J. S. KEPLER.

WIRE FORMING MACHINE.

APPLICATION FILED JULY 3, 1917.

1,304,780.

Patented May 27, 1919.

4 SHEETS—SHEET 1.

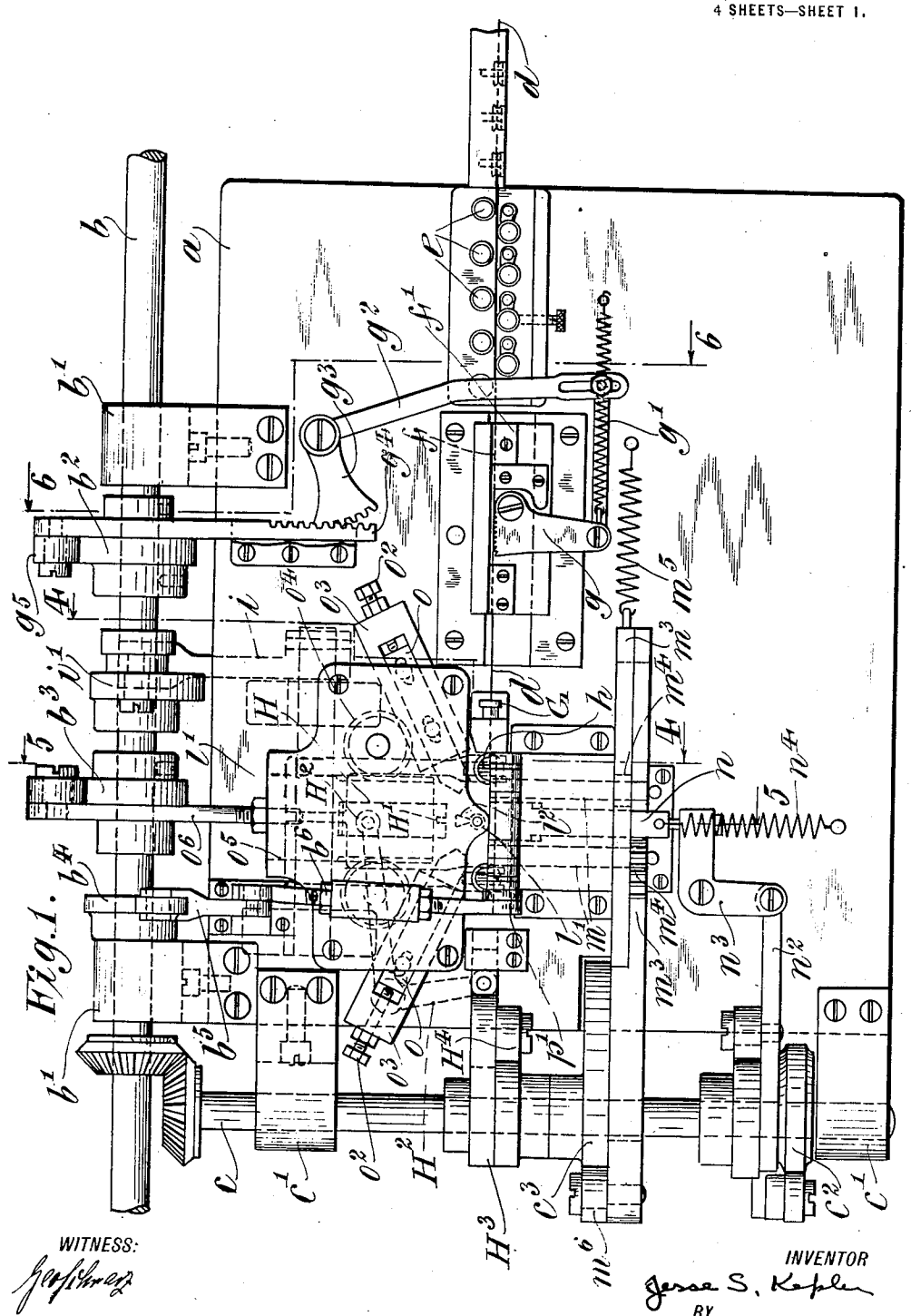


Fig. 1.

WITNESS:

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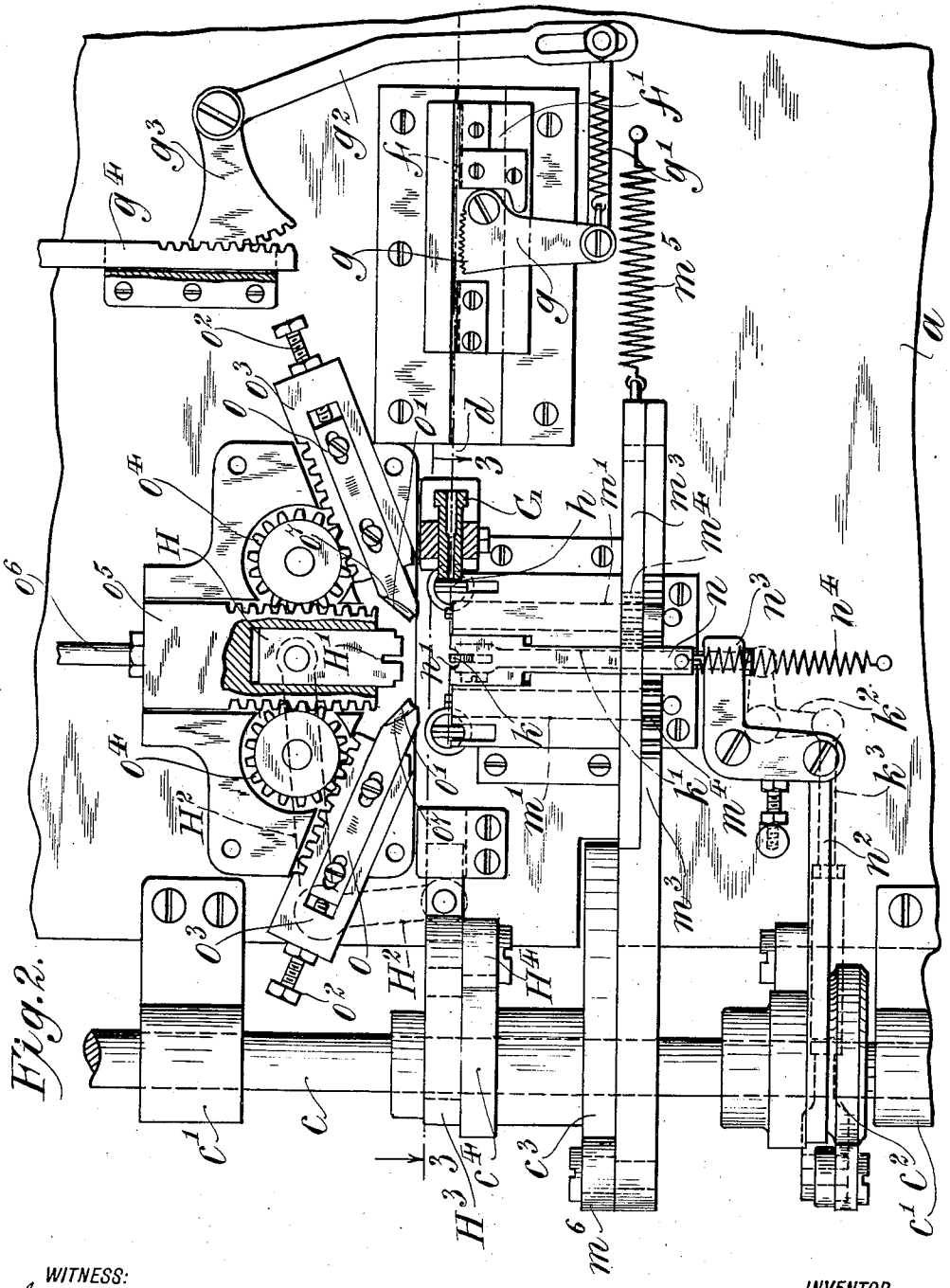


Fig. 2.

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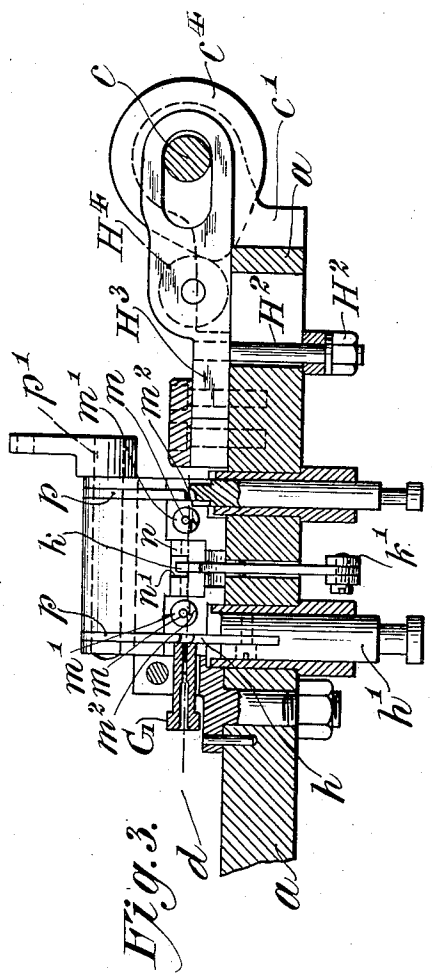


Fig. 3.

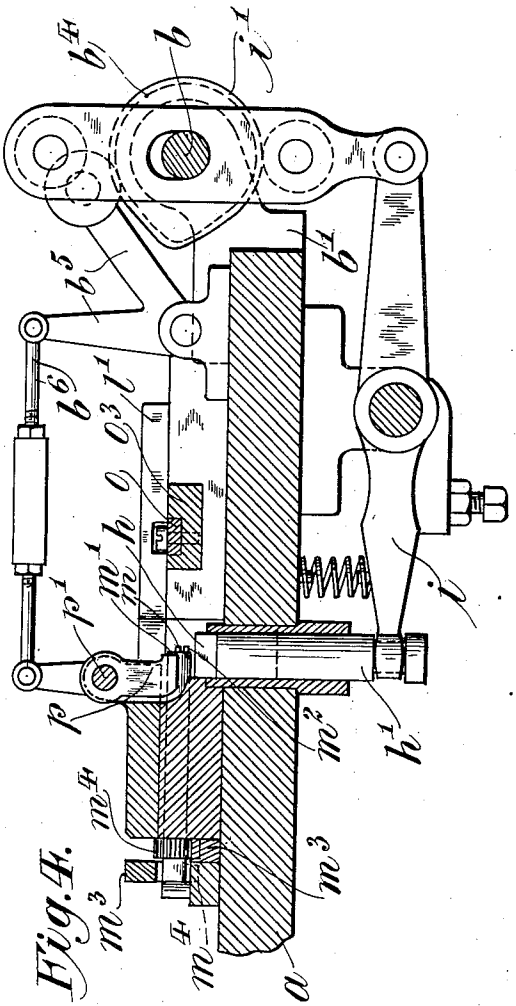


Fig. 4.

WITNESS:

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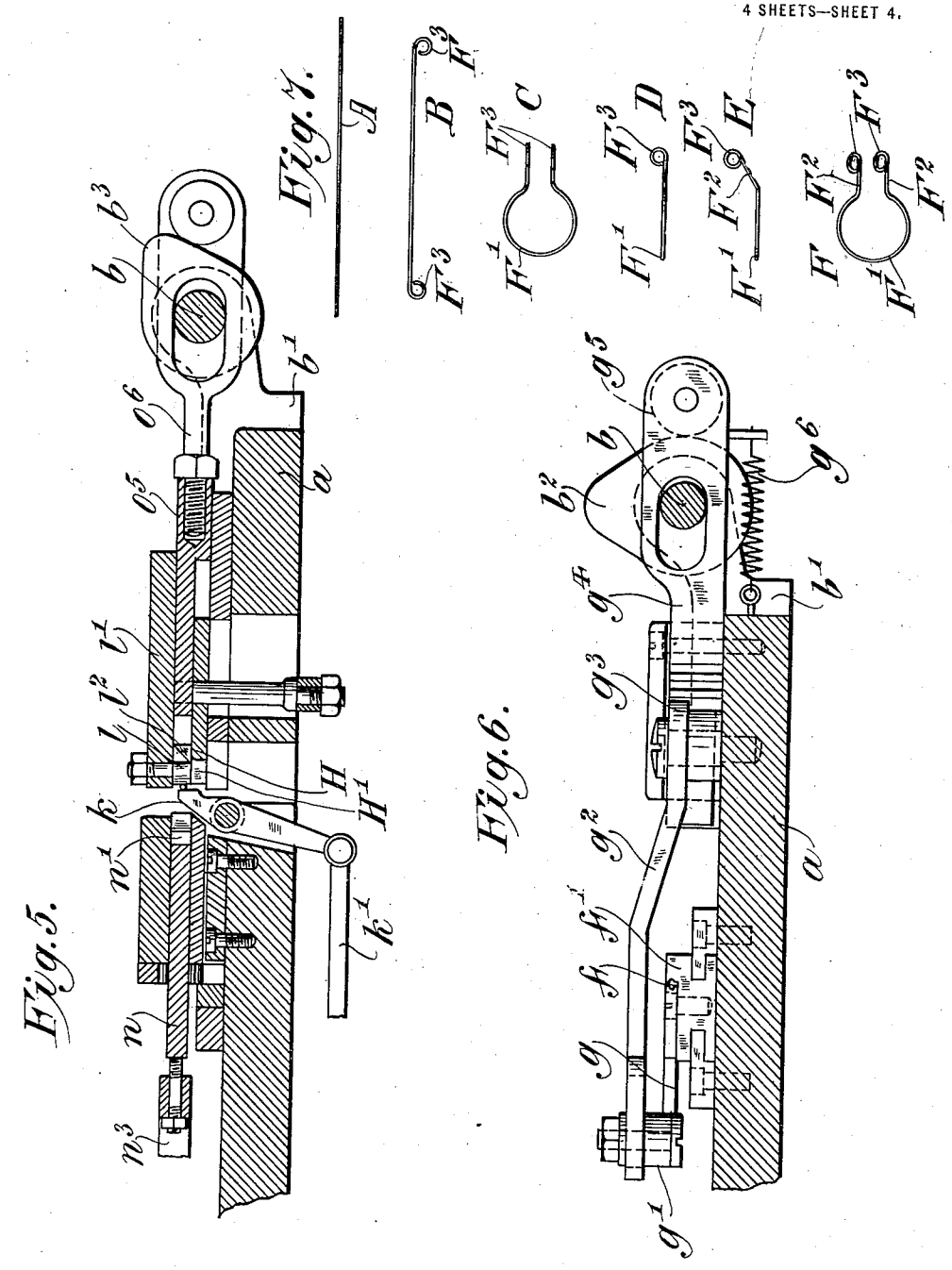
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WITNESS:

Geo. F. Smartz

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UNITED STATES PATENT OFFICE.

JESSE S. KEPLER, OF DAYTON, OHIO, ASSIGNOR TO CAP-HOLD INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

WIRE-FORMING MACHINE.

1,304,780. Specification of Letters Patent. Patented May 27, 1919.

Application filed July 3, 1917. Serial No. 178,436.

To all whom it may concern:

Be it known that I, JESSE S. KEPLER, a citizen of the United States, residing in the city of Dayton, State of Ohio, have invented certain new and useful Improvements in Wire-Forming Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

In U. S. Letters Patent No. 1,210,600, dated January 2, 1917, there is disclosed a retaining device for the caps of deformable tubes, which consists essentially of a piece of wire so shaped as to engage the cap and encircle the threads on the neck of the tube, so as to be threaded on and off of the neck with the cap. The present invention is concerned with a machine for forming wire retainers of the general type described. The general objects of the invention are to provide such a machine which shall be effective to perform the required work with a maximum capacity and of such relatively simple construction as to minimize its liability to derangement during operation. The details of the machine will appear fully from the following description of the appended drawings, in which—

Figure 1 is a fragmentary view in plan of so much of the machine as is necessary for an understanding of the general cycle of operations in the formation of the retainer wire.

Fig. 2 is a view somewhat similar to Fig. 1, but on a somewhat larger scale, some of the parts being broken away or omitted in the interest of clearness.

Fig. 3 is a fragmentary detail view in section, taken along the plane indicated by the line 3—3 of Fig. 2 and looking in the direction of the arrows.

Fig. 4 is a detail sectional view, taken on the planes indicated by the broken lines 4—4 of Fig. 1 and looking in the direction of the arrows.

Fig. 5 is a sectional view, taken along the plane indicated by the line 5—5 of Fig. 1 and looking in the direction of the arrows.

Fig. 6 is a fragmentary sectional view taken along the planes indicated by the broken lines 6—6 of Fig. 1 and looking in the direction of the arrows.

Fig. 7 shows the wire retainer in successive stages of its formation.

Before proceeding with the description of the machine itself and the devices for shaping the wire retainer into the desired form, it will be well to refer to Fig. 7 in which the retainer wire lettered F is shown in its completed form. This retainer, it will be noticed, is formed with a loop F′ which is of the diameter of the neck of the tube along the threads of which the retainer is to be threaded. This loop terminates in two legs F^2 at the ends of which are formed eyes F^3 which may engage lugs cast with the cap of the tube. This general form of the retainer is disclosed in the aforesaid patent. The several views of Fig. 7 lettered A—F show the successive stages of the formation of the wire retainer in the improved machine according to the operations performed. For instance, view A shows the straight strand of wire cut to length. The next view B shows this wire with eyes formed at its opposite ends. Views C and D show the loop F′ bent in the wire with the eyes extending therefrom. View E shows the legs F^2 of the wire bent at an angle with the plane of the loop F′ as is desirable.

The main parts of the improved machine may be said to comprise a plate *a* on which are supported the various operating elements and two intermeshing rotating cam shafts *b*, *c*, supported on plate *a* in suitable brackets *b′*, *c′*, respectively, and connected operatively with the forming devices, as will later appear. The wire *d* is fed from any available source past guide spools *e* by means of feeding mechanism now to be described, this mechanism being of such a character as to feed the wire forward with a step-by-step movement so that only such length of wire is presented to the forming devices as is predetermined. The wire *d* after passing over the friction spools *e* is threaded along a channel *f* in a sliding block *f′* where it is exposed to and may be engaged periodically by an eccentric frictional clamp *g* which is pivoted on the guide block *f′*. From the guide block *f′* the wire extends through a guide tube G for the forming operations to be described. The step-by-step feeding of the wire is obtained by reciprocating the guide block *f′*, the wire *d* meanwhile being held against relative movement with relation to the block by its engagement by the clamping lever *g*. These reciprocations are obtained by connecting the end of the clamping lever *g* operatively with a cam b^2 on the cam shaft *b*

(see Fig. 6). This connection may comprise a link g' secured adjustably to the end of one arm g^2 of a bell crank lever, the other arm g^3 of which is formed with a sector in mesh with a reciprocable rack bar g^4 the free end of which carries a roller g^5 which rides on the face of the cam b^2. The rack bar g^4 is retracted by the action of the cam b^2 on the roller g^5 against the tension of a spring g^6. Each retraction of the rack bar g^4 serves to throw the lever clamp g into binding engagement with the wire d and reciprocates the block f', thereby moving the wire forward a distance determined by the length of travel of the rack bar. When the cam b^2 permits the rack bar g^4 to move in the opposite direction, the lever clamp g is drawn out of engagement with the wire and the block f' is slid in the opposite direction.

Following the forward movement of the wire in the manner described through the guide tube G a vertically disposed reciprocating knife h is forced upward across the inner end of the tube G, thereby shearing the wire to length. This knife is shown most clearly in Figs. 3 and 4. It comprises a simple plunger h' extending vertically through the plate a and engaged operatively by a rocker arm i connected operatively with a cam i' on the cam shaft b, whereby the knife is forced upwardly across the inner end of the guide tube G at the proper time to cut the wire to length. The length of wire thus cut is held in position for the forming operations by means of a finger k which presses the wire against a fixed anvil block l carried on the under-face of a cover plate l' for certain of the parts to be referred to later. The finger k which is pivoted in the frame a is connected operatively by a link k', a bell crank lever k^2 and rod k^3 to a cam c^2 on the cam shaft c. The action of the cam is to rock the finger k in such a manner as to alternately press the length of wire, such as is shown in Fig. 7, A, against the fixed anvil l and release it at the desired time. The length of wire maintained in the position described may rest on a sliding plate H which reciprocates horizontally on the plate a and is disposed immediately beneath the anvil l. This plate, as shown in Fig. 2, is slotted at its front edge, as at H', to straddle the finger k when the latter is rocked to press the wire against the anvil.

The straight strand of wire being thus held against the anvil l, the first operation is to form the eyes in its end indicated in Fig. 7, D. These eyes are formed by cam fingers m^2 on spaced oscillating shafts m' at the center of each of which is a projecting pin m about which the wire is to be twisted. The shafts m' just described are journaled horizontally on the plate a and carry at their rear ends suitable devices for oscillating them for the formation of the eyes in the wire. The means for producing this oscillation periodically consists of opposed reciprocable rack bars m^3 which engage, respectively, pinions m^4 carried on the rear ends of the shafts m'. These rack bars as described are reciprocated against the action of a spring m^5 by their operative connection with a cam c^3 on the cam shaft c, this cam c^3 being engaged constantly by means of a roller m^6 on the extreme end of the racks. Referring now to Fig. 3, it will be seen that the wire after being led through the guide tube G passes between the projecting studs m and cam fingers m^2 on the ends of the oscillatory shafts m'. The wire having been cut to length in the manner previously described, these shafts m' are given an oscillation simultaneously by the racks m^3 and in this way the eyes are formed in the wire at the opposite ends thereof.

The next step in the shaping of the wire is to form the loop shown in Fig. 7, C. This loop is formed by pressing the wire around the curved anvil block l. This pressing is done by means of a sliding bar n, the forward end of which is slotted, as at n', to straddle the finger k, this forward end also being curved to conform generally to the curvature of the anvil block l, so that when the bar n is forced forward the wire will be pressed around the curved anvil block l and into snug engagement therewith. The required reciprocations of the forming bar n may be imparted to it from the cam shaft c by means of a suitable link n^2 and bell crank lever n^3, the movement of the bar in one direction being opposed by a spring n^4 secured thereto, so that the bar is returned to its normal position when released by the controlling cam on the cam shaft c.

The anvil block l, instead of being circular, is formed at its rear side, away from the wire, with inclined rearwardly extending faces l^2 against which the legs of the wire retainer are forced by suitable devices to insure the creation of a circular loop in the wire and the placing of the loop thus formed under moderate tension. For the purpose of thus shaping these legs there are provided at opposite sides of the anvil l opposed formers o which are inclined to one another and have at their ends angular noses o' which are adapted to be forced into direct engagement with the wire and to press the wire into the sharp recess between the inclined faces l^2 and the curved portion. The character of these formers is best shown in Fig. 2 wherein are also shown adjusting devices in the form of thumb screws o^2 whereby the relation of the formers to the anvil may be readily adjusted. The sliding carriers o^3 in which the formers are supported are provided with rack teeth on their side edges and these rack teeth engage re-

spectively pinions o^4 which are, in turn, engaged by another reciprocating rack bar o^5 connected operatively through a rod o^6 with a cam b^3 on the cam shaft b. In the operation of the devices just described, reciprocation of the rack bar o^5 at the proper time forces the formers o inwardly in opposed positions until they engage the legs of the wire-retainer shown in Fig. 7, C, and press them snugly against the inclined side faces l^2 of the anvil l. In carrying the wire forward by means of the reciprocating bar n in the manner just described, the eyes in the ends of the wire are kicked off their respective pins m by means of pivoted fingers p, to which an oscillatory movement may be imparted in proper phase relation to the other operations of the machine from a cam b^4 on the cam shaft b through a bell crank b^5 and connecting link b^6 in a manner which appears clearly from Figs. 3 and 4. These fingers p at the required time are thrust forward and serve to press the ends of the wire toward the anvil l.

Simultaneously with the crimping of the legs with relation to the loop the formers o, coöperating with the rearwardly extending portion of the anvil faces l^2, turn the legs of the wire retainer up from the plane of the loop in the manner indicated in Fig. 7, E. It is desirable to offset the eyes from the plane of the loop in this manner, so that when the retainer is in use the eyes will be substantially in the plane of the cap while the loop will be below the edge thereof. For the purpose of giving these legs their inclination to the plane of the loop, the rear faces l^2 of the anvil l are beveled downwardly while the front ends of the formers o are correspondingly beveled upwardly, as at o^7, to coöperate with the faces of the anvil. When the formers begin their inward travel to crimp the legs, it is to be understood that the legs lie between the ends of the formers and the beveled faces l^2 of the anvil. When the legs are squeezed between the faces l^2 and the beveled ends of the formers o they are thrust upwardly along the beveled ends of the formers with the eyes until they take some such inclination to the plane of the loop as is indicated in Fig. 7, E.

Upon the completion of the described operations, the supporting plate H for the wire is retracted by its operative connection through linkage H^2 with a cam c^4 on the cam shaft c. This linkage includes a reciprocating bar H^3 supported on the plate a and carrying a roller H^4 which rests constantly against the face of the cam c^4. Simultaneously with the retraction of the plate H in the manner described, the finger k is rocked out of engagement with the wire d thereby permitting the wire to fall freely through an opening in the plate a to any suitable receptacle therebeneath. When thus discharged it will be in the completed form shown in Fig. 7, F.

It will be apparent to those skilled in the art that mechanical equivalents for some of the elements employed may be substituted to equal advantage, but all such mere substitutions are to be deemed within the scope of this invention, the spirit of which contemplates the provision of a complete machine having the forming elements thereof so coördinated in operation as to produce with a maximum capacity the peculiar wire retainer shown in Fig. 7.

I claim as my invention:

1. A machine for forming wire retainers of the character described, comprising in combination a step-by-step feed for the wire strand, a reciprocating knife for cutting the wire to length, devices to coil the ends of the wire, a curved anvil, a former coöperating therewith to loop the wire circularly and opposed formers coöperating with the anvil to crimp the legs of the wire, said anvil having beveled rear faces and the last named opposed formers having correspondingly beveled front faces to press the legs up the beveled sides and incline them to the plane of the loop.

2. A machine for forming wire retainers of the character described having a reciprocating former bar provided with a curved recess in its end, means to move the bar transversely of the wire, a curved fixed anvil around which the wire is pressed by the bar to form a circular open loop, beveled side faces at the rear side of the anvil, inclined opposed former bars having beveled side faces corresponding with the beveled faces of the anvil to coöperate therewith and press the legs of the wire along the beveled faces to an inclined position with relation to the plane of the loop.

This specification signed this 29th day of June, D. 1917.

JESSE S. KEPLER.