May 6 1924. 1,493,103

G. A. CARLSON

SWAGING MACHINE

Filed Feb. 20, 1920 8 Sheets-Sheet 1

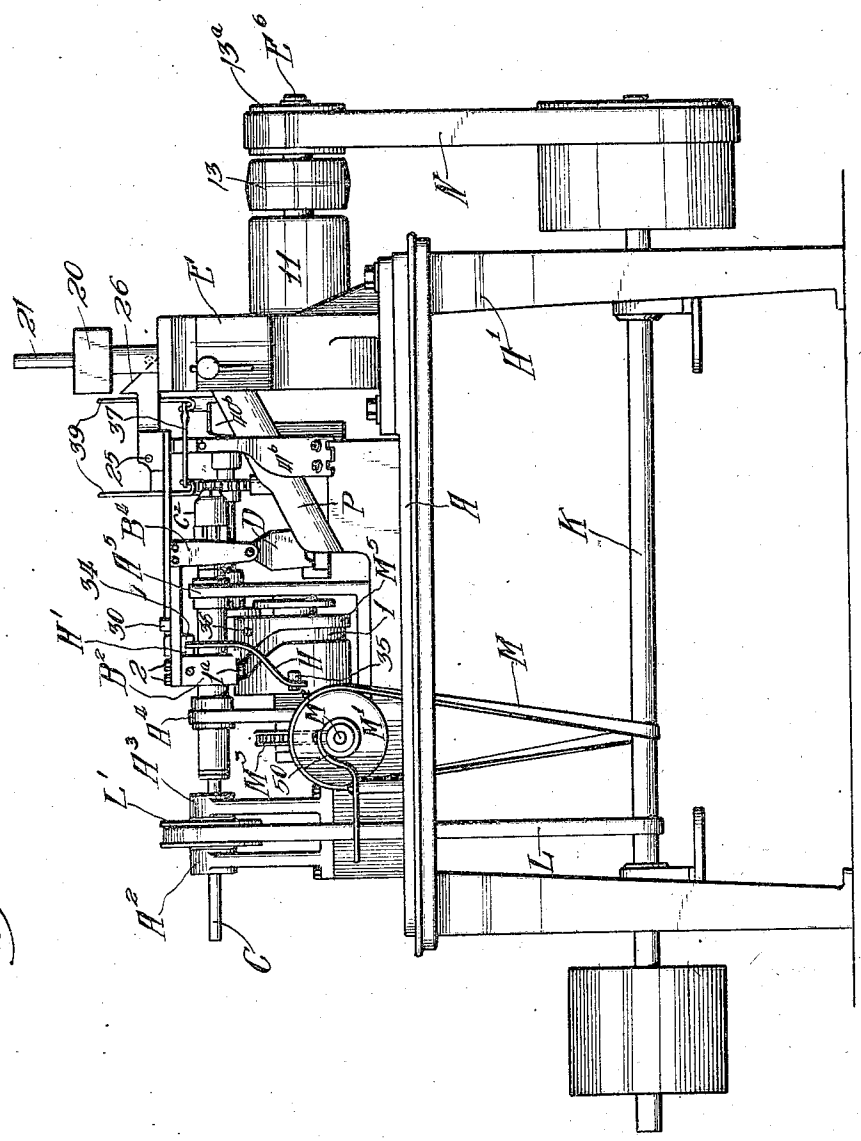


Fig. 1

Witness:
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G. A. CARLSON

SWAGING MACHINE

Filed Feb. 20, 1920 8 Sheets-Sheet 2

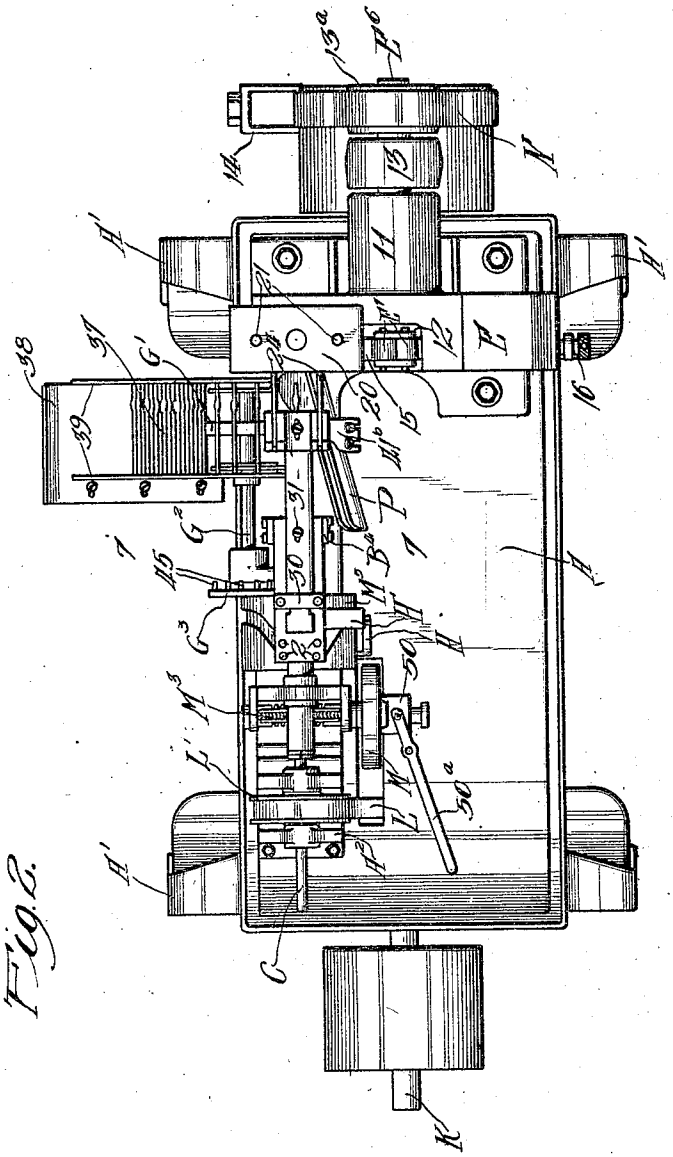


Fig. 2.

Witness:
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May 6, 1924.

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G. A. CARLSON

SWAGING MACHINE

Filed Feb. 20, 1920

8 Sheets-Sheet 3

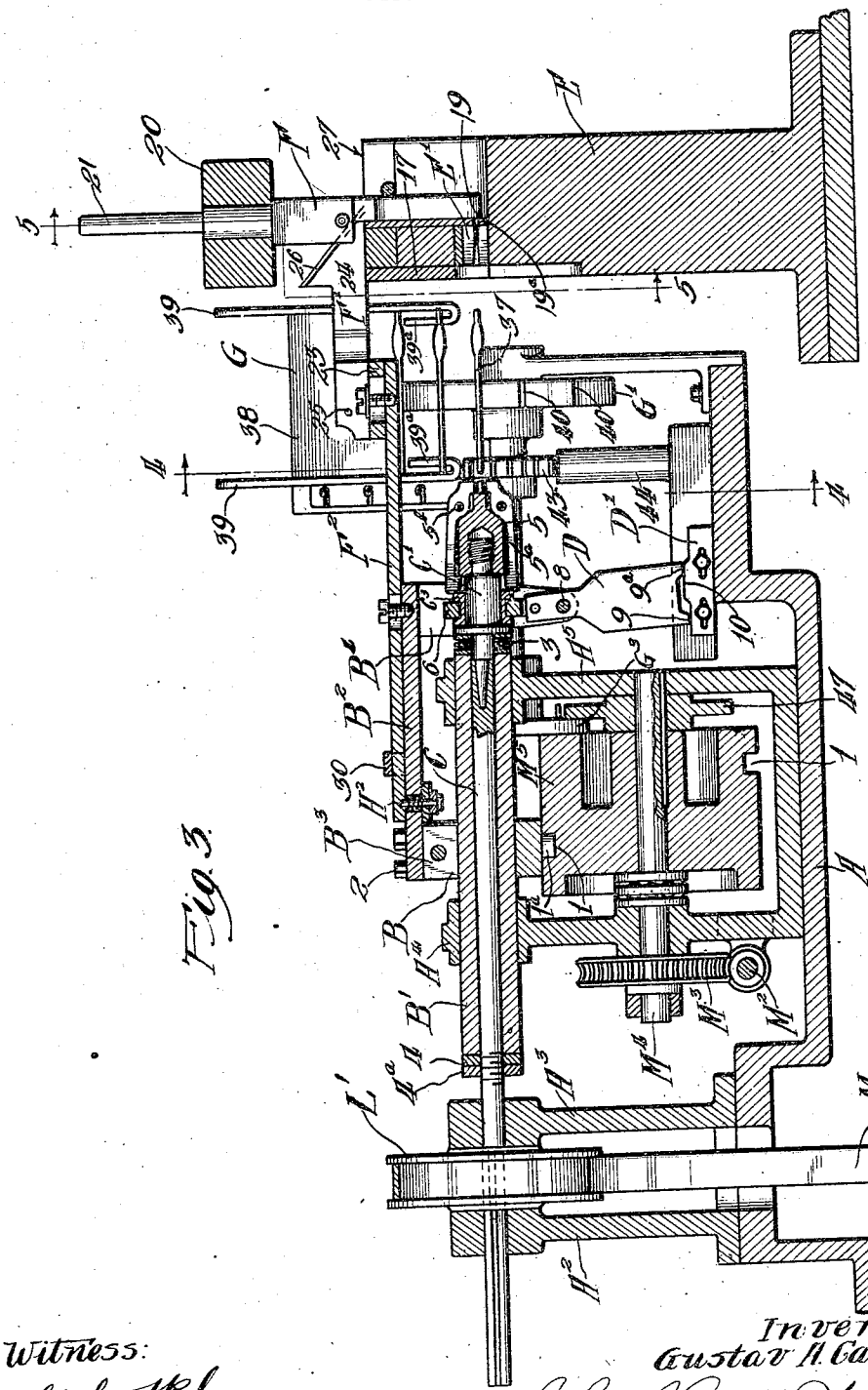


Fig. 3.

Witness:
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May 6, 1924.

1,493.103

G. A. CARLSON

SWAGING MACHINE

Filed Feb. 20, 1920

8 Sheets-Sheet 4

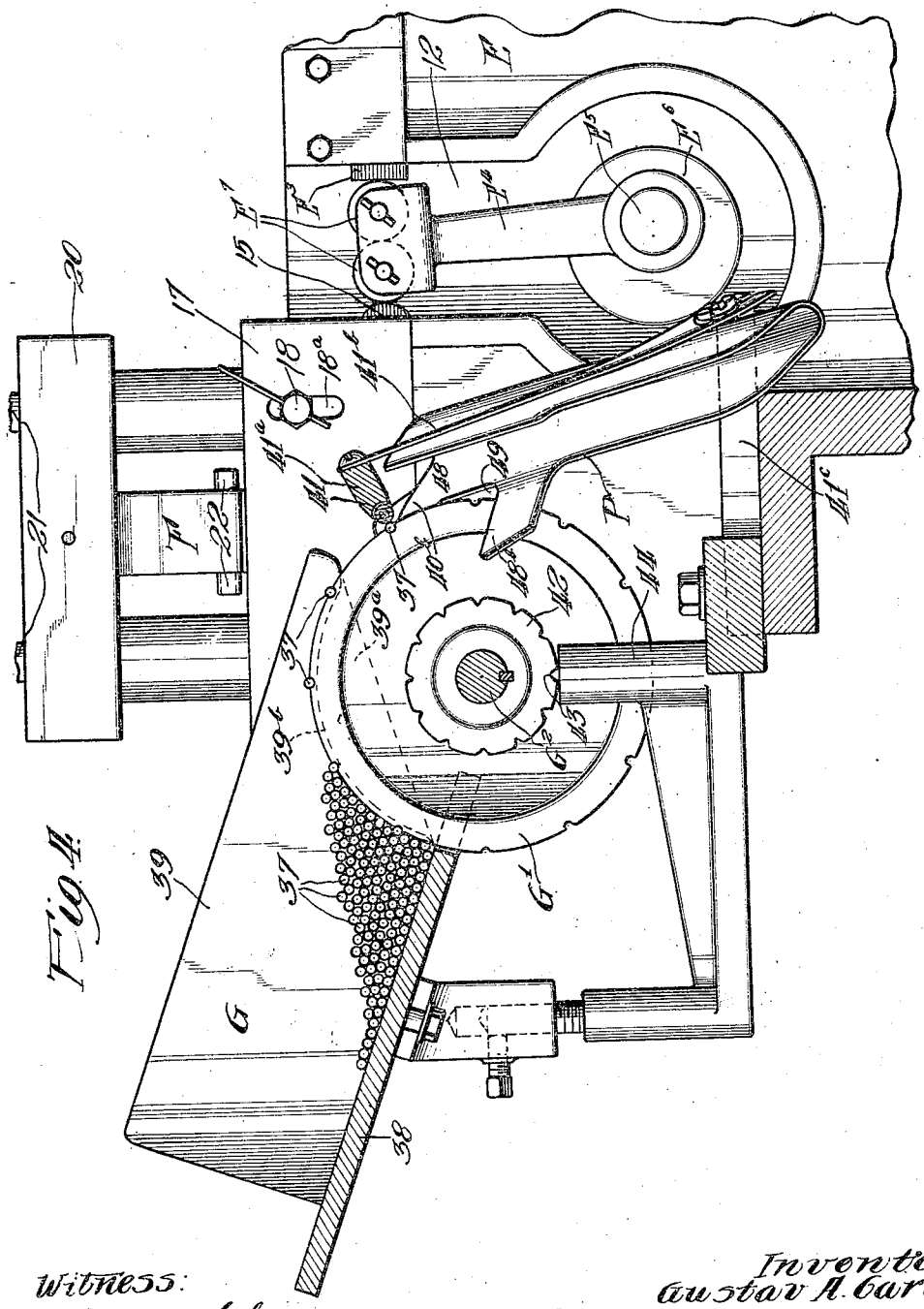


Fig. 4.

Witness:
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May 6, 1924. 1,493,103

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SWAGING MACHINE

Filed Feb. 20, 1920 8 Sheets-Sheet 5

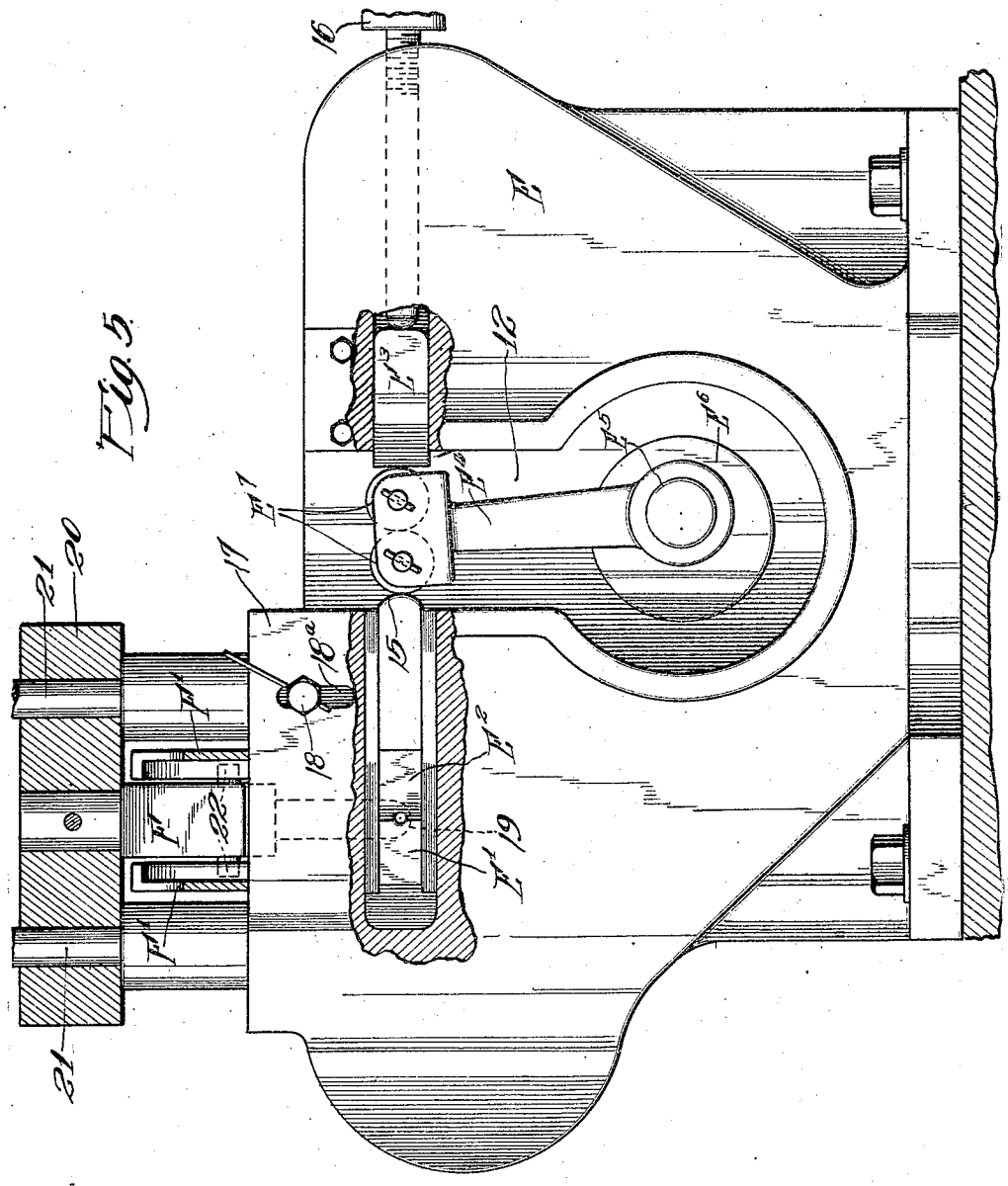


Fig. 5.

Witness:
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Attys

May 6, 1924. 1,493,103

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SWAGING MACHINE

Filed Feb. 20, 1920 8 Sheets-Sheet 6

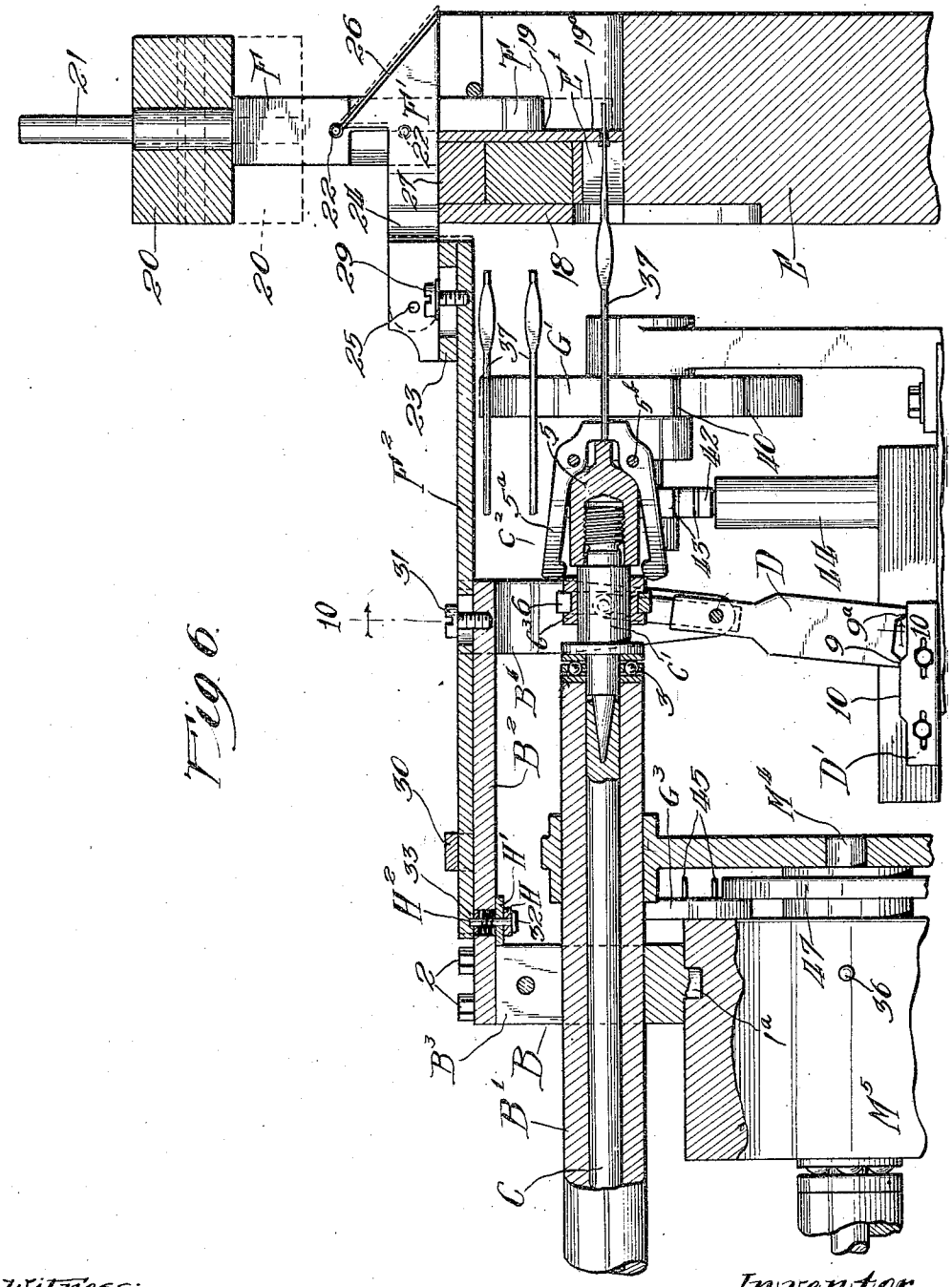


Fig. 6.

Witness:
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May 6, 1924. 1,493,103

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SWAGING MACHINE

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Fig. 8.

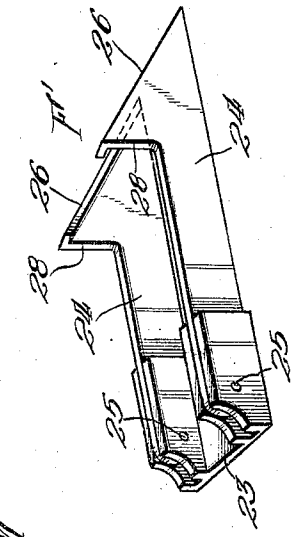
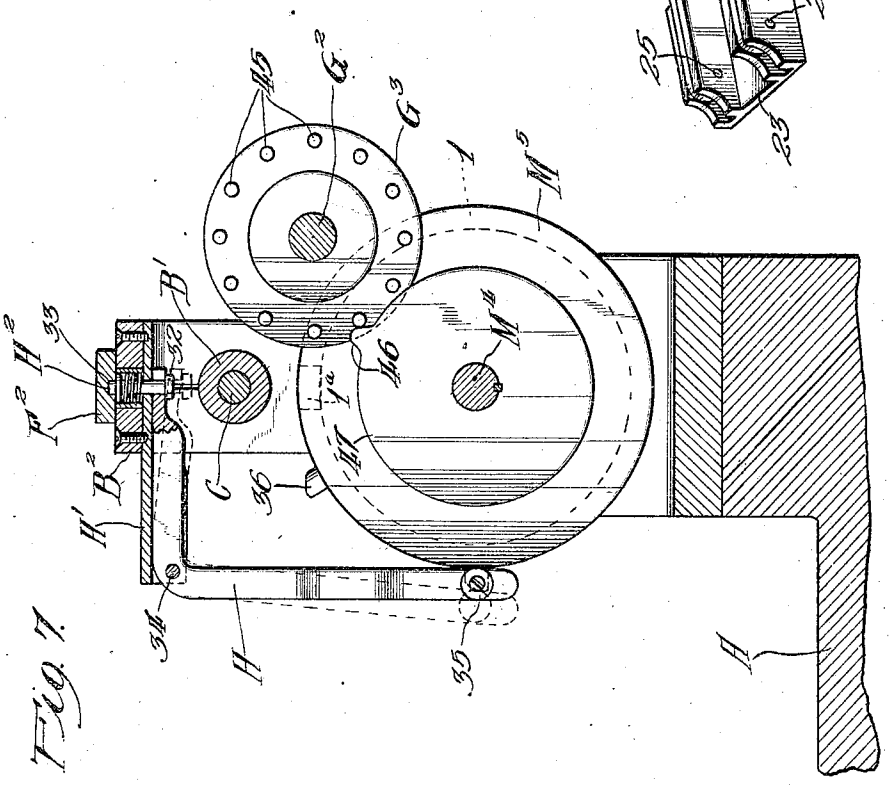


Fig. 7.



Witness:
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G. A. CARLSON

SWAGING MACHINE

Filed Feb. 20, 1920 8 Sheets-Sheet 8

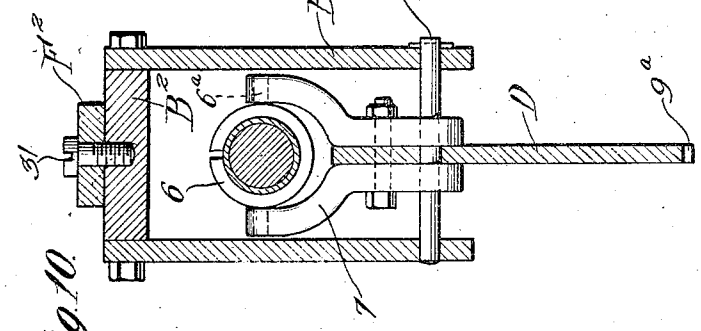


Fig. 10.



Fig. 12.



Fig. 11.

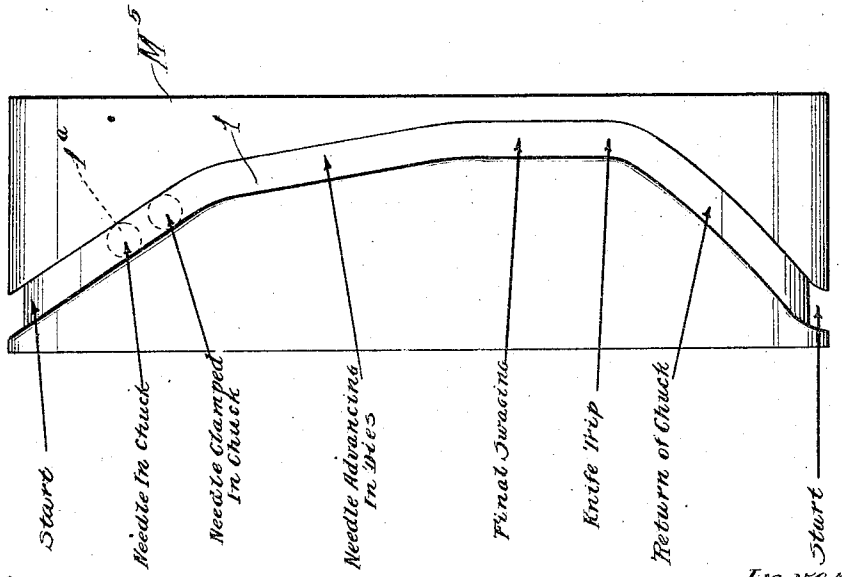


Fig. 9.

Witness:
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Inventor
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By Dyrenforth, Lee, Christy & Wiles Attys.

Patented May 6, 1924. 1,493,103

UNITED STATES PATENT OFFICE.

GUSTAV A. CARLSON, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE BOYE NEEDLE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

SWAGING MACHINE.

Application filed February 20, 1920. Serial No. 360,117.

To all whom it may concern:

Be it known that I, GUSTAV A. CARLSON, a citizen of Sweden, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Swaging Machines, of which the following is a specification.

This invention relates particularly to swaging machines adapted to swage small shafts, or steel rods, such, for instance, as may be employed in the manufacture of crochet needles.

The primary object of the invention is to provide an automatic machine of the character indicated, which is simple in construction, reliable in operation, and capable of producing large output. The accompanying drawings illustrate a machine embodying the invention, which is capable of operating upon a crochet needle blank of the form shown in Fig. 11, and producing a tapered end, as illustrated in Fig. 12.

In the drawings,—

Fig. 1 represents a side elevational view of a swaging machine embodying the invention in its preferred form; Fig. 2, a plan view of the same; Fig. 3, a vertical longitudinal sectional view, on an enlarged scale; Fig. 4, an enlarged broken transverse sectional view taken as indicated at line 4 of Fig. 3; Fig. 5, an enlarged sectional view taken as indicated at line 5 of Fig. 3 and showing the swaging mechanism; Fig. 6, an enlarged broken longitudinal sectional view similar to Fig. 3, but showing the carriage in advanced position and the crochet needle undergoing a swaging operation, this view showing the condition at the instant preceding the release of the trimming knife, which serves to trim the reduced end of the needle; Fig. 7, a broken transverse vertical sectional view illustrating the means for actuating the feed device which serves to feed the needles to the chuck employed; Fig. 8, a perspective view of a cam-device employed for elevating the trimming knife and permitting the same to drop at the proper instant; Fig. 9, a development of a cam-wheel employed; Fig. 10, a vertical sectional view taken as indicated at line 10 of Fig. 6 and illustrating the means for automatically opening and closing the chuck; Fig. 11, a perspective view of a crochet needle blank which is to be swaged; and Fig. 12, a perspective view of the same after the swaging operation has been performed.

It may be stated here that needle blanks of the form shown in Fig. 11 are produced by means of a suitable machine operating upon a small steel rod, or heavy steel wire, and that a quantity of such blanks are placed in a suitable hopper with which the machine herein described is provided, and these blanks are automatically fed to a reciprocating chuck which is provided with automatically-actuated jaws; and each blank, in turn, is carried forwardly by the chuck and its advance end is fed between an anvil-die and a rapidly reciprocating hammer-die, by means of which the swaging operation is performed, the needle rotating with the chuck during the swaging operation; and after the swaging operation has been completed, a trimming knife drops and trims off the waste end of the needle, after which the chuck returns to its initial position and releases the needle, which, upon the next step of the feed-wheel, is dislodged from the feed-wheel and drops into a discharge chute.

In the preferred embodiment, which is illustrated, A represents the bed of a machine-frame, mounted on legs A′, and equipped with standards A^2, A^3, A^4, and A^5; B, a reciprocating carriage comprising a sleeve B′ which reciprocates in bearings with which the standards A^4 and A^5 are provided, and a bar B^2 which is mounted on a clamping-ring B^3 secured to the sleeve B′; C, a rotating shaft which is journaled in the sleeve B′ and which reciprocates therewith; C′, a chuck-shank which is detachably entered in a socket with which the front end of the shaft C is provided; C^2, an automatically opening and closing chuck carried by the member C′; C^3, an automatically shifted collar which serves to operate the levers, or jaws, of the chuck; D, a lever, or trigger, which is pivotally mounted on a hanger B^4 carried by the bar B^2 of the carriage (Figs. 1 and 10); D′, a fixed cam-member mounted on the frame and serving to actuate the chuck-clamping and releasing lever D; E, a heavy standard mounted on one end of the frame of the machine and serving to carry the swaging mechanism and the trimming knife; E′, a fixed swaging die (Fig. 5), which may be termed the anvil-die; E^2, a

reciprocating swaging die, which may be termed the hammer-die; E^3, an adjustable abutment; E^4, a pitman actuated by an eccentric E^5 of a shaft E^6, the free end of said pitman being equipped with rollers E^7, which operate between the abutment E^3 and the hammer-die, and thus serve to actuate the hammer die; F, a trimming knife mounted on the standard E and adapted to be lifted and dropped by means of a cam-device F′ actuated by a bar F^2 which is shiftably mounted on the bar B^2 of the carriage; G, a needle-blank hopper associated with a feed-wheel G′ which serves to pick the needle-blanks therefrom and carry them into position to enable them to be gripped by the chuck, the wheel G′ being mounted on a shaft G^2 which is equipped with a wheel G^3, in the nature of a star wheel, adapted to be turned in a step-by-step manner; H, a trip-lever which is pivotally mounted on a bracket H′ carried by the bar B^2, and which serves to actuate a catch-device H^2 which forms a releasable connection between the bar B^2 of the carriage and the bar F^2 which actuates the cam-device F′ for elevating and tripping the knife; K, the main power shaft of the machine; L, a belt actuated by the shaft K and serving to actuate the pulley L′ which is splined on the chuck-shaft C; M, a belt actuated by the shaft K and which serves to actuate a pulley M′ mounted on a shaft M^2, which, through the medium of a worm and gear M^3, serves to actuate a shaft M^4 which extends parallel with the shaft C and which is equipped with a cam-wheel, or drum, M^5, which serves to reciprocate the carriage B; and N, a belt actuated by the shaft K and serving to actuate the shaft E of the swaging mechanism.

The frame of the machine may be of any suitable construction, and the bed A is of suitable design to support the standards which carry the operative parts.

The reciprocating carriage B is actuated by the cam-wheel M^5, which is provided with a peripheral cam-groove 1, engaged by a cam-stud 1^a which depends from the member B^3, which is clamped to the tubular member B′, which thus reciprocates with the member B^3. The bar B^2 of the carriage is fixedly secured to the member B^3 by means of cap-screws 2. At the front end of the sleeve B′ a thrust-bearing 3 is interposed between the chuck-member C′ and the sleeve. At the rear end of the sleeve B′, the shaft C is equipped with an adjustable bearing collar 4 and a lock-nut 4^a. Thus, reciprocation of the shaft C with the sleeve B′ is effected, it being understood that the shaft C rotates continuously in the sleeve.

The chuck C^2 comprises an internally-threaded mounting 5 which screws on to a threaded extension in the member C′; and gripping levers 5^a mounted on pivots 5^b carried by the member 5. The front ends of the levers 5^a are suitably shaped to grip the rear end of the crochet-needle blank. The rear ends of the levers 5^a are provided with cam surfaces adapted to be engaged by the shiftable collar C^3. The collar C^3 is mounted to slide on the chuck-member C′, and is provided with a peripheral groove in which is mounted a ring 6, which is provided with laterally-projecting studs 6^a (Fig. 10), engaged by the arms of a yoke 7 with which the upper end of the chuck-clamping lever D is equipped. The lever D is supported on a pivot 8 carried by the members B^4 which depend from the front end of the bar B^2 of the carriage. The blanks for the crochet needles are delivered by the wheel G′, in turn, in the path of the chuck; and as the chuck moves forward, the lever D shifts the collar C^3 forwardly and causes the levers 5^a to grip the rear end of the blank. In the further forward movement of the chuck, the front end of the blank is fed into the dies, and in the return movement of the chuck the needle is withdrawn from the dies and the lever D operates to shift the collar C^3 rearwardly and effect release of the levers from the needle. The cam-member D′ has its lower end provided with two projections 9 and 9^a, the former of which engages a projection 10, with which the member D′ is provided as the chuck is carried forwardly, and the latter of which engages said projection 10 as the chuck is carried rearwardly.

The standard E preferably comprises a heavy cast-metal member which is sufficiently strong to serve as a mounting for the swaging mechanism. This standard is equipped with a bearing 11 for the actuating shaft E^6 of the swaging mechanism, and is provided with a vertical channel 12 through which the pitman E^4 works. The shaft E^6 is equipped with a tight pulley 13 and a loose pulley 13^a; and the belt N may be shifted by means of a belt-shifter 14. The shaft E^6 is so geared to the shaft K that said shaft E^6 will rotate very rapidly, and thus cause the hammer-die to operate rapidly. The rollers E^7 are suitably journaled in the upper end of the pitman E^4, as shown in Fig. 5. As the pitman reciprocates, the rollers pass first above and then below a horizontal plane containing the axis of the hammer-die E^2 and the abutment E^3. The rear end of the shank of the hammer-die E^2 is rounded, as indicated at 15. It will be understood that the pitman, thus equipped with rollers, acts as a wedge-member between the abutment E^3 and the hammer-die, and that two blows will be imparted to the hammer die at each complete reciprocation of the pitman. The resilience of the metal tends to separate the die E^2 from the die E′ after each impact,

and the needle-blank is readily fed, or forced forward, by the rotating chuck as it advances. The abutment E^3 is adjustable through the medium of an adjusting screw 16. The dies are located in a suitable horizontal passage, or chamber, with which the casting E is provided. One wall of this chamber is afforded by a removable plate 17 which is secured in place by a set-screw 18. The plate is provided with a slot 18^a, which is engaged by the set-screw, so that the plate may be lifted, when the set-screw is loosened, to afford access to the dies.

The knife F comprises a heavy bar which works in a suitable guide and is provided with a shearing edge, or corner, 19, which co-acts with a shearing member 19^a, provided with a perforation through which the end of the swaged needle may project beyond the dies. The knife is equipped with a weight 20, which constitutes a cross-member which is provided with perforations which engage the guides 21 which extend upwardly from the standard E. The shank-portion of the knife is equipped with laterally-projecting cam-studs 22 which are adapted to be engaged by the wedge-shaped cam F′. The cam F′ comprises a clip 23 and arms 24 connected, by means of pin 25, with the clip 23. The arms 24 are equipped at their advance ends with inclined flanges 26, upon which the cam-studs 22 ride, in the operation of lifting the knife. The cam-members 24 ride upon a surface 27 at the upper portion of the standard E. These members are in the form of half spear-heads, and afford abrupt shoulders 28 at the rear ends of the inclines.

The clip 23 is adjustably secured to the front end of the bar F^2 by slot-and-screw connection 29. The bar F^2 is mounted in a guide 30 with which the bar B^2 of the carriage is equipped; the bar B^2 is further equipped with a stud, or screw, 31, which freely engages a slot with which the bar F^2 is provided. Thus, the bar F^2 may move with relation to the bar B^2, assuming the catch-device H^2 to be released. The catch-device H^2 comprises a spring-held stud 32 whose upper end engages a recess 33 with which the rear end of the bar F^2 is provided. The stud is adapted to be released by the bell-crank lever H, which is mounted on a pivot 34 (Figs. 1, 6 and 7), carried by the member H′, which, in turn, is carried by the bar B^2 of the carriage. The long arm of the bell-crank lever H depends in front of the cam-wheel M^5 and is bent, as illustrated in Fig. 1. The extremity of the long arm is equipped with a cam-roller 35, which is adapted to be engaged by a cam-stud 36, with which the cam-roller M^5 is equipped. This engagement occurs after the swaging operation has been completed and the carriage is at the forward end of its traverse. The result is to release the catch H^2 from the bar F^2 just after the centers of the studs 22 of the knife have passed the apex of the wedges of the cam-members F′, that is, when the parts are in the position shown in Fig. 6. The bar F^2 being thus released from the catch H^2 will be suddenly shifted by the weight of the knife, and the knife will drop and sever the waste end of the needle. In the return movement of the carriage, the flanges 26 ride over the studs 22 of the knife, the pivotal connections 25 permitting the members 24 to be raised during the return movement. When the carriage again moves forward, the weight of the knife on the inclined portions 26 of the members F′ is sufficient to hold the bar F^2 until it is again latched to the bar B^2 of the carriage.

The hopper, or receptacle, G, for the needle blanks 37 comprises an inclined bottom member 38, and side members 39. The side members 39 are sheet-metal members which have their front lower corners bent inwardly and upwardly, as indicated at 39^a in Fig. 3. Thus, there are provided inside of the front ends of the walls 39 the upturned members 39^a, and these members are trimmed to provide curved edges 39^b.

The feed-wheel G′ comprises a comparatively narrow metal disk, which is provided in its periphery with needle-receiving grooves 40, which extend parallel with the axis of the wheel. The needle-blanks gravitate to the lower end of the hopper and tend to bear against the curved edges of the flanges 39^a. The periphery of the wheel projects slightly beyond the curved edges of said flanges, however, and thus the needles enter the notches of the wheel and are elevated and carried around by the wheel in the manner illustrated in Fig. 4. At the point where the needle-blank is picked up by the chuck, there is provided a presser member 41 in the form of a roller mounted in a member 41^a carried by a spring 41^b, which is secured to a bracket 41^c. The roller 41 is adapted to ride on the periphery of the wheel G′ as the wheel rotates, and to engage the needle-blank when it arrives at the position where it is to be chucked. The wheel G′ is disposed centrally between the flanges 39^a of the hopper, and it will thus be understood that the needle-blanks are supported at intermediate portions by the wheel and are engaged, in turn, by the presser member 41 when they arrive at the chucking position.

The shaft G^2 of the wheel G′ is equipped with a peripherally-notched locking wheel 42, the notches of which are adapted to be engaged by a spring-pressed pawl 43 mounted in a support 44. The pawl 43 is adapted to properly center the feed-wheel G′, that is, to insure just the proper angular rota-

tion to insure the proper position of the needle-blank in alinement with the axis of the chuck.

The star wheel G^3 which is secured to the shaft G^2 of the feed-wheel G′ is equipped with a circular series of studs 45 (Fig. 7), which are spaced at equal distances apart. These studs are adapted to be engaged by a tooth 46 on the periphery of a wheel, or disk, 47, mounted on the shaft M^4. Thus, at each revolution of the shaft M^4, the feed-wheel G′ will be advanced one step. This movement occurs during the return movement of the chuck and after the needle, which has been swaged, is released from the chuck.

After the needle-blank has been swaged and released from the chuck, it is carried downwardly from its position beneath the presser member 41 (Fig. 4) and discharged into a discharge chute P, whose upper end is located just below the presser member 41. The chute P inclines downwardly and rearwardly. It has an extension 48 which is disposed just beneath the presser member 41 and passes the front side of the wheel, and at a lower point there is a guide-member 48^b which is disposed adjacent the rear side of the wheel, thus forming a crotch 49, which loosely embraces the periphery of the wheel. The front end-portions of the needle-blanks engage the inclined member 48 and tilt the needles, and the member 40^b insures the dislodging of the needles from the wheel, and throws them into the chute P, down which they gravitate to any suitable receptacle (not shown).

The shaft M^2 is shown equipped with a clutch 50 equipped with a lever 50^a, by means of which the operation of the cam-wheel M^5 may be controlled.

The operation may be described briefly. The needle-blanks 37 are placed in the hopper G and gravitate against the periphery of the feed-wheel G′, which picks up blanks and carries them, in turn, to a position beneath the presser member 41 and in alinement with the axis of the chuck. The chuck rotates continuously, and reciprocates with the carriage B, which is actuated by the cam-wheel M^5. After the front ends of the clamping levers of the chuck have reached a position to embrace the rear end of the needle-blank, the trigger, or lever, D, is actuated by the cam member D′, causing the levers to clamp the needle-blank. In the further advance movement of the chuck, the needle-blank is shoved longitudinally through the peripheral groove of the wheel, while the presser member 41 bears against the needle-blank, and the front end of the needle-blank is caused to enter the space between the swaging dies. The swaging dies have a continuous relative reciprocation, that is, the hammer-die E^2 is continuously reciprocated by the roller-equipped pitman E^4, which imparts a very rapid vibration and is capable of exerting very strong swaging pressure. The movement of the hammer-die is, of course, slight. Because of the rapid vibration, the dies make only instantaneous swaging contact with the needle-blank, so that the forward feed of the needle blank is not interrupted. As the carriage moves forwardly, the cam-members F′ elevate the knife F; and after the swaging operation has been completed, and at the proper instant, the trip-lever H is moved to release the catch H^2 and permit the cam-members F′ to suddenly release the knife and to permit it to drop. In the return movement of the carriage, the needle-blank is withdrawn from the dies, and the flanges 26 of the cam-members F′ ride idly over the cam-studs 22 of the knife. At the proper instant, the gripper-actuating collar C^3 is shifted rearwardly by the trigger D, causing the chuck to release the needle. The feed-wheel G′ then rotates through another step, bringing a fresh needle-blank into alinement with the axis of the chuck, and discharging the needle-blank which has been swaged.

In Fig. 12, 37^a designates the needle-blank after it has been swaged by means of the improved machine. It may be explained that the tapered extremity of such blank may be formed, in a suitable machine, into a small hook, a further trimming operation being performed if necessary, to complete the crochet hook.

In Fig. 9 is shown a development of the cam-wheel M^5. The diagram there given indicates the position of the cam-stud 1^a in the cam groove 1 of the wheel M^5 when the various operations of chucking the needle, advancing it into the dies, performing the swaging operation, tripping the knife, and withdrawing the needles, are performed. The first portion of the advance is rapid, the advance of the extremity of the needle-blank through the dies is comparatively slow, and the movement of the retraction of the carriage and withdrawal of the needle-blank is rapid.

The improved machine operates rapidly and economically to automatically swage the needle-blanks. The machine is of high capacity, and is reliable in operation. The swaging mechanism is powerful and serves to operate the dies at an exceedingly rapid rate, without injury to the parts.

The improved swaging mechanism may be advantageously employed, regardless of the means by which blanks are fed to and withdrawn from the swaging mechanism; also, the improved feed mechanism for delivering blanks to the reciprocating rotary chuck may be advantageously employed in analogous machines; also, the feed of a

reciprocating rotary chuck for advancing and retracting the article to be operated upon by the machine, associated with means for intermittently feeding blanks or articles to the chuck, may be advantageously employed in connection with other mechanism than swaging mechanism. For instance, this principle may be employed in connection with buffing mechanism, or polishing mechanism. The principle of intermittently feeding blanks to a rotary chuck which operates to automatically advance the blanks and rotate them while some operation is performed upon the blanks is one which may be advantageously employed in various situations.

The improved machine is well adapted to the purpose of swaging a shaft-like member, or blank, such as is used in forming crochet hooks, for example. The term "shaft" is used in some of the appended claims in the sense of a blank, or piece of stock of this general character which is to be subjected to a swaging operation.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitation should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What I regard as new and desire to secure by Letters Patent is:

1. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck, an intermittently rotated feed-wheel provided with peripheral grooves extending parallel with its axis, said grooves being adapted to receive shafts, carry them, in turn, to a point in alinement with the axis of the chuck and to serve as a guide for the shaft during the advance and return movements of said shaft when reciprocated by said chuck.

2. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck equipped with automatically-actuated clamping means, an intermittently actuated rotary feed-wheel equipped with peripheral grooves adapted to receive shafts to be swaged, a presser member adapted to hold each shaft, in turn, in its groove during the advance and return movements of the shaft, and a discharge chute disposed below the presser member and adapted to receive the shafts as they are discharged from the feed wheel.

3. The combination with a swaging mechanism, of a reciprocating rotary chuck adapted to project the article to be swaged into the dies and then retract it while the article is rotated by the chuck, and automatically actuated trimming means associated with the dies of the swaging mechanism.

4. The combination with swaging mechanism, of a reciprocating rotary chuck adapted to project the article to be swaged into the dies and then retract it while the article is rotated by the chuck, a vertically movable trimming knife associated with the dies of the swaging mechanism, and a knife-elevating device adapted to lift the knife during the advance movement of the chuck and permit the knife to drop after the completion of the swaging operation.

5. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating carriage, a rotary chuck reciprocating therewith and equipped with automatic clamping means, a feed-device serving automatically to deliver the articles to be swaged to the chuck, a reciprocable trimming knife associated with the dies, and a cam-device actuated by said carriage and serving to elevate and trip the knife.

6. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating carriage, a rotary chuck reciprocating therewith and equipped with automatic clamping means, a feed-device serving automatically to deliver the articles to be swaged to the chuck, a reciprocable trimming knife associated with the dies, a bar shiftably mounted on said carriage, a latching device for said bar equipped with means for automatically tripping the latch, and a cam device movably mounted on said bar and adapted to elevate and trip the knife.

7. In a machine of the character set forth, the combination with swaging mechanism, of a rotary cam-wheel, a reciprocating carriage actuated by said cam-wheel, a rotary chuck mounted in said carriage and reciprocating therewith, means for imparting continuous rotation to said chuck, means for automatically closing and opening the chuck during the advance and return movements thereof, feed mechanism adapted to automatically deliver needle-shafts to the chuck, a trimming knife associated with the dies of the swaging mechanism, a bar shiftably mounted on said carriage, a latch device for said bar equipped with a trip-member adapted to be actuated by said cam-wheel to release the latch, and a knife-elevating cam member actuated by said bar and serving to elevate and trip the knife.

8. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck equipped with clamping means, shiftable means associated with said chuck for actuating the clamping means, a cam-lever movable forward and back with the chuck and serving to actuate said shiftable means, and a stationary cam adapted to actuate said cam lever in both directions.

9. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocable carriage, means for actu-

ating the same, a chuck journaled in said carriage and reciprocating therewith, means for continuously rotating the chuck, a cam-lever mounted on said carriage adapted to open and close the chuck, and a stationary cam-device adapted to actuate said lever.

10. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck equipped with automatically-actuated clamping mechanism, and means for feeding shafts to the chuck, comprising an inclined hopper provided near the lower ends of its side walls with curved shoulders, a feed wheel having its periphery provided with grooves extending parallel with its axis, said wheel being disposed midway between the planes of the members affording said curved shoulders and the periphery of the wheel projecting into the hopper beyond the boundaries of said curved shoulders, and means for intermittently actuating said feed wheel.

11. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck equipped with automatically-actuated clamping mechanism, and means for feeding shafts to the chuck, comprising an inclined hopper provided near the lower ends of its side walls with curved shoulders, a feed wheel having its periphery provided with grooves extending parallel with its axis, said wheel being disposed midway between the planes of the members affording said curved shoulders and the periphery of the wheel projecting into the hopper beyond the boundaries of said curved shoulders, means for intermittently actuating said feed wheel, and a spring-held presser member adapted to engage the articles to be swaged as they arrive, in turn, in alinement with the axis of the chuck.

12. In a machine of the character set forth, the combination with swaging mechanism comprising dies affording a channel between them, of a reciprocating carriage, a rotary chuck mounted in said carriage and reciprocating therewith, said chuck having a shaft extending through the carriage and projecting in the rear thereof, a wheel connected with said shaft and serving to impart continuous rotation thereto, a cam-wheel having a shaft parallel with said first-named shaft and equipped with a cam-groove engaging a cam-member with which said carriage is equipped, means for imparting continuous rotation to said second-named shaft, a cam-lever carried by said carriage and serving to automatically open and close the chuck, and a feed-device interposed between the swaging mechanism and the chuck and serving to automatically deliver to the chuck articles to be swaged.

13. In a machine of the character set forth, the combination of a frame equipped at one end with a standard, an anvil-die and a hammer-die mounted in said standard, actuating means for the hammer-die having a forwardly-extending shaft, a carriage, a rotary chuck mounted in said carriage, means for continuously rotating said chuck, means for automatically closing and opening the chuck during the advance and return movements of the carriage, a cam-wheel having a shaft parallel with the axis of the chuck and provided with a peripheral cam-groove adapted to actuate said carriage, and a main drive-shaft journaled in said frame below the bed of the machine and geared to said cam-wheel and to the shaft of said hammer-die.

14. In a machine of the character set forth, the combination of a frame equipped at one end with a standard, an anvil-die and a hammer-die mounted in said standard, actuating means for the hammer-die having a forwardly-extending shaft, a carriage, a rotary chuck mounted in said carriage, means for automatically closing and opening the chuck during the advance and return movements of the carriage, a cam-wheel having a shaft parallel with the axis of the chuck and provided with a peripheral cam-groove adapted to actuate said carriage, and a main drive-shaft journaled in said frame below the bed of the machine and equipped with belts serving to actuate the shaft of the swaging mechanism, the cam-wheel, and the shaft of the chuck.

15. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck equipped with automatically-actuated clamping means, and means for automatically delivering needle-shafts to said chuck, comprising an inclined hopper, a feed-wheel provided with peripheral grooves, means for intermittently actuating said feed-wheel, and means for centering and locking the feed-wheel after each successive step.

16. In means of the character set forth, the combination with a reciprocating rotary chuck equipped with automatically actuated clamping means, of means for automatically feeding shafts thereto, comprising a wheel provided with peripheral grooves, means for intermittently actuating said wheel, means constructed and arranged to hold the shafts and permit the same to gravitate into a position across the periphery of said wheel, and means for centering and locking the wheel after each step of actuation.

17. In a machine of the character set forth, the combination with means for advancing and rotating a shaft to be swaged, of swaging mechanism comprising an anvil-die, a hammer-die, and a reciprocating pitman equipped with a roller which works across the rear end of the shank of the hammer-die and serves to actuate the hammer-die.

18. Swaging mechanism comprising a hammer-die equipped with a shank, an op-

posed abutment, one of said members having a rounded surface, and a reciprocating pitman equipped with rollers working as a wedge between said abutment and the shank of the hammer-die.

19. Swaging mechanism comprising a rotating shaft equipped with an eccentric, a pitman mounted on said eccentric and equipped with a pair of rollers, a hammer-die engaged by one of said rollers, and an opposed abutment engaged by the other of said rollers.

20. Swaging mechanism comprising a rotating shaft equipped with an eccentric, a pitman mounted on said eccentric, a hammer-die and an opposed abutment, one of which has a rounded surface with a central apex, and roller means carried by said pitman and adapted to work with wedging effect between said hammer-die and said abutment.

21. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating rotary chuck equipped with automatically-actuated clamping means, a carriage in which said chuck is mounted, a cam-wheel serving to actuate said carriage, a feed-wheel having an axis parallel with the axis of the chuck, a star wheel serving to actuate said feed wheel, and a wheel rotating with said cam-wheel and provided with a tooth adapted to actuate the star wheel one step at each revolution of the cam-wheel.

22. In a machine of the character set forth, the combination with swaging mechanism, of a reciprocating carriage, a rotary chuck reciprocating therewith and equipped with automatically-actuated clamping means, a trimming knife associated with the dies of the swaging mechanism, a bar shiftably connected with said carriage and equipped with a cam-device for elevating and tripping the knife, a latch-device connecting said bar with said carriage and equipped with a trip-arm, a cam-wheel serving to advance and retract the carriage, and a cam carried by said cam-wheel and serving to actuate said trip-arm.

23. In a machine of the character set forth, the combination of a reciprocating rotary chuck, an intermittently rotated feed-wheel provided with peripheral grooves extending parallel with its axis, said grooves being adapted to receive shafts, carry them, in turn, to a point in alinement with the axis of the chuck and to serve as a guide for the shaft during the advance and return movements of the shaft when reciprocated by said chuck.

24. In a machine of the character set forth, the combination of a reciprocating rotary chuck equipped with automatically-actuated clamping means, an intermittently actuated rotary feed-wheel equipped with peripheral grooves adapted to receive shafts to be swaged, a presser member adapted to hold each shaft, in turn, in its groove during the advance and return movements of the shaft, and a discharge chute disposed below the presser member and adapted to receive the shafts as they are discharged from the feed-wheel.

25. In a machine of the character set forth, the combination of a reciprocating rotary chuck equipped with clamping means, shiftable means associated with said chuck for actuating the clamping means, a cam-lever movable forward and back with the chuck and serving to actuate said shiftable means, and a stationary cam adapted to actuate said cam lever in both directions.

26. In a machine of the character set forth, the combination of a reciprocating rotary chuck equipped with automatically-actuated clamping mechanism, and means for feeding shafts to the chuck, comprising an inclined hopper provided near the lower ends of its side walls with curved shoulders, a feed-wheel having its periphery provided with grooves extending parallel with its axis, said wheel being disposed midway between the planes of the members affording said curved shoulders and the periphery of the wheel projecting into the hopper beyond the boundaries of said curved shoulders, and means for intermittently actuating said feed-wheel.

27. In a machine of the character set forth, the combination of a reciprocating rotary chuck with automatically-actuated clamping mechanism, and means for feeding shafts to the chuck, comprising an inclined hopper provided near the lower ends of its side walls with curved shoulders, a feed wheel having its periphery provided with grooves extending parallel with its axis, said wheel being disposed midway between the planes of the members affording said curved shoulders and the periphery of the wheel projecting into the hopper beyond the boundaries of said curved shoulders, means for intermittently actuating said feed wheel, and a spring-held presser member adapted to engage the articles as they arrive, in turn, in alinement with the axis of the chuck.

28. In a machine of the character set forth, the combination of a reciprocating rotary chuck equipped with automatically-actuated clamping means, and means for automatically delivering needle-shafts to said chuck, comprising an inclined hopper, a feed-wheel provided with peripheral grooves, means for intermittently actuating said feed-wheel, and means for centering and locking the feed-wheel after each successive step.

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