

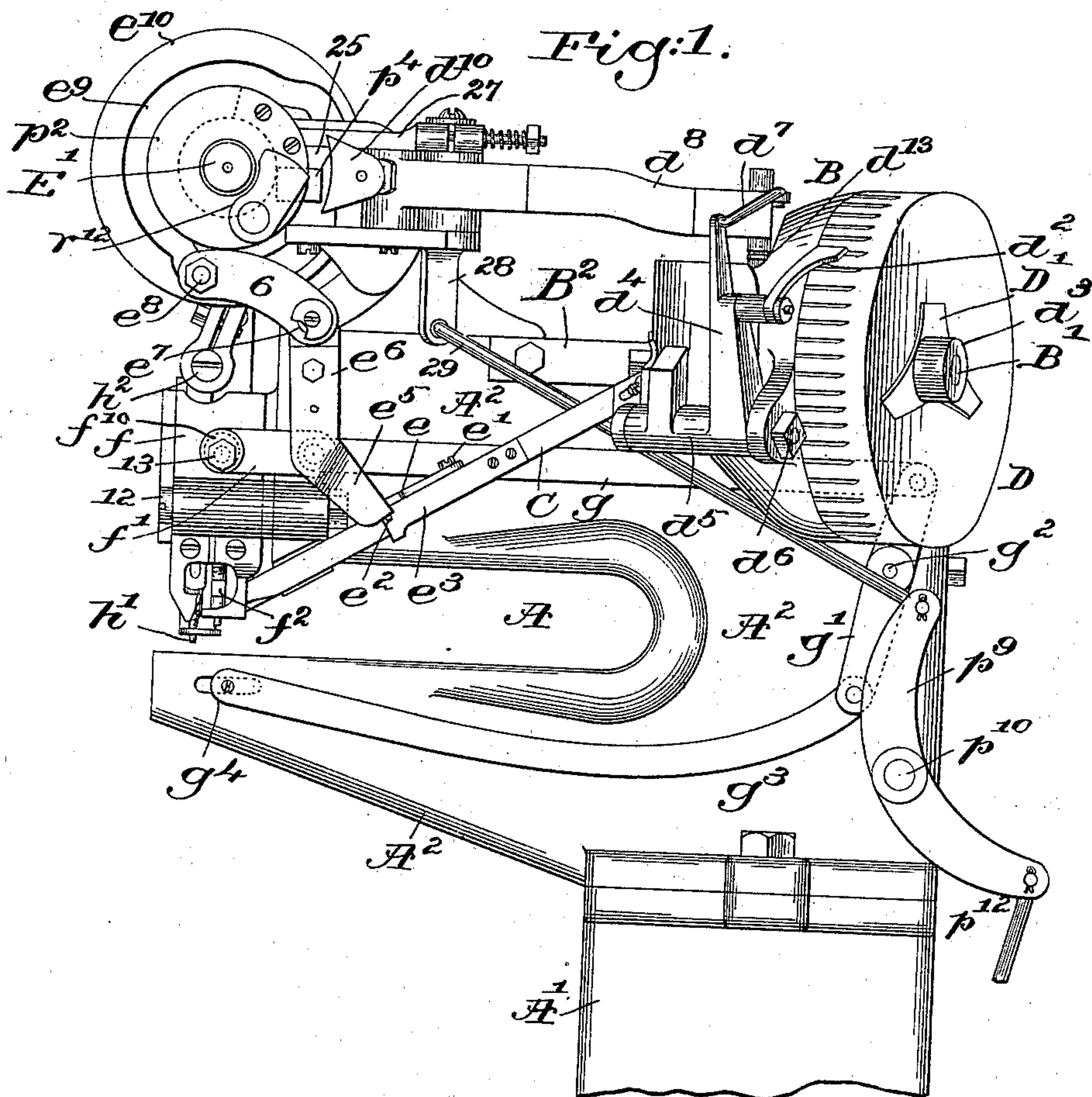
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H. H. CUMMINGS.  
RIVET SETTING MACHINE.

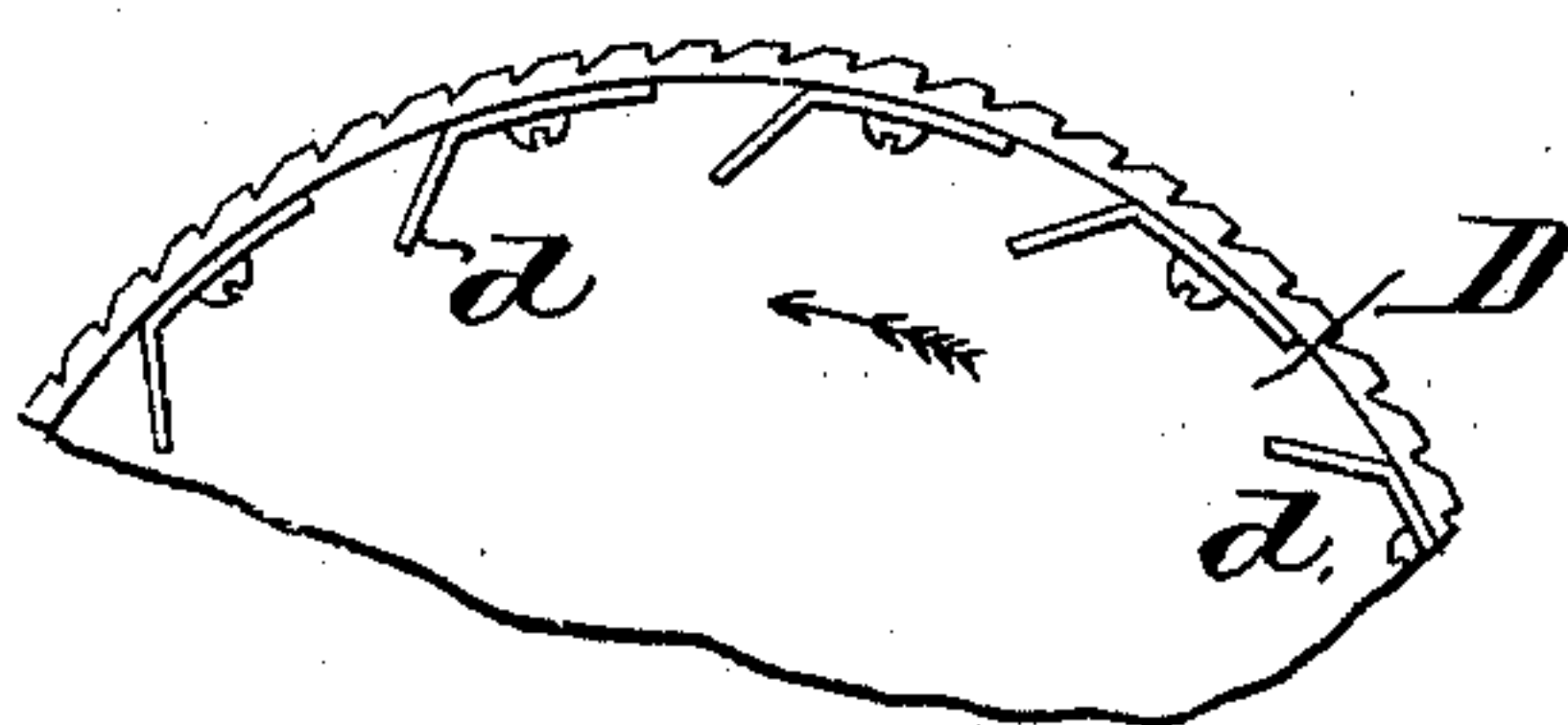
3 Sheets—Sheet 1.

No. 513,634.

Patented Jan. 30, 1894.



*Fig. 1a*



Witnesses.  
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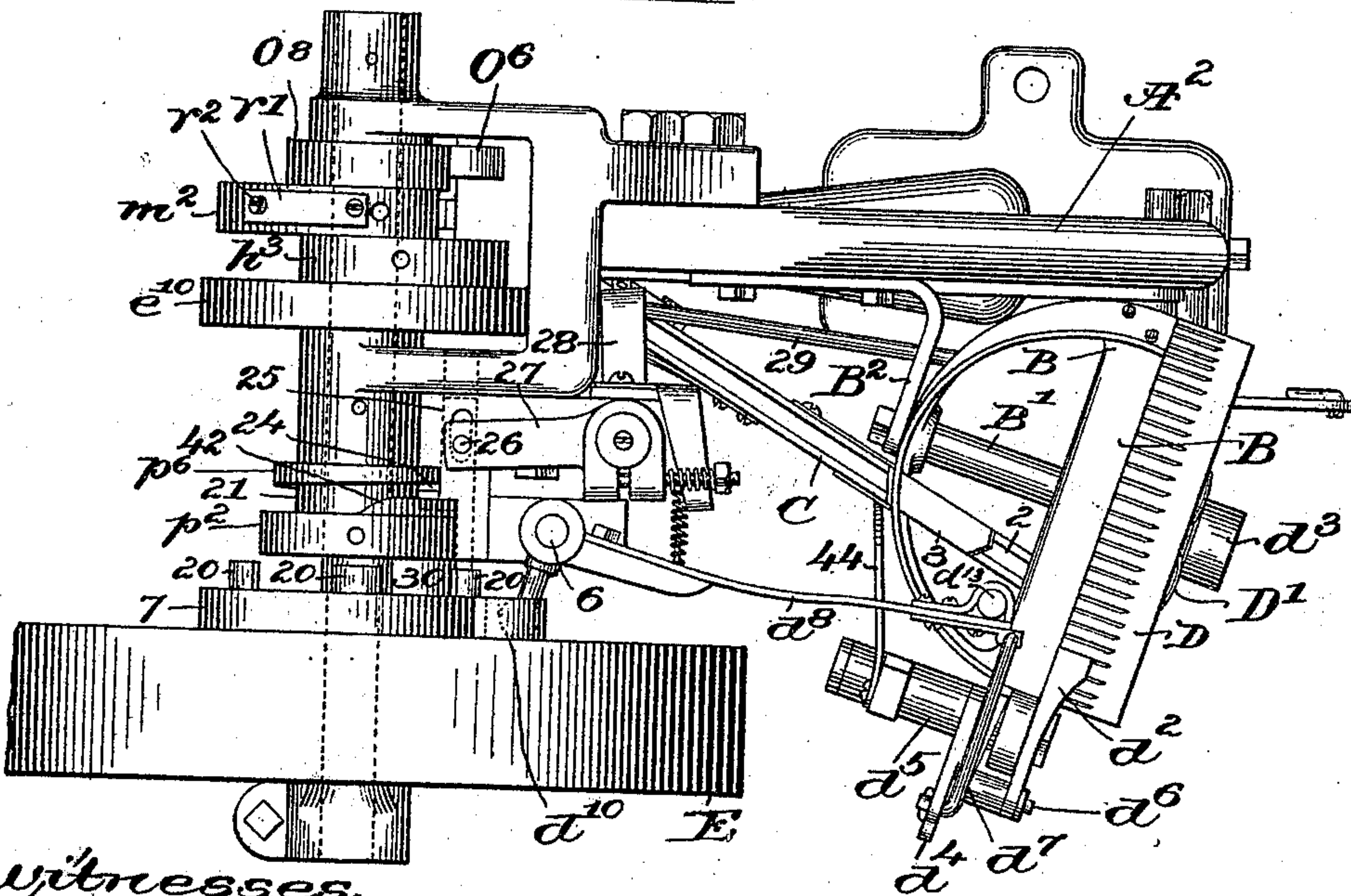
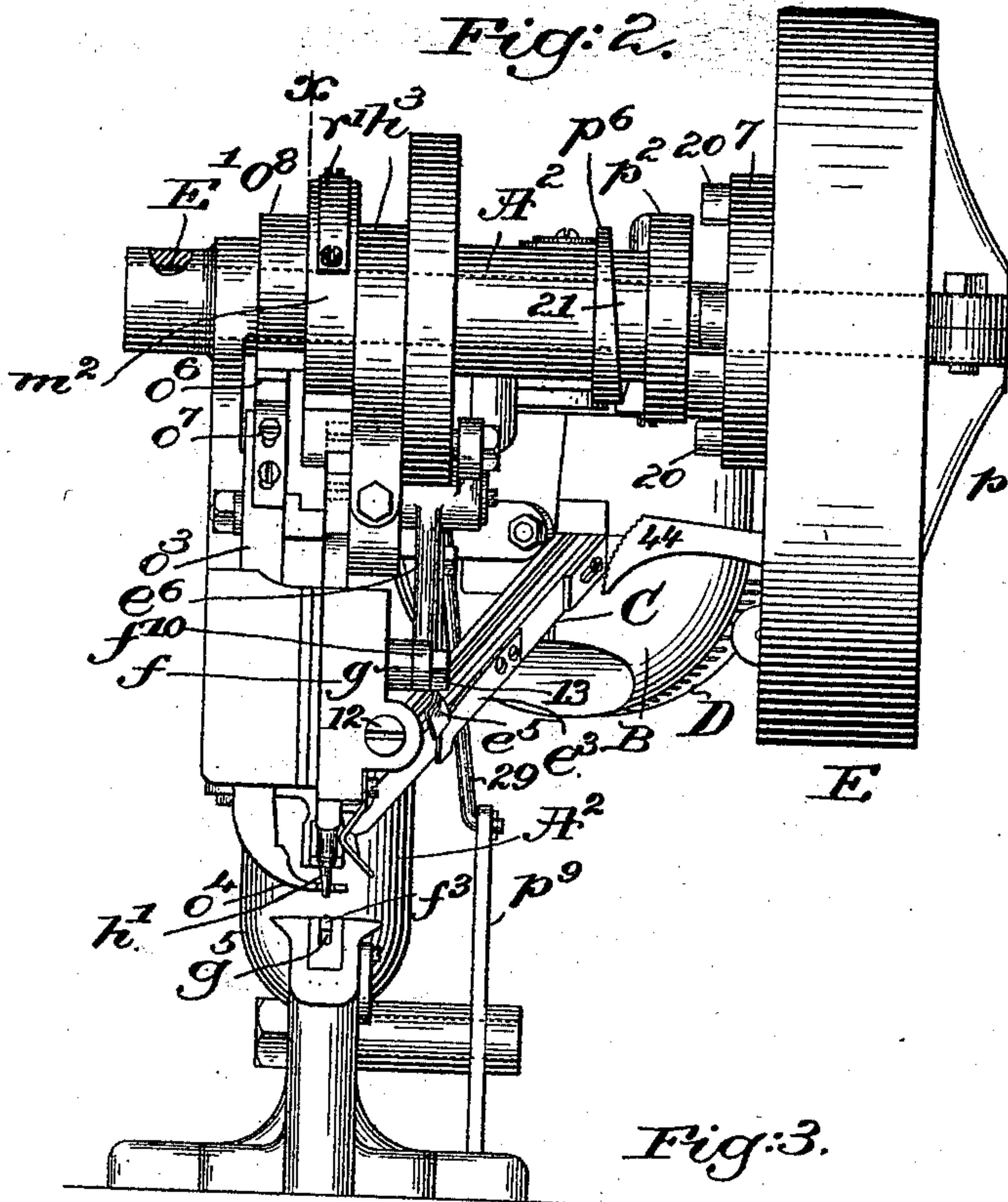
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H. H. CUMMINGS.  
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3 Sheets—Sheet 2.

No. 513,634.

Patented Jan. 30, 1894.



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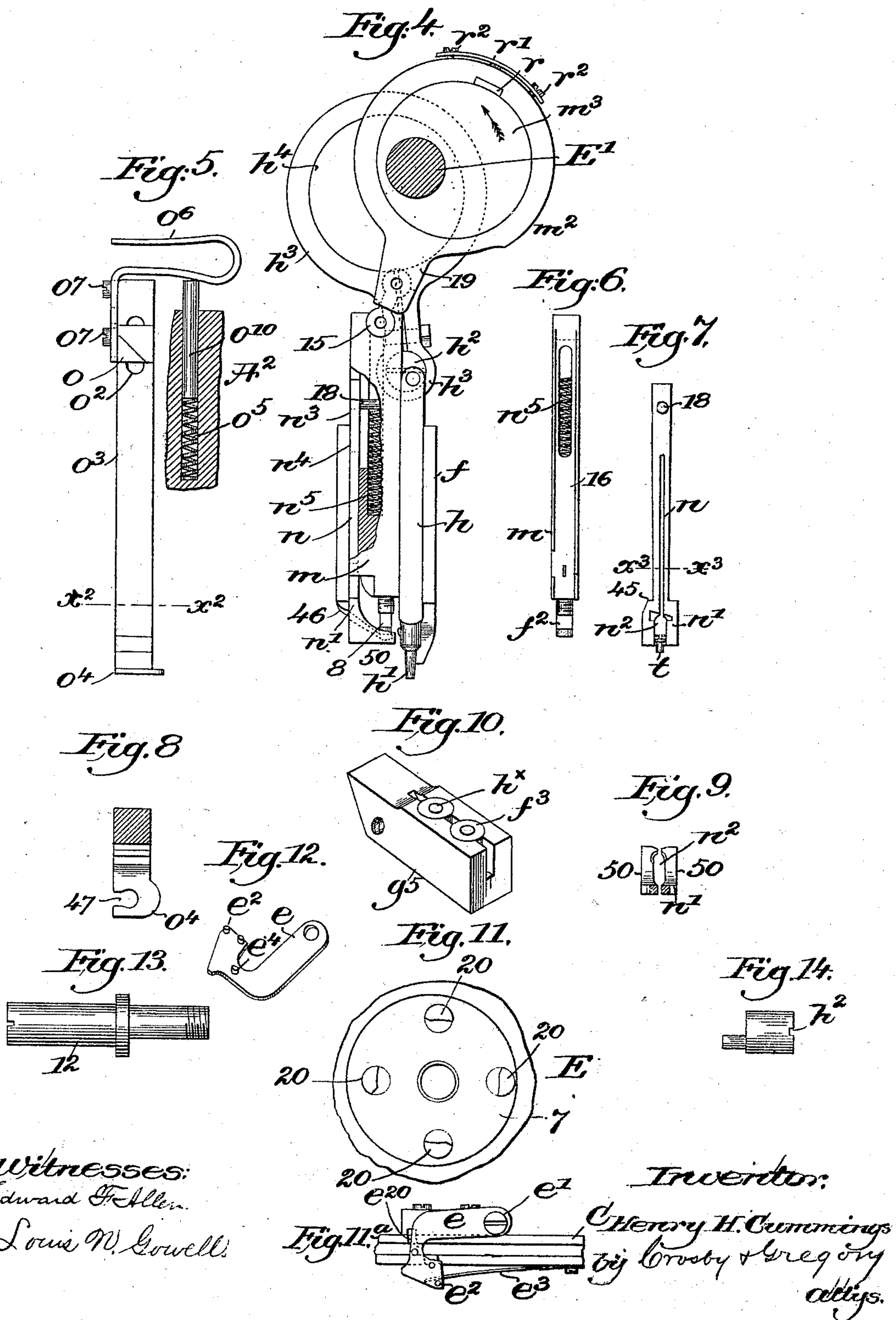
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3 Sheets—Sheet 3.

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RIVET SETTING MACHINE.

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# UNITED STATES PATENT OFFICE.

HENRY H. CUMMINGS, OF MALDEN, MASSACHUSETTS.

## RIVET-SETTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 513,634, dated January 30, 1894.

Application filed May 9, 1893. Serial No. 473,501. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY H. CUMMINGS, of Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Rivet-Setting Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

10 This invention has for its object to improve that class of rivet-setting machines adapted to set tubular rivets, my improved invention being an improvement on that represented in application Serial No. 439,972, filed July 14, 15 1892. In the machine described in the said application the rivets were fed from a hopper into a chute having its lower end closed, and the rivets were lifted vertically from the closed lower end of the chute by a carrier 20 composed of jaws adapted to straddle the end of the raceway and engage the head of the rivet in their upward movement, the said carrier then being moved laterally to place the rivet held by it in the path of the movement 25 of the top-set. In that application the punch-bar also has a vibrating movement in order to put it into and then out of punching position, and the machine was not adapted to operate wholly by power throughout the entire 30 punching and setting operation.

In this my present invention, the rivets are put in bulk into a hopper and are delivered from the hopper into a chute provided with a proper let-off, the lower open end of the chute 35 terminating opposite the bifurcated lower end of a carrier into which the rivets are discharged or fed one at a time, the carrier always occupying such position with relation to the top-set as to enable the head of the rivet to pass 40 directly from the chute into the carrier and under the top-set. The carrier and top-set are mounted in the same carriage and are moved forward and backward, and also up and down, as will be hereinafter described. 45 The shank of the carrier is adapted to slide, however, vertically to a limited extent in the shank of the top-set bar. The punch bar and top-set bar are arranged side by side in one and the same carriage, and both are adapted 50 to be reciprocated vertically in the carriage. The bars carrying the punch and the top-set

are each reciprocated from suitable eccentrics or cams upon the main shaft, and I have provided the machine herein to be described with devices whereby a presser-foot, which is 55 rendered self adapting to the thickness of the stock, is made to control the extent of downward movement of the bar carrying the top-set, so that the rivet will be upset more or less according to the thickness of the material 60 then present under the presser-foot.

One part of my invention comprehends a rivet-setting machine containing the following instrumentalities, viz:—an under-set, a top-set, a presser-foot, a top-set bar, means to 65 actuate it, and tripping devices to trip the actuating means of the top-set bar according to the thickness of the material under the presser-foot, substantially as will be described.

Other features of my invention will be 70 hereinafter described, and claimed at the end of the specification.

Figure 1, of the drawings is a partial right-hand side elevation of the machine containing my improvements, the fly-wheel and some 75 of its co-operating parts being omitted; Fig. 1<sup>a</sup>, a detail of the lifting device of the hopper. Fig. 2 is a front elevation of the machine, Fig. 1, partially broken away to shorten the figure upon the drawings. Fig. 3 is a top or 80 plan view of the machine shown in Fig. 1; Fig. 5, a section to the left of the dotted line  $x$ , Fig. 2, the parts being somewhat enlarged; Fig. 5, an enlarged detail of the presser-bar, and its lifting device; Fig. 6, a detail showing 85 the rear side of the top-set bar and top-set. Fig. 7 is a detail of the carrier for the rivet. Fig. 8 is a section below the dotted line  $x^2$ , Fig. 5; Fig. 9, a section below the dotted line  $x^3$ , Fig. 7; Fig. 10, an enlarged detail 90 of the block containing the punch-bed and the under-set. Fig. 11 shows the cam 7 in outline. Fig. 11<sup>a</sup>, is a detail of part of the chute and let-off on it. Fig. 12 shows the let-off  $e$  detached; Fig. 13, a detail of the eccentric stud 12; and Fig. 14, a detail of the eccentric stud  $h^2$ . 95

The frame-work consists essentially of a suitable base, not shown, upon which is erected a column  $A'$  which sustains the head  $A^2$  of 100 the machine, the said head containing an open slot or space  $A$  for the reception and manipu-



lation of the work, and having suitable bearings and attachments, to be hereinafter described, for properly supporting the working parts.

5 The hopper B to contain the rivets is made as a sort of circular or semispherical pot mounted upon a stud B' fixed to a stand B<sup>2</sup>, shown best in Fig. 3, as attached to the upper part of the head A<sup>2</sup>.

10 The upper part of the chute or raceway C of usual shape, is extended into the hopper referred to, and has a suitable opening 2 into which are dropped the rivets, the opening being of a width less than the diameter of the heads of the rivets, the upper end of the raceway having a cover 3 under which the heads of rivets properly lodged in the raceway must pass to be discharged, as will be described.

The stud B', at one side of the hopper has 20 mounted loosely upon it a lifting device D, shown separately in part in Fig. 1<sup>a</sup>, as a rotating wheel having at its interior a series of shelves, as *d*, to engage the rivets in the lower portion of the hopper, the shelves, in the rotation of the wheel, carrying the rivets up, 25 and dropping them into or upon the upper end of the chute.

The lifting device referred to derives its step-by-step motion by or through a suitable 30 pawl *d*<sup>2</sup> which engages notches thereof, as shown in Figs. 1, 1<sup>a</sup> and 3, said wheel being prevented from over-running its motion preferably by means of a friction device, which may be a spring D' duly interposed between 35 the said wheel and the nut *d*<sup>3</sup> secured to the outer end of the stud B', referred to. The pawl *d*<sup>2</sup> is attached to the upper end of an arm *d*<sup>4</sup> of a sleeve *d*<sup>5</sup> mounted on a stud *d*<sup>6</sup> held preferably in an ear projecting from a 40 part of the hopper. See Fig. 1 The arm *d*<sup>4</sup> referred to at its upper end has attached to it a link *d*<sup>7</sup>, the opposite end of which is attached to an arm of an elbow lever *d*<sup>8</sup> having its fulcrum on a pin 6 fixed to the frame, the 45 shorter arm of the said lever entering, as herein shown, a suitable shoe *d*<sup>10</sup>, see Fig. 3, which is acted upon by a cam 7, the shape of which is best represented in Fig. 11, said cam being, in this embodiment of my invention, 50 fixed on the fly-wheel E loose on the main shaft E', carrying the eccentrics and devices for actuating the moving parts to be described. The lever *d*<sup>8</sup> carries a suitable brush *d*<sup>13</sup>, which, in the movement of the lever, is 55 made to sweep across the upper end of the raceway and discharge any rivets thereat which are not properly lodged with their shanks in the raceway. The raceway is provided between its upper and lower ends with 60 a suitable let-off *e*, see Figs. 1, 11<sup>a</sup>, and 12, pivoted at *e*' and having a pin *e*<sup>2</sup> which is acted upon by a spring *e*<sup>3</sup> attached to the side of the raceway, said spring normally keeping a projection *e*<sup>4</sup> of the let-off in the raceway 65 and in the path of movement of the series of rivets. The side of the raceway is cut away at *e*<sup>20</sup>, so that the projection *e*<sup>4</sup> may move into

and out of the line of travel of the rivets, it being held in place to act as a stop by the spring *e*<sup>3</sup>, the let-off being pushed in the opposite direction to let off a rivet by means of 70 a beveled or inclined arm *e*<sup>5</sup> carried by an arm of an elbow lever *e*<sup>6</sup> mounted upon the stud *e*<sup>7</sup> attached to the head, the opposite end of said arm having a cam roll *e*<sup>8</sup> which enters a 75 cam groove, see Fig. 1, in a disk *e*<sup>10</sup> fast on the main shaft.

The lower arm of the elbow lever *e*<sup>6</sup> referred to has attached to it a link *f*', see Figs. 1 and 2, provided at its outer end with a round hole 80 to receive a stud screw 13, said stud entering the carriage *f*, said carriage being loosely mounted upon an eccentric stud 12, upon which stud it will be reciprocated back and forth at the proper times by the said elbow 85 lever and link to put the punch and top-set, to be described, in their proper positions with relation to the punch-bed and under-set.

The rotation of the eccentric stud provides means whereby the position of the carriage 90 may be adjusted laterally to enable the top-set *f*<sup>2</sup> and the punch *h*' to co-operate properly with the under-set *f*<sup>3</sup> and punch-bed *h*<sup>x</sup>, to be hereinafter described.

The lower end of the elbow lever referred 95 to has also connected to a link *g* which is jointed to a lever *g*' pivoted at *g*<sup>2</sup>, the lower end of the lever *g*' being connected by a link *g*<sup>3</sup> with a stud *g*<sup>4</sup> of the slide block *g*<sup>5</sup>, carrying not only the punch block, but also the under-set. 100

The carriage *f* receives in it nearest the front of the machine the punch-bar *h*, to the lower end of which is properly attached the 105 punch *h*', the upper end of the bar having preferably an eccentric stud *h*<sup>2</sup> which is embraced by the arm of an eccentric strap *h*<sup>3</sup> encircling the eccentric *h*<sup>4</sup> fast on the main shaft, the rotation of the said eccentric stud providing for vertical adjustment of the 110 punch-bar.

The carriage *f*, at the rear of the punch-bar has suitable guideways for the reception of the set bar *m* provided at its lower end with the top-set *f*<sup>2</sup>, the said set bar at its upper 115 end being herein represented, see Fig. 4, as socketed to receive one end of a toggle link 15, the opposite end of the said link being seated loosely in a part of an eccentric strap *m*<sup>2</sup> surrounding an eccentric *m*<sup>3</sup>, also fast on 120 the main shaft.

The set bar is grooved at its rear side, as at 16, see Fig. 6, to receive the slotted shank *n* of the rivet carrier *n*', bifurcated for a sufficient 125 portion of its length so as to leave yielding arms 50, 50, see Fig. 9, which, while they grasp and retain the rivet *t* let into the space *n*<sup>2</sup> from the end of the raceway, may, under the action of the top-set, or the head of the rivet being driven, spring apart to let the rivet head pass 130 below them.

The shank of the carrier is shown as provided with a pin 18 which rests on a spring *n*<sup>5</sup> carried by the top-set bar. See Figs. 4 and 6.



The eccentric strap  $m^2$ , to which the set-bar is attached by the toggle joint referred to, has a friction device shown as a block  $r$  normally pressed against the eccentrics by a spring plate  $r'$  held in place by suitable screws  $r^2$  adjustable to insure the proper friction. This strap is so applied to the eccentric that when the main shaft is being rotated in the direction of the arrow Fig. 4, the said eccentric will, during the first part of the movement of the shaft, be carried with the shaft so that the trip leg 19, forming part of the strap and to which the upper end of the toggle link is connected, will be thrown forward, as shown in Fig. 4, in the range of movement of the tripping device  $o$ , see Fig. 5, made adjustable vertically in a slot  $o^2$  of the shank  $o^3$  of the clamping or presser-foot  $o^4$ , the said foot being adapted to descend upon the work.

The spring  $o^5$  seated in a hole in the frame head  $A^2$  acts on pin  $o^{10}$ , see Fig. 5, to normally keep a leaf or other equivalent spring  $o^6$  adjustably attached to the upper part of the presser-bar by suitable screws  $o^7$ , against and in the path of movement of a cam  $o^8$  fast on the main shaft.

The cam  $o^8$  acting on the spring  $o^6$ , pushes the presser or clamping foot down until it rests upon the surface of the work into which the rivet is to be driven, and thereafter the spring  $o^6$ , owing to its shape, yields before the cam  $o^8$ , and the foot is not farther forced down. In the operation of the machine, however, as the clamping foot comes to rest upon and calipers the thickness of the leather under it, the projection  $o$  is of course stopped, but the shaft continues to rotate and the eccentric  $m^3$  acts to depress the top-set bar. The descent of the top-set bar continues until the trip leg 19 of the eccentric strap meets and is arrested by the tripping device or projection  $o$  on the foot bar, the arrest of the eccentric strap causing the upper end of the toggle 15 to be carried over to the left from the position Fig. 4 in such manner that the descent of the top-set will be arrested, such provision enabling the rivet to be clinched or upset, more or less, at its end according to the thickness of the stock under the foot.

The outer end of the main shaft is represented as provided with a counterbalance  $p$  fixed to the shaft, and the cam 7 referred to as connected to the loose-pulley, or belt wheel  $E$ , has a series of dogs 20, and fast upon the shaft near the loose pulley is a notched collar  $p^2$ , and a short distance from it a side cam  $p^6$  with a space 21 between. A slide-bar  $p^4$  guided in a block 25 has a pin 26 which is engaged by a lever 27 having an arm 28 extended downwardly, said arm having jointed to it a rod 29 attached to a lever  $p^9$  pivoted at  $p^{10}$  and connected to a treadle rod  $p^{12}$ , the operator by depressing the same causing the lever 27 to withdraw the slide-bar  $p^4$  from behind the dog  $r^{12}$  pivoted upon one side of the collar  $p^2$ . Whenever the slide bar  $p^4$  is withdrawn to release the dog  $r^{12}$ , the latter drops suffi-

ciently to place its upper end in the path of movement of one of the projections 20 on the belt wheel, and said projection, engaging the dog rotates the shaft, the said slide-bar when drawn in as stated, removing a part of its projection 24 from its engagement with a shoulder piece 42 secured to the cam  $p^6$ , thus enabling the shaft to start. The operator having retracted the slide bar  $p^4$  to release the shaft  $E'$ , the cam  $p^6$  acts immediately on the projection 24 to again push the slide-bar outwardly, this being done before the completion of the rotation of the shaft, so that when the dog  $r^{12}$  again reaches the said slide-bar, the dog will be arrested by the slide-bar and be pulled out of engagement with the projection 20, and at the same time the shoulder piece 42 will strike the projection 24 and arrest the cam shaft positively.

In the operation of the machine, the carriage  $g^5$ , in which the punch-bed and under-set are secured, is moved in one direction, while the carriage  $f$  containing the punch-bar and top-set is moved in the opposite direction, and the machine is stopped after setting each rivet with the carriage  $f$  in its backward position, and the carriage  $g^5$  in its forward position, the punch being over the punch-block. In this normal condition of the machine, the operator will put into position the leather or other material which is to be riveted together, and will, by a movement of the lever  $b^9$  start the machine. During the first part of the rotation of the cam shaft the punch bar descends and punches a hole in the material, and the punch then rises quickly and the carriages shift their position, putting the under-set in working position and the top-set directly above it. The rivet-carrier and top-set move backward and forward together, and the rivet-carrier is supplied with a rivet just as the machine is stopped, the carriage  $f$  being then in its backward position. The punch-bar having been lifted, the carriage  $f$  is moved forward as the carriage  $g^5$  is moved backward, and the point of the rivet hanging below the carrier is placed opposite the hole made in the material, and the top-set descends upon the head of the rivet, pushes it vertically out from between the yielding arms of the carrier and drives the rivet through the hole previously made in the material, forcing the end of the rivet against the under-set, the toggle joint 15 being broken sooner or later, as described, according to the thickness of the material then under the presser-foot, thus adapting the clinching of the end of the rivet to the thickness of the material to be fastened by that particular rivet.

During the operation of the machine a suitable hammer or device 44, see Fig. 2, connected with the sleeve  $d^5$ , may strike and vibrate or shake the raceway, and thus insure the correct falling or proper descent of the rivets to the carrier.

The rear side of the carrier is notched at  $n^2$ , as best shown in Fig. 7, to receive the head



of the rivet, letting the shank of the rivet drop down between the inner sides of the bifurcated spring nipper-like arms 50 thereof.

I have shown in Fig. 7, a rivet suspended from the carrier.

The carrier has shoulders 45, see Fig. 7, which strike against stops 46 suitably attached to the carriage  $f$ , said stops limiting the backward movement of the carrier under the action of the spring  $n^5$ , said stops and shoulders keeping the opening at the rear side of the carrier in proper position with relation to the end of the chute.

The carrier is normally kept up toward the lower end of the top-set by the spring  $n^5$ , and when the top-set begins to descend, the carrier descends with it until the under side of the carrier rests upon the top side of the clamp or presser-foot  $f^4$ . The descent of the carrier having been arrested, the top-set continues to descend acting on the head of the rivet, pushing it down between the yielding jaws of the carrier and forcing the head of the rivet into the opening 47 made for it in the presser-foot. This done, the top-set rises, the carrier follows until arrested by the stop 46, and the carriage  $f$  is retracted into its backward position to receive a new rivet, and the machine is stopped with the presser-foot elevated ready for the material to be again inserted and punched as before.

This invention is not limited to the exact construction of the connection between the eccentric strap and the top-set bar, so long as the construction is such as to permit the descent of the bar to be arrested, preferably by or through the position of the presser-foot resting upon the material so as to automatically clinch the rivet more or less; nor is this invention limited to the particular construction of the friction device between the eccentric strap  $m^2$  and the eccentric  $m^3$ .

The rivet which this machine is more particularly adapted to set is one having a hollow shank, but this invention is not limited to the particular construction of the shank of the rivet to be set. The screw 13 passes through an eccentric bushing  $f^{10}$  screwed into the carriage  $f$ , the eccentric shank of the bushing shown by dotted lines in Fig. 1, being embraced by the link  $f'$ . The eccentric collar  $f^{10}$  may be rotated when desired to thus alter the position of the carriage  $f$  and link  $f'$ , so that said link may in its movements control the starting and stopping points of the carriage  $f$  in its extreme positions.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for setting rivets, the following instrumentalities, viz;—an under-set, a top-set, a presser-foot, a top-set bar, means to actuate it, and tripping devices to trip the actuating means of the top-set bar according to the thickness of the material under the presser-foot, substantially as described.

2. In a machine for setting rivets the fol-

lowing instrumentalities, viz:—a carriage; a top-set bar having a top-set; and a carrier composed of a shank having at its lower end yielding arms, said bar and the shank having the carrier being both mounted and being made vertically movable in said carriage; combined with a raceway from which rivets are discharged directly into the carrier from its rear side next the open end of the raceway, the heads of the rivets entering the carrier falling directly under the top-set; and means to both reciprocate the said carriage to and fro and to move the said top-set and carrier vertically in said carriage, substantially as and for the purpose set forth.

3. In a machine for setting rivets, a raceway; a carriage; a top-set bar therein provided with a top-set and grooved to act as a guide; and a spring contained in said top-set bar; combined with a bifurcated carrier having its shank  $n$  inserted in said groove, the carrier having an opening  $n^2$  at its rear end toward and adapted to receive the rivets from the end of the raceway, said carrier being supported by said spring and being adapted to be moved vertically in and with relation to the said top-set bar, substantially as and for the purposes set forth.

4. In a machine for setting rivets, the cam  $o^8$ , and vertically movable presser-bar provided with the presser-foot, combined with the interposed spring  $o^6$  adapted to yield to the cam after the descent of the foot has been arrested by the material, substantially as described.

5. In a machine for setting rivets, the carriage  $f$ , the reciprocating bar  $h$  therein, and the eccentric strap, combined with the eccentric stud connecting said strap and bar, the rotation of the said stud regulating the effective stroke of the bar, substantially as described.

6. In a machine for setting rivets, the horizontally movable carriage  $f$ , its contained punch-bar and top-set bar, and means to reciprocate said carriage, combined with an eccentric stud forming a support for said carriage, the rotation of the said stud enabling the said carriage to be adjusted laterally to place the punch-bar and top-set in correct position with relation to the punch-bed and under-set, substantially as described.

7. In a machine for setting rivets, the following instrumentalities, viz;—an under-set, a top-set, a presser-foot, a top-set bar, means to actuate it; tripping devices to trip the actuating means of the top-set bar according to the thickness of the material under the presser-foot, and a punch and punch-bed, substantially as described.

8. In a machine for setting rivets, the following instrumentalities, viz;—a carriage; a top-set bar having a top-set; a punch-bar provided with a punch; and a carrier having yielding arms, said bars and carrier being mounted and made vertically movable in said carriage, and a carriage having an under-set



and a punch-bed, combined with a raceway from which rivets are discharged directly into the carrier, the heads of the rivets falling directly under the top-set, and means to reciprocate the said carriage to and fro and to actuate the said top-set and carrier vertically, as and for the purposes set forth.

9. The carriage, its top-set bar, top-set, the rivet-carrier, and the carriage-support, combined with the link *f'* suitable actuating devices therefor and with an eccentric collar

and stud to connect said link and carriage and to permit the throw of the carriage to be regulated, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY H. CUMMINGS.

Witnesses:

GEO. W. GREGORY,  
M. J. SHERIDAN.