in carrying the staple into

position relatively to the material for its insertion therein, and a staple leg clinching device.

15. In a stapling mechanism, the combination, substantially as described, of a curved anvil, a traveling tool and means causing it to sweep rotatively over said anvil in forming a staple, and, in carrying the staple into position relative to the material for its insertion therein, with a staple leg clinching device moving rotatively in co-operation therewith.

16. In a stapling mechanism, the combination, substantially as described, with means feeding material onward, of a curved anvil, a traveling tool and means causing it to sweep rotatively over said anvil in forming a staple, and, in carrying the staple into position relative to the material for its insertion therein, and a staple leg clinching device moving rotatively in co-operation therewith.

17. In a staple forming mechanism, the combination, substantially as described, of an anvil having a wedge like receiving end therefor, a traveling tool co-operating therewith, and means causing the latter to sweep longitudinally over said anvil in the operation of forming a length of wire into a staple.

18. In a staple forming mechanism, the combination, substantially as described, of a curved anvil having a wedge like receiving end therefor, a traveling tool co-operating therewith, and means causing the latter to sweep in an arc over said anvil in the operation of forming a length of wire into a staple.

19. In a stapling mechanism, the combination, substantially as described, of an anvil having a wedge like exit end to enable the material to be stapled to run close to the plane in which the staple crown moves, a traveling tool carrying the staple, means causing the tool to sweep longitudinally over said wedge like exit end during the insertion of the staple into the material, and means causing said tool to retreat as the staple is progressively inserted therein.

20. In a stapling mechanism, the combination substantially as described, with means for feeding material onward, of an anvil having a wedge like exit end to enable the material to be stapled to run close to the plane in which the staple crown moves, a traveling tool carrying the staple, means causing the tool to sweep longitudinally over said wedge like exit end during the insertion of the staple into the material, and means causing said tool to retreat as the staple is progressively inserted therein.

21. In a stapling mechanism, the combination substantially as described, with means for feeding material onward, of an anvil having a wedge like exit end to enable the material to be stapled to run close to the plane in which the staple crown moves, a traveling tool carrying the staple, means causing the tool to sweep longitudinally over said wedge like exit end during the insertion of the staple into the material, a device for clinching its legs, and means causing said tool to retreat as the staple is progressively inserted therein.

22. In a stapling mechanism, the combination, substantially as described, of a curved anvil having a wedge like exit end to enable the material to be stapled to run close to the plane in which the staple crown moves, a rotative tool carrying the staple, means causing the tool to sweep in an arc over said wedge like end during the insertion of the staple into the material, and means causing said tool to retreat as the staple is progressively inserted therein.

23. In a stapling mechanism, the combination, substantially as described, with means for feeding material onward, of a curved anvil having a wedge like exit end to enable the material to be stapled to run close to the plane in which the staple crown moves, a rotative tool carrying the staple, means causing the tool to sweep in an arc over said wedge like end during the insertion of the staple into the material, and means causing said tool to retreat as the staple is progressively inserted therein.

24. In a stapling mechanism, the combination, substantially as described, with means for feeding material onward, of a curved anvil having a wedge like exit end to enable the material to be stapled to run close to the plane in which the staple crown moves, a rotative tool carrying the staple, a staple leg clinching device, means causing the tool to sweep in an arc over said wedge like end during the insertion of the staple into the material, and means causing said tool to retreat as the staple is progressively inserted therein.

25. In a stapling mechanism, the combination, substantially as described, of an anvil having wedge like receiving and exit ends, a traveling tool, means causing the tool to sweep longitudinally over said anvil, in forming a staple and carrying it onward for insertion into the material, and means causing said tool to retreat as the staple is progressively inserted therein while the wedge like exit end of the anvil is traversed by the tool.

26. In a stapling mechanism, the combination, substantially as described, with means for feeding the material onward, of an anvil having wedge like receiving and exit ends, a traveling tool, means causing the tool to sweep longitudinally over said anvil, in forming a staple and carrying it onward for insertion into the material, and means causing said tool to retreat as the staple is progressively inserted therein while the wedge like exit end of the anvil is traversed by the tool.

27. In a stapling mechanism, the combination, substantially as described, with means for feeding the material onward, of an anvil having wedge like receiving and exit ends, a traveling tool, means causing the tool to sweep longitudinally over said anvil, in forming a staple and carrying it onward for insertion

into the material, a staple leg clinching device, and means causing said tool to retreat as the staple is progressively inserted therein, while the wedge like exit end of the anvil is traversed by the tool.

28. In a staple forming and inserting mechanism, the combination, substantially as described, of a curved anvil having wedge like receiving and exit ends, a traveling tool, means causing the tool to sweep in an arc longitudinally over said anvil in forming a staple and carrying it onward for insertion into the material, and means causing said conveyer to retreat as the staple legs are progressively inserted into the material while the wedge like exit end of the anvil is traversed.

29. In a staple forming and inserting mechanism, the combination, substantially as described, with means for feeding material onward, of a curved anvil having wedge like receiving and exit ends, a traveling tool, means causing the tool to sweep in an arc longitudinally over said anvil in forming a staple and carrying it onward for insertion into the material, and means causing said conveyer to retreat as the staple legs are progressively inserted into the material while the wedge like exit end of the anvil is traversed.

30. In a staple forming and inserting mechanism, the combination, substantially as described, with means for feeding material onward, of a curved anvil having wedge like receiving and exit ends, a traveling tool, means causing the tool to sweep in an arc longitudinally over said anvil in forming a staple and carrying it onward for insertion into the material, a staple leg clinching device, and means causing said conveyer to retreat as the staple legs are progressively inserted into the material while the wedge like exit end of the anvil is traversed.

31. In a stapling mechanism, the combination, substantially as described, of a traveling tool, means causing it to sweep rotatively in carrying the staple into position relative to the material for its insertion therein, means for inserting the staple, and, means causing said tool to retreat as the staple is progressively inserted.

32. In a stapling mechanism, the combination, substantially as described, of a traveling tool, means causing it to sweep rotatively in carrying the staple into position relative to the material for its insertion therein, means for inserting the staple, a staple leg clinching device, and, means causing said tool to retreat as the staple is progressively inserted.

33. In a stapling mechanism, the combination, substantially as described, with means for feeding material onward, of a traveling tool, means causing it to sweep rotatively in carrying the staple into position relative to the material for its insertion therein, means for inserting the staple, a staple leg clinching device, and, means causing said tool to retreat as the staple is progressively inserted.

34. In a stapling mechanism, the combination, substantially as described, of a traveling tool, means causing it to sweep rotatively in carrying the staple into position relative to the material for its insertion therein, means for inserting the staple, a rotative staple leg clinching device, and, means causing said tool to retreat as the staple is progressively inserted.

35. In a stapling mechanism, the combination, substantially as described, with means for feeding material onward, of a traveling tool, means causing it to sweep rotatively in carrying the staple into position relative to the material for its insertion therein, means for inserting the staple, a rotative staple leg clinching device, and, means causing said tool to retreat as the staple is progressively inserted.

36. In a stapling mechanism, the combination, substantially as described, with staple inserting means, the holder or presenting tool whereof is protruded from its stock while traveling onward and approaching the staple setting point, of an opposing co-operating device contact with which operates to retract or retire said tool and cause the legs of the staple to progressively enter through the material.

37. In a stapling mechanism, the combination, substantially as described, with staple inserting means the holder or presenting tool whereof is protruded from its stock while traveling onward and approaching the staple setting point, of an opposing co-operating staple leg clinching device contact with which device operates to retract or retire said tool and cause the legs of the staple to progressively enter through the material.

38. In a stapling mechanism, the combination, substantially as described, with staple inserting means, the holder or presenting tool whereof is protruded from its stock while traveling rotatively onward and approaching the staple setting point, of an opposing co-operating rotatively moving staple leg clinching device contact with which device operates to retract or retire said tool and cause the legs of the staple to progressively enter through the material.

39. The combination, substantially as described, with means for delivering a staple length of wire thereto, of an anvil, and a traveling tool sweeping longitudinally over said anvil to form a staple and to carry it into position for presentation to the material at the point for its insertion therein.

40. In a stapling mechanism, the combinations of a supporting shaft, staple inserting means carried thereby and provided with means for supporting the staple with its legs radial with respect to the shaft, means for rotating the inserting means so that the staple will be first brought into contact with the material and thereafter be inserted therein solely by the rotating movement of the inserting means, and means for feeding the material

onward as the staple is inserted, substantially as described.

41. In a stapling mechanism, the combinations substantially described, with means for feeding the material onward as the staple is inserted, of a supporting shaft, staple inserting means carried thereby and provided with means for supporting the staple with its legs radial with respect to the shaft, means for rotating the inserting means so that the staple will be first brought into contact with the material and thereafter not only be inserted therein solely by the rotating movement of the inserting means, but have its legs maintained and guided while the inserting operation is performed.

42. In a stapling mechanism, the combination, substantially as described, with means for feeding the material, of a staple holder or presenting tool rotatively moving in the direction of the feeding movement of the material to present the staple relative to the material for insertion therein and means supporting said tool radially with relation to its arc of travel.

43. The combination with a wire feeding mechanism and a cutter for severing staple lengths of wire, of an anvil and traveling tool co-operating therewith, and means causing the latter to sweep longitudinally over said anvil in forming the staple, substantially as described.

44. The combination with a wire feeding mechanism and a cutter for severing staple lengths of wire, of an anvil, a traveling tool co-operating therewith, means causing the latter to sweep longitudinally over said anvil to form a staple and carry it into position relative to the material for its insertion therein for clinching the legs of the staple, substantially as described.

45. The combination with a traveling staple inserting means, of a staple leg clinching device open in the direction of the movement of said tool to provide for the clearance of the staple during the clinching operation, substantially as described.

46. The combination, substantially as described, with a stationary anvil, and a tool operating to sweep longitudinally over said anvil in forming a staple, of inserting means pressing the interposed wire outwardly whereby wear of the tool is prevented.

47. The combination, substantially as described, with a stationary anvil, of a holder or presenting tool and an outwardly pressed driver or inserting tool, both traveling longitudinally over said anvil in forming a staple and carrying it onward for insertion, whereby the wire interposed between said tool and anvil operates to prevent wear of the tools.

48. The combination with a continuous wire feeding device, of a wire cutter and the arm 43 operating the same and provided with a removed portion, as 14, substantially as described.

49. A wire cutting device consisting of the die 18, a moving cutter, and the traveling arm 43 of the rotatively moving holder or presenting tool for operating the same, to sever a wire length, while it sweeps longitudinally over the forming anvil substantially as described.

50. The combination with a wire feeding mechanism, a staple holder or presenting tool and a cutter for severing wire lengths, of a stationary anvil provided with wings 7, 8 coacting therewith to support the wire during the cutting operation, substantially as described.

51. The combination with the staple holder or presenting tool, means whereby it is moved to and from the wire receiving point, and sweeps longitudinally over the forming anvil, and means for feeding wire across the pathway in which the tool travels, of a cutter operated by the said tool to sever the wire, substantially as described.

52. The combination with a rotative carrier or stock in which the staple holder or presenting tool is spring seated and carried to and from the staple setting point, of a co-operating carrier or clinching device by contact with which the said tool is retracted in the operation of inserting and clinching the staple.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUTHER C. CROWELL.

Witnesses:
H. T. MUNSON,
T. F. KEHOE.