

L. E. McKINNON.
MACHINE FOR MAKING CHAINS.

APPLICATION FILED JUNE 17, 1908. RENEWED NOV. 18, 1912.

1,064,080.

Patented June 10, 1913.

3 SHEETS—SHEET 1.

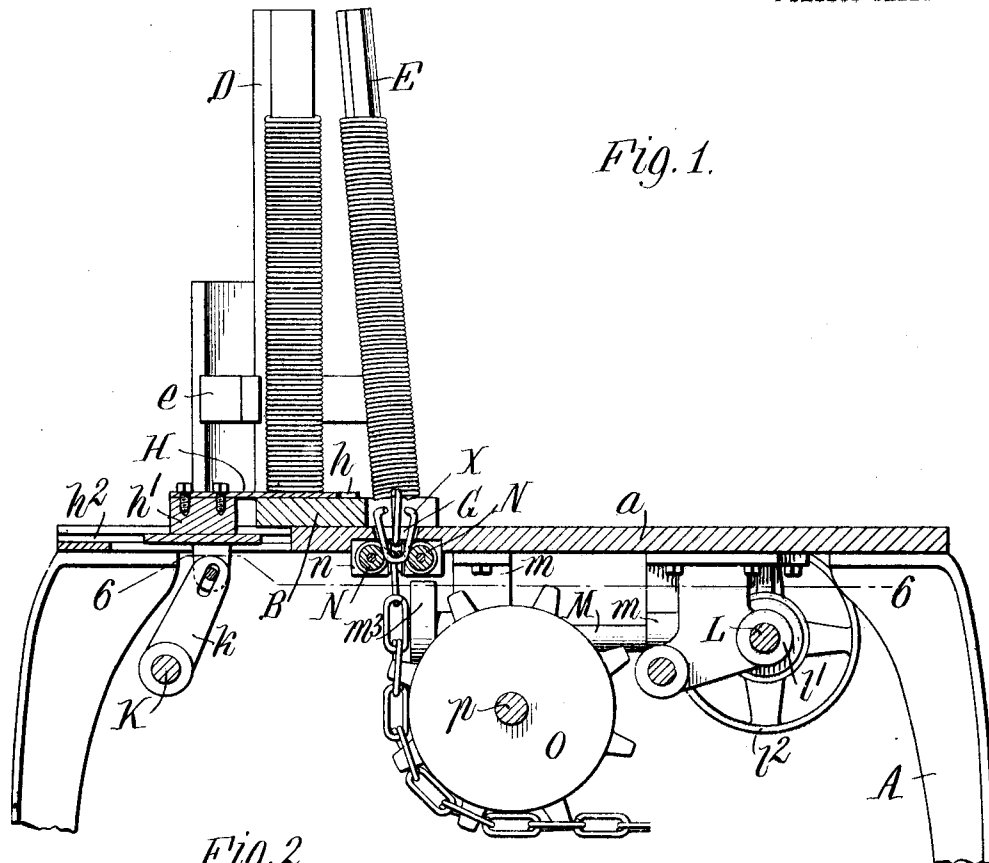


Fig. 1.

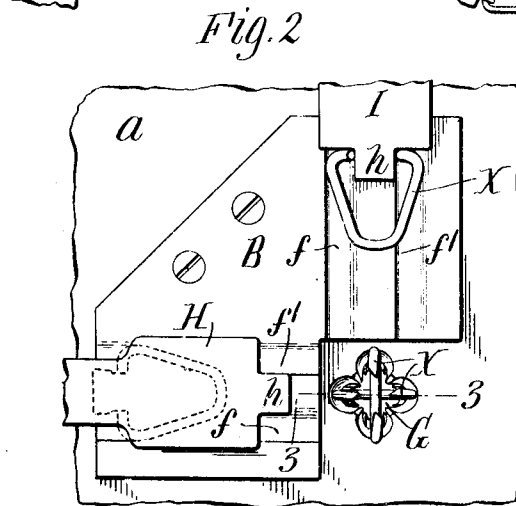


Fig. 2.

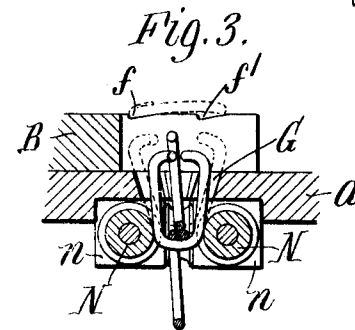


Fig. 3.



Fig. 4.

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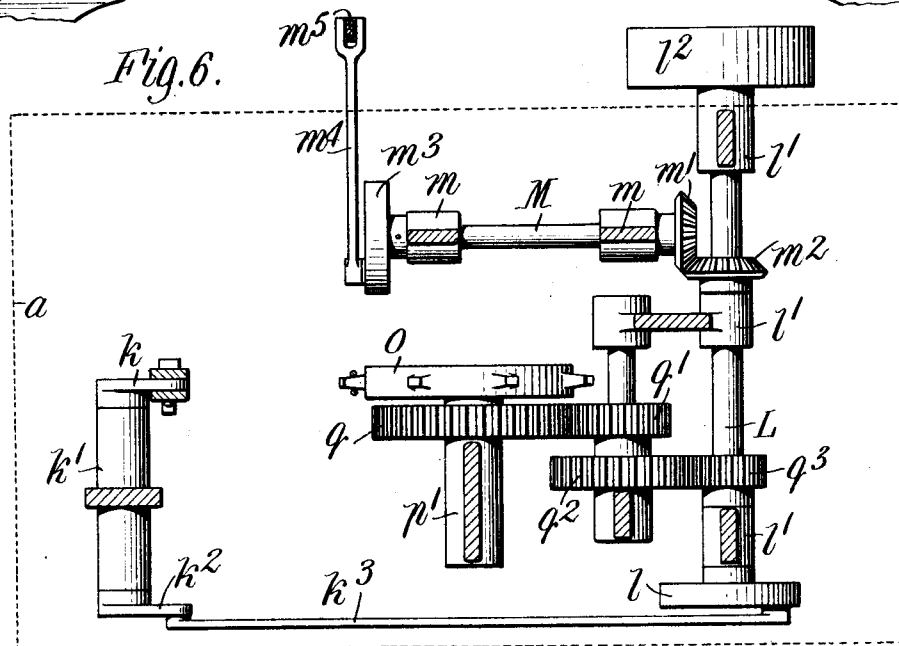
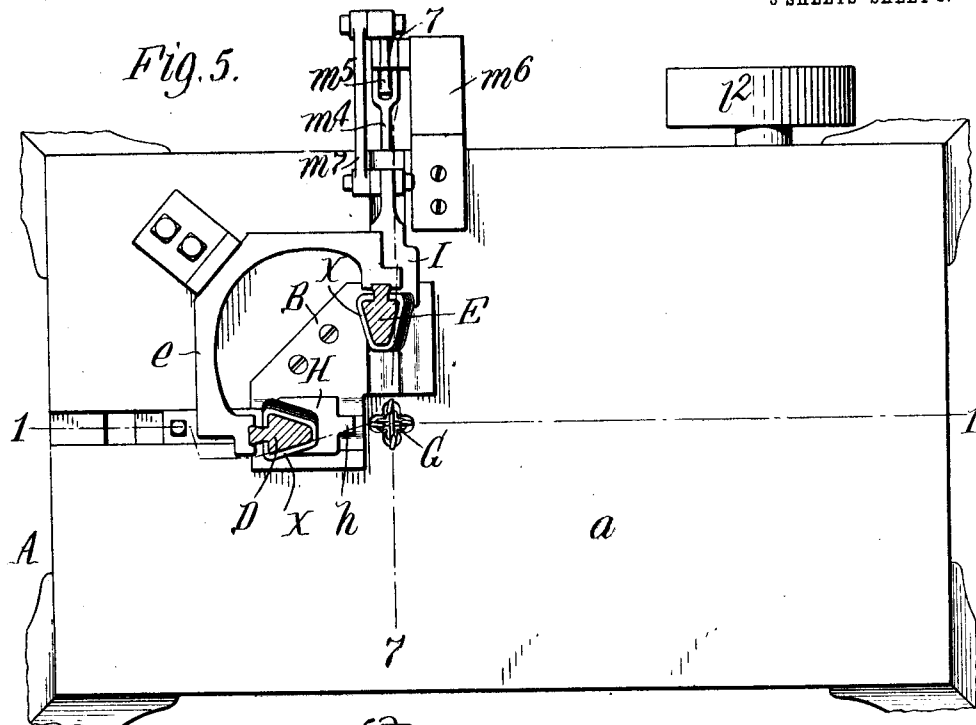
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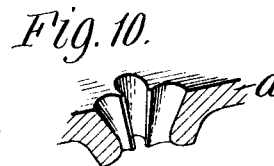
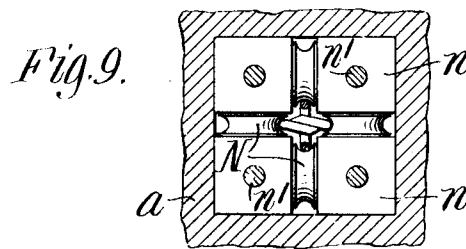
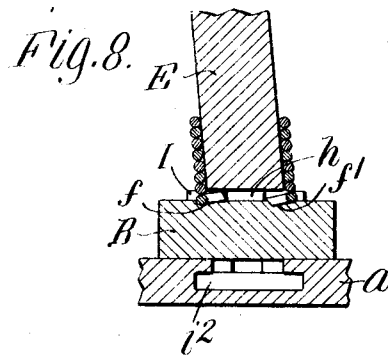
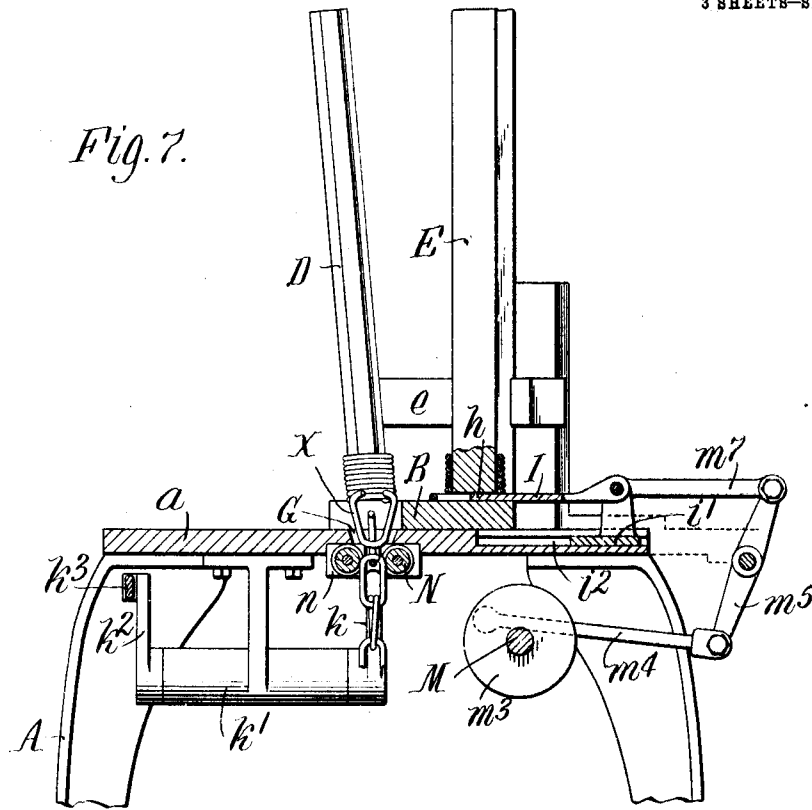
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

LACHLAN E. MCKINNON, OF BUFFALO, NEW YORK, ASSIGNOR TO MCKINNON CHAIN COMPANY, OF BUFFALO, NEW YORK.

MACHINE FOR MAKING CHAINS.

1,064,080.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed June 17, 1908, Serial No. 439,037. Renewed November 18, 1912. Serial No. 732,133.

To all whom it may concern:

Be it known that I, LACHLAN E. MCKINNON, a subject of the King of Great Britain, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Machines for Making Chains, of which the following is a specification.

This invention relates more particularly to machines for joining or interlocking and closing partially formed open chain links to form the chains.

The invention is herein described in connection with a machine for making chains composed of straight oval links with lapped ends which are afterward welded, but the invention is also applicable to machines for making other styles of chains in which the links interlock at an angle to each other.

The object of the invention is to produce an efficient and desirable machine of very simple construction for rapidly interlocking and closing the partly formed open links.

The machine is provided with magazines or stack-holders which support the partially formed open links flatwise in two stacks, with the links of one stack approximately at right angles to the links of the other stack. A link is fed first from one stack, closed end foremost, into a guide device which supports the link with its open end uppermost or rearwardly with respect to the direction of travel of the link through the machine. A second link is fed from the other stack, closed end foremost, into the guide and between the separated ends of the first link and is temporarily supported in a plane at right angles to the plane of the first link and with its open end uppermost or rearwardly. The first link is then advanced between devices which press or close its open ends toward each other and pass the ends through the loop of the second link. In the advance movement of the first link its ends are closed together and engage the closed end of the second link and draw it between the closing devices, so that its open ends are closed together through the loop of the next following or third link which has in the meantime been fed from the first stack into the guide between the separated ends of the second link and is temporarily supported by the guide at right angles to the second link until engaged by the second link and drawn between the closing devices.

The links are thus fed alternately from the two stacks into the guide and drawn in succession through the same between the closing devices which interlock and close the links, making a continuous chain. In thus interlocking and closing the links it is not necessary to twist or turn either the chain, the links, or the devices which interlock and close the same.

In the accompanying drawings, consisting of three sheets: Figure 1 is a longitudinal sectional elevation of a chain-making machine embodying the invention, in line 1—1, Fig. 5. Fig. 2 is a fragmentary plan view, on an enlarged scale, of the feed table and guide for the links. Fig. 3 is a fragmentary sectional elevation thereof in line 3—3, Fig. 2. Fig. 4 is a perspective view of one of the closed links detached. Fig. 5 is a plan view, partly in section, of the machine. Fig. 6 is a sectional plan thereof in line 6—6, Fig. 1. Fig. 7 is a transverse sectional elevation thereof, in line 7—7, Fig. 5. Fig. 8 is a fragmentary section, on an enlarged scale, of the lower portion of one of the link magazines. Fig. 9 is a sectional plan view, on an enlarged scale, of the link closing rollers or devices. Fig. 10 is a sectional view, showing a modified construction of the closing guide.

Like reference characters refer to like parts in the several figures.

The links are bent into a preliminary shape so as to be closed at one end and open at the other, as shown at X, Figs. 1, 2 and 5, in a suitable machine before they are placed in the machine herein described, which interlocks the links and closes or presses their separated ends together, as shown in Fig. 4. A portion of the chain is shown in Fig. 1. In the particular style of link illustrated in the drawings the separated ends of the link are hook-shaped and overlap when closed.

A represents a frame of any suitable construction having a horizontal top or table *a*, and *B* a feed plate which is fastened by screws, or otherwise, on the table. The open links *X* are placed flatwise in two upright magazines or stacks on the feed plate with the links in one stack substantially at right angles to those in the other stack, as shown in Fig. 5, and are so retained by suitable means, such as magazine or stack holding bars *D* and *E* which are supported in upright position over the feed plate by a

bracket *c* secured to the table *a* or other suitable means. The lower ends of the magazine bars are spaced just far enough above the feed plate to allow the links to be fed one at a time from the bottom of each stack without disturbing the other links, by a feed plunger or device which reciprocates beneath the magazine bar.

As the two side bars of a link are not directly opposite each other in the same plane but are twisted somewhat in opposite directions to enable the hooked ends to overlap when pressed together, the link will not lie flat upon a plain surface but one hook will be higher than the other and the link will wobble more or less, which would cause the links to interfere and prevent the proper feeding of the same from the stacks. To cause the links to lie steadily with the high points of their hooked ends in the same horizontal plane and thereby insure the proper feeding of the links singly from the stacks, the upper face of the feed plate is preferably grooved at *f f'* beneath each magazine bar in the direction of feed of the links from the stack and the ends of the links lie in these grooves, which steady the links and guide them when pushed from beneath the stacks. This formation of the feed plate requires the stacks of links to tilt laterally somewhat from the vertical, as shown in Fig. 7, and the magazine bars *D* and *E* are therefore correspondingly tilted from the vertical.

G represents a guide opening or passage extending through the table at the intersection of upright planes extending through the stacks of links in the direction of feed of the links from the stacks, so that when a link is pushed off the feed plate from either stack it will tilt downwardly and fall in upright position into this guide opening. The guide opening is substantially cruciform in shape and contracts downwardly, its widest portions being of slightly less width than the upper flaring portion of the link, so that a link fed from one stack and dropping therein will be supported in an upright position, and in a plane at right angles to a link fed from the other stack and dropping into the opening, as shown in Figs. 1, 2 and 3.

The links are fed alternately from the two stacks into the guide opening by suitable means which, in the machine illustrated, consist of feed plungers *H* and *I* which are reciprocated horizontally between the feed plates and the lower ends of the magazine bars in directions at right angles to each other. Each plunger engages and feeds the lowest link from its stack at each advance movement. Each feed plunger preferably has a central front extension *k* which enters between the separated ends of the links and assists the grooves *f f'* of the feed plate in guiding the links when fed forwardly from the stacks. The feed plungers *H* and *I* are

mounted upon slides *h' i'*, respectively, Figs. 1 and 7, which are movable horizontally in guide ways *h²* and *i²* in the table *a*. The slide *h'* has a lug depending through a slot in the table, Fig. 1, and connected to the end of a rock arm *k* on a horizontal shaft *K* which is journaled beneath the table in a bearing *k'* and is provided with a crank arm *k²*, Fig. 6, connected by a pitman *k³* to a crank wheel *l* on a horizontal shaft *L* which is journaled beneath the table in bearings *l'*. This shaft *L* is provided at one end with a belt pulley *l²* and constitutes the drive shaft for the machine.

M represents a horizontal shaft which is journaled beneath the table at right angles to the drive shaft *L* in bearings *m* and is driven from the drive shaft by bevel gear wheels *m' m²*, Fig. 6. A crank wheel *m³* secured to one end of the shaft *M* is connected by a pitman *m⁴* to a lever *m⁵*, Fig. 7, which is fulcrumed on a bracket *m⁶* projecting from one side of the table and is connected by a link *m⁷* to the slide *i'* of the feed plunger *I*. By this mechanism one feed plunger is advanced while the other feed plunger is retracted, so that the links are fed alternately first from one stack and then from the other.

When a link is fed from one stack it drops with its closed front end into the guide opening and is supported thereby with its open rear end uppermost, and when a link is fed from the other stack it drops with its closed front end into the guide opening and between the separated ends of the first link and is supported by the guide opening in a plane at right angles to that of the first link and with its separated ends uppermost, as shown in Figs. 1, 2, 3 and 7. Each link thus drops between the separated ends of the preceding link in a position in which the separated ends of the foremost link will be passed through the next following link in closing the foremost link. By drawing the links in succession through the guide opening the separated ends of the links are successively pressed or closed together, whereby the links are interlocked or joined together in a chain.

The described mechanism for feeding the links alternately in directions approximately at right angles to each other from the bottoms of two stacks or magazines into the guide opening is simple and efficient but the invention is not limited to this particular means for feeding the links and other means may be employed.

The means for closing the links to interlock them preferably consist of grooved rolls *N* arranged in two pairs below the guide opening *G* in the table. The pairs of rolls are located in vertical planes at right angles to each other in such manner that one link will pass from the guide opening *G* between the rolls of one pair with its side bars bearing in the grooves of the rolls,

and the next link will pass in a similar manner between the rolls of the other pair, see Fig. 9. The rolls of each pair are spaced apart such a distance that by drawing the links between them the rolls will press or squeeze the side bars of the links toward each other to cause the hooks to overlap and close the open ends of the links. The rolls can be mounted in any suitable manner, being, in the construction shown, supported by axles which turn in journal blocks *n* secured by bolts *n'* in a rectangular recess in the under side of the table *a*. When a link is dropped into the guide opening its lower closed end will enter the space between the rolls of one pair and the next following link will occupy a similar position between the rolls of the other pair. When the first mentioned link is drawn between its pair of rolls its separated ends are gradually closed together through the loop of the following link and caused to overlap. As the movement of the first mentioned link continues its lapped ends engage the closed end of the following link and draw the latter between its rolls, whereby its separated ends are interlocked with the next following link and closed. Thus each link when it is closed and advanced engages and advances the succeeding link and causes it to be closed. The rolls arranged in this manner constitute exceedingly simple means for closing the links and they form in effect anti-friction or rolling continuations of the guide faces of the opening *G* through which the links pass. The guide opening itself can have its working faces so shaped and proportioned as to act, not only as a guide to properly position the links, but also as a die to close the links as they are drawn through it, which construction is represented in Fig. 10, but the rollers are preferable as they close the links with less draft on the chain. The links could, however, be successively closed as they are advanced through the guide by other means without changing the principle of operation of the machine.

A sprocket wheel *O*, Figs. 1 and 6, is shown for pulling the chain to draw the links through the passes of the link-closing rolls. This sprocket wheel, which has teeth suitably arranged to engage the links of the chain, is secured to a horizontal shaft *p* which is journaled beneath the table in a bearing *p'*, and is driven at the proper speed by suitable means, such as a train of gears *q* *q'* *q''* *q'''* connecting it with the main drive shaft *L*. Other means could be employed in place of the sprocket wheel for pulling the chain to move the links past the closing device. The chain can pass from the sprocket wheel *O* or other draft device to a windlass or reel, not shown, for taking up the chain as it is produced.

The closing means or die maintains at all times a fixed or stationary relation to the link magazines which are arranged in converging or intersecting planes, and in assembling and closing the links the latter are fed into the closing means or die alternately in two intersecting planes and are closed by a straight progressive movement through the closing means or die, without requiring a rotary or twisting movement about the axis of the closing means or die, either in the latter or in the links or chain.

I claim as my invention:

1. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of means for feeding the links successively and alternately in intersecting planes with the closed end of one link between the separated ends of the next preceding link, and closing means past which the links advance and which close the links in succession, substantially as set forth.

2. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of means for feeding the links alternately from different directions at an angle to each other with the closed end of each link between the separated ends of the next preceding link and in a plane at right angles thereto, and means for closing the interlocked links in succession, substantially as set forth.

3. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of means for feeding the links successively and alternately in intersecting planes with the closed end of one link between the separated ends of the next preceding link, means for advancing the links with a straight progressive movement, and closing means past which the links are advanced and which occupy a fixed position relative to the feeding means, said closing means operating alternately upon successive links, substantially as set forth.

4. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of link closing means having parts arranged in intersecting planes for closing alternate links, means for feeding the links to said closing means with the closed forward end of one link between the separated rear ends of the link in advance thereof and alternately in the planes of the parts of said closing means which operate alternately upon said links, and means for advancing the links past said closing means, substantially as set forth.

5. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of

- link closing means, and means for feeding the links alternately from different directions at an angle to each other to said link closing means with the closed end of each link between the separated ends of the next link and in a plane at an angle to the plane of said next link, and means for advancing the links in succession past said link closing means, substantially as set forth.
- 10 6. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of link closing means, means for holding the open links in two stacks with the links in one stack at an angle to the links in the other stack, and means for feeding the links alternately from said two stacks to the link closing means with the forward end of each link between the separated ends of the link in advance thereof and at an angle thereto, substantially as set forth.
- 25 7. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of a guide for holding two links one in advance of the other with the closed forward end of the second link between the separated rear ends of the first link, means for feeding the open links into said guide, means in advance of said guide for closing the links in succession, and means for advancing the links from said guide past said link closing means by a straight progressive movement, substantially as set forth.
- 35 8. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of means by which the links are fed alternately from two directions at an angle to each other, a cross-shaped guide located below the plane in which the links are fed and into which each link drops in substantially upright position at an angle to the preceding link and between the separated ends thereof, means below said guide for closing the open ends of the links, and means for moving the links through said guide and past said closing means, substantially as set forth.
- 50 9. In a machine for interlocking and closing chain links which are closed at one end and open at the other, the combination of means for holding the open links in two stacks with the links in one stack at an angle to the links in the other stack, means for feeding the links alternately from the two stacks, an upright cross-shaped guide into which the links pass and which holds them at an angle to each other with one link between the separated ends of the preceding link, means below said guide for closing the links, and means for advancing the links past said closing means, substantially as set forth.
10. The combination of two link stacking means arranged in intersecting planes, a link closing device having a fixed position relative to said stacking means and comprising guiding means for receiving and guiding alternate links in similar intersecting planes and closing means acting upon alternate links successively, and means for moving the links past said closing device by a straight progressive movement, substantially as set forth.
11. The combination of two link stacking means arranged in intersecting planes, a link closing device having a fixed position relative to said stacking means and having two pairs of converging guide grooves arranged in similar intersecting planes and closing means acting upon alternate links successively, means for feeding the links from said stacking means alternately, and means for moving the links past the closing device, substantially as set forth.
12. The combination of two link stacking means arranged in intersecting planes, a link closing device having a fixed position relative to said stacking means and having two pairs of converging guide grooves arranged in similar intersecting planes, closing rollers at the outlets of said grooves, means for feeding the links from said stacking means alternately, and means for moving the links through said grooves and past said rollers, substantially as set forth.
13. The combination of two upright link magazines, means for feeding out horizontally and in converging directions the lowermost links alternately from said magazines, a guide into which the links descend successively and which holds them in an upright position and alternate links in intersecting planes, closing means for the links arranged below said guide, and means for moving the links through said guide and past said closing means, substantially as set forth.
14. The combination of a feed plate provided in its upper surface with grooves for receiving the separated ends of the lowermost link, an upright magazine bar arranged above said plate and spaced therefrom to permit the lowermost link to be fed out underneath said bar, and means for feeding out the lowermost link, substantially as set forth.
- Witness my hand in the presence of two subscribing witnesses.
- LACHLAN E. MCKINNON.
- Witnesses:
EDWARD WILHELM,
C. B. HORNBECK.