

UNITED STATES PATENT OFFICE.

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MACHINERY FOR MANUFACTURING WELDLESS CHAINS.

SPECIFICATION forming part of Letters Patent No. 647,167, dated April 10, 1900.

Application filed March 27, 1899. Serial No. 710,541. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER GEORGE STRATHERN, residing at Hillside, Stepps, in the county of Lanark, Scotland, have invented certain new and useful Improvements in Machinery Employed in the Manufacture of Weldless Chains, (which were patented in Great Britain on the 3d day of September, 1898, No. 18,848,) of which the following is a specification.

This invention relates to improvements in machinery for the manufacture of weldless chains, such as described in my pending application, Serial No. 672,180, the chain being produced from a bar of cruciform or other section by a consecutive series of stamping and pressing actions while the dies employed move each through an arc of a circle.

The present improvements relate principally to the first stage of manufacture and have for their object the simplifying of the machine employed therein.

The invention is illustrated by the accompanying drawings.

Figure 1 is a front elevation, partly in section, of the improved machine; Fig. 2, a vertical section at right angles to Fig. 1; and Fig. 3, a perspective view of the preferable form of bar used in the machine to produce a weldless chain, although other forms of bar, such as round or square bars, may be employed.

In carrying out this invention bars of metal of cruciform section, such as are illustrated at Fig. 3, or of other section are presented between dies A, having a wedge-shaped form in cross-section, as shown at Fig. 1, while longitudinally the acting faces of the dies form each an arc of a circle, as shown at Fig. 2. The dies A are arranged radially around the bar B of metal and have protuberances and depressions made, as described in the application referred to, on their adjacent faces corresponding to the form of link desired.

The machine to be used for operating the dies A and other forming mechanism in manipulating bars B of cruciform or other section to form weldless chains consists, preferably, of a bed-plate D, on which is mounted the main frame D' or side brackets and the bearings D³ for the driving-shaft C⁴. The main frame D' carries near its center four guides D⁴, through which the four rams work,

each ram consisting of a toggle-lever G and sliding piece F. The outer ends of these toggle-levers are attached to blocks, which are connected by dovetail tongue and groove to a wedge E, which is actuated by a screw E' for positioning the dies. The inner ends of the rams—i. e., the sliding pieces F—are formed for the reception of oscillating or rotating arms, which are pivoted thereto and which carry or form the dies A. The swinging frame C is actuated by a connecting-rod C² or rods attached to a crank C³ or cranks on the driving-shaft C⁴, which shaft is rotated by spur or other gearing C⁵, driven by a motor-engine or belt. The dies A are operated so as to enter the angles formed by the webs of the cruciform bar, when a bar of this section is used, by the oscillation of the frame C, which is centered on hollow trunnions D², forming part of side brackets D', which oscillation effects the advancing of the dies A, as shown particularly at Fig. 1, by means of the toggle-levers G, carried between the wedge-pieces E in the oscillating frame C and the sliding pieces F in the stationary side brackets D', the dies A acting simultaneously on the vertical and horizontal webs and forcing in as near as possible to the center of the core portion of the bar. When this point is reached, the dies A are caused simultaneously to describe an arc of a circle corresponding to their length, thereby crushing the metal into links and at the same time feeding the bar B forward for the next stroke of the dies A. The rotation of the dies is effected by the action of the curved surface of the dies, which curve is struck from a point between the pivot of the dies and a pin A', so that the dies have a rolling as well as a crushing action. The pin A' is secured in each die, said pin moving in a recessed path D⁵ on the stationary framing D' during the advancing rolling and withdrawing action of the dies A, the rolling action effecting the crushing of the dies into the bar and the pin guiding and returning the dies to their original position during their return movement. After the dies A have described the arc of a circle before mentioned they are withdrawn from the bar by the backward oscillation of the frame C to its normal position a sufficient distance to permit of their being rotated into their first position, when

they are again forced into the core of the bar B and the subsequent operation repeated throughout the length of the bar. The links so formed and which are shown at Fig. 3 may
 5 be long or short, stayed or unstayed, and the stay may or may not be an integral part of the link.

After the chain-links have been formed on the bar the surplus metal is removed, either
 10 by suitable cutters or punches or by rolls having the necessary projections and depressions on their periphery, as already described. The links are then separated and any remaining barbs removed and are then closed
 15 between dies, if necessary, to give the ultimate form desired.

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

20 1. The combination, in a machine for making weldless chains, of a fixed frame D' having guides D⁴ at an angle to each other, rams in said guides comprising pieces F and toggle-levers G, swinging frame C, means for actuating frame C, trunnions on frame D' supporting frame C, dies A pivoted to pieces F,
 25 said dies being wedge shape in transverse cross-section and longitudinally curved on arcs the centers of which are in advance of the pivots of said dies, means for holding the dies from swinging on their pivots during the first part of their movement toward the bar
 30 being operated upon and allowing the dies to swing on their pivots during the latter part of such movement, whereby the dies are given
 35 both a crushing and a rolling action on the bar which impresses the links therein and also feeds the bar forward.

2. The combination, in a machine for making weldless chains, of a fixed frame D' having guides D⁴ at an angle to each other, rams in said guides comprising pieces F and toggle-levers G, swinging frame C, means for actuating frame C, trunnions on frame D' supporting frame C, dies A pivoted to pieces F,
 45 said dies being wedge shape in transverse cross-section and longitudinally curved on arcs the centers of which are in advance of the pivots of said dies, means for holding the dies from swinging on their pivots during the first part of their movement toward the bar
 50 being operated upon and allowing the dies to swing on their pivots during the latter part

of such movement, and means for returning the dies to initial position during reverse
 55 movement of pieces F.

3. The combination of pieces F, guides therefor, means for reciprocating pieces F, dies A pivotally connected to pieces F, the dies being wedge shape in cross-section and
 60 curved longitudinally, guides or paths D⁵, and pins A' guided thereby and connected to dies A.

4. The combination, in a machine for making weldless chains from bars, of a fixed frame
 65 D', a swinging frame C supported thereby so as to permit a forward and backward turning movement, means for moving frame C, four guides in the fixed frame, sliding pieces F in said guides, toggle connections between pieces
 70 F and frame C, dies A carried by pieces F being pivotally connected thereto the dies being in pairs, the dies of each pair being in the same plane and the two pairs being at right angles to each other, the operating-faces
 75 of the dies being transversely wedge shape in cross-section, and longitudinally being curved on centers in advance of the pivots connecting the dies to pieces F the forward ends of the arcs approaching the nearer to-
 80 gether in advance of a plane passing through the pivots of their dies, whereby pressing the dies against the bar being worked tends to swing the dies transversely to their forward
 85 movement, means for preventing swinging of the dies toward the bar being operated on; and for permitting swinging during the last portion of such movement toward the bar.

5. In a machine for the manufacture of
 90 weldless chains, the combination with a swinging die-operating frame having pivoted dies each having a curved acting face struck from a point to one side of the pivot-pins, pivot-pins in said dies, and guide-slots on the sta-
 95 tionary frame of the machine in which said pins travel to return the dies to their original position on the backward oscillation of the swinging die-operating frame, substantially as described.

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

ALEXANDER GEORGE STRATHERN.

Witnesses:

WALLACE FAIRWEATHER,
 JNO. ARMSTRONG, Jr.