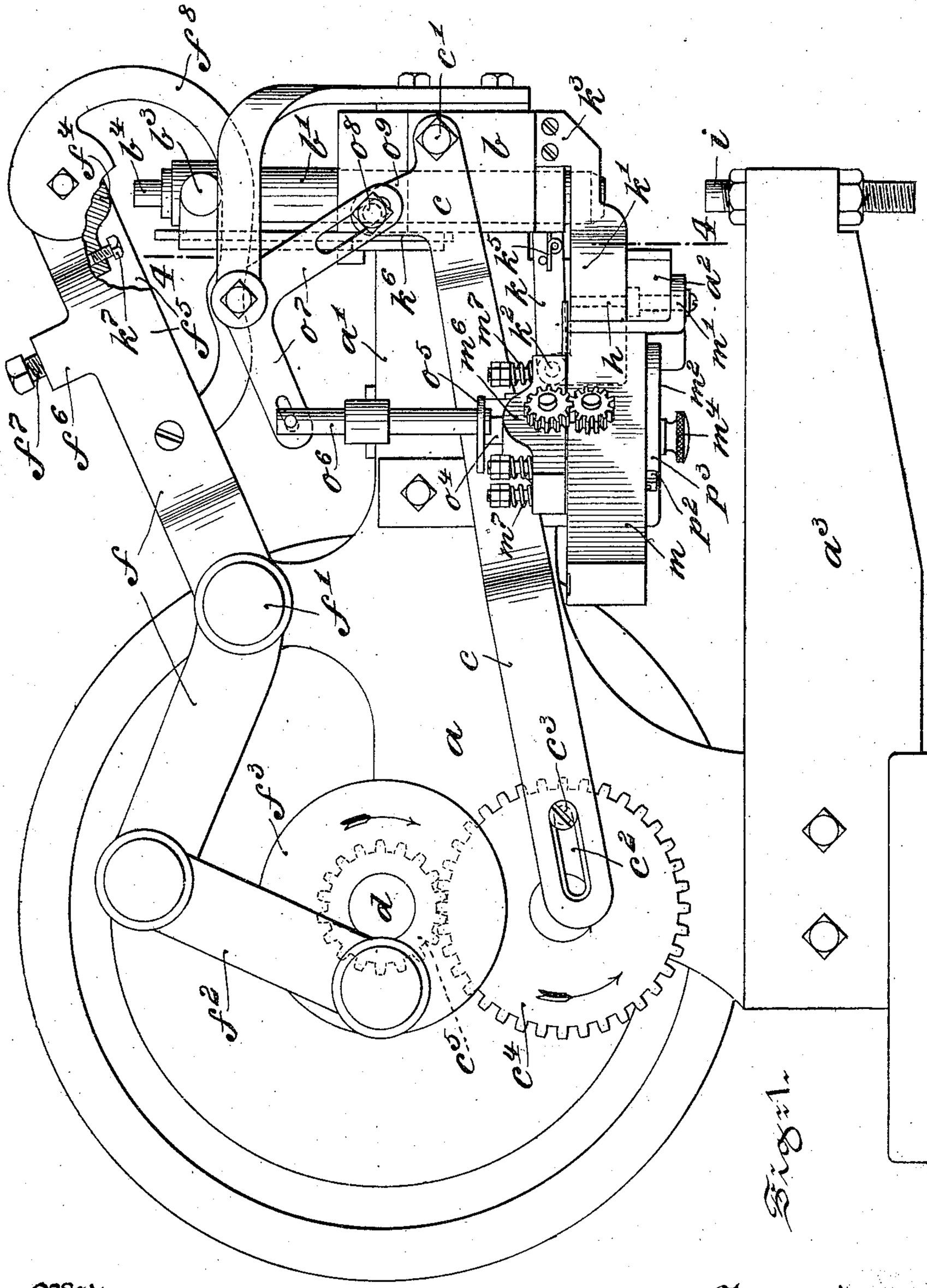
No. 846,826. PATENTED MAR. 12, 1907.

R. COATES.

STAPLE MACHINE.

APPLICATION FILED APR. 23, 1906.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 2.

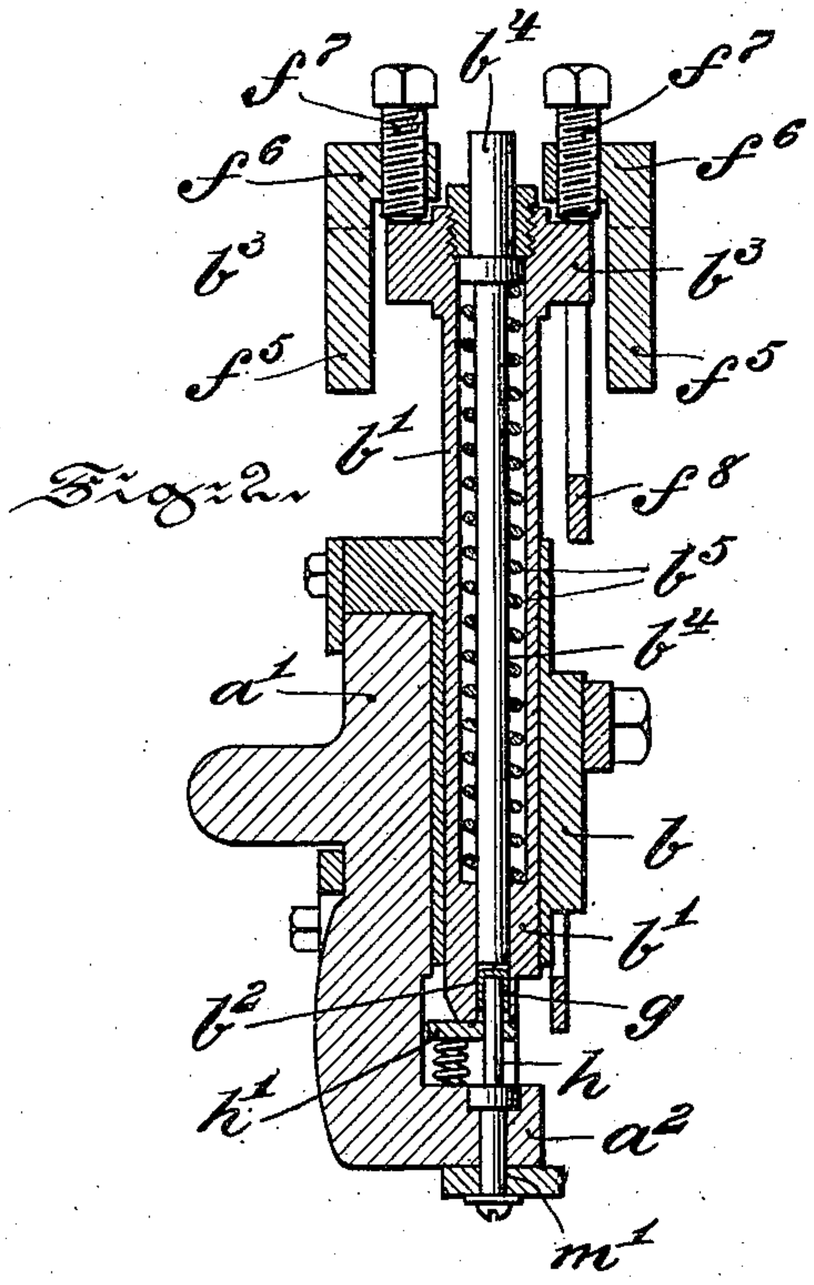


Fig. 3.

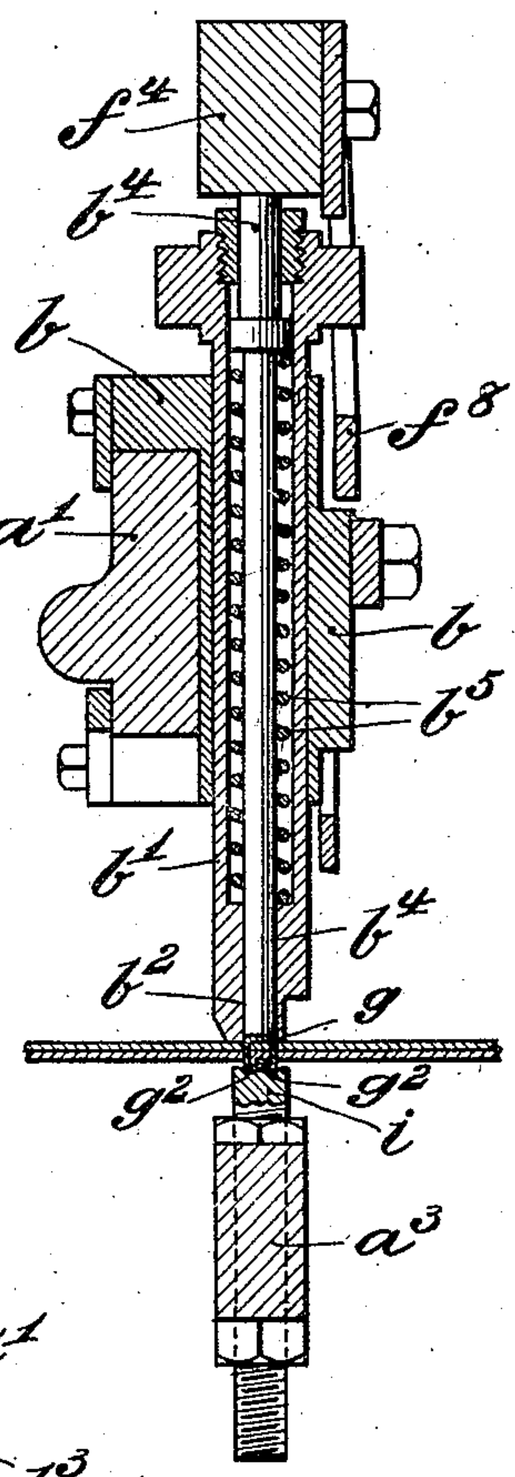


Fig. 4.

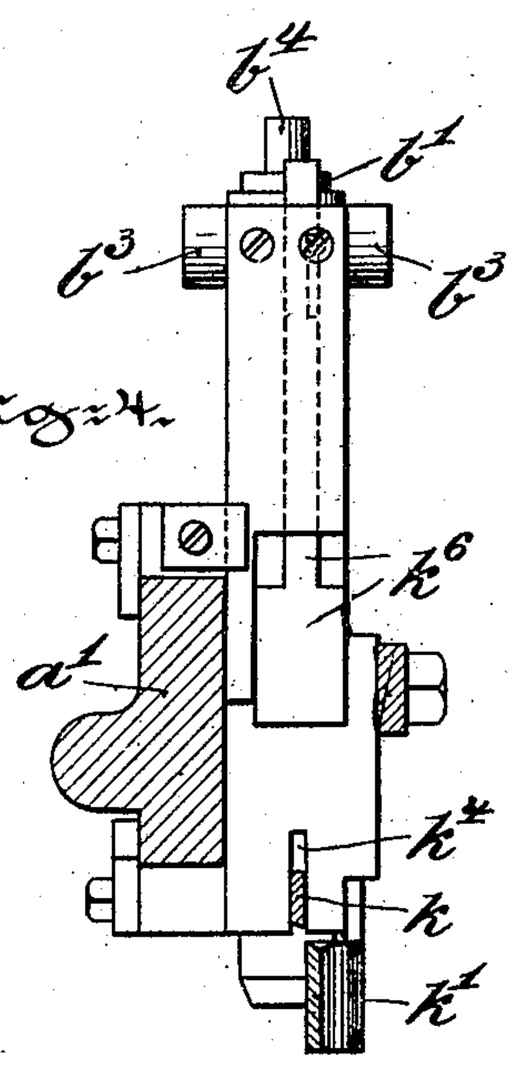


Fig. 5.

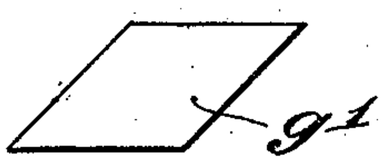
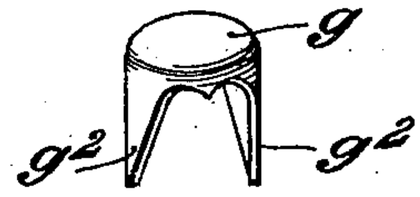


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

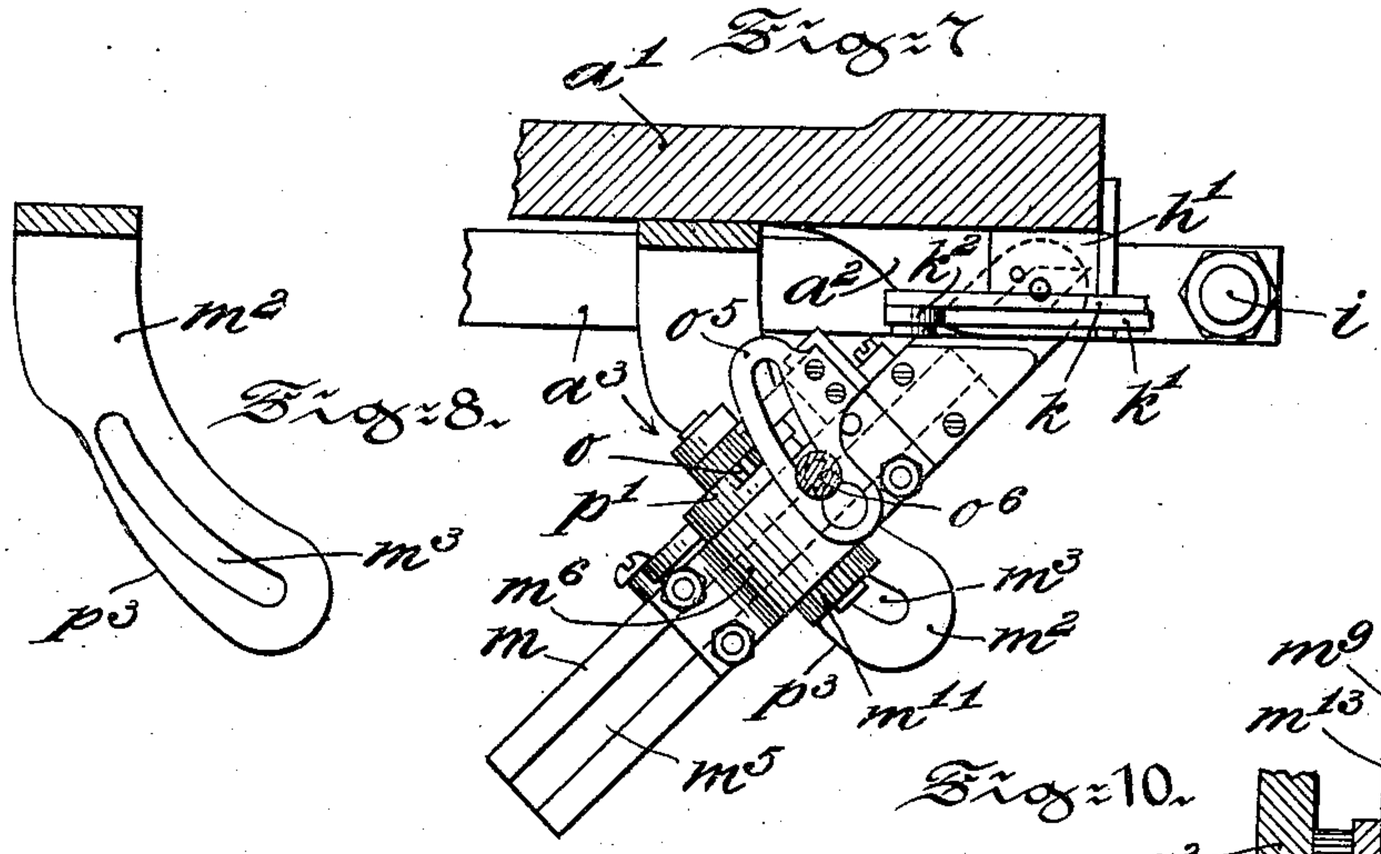


Fig. 8.

Fig. 10.

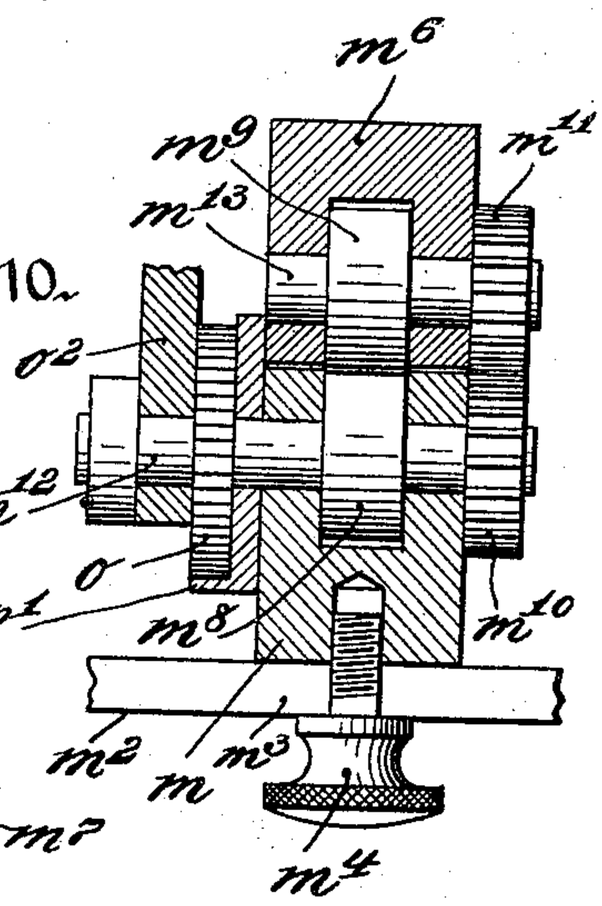


Fig. 9.

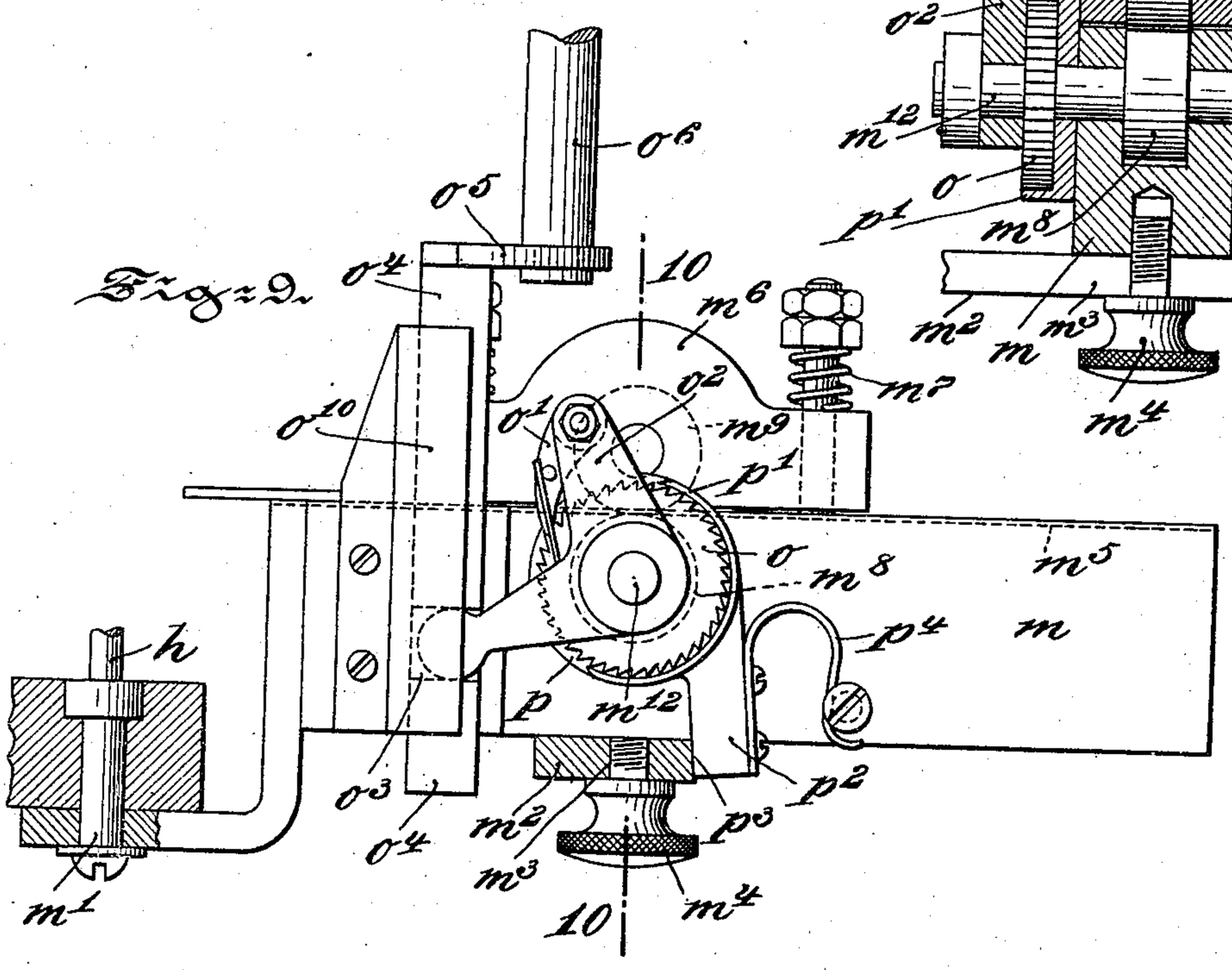


Fig. 11.

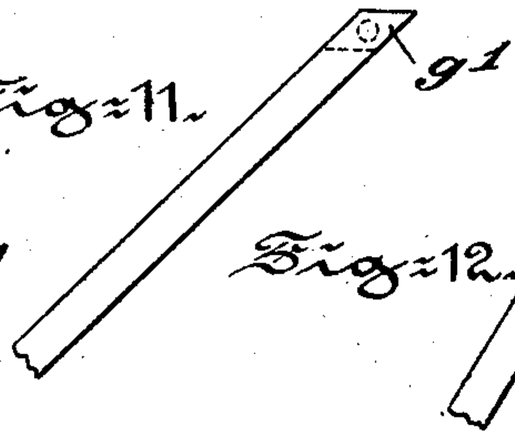
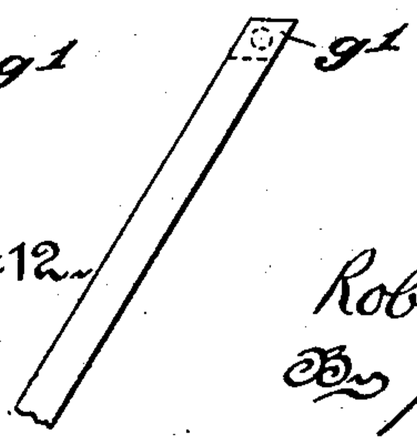


Fig. 12.



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UNITED STATES PATENT OFFICE.

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STAPLE-MACHINE.

No. 846,826. Specification of Letters Patent. Patented March 12, 1907.

Application filed April 23, 1906. Serial No. 313,106.

To all whom it may concern:

Be it known that I, ROBERT COATES, a subject of the King of Great Britain, residing in the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Staple-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention hereinafter described relates to machines for successively cutting staple-blanks of various sizes without waste from a metallic ribbon fed into the machine shaping the blanks by dies into riveting-staples, and finally driving and setting such staples in the paper boxes or other stock to be riveted.

In such former machines the staple-forming plunger and head carrying the same were fixed, while the opposite and male die were movable into and out of operative position to successively form the staple and to drive it. Greater certainty of action is produced by a reversal in the actuation of said parts. Hence in my present machine I provide a female-die head with a movable plunger therein, the head being shifted into two positions, first to form the staple and then to drive it, the male die being fixed and the setting-anvil also. Again, in such former machine there was no completely adequate provision for governing the feed to form staples of varying lengths of prongs nor to effect this automatically.

My present invention in that class of machines consists of improved mechanical elements in a concrete machine for effecting each of those operations, and in novel actuating mechanism for each of said elements, whereby they are operated with increased range of effectiveness and with greater certainty and wherein the staple-forming head is utilized not only for the performance of that function, but for performing the successive act of driving and setting the staple, novel coacting mechanism being provided to shift the head into the staple-forming and staple-driving positions, respectively, as required, and wherein the feed device for the metallic ribbon is provided with guiding mechanism operating to cause it to make a wide variety of lengths of staples.

In the accompanying drawings, illustrating my invention, Figure 1 is a side elevation of the machine. Fig. 2 is a vertical section of the staple-forming mechanism in operative position with the plunger mechanism shifted to left over the lower (fixed) die. Fig. 3 is a section of the plunger mechanism shifted to the right over the anvil in position to drive and clench the previously-formed rivet which was formed by the parts in position shown in Fig. 2. Fig. 4 is a vertical section and elevation on line 4 4 of Fig. 1, looking to right, of the shearing device which cuts the blank rivet from the metal strip. Fig. 5 is a plan view of blank cut off from strip; and Fig. 6 is the rivet formed therefrom. Fig. 7 is a plan view, partly in section, of the feed device for the metal strip; and Fig. 8 is a plan of slotted cam-bracket governing the angle of inclination of the feed and of the shape of the metal blank cut off and incidentally to support the feed-table. Fig. 9 is an elevation of the feed-carriage of Fig. 7 looking at latter in direction of arrow. Fig. 10 is a section on line 10 10 of Fig. 9 looking to left. Figs. 11 and 12 are views of the metal strip, showing effect thereon of changing the angle of the feed.

The machine hereinafter described is a unitary structure operating to cut variously-shaped blanks and forming staples therefrom of various shapes and of varying lengths of prongs from a metallic ribbon of uniform width without the formation of scrap, all the material in the metallic ribbon fed into the machine being incorporated in the staples formed thereby. In the drawings the Figs. 11 and 12 indicate strips of metallic ribbon both of same width, the length of the oppositely-disposed pair of prongs being governed by the direction or inclination at which the ribbon is delivered by the feeding devices to the cutting-off shear and staple-forming dies, while Fig. 5 indicates the length of the material cut by the first act of the mechanism and forming a blank from which the staple is made, and Fig. 6 shows the finished staple struck up from such blank by the staple-forming dies of the head.

Referring now to Fig. 1 of the drawings, *a* represents the frame of the machine, having an overhanging arm *a'*, which operatively supports the cross-head *b*, carrying the sta-

ple forming and driving plunger b' in each of the two positions of the former, the latter over the anvil i, mounted in the end of the frame-plate a, and which also operatively supports the feed mechanism for the strip of metallic ribbon fed to the dies, as hereinafter described. A characteristic feature of the device is the horizontal reciprocation of the cross-head b on the overhanging arm a' of the frame, which is suitably shaped and adapted to that end. The reciprocation of the cross-head b is effected by means of a connecting-rod c, pivoted at one end to the cross-head at c' and provided at the other end with a slot c^2, which is engaged by a stud c^3, carried by a gear-wheel c^4, which gear-wheel is driven by a pinion c^5, mounted upon the main shaft d of the machine. The purpose of the slot c^2 in the connecting-rod c is to give the cross-head b a period of rest in each of its positions while the different operations are being performed upon the staple. The plunger b', within which the operations of forming and setting the staple are performed, is carried by the cross-head b and is actuated, in a manner to be hereinafter more fully described, by means of a rocking lever f, pivoted at f' to the frame a. The rocking motion of said lever f is imparted to the same by means of a connecting-rod f^2 and a crank-disk f^3, which is mounted upon the main shaft d of the machine. The arrangement of the lever f, connecting-rod f^2, and a crank-disk f^3 is such with respect to the pinion c^5, gear c^4, and connecting-rod c that the outer end f^4 of lever f will be given a downward movement to effect the different operations within the plunger b' when the cross-head b is in its front and rear positions, respectively.

Referring now to Fig. 2, which is a vertical section through the cross-head b and plunger b' and its coacting parts in the rear position—that is, in the position in which the staple is formed within the plunger—the parts are shown in the position assumed during the forming of the staple g (shown in Fig. 6) from the diamond-shaped blank g'. (Shown in Fig. 5.) The plunger b' is bored out at b^2 to form the upper forming and carrying die, which, coacting with the lower forming-punch h, effects the forming of the staple when the plunger b is forced downwardly over said punch h. The punch h is carried in a depending extension a^2 of the overhanging arm a' of the frame a. To force the plunger downward when the same is in the position shown in Fig. 2, the rocking lever f, hereinbefore described, is bifurcated at f^5 to straddle the plunger b', and extending upwardly and inwardly from said bifurcated portion f^5 are lugs f^6 f^6, each of which carries a set-screw f^7, adapted in the downward movement of lever f to encounter projections b^3, carried at the upper end of plunger b'. To raise the plunger b' from the lower forming-punch h after the staple has been formed, the rocking lever f is provided with a bail member f^8, so shaped as to engage the under side of one of the projections b^3 of plunger b' upon the upward movement of rocking lever f. To prevent the staple being withdrawn from the die by frictional engagement with the lower forming-punch h, there is provided a spring-controlled stripper-plate h'.

Referring now to Fig. 3, which is a vertical section through the cross-head b and plunger b' and its coacting parts in the forward position—that is, in the position in which the staple is driven and clenched—the parts are shown in the condition assumed during the clenching of the staple in the goods. Within the upper forming and carrying die b^2 and extending upwardly through the center of the plunger b' there is mounted the driving and clenching punch b^4, which is normally retracted by a spring b^5, but which in the driving and clenching operation is forced downward by the outer end f^4 of rocking lever f. The clenching of the staple is effected by forcing the prongs g^2 of the staple g after they have pierced through the goods against a suitably-shaped anvil i, carried at the outer end of an extending bracket a^3, which is secured at its inner end to the frame a.

To sever the diamond-shaped blank from the strip or ribbon of metal, there is provided the following mechanism, reference being had more particularly to Figs. 1, 4, and 7 of the drawings: A pair of shear-blades k and k', pivoted together at k^2, are arranged with their cutting edges in such position as to sever a diamond-shaped blank from the metallic ribbon, which, as will be hereinafter more fully described, is fed at an angle to said shears. The free end of the lower shear-blade k is secured to the cross-head at k^3, while the upper shear-blade k is suitably guided in a slot k^4 in said cross-head. A spring k^5 normally holds the shears k and k' open for the passage of the ribbon therebetween. A slide k^6, mounted upon the cross-head b, is adapted to be forced downward by means of a set-screw k^7, arranged in the rocking lever f to encounter the upper shear-blade k and actuate the same to effect the severing of the blank from the ribbon. This operation is accomplished with the same downward movement of lever f that drives and clenches the staple in the goods.

The mechanism for feeding the metallic ribbon at various angles and correspondingly-varying lengths to produce staples of different sizes is shown in Fig. 1 and Figs. 7 to 12 of the drawings. A feed-table m is pivoted at m' to the lower end of the staple-forming punch h and is also supported by a curved bracket m^2, having a sector-slot m^3, through which passes the clamping thumb-nut m^4 to clamp the feed-table m in any desired angular position. By thus making the axis of

movement of the feed-table for various angular positions coincident with the center of the staple-forming punch *h* it will be apparent that the blank which will be severed by the shears *k k'* from the metallic ribbon will always occupy a true central position with respect to said forming-punch. The upper face of the feed-table *m* is provided with a shallow channel m^5, through which the metallic ribbon is adapted to be fed.

Arranged above the upper face of the feed-table is a cap m^6, which is forced down toward the feed-table by means of springs m^7.

Mounted, respectively, on the feed-table *m* and in the cap m^6 are the lower and upper feed-rolls m^8 and m^9, carrying meshing gears m^{10} and m^{11} on the outer ends of the respective shafts m^{12} and m^{13} of said feed-rolls m^8 m^9. Shaft m^{12} of the lower feed-roll m^8 also carries a ratchet-wheel *o*, adapted to be intermittently operated by a pawl *o'*, carried at one end of a bell-crank lever o^2, loosely mounted on shaft m^{12}. The other end of bell-crank lever o^2 is slidably journaled in a recess o^3 of a bar o^4, vertically slidable in a bracket o^{10}, secured to the feed-table *m*. The upper end of bar o^4 carries a sector-plate o^5 in slotted engagement with the lower end of a rod o^6, the upper end of which is slidably pivoted to one end of a bell-crank lever o^7. The other end of bell-crank lever o^7 is in slotted engagement with a stud o^8, carried by a lug o^9 of the connecting-rod *c*, which effects the horizontal reciprocation of cross-head *b*.

It will be apparent from inspection of Figs. 11 and 12 that when the angular position of the feed-table is changed to produce a staple of different length it is also necessary in order to make a symmetrical staple to change the length of feed of the metallic ribbon. In other words, the length of feed of the metallic ribbon must in all cases be substantially equal to the length of the cut sides of the blank. This result is accomplished by the following preferred mechanism.

Journaled on the shaft m^{12}, upon which the ratchet-wheel *o* is mounted, is a disk *p*, carrying a shield *p'*, which partly encircles the ratchet-wheel *o* and bears such relation to pawl *o'* as to raise said pawl out of engagement with said ratchet during a portion of the travel of said pawl. The disk *p* also has an extension p^2, which is held against the cam-surface p^3 of the bracket m^2, which supports the feed-table *m*, by means of a spring p^4. The shape of the cam-surface p^3 is such with respect to position of feed-table as to cause the shield *p'* to assume such position which will allow the pawl *o'* to engage the ratchet-wheel *o* during such portion only of its travel as will feed the ribbon the proper distance, dependent upon the angular position of the feed-table.

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

1. In a machine for successively forming and setting metallic staples, comprising devices for feeding a metallic ribbon, devices for cutting a staple-blank therefrom and presenting it to staple-forming dies and devices for driving and setting the staple, of a main frame having an overhanging arm, a cross-head mounted to reciprocate laterally thereon, a staple-forming die and a contained staple-driving plunger mounted in said cross-head, with actuating means operating to reciprocate said cross-head laterally, whereby the staple-forming die and its contained plunger are brought in alternating succession into operative position to form a staple and then to drive and set the previously-formed staple.

2. In a machine of the class described, comprising devices to cut a staple-blank from a metallic ribbon fed thereto, a fixed male die adapted to receive the blank therefrom, and a corresponding die brought into operative relation with said fixed die, of a main frame having an overhanging arm, a cross-head mounted thereon and carrying a staple-forming and staple-driving device, and means to reciprocate said cross-head laterally, said means consisting of a rod pivoted at one end to said cross-head and slotted at the other end, a studded gear-wheel coacting with said slot, and means to drive said gear-wheel from the main shaft, whereby the cross-head is brought to a position of rest at the termini of its reciprocatory movements pending the formation of the staple and pending the driving of the same.

3. In a machine of the class described, comprising a staple-forming and staple-driving device, with means to operatively support and reciprocate the same laterally into staple-driving and staple-forming positions respectively, of actuating mechanism comprising the main shaft and a pivoted rocking lever with means to impart motion thereto, mounted intermediate it and the main shaft, said lever having a bifurcated end, with stop-lug devices thereon adapted to engage the plunger, operating to actuate the staple forming and driving elements in downward stroke, and with means to engage projections thereon to actuate the same in upward stroke.

4. In a machine of the class described, comprising devices to feed a metallic ribbon and means for severing a staple-blank therefrom, and staple-forming and staple-driving devices, with means to operatively support and reciprocate the same laterally into staple-forming and staple-driving positions respectively, said means comprising a laterally-reciprocating cross-head, with means to bring said cross-head into positions of rest

pending the successive cutting, forming and driving of the staple, and means to actuate the blank-forming, the staple-forming and staple-driving devices during said respective periods of rest.

5. In a machine of the class recited, comprising successively-acting means to feed a strip of metal in predetermined lengths, means to sever a rivet-blank therefrom and means to form a rivet from such blank, the combination therewith of a feed-table pivotally mounted at its delivery end to the blank-forming punch, and carrying a grooved guide for the metallic strip, with means to operatively support said feed-table intermediate of its length and guide its lateral swing in an arc of a circle and coincident with the center of the blank-forming punch, said means consisting of a curved bracket-arm having a sector-slot, and connecting devices between the feed-table and the said slot, with means to fixedly secure said elements at any point of relative adjustment.

6. In a machine of the class recited, comprising successively-acting means to sever a rivet-blank from a strip of metal and means to form a rivet from such blank, the combination therewith of a concrete mechanism operating to simultaneously govern the length of the strip fed and cut off and the angle at which it shall be cut, said mechanism consisting essentially of a grooved feed-table pivotally mounted at its delivery end to the blank-forming punch, a curved cam-bracket having a sector-slot in which said feed-table is operatively mounted and guided intermediate its length, with clamping devices between the cam-bracket and the feed-table, a pair of feed-rolls mounted over said feed-table, pawl-and-ratchet mechanism governing the rotation of the feed-rolls, and means between the ratchet and the cam-surface of the curved cam-bracket governing the engagement of the pawl with the ratchet.

7. In a machine of the class recited, comprising a staple-forming and staple-driving device, with means to operatively support and reciprocate the same laterally into staple-forming and staple-driving positions respectively, said means consisting essentially of a laterally-reciprocating cross-head, the combination therewith of devices to cut a staple-blank from a strip of metallic ribbon, consisting of a pair of pivotally-connected shear-blades, a spring normally holding the blades separated, the free end of the lower shear-blade being secured to the cross-head, a slot in the latter in which the upper blade is guided, and means to move said blade shear-like relatively to the lower and fixed blade.

In testimony whereof I have hereunto affixed my signature this 10th day of April, A. D. 1906.

ROBERT COATES.

Witnesses:
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JOS. A. TANEY.