(No Model.) 2 Sheets—Sheet 1.

J. KINDER.

MACHINE FOR MAKING ORNAMENTAL CHAINS.

No. 263,533. Patented Aug. 29, 1882.

FIG. 2.

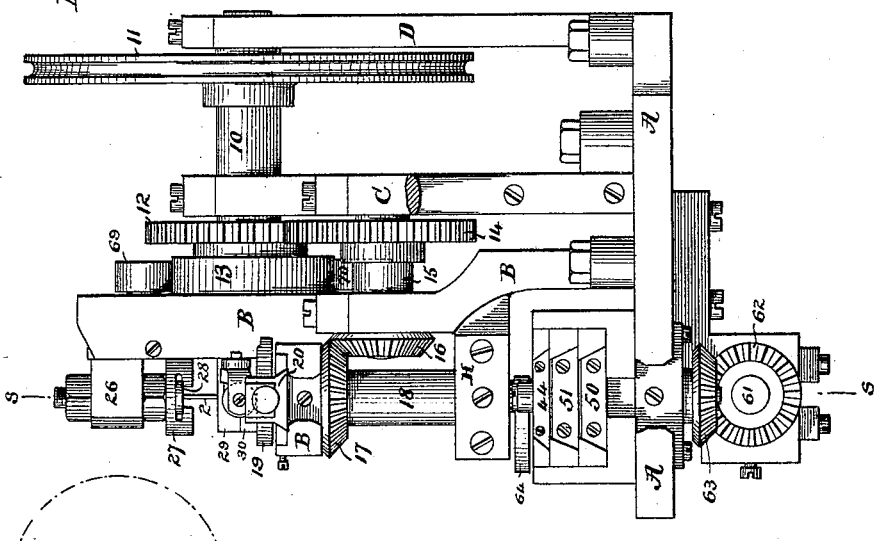
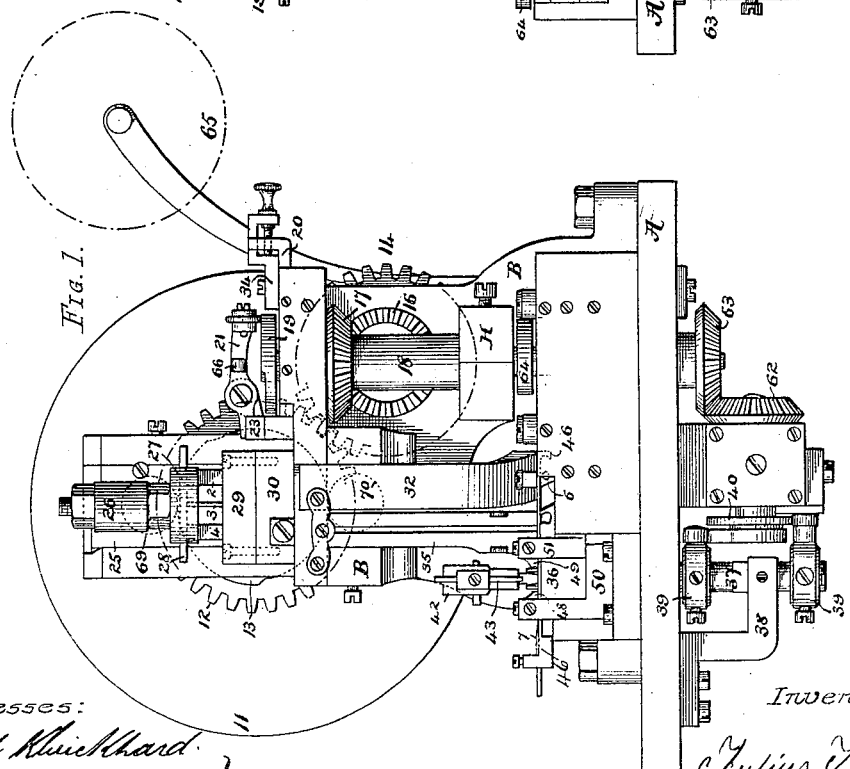


FIG. 1.



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Inventor:
Julius Kinder

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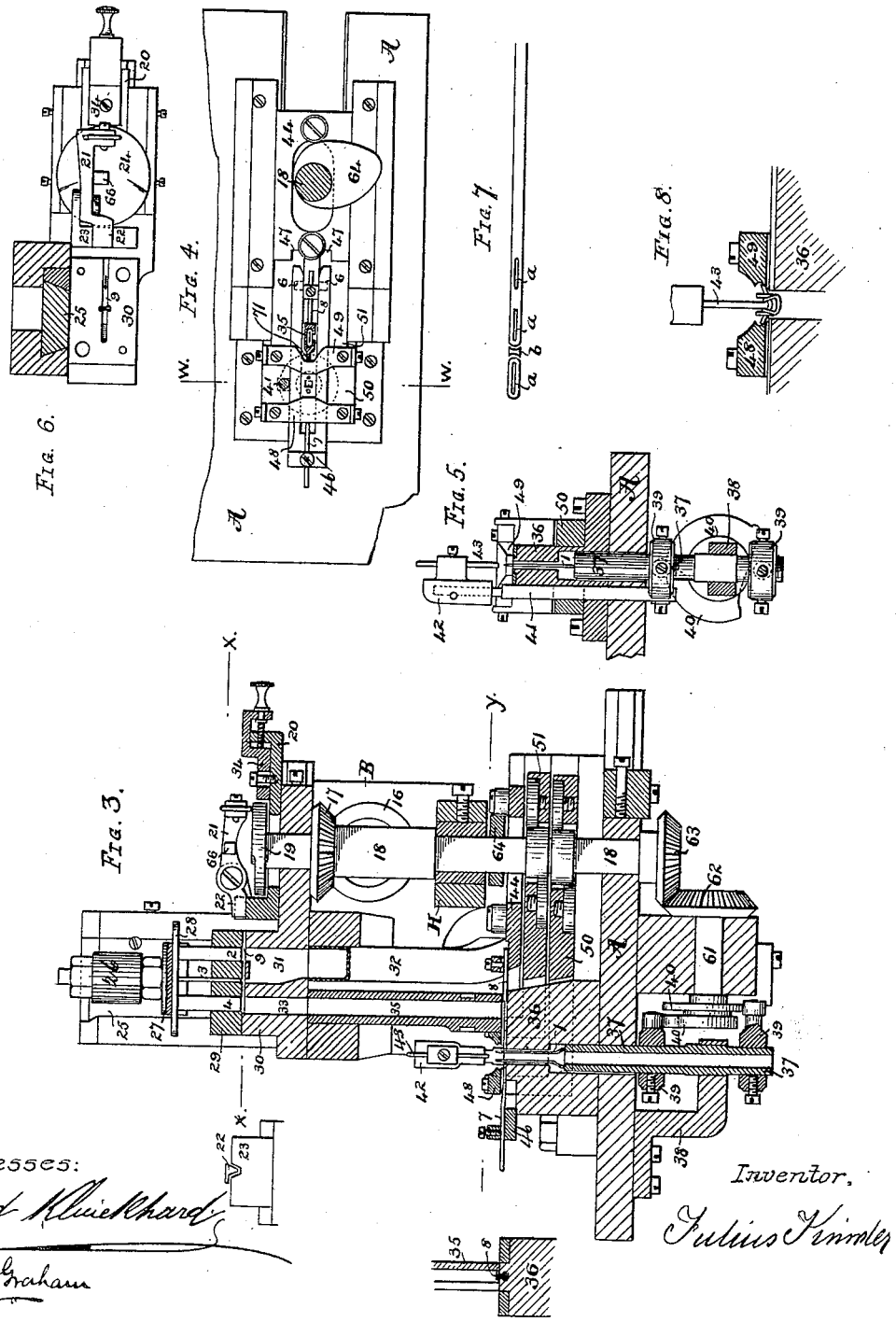

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UNITED STATES PATENT OFFICE.

JULIUS KINDER, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO FREDERICK W. GESSWEIN, OF SAME PLACE.

MACHINE FOR MAKING ORNAMENTAL CHAINS.

SPECIFICATION forming part of Letters Patent No. 263,533, dated August 29, 1882.

Application filed December 1, 1881. (No model.)

To all whom it may concern:

Be it known that I, JULIUS KINDER, a subject of the Emperor of Germany, residing in the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Machines for Making Ornamental Chains, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to machines which automatically feed a flat narrow strip of metal to a punching and severing or link-forming device, and then present the links to a mechanism that feeds each link to bending devices that automatically thread the links together, and from which a completed endless chain issues, known to the trade as "fox-tail" chain. In this style of chain it has been usual to insert the new link into the bent ends of two previous links, by which each link is interlocked with two others, so that greater strength and a closer chain are obtained; and although I do not limit my invention to this mode of interlocking, it will be supposed, for convenience of description, that the drawings illustrate a machine designed to produce such a chain.

Heretofore in the manufacture of ornamental chain by machinery many difficulties have been encountered in the operations of cutting the links and interlocking them together, and no mechanism had previous to my invention been devised that would automatically center the new link in the upturned ends of the previous link and clamp said ends together, so that the chain when completed would be symmetrical at all points and present a perfect appearance. This previously-manufactured chain, although produced in large quantities, has not met the requirements for the uses to which it has been put, the defects being such that breaks often occur in the chain, owing to the defective cutting of the links and the manner in which they are bent, resulting in much waste; and the extreme openness of the chain lacking a certain degree of stiffness that is desirable from the necessity of using an unnecessary length of link, it being practically impossible on the old machines to work automatically with speed and use a short link.

The object of my invention is to so construct this class of machines that these many defects are overcome, and to provide means whereby the links are interlocked by positive mechanism that will insure such interlocking and produce a more perfect chain; and to this end my invention consists, first, in a new construction of the wire or metal feeding device in such machines, whereby the metal is presented to the link-former in suitable lengths and positively fed thereto, and in rendering such feed adjustable, so that it may be varied within narrow limits and accurately adjusted; second, in a mechanism by which the links are positively bent or doubled and interlocked in each other, and by which the closeness or openness of the chain is obtained and regulated; and, third, in various combinations of parts and details of construction, all of which will be too fully hereinafter set forth to need further preliminary description.

In the drawings accompanying this specification I have illustrated my invention in a compact form, the machine receiving motion from one driving-pulley; but, for reasons which will hereinafter appear, this may be changed and the interlocking mechanism be run independent of the link-forming devices.

In these drawings, Figure 1 is a front elevation of a machine embodying my improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a transverse vertical section on the line *s s* of Fig. 2. Fig. 4 is a horizontal section on the line *y y* of Fig. 3, showing the chain-forming mechanism in plan view. Fig. 5 is a cross vertical section on the line *w w* of Fig. 4, showing the face of one of the link-bending jaws and the hollow spindle. Fig. 6 is a horizontal section on the line *x x* of Fig. 3, showing in plan view the metal-feeding device and the female cutting-dies for forming the links. Fig. 7 is a view of the metal strips, showing a complete and incomplete link; and Fig. 8 is an enlarged sectional elevation of the clamping or doubling jaws, showing their operation upon a link.

A is the bed-plate upon which the machine is supported, and bolted to which are vertical standards B, C, and D. The standards C and D support at their upper ends a main driving-shaft, 10, which is provided at one end with a driving-wheel, 11, and at the opposite

end with a toothed wheel, 12, and a cam, 13. This toothed wheel meshes with a similar wheel, 14, mounted upon a short horizontal shaft, 15, having bearings in the standards B and C. Upon the end of said shaft 15, projecting to the front of the standard B, is secured a bevel-wheel, 16, that meshes with a similar wheel, 17, secured to a vertical shaft, 18, and operates the metal-feeding device hereinafter described. Forming the link from the strip of metal is an important feature in this class of machines, the smallness of which link has made it difficult to construct reliable cutting and feeding tools that will be most accurate in their operations and produce a perfectly-formed link, so that the chain formed thereof will be of even texture and strength; and, in order to attain this perfection, much depends on the positive action of the feed of the metal to the cutters, and by such action, conjointly with the action of other mechanism, a constant supply of links is fed to the chain-forming mechanism. This part of the invention will now be described.

The shaft 18 carries at its upper end a cam-wheel, 19, which imparts a reciprocatory motion to a feeding-plate, 20, through a short stud or projection, 23, at one end and an adjustable end piece, 34, at the other end of said feeding-plate, by which latter the length of the movement of the plate, and thereby the amount of metal fed to the cutting device, is regulated. This feeding-plate is situated under the cam-wheel 19, and slides in horizontal ways formed in the standard B, (the said plate having a slot through which the shaft 18 passes,) and is provided with a clamping-arm, 21, that is pivoted to the short stud or projection 23, which clamping-arm is provided at its short end with a male jaw, 22, and a small friction-wheel at its opposite end, that rests upon the upper surface of the cam 19, which, by reason of its conformation, causes the jaw 22 to open and close upon the metal strip led under it within a V-shaped groove in the projection 23, by which the metal strip is fed at regular intervals to the link-formers.

The link-formers consist of two cutters and corresponding cutting-edges, whereby the metal strip, as it is fed thereto, is provided with short holes and severed into suitable lengths a little larger than the holes, so that the same quantity of metal is left on all its sides, which is of much importance. These cutters (marked 2 3 in the drawings) are secured to and depend from a supporting-bar, 28, and project into guiding-slots formed in a block, 29, that guides them in their movements and secures them in proper relation to a cutting-die, 30, upon which said block rests and is secured. The cutter 2 is of a shape suited to impart a narrow slot, as *a*, to the metal strip, and the cutter 3, which severs the same into links, is provided with concaved cutting-edges, so that it will provide the link severed by it and the adjacent end of the strip with curved ends at one and the same operation. These cutters are situated a link's length apart, and at each descent will complete one link, partially complete the succeeding one, and cut the hole of a third. The supporting-bar 28 is loosely held in grooves formed in the under side of a carrying-head, 27, that is secured to a projecting stud, 26, of a vertical slide, 25, the said head being capable of vertical adjustment by means of its threaded bolt which passes through said stud and the screw-nuts, as is clearly shown in Figs. 1, 2, and 3, whereby the cutters can be readily adjusted when worn down by use and sharpening. By this construction the cutters are readily drawn from the carrying-head 27 without removing them from the guiding-block by reason of the groove in said head. The withdrawal is accomplished by loosening the screws which hold the guiding-block onto the cutting die 30, thus allowing the former to be slid therefrom, and with it the cutters, &c. Either of them may be easily removed should it be imperfect or broken in any manner; and it furthermore renders them independent in their vertical position of the carrying-head and its operating-slide, by which greater accuracy in the cuts is obtained and the cutters are rendered less liable to cut unevenly.

Also attached to the cutter-supporting bar 28 is a plunger, 4, that is guided in a slot provided in the block 29, that serves, in connection with the feeding movement of the plate 20, at every downward reciprocation of the carrying-head 27, to push a completed link down into a slot formed in the cutting-die and having a shape like that of the link, and from thence into a link-feeding guide, 35, that forms a continuation of said slot. This plunger 4 is about the size and shape of a completed link, and is separated from the cutter 3 by a space equal to the length of a link, so that the plunger may descend simultaneously with that of the cutters 2 and 3 without disturbing the partly-finished link presented under the latter cutter.

The cutting-die 30 is provided in its face with a narrow guiding-slot, 9, of the width and the depth of the metal strip before referred to, and extends from the side adjacent to the metal-feeding plate 20 inward toward the center of the die, under the cutters 2 3 and plunger 4, and stops at the farther side of the feeding-slot 33. The upper side of this guiding-slot 9 is formed by the under side of the block 29, whereby the metal strip which is fed therein is more surely and properly presented to the cutters and plunger. The cutting-die is also provided with a channel, 31, into which the waste metal is forced by the cutters 2 and 3 through cutting-holes that correspond and coact therewith in the operation of forming the links and severing them apart, from which channel said waste is led out of the machine by a chute, 32.

The link-feeding guide 35 extends from the under side of the cutting-die, and rests upon the top of a table, 36, and is provided at its under side with a narrow slot of the width of

the link, so that the sudden movement of a feeding-pin, 8, will not cause it to be thrown out of place, and whereby it is more perfectly guided over the table.

The table 36 rests upon and is secured to the bed A, and extends from the feeding-guide for a short distance, sufficient to present an even surface for the link to slide over to a central vertical aperture therein, that serves to allow the chain as it is formed to pass out of the machine. A hollow spindle, 37, extends vertically up into an enlargement of said aperture and forms a continuation thereof to allow the passage of the chain, which spindle is held and guided therein by an arm, 38, depending from the under side of the bed of the machine. From the upper end of this hollow spindle may project two needle-pointed tools, 1, which, when the spindle is reciprocated to its highest extent, will protrude slightly above the top of the table, by which the ends of the link, when resting over said aperture, are slightly enlarged or spread. The hollow spindle receives vertical reciprocations from suitably-shaped cams, 40, projecting from a short horizontal shaft, 61, that is held in bearings from the under side of the bed A, and receives motion from the vertical shaft 18 through bevel-gears 63 62, as is clearly shown in Figs. 1 and 3. The cams 40 so engage small friction-rollers extending from collars 39, that are securely held to said spindle, that the one will cause the downward movement of the spindle, while the other the upward, which movements are so timed that the needle-pointed tools 1 remain below the surface of the table a greater portion of the time. A primary bending-punch, 43, is brought into action at the required moment to bend the flat link slightly, and remains on said link while the first part of the final bending operation is performed. This punch 43 is secured to a holder, 42, so that its length may be varied when required, and is connected with the hollow spindle 37 by a vertical bar, 41, that is secured to the upper one of the collars 39, and extends up through and is guided in its reciprocations by the bed A and a portion of the table 36.

In machines heretofore constructed the bending or doubling of the flat link, after it has been pushed through the upturned ends of the previously-bent links, has been wholly accomplished by either drawing down upon the chain by hand, so that the flat link will be forcibly drawn within the hole in the bed of the machine and thereby bent, or by the aid of a punch that partially bends and pushes said link within said hole, to be afterward drawn down therein by hand. It will thus be seen that such chain would necessarily be of the same diameter as the hole, and the perfection to which each link was bent would depend upon the wearing of said hole, that also determines the closeness at which the upturned ends are forced toward each other, no means having been devised to insure doubling or bending the link at its center, so that when the new link was presented it should not miss going through all of the upturned ends by reason of one end being shorter than the other.

In order to overcome these objectionable features and to perform the final operation of bending the link in a manner such as will enable the production of a perfectly-formed chain, and by which the operations of the machine are rendered automatic, I provide two bending or doubling jaws, 48 49, that overlie the top of the table 36 and on either side of the central aperture therein, and are secured to the upturned ends of two reciprocating slides, 50 51, respectively, by which the said jaws are reciprocated toward and from each other on said table through suitable-shaped cams on the shaft 18, that engage with small friction-wheels in said slides, as is clearly shown in Fig. 3. Said cams are so shaped that when a new link is being pushed through the upturned ends of the bent links, which project slightly above the face of the table, the jaws 48 49 will remain stationary a suitable length of time, and be gripping or pressing against the upturned ends of the link that was last partially bent thereby, and by which gripping action the chain, in connection with a horizontal needle, 7, is supported and prevented from falling out of the machine, and when the new link has been properly inserted in said upturned ends the jaws 48 49 continue their movement toward each other and complete the bending of said ends of the link, after which movement, by the continued action of the cams, the jaws are reciprocated from each other and away from the central hole in the table 36.

From this description it will be seen that the jaws (supposing them to be at the end of their withdrawing movement) will first be reciprocated toward each other sufficient to bend the ends of the links to a vertical position, or nearly so. They then pause during the insertion of the new link, and then make a further movement toward each other, finishing the bending of the link, and then recede to their former position, when the operation is repeated.

The pin 8 is secured at one end to a reciprocating slide, 44, to which motion is imparted by a cam, 64, on the shaft 18, and is guided in its back and forth movements in a depressed groove in the table 36, but leaving a projecting end sufficient to catch a link that has been pushed down the guide 35 until it rests upon the table, so as to carry it forward toward the central aperture and through the free upturned ends of the links therein, the upper surface of which pin being flattened, so that when it is under the said guide 35 it prevents a link falling onto the table before it has returned to its rear position. The movements of this slide 44 also cause a carriage, 46, to move back and forth on the table 36, by which the needle 7, which is secured to one end thereof, is entered into the upturned ends of the link before the new link is pushed therein by the said pin 8, thereby perfecting the enlarged or spread ends of the link and bringing them in a direct line

with the path of its travel, so that it freely passes through them. This carriage 46, and with it the needle 7, is moved in one direction by studs 6, that project from either side of the narrow portion of the slide 44 and engage with the hooked ends of the carriage and cause it to travel with said slide in its backward movement, and in the reverse direction by the recessed portions 47 of the slide coming in contact with the ends of the carriage in the former's forward movement. By this construction the new link that is fed forward by the pin 8 in this forward movement of the slide 44 will be caused to follow closely in the path made by the needle 7 through the upturned ends of the links projecting above the table 36 as it withdraws therefrom, from which it can be seen that the needle 7 moves about half of the distance traversed by the slide 44, and thus allows a sufficient time to elapse between its reciprocations to allow the new link to have its ends enlarged, partially bent by the punch 43, and doubled by the jaws 48 and 49.

The operation of the machine will now be described, referring first to the link-forming device and then to the interlocking devices.

A strip of metal of suitable size is led from a spool, 65, through an eye, 66, on the clamping-arm 21, under its jaw 22, which is opened by reason of its friction-wheel resting on the lowest part of the surface 24 of cam-wheel 19, the machine having been first turned so as to bring the feeding-plate 20 into its rearmost position, and the metal strip is then led into the guiding-slot 9 in the die until it abuts against the side of the cutter 2, which, as it will afterward appear, will have been moved down into its cutting-hole upon the rearward movement of said feeding-plate. The metal strip having been thus introduced, the machine is put into operation. The cutter-head is reciprocated upward by the action of the high part of the cam 13 upon a friction-stud, 69, projecting from the rear side of the slide 25, by which the cutters 2 3 and plunger 4 are caused to rise within their guiding-slots in the block 29. At the same time motion will have been imparted to the cam 19 through the bevel-wheels 16 17, which, on rotating, presents the high part of its surface under the friction-wheel of the clamping-arm 21, and thus causes it to seize the metal strip, and also, by the pressure of its peripheral surface against projection 23 of feeding-plate 20, moves the feeding-slide forward and pushes the said strip forward into the guiding-slot 9 a distance equal to about the length of a link, whereby an uncut portion is presented under the cutter 2, which, together with cutter 3 and plunger 4, is now descending by the action of the cam 13 upon the lower frictional stud, 70, of the slide, whereby the metal is cut and provided with a slot, *a*, in direction with its length, at which time the feeding-plate 20 will be moved to its rearmost position by the pressure of the peripheral surface of the cam 19 against its adjustable end piece, 34, when the operations will be repeated. Upon the return movement of the said plate a new surface of the strip will be presented under the cutter 2, and that portion previously cut will be thereby moved in said guiding-slot, so that the end thereof will, by the action of the cutter 3, be slightly curved or rounded off; and upon the next feed of the strip said first slot, *a*, will have been fed past the cutter 3, which, on descending, will sever the link from the strip, curving or rounding its end and that of the succeeding link, and in so doing cut a small piece, *b*, of the strip away, as is clearly shown at Fig. 7, which severed link, upon the next feed of the metal, will be presented under the plunger 4, that, on descending, will push it down into the slot 33, and thence into the guide 35. Thus it will be seen that the feeding-plate 20 at each of its feeding movements causes the metal strip to be fed into the guiding-slot under the cutters 2 and 3, and in so doing presents a fresh portion of the metal under the cutter 2. A partially-formed and unsevered link is fed past the cutter 3 into such a position thereunder that in its next severing operation a link will be properly severed, and it and the unsevered adjacent link be provided with curved ends; and the previously-severed and completed link is pushed under the plunger 4, so that at the latter's next operation said link will be fed into the guiding-slot, and so on until the guide 35 is filled with completed links.

Although the interlocking mechanism has been operating during the operation of the feeding and cutting mechanisms, no link will have been presented to it until the feeding-guide 35 is entirely full of links, it being constructed closely to the size and shape of the links, so that the links will be positively fed upon the table 36 by the operation of the plunger in pushing a link down into said slot 33. Supposing the guide 35 to have been filled with completed links, the lowermost one of which, by the action of the plunger 4 in feeding another link into the slot 33, has been pushed upon the table 36 and out of the guide in front of the pin 8, which, by the action of the cam 64 upon its slide 44, moves forward, pushing said link toward the central aperture in the table. In this movement the link is guided and prevented from accidental displacement by a grooved channel-way in the under side of the projection 71 of the guide 35 and in the under side of the clamping-jaw 49, which, when in its rearmost position, forms, in connection with the projection 71, a continuous and inclosed channel-way for the links and renders their displacement impossible. The pin 8, after moving a short distance, will have pushed the link up to or near the point of the needle 7, at which time the recessed portions 47 of the slide 44 will have come in contact with the ends of the carriage 46, thereby causing said carriage to travel with the slide, and thus withdrawing said needle from the ends of the bent links, which project above the table in the central aperture therein, (that have been

previously operated upon and arrived in such position by the action of the machine,) the retiring needle being closely followed by the link, which is pushed into said ends of the bent links until it overlies the said aperture in a central position. The bending or doubling jaws 48 49, which have remained stationary and nearly overlying the aperture in the table during the latter part of the feeding action of the slide 44, will now be caused to move toward each other and complete the bending or doubling of the lowermost projecting link therein, after which the jaws both recede from each other. Before these latter operations the hollow spindle 37 was moved down, thus bringing the needle-pointed tools 1 (should they be used in the machine) within the table 36, but which now immediately rise from the action of one of the cams 40 upon the upper frictional stud, by which the said pointed tools are forced through the slot of the link just previously fed over the central aperture and slightly spread open the ends thereof. The same action of the cam raises the bending-tool 43, which has been resting upon the ends of the last completely-doubled link, and upon the reverse action of the other cam, 40, upon the lower stud on the hollow spindle 37 said bending-tool is moved down against the flat link (at which time the pointed tools 1 withdraw) and slightly bends the link at its middle, (causing the ends thereof to turn up a little,) which up to this time has been held at both its ends—on one side by the point of the needle 7 and on its other by the pin 8—so that when the bending-jaws 48 49 recede from each other, as they did just previous to the operation of the pointed tools 1, the link will not be moved out of its place accidentally, but be kept perfectly true within the upturned ends of the other links. These jaws are now moved toward each other by the action of their respective cams on the shaft 18, which, coming in contact with the ends of this link, bend or double the same into a vertical position, during which action the bending-tool is kept resting on the center of said link, so as to insure its not getting out of place while the jaws are doubling its ends upward. By this time the slide 44 will have been moved so as to bring the pin 8 rearward, during the latter part of which movement the needle 7 will be caused to follow by the studs 6 coming into contact with the hooked ends of its carriage, thus forcing it through the ends of the newly-doubled link and those of that previously doubled, (at which time the bending-tool 43 will have been raised slightly out of the way,) so that the said ends are brought into a right line with the path of travel of the next link, by which it easily enters said openings. The pin 8 now commences to advance and pushes a link forward, and the operations are repeated, and so on until a chain of indefinite length is produced. While the needle 7 is within the doubled ends of the links it supports the chain or interlocked links depending therefrom, which, when the needle is withdrawn, is supported by the link just introduced and by the jaws 48 49 during their doubling action, so that the chain is always supported in the central aperture in the table 36 without relying upon the friction between it and the sides of said aperture. By this means the chain is readily fed out of the machine without the action of the bending-tool 43, which, however, should it become stopped from any cause, would, during its bending of the link, act to feed the same out. The chain as it is made passes out through the hollow spindle 37, which forms a convenient means of conducting it out of the machine, so that there is less liability of its being caught by any of its moving parts and injured thereby or caused to come to a stop.

As is hereinbefore mentioned, the needle-pointed tools 1 may be dispensed with, as the needle 7 performs all the functions of such tools, and in a way less liable to disturb the position of the links.

The shaft 18 may be divided at or near its supporting-bracket H, so that the link-forming devices and the interlocking mechanism may be operated separately, in which case the short shaft 61 would be extended out far enough to receive a driving-pulley, by which that portion of the machine would receive motion, the link-forming devices receiving motion through the main shaft 10 and its connections, as before; but in such an arrangement means may be provided for stopping the driving of either of the said shafts 18 61 and connecting said divided shaft 18, so that power applied to one of the driving-pulleys would operate the machine, as before.

It is obvious that any metal may be used in this machine, the positive bending of the links by the jaws 48 49 allowing the use of annealed metal, as is often the case in making gold chains, and in such use the links, after coming from the cutters, may be presented to an annealing apparatus, and from thence fed to the action of the pin 8, as before.

Having thus described my invention, what I claim is—

1. The combination, with a reciprocating feeding-plate supporting and carrying a pivoted clamping-arm provided with a jaw that coacts with a V-shaped groove in the feeding-plate, of a rotating cam, as 19, provided with an irregular surface, as 24, substantially as described.

2. In a device for feeding a continuous metal strip to the action of cutters, the combination, with a reciprocating feeding-plate, as 20, of a pivoted clamping-arm, as 21, supported and carried by said plate in its reciprocations, and rotating cam, as 19, for operating said plate and arm, substantially as described.

3. The combination, with the reciprocating feeding-plate, as 20, carrying the pivoted clamping-arm, as 21, provided with the clamping-jaw, of the rotating cam, as 19, for operating both jaw and plate, substantially as described.

4. The combination, with a reciprocating feeding-plate, as 20, carrying and supporting

a pivoted clamping-arm, as 21, and a rotating cam, as 19, for operating said plate and arm, of a plunger, as 4, whereby the links are fed to a feeding-guide and channel-way, as 35, substantially as described.

5. In a machine for making chain, the combination, with the needle 7, of reciprocating link bending or doubling jaws, as 48 49, substantially as described.

6. In a machine for making chain, the combination, with the needle-pointed tools 1, of reciprocating link bending or doubling jaws, as 48 49, substantially as described.

7. In a machine for making chain, the combination, with the feeding-pin 8, primary bending-tool 43, needle 7, and needle-pointed tools 1, of reciprocating bending or doubling jaws, as 48 49, substantially as described.

8. The combination, with reciprocating bending or doubling jaws, as 48 49, of means for operating them to partially bend a link, and then dwell and hold it while a new link is entered into its bent ends, and then to complete the bending, substantially as described.

9. The combination, with a supporting-table having a central aperture and a hollow reciprocating spindle, as 37, forming a continuation of said aperture, of two needle-pointed tools, as 1, carried by said spindle, substantially as described.

10. The combination, with the hollow reciprocating spindle 37, carrying needle-pointed tools 1, of the bending-tool 43, substantially as described.

11. The combination, with the guide 35, having a projection, 71, provided with a groove for the guidance of the links, of a link bending or doubling jaw, as 49, also having a groove that coacts with the former groove to form a continuous channel-way for the link passing from said guide to the central aperture in the table, substantially as described.

12. The combination, with the slide 44, provided with studs 6, of the carriage 46 and needle 7, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JULIUS KINDER.

Witnesses:
EDWARD KLINCKHARD,
WILLIAM EDGE.