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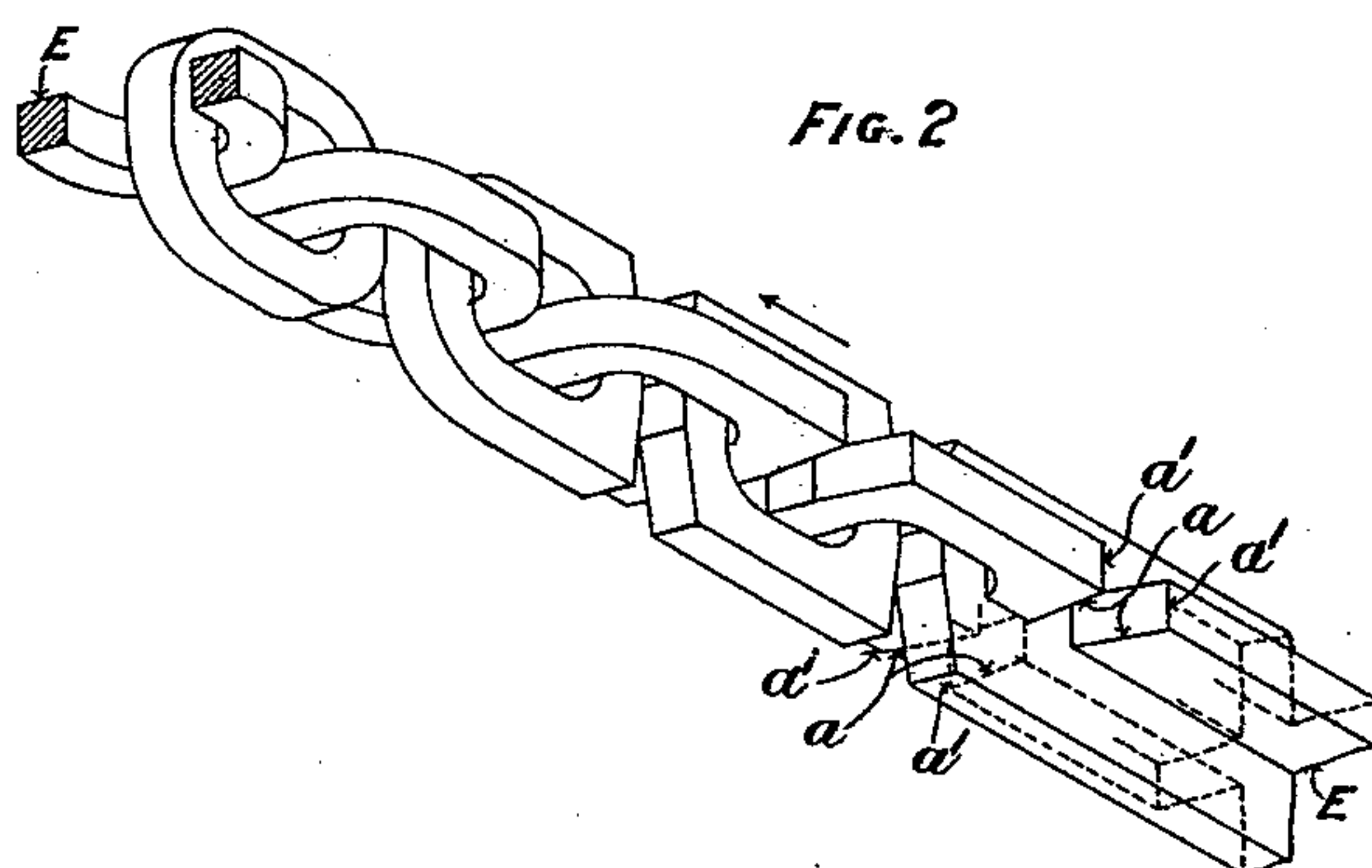
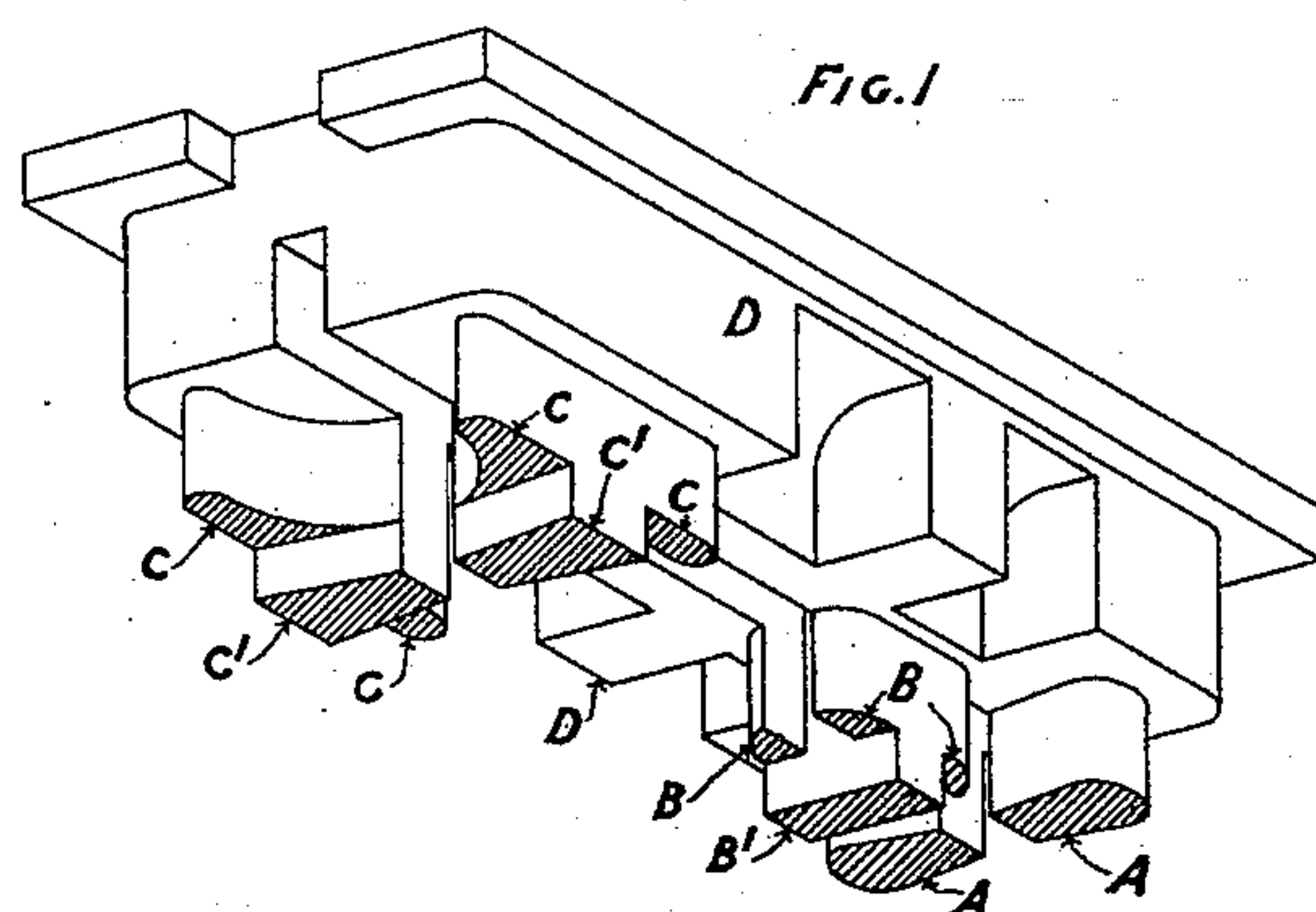
Patented Sept. 6, 1898.

J. M. DAVIS.
MACHINE FOR MANUFACTURING WELDLESS CHAINS.

(Application filed June 9, 1897.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES,
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G. S. Brock

INVENTOR:
Joseph M. Davis.

BY *Munn & Co.*

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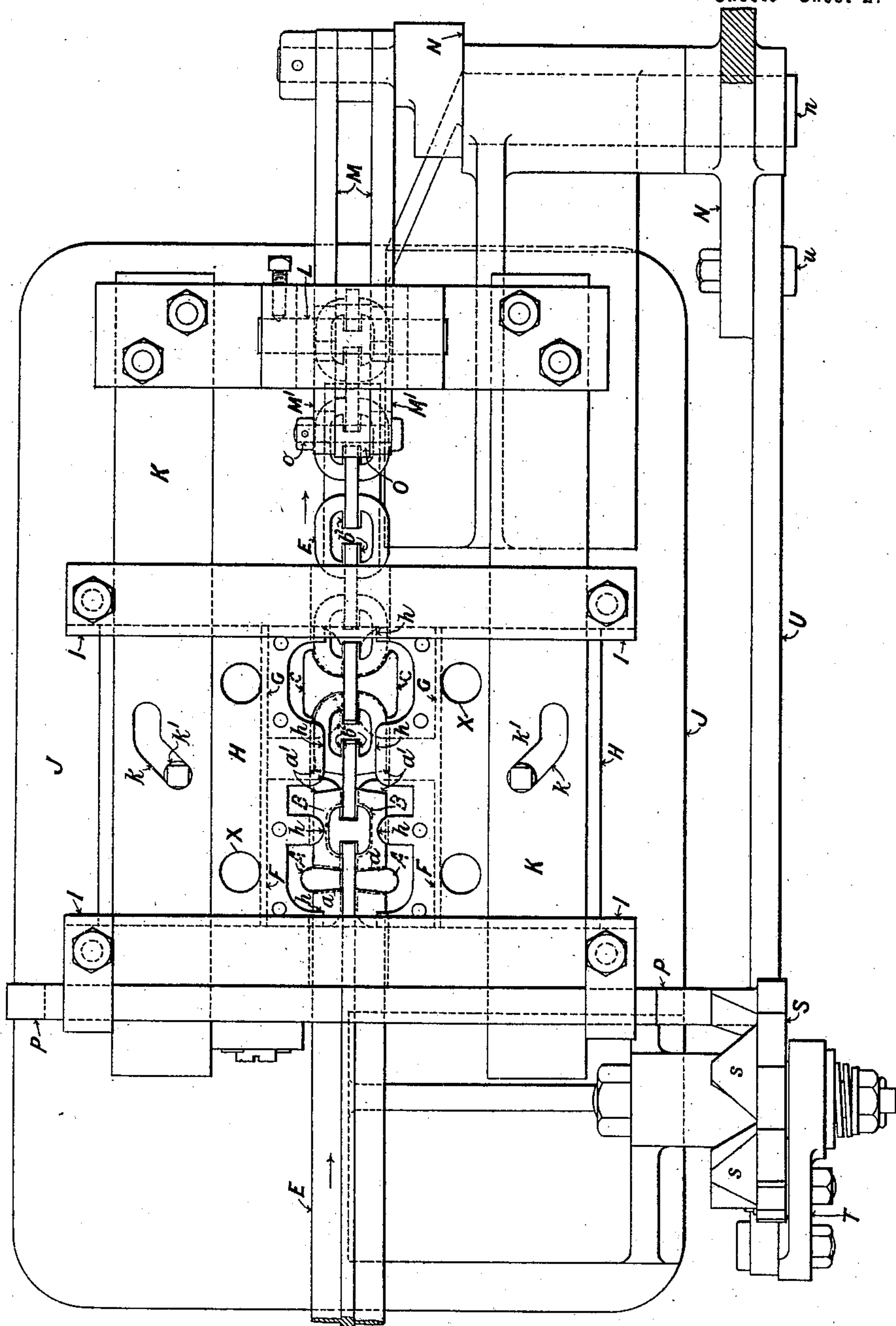
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FIG. 3.



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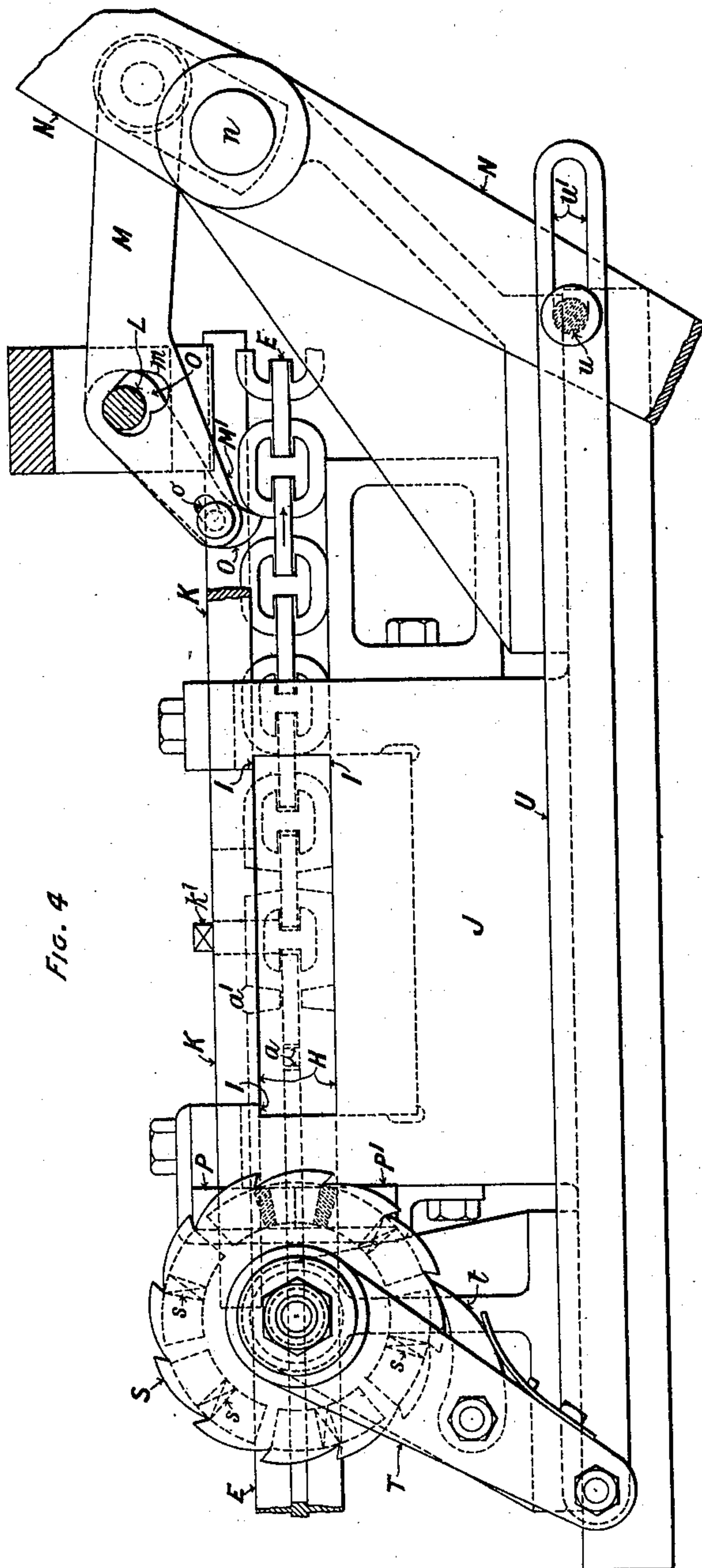
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UNITED STATES PATENT OFFICE.

JOSEPH MAYERS DAVIS, OF GLASGOW, SCOTLAND.

MACHINE FOR MANUFACTURING WELDLESS CHAINS.

SPECIFICATION forming part of Letters Patent No. 610,434, dated September 6, 1898.

Application filed June 9, 1897. Serial No. 640,091. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH MAYERS DAVIS, managing director, of 56 Dalhousie street, Glasgow, North Britain, have invented new and useful Machines for the Manufacture of Weldless Chains, of which the following is a full, clear, and exact description.

This invention relates to a machine for the manufacture of weldless chains having open or unstayed links, with or without thickened ends, from a bar of cruciform section by a consecutive series of cold-punchings and other operations. The present improvements have reference to a machine only for the initial stage of manufacture. The bar of cruciform section is transformed into a series of en-
10 chained unstayed links by being passed once through a machine actuating three sets of punches arranged to act at consecutive points, so as to follow each other and perform the
20 punching in several stages, the punching operations being performed on the one web and on the other alternately and the bar being fed forward and turned a quarter round after
25 each punching stroke of the machine. After the punching operations which constitute the initial stage of manufacture and to the machine for performing which my invention relates the bar may be by any desired means
30 broken up into links, which are afterward brought to a round section by stamping the bows of the links between a pair of suitable dies, any fins or other surplus metal which may have been thrown out being then re-
35 moved by clipping and the links being finally compressed laterally to the desired form and dimensions.

The invention is illustrated in the accompanying drawings, forming part of this specification, wherein—
40

Figures 1 and 2 are perspective views of the punches and of a portion of the bar under operation viewed from beneath. Fig. 3 is a plan view of the machine. Fig. 4 is a side elevation thereof. Fig. 5 is an elevation at the
45 end at which the bar enters, and Fig. 6 is a cross-section looking in the direction in which the bar is fed to the machine.

For the punching operations I use, preferably, three sets (A A, B B, and C C) of punches arranged in one holder D, these three sets of
50 punches operating at three different points

of the bar during the same stroke, but preferably in consecutive order, the punches being of such relative lengths that all three sets do
55 not come in contact with the bar at one time, the progress of the operation being as follows: The bar is fed through in the direction of the arrow a distance equal to the distance between the center lines of the punches A and of the
60 punches B and is turned a quarter round between consecutive strokes of the machine. By the first set of punches A A angular notches *a* are cut in that web of the bar E which for the time being is horizontal, 65 these notches extending from the edges of the horizontal web close up to the faces of the vertical web. After the subsequent feeding and turning operation of the bar the notches so cut are presented in the vertical plane to
70 the second set of punches B, the leading part B' of which enters the then uppermost notch *a* and removes the portion of the core of the bar common to the two webs which was left by the previous operation of the punches A. 75 This part of the punch likewise removes the middle portion of the interior of the link, which is fully punched out by the subsequently-acting portions B of the punches, the punching out of the interior being of course
80 completed at one stroke at the same time that the next following notches *a* are cut by punches A in the now horizontal web, which will in turn be presented to punches B after the next feeding and turning of the bar. Af- 85 ter four such successive feeding and turning motions of the bar the notches *a* first cut are presented beneath the punches C, by which the shoulders *a'* (left for the support of the vertical web while under the action of punches
90 B B') are removed, thus rounding the bows of adjacent links exteriorly. During the same stroke the punches A B B' are of course acting in their respective positions on the bar, as above described, the wide interval between
95 the punches B and C being designed to prevent distortion of the bar by the die-pressure being locally concentrated and to facilitate construction of the bed-dies. The leading parts B' and C' of punches B and C, and by
100 first entering the notches *a a*, act as guides to correct any slight irregularity before the punches B C come into action.

The punch-holder D is mounted in a press-

head in position to act in conjunction with bed-dies, (shown in Figs. 3 and 6,) the press-head being provided with steady-pins, which enter guide-holes X, formed in the slides H and the bed J of the machine. The bed-dies are preferably arranged in two pairs F F and G G, the pair F having openings corresponding to the punches A A and B B', while the pair G have openings corresponding to the punches C. These dies are attached to laterally-movable slides H H, formed with lips h, adapted to overlap at various points and hold down the horizontal web of the bar during the rising motion of the punches. The slides H work in guides I on the base J and are actuated by cam-slots k in a pair of longitudinally-sliding rods K, engaging with studs k', whereby the slides and bed-dies are moved outward, so as to leave the cruciform bar E free to be turned about its axis after each stroke. The reciprocating bars K are coupled by a cross-pin L and a pair of links M to a lever N, which receives oscillating motion about its axis n. The slot m, by which links M engage with pin L, is of such form as to act as a cam, whereby extensions M' of the links are lowered and raised before each forward and backward stroke of the bars K takes place for the purpose of throwing in and out of engagement with the notched vertical web of the bar a feed-finger O, pivoted loosely upon pin L between links M and engaged by stud and slot o with their extensions M'. The turning movement of the bar through a quarter-circle is effected by means of a pair of oppositely-movable single-toothed bars P P', engaging with the vertical webs, as shown in Fig. 5, the bars being coupled by a rock-lever Q, pivoted to the bed J and connected to the bars P P' by studs and slots q. The bars P P' work in guides and their beveled ends are formed as teeth to correspond to the interspaces of the cam-like crown-teeth s of a ratchet-wheel S, the end of the one bar being at the summit of a tooth s when the end of the other bar is in an interspace. The ratchet-teeth of wheel S are therefore twice as numerous as the crown-teeth and are engaged by a pawl t on a lever T, pivoted on the wheel-axis and reciprocated through a link U, coupled by stud u and slot u' with the lower arm of lever N, the lost motion allowed by the slot permitting of the retraction of the slides H and bed-dies F G before the turning mechanism comes into action. By the action of this machine the bar is brought to the chain-like but still rigid form shown. The bar is then subjected to the action of round-nosed wedge-dies, which by being forced repeatedly and alternately into the one and the other pair of opposite reëntering angles so change the relative angular positions of the planes of the webs as to ultimately break the bar up into enchainned links. One end of each link is then presented between a pair of swages, whereby the desired sectional form is given to the end of the link, any metal

left at b^2 by the punches B being thus utilized for thickening up the end of the bow of the link. This operation having been performed on both ends of all the links any fins thrown out are removed and the final operation of contracting the width of the links, so as to bring them to the desired shape, is then performed by presenting them edgewise between a pair of dies adapted to grip the sides of the link and press them toward each other, thus narrowing and elongating the link.

By making the links in the manner above described the amount of metal removed from the core of the bar common to both webs is reduced to the minimum compatible with the necessary strength of the punch B', and consequently a chain of much shorter pitch can be made by the series of punching operations described than is possible when material to form a stay is left, while if a stay is required it may be inserted as a separately-forged piece immediately before the last-described operation, by which the links are contracted laterally, the sides of the link by this operation being caused to engage in the crutched ends of the stay.

I claim—

1. The combination of a pin mounted to move transversely, a pawl mounted to swing on the pin, and a link having a slot in which the pin is received and which permits the link to have limited independent movement on the pin, the link having connection with the free end of the pawl.

2. The combination of two sliding bars, a lever, the arms of which are respectively connected with the bars so that the bars move in unison, and a wheel mounted at the ends of the bars and provided with cam-like crown-teeth engaging the bars to reciprocate the same.

3. The combination with a bed, of bed-dies mounted thereon to move transversely toward and from each other, slide-bars mounted on the bed and having connection with the dies to move the same, a link in connection with the slide-bars, a work-advancing pawl carried to move with the slide-bars and having connection with the link to be operated thereby, a lever mounted on the bed and having connection with the link, a second link in connection with the lever, a ratchet-wheel, a crank mounted to swing on the axis of the ratchet-wheel and serving to drive the ratchet-wheel, a series of cam-like crown-teeth carried by the wheel, and two reciprocal bars driven by the cam-teeth and serving to turn the work.

4. The combination with a bed or frame, of two bed-dies mounted thereon and adapted to move toward and from each other, longitudinally-reciprocal bars mounted on the bed and having connection with the dies to move the same, two bars sliding transversely to the first-named bars whereby to engage and turn the work on the bed-dies, and means for operating the several bars so that the dies move

toward and from each other in unison with the turning of the work by the sliding bars.

5 5. The combination with a bed or frame, of two bed-dies movable toward and from each other, two sliding bars disposed transversely to the dies and adapted to turn the work on the dies, and means for operating the dies and

bars so that the dies move toward and from each other simultaneously with the turning of the work by the sliding bars.

JOSEPH MAYERS DAVIS.

In presence of—

J. ROSS YOUNG,
ROBERT M. RULE.