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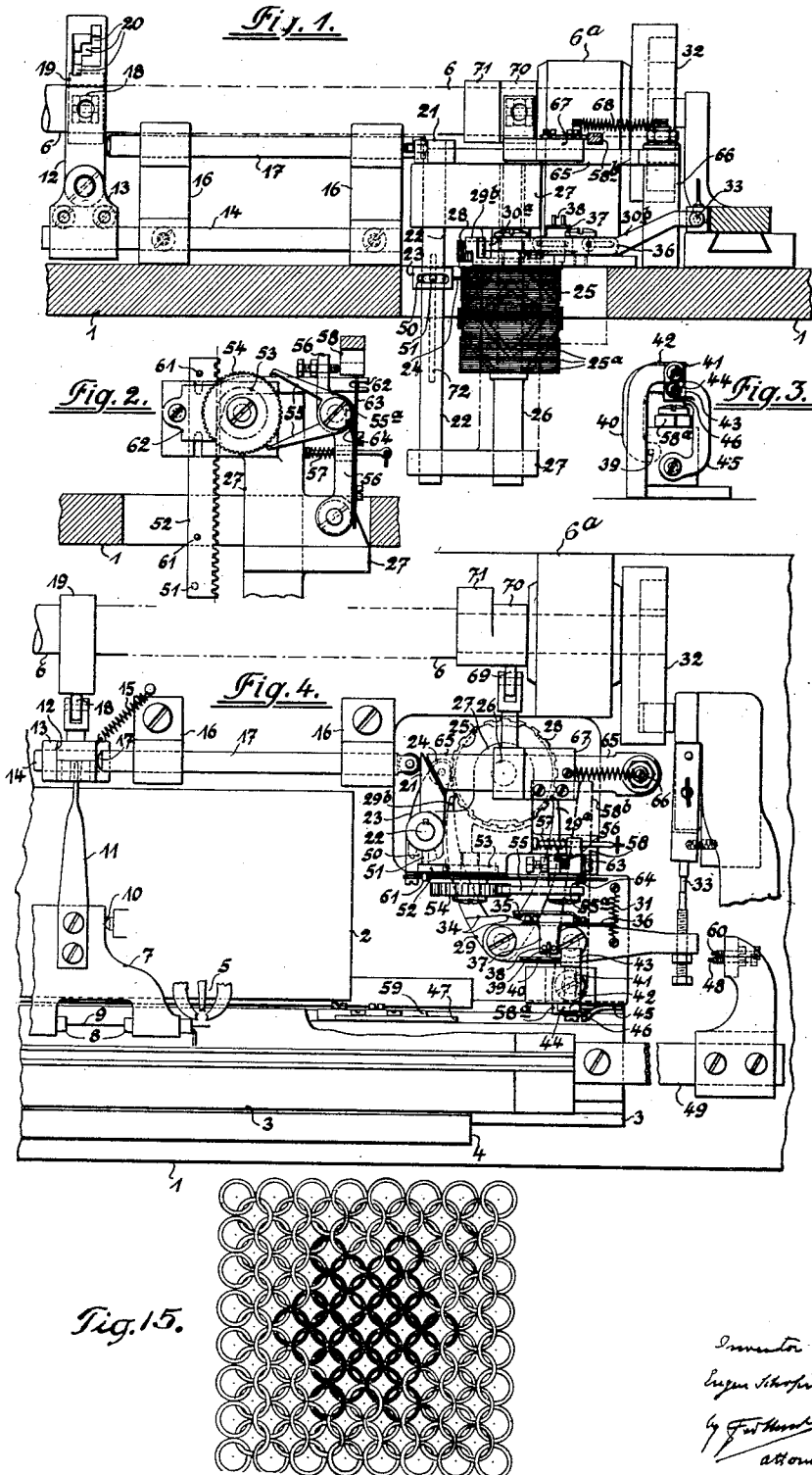
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MACHINE FOR MANUFACTURING METAL CHAIN MAIL

Filed Oct. 24, 1927

2 Sheets-Sheet 1



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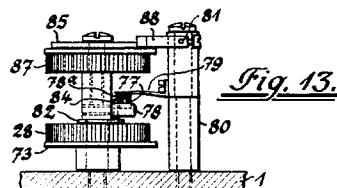
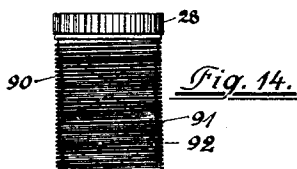
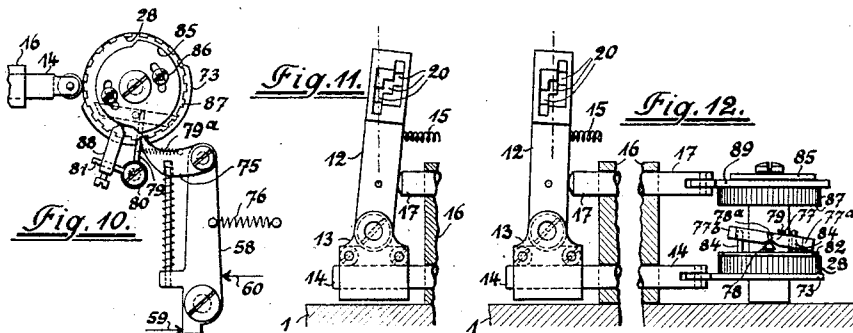
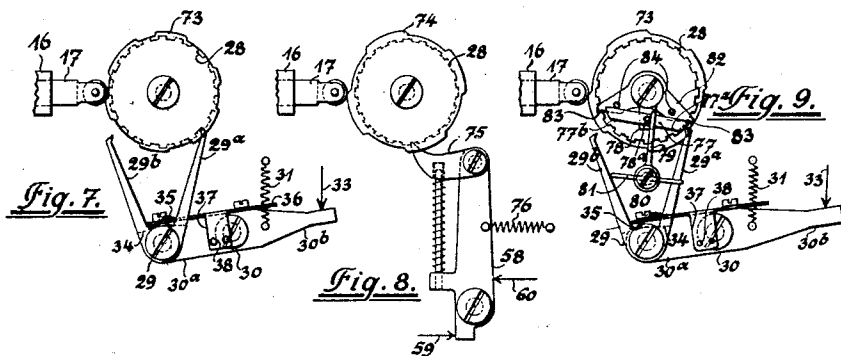
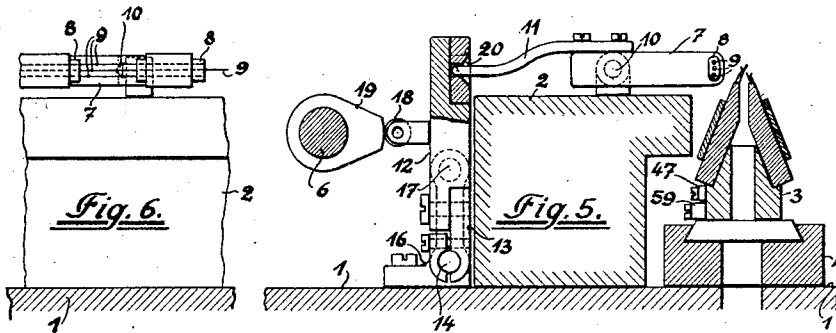
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MACHINE FOR MANUFACTURING METAL CHAIN MAIL

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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MACHINE FOR MANUFACTURING METAL CHAIN MAIL

Application filed October 24, 1927, Serial No. 228,209, and in Germany August 25, 1927.

This invention relates to a machine for manufacturing metal-chain-mail and specially to a mechanism for producing ring-chain-mail figured in any pattern and in any 5 colours.

According to the invention a multiple wire-feeding-device, carrying a number of differently coloured metal-wires, is operated by a control-device so that, according to the 10 pattern, now the one and then another coloured wire is brought into the range of the link-forming tools, said control-device for the wire-feeder being controlled, according to the desired pattern, by one, by two or by more 15 than two eccentric disks or by one eccentric drum, the superposed eccentrics of which form either a closed cylinder or a spiral extending over the entire length of the drum the eccentrics or eccentric drum being rotated by anchor-feed-mechanisms which, ac- 20 cording to the pattern, are influenced by an eccentric mounted on the main eccentric-shaft of the chain-mail machine or of the chain-mail supporting carriage, and are 25 moved and fed stepwise, either for each ring or for each row of rings.

By means of this arrangement any coloured figured-ring-chain-mail can be made on a ring-chain-mail manufacturing-machine, i. e. ring-chain-mail with transverse 30 stripes, with longitudinal stripes, with oblique stripes, with zig-zag stripes and the like, and ring-chain-mail with any coloured figured design.

35 An embodiment of the invention is illustrated by way of example in the accompanying drawing in which:

40 Fig. 1 shows in elevation a part of the machine, i. e. those elements designed to drive the link,

Fig. 2 shows in elevation the driving and reversing mechanism for a feeder co-operating with the eccentric drum.

45 Fig. 3 shows in elevation a part of the reversing mechanism for the eccentric drum.

Fig. 4 shows the whole mechanism in top plan view.

50 Fig. 5 shows in side elevation the apparatus viewed from the left side of Fig. 1.

Fig. 6 shows in elevation the wire feeding lever.

Figs. 7 to 13 show special constructions of parts of the mechanism for driving the link adapted for the production of different 55 striped patterns.

Fig. 7 shows the mechanism for the production of chain mail with longitudinal stripes.

Fig. 8 shows the arrangement of chain 60 mail with transverse stripes.

Fig. 9 shows the arrangement for the production of chain mail with oblique stripes.

Fig. 10 shows an arrangement for the production of chain mail with zig-zag stripes. 65

Figs. 11 to 13 show an arrangement for the production of stripes composed of rhombs, said arrangement being shown in Figs. 11 and 12 in elevation and in Fig. 13 in 70 side elevation.

Fig. 14 shows in elevation a form of construction of the eccentric drum in spiral shape.

Fig. 15 shows a piece of chain mail produced on the machine. 75

Only those elements of the chain-mail-manufacturing machine are illustrated and will be described which co-operate with the new mechanisms, these elements being: the 80 table-plate 1 of the machine, the bracket 2, the carriage 3 carrying the chain-mail, the guides 4 of this carriage, the tools 5 for forming the ring-shaped links and the eccentric-shaft 6 of the machine with its bearings 6a.

85 The mechanism for the production of coloured figured ring-chain-mail consists of a wire-feeder 7, having on its front-edge a number, for instance three superposed wire-feeders 8 in which wires 9 of different colours are guided. The wire-feeder 7 is oscillatably 90 mounted on a right axle 10 after the manner of a two-armed lever, and its rearwardly projecting arm 11 is moved up and down so that now the one then the other or the third wire 9 is brought into the range of the tools 95 5 for forming the ring-shaped links.

The rearwardly projecting arm 11 of the wire-feeder 7 is controlled by a link 12, adapted to be oscillated in lateral direction around a hinge-element 13 and to be oscil- 100

lated in forward and rearward directions with said hinge-element 13 and with the carrying shaft 14 of the same, a diagonal spring 15, fixed at the one end to the machine-frame and attached at the other end to said link 12, pulling the same to the right and to the rear. The carrying shaft 14 is secured in two bearings 16, 16 so that it cannot shift in longitudinal direction. Against the right side of the link 12 bears the free end of a pressure-rod 17, mounted in the bearings 16 and shiftable in longitudinal direction to make the link 12 oscillate in lateral direction. A roller 18 on the rear side of link 12 rests upon the circumference of an eccentric 19, mounted on the main driving shaft 6 of the chain-mail-machine so that said link can be moved in forward and backward direction. On the upper end, on the front side of the link 12, three funnel-shaped channels 20 are arranged the one at the side of the other which correspond, as regards position, to the three positions which the rear lever arm 11 of the wire-feeder 7 can adopt.

The link 12 is oscillated in backward direction during the interval between the formation of two ring-links by the eccentric 19, whereupon, by a movement of the pressure-rod 17 in lateral direction, an oscillating movement is communicated to the link so that one of the channels 20 is brought into register behind the free end of the rearwardly extending lever-arm 11 of the wire-feeder 7 whereupon the link 12, by a projecting portion of the eccentric 19, is again oscillated in forward direction so that the adjusted channel 20 is pushed over the free end of the rear-lever-arm 11 of the wire-feeder 7 to bring the same into another position, i. e. to bring a wire of another colour into the range of the ring-link forming tools 5.

The pressure-rod 17, which communicates to the link its lateral oscillation, is operated by a tappet-lever 21, on the vertical axle 22 of which, having a key and groove connection 72, a feeling lever 23 is arranged so that it can be moved in longitudinal direction and which, by means of a feeling roller 24 at its free end, feels off the circumference of an eccentric drum 25, the superposed eccentrics 25a of which protrude or recede at their circumferences in accordance with the desired design of the ring-chain-mail. The lateral alteration of one closed section of a chain-mail-design corresponds to the circumference of an eccentric, which rotates so many times as the pattern or design-section is repeated in the width of the ring-chain-mail, while the alteration of design in the height of the chain-mail, i. e. from one row of ring-shaped links to the other row, is controlled by the next higher or next lower eccentric 25a of the eccentric-drum 25, the feeler 23 being shifted in longitudinal direction at the com-

pletion of one row of ring-shaped links on the eccentric-drum of the height of one eccentric.

The eccentric drum 25, which is rotatably mounted on a vertical axle 26 journaled in a bearing 27, is step-wise rotated by an anchor-feed-mechanism. This anchor-feed-mechanism consists of a ratchet-wheel 28, rigid with the eccentric-drum 25 and of an anchor-double pawl 29, composed of two pawls 29a and 29b, rigidly connected the one with the other and mounted on a lever-arm 30a of an anchor-oscillatable-lever 30, the other lever-arm 30b of which is oscillated, in opposition to the pull of a spring 31, by a pushing pin 33, controlled by an eccentric 32 on the main driving shaft 6. The double pawl 29 is thus moved to and from the ratchet wheel 28, so that this ratchet wheel with the eccentric-drum 25 is rotated by one of the pawls, for instance 29a, which bears resiliently against the circumference of the ratchet wheel 28, while the other pawl 29 stops this movement by engaging with the gap between teeth of the ratchet wheel 28. The direction of rotation of the eccentric-drum 25 is reversed after completion of a horizontal row of rings by interchanging the part played by the pawls 29a and 29b. With this object in view two converging tangential surfaces 34 are arranged on the hub of the double pawl 29 at the right and left on the pivot-point of the same, against which tangential surfaces a pressure-spring 35 bears, whereby the double pawl 29 is oscillated to the one side or to the other side so that either pawl 29a or pawl 29b is resiliently pressed against the circumference of the ratchet wheel 28. The pressure-spring 35 bearing against the guiding surfaces 34 is fixed on a flat slide 38 which is guided in longitudinal direction on the long side of the oscillatable lever 30 in oblong holes by means of screws and has a flat extension 37, bent at right angles, and carrying two vertical pins 38. Between these vertical pins 38 engages a horizontal pin 39, fixed on the lower end of a lever 40 which is bent sideways and is oscillatably mounted, by means of a forwardly directed axle 41, at its upper end in a bearing 42, bent at the top-end at right angles, said lever 40 being connected in front and behind of said bearing with a downwardly directed short lever arm 43, 44 respectively. To the front lever-arm 43 the upper end of a lever 45, which is bent to the right and oscillatably mounted at its lower end, is connected said lever-arm 43 having, underneath the connection-point, a forwardly bent abutment 46. On the carriage 3 carrying the chain-mail two abutments 47 and 48 are arranged the one 47 of said abutments being directly fixed on the carriage 3, the other one 48 being mounted on an extension 49 of the carriage. These abutments serve to make

the lever 40 oscillate, when the carriage 3 arrives at its extreme positions, the abutment 47 striking against the abutment 46 of lever 48 when the carriage 3 is in the right extreme position so that said lever 48 turns to the right the lever 40, bent to the left, and through the intermediary of the front short lever 44, while the abutment 48, mounted on the extension 49 bears, in the left extreme position of carriage 3, against the short lever arm 43 behind the bearing 42, whereby the lever 40, bent to the left, is oscillated to the left. By the engaging pins 37, 38 of lever 40 and slide 36 this slide is pushed to and fro accordingly, so that the pressure-spring 35 mounted on the slide 36 moves from one surface 34 of the double pawl 29 to the other pressure-surface and oscillates this pawl from the one side to the other.

For moving the feeler 23 in longitudinal direction on the eccentric-drum 25, this feeler engages, by a transverse-slot 50, over a horizontal stud 51 of a rack 52 which is vertically guided in the bearing-body 27 and meshes with a spur-wheel 53 which is rotated from the anchor-feed-mechanism and reversed when the feeler has felt off the higher or lower eccentric on the eccentric-drum. This anchor-feed-mechanism consists of a ratchet wheel 54, rigid with a spur-wheel 53, and rotatable on the same axle and driven by a double pawl 55, mounted on an oscillatable lever 56, pushed to the right by a spring 57 and oscillated to the left by a lever 58, acting upon its free end and directed to the rear in horizontal direction. The pivot-axle of this lever 58 is mounted on a horizontal surface of the bearing 42 and its front short arm 58a projects forward into the range of an abutment 59, fixed on the carriage 3 and by means of which the lever 58 is oscillated, when the carriage is in the extreme right position. An abutment 60 on the extension 49 of the carriage oscillates the lever 58 when the carriage 3 is in the left extreme position. In this manner the feeler is shifted each time the width of an eccentric of the eccentric-drum after completion of a horizontal row of rings.

When the feeler 23 has arrived in its extreme positions on the eccentric drum 25, one of the pins 61 on the rack 52 bears against the upper or lower side-edge of a lever 62 enlarged at this point and which has a stationary pivot-point at the left of the rack 52 and in front of the same on the bearing body, the free, slit end of this lever engaging with a slide 63, guided on the right long side of the oscillatable lever 56 by means of oblong slots and screws and having a pressure-spring 64, pressing upon tangential-surfaces 55a on the hub of the double pawl 55 so that this pawl is oscillated, the parts played by the two pawls of the double pawl 35 as shifting and locking pawls being reversed, so

that the longitudinal movement of the feeler 23 on the eccentric-drum 25 is reversed.

In cases, in which the designed figures of the chain-mail-pattern do not extend the one into the other, so that between two vertical-rows of figures a vertical-interval coloured in one colour remains, the corresponding vertical-longitudinal strip of the circumference of the eccentric-drum is quite plane and the feeler 23 can, at this portion, be pushed without difficulties slidingly from eccentric to eccentric. For designs, however, the figures of which engage the one with the other in the direction of the width of the ring-chain-mail, there is no smooth longitudinal-strip on the eccentric-drum. In order to be able to shift the feeler nevertheless in longitudinal direction, it is lifted from the drum by a separate mechanism at the beginning of its longitudinal shifting movement and placed on the same at the end of this longitudinal movement.

This lifting mechanism for the feeler consists of a bar 65, the left hand free end of which stands in operative direction behind the back of the tappet-lever 21 which, by the axle 22, is rigidly connected with the feeler 23. The right end of the bar 65 is oscillatably mounted on an upright 66 and carries a carriage 67 adapted to be shifted in longitudinal direction and to be pushed to the right by a spring 68 and to the left by an extension 58b of the lever 58, said lever operating the lifting and lowering mechanism for the feeler. A roller 69 on the rear of the carriage bears, when said carriage is in the right end position, on a ring 70 of the main-shaft 6 and, when the carriage is in the left extreme position, on an eccentric 71 on the main-shaft 6, the carriage 67 and with the same the bar 65 being, in the left position of the carriage, oscillated by said eccentric around the central axis of the upright 66 so that the free end of bar 65 bears against the back of the tappet-lever 21 and makes the same oscillate, the feeler 23, mounted on the same axle 22 as the tappet-lever 21, being oscillated also by the key and groove-connection 72 so that it is lifted off the circumference of the eccentric-drum 25 and brought again into contact with the same when, after the reversing of the carriage 3, the lever-extension 58b is oscillated back. For the production of simply patterned chain-mail the simplified feeding-arrangements may be used which will be hereinafter described.

For the production of long-striped chain-mail serves the mechanism shown in Fig. 7, and which consists of an eccentric-disk 73, mounted at the same height as the pressure-rod 17 and rotatable around a vertical-axle, the pressure-rod 17 and by the same, through the intermediary of the link 12, the wire feeding-device 7 being controlled, according to the desired design, by the projecting and receiving portions of the circumference of said

eccentric-disk. The eccentric-disk 73 is rotated by a ratchet wheel 28 connected with the same and by the elements 29 to 49 which have been above described.

5 For the production of transverse-striped chain-mail, a mechanism is designed as shown in Fig. 8. It consists of a cam-disk 74 which is step-wise rotated, every time when the carriage 3 arrives in one of its extreme positions, by the tappets 59 and 60 of said carriage and by the lever 58 which has on its free end a spring-controlled pawl 75 and is itself pulled back by the action of a spring 76.

10 Fig. 9 shows a mechanism for the production of obliquely-striped chain-mail comprising, besides the mechanism for producing long-striped chain-mail shown in Fig. 7, a special device for altering the lateral succession of the colouring of the chain-mail from one ring-row to the other ring-row of one or several ring-widths. This displacing device consists of a locking beam 77 mounted, over the ratchet wheel 28 arranged at some distance above the cam disk 73, on a bolt 78 extending horizontally from the bearing bolt of the cam-disk 73 and on the ratchet-wheel 28 so that it can move up and down like a scale-beam, and on a stud 78a of bolt 78 so that it can oscillate in forward and backward directions, its arms 77a, moving in forward and downward directions, projecting with its end face, bevelled accordingly, to the outer circumference of the ratchet-wheel 28 and prevents thus the corresponding pawl 29a of the double-pawl 29 from coming into engagement with the ratchet wheel 28. The locking beam 77 is held in the locking position by a pressure-spring 79, oscillatable on a column 80 by means of a handle 81 and bearing, according to its adjusting, against the surface of the one or other arm 77a, 77b of the locking beam to press downward the corresponding arm, for instance 77a, and to hold the same in its forwardly oscillated position. Under the locking beam 77 and its bearing 78 a plate 82 is oscillatable on the ratchet-wheel 28 and around the axle of the same, said plate having at its extreme lateral ends teeth 83, which are arranged underneath the locking position of the locking surfaces of the locking beam 77 and project over the outer circumference of the ratchet-wheel 28 and over the locking surface of the locking beam 77, said plate having two vertical-pins 84 gripping behind the locking beam 77. This mechanism serves to bring the locking beam 77 after its action, the interruption of the colour changing of an interval between rings, out of its locking position. The pawl 29a which rotates the ratchet wheel 28, when it is in working position, is prevented by the locking-beam 77 from engaging with the ratchet-wheel 28; it comes however, in the course of its forward movement, into engagement with the projecting tooth 83 of plate 82 and rotates the same

whereby the plate 82, by means of one of its vertical-pins 84 gripping behind the not engaged arm 77b of the locking beam 77, pushes the locking-arm 77a of the locking-beam 77 to the rear so that the locking surface of the same moves away from the circumference of the ratchet-wheel 28 and releases thus the step-wise movement of the ratchet-wheel 28 and of the cam-disk 73 for the row of rings which has been just begun. At the end of this row of rings the double-pawl 29 is reversed by means of the elements 34 to 48 above described so that the other pawl 29b comes now into engagement with the ratchet-wheel 28 but at the same time with the second tooth 83 of plate 82 projecting on this side so that, at the first part-rotation of the ratchet-wheel 28, it rotates also this plate. The other vertical-pin 84 of plate 82 is thus made to bear against the arm 77a of the locking-bolt 77, which has a little while ago been oscillated out of the locking-position and pushes the same again into the locking position. When the elements are in the position shown in Fig. 9 the striped pattern is shifted to the right one ring-shaped link so that a chain-mail is produced which is striped from the right above to left below. When the spring 79 is oscillated beyond the pivot-point of the locking-beam 77 onto the left arm 77b of the same, the pattern is displaced to the left and consequently a chain-mail is produced striped from left above to right below. When more teeth 83 are arranged on the free end of plate 82 and when the pins 84 are placed farther back accordingly, the locking beam 77 will be brought out of the locking position only after an accordingly greater forward movement of the double-pawl 29, the colour changing being displaced several ring-links so that the angle of inclination of the striped-pattern is altered accordingly.

The mechanism shown in Fig. 10 is designed for the production of ring-chain-mail patterned in zig-zag. It consists of a cam-disk 85 which, by means of a ratchet-wheel 87, rigidly connected with it by screws 86, and by the elements 58 to 60 and 75, 76 described above, is rotated one step at each changing of the row of rings.

The circumference of this cam-disk projects, in accordance with the height of the change of direction of the zig-zag pattern, and brings, by means of a feeler 88 moving over its circumference and fixed on the handle 81 of spring 79, this pressure-spring 79 pulled to the right by the action of a pull-spring 79 over the locking beam 77 of the colour-control-mechanism, constructed as shown in Fig. 9 and situated on a lower plane, into a position alternately at the right and left of the pivot-point of the locking beam 77, whereby this locking beam 77 is now displaced to the right and then to the left, ef-

fecting thereby the shifting of the zig-zag pattern.

In this case the oscillating movement of the link 12 is not effected by the pressure-rod 17, this being locked in its position. The locking of the supporting-axle 14 of link 12 is released, and the driving mechanism as shown in Fig. 9 acts upon this axle 14 and shifts the same in lateral direction. The link 12 oscillates consequently around the stationary supporting point at the left end of the pressure-rod 17 which is now locked (see Fig. 11).

Another kind of chain-mail-pattern can be produced by changing the colour-succession at the same time as the direction of the zig-zag pattern is changed. A design is thus produced, constituting of horizontal rows of rhomboids mutually alternating as regards colour and inclined alternately to the right and to the left. In order to produce this colour-alternation, together with the alternation of direction in the zig-zag-design, a second cam-disk 89 is fixed between the cam-disk 85 and the ratchet-wheel 87 of the same, in the mechanism shown in Figs. 9, 10 and 11, said second cam-disk 89 serving again to move the pressure-rod 17 to and fro in accordance with the displacing-mechanism. When the pressure-rod is in the pulled back-position, the link 12 would be moved only by the released supporting axle 14 moved in longitudinal direction under the action of cam-disk 73, and the control-lever 11 of the wire-feeder 7 will for instance be influenced only by the central and left deflection-channels of the same. When the central wire in the wire-feeder is red and when the upper and lower wires are white, the design in the width in consideration of the position shown in Fig. 3 beginning with white, would change between white and red. At the changing of the direction of shifting, and in the extreme position of the chain-mail-carriage, i. e. of the changing of the ring-row, the link will be oscillated to the left (Fig. 12) by the circumference of the cam-disk which at this moment is projecting and through the intermediary of the pressure-rod 17, one deflecting-channel to the left so that the control-lever is now inserted first into the central-deflecting-channel, corresponding to the red wire in the wire-feeder so that the design, beginning now with red, alters from red to white owing to the similar movement of the supporting axle which makes the ring row oscillate between its central and right deflecting-channels.

In the mechanism shown in Figs. 1 to 6 for the production of figured pattern-chain-mail an eccentric drum 90 with spiral-eccentrics 91 merging the one into the other as shown in Fig. 14 may be used instead of an eccentric-drum 25 with closed eccentrics 25a, guiding edges 92 being arranged between the

spiral-windings helically extending over the entire length of the drum, said guiding edges projecting over these windings, the feeder 23 being guided, by means of its pulley 24 between these guiding edges so that it is moved along the eccentric-drum without the special lifting and lowering mechanism 50 to 58, the disengaging mechanism 65 to 71 being also not necessary. The arrangement just described is however adapted, owing to the greater length of the eccentric-drum, only for less high pattern-sections.

I claim:

1. A machine for producing coloured patterned ring chain mail, comprising in combination a wire feeder in the form of a double lever oscillatable around a horizontal axle, several wire feeders on the front arm of said double lever superimposed to each other and parallel to the axis of oscillation the rear arm of said lever serving as steering lever, a link having in its upper end three funnel-shaped indentations arranged on its front side the one at the side of the other at different heights and within range of the free end of the steering arm of said double lever, a hinge piece on which the lower end of said link is oscillatably mounted, a carrying axle on which said hinge piece and said link are mounted adapted to oscillate forward and backward, a pull spring attached to said link diagonal to the right and rear, a roller on the back of said link, an eccentric on the main shaft against which said roller of said link bears, a pressure rod parallel above the carrying axle against the left end of which rod said link bears, and elements of a driving mechanism against which bear the right ends of said pressure rod or the carrying axle or both said pressure rod, when not bearing, being secured in the longitudinal direction, eccentrics on the main shaft of the machine, and stops on the carriage carrying the chain mail or on an extension of the same the opposite end parts of the driving mechanism of the pressure rod bearing against or being in engagement with or situated in the range of said eccentric and of said stops.

2. A machine as claimed in claim 1, comprising in combination with the pressure rod, a finger against which the right end of said pressure rod bears, said finger fixed on the upper end of a vertical axle, a wedge spring along said axle, a feeder vertically shiftable on said axle and on said wedge spring, a roller on the free end of said feeder, an eccentric drum composed of several eccentric discs having eccentric ribs on the circumference, said roller of said feeder bearing against said eccentric drum, a ratchet wheel fixed on said eccentric drum, a spring-controlled double pawl pressing against said ratchet wheel with the one or the other or alternately with both pawls, a push pin, a double lever oscillatable in a horizontal plane carry-

ing said double pawl on one end, its other spring-controlled arm bearing against said push pin, a sliding element carrying said push pin, and an eccentric on the main shaft with which said sliding piece engages.

3. In a machine as specified in claim 1, the reversing mechanism for the double pawl comprising in combination the hub of said double pawl having a tangential face, a sliding piece conducted along said pawl lever, a blade spring at one end of said sliding piece pressing against said tangential face, two vertical pins on said sliding piece, a horizontal axle, two levers rigid on said horizontal axle, a horizontal pin on said rear lever engaging with said vertical pins of said sliding piece, an abutment on said front lever directed to the left towards an abutment on the chain mail carriage, and an abutment on said rear lever directed to the right towards an extension of said chain mail carriage said abutment adjusted according to the extreme position of said carriage.

4. In a machine as specified in claim 1, the mechanism for vertically shifting the feeler, comprising a vertical rack, a catch pin on said rack engaging with a horizontal slot of said feeler, a spur wheel meshing with said rack, a ratchet wheel rigid with said spur wheel, a spring-controlled double pawl alternately engaging with its two pawls in said ratchet wheel, a spring-controlled vertical lever oscillatably mounted at its lower end adapted to be oscillated toward said ratchet wheel and carrying said double pawl, a horizontal lever bearing against said vertical lever fulcrumed near its front end, an abutment on said carriage opposite the left side of said horizontal lever before the fulcrum of the same, an abutment on said extension of said carriage opposite the right side of said horizontal lever behind the fulcrum of the same, a lever in front of said rack, the fulcrum of said lever behind the back of said rack, two abutment pins on said rack opposite the abutment edges of said rack and arranged in accordance with the extreme positions of said rack, a reversing sliding piece on said vertical lever engaging with the free end of the lever in front of the rack, and a blade spring on said reversing lever acting upon the inclined faces on the hub of said double pawl.

5. In a machine as specified in claim 1 the arrangement for lifting the feeler during the shifting, comprising a bar the left end of said bar situated behind the inclined back of said finger, its other end mounted on an upright oscillatable in a horizontal plane, a carriage on said bar, a pull spring pulling said carriage to the right against said horizontal lever which is controlled by the abutment on said chain mail carriage or on the extension of said carriage, a roller on the rear side of said carriage, a ring on the main shaft determining the right hand extreme position

of said carriage, an eccentric on the main shaft merging into said ring and corresponding to the left hand extreme position of said carriage, and a roller on said carriage resting on said ring or on said eccentric.

6. A machine for producing longitudinally striped metal ring chain mail as claimed in claim 1, comprising a single eccentric disc on which bears the right end of the pressure rod, a ratchet wheel connected to said eccentric disc, and a double pawl engaging with and rotating said ratchet wheel.

7. A machine as specified in claim 1, comprising an arrangement for producing transversing striped chain mail consisting of a simple pawl mounted on the short free end of the horizontal lever which co-operates with abutments on the chain mail carriage and on the extension of the same, said pawl being pressed by spring power against the teeth of said ratchet wheel.

8. A machine as specified in claim 1, with arrangements for the production of obliquely striped chain mail, comprising in combination a plate bearing on a ratchet wheel of an eccentric and adapted to oscillate around an axle of said eccentric, one or several teeth on both ends of said plate extending beyond the teeth of the ratchet wheel and engaging with the double pawl, two vertical pins near the ends of said plate, a beam, a horizontal edge above said plate, said beam oscillatable in vertical direction on said edge, a vertical pin on said edge on which said beam is adapted to be oscillated in horizontal direction by said vertical pins of said plate said beam having bevelled end faces projecting when said beam is oscillated forward up to the outer rim of the teeth of said ratchet wheel, a vertical axle, a hub with swivel oscillatable on said vertical axle, and a blade spring horizontally projecting from said hub the free end of said blade spring pressing on said beam said blade spring adapted to be adjusted to the one or other side of the bearing of said beam.

9. A machine as specified in claim 1, comprising an arrangement for producing chain mail striped in zig-zag comprising a feeler on one arm of the swivel of the blade spring of the beam, a second eccentric above said beam and mounted on the same axle as the first mentioned eccentric against which the pressure rod bears, a ratchet wheel rigid with said eccentric, and a ratchet mechanism with ratchet pawl on the horizontal shortened lever controlled by the abutments on the chain-mail carriage and on the extension of the same.

10. A machine as specified in claim 1 comprising a mechanism for the production of zig-zag striped chain-mail with colour changing at the change of direction of said zig-zag stripes (rhomb pattern) comprising a third eccentric fixed between the upper second ec-

centric and the ratchet wheel of the same,
the pressure rod bearing against said third
eccentric, and the carrying axle released from
its locked position bearing against said first
eccentric which is arranged at the height of
5 the carrying axle.

In testimony whereof I affix my signature.
EUGEN SCHOFER.

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