(No Model.) 4 Sheets—Sheet 1.

C. F. SMITH & J. J. NORWELL.

MACHINE FOR MAKING SHEET METAL CHAINS.

No. 583,853. Patented June 1, 1897.

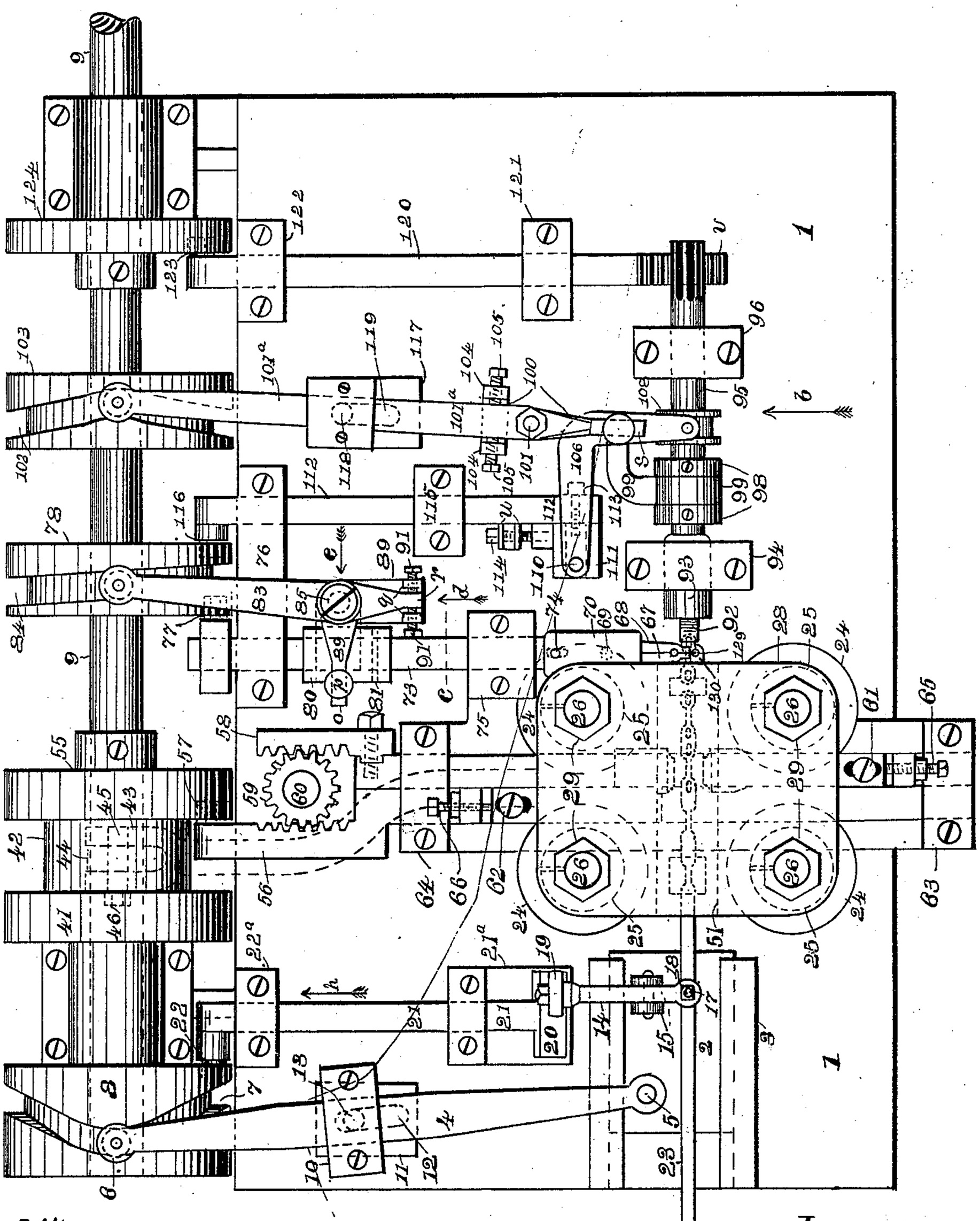

FIG. 1.

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(No Model.) 4 Sheets—Sheet 2.

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FIG. 2

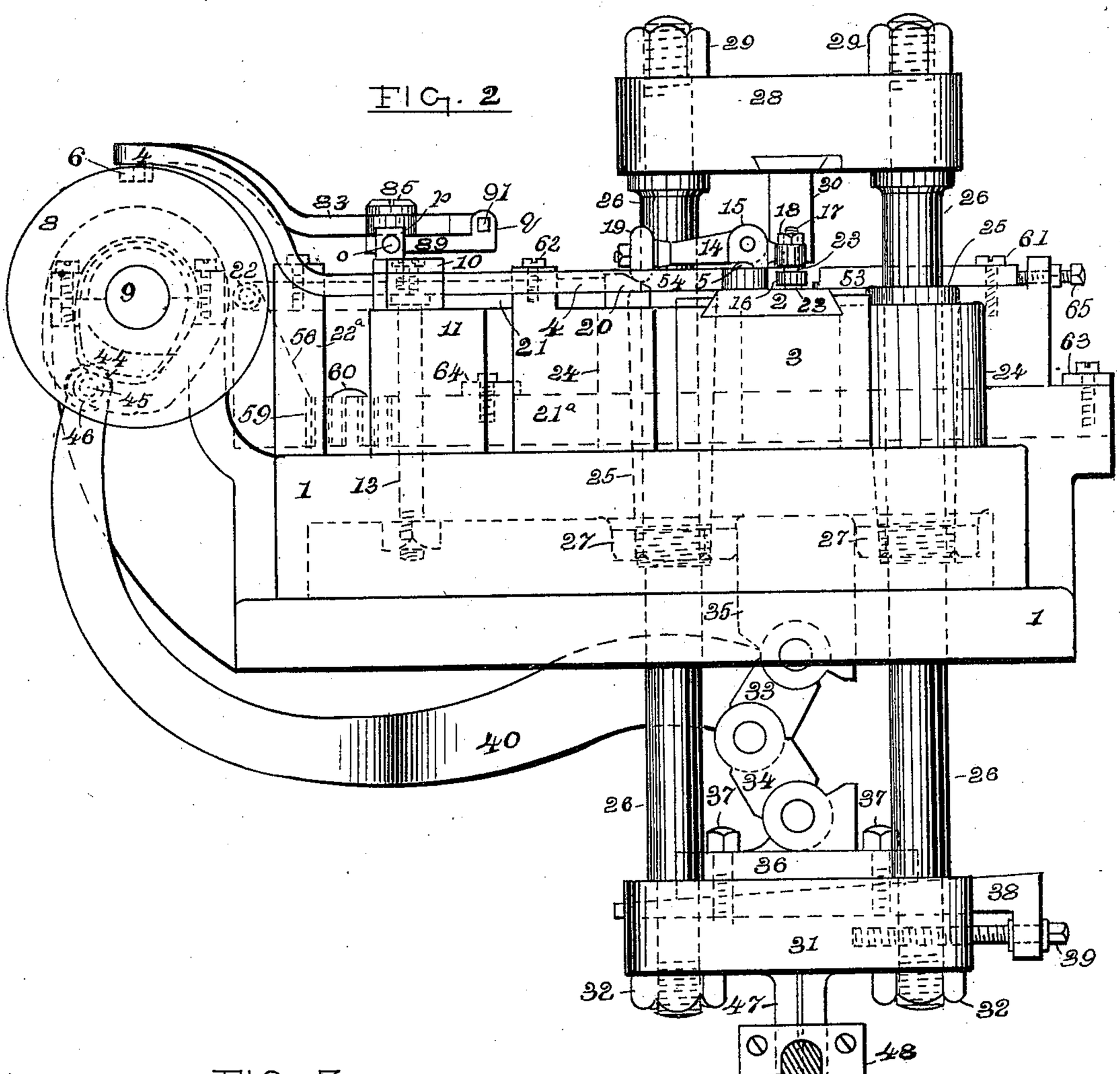
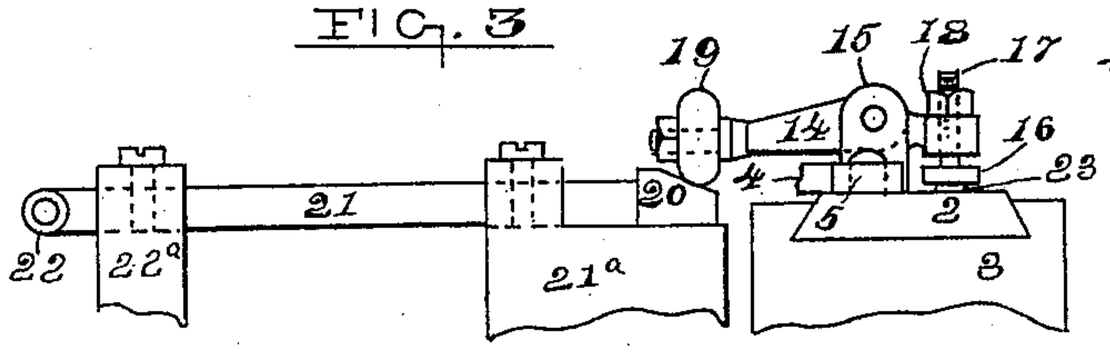


FIG. 3



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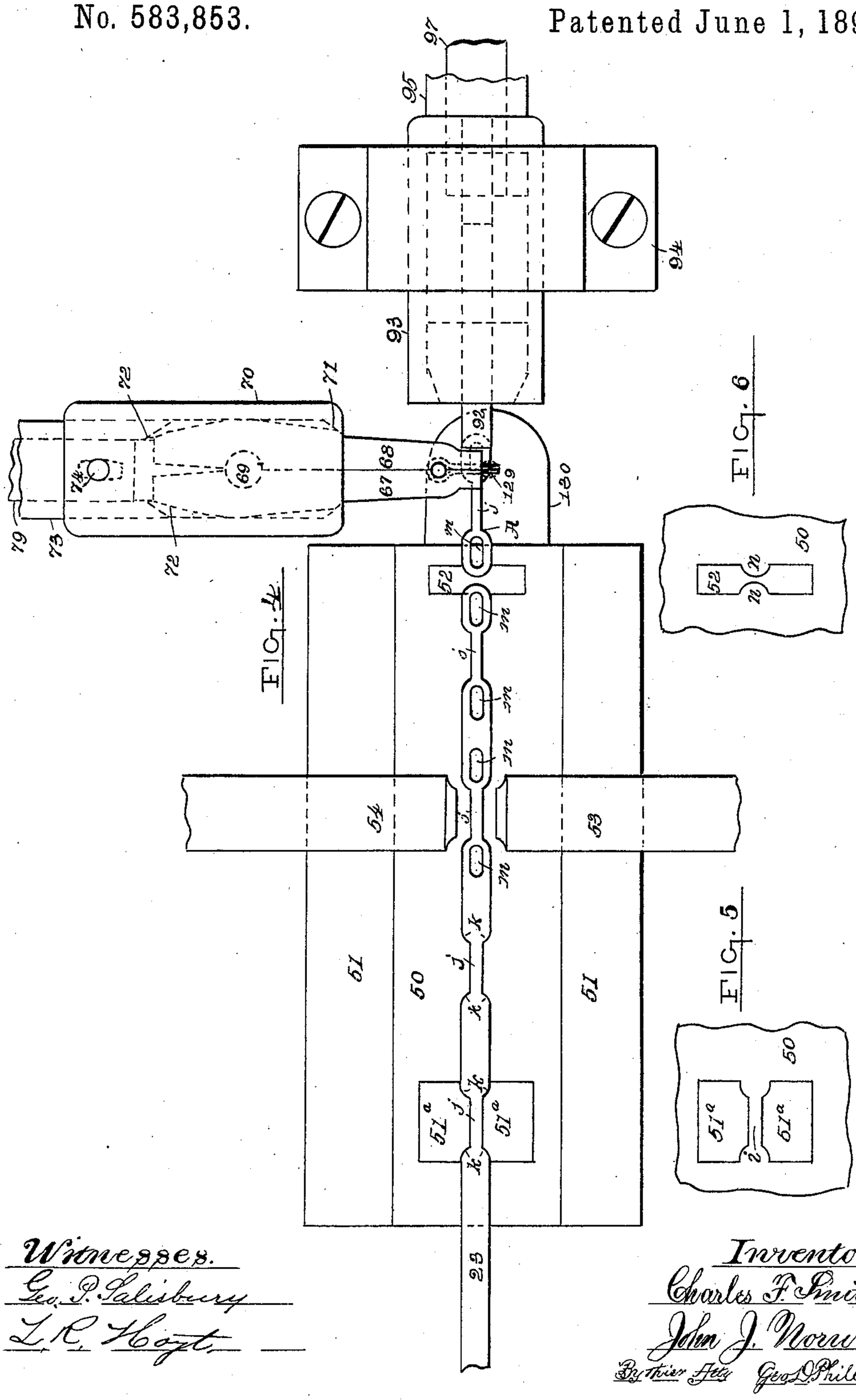

FIG. 4.

FIG. 6

FIG. 5

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MACHINE FOR MAKING SHEET METAL CHAINS.

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FIG. 7

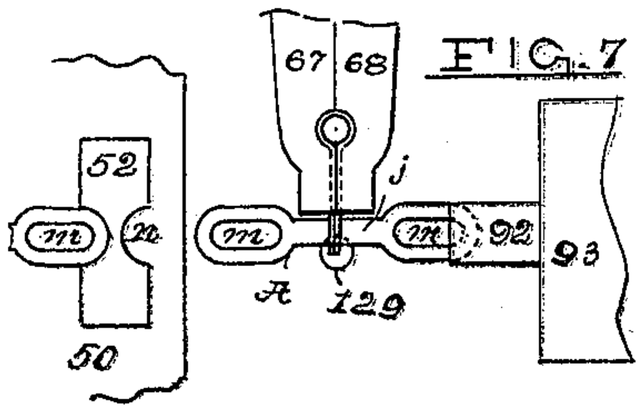


FIG. 8

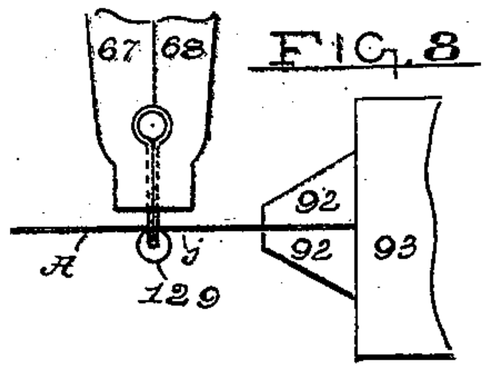


FIG. 9

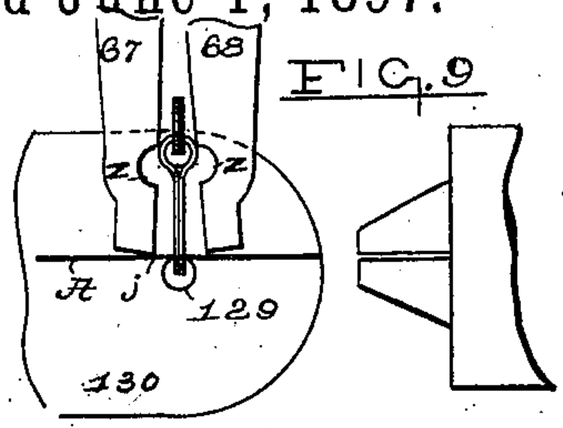


FIG. 10

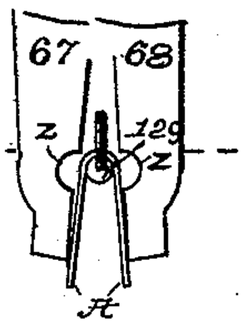


FIG. 11

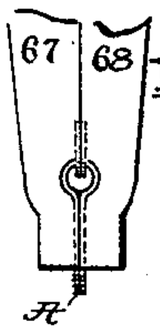


FIG. 12

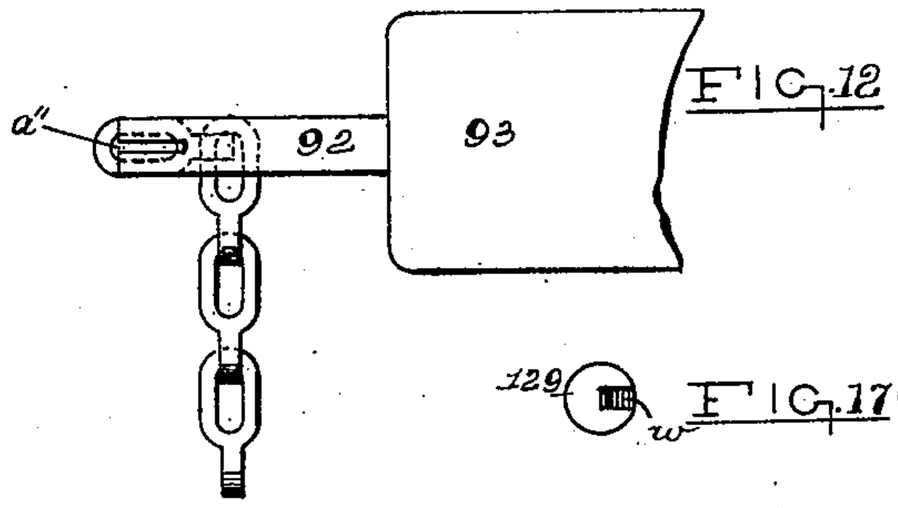


FIG. 17

FIG. 18

FIG. 14

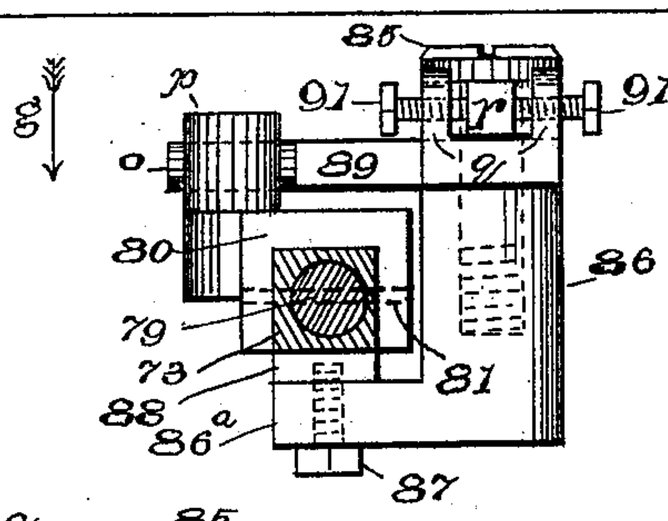


FIG. 16

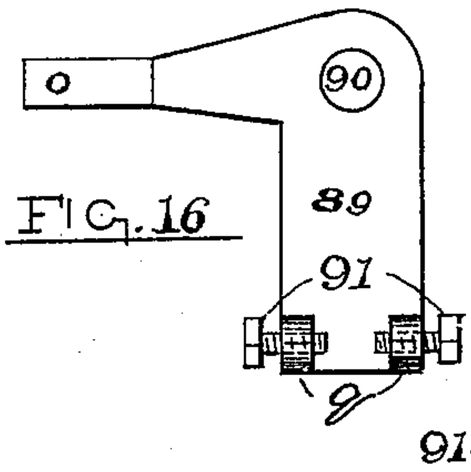
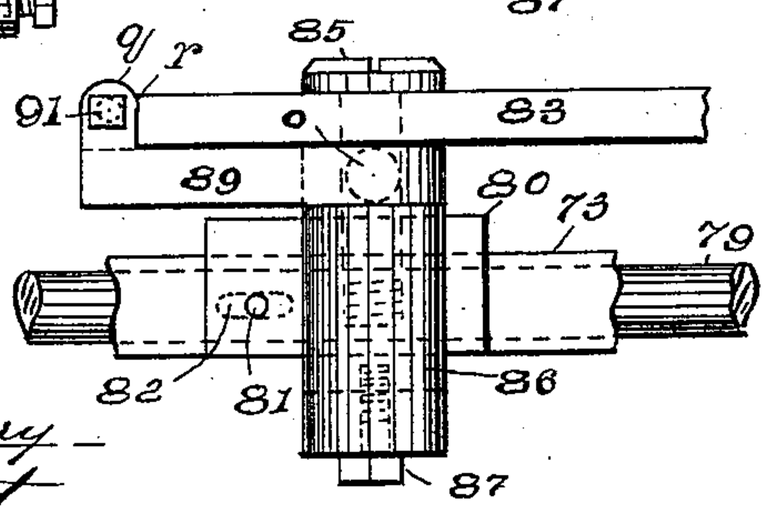


FIG. 15



Witnesses.
Geo. P. Salisbury
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By their Atty. Geo. D. Phillips.

UNITED STATES PATENT OFFICE.

CHARLES F. SMITH AND JOHN J. NORWELL, OF BRIDGEPORT, CONNECTICUT, ASSIGNORS TO GEORGE MORTSON, OF HARTFORD, CONNECTICUT.

MACHINE FOR MAKING SHEET-METAL CHAINS.

SPECIFICATION forming part of Letters Patent No. 583,853, dated June 1, 1897.

Application filed September 5, 1893. Serial No. 484,842. (No model.)

To all whom it may concern:

Be it known that we, CHARLES F. SMITH and JOHN J. NORWELL, citizens of the United States, and residents of Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Sheet-Metal Chains, of which the following is a specification.

Our invention relates to certain novel and useful improvements in a machine for making sheet-metal chains. It has heretofore been the practice to punch each link or blank from the metal strip, and then by means of a push-bar or feeder or other mechanical device convey the blanks forward to be operated upon by the bending-fixture. This arrangement in chain-making is wrong in principle, as the intermediate feeding mechanism for the blanks is by no means sure in its operation, owing in part to the burs inevitably formed on the links from the blanking or punching operations. Therefore failure on the part of the feeding mechanism to coöperate with the bending-fixture at the right time will result in the dropping of the previously-formed chain from the latter, thus causing frequent and serious interruptions in what should be a continuous operation. Besides, this manner of blanking the link from the body of a strip is attended with much loss of stock or waste metal.

Our invention consists of a combination of mechanical devices whereby all of the necessary operations for forming a complete link are made on a metal strip before severing such link from the strip, means whereby the strip is advanced so as to thread the link about to be severed through the eye of a previously-bent link, and means for holding such link firmly while it is being secured. The advantage of this arrangement over the old devices is apparent not only in the saving of stock and cheapness of construction, but also in the positive assurance that each link is placed in position for bending before it is cut from the rod, thus dispensing with all doubtful intermediate feeding mechanism.

For a full description of our improved construction for chain-making and the novel mechanism by which we achieve such good results reference is had to the following specification, and such features as we believe to be new and novel will be particularly pointed out in the claims.

To enable others skilled in the art to fully understand our invention, reference is had to the accompanying drawings, in which—

Figure 1 represents an upper plan view of the machine, showing the various levers, cams, and other necessary mechanism for the purpose hereinafter to be more fully explained. Fig. 2 is an end elevation of the machine, looking in the direction of arrow *a*, Fig. 1; also broken section of one of the supporting-arms which operate as a brace for the lower part of the movable gate. Fig. 3 is a detail side elevation of the stock-feeding mechanism and broken section of the supports upon which they operate, looking in the direction of arrow *a*, Fig. 1. Fig. 4 is an enlarged detail plan view of the chain-forming mechanism, consisting of the dies, die-block, and support therefor; broken views of the swaging-dies, gripping and bending jaws, all in operative position; also section of a metal rod or strip, showing the several operations for making the link performed thereon, together with a completed link severed therefrom and in possession of the gripping-jaws. Figs. 5 and 6 are detail broken sections of the shaping and cutting-off dies. Fig. 7 is an enlarged broken view of the link forming and gripping jaws, cutting-off die, and a link severed thereby and drawn by the gripping-jaws longitudinally central with the previously-formed link within the grasp of the bending-jaws. Fig. 8 is a broken detail view of both the gripping and bending jaws, showing the former turned to a quarter position preparatory to bending the link therein. Fig. 9 is also an enlarged broken detail view similar to Fig. 8, showing the gripping-jaws released from the link and retreated therefrom, so as to permit of a forward movement of the bending-jaws, which are shown opened and ready to advance. Fig. 10 is a broken detail view of the bending-jaws advanced to their extreme forward movement, with the link bent in U shape formed around the bending-pin. Fig. 11 is a view similar to Fig. 10, showing the bending-jaws closed, compressing the two

ends of the link firmly together. Fig. 12 is a detail broken side elevation of the bending-jaws, showing a portion of the completed chain depending therefrom. Fig. 13 is a detail front elevation of the gripping-jaws, its shaft, supports therefor, and other mechanism for operating the same; end view of the bending-jaws and portion of their operating mechanism; broken view of the die-bed and bed of the machine, looking in the direction of arrow *b*, Fig. 1. Fig. 14 is a detail front end elevation of the mechanism for operating the link-forming jaws, looking in the direction of arrow *d*, Fig. 1, and sectional view of the square and round shafts of the same through dotted line *c*. Fig. 15 is a side elevation of Fig. 14, looking in the direction of arrow *f*, Fig. 14, or arrow *e*, Fig. 1, showing broken section of the round shaft which opens and closes the link-forming jaws; also broken section of the square shaft for moving the said jaws longitudinally and independent of the round shaft; broken view of the lever operating the round bending-jaw shaft and bell-crank lever connected therewith. Fig. 16 is a detail plan view of the bell-crank lever shown in Figs. 14 and 15, looking in the direction of arrow *g*. Fig. 17 is an elevation of the operating-pin around which the links of the chain are bent.

Its construction and operation—beginning with a detailed description of the stock-feeding mechanism—are as follows:

1 (see Figs. 1 and 2) represents the bed of the machine.

2 is a feed-slide operatively mounted in the supports 3.

4 is a lever having one end journaled to the pin 5 of slide 2, while the opposite end is provided with the roll 6 to engage with the groove 7 of cam 8, mounted on the driving-shaft 9. The lever 4 is secured to the block 10, which in turn is swiveled to the supporting-standard 11, having the elongated hole 12 therethrough to accommodate the changed positions of the bolt 13 for the purpose of shortening or lengthening the travel of the feed-slide 2.

14 is the vertically-operating clamping-finger, pivotally mounted in the ears 15 of the slide 2. One end carries the clamping-pad 16, (see also Fig. 3,) whose threaded shank 17 is adjustably secured to the finger 2 by the nut 18. Roll 19 is journaled on the opposite end of said finger and is arranged to engage with the inclined face of the T-shaped end 20 of the lever 21, whose opposite end is provided with the roll 22, engaging in a cam-groove cut in the vertical face of the cam 8. When, therefore, the slide 2 is carried to its extreme forward position, as shown in Fig. 1, the taper-face of the T-shaped end of the lever 21 will be forced sufficiently hard against the roll 18, so as to firmly hold the metal strip 23 against the slide 2. After the operation on that part of the metal strip overlying the die (presently to be described) is completed the lever 21 will retreat, (in the direction of arrow *h*,) releasing the grip of the finger 14 on the stock 23 sufficient to allow the slide 2 to be moved back, carrying the said finger with it. The T-shaped head 20 is long enough to allow for any travel to which the slide will be subjected, so that when said slide 2 is in readiness to be again moved forward the lever 21 will force the taper-face of said T-shaped end hard against the roll 18, thus causing the head or pad 16 to firmly grip the strip 23 for the forward movement of the slide 2, during which the roll 18 will travel along the inclined face of the head 20, meanwhile maintaining a firm engagement of the opposite end of the finger 14 with the metal strip 23.

Die and punch mechanism.—24 (see Figs. 1 and 2) are four round projections or bosses integral with the machine-bed, having each a large taper hole or bearing therethrough to receive the split taper bushings or sleeves 25, which in turn are bored to receive the round columns or rods 26, representing the movable gate for operating the punches. These bushings 25 project through the bed of the machine (see Fig. 2) and are provided with threaded ends, whose nuts 27 adjust such bushings to the columns or rods 26. The punch-supporting plate or cap 28 is mounted upon a shouldered portion of the rods 26 and firmly secured thereto by the nuts 29. To the under side of this cap is secured the punch 30. A similar cap 31 is mounted on the lower ends of the rods 26 below the bed and secured thereto by nuts 32. Vertical motion is imparted to the punch by means of the toggle-arms 33 and 34, the former, which is pivotally supported to the rigid block 35, projecting below the bed, and the latter to the adjustable block 36, which is attached to the lower cap 31 by the bolts 37. The under side of this block is tapered and engages with the taper-face of the key 38, so that by loosening bolts 37 and by means of the adjusting-screw 39 of the key the angular position of the toggle-arms 33 and 34 may be adjusted. The operating-lever 40, connected therewith, is controlled in its movements by the cams 41 and 42. The forked end 43 of said lever carries the roll 44 to engage with the face of the cam 42, while on the end of the bolt 45, which supports roll 44, is the cam-roll 46, which engages with a cam-groove in the vertical face of the cam 41. This arrangement of the two independent cams for the same lever dispenses with the use of a spring which would otherwise be required to keep a single roll in engagement with its cam. To counteract any tendency of the large rods or columns 26 to spring laterally under the strain brought to bear on them by the toggle-arms, the slide, Fig. 2, attached to and projecting below the lower cap 31 operatively engages with the support 48, which is attached to the bed of the machine by the braces 49, a sectional view of one only being shown.

The upper surface of the die-plate 50 is,

when such die is resting in its bed 51, (see Figs. 1 and 3,) level with the upper surface of the feed-slide 2. The first die 51^a in the said plate (see Fig. 5) is provided with the bridges *i* to support the shank or bar *j* of the link, Fig. 4, when the punches which correspond to said die cut out the stock in the edges of the metal strip to make such bar, rounding the ends *k* or corners of the proposed link in this the first operation. Directly under the first two elongated holes *m m* in the strip 23, which holes represent the eyes in the proposed link, are dies corresponding to such holes. The cutting-off die 52 is the last operation, and while severing a completed link from the end of the strip will round the end of the severed link and also the remaining end of the uncompleted link still attached to the metal strip. The form of this die can be more clearly seen at Fig. 6, showing the projections *n* for supporting the ends of the link and forming the rounded ends thereof. It will readily be understood that the punches (not shown) in the holder 30 of the cap 28 conform, as regards their shape and position, to the dies just described. The advantage of the arrangement before mentioned for operating the punches is vastly superior to the ordinary press now universally employed in chain-making. The whole upper surface, outside of the cap 28, is fully exposed and readily accessible for adjusting any of the mechanism thereon, and the cap 28 being small as compared with the overhanging portion of an ordinary press will enable the operator to readily observe the operation of the punches and easily make whatever changes are necessarily connected therewith. To resharpen the ends of the punches, the cap 28 is removed and placed under an emery-grinder for that purpose and replaced without disturbing the dies. The toggle-arm arrangement will furnish more power for a short stroke and with less tendency to spring by means of the arrangement of the rods or columns 26 than can be obtained with the common press, being in every respect far more rigid and substantial and much better adapted for the work in hand.

Swaging-dies.—The dies 53 and 54, as shown in Figs. 1, 2, and 4, overlie the die-plate 50 and are operated by the cam 55 in the following manner: The bar 56 is provided with the roll 57, which operates in a cam-groove in the vertical face of the cam 55. Motion is transmitted to its companion bar 58 through the medium of their toothed faces and the pinion 59, operatively mounted on the stud 60, so that by this arrangement the two bars will be moved in opposite directions by means of a single cam. To these bars are attached, by screws 61 and 62, the swaging-dies 53 and 54. As the bars 56 and 58 are arranged to operate in the same horizontal plane, the swaging-die 54 will require to be offset sufficient, Fig. 1, to bring it on a line with its companion 53. These bars 56 and 58 are operatively held to the machine-bed by means of the caps 63 and 64 and the screws therein shown. These bars also pass beneath the die block or support 51, while the swaging-dies, before mentioned, overhang the link-forming dies to operate in the manner presently to be described. These swaging-dies are also adjusted on their respective bars by means of the screws 65 and 66.

Link-bending jaws and mechanism therefor.—These jaws 67 and 68 (see Fig. 4) are hinged together by means of the pin 69. (Shown in dotted position within the outer sleeve 70.) The front and rear portions 71 and 72 of said jaws within the sleeve 70 are tapered to engage with corresponding tapered faces of such sleeve, so as to open and close them, as required. 73 (see also Fig. 1) is a square shaft attached by pin 74 to the sleeve 70. This square shaft has a reciprocating movement in the supports 75 and 76 by means of its roll 77 operating in a cam-groove in the vertical face of the cam 78. Within this square shaft (see Figs. 14 and 15) is the round shaft 79, and having an independent movement within said square shaft 73 as follows: 80 is a cap operatively mounted on shaft 73, and by means of pin 81 is rigidly secured to the central round shaft 79. The elongated slot 82, Fig. 15, in the square shaft 73 permits said round and square shafts to move independent of each other. The forward end of the former being connected with the fulcrum-pin 69 of the bending-jaws, Fig. 4, will therefore open and close the same when required. Motion is communicated to the round shaft 79 by means of the lever 83, whose outer end is provided with a roll to engage the groove 84 in the outer face of the cam 78, Fig. 1. This lever 83 is pivotally supported by the screw 85 to the block 86, which in turn, Fig. 14, is, by means of its angular foot 86^a and bolt 87, attached to the projection 88 of the square shaft 73. The bell-crank lever 89 (see Fig. 16) has the hole 90 also provided for the reception of the screw 85, and such lever underlies the lever 83. The cylindrical end *o* of the bell-crank lever operatively engages with a hole, Fig. 14, provided in the projection *p* of the cap 80. The other arm of this bell-crank lever 89 has erected at its extreme end the ears *q*, through which are placed the adjusting-screws 91. Between the ears *q* are placed the small end *r* of the cam-lever 83, whereby the relative position and movement of the round shaft 79, before mentioned, and the movement of the square shaft is maintained with respect to the grooves in the cam 78 that operate the lever 83 and the said square shaft. From the foregoing description it will readily be seen that the square shaft will reciprocate the jaws at right angles to the travel of the metal strip from which the links are formed, while the round shaft is independently operated to open and close such jaws when required and for the

purpose hereinafter to be more fully explained.

Link-gripping jaws and mechanism therefor.—The construction of the jaws 92, Fig. 4, together with the sleeve 93, is similar to the jaws and sleeve or holder of the bending device previously described. The said sleeve of the latter fixture (see also Fig. 13) is journaled in the standard 94. The shaft 95, which is in this case round instead of square, is also attached to the sleeve 93 and journaled in the back standard 96. The round shaft 95 (see Fig. 4) also corresponds to the round shaft of the bending-fixture. Between the collars 98 and rigidly mounted on the shaft 95 is journaled one end of the angular lever 99. The other rounded end of said lever operatively receives the cylindrical end *s* of the adjustable clamp 100. Overlying this clamp and secured thereto by the bolt 101 is the operating-lever 101[a], whose outer end is provided with a roll to engage with the groove 102 of the cam 103. Ears 104, having the bolts 105 therethrough, are furnished to adjust the position of the shaft 95 relative to the work it has to perform. 106 is a bell-crank lever whose forked end, Fig. 13, is provided with rolls 107 to engage with the grooved collar 108, which is rigidly attached by the pin 109 to the internal shaft 97, Fig. 4. The elongated slot *t*, Fig. 13, in the outer shaft 95 gives the same independent motion to the two shafts, as explained in the bending mechanism. The other end of the bell-crank lever 106 has the pin 110, carrying on its under side, Fig. 1, a roll (not shown) which operates in a slot (not shown) in the block 111, which block is secured to the end of the operating-bar 112 by the bolt 113. The screw 114, journaled in the fixed ears *u* of the bar 112, and whose threaded end engages with the block 111, will adjust such block on the bar 112 and by so doing change the relative position of the jaw-operating shaft 97 with the outer shaft 95. The bar 112 operates in the bearings 115 and 76. Its cam-roll 116 operates in a groove in the vertical face of the cam 78. The lever 101[a] is adjustably secured to the standard 117 by the bolt 118 and elongated slot 119, similar in every respect to the stock-feeding lever 4, previously described. The outer end of the shaft 95 is provided with teeth to engage with the toothed end *v* of the bar 120, operatively mounted in the supports 121 and 122. The outer end of this bar has the roll 123, which engages with a groove in the vertical face of the cam 124. The object of this last arrangement is to give a quarter-turn at the proper moment to the shaft 95, together with the jaws and their sleeve located at the other end. To counteract any tendency of this rotary motion of the shaft 95 to disturb the position of the angular lever 99, the projection 125, Fig. 13, carries at its lower end the roll 126, which is operatively placed between the uprights 127, one only being shown. From the foregoing it will be seen that the gripping-jaws are in their operation similar to the bending mechanism, except that the former is provided with a partial rotative action which is not given to the latter.

The vertically-operating pin 129, around which the links are bent, (seen more clearly at Fig. 13,) is supported in the projection 130 of the die-support 51, whose upper surface is on a line with the bottom of the jaws of the bending-fixture, so as to fully support said pin close to the bending field. The side of the pin facing the bending-jaws (see upper plan view of same, Fig. 17) is provided with a slot *w* to admit the heads of a previously-bent link, so that the link to be bent will be fully supported against the cylindrical surface of the pin. Said pin extends below the bed of the machine and is arranged to have a vertical intermittent motion by any simple means. (Not shown, but readily constructed.)

Operation of chain-making.—The edges of the narrow metal strip 23, Figs. 1 and 4, are preferably rounded, and such strip is intermittingly fed forward in a manner fully described in the direction of arrow *a*. The first operation on the strip will cut away sufficient stock on the opposite edges of the same to form the narrow bar *j* at the same time round the inner ends of the heads of the proposed link. The eyes *m* will be formed when the position between the swaging-dies is reached. It will be understood that all of the operations—viz., shearing the edges of the strip to form the central connecting-bar of the link, piercing the eyes, and cutting of a completed link—are performed at one stroke of the punch-gate. To avoid crowding the operations into too small a compass and at the same time give ample room for the working of the swaging-dies, there are preferably four unfinished links on the strip when the machine is in full operation.

When the metal strip is being fed forward, the gripping-jaws 92 are in their extreme backward position. (Shown at Fig. 9.) For an illustration let it be supposed that the link A (shown as severed in Fig. 4) is still attached to the metal strip, but projected through the eyes of the bent link shown within the grasp of the closed bending-jaws 67 and 68. Now the punches are in a raised position and ready to descend. Previous, however, to their doing so the gripping-jaws 92 will advance, open, and firmly grip the protruding head of the unsevered link, remaining in this position while the punches descend and form another connecting-bar on the strip, pierce the eyes, and sever the link held by the gripping-jaws therefrom. When the punches are within their respective dies, they will remain there long enough to permit the swaging-dies 53 and 54 to advance and round or otherwise finish or shape the previously-sheared edges to conform to the rounded edges of the heads not operated on. The piercing-punches, while still within the metal strip, act as an anvil and assist in supporting and preserving the shape of the eyes and prevent their being

crushed in by the pressure of the said swaging-dies. While this operation of swaging is going on, and, in fact, as soon as the link A is severed from the strip, the gripping-jaws will retreat and bring the link central with the link within the bending-jaws, (shown at Fig. 7,) the position of the bending-jaws being at the same time in the position shown at Figs. 1 and 2, which position is most favorable to admit the head or widest part of the new link through the eyes of the previously-formed link in the bending-jaws. When the link just severed is in the position shown in Fig. 7, the bending-jaws will retreat to the position shown therein, so as to permit the new link to be given, by means of the rack-bar 120 previously mentioned, a quarter-turn, as shown in Fig. 8. When in this position, the bending-pin 129 will be projected close up against the vertical face of the link-bar *j* and in its central part, while the projecting ends of the link in the grip of the bending-jaws will enter the groove *w* of the bending-pin. The said jaws will now open, Fig. 9, and advance, pressing the new link against the bending-pin. The gripping-jaws will instantly release their hold and retreat, leaving the link under control of the bending-jaws, which will continue to advance, crossing the central feeding-line *y*, Fig. 10, until the circular recesses *z* of said jaws are opposite the bending-pin, when said jaws will close, as shown in Fig. 11. The bending-pin will then drop out of the way, when said jaws will retreat to their normal position (shown at Figs. 1 and 4) in readiness to receive another unsevered link. The bending-jaws (see Figs. 12 and 13) have the narrow transverse slot *a''* in their ends to admit the link end of the advancing metal strip central with the eyes of the link in the grasp of said jaws.

It is quite evident that any other form of link besides the one shown, capable of being made on a narrow strip, could be adopted with equally good results. Therefore we do not claim the special form of link shown, but only the manner of making the same, which, in chain manufacture, is believed to be an entirely new and economical feature, it being impossible for the link to avoid its destination through the faulty working of intermediate feeding mechanism, as when the link is first blanked out before passing through the eyes of a previously-formed link, as the end of the strip in our device is first passed through said eyes and firmly held within the gripping-jaws before the new link is severed from such strip. We hold that to employ a metal strip wider than the widest part of the exposed link, trimming off or shaping the whole link instead of a part thereof, as shown, and advance the link thus formed through the eyes of a previously-formed link of the chain and holding the same rigid therein while it is being severed from the main body of the metal strip to be simply an equivalent of our device, but attended with a greater waste of material.

To guide the metal strip along the surface of the die, rolls can be used on the bottom surface of a spring-stripper. This being an old mechanical device it is not shown in the drawings.

It will also be understood that in some cases the side swaging-dies may be dispensed with, as in some form of links they may not be required, while in some cases they can also be used with good effect to close the central portion of a skeleton link.

It will also be understood that the number of the vertically-operating columns of the punch-gate may be increased or decreased at pleasure, as we do not wish to be strictly confined in use to four when a less number would suffice.

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

1. In a chain-making machine, of the character described, comprising in combination, a reciprocating feed-slide for supporting the metal strip, a lever for operating said slide, and means whereby the fulcrum of said lever may be changed to increase or decrease the travel of said slide; a clamping-finger pivotally supported on said slide, one of the free ends of said finger adapted to alternately engage the metal strip and hold it firmly against the feed-slide, and means for adjusting said end of the finger for different thicknesses of stock; a friction-roll on the opposite end of said finger, to engage an inclined track, and mechanism for giving such track a movement at right angles to the movement of said feed-slide, substantially as set forth.

2. A chain-making machine adapted to feed a strip of metal, from which the links are formed; dies and punches for forming the links on said strip preparatory to cutting them off; gripping-jaws for seizing a partially-completed link, on the end of said strip, as soon as it has passed through the eye of a previously-bent link and hold the same while being severed therefrom; and means for causing said jaws to retreat, with the severed link, so as to bring such severed link central with the previously-bent link, the parts being combined substantially as described.

3. A chain-making machine adapted to feed a strip of metal, from which the links are formed, dies and punches for forming the links on said strip preparatory to cutting them off; gripping-jaws for seizing the partially-completed link, on the end of said strip, as soon as it has passed through the eye of a previously-bent link and hold the same while being severed therefrom; means for causing said jaws to retreat with such severed link central with the previously-bent link; and means for imparting a quarter-turn to said jaws, and means for bending such link, the parts being combined substantially as set forth.

4. The combination in a chain-making machine of the punch-gate consisting of the vertically-operating columns or rods, adjustable bushings therefor, punch-carrying cap mounted on such rods above the bed, a lower cap or plate secured to said rods below said bed, toggle-arms arranged between said lower plate and bed and means for operating said arms, as set forth.

5. The combination in a chain-making machine, of the vertically-operating punch-gate consisting of the columns or rods, adjustable bushings therefor, upper and lower caps or plates, toggle-arms arranged as shown with means for adjusting the angular position of said arms, as set forth.

6. The combination in a chain-making machine of the character described, of the reciprocating bars carrying adjustable swaging-dies, means for operating said bars; and the swaging-dies overlying the die-plate and moving transversely to the travel of the metal strip, so as to finish the edges of said strip that have been previously operated upon in the process of forming the links, as set forth.

7. The combination, in a chain-making machine, of the character described, of the link bending and forming device operating transversely to the feeding-line of the metal strip from which the links are severed, said device consisting of two longitudinally and independently operating shafts, link-bending jaws arranged to open and close through the medium of the inner shaft, the outer shaft operating said jaws transversely to the metal-feeding line, and means for operating said shafts, as set forth.

8. A chain-making machine comprising in combination two shafts, one of which shafts operates the jaws, opening and closing the same, the other shaft moving said jaws transversely to the feeding-line of the metal strip from which the links are severed, means for imparting independent longitudinal motion to said shafts, and means for adjusting said shafts relative to each other and to the links to be bent, and a bending-pin anvil or other like means, as, and for the purpose set forth.

9. A chain-making machine comprising in combination, gripping-jaws for siezing and firmly holding a rod-connected link protruding through the eyes of a previously formed and bent link, said jaws arranged to have a longitudinal and partially-rotating movement to the feeding-line of the metal strip, two independently-operating shafts connected with said jaws, one placed within the other, means for adjusting the relative position of said shafts, and means for imparting a longitudinal and a partial rotary motion to one of said shafts and means for imparting an independent longitudinal movement to the other of said shafts, as set forth.

10. A chain-machine comprising in combination, feeding mechanism for feeding a narrow strip of metal, dies and punches for shaping on such strip, in the direction of its length, the links to be united together to form a chain, punch-gate constructed and operated as shown, link-bending jaws constructed and operated as shown, and gripping-jaws, pin-anvil around which the links are bent, the said gripping-jaws arranged to advance and grasp the projecting end of a link—connected to the metal strip—after it has passed through the eyes of a previously-formed link—within the grasp of the bending-jaws—and holding said projecting end firmly while said link is being severed from the metal strip.

Signed at Bridgeport, in the county of Fairfield and State of Connecticut, this 19th day of August, A. D. 1893.

CHARLES F. SMITH.
JOHN J. NORWELL.

Witnesses:
SIG. DORMITZER,
CORNELIUS TOPITZER.