No. 689,520. Patented Dec. 24, 1901.

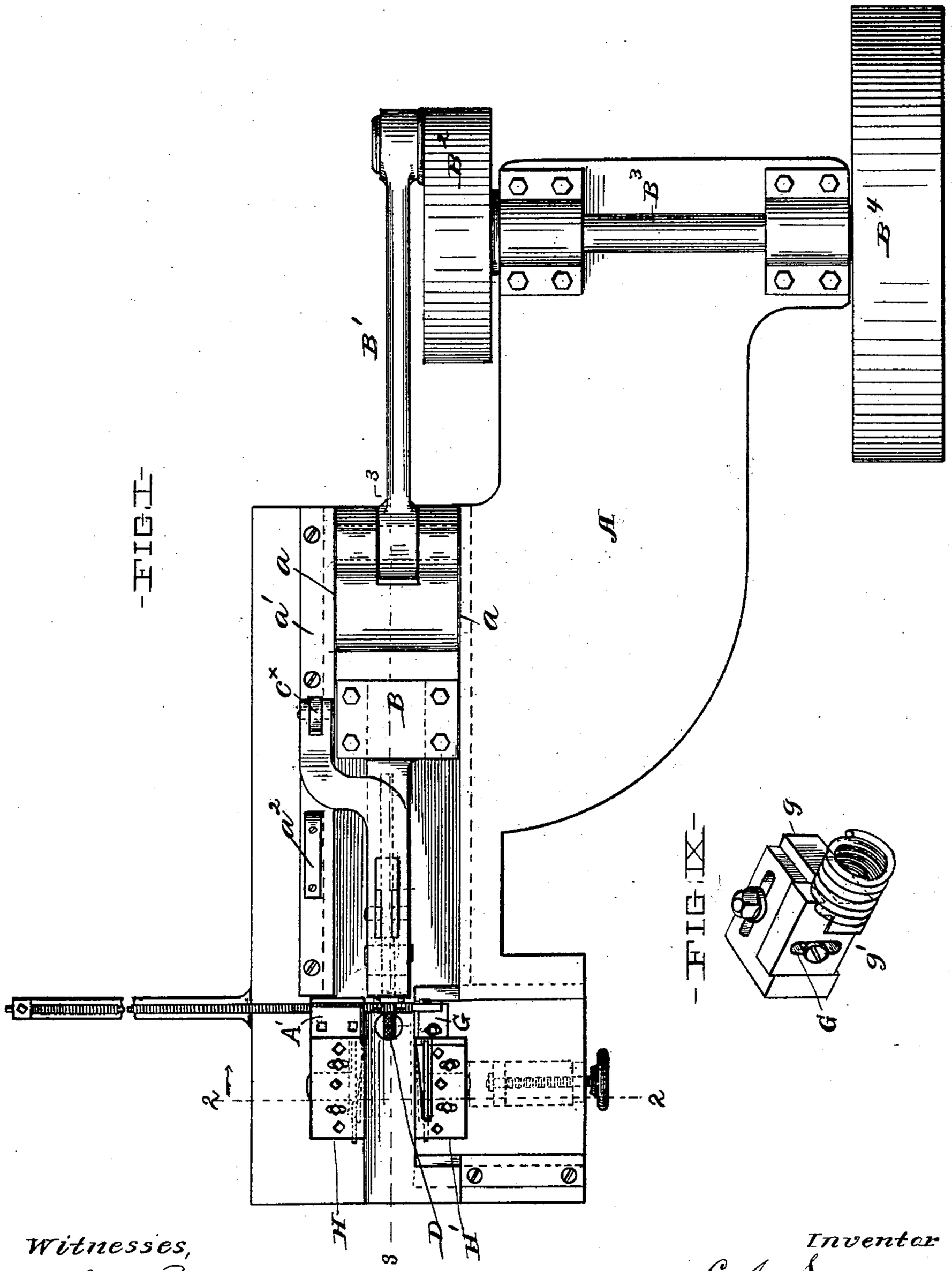
L. J. SANKER.

MACHINE FOR LOOPING SPRINGS.

(Application filed May 4, 1901.)

(No Model.) 3 Sheets—Sheet 1.

-FIG. I-



-FIG. IX-

Witnesses,
J. C. Turner
A. E. Merkel

Inventor
L. J. Sanker
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Atty.

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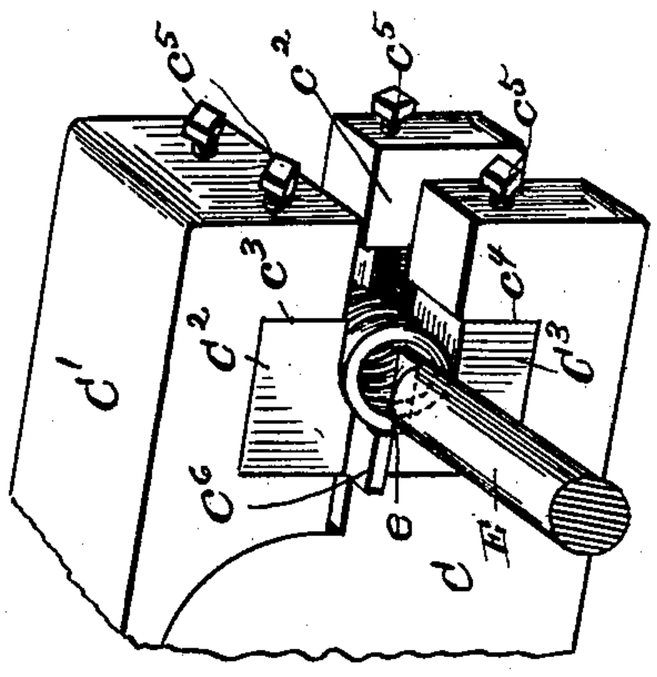
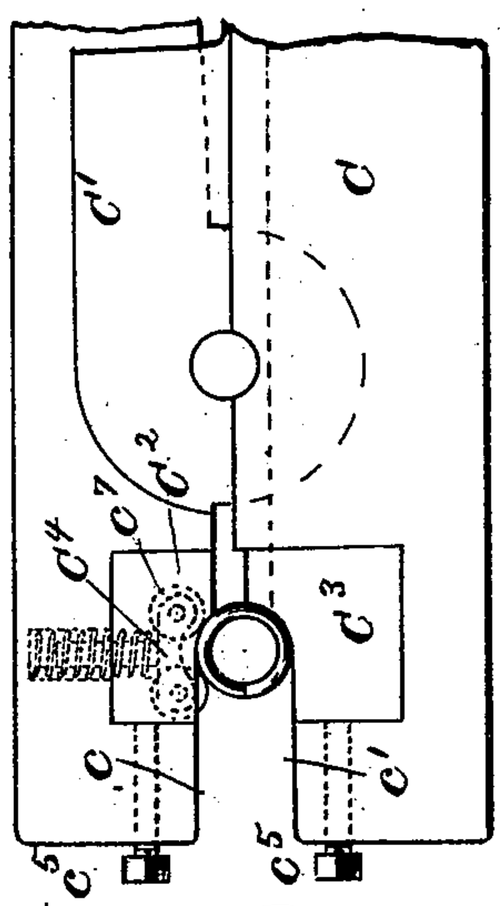
(No Model.) 3 Sheets—Sheet 2.

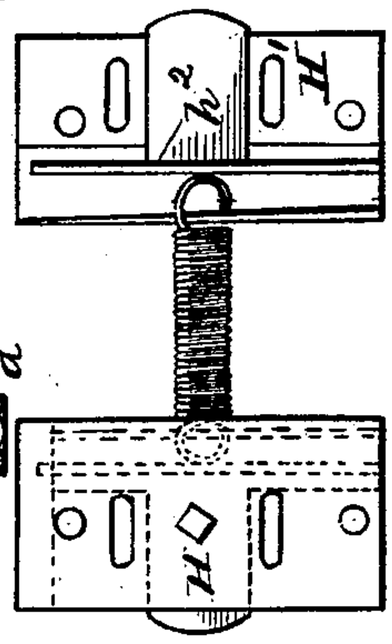
-FIG. V-



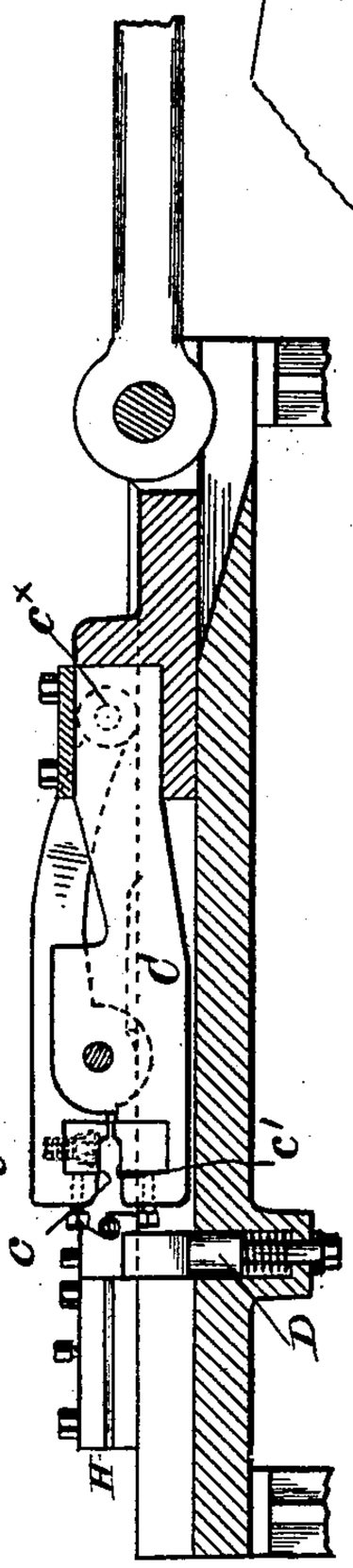
-FIG. VI-



-FIG. VII-

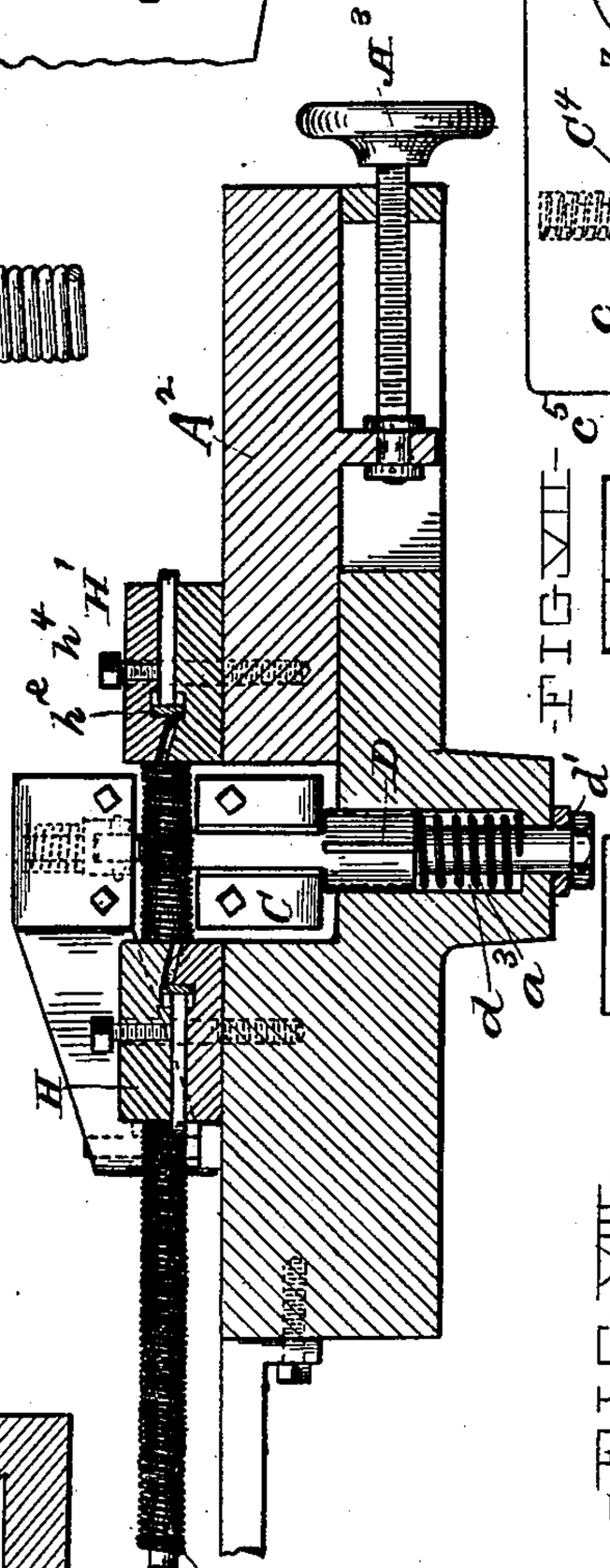


-FIG. III-

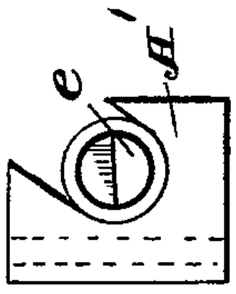


-FIG. IX-

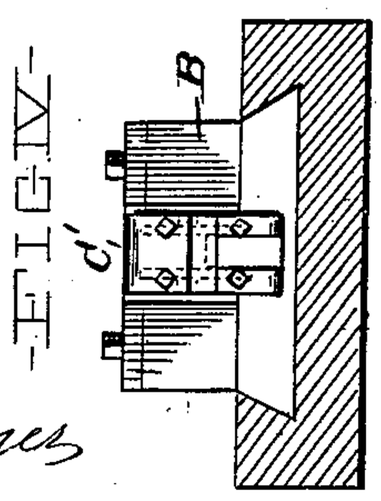
-FIG. II-



-FIG. VIII-



-FIG. IV-



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(No Model.) 3 Sheets—Sheet 3.

FIG. X

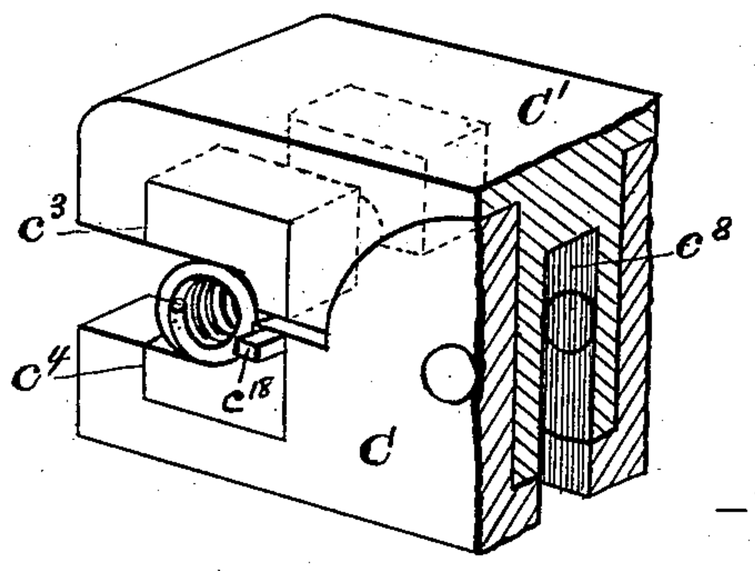


FIG. XIII

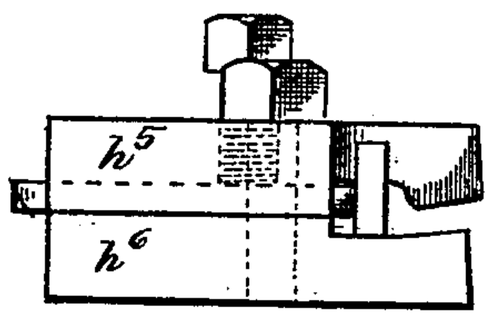


FIG. XI

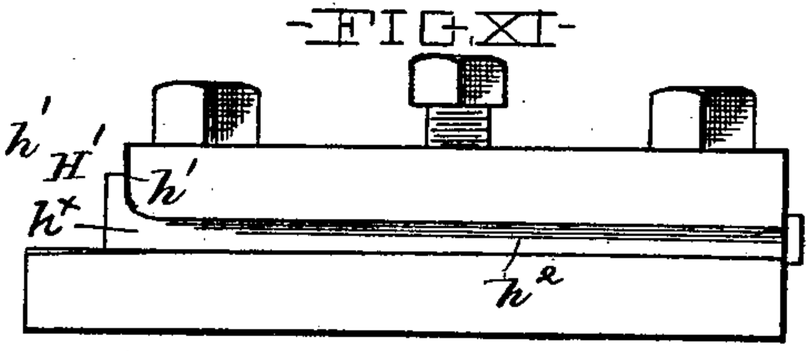


FIG. XIV

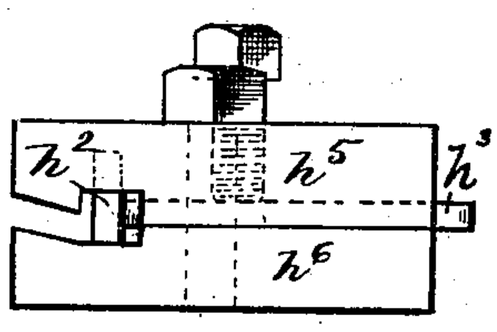


FIG. XV

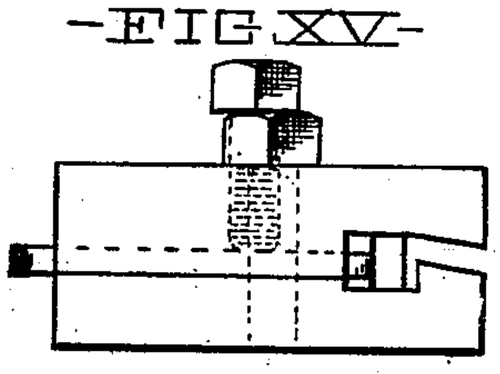


FIG. XII

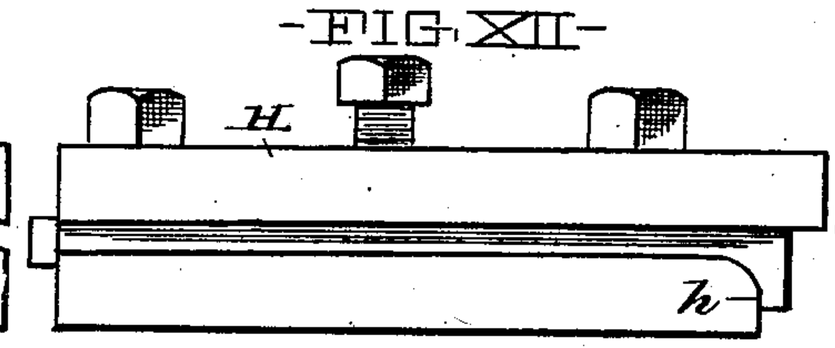


FIG. XVI

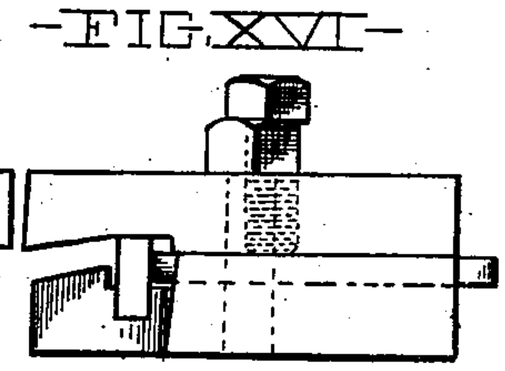
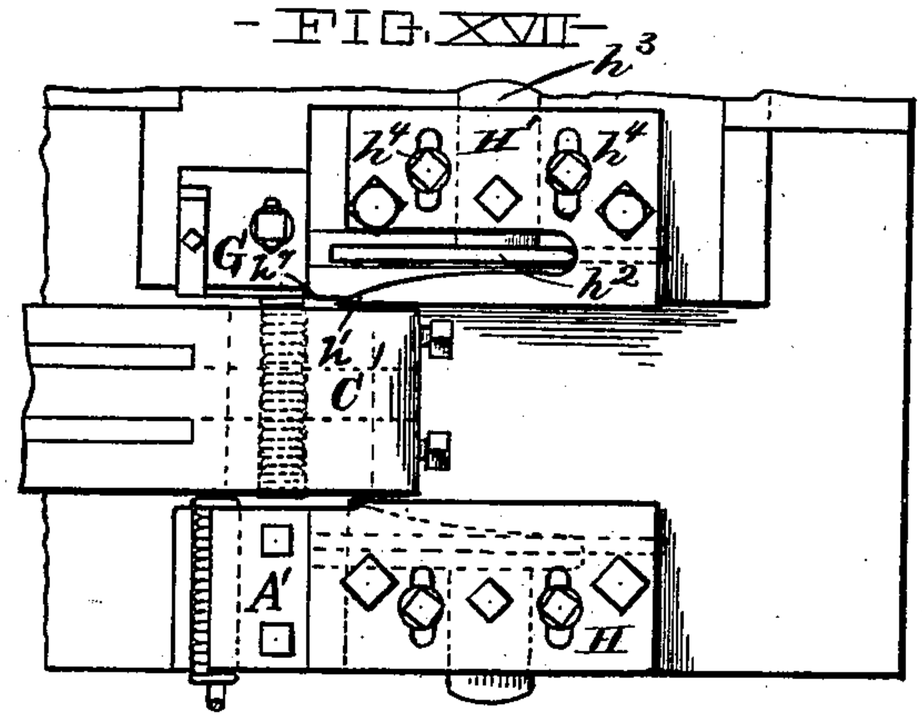


FIG. XVII



Witnesses,
J. C. Turner
A. E. Merkel

Inventor.
L. J. Sanker
By J. D. Fay
Atty.

UNITED STATES PATENT OFFICE.

LEONARD J. SANKER, OF CLEVELAND, OHIO.

MACHINE FOR LOOPING SPRINGS.

SPECIFICATION forming part of Letters Patent No. 689,520, dated December 24, 1901.

Application filed May 4, 1901. Serial No. 58,750. (No model.)

To all whom it may concern:

Be it known that I, LEONARD J. SANKER, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Machines for Looping Springs, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to machines for cutting and forming loops upon the ends of helical springs, its object being to economically effect such operation.

The said invention consists of means hereinafter fully described, and specifically set forth in the claims.

The annexed drawings and the following description set forth in detail one mode of carrying out the invention, the described means, however, constituting but one of various forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents a plan view of a machine for the above-described purpose embodying my invention. Fig. II represents a cross-sectional view, on an enlarged scale, taken upon the plane indicated by the line 2 2 in Fig. I looking in the direction indicated by the arrow. Fig. III represents a longitudinal section taken upon the plane indicated by the line 3 3 in Fig. I and showing portions cut by such plane in elevation. Fig. IV represents a detail end view of the spring-carrier used in my invention with a section of the framework of the machine. Fig. V represents an enlarged detail perspective view of the end of such carrier, showing a spring located in the carrying-pocket thereof. Fig. VI represents an enlarged side elevation of the end of said carrier, showing a spring located in said pocket. Fig. VII represents a detail plan view of the two bending or looping dies used in my said invention with parts removed, showing a spring having its ends located therein and with the loops in the process of formation. Fig. VIII represents an enlarged detail end view of the mandrel used for feeding the spring-stock to the machine and a portion of the machine immediately adjacent thereto. Fig. IX represents a detail perspective view of a gage used in my said invention. Fig. X represents an enlarged detail perspective view of the end of said spring-carrier with a spring located in the pocket thereof as viewed from the side opposite that from which the view shown in Fig. V is taken. Figs. XI and XII represent, respectively, side elevations of the two bending or looping dies. Figs. XIII, XIV, XV, and XVI represent end views of said dies, respectively. Fig. XVII represents a plan view of a part of the machine, and Fig. XVIII represents one end of a finished spring.

Upon the frame A of the machine are formed guideways *a* for a cross-head B, which is reciprocated therein by means of a pitman B′, crank-disk B^2, shaft B^3, and driving-pulley B^4. In the end of said cross-head is secured a carrier-jaw C, to the forward portion of which is fulcrumed an upper carrier-jaw C′, Fig. III. The rear end of such jaw C′ is provided with an antifriction-roller $c^\times$, which rolls upon a surface *a*′, provided and fixed upon the frame A, as shown in Fig. I, such end of said jaw being laterally bent, as shown, for such purpose. The forward ends of the jaws C and C′ are respectively formed with longitudinal recesses *c* and *c*′, which jointly form a pocket for the reception of the spring-blank upon which it is desired to perform the looping operation, Fig. VI. The lower jaw C is provided with a longitudinal slot c^2 at its end, which intersects the slot *c*′ transversely, as shown in Fig. V. In each such jaw end is formed a transverse slot c^3 and c^4, respectively, in which are located dies C^2 and C^3, such dies being made in two parts and being secured by means of set-screws c^5, whereby the two parts of such dies may be laterally adjusted relatively to each other. The inner ends of the recesses *c* and *c*′ terminate in said dies, the portion of such recesses in said dies forming the spring-receiving pocket. It is therefore seen that the width of said pocket may be varied to accommodate varying lengths of spring-blanks by loosening the set-screws and changing the location of the respective parts of each die to conform with such length of spring-blank. These two described jaws constitute a spring-carrier and operate in a manner hereinafter described.

Located in the path of the roller $c^{\times}$ is a cam a^2, by means of which the outer ends of the jaws are caused to approach each other at a given point in the reciprocation of the spring-carrier, the upper jaw in such operation being alone moved, as will be readily understood from the construction shown. The location of the cam a^2 is such as to effect the closing movement of the jaws at a point intermediate of the ends of the stroke of the carrier.

Projecting upwardly into the groove of the lower jaw C and so as to intersect the path of the spring-carrying pocket during the reciprocation of the carrier is a plunger D, whose upper surface is milled or toothed, as shown in Fig. I, the location of such plunger being near the inward or beginning of the forward stroke of the carrier. Said plunger is normally actuated so as to cause its upper toothed surface to intersect the carrying-pocket, as described, by a spring d, located in a suitable bore a^3, formed in the frame of the machine, as shown in Fig. II, the upward movement of said plunger being limited by a nut and washer d', Fig. II.

A mandrel E, which is of a diameter such as to permit of its insertion into the spring-stock F, from which the spring-blanks are cut, as will hereinafter be described, is supported upon the frame at right angles to the direction of movement of the carrier, the inner end of such mandrel being located opposite the spring-receiving pocket of the carrier when the latter is at the end of its inward or the beginning of its outward stroke, as shown in Fig. I. The inner extremity of said mandrel is formed or provided with one member e of a cutting device, a second member c^6 being formed upon the contiguous member of the upper die C^2, as shown in Fig. V, the said two cutting members being located so as to effect the shearing off of the spring-stock upon the mandrel and extending into the pocket upon the forward movement of the carrier, as will be readily understood. Surrounding the inner end portion of said mandrel and concentric therewith is a stationary holding device or guide A', secured to the machine-frame, which is of a diameter sufficient to receive and guide the spring-stock, as shown in Fig. VIII. Upon the opposite side of the path of travel of the carrier is located a gage G, Figs. I and IX, provided with an inwardly-projecting lug g, such lug being located so as to bring its rear surface g' into the transverse plane of the spring-stock, as shown.

The upper jaw C' is provided with a central longitudinal slot c^8, Fig. X, passing between the two die members located in said jaw, in which depends a spring-actuated hanger C^4, upon the lower extremity of which are journaled two antifriction-rollers c^7, which are caused to normally and yieldingly project into the upper portion of the spring-carrying pocket, as will be seen in the construction shown by dotted lines in Fig. VI.

Secured upon a frame and upon each side of the forward portion of the path of movement of the carrier is located a looping-die H and H', respectively. Each looping-die is formed with a groove $h^{\times}$, Fig. XI, of varying depth and width, as shown in Figs. XIII and XIV, the depth being greatest at the inner end of the die and least at the outer end thereof, the width being least at the inner end and greatest at the outer end. These grooves are identical in construction, the one upon one side being, however, reversed in position, as shown in Fig. XII, with reference to the other. At the upper portion of the inner end of the groove in each die is formed a wedge-like portion h, which is adapted to enter between two convolutions of a spring-blank, which may be impinged upon it. At the lower portion of the inner end of the die H' is formed a similar wedge h', performing a function similar to that of the wedge-like portion h described. The grooves are located so as to bring their outer ends in a plane passing through the axis of a spring-blank in the spring-carrying pocket during the reciprocation of the reciprocating carrier between the dies. The groove-wall opposite the groove's intersection with the die-surface is made adjustable relatively to such surface and consists of a plate h^2, Fig. II, secured to an arm h^3, which is adjustably secured in the die by means of bolts h^4. The dies are preferably formed of two horizontally-disposed plates h^5 and h^6, as shown in Fig. XIII, which are bolted together and which secure between them the arm h^3, so as to secure the groove-wall formed by the plate h^2. These two portions are provided with grooves which jointly form the loop-forming groove $h^{\times}$ of the die. The one die is mounted upon a transversely-slidable frame A^2, which is adjustable toward and from the opposite die by means of a hand-wheel A^3, thread, and nut, as shown in Fig. II. Such adjustability of the die permits the looping operation to be performed upon blanks of varying length, as is readily understood, the dies C^2 and C^3 in the carrier being adjusted to correspond with the distance between the two dies H and H'. On the side of the carrier opposite that upon which is formed the cutting member c^6 is formed a laterally-projecting lug c^{18}, being adapted to enter the grooves in the looping-dies as the carrier is reciprocated between the latter. The lower plate of die H' extends to the rear of the machine a greater distance than does the upper plate, as shown in Fig. XVII, and such extended portion is provided with a cam-face h^7 contiguous to the path of movement of the carrier, as shown.

The above-described device operates as follows: The carrier being in the position shown in Fig. I—that is, at the innermost end of its stroke—in which position the jaws are retracted, thereby forming a dilated spring-carrying pocket, the spring-stock being fed upon the mandrel E, such stock is fed transversely

until the end thereof strikes the gage G. The stock is then rotated upon its axis until the extremity of the last convolution strikes the overhanging lug *g* of the gage. Such position is that required for cutting off a spring-blank, so as to bring the point of cutting diametrically opposite such extremity, as is shown in Fig. V. The carrier being now advanced, the spring-stock is received between the jaws and enters the spring-carrier pocket. Upon reaching such position the further advance of the carrier effects the severing of the blank from the stock through the medium of the two cutting members *e* and c^6, as shown in Fig. V. The spring meanwhile disengages itself from its gage as a result of such forward movement, which causes the gage-engaging end of the spring to twist and release itself, as will be readily understood. The subsequent advancing movement of the carrier and the severed blank brings the latter into contact with the upper surface of the plunger D, such plunger engaging the blank and causing the latter to rotate, the rotation being facilitated by the antifriction-rollers c^7, previously described. Such upper surface of said plunger is of a length such as to effect sufficient rotation of the blank upon its axis and to bring the two free ends into proper longitudinal alinement with the wedge-like portions h' of the two looping-dies. In order to properly gage the blank, it was necessary to move same one convolution too far transversely, as the position of the blank in Fig. XVII indicates. This position is changed and the blank brought into proper transverse alinement by the cam-face h^7, which moves the blank into a position in which the two wedge portions h' may on the further advance of the carrier be caused to enter between the extreme end pairs of convolutions of the spring-blank, and thereby open out from the main portion of such blank the extremities thereof which are required to be looped. Upon reaching such wedges h' these extremities are separated and upon passing through the grooves are bent at right angles to their original positions, as shown in Fig. VII. During such bending each loop so formed comes in contact with the plate h^2 of the die, which determines the form and amount of opening of the loop. These walls being adjustable, it is seen that by proper adjustment a loop of the required form and size of opening may be obtained. During the looping process the cutting member c^6 and the lug c^{18} form a backing at the point where the greatest amount of bending takes place, thereby preventing the spring-blank from being rearwardly distorted. To effect such operation upon the blank, it is necessary to securely hold the same in the carriage. Such holding or clamping operation is performed upon the blank before the operation of bending takes place by the cam a^2, which engages the upper movable jaw, thereby closing the carrying-pocket upon the blank before the spring extremities enter the grooves in the bending-dies. Such clamping operation is continued throughout the bending process, after which the blank is released by the carrier as a result of the disengagement of the movable jaw from the cam a^2, which takes place at the end of the outward stroke, whereupon the finished looped spring may be removed from the carrier prior to the return of the latter for the next operation.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any one of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention—

1. In a machine for looping springs, the combination of looping mechanism comprising two looping devices, a carrier having a reciprocating movement relatively to said devices, the latter lying respectively upon opposite sides of the path of movement of said carrier; and means for effecting such movement.

2. In a machine for looping springs, the combination of looping mechanism comprising two looping devices, a reciprocable carrier provided with gripping mechanism and having its path of movement extending between said looping devices; and means for effecting the carrier movement.

3. In a machine for looping springs, the combination of looping mechanism, a reciprocable carrier, means for partially rotating a spring upon its axis while in said carrier, means for securing such spring in the latter subsequently to such rotation, and means for effecting the carrier's reciprocation.

4. In a machine for looping springs, the combination of a reciprocable carrier provided with a carrying-pocket, looping mechanism comprising two looping devices adapted to simultaneously operate at opposite sides of said pocket, means for effecting the carrier's reciprocation, a stationary toothed surface intersecting the path of movement of said pocket, whereby a partial axial rotation of a spring in said pocket may be effected; and means for securing such spring in said pocket subsequently to such rotation.

5. In a machine for looping springs, the combination of looping mechanism comprising two looping devices adjustably secured relatively to each other, a carrier having a reciprocating movement relatively to said devices, the latter lying respectively upon opposite sides of the path of movement of said carrier; and means for effecting such movement.

6. In a machine for looping springs, the combination with a reciprocable carrier having a spring-pocket, of a stationary pressure device intersecting the path of movement of said pocket and adapted to impart a rotative

movement to a spring located therein during the reciprocation of said carrier.

7. In a machine for looping springs, the combination with a reciprocable carrier having a spring-holding pocket, of a stationary spring-actuated pressure device adapted to project into said pocket throughout a portion of the movement of said carrier.

8. In a machine for looping springs, the combination with a reciprocable carrier having a spring-holding pocket, of a stationary pressure device provided with a toothed surface yieldingly projecting into said pocket throughout a portion of the movement of said carrier.

9. The combination of a spring-carrier provided with a cutting member, means for actuating said carrier, means for feeding spring-stock into the latter, a second cutting member coöperating with said carrier-cutter for severing a blank from such stock, and means for simultaneously operating upon the ends of such severed blank so as to bend such ends to form a loop.

10. The combination of a spring-carrier provided with a cutting member, means for actuating said carrier, means for feeding spring-stock into the latter, a second cutting member coöperating with said carrier-cutter for severing a blank from such stock, and duplex devices located upon opposite sides of the carrier's path of movement adapted to bend the end convolutions of such blank into a loop.

11. The combination with a reciprocable spring-carrier having a spring-holding pocket for securing a blank in said carrier, of means for forming a loop upon the end of said blank during the reciprocation of said carrier, the latter provided with a laterally-extending lug located in proximity to said pocket.

12. In a machine for looping springs, a carrier consisting of two relatively retractable jaws jointly forming a spring-holding pocket, in combination with means for reciprocating said jaws and for causing them to retract or approach at a given point in their reciprocating movement.

13. In a machine for looping springs, a carrier consisting of two relatively retractable jaws, each of which is provided with two dies adjustable laterally relatively to each other.

14. In a machine for looping springs, a looping-die having a groove of varying depth and width, the groove-wall opposite the groove's intersection with the die-surface being adjustable relatively to such surface.

Signed by me this 3d day of April, 1901.

LEONARD J. SANKER.

Attest :

D. T. DAVIES,

A. E. MERKEL.