

No. 666,370.

Patented Jan. 22, 1901.

O. ARNOLD.

TOOTH FORMING AND INSERTING MECHANISM FOR CARD SETTING MACHINES.

(Application filed Apr. 27, 1900.)

(No Model.)

2 Sheets—Sheet 1.

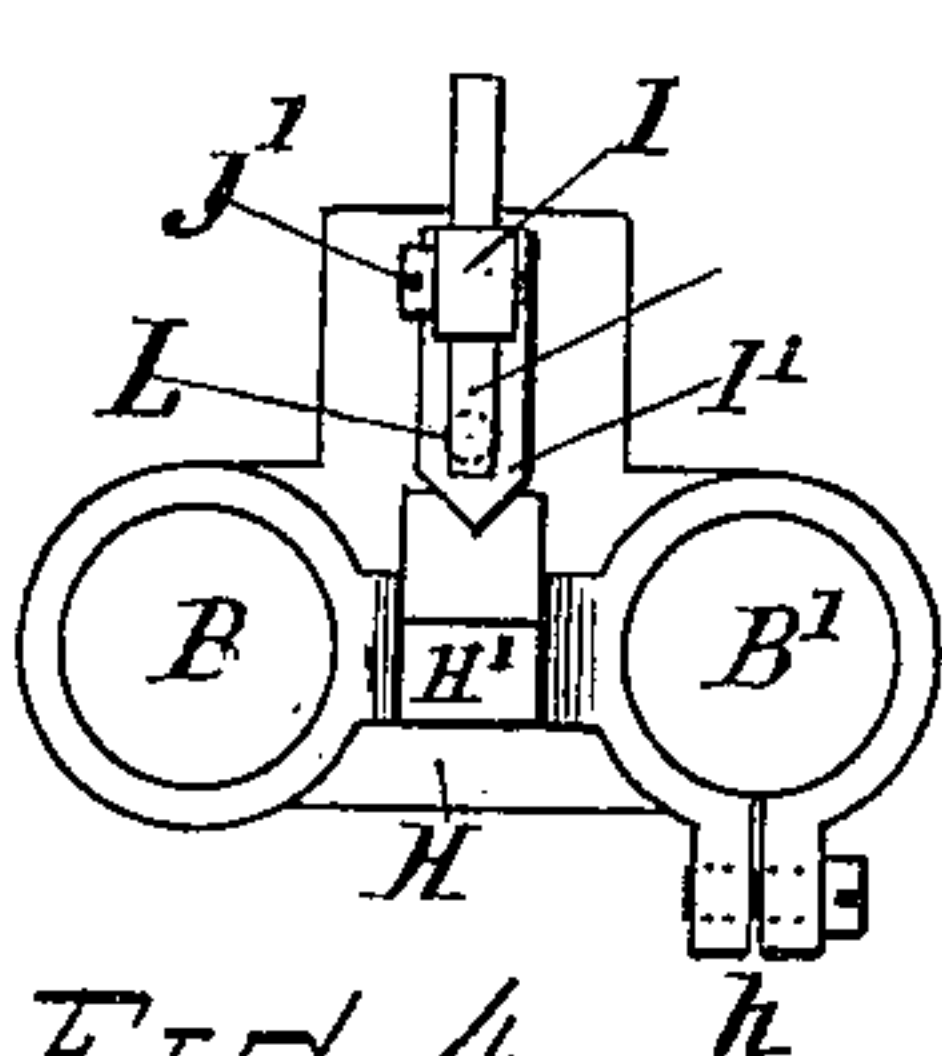
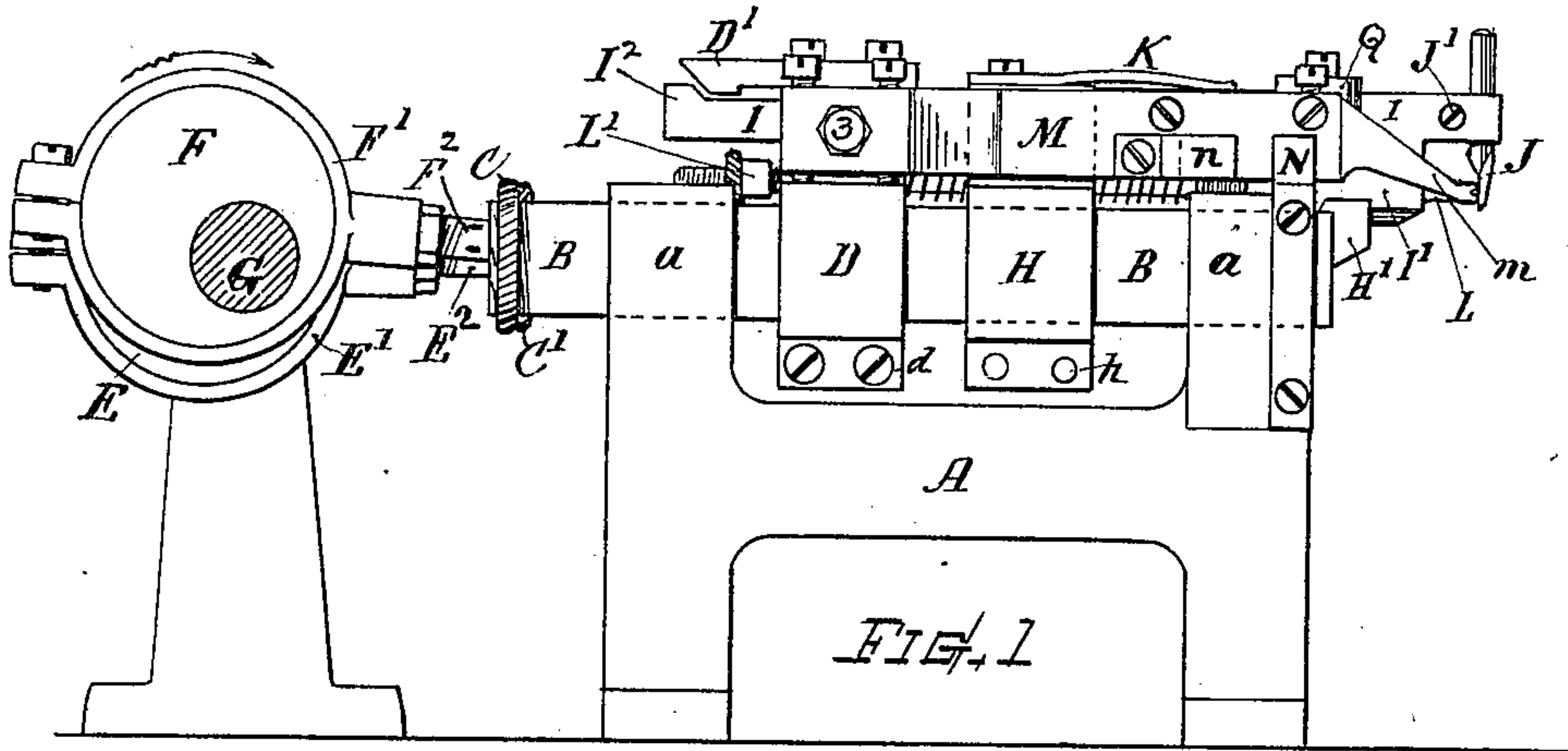


FIG. 4

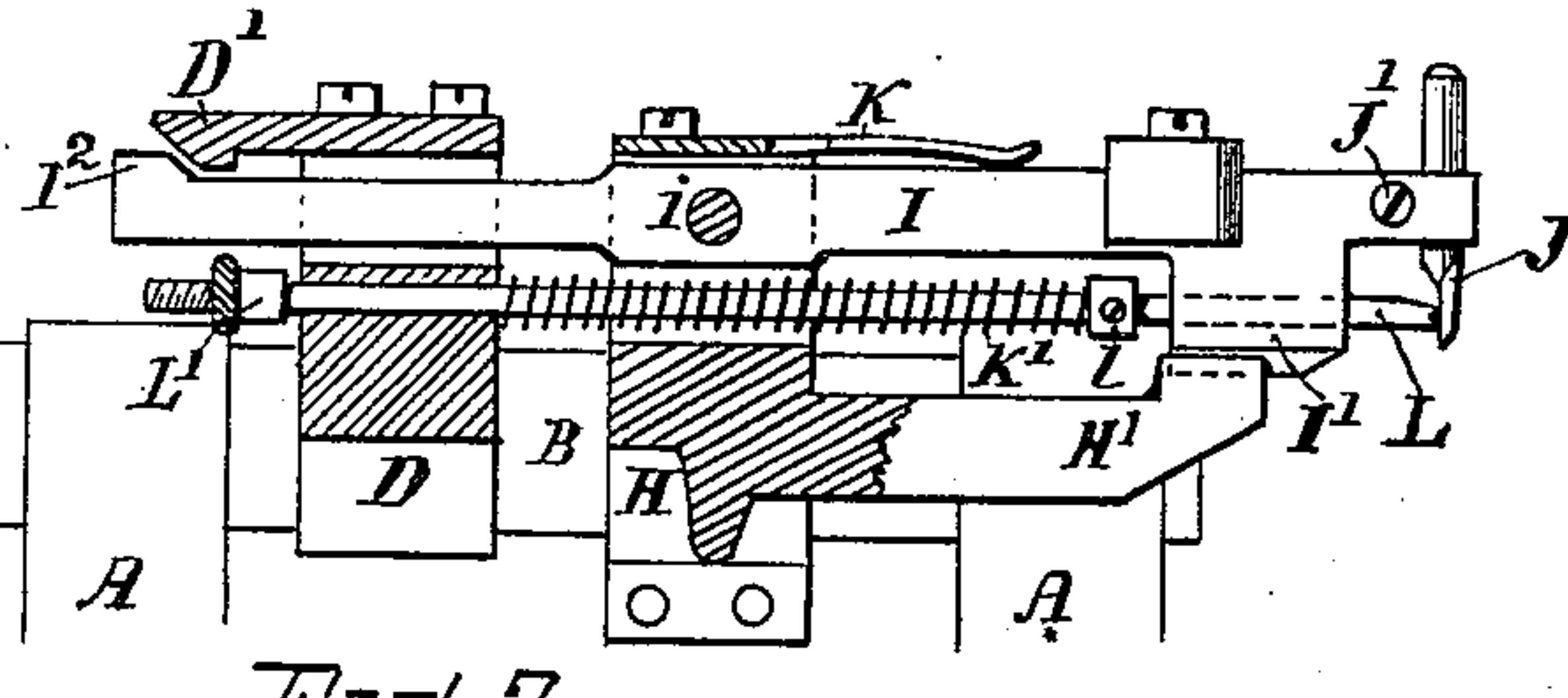


FIG. 3

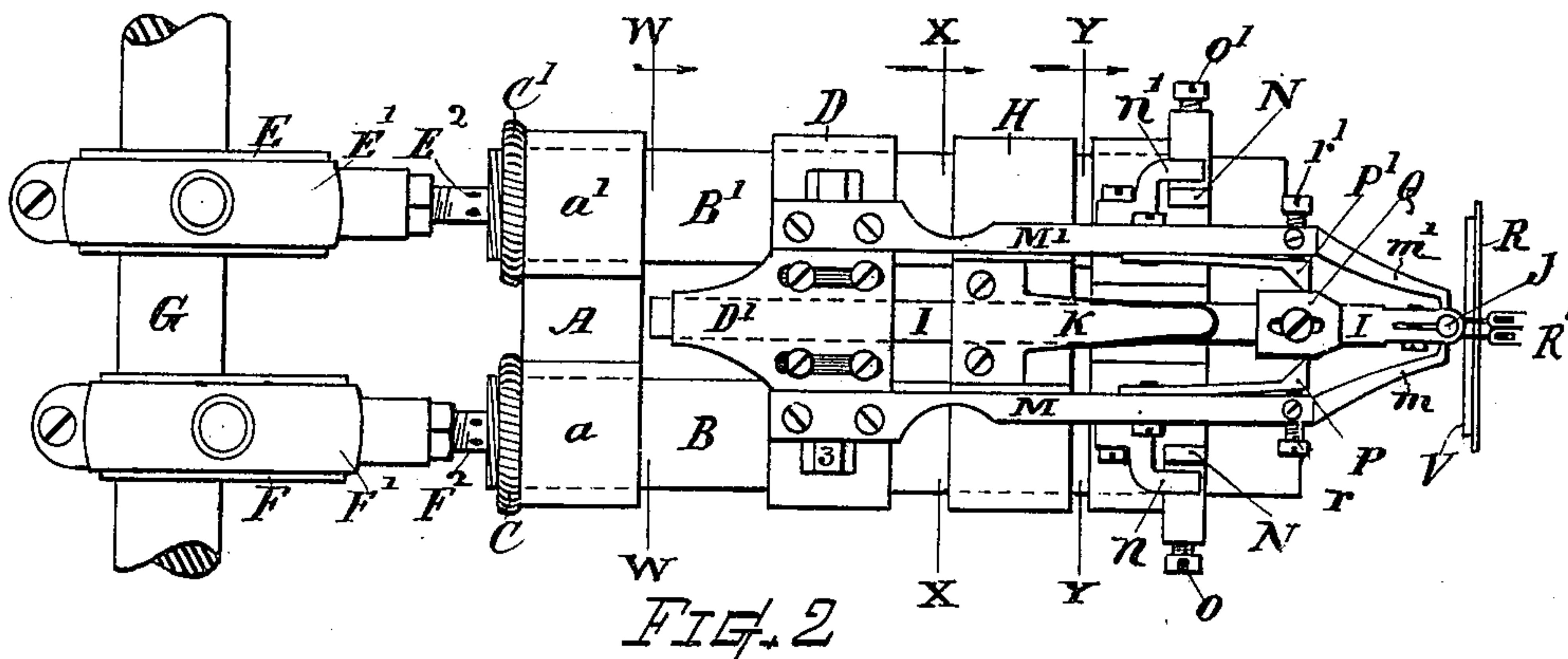


FIG. 2

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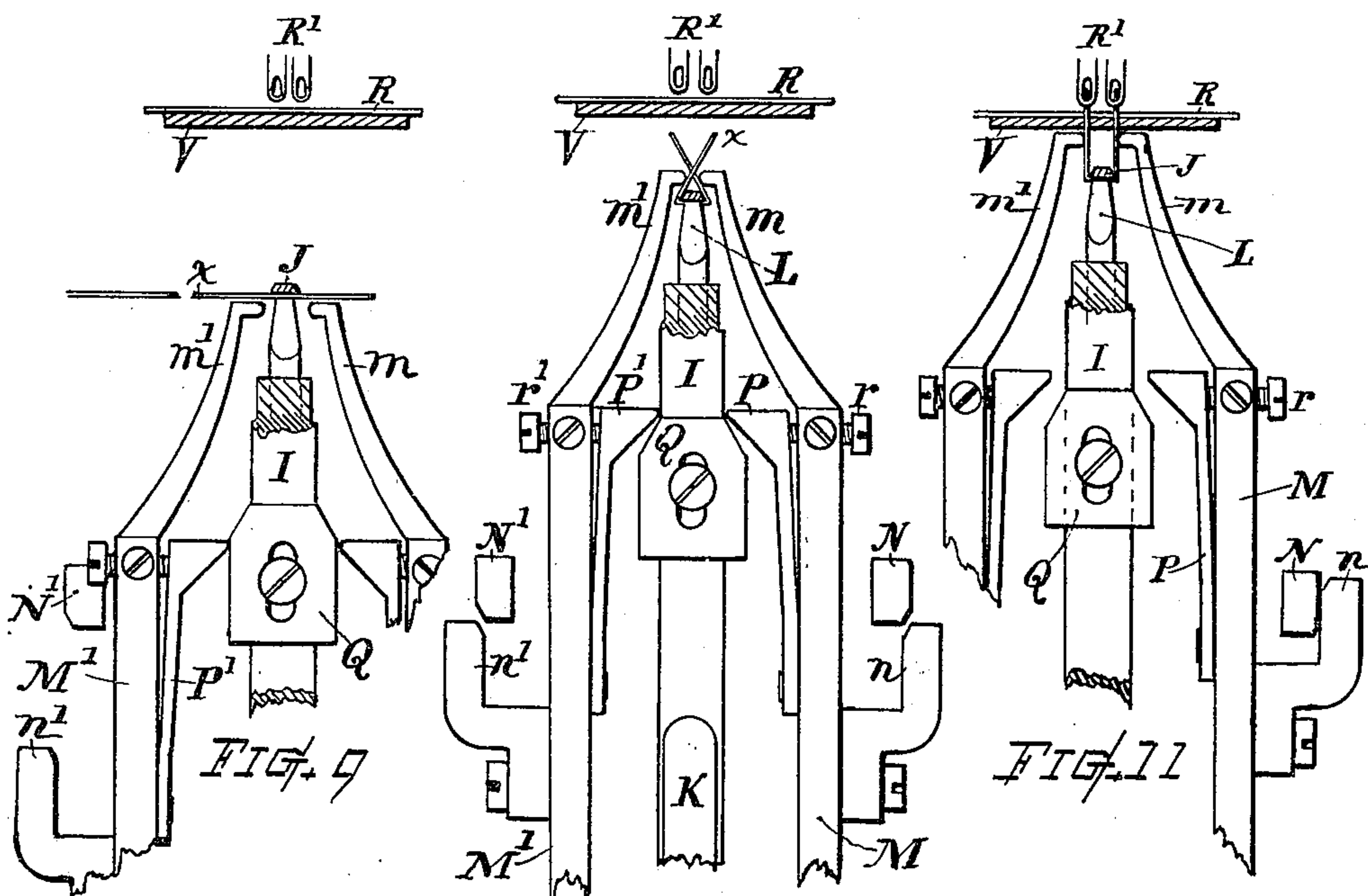
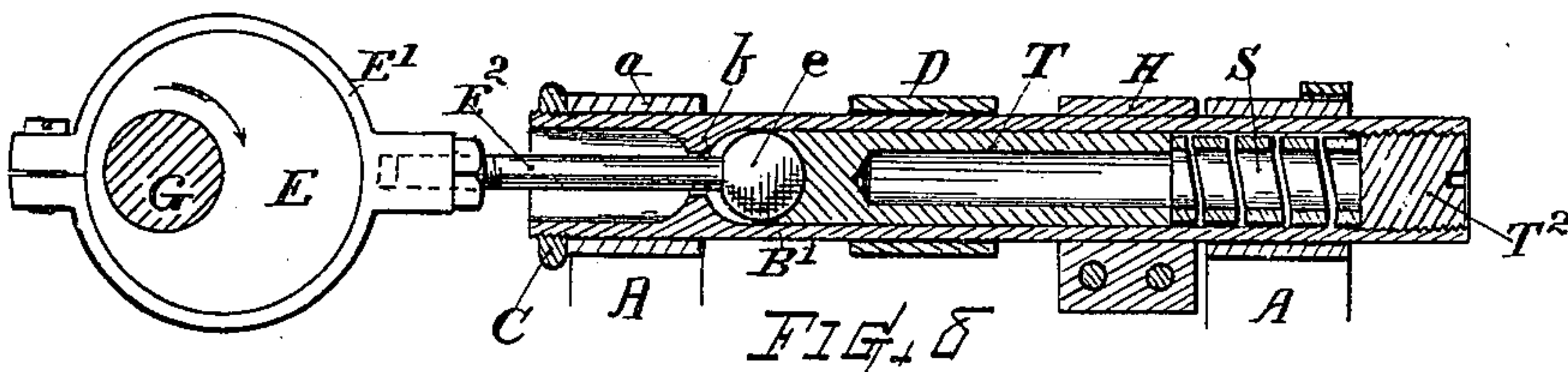
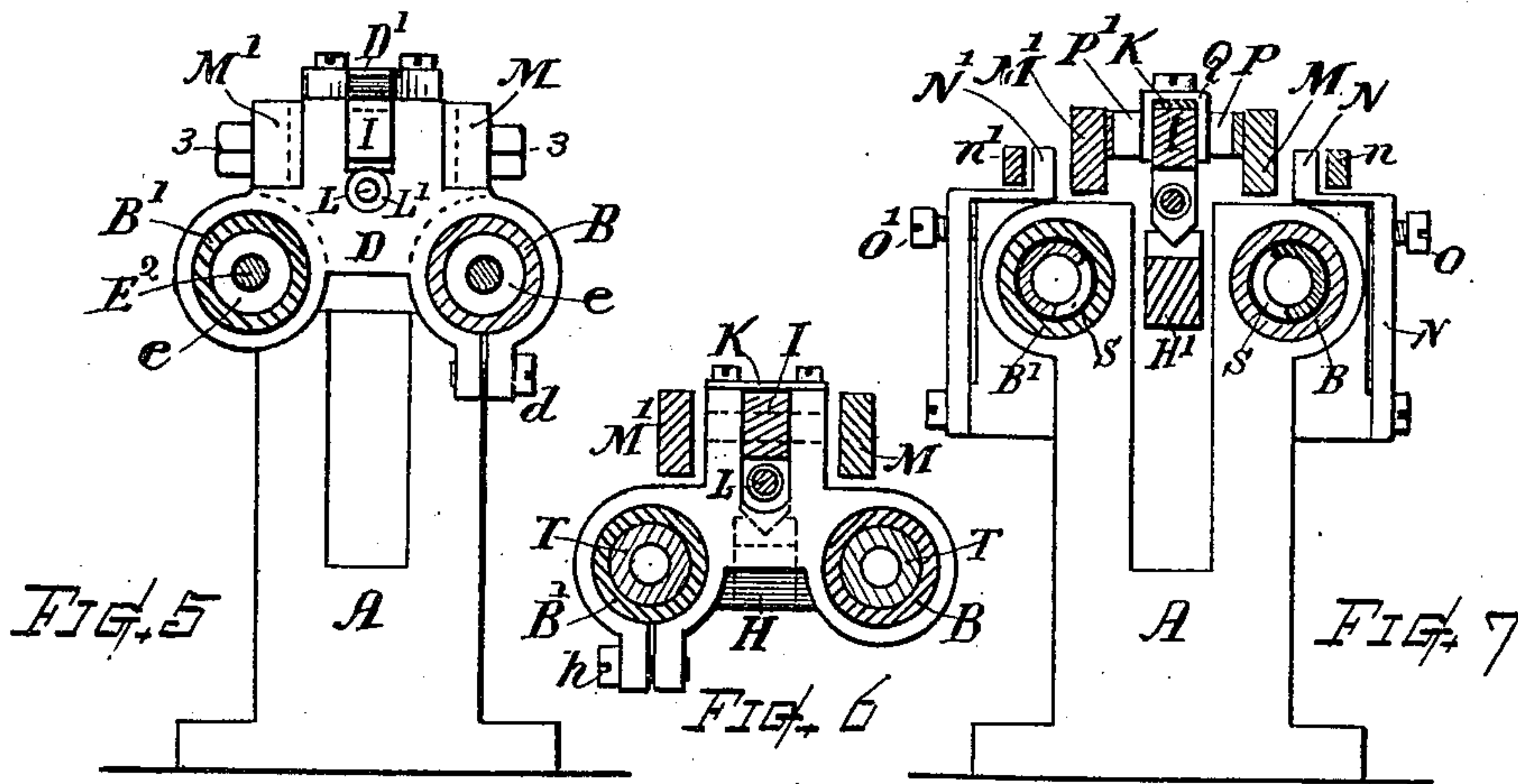
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UNITED STATES PATENT OFFICE.

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TOOTH FORMING AND INSERTING MECHANISM FOR CARD-SETTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 666,370, dated January 22, 1901.

Application filed April 27, 1900. Serial No. 14,548. (No model.)

To all whom it may concern:

Be it known that I, OLIVER ARNOLD, a citizen of the United States, residing at Leicester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improved Tooth Forming and Inserting Mechanism for Card-Setting Machines, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

My present invention relates to that portion of a card-setting machine whereby the detached sections of wire as they are cut off at the required length are gripped, bent into proper shape to form the staples or card-teeth, and their ends inserted through the previously-punctured backing fabric; and my said invention consists in a novel construction and combination in tooth forming and inserting appliances and means for operating and controlling the movements of the same; also, in the adaptation to a tooth-forming mechanism in a card-setting machine of circular eccentric cams for actuating the reciprocating parts, as more fully hereinafter explained, the objects of my improvements being, first, to afford a smooth, positive, and accurate movement for the card-tooth forming and inserting devices both in forward and backward direction; second, to produce a tooth-forming mechanism for card-setting machines capable of rapid and efficient action; third, to provide means for connecting the circular eccentric cams and actuated reciprocating parts in a manner to afford a dwell or yielding effect, as hereinafter specified, and, fourth, to afford improved facilities for the ready adjustment of the operating parts and to render their actions precise in degree of effect and time of occurrence; also, to do away with the use of springs as moving powers for the carriers. These objects I attain by the mechanism illustrated in the accompanying drawings, wherein—

Figure 1 represents a side view of mechanism embodying my invention. Fig. 2 represents a top plan view of the same. Fig. 3 is a sectional view showing the detail of the doubler-bar and tooth-gripping devices, and Fig. 4 is a front end view of the same. Fig. 5 rep-

resents a transverse section at line W W on Fig. 2, showing the bender carrier-head. Fig. 6 represents a transverse section at line X X, showing the doubler carrier-head. Fig. 7 represents a transverse section at line Y Y, showing the frame end, wing-guiding devices, and doubler-bar rest and adjacent parts. Fig. 8 represents a longitudinal section through one of the reciprocating carrier-tubes, illustrating the yielding connection devices and actuating-cam; and Figs. 9, 10, and 11, on a somewhat-larger scale, represent the fore ends of the gripping and bending devices, showing their respective relation at different stages in their operation.

In the embodiment of my invention as shown in the drawings the part marked A represents the frame, which is of suitable form for supporting the operating parts.

B and B' indicate two endwise-movable carriers or cylindrical tubes mounted in parallel relation to have reciprocative sliding action in guide-bearings *a* and *a'* on said frame and respectively actuated, through uniting connections hereinafter described, by a pair of eccentric circular cams E and F, mounted upon a rotatable shaft G, which may be the operating-shaft in a card-setting machine, and rotated in the usual manner. Mounted upon said carriers I arrange two cross heads or slides D and H, preferably formed with eye-bearings that surround the respective tubes and provided with suitable seat-lugs for attachment of the appurtenant parts. One of said cross-heads D, which I term the "bender" carrier-head, is rigidly secured to the tube or carrier B by a suitable fastening or clamp device at *d* and is fitted to slide free upon the tube B'. The other cross-head H, which I term the "doubler" carrier-head, is rigidly secured to the carrier or tube B' by a suitable clamp or fastening at *h* and is fitted to slide free upon the tube B. Thus each of said carriers or tubes carries one of the said cross-heads and forms a supporting-guide for the other cross-head, which slides thereon, while maintained in proper horizontal relation, as illustrated.

I indicates a longitudinally-disposed bar or lever, termed the "doubler-bar," which is horizontally pivoted at *i* between upright ears formed on the doubler carrier-head H, so as

to have upward and downward tilting action at its fore end. Said bar is furnished with a downward lug I', that normally rests upon an arm H', projecting forward from the cross-head H. The seating-faces of the lug I' and the supporting-arm H' are preferably made in countermatching V shape to afford a centering effect. The rear end of the doubler-bar is furnished with an upward lug I², the purpose of which is hereinafter explained. The doubler-detent or crown-form J is adjustably secured in the slotted fore end of the bar I by a clamping-screw J' or means whereby said crown-form is held rigid in relation to the doubler-bar. The crown-form J consists of a short pin or shaft having its lower end flattened and beveled, as indicated, to give the desired width of tooth-crown as the tooth-wire is doubled about said end. This crown-form J also serves as one jaw of the wire-holding grip.

A suitable spring K is provided for normally depressing the fore end of the doubler-bar I with the crown-form J and pressing the foot of the lug I' into the V-shaped seat on the arm H'.

L indicates an endwise-movable rod or crown-grip device extending through and having a bearing within the lug I' and a rear bearing within the cross-head D. The fore end of said rod impinges on the crown-form J and is fitted for receiving and holding the tooth-wire central and securely against the face of the crown-form while the bending and inserting operations are performed. A stop-nut L' is adjustably arranged upon the threaded rear end of said grip-rod, and an expanding coiled-wire spring K' is provided between the head D and a set-collar l, whereby said rod is normally pressed forward for gripping the tooth-wire. Its retraction is effected by the head D moving against the nut L'.

M and M' indicate a pair of laterally inward springing wing-bars secured at their rear ends to the cross head or slide D by the bolts 3 and terminating at their fore ends in the bending-fingers m m', the ends of which are formed and disposed in proper manner for manipulating the wire in conjunction with the crown-form and crown grip-rod in the formation and insertion of the teeth. Fixed upon the outer sides of said wings M M' there are forwardly-projecting guide-tongues n n', that act in coöperation with two independently-adjustable guides N N', supported on the bearing-frame A for directing the bender-fingers when inserting the teeth into the card backing or fabric V. The guides N N' are made adjustable by screws o o' for affording accurate and separate adjustment of the bender-fingers in their operative relation to the crown-form. The wing-bars are respectively provided with attached contact-fingers P and P', the ends of which are fitted to act against a wedge or opener block Q, adjustably secured upon the doubler-bar I and in

coöperation therewith to effect the opening or separation of the wings and bender-fingers. The opener-block Q is made adjustable on the bar I, so that its inclined surfaces can be set to act on the fingers P P' at the proper instant. The contact-fingers are best made inwardly and outwardly adjustable in relation to the wing-bars by means of the screws r and r'.

A plate D' is adjustably secured to the cross-head D and provided with a trip-lug that engages with the lug I² and by depression thereof swings upward the fore end of the doubler-bar I for lifting the crown-form J from the completed tooth.

R indicates the usual rest or brace against which the card backing or fabric V is drawn in well-known manner for receiving the card-teeth in the manufacture of card-clothing, and R' indicates the ends of the well-known dies that act in conjunction with the edge of the rest to give the knee or second bend to the teeth after their partial insertion, said dies operating in the usual manner.

The connections from the circular eccentric cams E and F for operating the respective reciprocating members or carriers B and B' are best made and combined in the following described manner, and as the parts in each of the sets of carriers, connections, and cams are similar in structure a description of one set will suffice for an understanding of both: The cam E is surrounded by a strap or ring E', having a radial hub into which the connection-rod E² is secured by a screw-thread and held fast by a check-nut. The end of the connection-rod is furnished with a head or ball e. The carrier or member B', which is formed hollow, (see Fig. 8,) is provided with an interior flange or socket b for receiving said ball. Within the tube B' there is an endwise-movable piston or follower T, having at one end a concavity or socket-face that seats against the head or ball e opposite to the connection-rod, and its other end rests against a strong coiled spring S, arranged within the carrier-tube. The outer end of this spring is supported against a stationary seat or adjustable stop-block, as the threaded plug or cylinder T², screwed into the end of the carrier-tube. The spring S acts by expansive force to normally keep the ball e against the socket-face b. The tension of the spring S can be regulated by screwing the seat-block T² more or less into the hollow of the tube.

C and C' indicate adjustable or screw-threaded collars arranged on the respective carriers or tubes B and B', which collars by contact with the bearings a a' or frame serve for arresting and limiting the forward movement of the carrier-tubes and parts connected therewith and for thereby regulating the nearness of approach of the tooth holding and bending devices to the rest R and card-backing or fabric. The connection mechanism for actuating the carriers is preferably so

constructed and assembled that the forward movement of the carrier-tube will become arrested by its stop-collar before the circular eccentric cam reaches its full throw forward or limit of advance action. Under this condition the force of the cam, acting through the connection-rod E^2 , overcomes the resistance of the spring S and causes the piston T to move endwise in the tube, allowing the ball e to retreat slightly away from the seat b , thereby affording a yielding effect and a dwell or cessation of carrier motion while the cam swings past the center line and for a given degree of its circle. The piston T , impelled by the spring S , returns the ball e to the socket-face b immediately as the cam commences to retreat, so that the yielding of the connections occasions no undue looseness or shock in the operation of the mechanism.

The working length of the connections E^2 and F^2 between the carrier-tubes and their circular eccentric actuating-cams can be adjusted and varied by screwing the threaded end of the connection-rod more or less into the hub of the eccentric strap or ring, thereby providing for a longer or shorter period of dwell for holding the teeth stationary while the dies R' are effecting the second bend in the teeth.

The eccentric cams E and F are arranged on the shaft G one somewhat in advance of the other and varied in extent of throw or eccentricity to the shaft-axis. I thereby attain a coöperative movement for the wire holding and bending mechanisms that steadily and quickly effects the reception, bending, and insertion of the tooth-wires.

The operation of forming and inserting the card-teeth by this improved mechanism is as follows: When the parts are at starting position, the grip-rod L is retracted by the head D , drawn back against the stop-nut L^2 . The wire x enters horizontally between the grip-rod end and the face of the crown-form. The forward movement of the head D releases the rod L , which is then pressed forward by its spring K' , so that the piece of wire as it is cut off is gripped at the position of the tooth-crown and firmly held between the grip-rod end and the crown-form J . (See Fig. 9.) As the carriers and cross-heads D and H move forward with a varied degree of speed the bender-fingers m and m' advance beyond the doubler or crown-form J , thereby doubling the ends of the wire forward, while the inward-springing force of the wings causes the fingers to press the two limbs of the tooth-wire inward or across each other (see Fig. 10) to accomplish what is known as "killing the wire"—that is, imparting such an excess of bend that the ends will not when released spring outward beyond a parallel alinement with each other. As the operation proceeds the fingers are slightly separated, permitting the killed tooth to spread to normal parallel relation. Then the tongues n n' move onto the guides N N' , which serve for directing the

wings and fingers m m' so that they will support and direct the ends of the tooth accurately into the holes in the backing fabric V , which, as will be understood, have been previously formed therein by a suitable perforating mechanism in the customary manner. A further advancement of the parts inserts the tooth through the fabric far enough to receive the knee or second bend which is imparted by the dies R' . The collars C and C' are adjusted so as to arrest the forward movement at this point, and the dwell for giving time for the dies R' to act is accomplished by the yielding of the connection mechanism between the cams and carriers—that is, by the forcing forward of the spring-pressed piston T in the carrier-tube. The crown of the card-tooth is securely held by the grip devices while the dies R' knee-bend the tooth across the edge of the rest R . The parts then commence their retroaction, the bender-carrier and its appurtenances slightly preceding in their movement. The wings and fingers m m' are spread apart by the contact-fingers P P' acting on the wedge-block Q . The cross-head D retracts the grip-rod L by contact with the stop L' , and the plate D' runs onto the lug I^2 , tilting the bar I and lifting the crown-form end from the loop of the partially-inserted tooth, (which is subsequently driven home in the usual manner by the end of the perforating mechanism,) and the several devices are smoothly drawn back by the circular eccentric cams to assume their primal positions for receiving another tooth-wire and to repeat their operation, which can be effected at a comparatively high speed.

By adjustment of the stops C and C' backward or forward on the end of the carrier-tubes the position at which the second bend is formed in the teeth by the action of the dies R' can be quickly and accurately regulated at any time without reference to the throw of the actuating-cam and without changing the extent, size, or positioning of the cam in its relation.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. In a card-setting machine, the combination with the operating-shaft, of a movable carrier-tube having the tooth-holding devices arranged thereon, and a movable carrier-tube having the tooth-bending mechanism arranged thereon, the actuating-cams consisting of circular eccentrics mounted on said operating-shaft, suitable eccentric-straps and connections for actuating said carrier-tubes from said circular eccentric cams, and adjustable contact-stops combined with said carrier-tubes for limiting their forward movement at a given position, substantially as set forth.

2. In a tooth forming and inserting mechanism for card-setting machines, the combination, with the reciprocating carrier having tooth-forming devices mounted thereon, of a stop for arresting or limiting forward move-

ment of said carrier, a circular eccentric cam for actuating said carrier, and a yieldable connection uniting said cam with the carrier, for the purpose set forth.

5 3. In a tooth-forming mechanism for card-setting machines, the combination of a hollow tubular carrier having an interior bearing-socket, suitable guide-bearings for said carrier, an actuating-cam, a cam connection-rod having a ball or enlarged head fitting inside of said socket, an endwise-movable presser, piston or follower adjacent to said head within said carrier-tube, a spring acting against said follower, and a bearing-seat or adjustable stop-block for the opposite end of said spring.

4. A tooth forming and inserting mechanism for card-setting machines, comprising a reciprocating carrier-tube having tooth-forming appliances mounted thereon, guide-bearings for said tube, an adjustable stop-collar on said tube, for limiting the forward movement of said carrier, a circular eccentric actuating-cam, and an operating connection between said cam and carrier provided with means for adjusting and varying the effective length of the connection.

5. In a tooth-forming mechanism for card-setting machines, the combination of a reciprocating carrier-head H having a forwardly-projecting arm H', a tiltable doubler-bar pivoted on said carrier-head and having a lug I' that seats on said arm, a bar-depressing spring therefor, a crown-form supported in the end of said doubler-bar, a longitudinally-movable grip-rod supported in said lug and impinging on said crown-form, an advancing spring and an adjustable retracting-stop on said grip-rod, a rear carrier-head D forming a bearing for said grip-rod, a trip device on said head that engages for tilting said doubler-bar, and means for independently moving said carrier-heads.

6. A tooth forming and inserting mechanism for card-setting machines, provided with two parallel endwise-reciprocating tubes or carrier-bars, guiding-bearings therefor, two carrier-heads supported on both of said car-

rier-bars and respectively secured one to each carrier-bar and sliding free upon the other carrier-bar; in combination with mechanism carried upon said heads for bending and inserting the tooth-wires.

7. The combination, of the parallel endwise-reciprocative carrier-bars, guiding-supports therefor, two carrier-heads supported on said carrier-bars respectively secured, one to each carrier-bar, and sliding free upon the other carrier-bar, a doubler-bar pivoted on the forward carrier-head, the crown-form mounted in the end of said doubler-bar, a pair of oppositely-disposed wing-bars attached to the rear carrier-head and terminated with bending-fingers adjacent to said crown-form, wing-guides and guide-tongues for controlling the lateral relation of said fingers, a spring-pressed grip-rod adapted for holding the tooth-wire against the crown-form, and means for imparting power and motion to said carrier-bars, substantially as set forth.

8. In a tooth-forming mechanism for card-setting machines, the combination, with the inwardly-springing bender-wing bars supported upon the movable carrier-head; of the forwardly-projecting guide-tongues $n n'$ fixed on said bender-wing bars, the tongue-engaging guides $N N'$ supported on the bearing-frame, and screws $o o'$ for effecting independent lateral adjustment of said guides, for the purpose set forth.

9. In combination, with the opposite inwardly-springing bender-wings, the movable wing-carrying head, the doubler-bar, and the movable doubler carrier-head, substantially as described, of means for opening or separating the bender-fingers, comprising the contact-fingers attached to the bender-wings, the adjusting-screws therefor, and the wedge-block adjustably mounted upon the doubler-bar and having inclined surfaces that act against said contact-fingers.

Witness my hand this 2d day of April, 1900.
OLIVER ARNOLD.

Witnesses:

ELLA P. BLENUS,
CHAS. H. BURLEIGH.