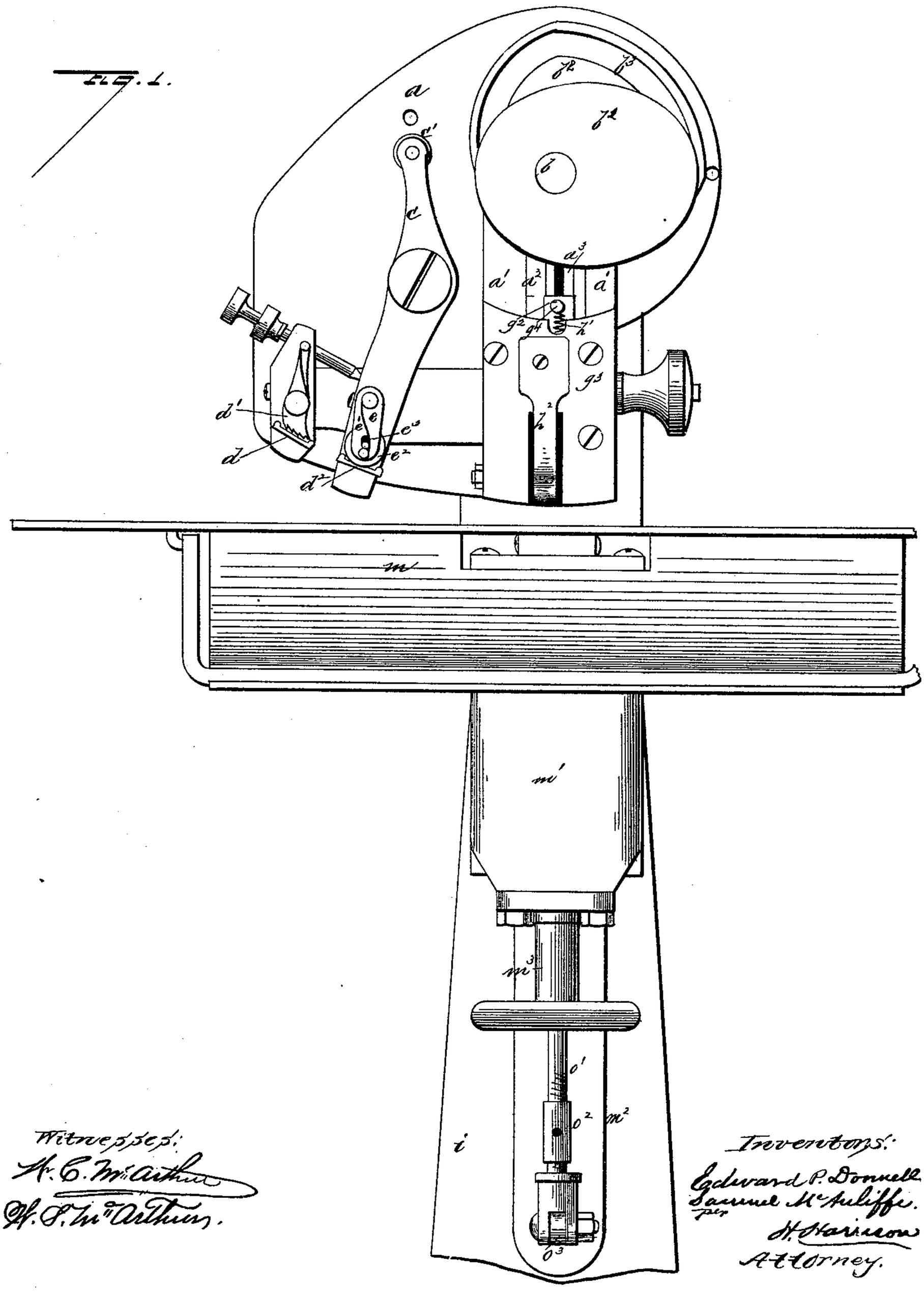
(No Model.) 5 Sheets—Sheet 1.

E. P. DONNELL & S. McAULIFFE.

BOOK STAPLING MACHINE.

No. 386,972. Patented July 31, 1888.

Fig. 1.



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Attorney.

(No Model.) 5 Sheets—Sheet 2.

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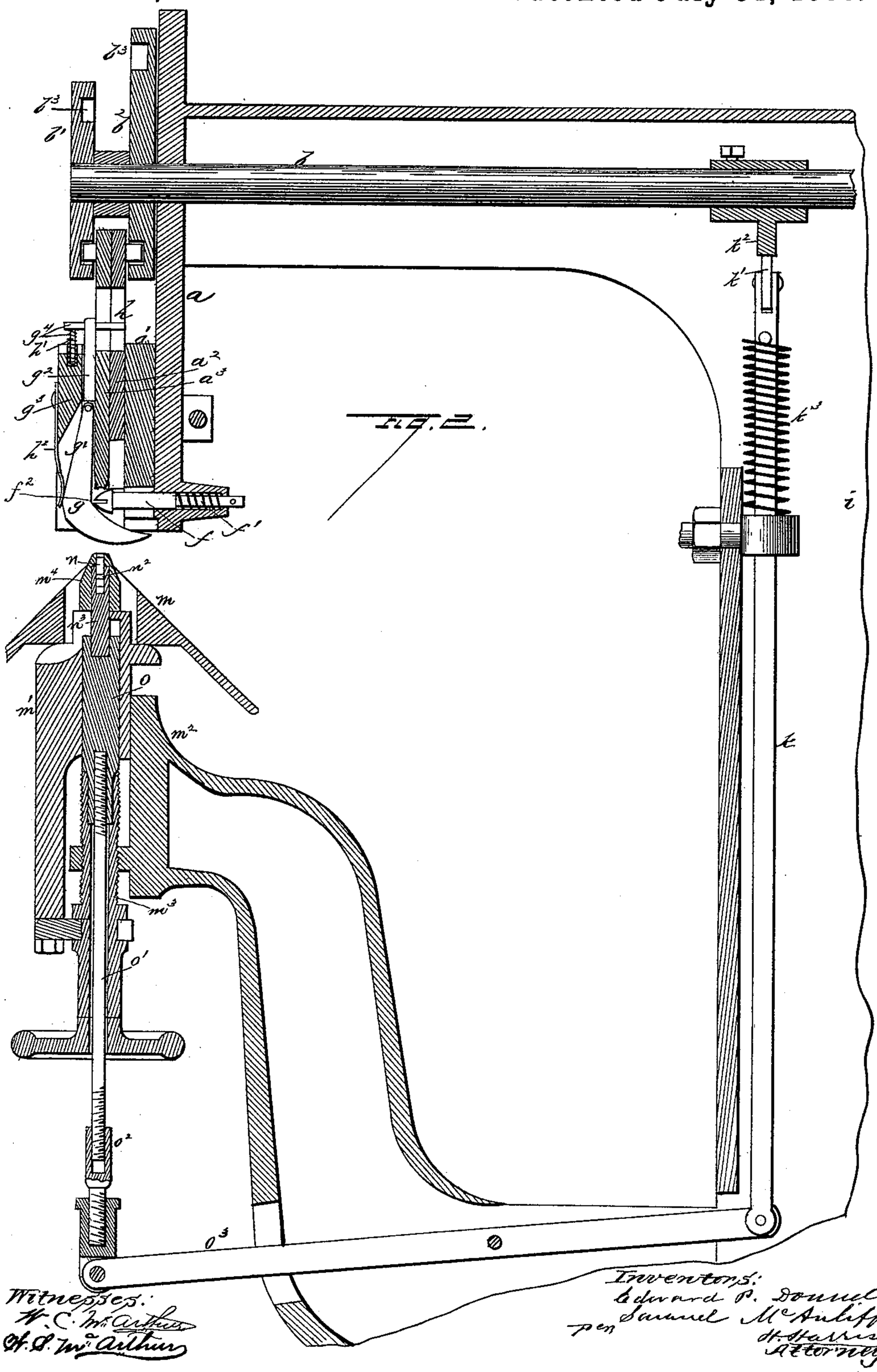

FIG. 2.

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FIG. 3.

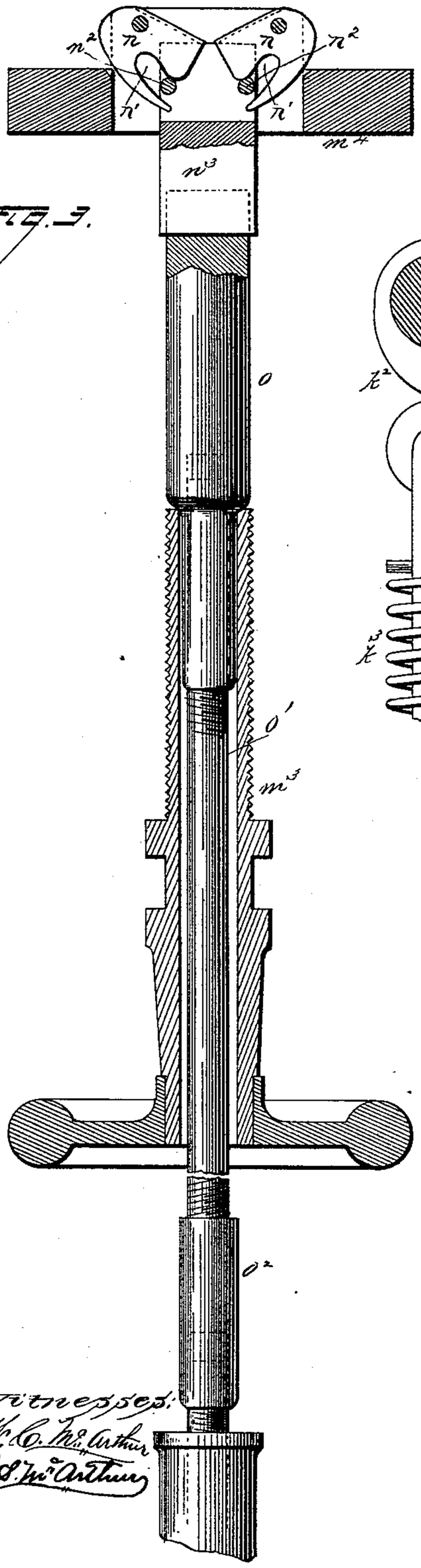


FIG. 4.

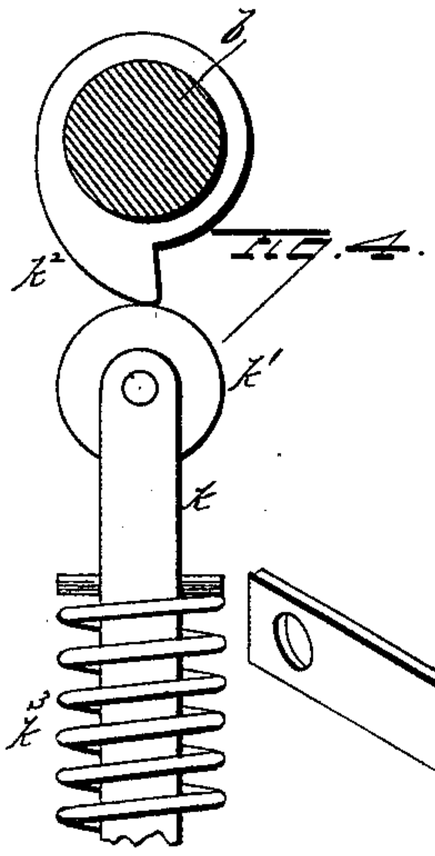


FIG. 5.

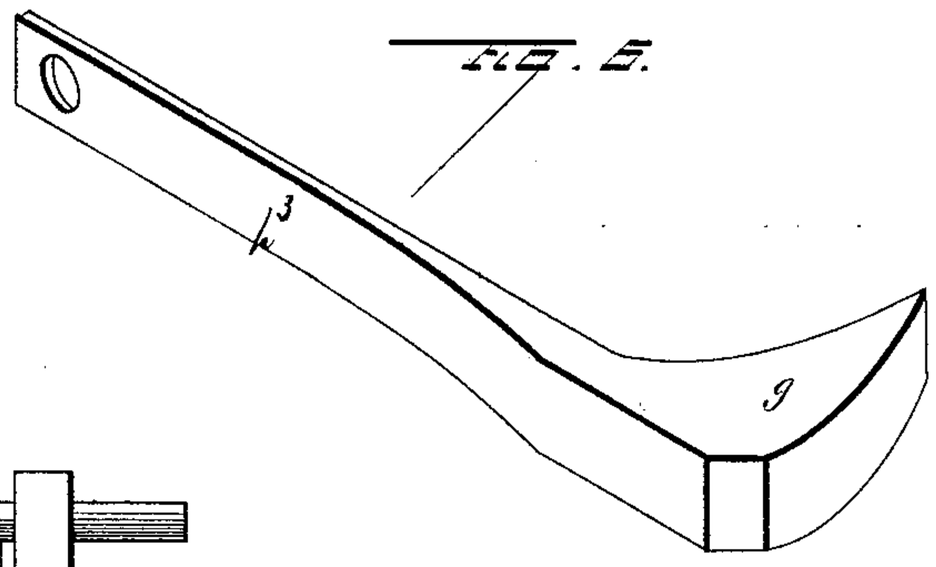
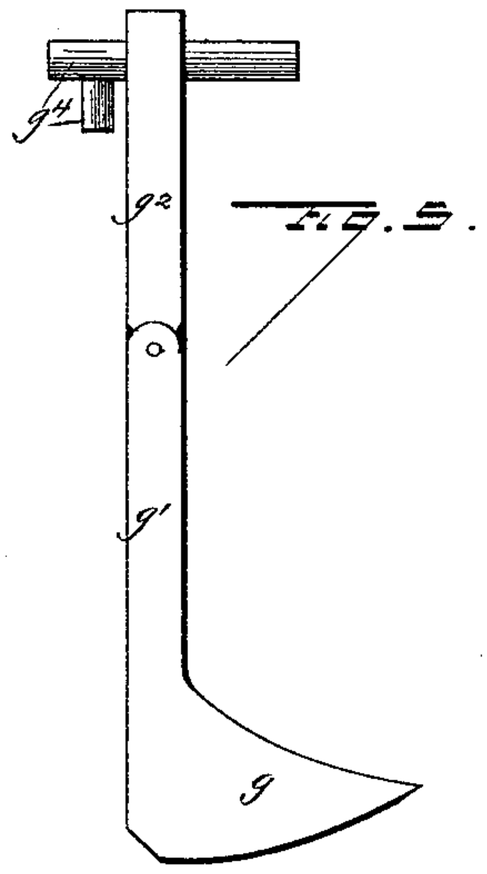


FIG. 6.



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E. P. DONNELL & S. McAULIFFE.

BOOK STAPLING MACHINE.

No. 386,972. Patented July 31, 1888.

Fig. 1.

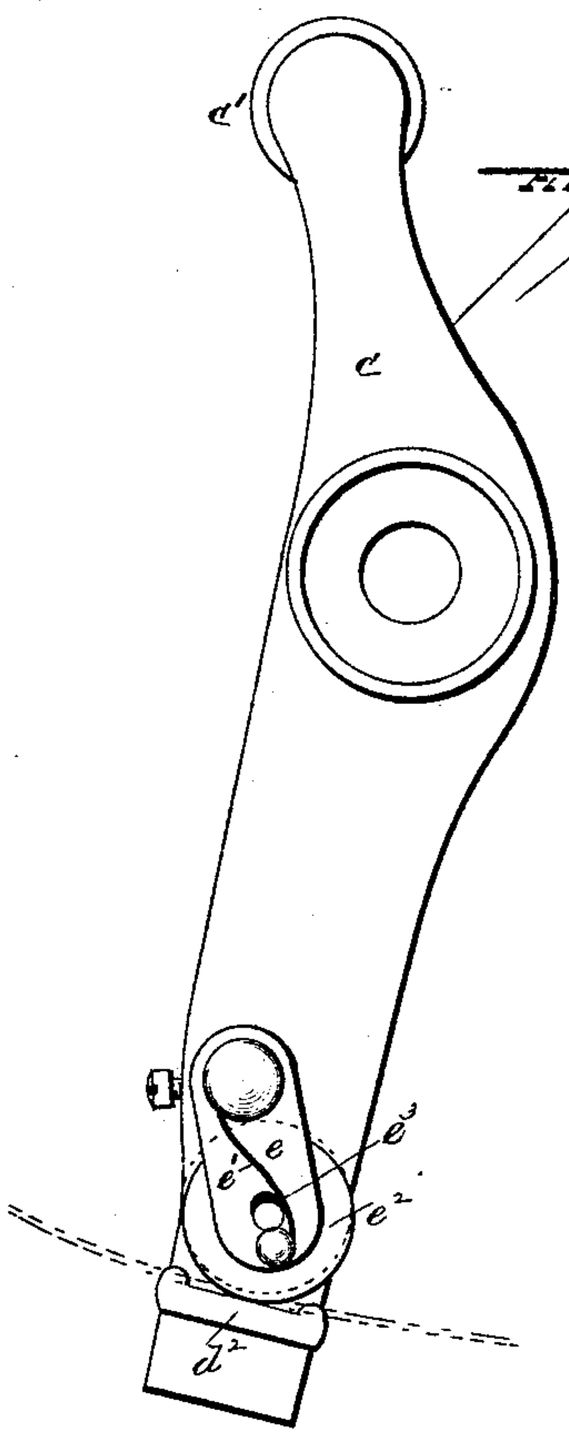


Fig. 2.

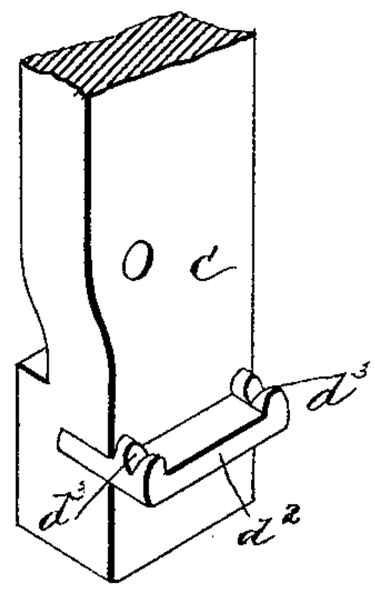


Fig. 3.

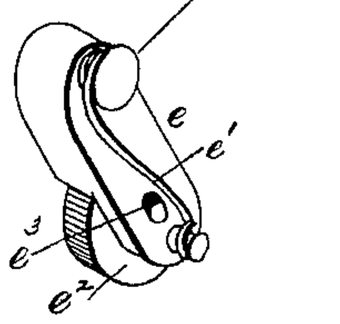
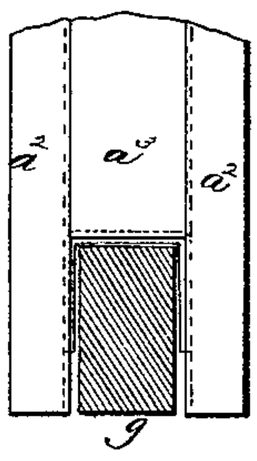


Fig. 10.



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BOOK STAPLING MACHINE.

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FIG. 11.

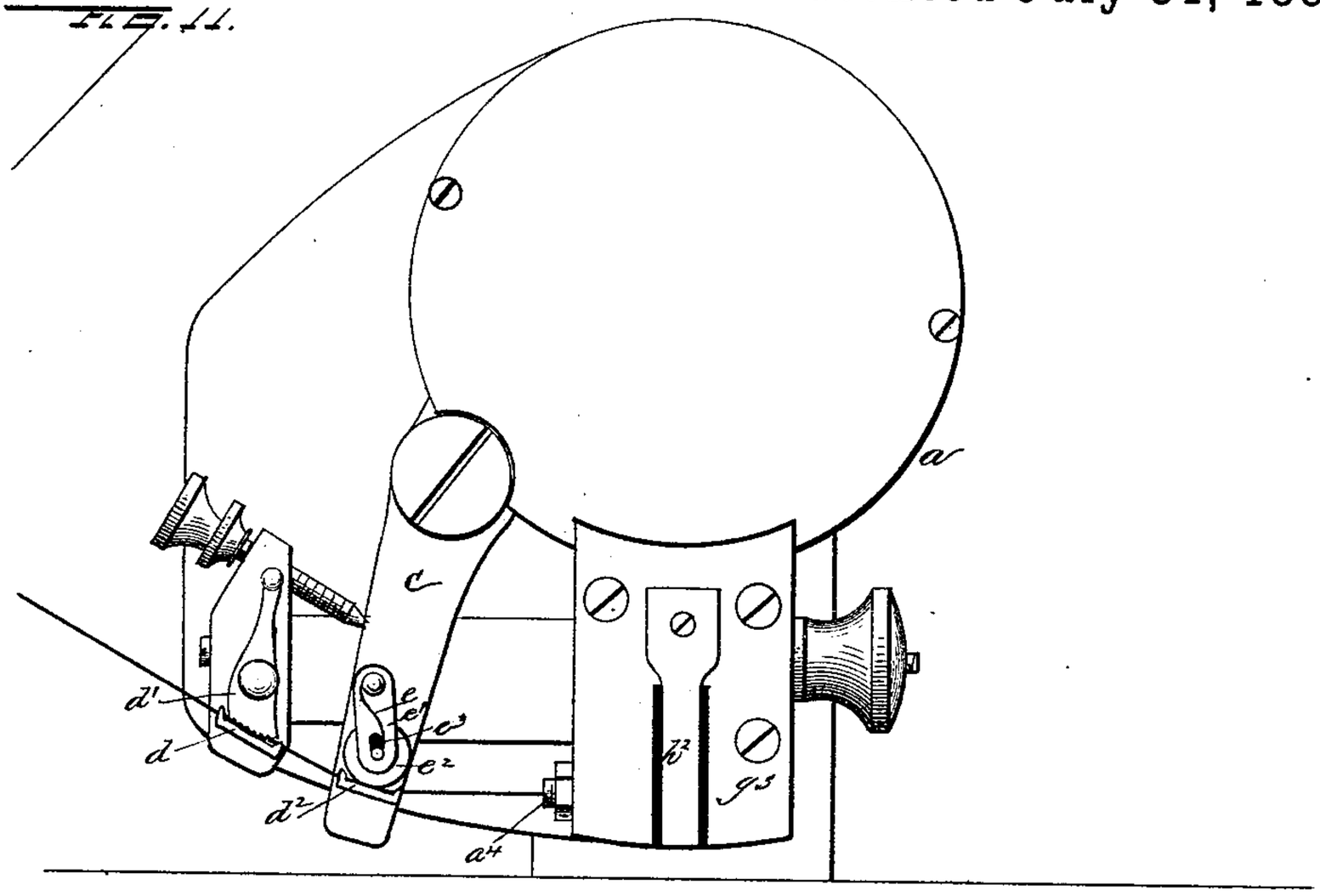


FIG. 12.

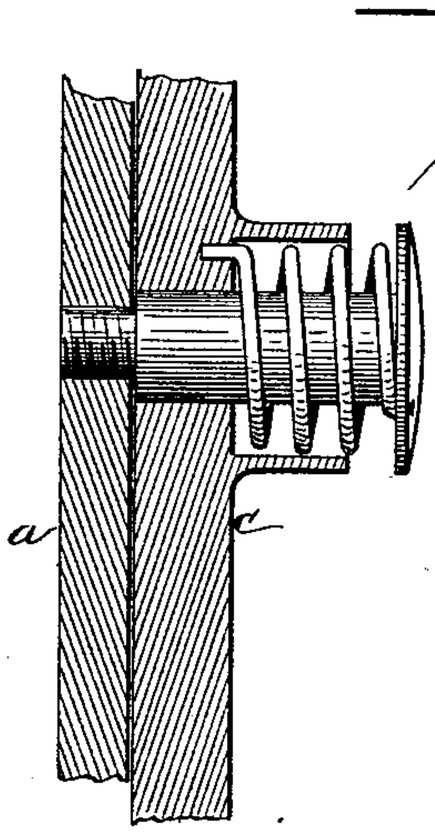


FIG. 13.

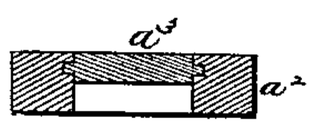
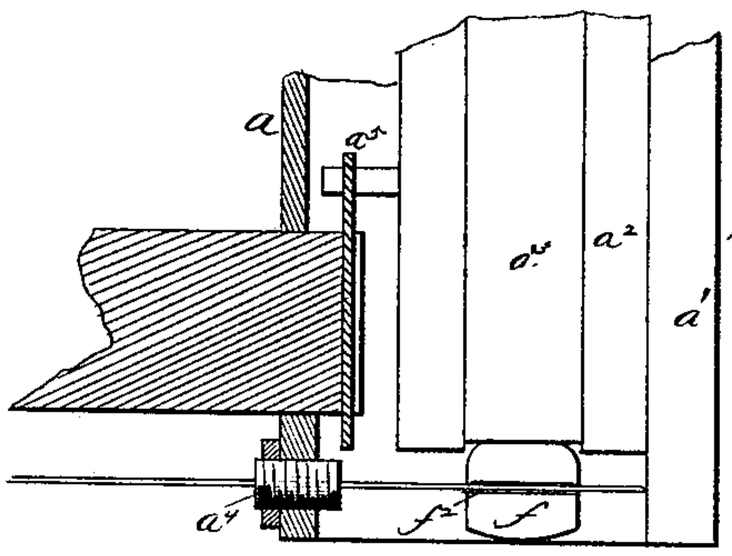


FIG. 14.



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UNITED STATES PATENT OFFICE.

EDWARD P. DONNELL AND SAMUEL McAULIFFE, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE E. P. DONNELL MANUFACTURING COMPANY, OF SAME PLACE.

BOOK-STAPLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 386,972, dated July 31, 1888.

Application filed December 30, 1886. Serial No. 223,005. (No model.)

To all whom it may concern:

Be it known that we, EDWARD P. DONNELL and SAMUEL McAULIFFE, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Book-Stapling Machines, of which the following is a specification, to wit:

This invention relates to an improvement in book-stapling machines; and it consists in certain peculiarities of the construction and arrangement of the same, substantially as will be hereinafter more fully set forth, and pointed out in the claims.

In order to enable others skilled in the art to which our invention pertains to make and use the same, we will now proceed to describe its construction and operation, referring to the accompanying drawings, in which—

Figure 1 is a front elevation of our machine with the cap removed from the head. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is an enlarged detail view of the clinching devices; Fig. 4, a detail view of the main shaft and the clinching-cam; Fig. 5, a view of the staple-supporter; Fig. 6, a modification of the same; Fig. 7, a detail view of the feeding-lever and its pawl. Figs. 8 and 9 are detached details of the same. Fig. 10 is a view of the lower end of the driver and former, showing the staple-supporter in position occupied in actual use. Fig. 11 is a front elevation of the head of our machine with the cap in place as when in use. Fig. 12 is a detail section of the feeding-lever and head-plate, showing the return-spring of this lever. Fig. 13 is a cross-section of the former and driver, and Fig. 14 is a front elevation of the lower ends of the former and driver, the anvil and a part of the main frame sectioned to show the cutter and wire lead.

a represents the head of our machine, or the plate upon which the staple forming and driving mechanism is carried. This head or plate is formed or provided with a guide or frame, a', in which the former and driver move, as usual. The former consists of a plate, a^2, the lower end of which is forked, as in Figs. 10 and 14, and the driver a^3 lies and moves in a groove in the face of the former, the edges of this groove being formed with recessed faces to receive guide-tongues upon the edges of the driver. This is plainly seen in Fig. 13, and is so common in this class of machines as to need no more detailed description at this place.

The wire is fed in through a guide tube or opening, a^4, over the edge of which it is cut by the cutter a^5, sliding in connection with the former, and when cut the descent of this former bends the ends of the severed piece of wire into a staple, the legs of which, when formed, lie in the recessed edges of the grooved former, as in dotted lines in Fig. 10, and are thereby guided in being driven into the work under operation.

The main shaft *b* extends through the head of the machine, suitably journaled, and carries upon its forward end a pair of disks, b' b^2, which disks are placed upon the shaft a short distance apart to allow of the former and driver lying between them. These disks are formed on their adjacent sides with cam-grooves b^3, in one of which is engaged a small roller upon the former and in the other a similar roller upon the driver, whereby these parts are at the proper intervals given their proper and peculiar movements in the formation and insertion of a staple. The edge of the disk b^2 also forms a cam for the proper operation of the feeding-lever *c*, which is pivoted upon the head at one side of the former and driver, and is provided with a friction-roller, c', upon its upper end, with which the disk b^2 contacts, as will be evident by reference to Fig. 1. This feeding-lever is operated in one direction by the cam-disk, and is withdrawn by a spring, but which is coiled upon the shank of the pivot-pin on which this lever is hung, as clearly illustrated in Fig. 12.

The wire from which the staple is formed is held upon a spool placed at any point found most convenient, and its end is led into the machine over a ledge, *d*, on which bears a spring actuated dog, d', having a roughened face. This dog allows the wire to be readily and freely drawn forward; but any tendency to backward motion is at once checked by the gripping of the wire by this dog against the

ledge *d*, on which it bears. The lower end of the feeding-lever *c*, as will be clearly seen in Figs. 1, 7, and 8, is also provided with a ledge, d^2, over which the wire is led, and both this ledge and the former one are, as Fig. 8, formed with upward projections, notched as at d^3, which serve to effectually retain the wire in position and prevent any accidental displacement under the action of the clamping-dogs.

Upon the feed-lever, above its ledge, is pivoted a small arm, *e*, provided with a spring, *e'*, for throwing it down upon the ledge, and on the free end of the arm is a small wheel, e^2, having a milled or roughened edge. This wheel is journaled in an elongated hole or short slot, e^3, giving it a slight movement to accommodate itself to different sizes of wire, and it will be at once understood that as the lever is moved forward to feed the wire the milled wheel is jammed down to grip the wire and draw it forward, drawing it freely under the dog *d'*, and when the lever is upon its backward stroke the spring-arm swings forward and the milled wheel passes over the wire, which is now held by the dog *d'*. This feeding arrangement insures a tight grip of the wire in feeding forward, a free passage over the same upon the back-stroke, and does not indent the wire where it is gripped and thereby enables us to form a staple the legs and body of which are not in any way weakened by such indentations, as has often occurred heretofore.

From the feeding-lever the wire is passed into the forming and driving mechanism, under the cutter, and over an anvil, on which the staple is formed. This anvil *f* is seated in the head, as in Fig. 2, with a spring, *f'*, to force it forward, and has its forward end or head formed with a deep notch, f^2, to receive the wire as it is fed into the machine. When the wire is fed in through the guide-tube, it passes through the notched head of the anvil a proper distance, and the former then begins to descend, carrying with it the cutter, which severs the wire from the main portion, and the forked ends of the former then strike the wire blank and bend down its ends over the anvil to form the legs of the staple, which lie in the grooved edges of the recessed former, and the staple, being thus held in place, is not affected when on the continued descent of the former it presses back the anvil and leaves the staple free to be acted on by the driver, which now descends upon it and forces it through the work. The anvil spring presses it forward again to its first position as soon as the former and driver are lifted to permit another length of wire to be fed in. It will be particularly noticed that when the anvil is withdrawn the staple is held in the guide-grooves of the former in the exact position required for the driver to properly contact with it to force it down through the work. In this latter movement it sometimes happens that the legs of the staple bend or curl up before entering the material, as they are only supported upon their outer sides, and we prefer, therefore, to provide the effective means for bracing and holding steady the part of the legs not actually being passed through the material. This is done as follows, referring to Figs. 2 and 5:

g represents a swinging foot or toe lying normally under the anvil, and of proper width to admit of the forked former straddling it in its descent. This foot has its upper side beveled off to a point at its rear edge, and is formed with a shank, *g'*, pivoted upon a slide, g^2, moving in a fixed guide-block, g^3, over the face of the driver. This slide is provided on its upper end with a pin or arm, g^4, which on the rear side projects through a slot in the driver into a similar slot, *h*, in the former. This arm g^4 on the forward side of the slide g^2 rests upon a supporting-spring, *h'*, which allows it a slight fall and returns it to its upper position again at the proper time. This vertical reciprocation is for the purpose of enabling us to place the foot directly beneath the anvil, and when the latter is drawn back and the staple rests upon the foot the latter descends with the former till the latter rests upon the work and stops. At this point the driver, continuing to descend, forces back the foot by reason of its inclined upper face, and the foot is swung back from under the staple just in proportion as the staple is driven, enough of the tapering foot always being under the staple to fill the space between it and the work, and firmly confine the staple-legs, so that they cannot by any chance become bent, but must pass straight down through the material. As the driver is drawn up, the foot is pressed back to position to receive another staple by a spring, h^2, behind it.

In some cases it may not be deemed necessary to support the staple till it has arrived at the work, and in that case the foot may be dropped to the lowest position occupied, and remain there at all times. In this case, no sliding of the foot being needed, we sometimes make it with a spring-shank, h^3, integral with the foot or toe, as clearly shown in Fig. 6, and which will be at once understood from the drawings.

The main driving-shaft *b* is extended back through the neck of the machine to and through the standard *i*, on which the whole machine is supported, and it will be seen that this standard is made hollow and contains a vertically-sliding rod, *k*, in the upper end of which is a small friction-roller, *k'*, as in Figs. 2 and 4, on which bears a cam, k^2, upon the main shaft to force the rod down, and a spring, k^3, is placed upon the rod to lift it again after the cam has passed.

The work-table *m* may be of any desirable form or kind, but is in the present instance formed with a double incline, forming what is known as a "hip-table," for the support and reception of folded work, the ridge of the table

lying in the fold or crease and holding the work properly for the accurate insertion of the staples. This table is supported upon a casting, m', sliding vertically upon an arm, m^2, secured to and projecting forward from the main leg or standard of the machine, as in Fig. 2. An adjusting-screw, m^3, swiveled in the sliding casting and passing through a projection of the arm m^2, serves to readily adjust the table up or down to accommodate the varying thickness of the work under operation.

The clinching mechanism, as will be seen clearly by reference to Figs. 2 and 3, consists of a pair of dogs, $n\,n$, pivoted in the anvil m^4, which is supported upon the adjustable table. The upper faces of these dogs are slightly grooved out, as indicated by dotted lines in Fig. 3, which grooves receive and guide the points of the staple-legs in clinching. The lower parts of these dogs are formed with slots n', through which pass the pins $n^2\,n^2$ of a slide, n^3, which works vertically in the anvil, and is forked to embrace the lower parts of the dogs, as clearly seen in the drawings. This slide is carried upon the upper end of a rod, o, sliding vertically in the casting m', and having its lower end connected to a threaded rod, o', which passes down through the adjusting-screw m^3, this latter being made tubular to serve this purpose. This rod works freely through the hollow screw, and is limited in its fall by the rod o, which rests upon the upper end of the hollow adjusting-screw, as represented, and it and all its connections are thereby lifted and lowered in exact and constant correspondence with the adjustment of the table and anvil. The rod o' is provided with a screw-thread at both ends, one being a right and the other a left hand thread, and at the bottom it is connected by a short connection, o^2, with a lever, o^3, pivoted in the supporting-arm m^2 and connected to the sliding rod k in the main standard of the frame. This arrangement is such that at the time the legs of the staple are driven through the work they are bent under and toward each other by contact with the dogs in the anvil. At this time the cam upon the main shaft depresses the rod k and by means of its connected lever o^3 and lifting-rod o' raises the dogs and clinches the legs of the staple firmly down upon the work. The passage of the cam releases this pressure, and the spring k^3 returns the whole clinching apparatus to its normal position.

The operation of the whole machine will now be readily understood.

The wire is fed into the machine by the feeding-lever actuated by the edge of its cam-disk, and the staple length is cut and bent around the former-anvil by the descent of the forked former. This anvil is next forced back and the staple carried down to the work, held firmly, as in Fig. 10, between the grooved former-legs and the spring-actuated dog or foot that lies between them. The driver now descends and forces the staple through the work, the foot g swinging back in exact proportion as the staple is driven, so that the part not forced into the work is always well supported and cannot bend under any circumstances. The clinching is next performed, and the parts then all return to their first position and the wire fed for a repetition of the movements.

In practice the cams on the main shaft, and indeed the main parts of the head mechanism, are covered by a cap, as in Fig. 11, and the dirt and dust are thus excluded from in any way interfering with their proper action.

It will be noted that all the parts described are made readily adjustable, and that the clinching of the staple is not only separately adjustable as to its extent of movement, but is also moved with the table, so as to always occupy the same relative position thereto.

It will be noted that the small milled wheel upon the feeding-lever is held in a shouldered recess of its hinged arm, and when forced up by contact with the wire the disk jams against the shoulder, and thus relieves the strain upon the pivot, and has no tendency to twist the disk out of place, and this construction also insures the proper gripping of the milled wheel under all circumstances, as the spring-arm falls and the pivotal centers of the arm and disk approach nearer to the line of contact with the ledge or wire beneath it.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a book-stapling machine, a feeding-lever provided with a bearing or ledge to receive the wire, in combination with a slotted pawl-arm pivoted thereon, and provided with a roughened disk held in said slot to bear upon the wire ledge, substantially as and for the purpose set forth.

2. In a book-stapling machine, the combination, with the forked staple-former and the driver working in a groove in its face, of a spring-actuated toe or foot having an inclined upper edge lying normally between the legs of the former, a slide to which this toe is hinged, and a spring for supporting the slide and toe and lifting them after being depressed, substantially as and for the purpose set forth.

3. In a book-stapling machine, the combination, with the work-supporting table, adjustable to suit the work under operation, of a pair of clinching-dogs therein, an operating-rod for the same, shouldered to rest upon but free to slide through the table-frame, and made in two parts adjustable as to length, whereby the clinching devices are carried upon the adjustable table, yet are adjustable independently of the same, substantially as and for the purpose set forth.

4. The combination, with the main frame and its work-supporting table m, provided with a hollow screw, m^3, for adjusting it, and also with an anvil, m^4, of the dogs $n\,n$, pivoted in

the anvil and formed with the notches n', the slide n^3, connected to said dogs, the actuating-rod $o\ o'\ o^2$, made in parts and threaded for adjustment, and the lever o^3, spring-actuated rod k, and cam k^2 on the main shaft, by which the dogs are actuated, all constructed and arranged for operation substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

EDWARD P. DONNELL.
SAMUEL McAULIFFE.

Witnesses:
W. C. McARTHUR,
W. S. McARTHUR.