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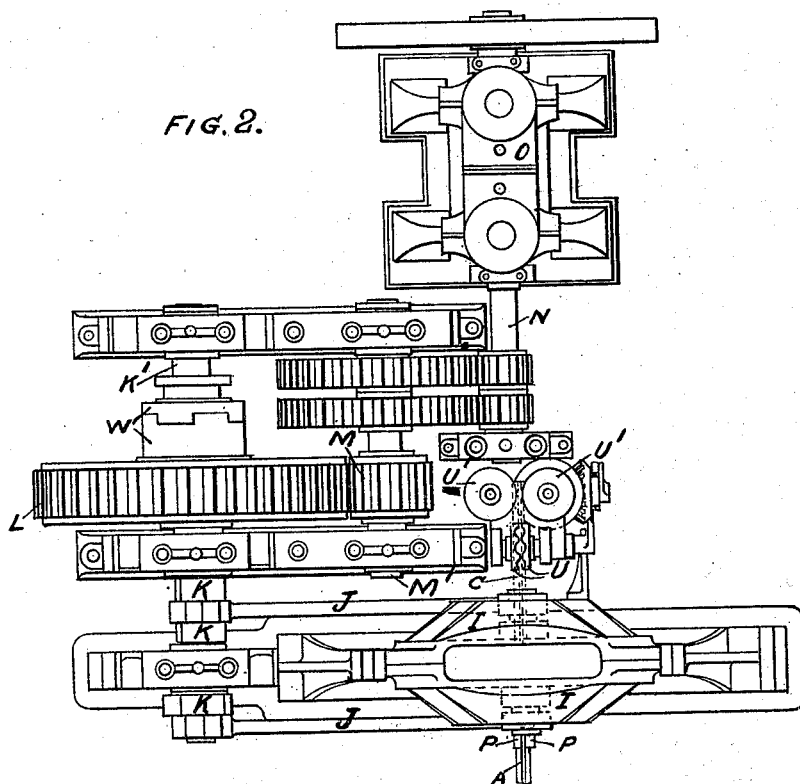
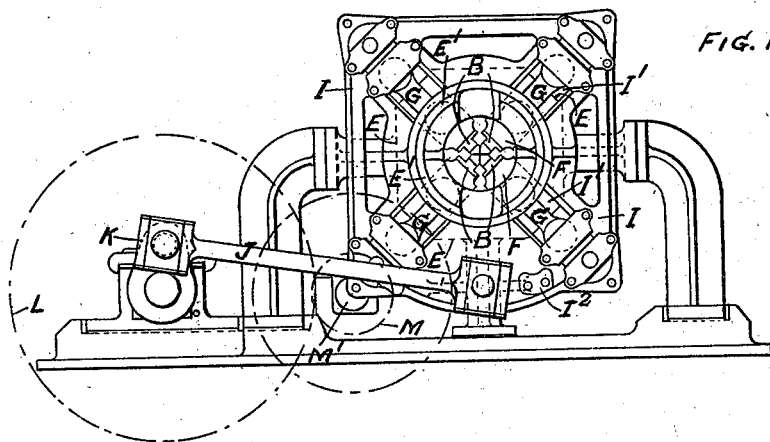
Patented Apr. 10, 1900.

A. G. STRATHERN.
MACHINE FOR MAKING WELDLESS CHAINS.

(Application filed Mar. 1, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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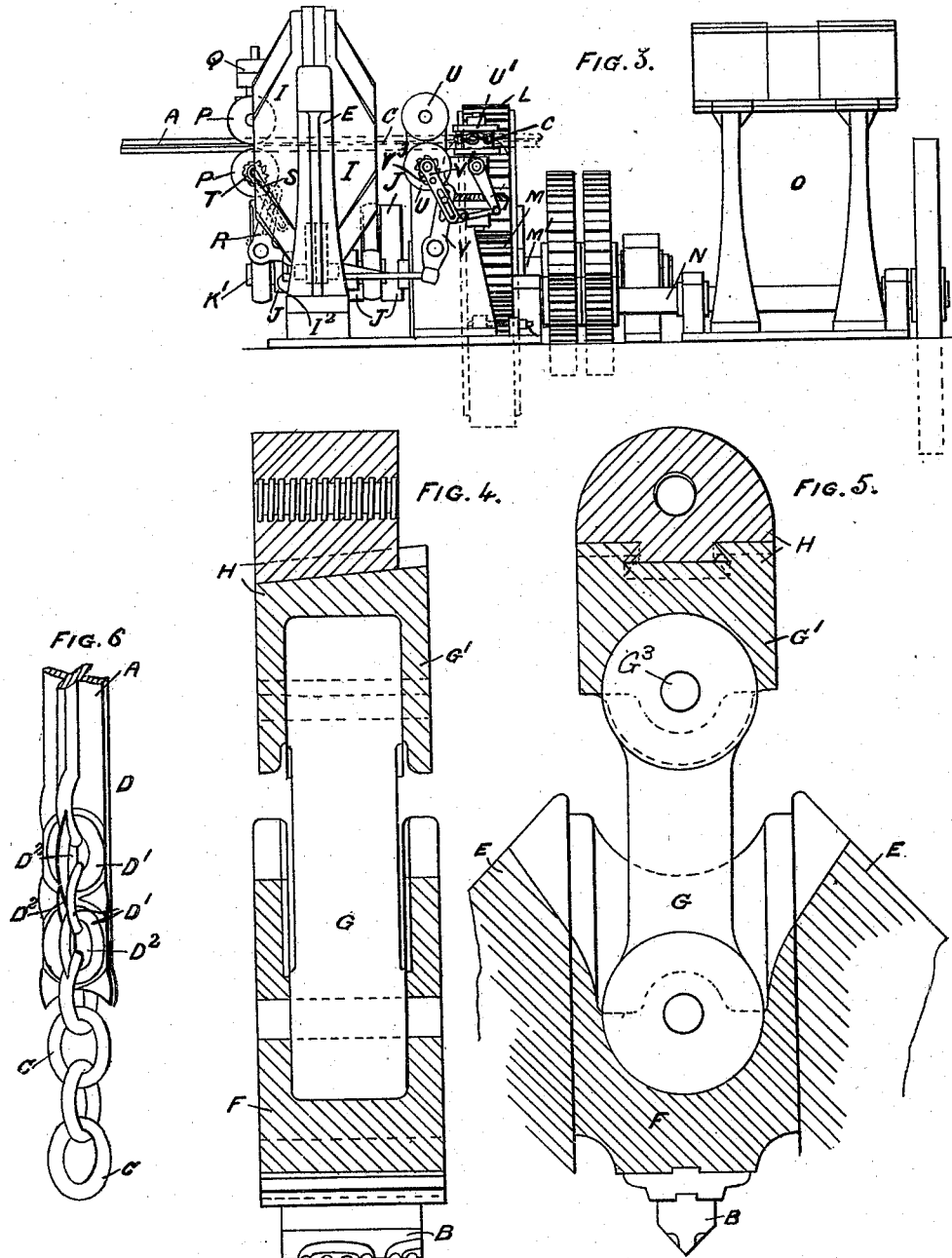
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3 Sheets—Sheet 2.



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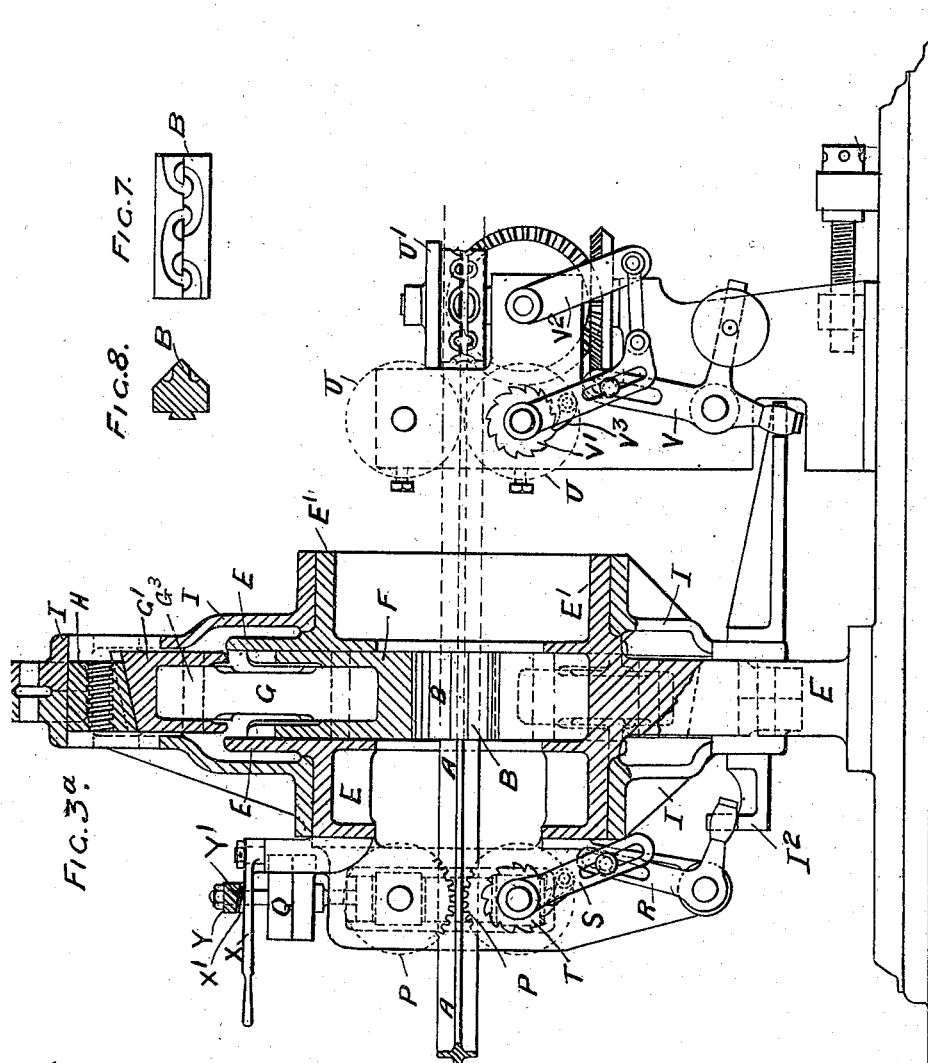
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

ALEXANDER GEORGE STRATHERN, OF HILLSIDE, SCOTLAND.

MACHINE FOR MAKING WELDLESS CHAINS.

SPECIFICATION forming part of Letters Patent No. 647,044, dated April 10, 1900.

Application filed March 1, 1898. Serial No. 672,180. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER GEORGE STRATHERN, engineer, residing at Hillside, Stepps, in the county of Lanark, Scotland, have invented certain new and useful Improvements in Machines for Making Weldless Chains, (which has been patented in Great Britain, No. 20,992, dated September 13, 1897,) of which the following is a specification.

This invention relates to machines for making chains from bars of cruciform section by a consecutive series of stampings while the bar is hot.

The invention is illustrated by the accompanying drawings, in which—

Figure 1 is a front view from the feeding-end of my improved machine for forming enchainned links from cruciform bars, the feeding mechanism being omitted for greater clearness. Fig. 2 is a plan, and Fig. 3 a side elevation, of the machine, showing the feeding mechanism in position. Figs. 4 and 5 are views at right angles to each other of the toggle-levers for actuating the dies, these being drawn to a larger scale than Figs. 1, 2, and 3. Fig. 6 is a perspective view showing the various stages of formation of the chain from the cruciform bar to the separation of the chain-links. Fig. 3^a is a vertical longitudinal section, to a larger scale, of the chain-forming and bar-feeding apparatus, the section through the framing being taken partly diagonal and partly vertical. Fig. 7 is a face view, and Fig. 8 a cross-section, of the die.

In carrying out this invention bars of metal A, of cruciform section, as shown in Figs. 3 and 3^a and at D, Fig. 6, are heated and caused to pass between dies B, each having a vertical and a horizontal face, which faces are adjacent to each other and have protuberances and depressions formed on them corresponding to the form of link to be produced. These dies are so arranged and operated as to enter the angles formed by the webs of the cruciform bar and act simultaneously on the vertical and horizontal webs. The links C may be long or short, stayed or unstayed, with or without thickened ends, and the dies may be so formed that a stay is produced as an integral part of the link. After the bar A has been acted upon by the dies it forms a series

of enchainned links, as shown at D', Fig. 6, which are held together by a thin film D², of metal, and this surplus metal is subsequently removed.

I will now proceed to describe the machinery to be used for operating the dies B and other forming mechanism in manipulating bars of cruciform section to form weldless chains.

To the main framing E of the machine are attached four guide-brackets, through which work four rams F, each carrying a die B. These dies B are secured at the inner ends of the rams F, while single or double links G are attached to the outer ends of the rams F and pivoted on bushes G', so as to form toggles, a wedge adjustment H (shown particularly at Figs. 4 and 5) being also provided for the purpose of positioning the dies B. The toggles G, and consequently the dies, are actuated simultaneously by the oscillation of a disk or frame I, mounted on a hollow trunnion E', secured to or forming part of the main frame E of the machine, the disk I being oscillated by means of a connecting rod or rods J, worked from a crank or cranks K, mounted on a shaft K', carrying a driving-wheel L, or the crank may form a part of this wheel, the wheel L in either case being driven by a pinion M, mounted on a counter-shaft M', which is in turn geared to the crank-shaft N of a motor-engine O, or by a shaft provided with fast and loose pulleys and driven by a belt or by spur or worm gearing. The disk I for operating the toggles G has slots I' formed in it, which are fitted with bushes G', which carry the toggle-pins G².

The mode of operation is as follows: The bar A is preferably fed into the machine by toothed rollers P, geared to rotate together and loaded by weights Q or springs to exert the necessary pressure on the bars, these rollers being actuated by suitable mechanism to give an intermittent and adjustable feed. This feeding mechanism may, as shown, consist of a bell-crank lever R, one arm of which is acted on by a cam-piece I² on the oscillating disk I and the other arm of which actuates a pawl-carrying lever S, the pawl acting on a ratchet T, secured on an end of one of the feeding-rollers P. When the bar A has

passed a sufficient distance through the machine and has, consequently, a certain number of chain-links impressed upon its surface, another method of feeding is preferably adopted, consisting of two pairs of rolls $U U'$, arranged to grip the vertical and horizontal webs of the bars, these rolls having projections and depressions corresponding to the size and shape of link C, and these projections and depressions may be used to remove the thin web D^2 of metal left internally and externally between the links C and also to round the interior portion of the sides of the links, left sharp by the action of the dies. When feeding the bar, the first pair P of the feed-rollers are thrown out of gear as soon as the bar is gripped by the second pair of rolls. The device for effecting the throwing of the feed-rollers P out of gear consists of a lever X, pivoted on a stationary part of the apparatus and having an inclined piece X' , which when it is desired to raise the top rollers P out of contact with the bar A is caused to act upon a similarly-inclined piece Y' on a bar Y, connecting the weighted bearings of these rollers, actuated by suitable mechanism, such as shown, and consisting of an arrangement of levers $V V' V^2$ and pawl V^3 , actuated in the same manner as described with reference to the first pair P of the feed-rollers to give an intermittent and adjustable feed. Although the dies before mentioned are only formed to stamp two links at a time, one link on the vertical and one link on the horizontal web of the bar, it is obvious that the length or number of the dies may be increased so as to stamp one and a half, as shown at Fig. 4, or several links on each web of the bar A at the same time. After the bar has been stamped and the surplus metal D^2 removed either by the rolls $U U'$, before mentioned, or by suitable punches or cutters the links are separated and any remaining barbs removed, the links being finally closed, if necessary, between suitable dies to give the ultimate form desired. At this latter operation the studs would be inserted, if necessary.

The driving-wheel L is or may be arranged to run loose on its shaft K' , in which case it will have attached to it one member of a clutch W, the other member being free to slide on feather-keys on the driving-shaft K' . The sliding member will be pushed into or out of gear when it is required to suspend the operation of the dies.

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

1. A machine for making weldless chains from bars with radial webs, consisting of a stationary framing E having guides formed near its center and diagonally of said framing, for the reception of rams F, an oscillating frame I mounted on trunnions on said stationary framing E and provided with diagonally-located guides, each guide carrying

two wedge-shaped blocks H, G' , connected together and adjustable upon each other by screws, toggles G connected to the lower of said adjustable blocks and to the rams F in the stationary framing E, die-blocks B carried by said rams F and having end faces at an angle to each other and protuberances and depressions on these faces corresponding to the form of link to be made, substantially as described.

2. In a machine for making weldless chains from bars with radial webs, means for intermittently feeding forward the bar after it has been operated upon, consisting of rollers $U U'$, and mechanism for actuating these rollers, consisting of a ratchet-wheel V' , a pawl V^3 and levers V, V^2 , connected together, an oscillating frame I, means for oscillating said frame, the lever V being actuated by a projection on the oscillating frame I, substantially as described.

3. In a machine for the manufacture of weldless chains, the combination with a bed-plate and stationary brackets, of a loose swinging frame on trunnions of the stationary brackets, mechanism for oscillating the swinging frame, reciprocating dies having operating-faces with link-forming protuberances and depressions, guides for the dies, and means for moving the dies from the swinging frame.

4. In a machine for the manufacture of weldless chains, the combination with a bed-plate and stationary brackets, radiating guides supported by the brackets, rams F in said guides, and dies on the forward ends of the rams, of a loose swinging frame having four radiating guides thereon, adjustable blocks in the latter guides, and double adjusting wedges for the adjustable blocks at each of the four corners of the swinging frame, and operating-levers between the blocks and the rams.

5. In a machine for producing weldless chains from bars, the combination with the stationary frame, and the swinging frame, of blocks with four double wedges attached to the swinging frame, screws for adjusting the wedges, sliding rams in the stationary frame in radiating guides, chain-pressing dies carried by the rams, and means between the rams and wedge-blocks for moving the rams, as described.

6. The combination in a machine for forming weldless chains, of means for feeding a rod to the machine, dies and means for operating them for impressing links in the rod, rollers $U U$ and $U' U'$ arranged to grip the rod at an angle one pair with the other, rollers U, U' having projections and depressions corresponding in size and shape to the links to be formed.

7. The combination in a machine for forming weldless chains, of means for feeding a rod to the machine, dies and means for operating them for impressing links in the rod,

rollers U U and U' U' arranged to grip the
rod at an angle one pair with the other, roll-
ers U, U' having projections and depressions
corresponding in size and shape to the links
5 to be formed, and means consisting of pro-
tuberances and depressions on said rollers
for separating adjacent links.

In witness whereof I have hereunto set my
hand in presence of two witnesses.

ALEXANDER GEORGE STRATHERN.

Witnesses:

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JNO. ARMSTRONG, Junr.