4 Sheets—Sheet 1.

O. D. & E. C. WOODBURY, & S. H. COLE.

WIRE LOOPING MACHINE.

No. 190,265. Patented May 1, 1877.

Fig. 1.

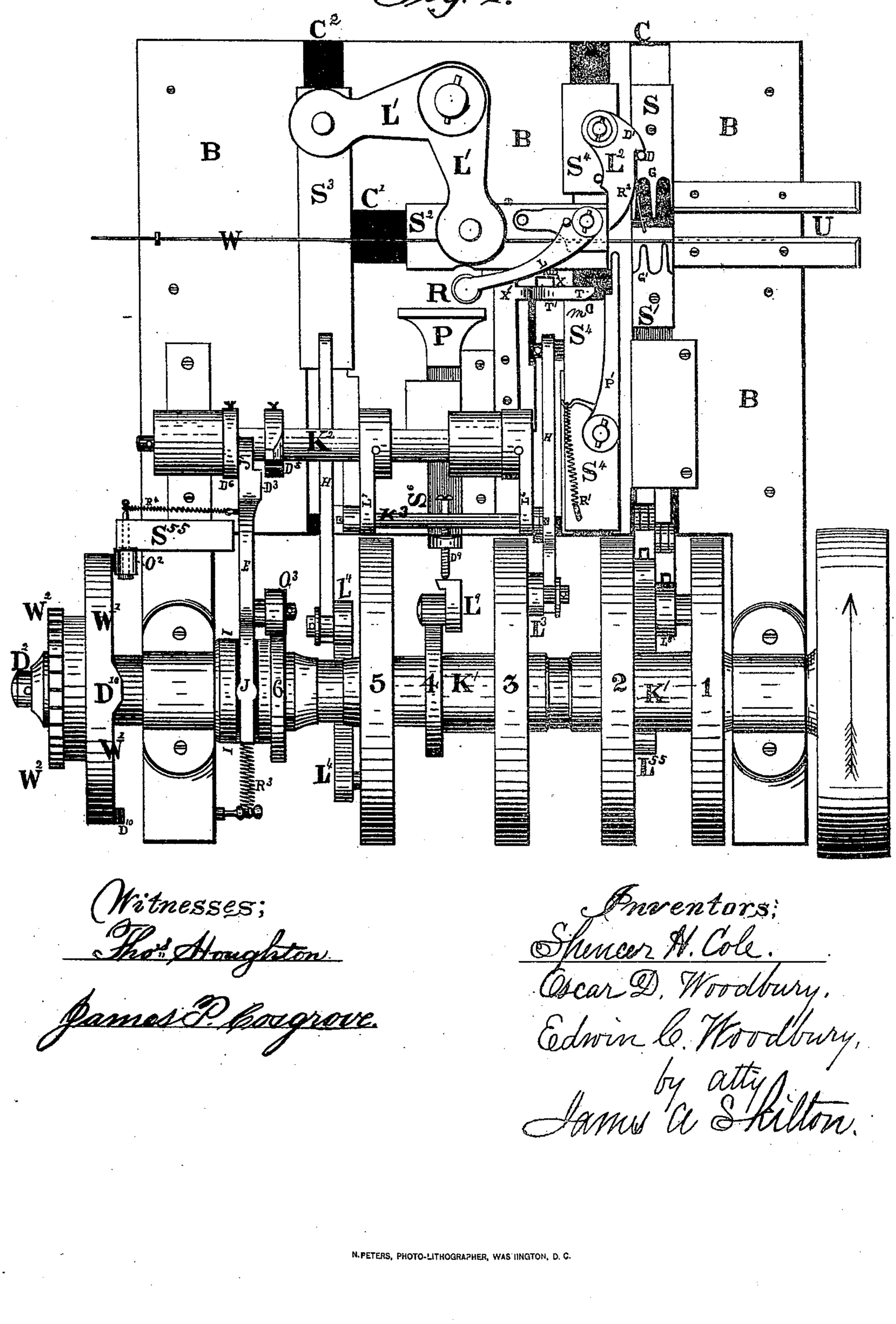

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Fig. 2.

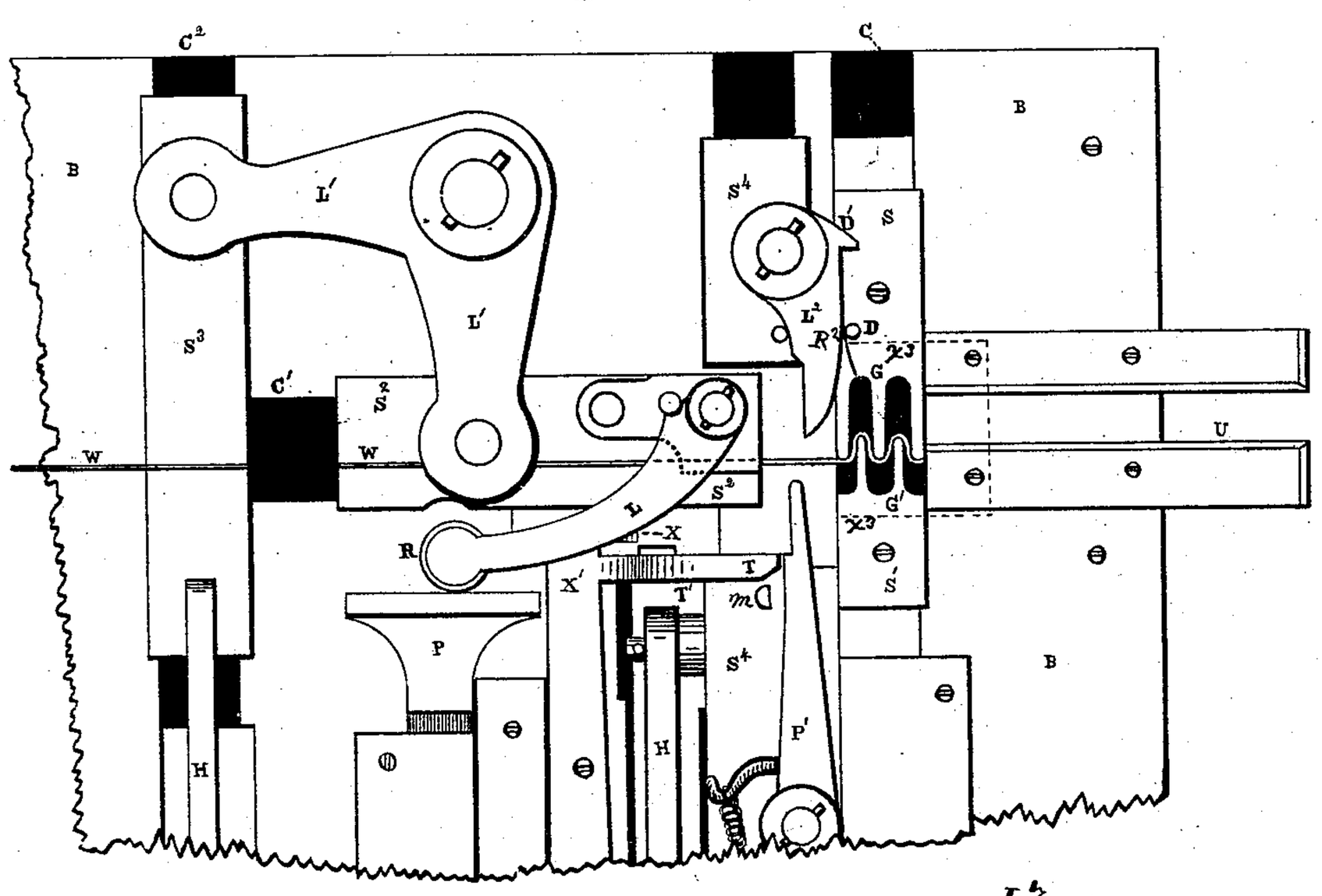

Fig. 14.

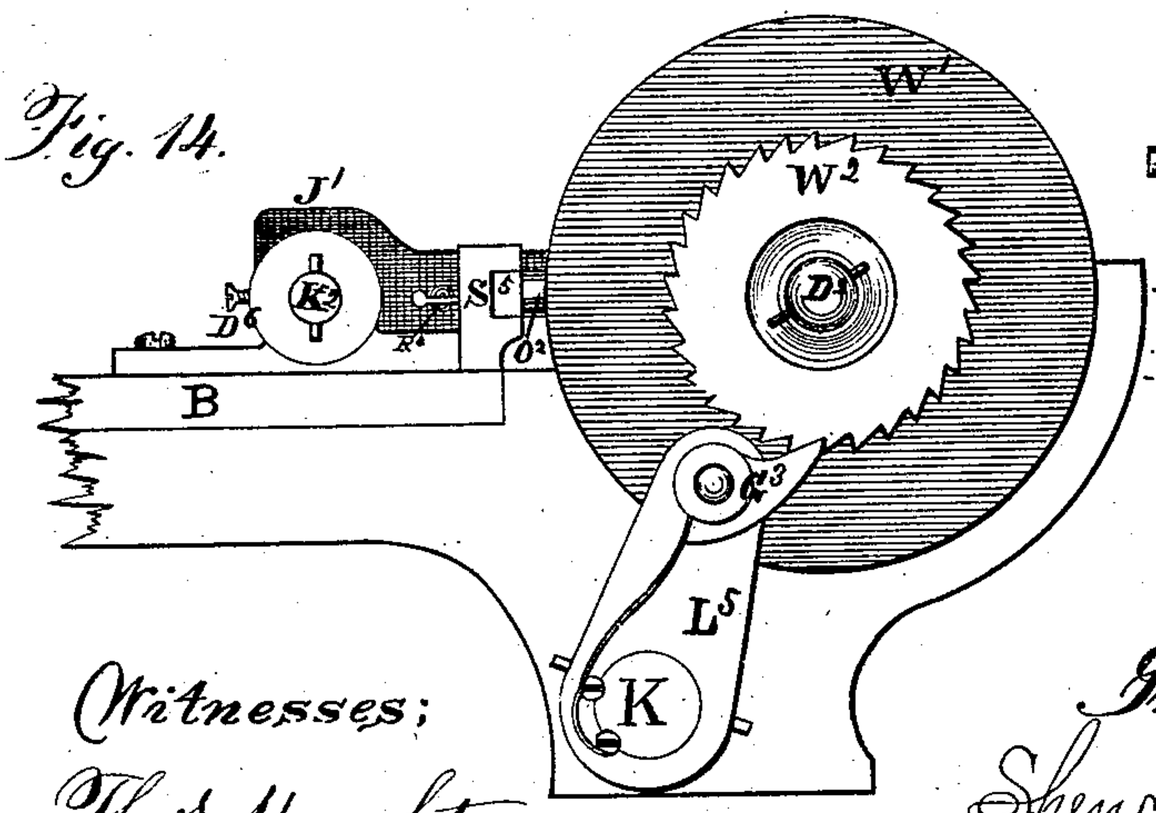

Fig. 15.

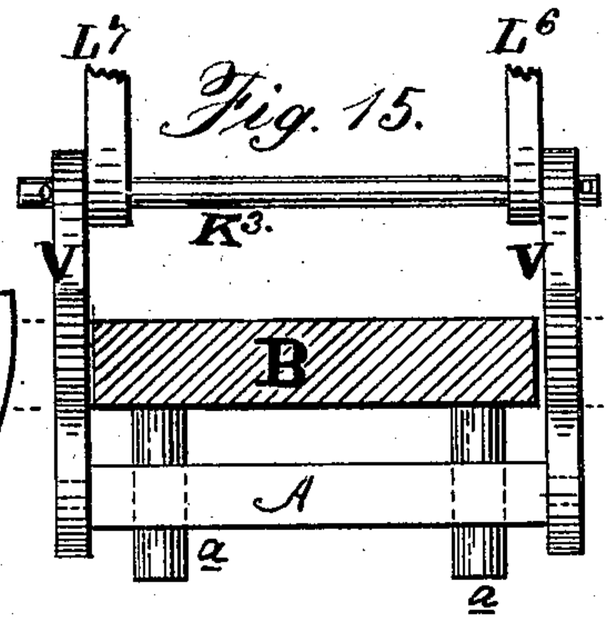

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Fig. 3.

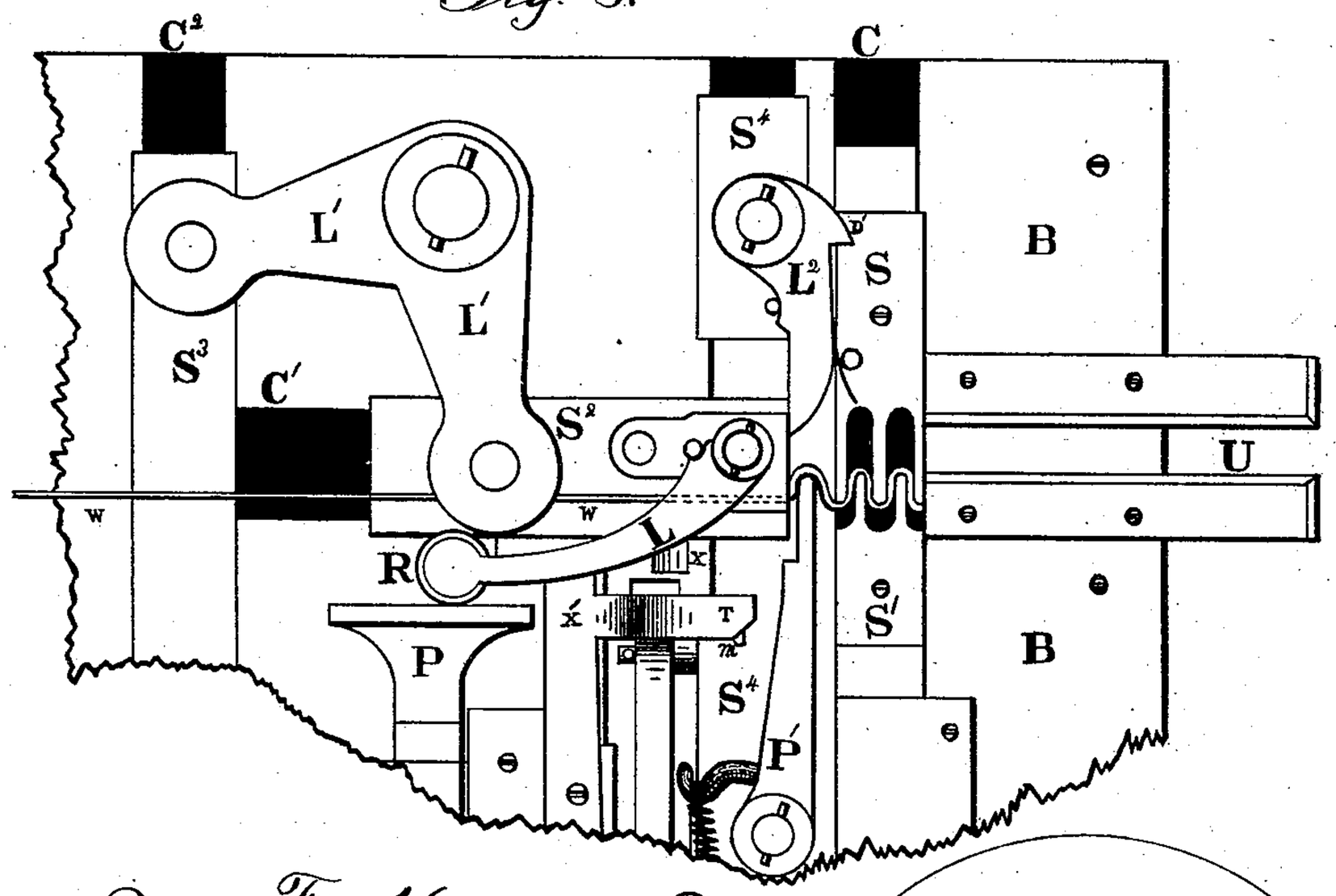

Fig. 16.

Fig. 4.

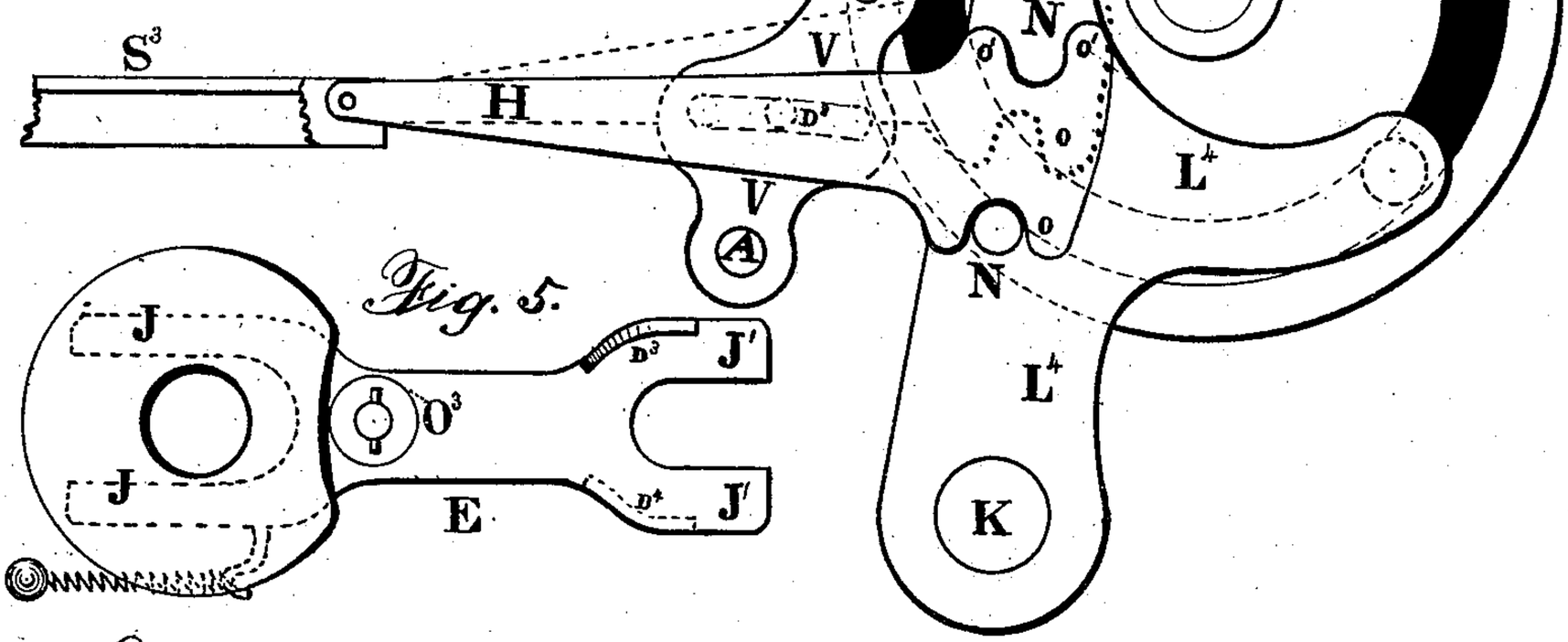

Fig. 5.

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Fig. 6.

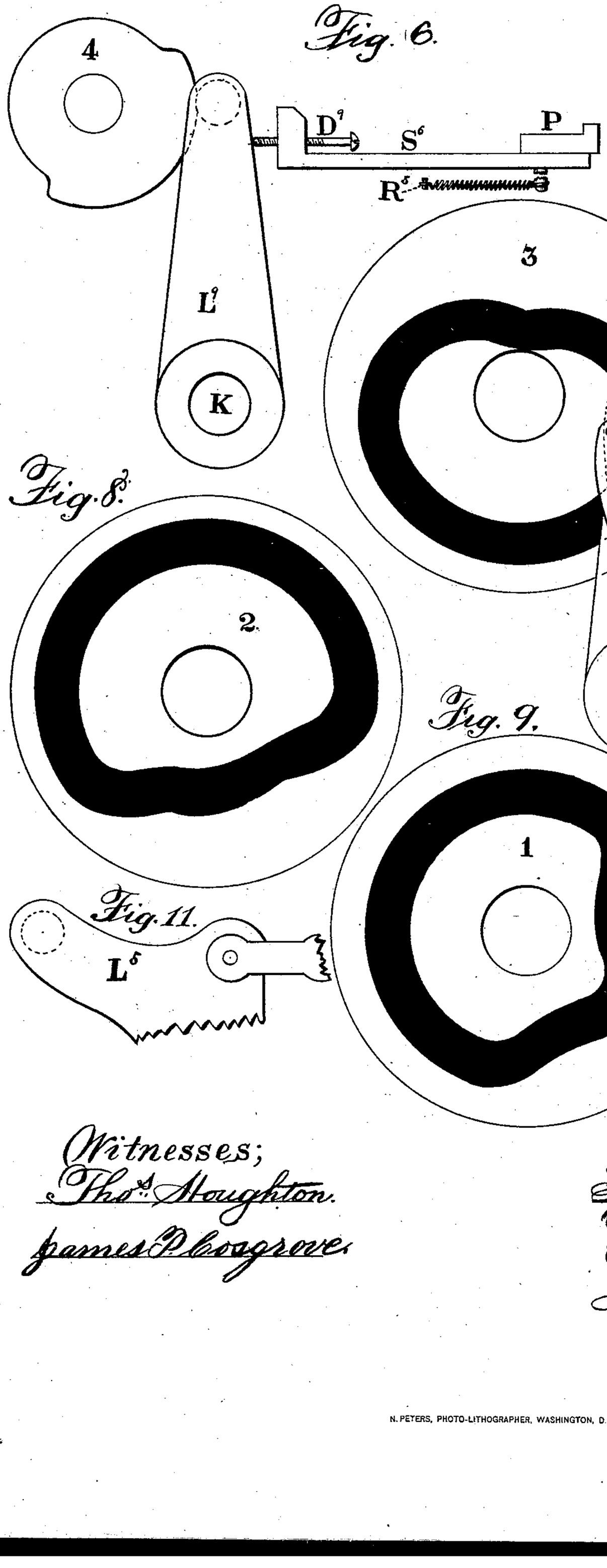

Fig. 7.

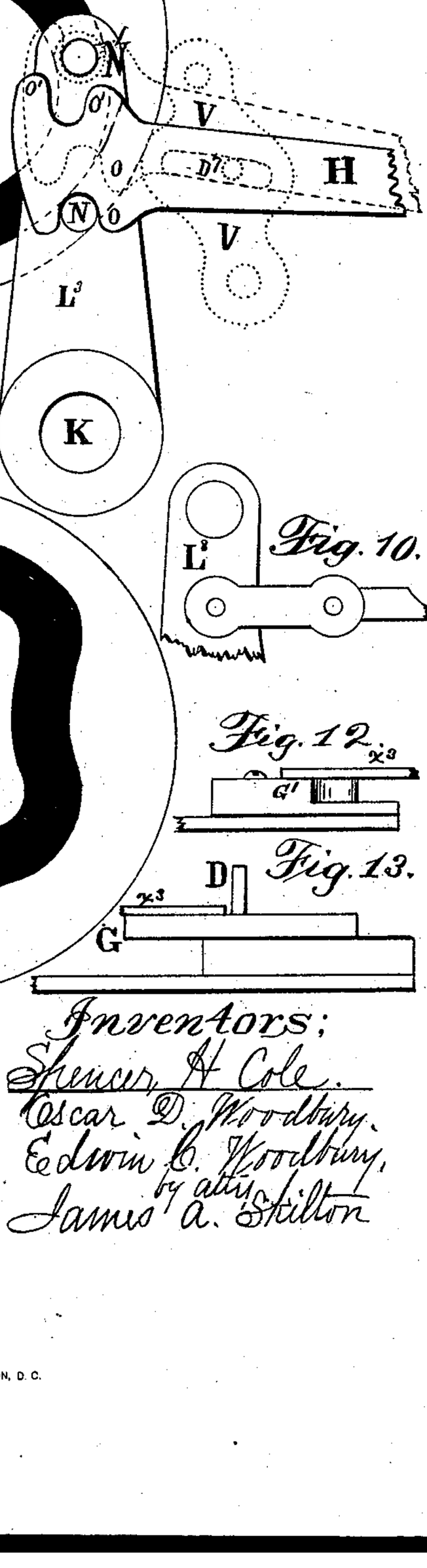

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN WIRE-LOOPING MACHINES.

Specification forming part of Letters Patent No. **190,265**, dated May 1, 1877; application filed April 12, 1875.

To all whom it may concern:

Be it known that we, OSCAR D. WOODBURY and EDWIN C. WOODBURY, both of New York city, county, and State, and SPENCER H. COLE, of Brooklyn, New York, have invented a Machine for Automatically Bending and Looping Wire in Loops or Serpentine Bends, and if necessary varying the lengths of the same at intervals and at will, of which the following is a specification:

The particular kind of work done by the precise machine shown and described is the formation of the serpentine wire corset clasp or busk shown and described in Letters Patent of the United States No. 144,689, dated November 18, 1873, and granted to J. P. McLean, which consists of steel wire formed into loops, the larger number of which are loops of one uniform size, but through and among which, at intervals which may be varied, longer loops are interposed intended to be used on one side of the clasp as hooks after being compressed and bent into the hook form, and on the other side as eyes to receive and retain the hooks placed at corresponding intervals. The machine is, however, capable of being adapted to the work of forming other articles from wire, large and small, and having regular or variable loops—that is to say, loops of one uniform size, or loops of two sizes, and placed at regular or at variable distances from each other.

The precise nature of the invention herein set forth will be found stated in the several clauses of claim appended to this specification.

The machine is illustrated in the four accompanying drawings, in which Figure 1 is a top view, showing the bed-plate and working parts; Fig. 2, a top view of a part of the same, showing the position of the parts just before the plunger advances; Fig. 3, the same of the same when the plunger has advanced to form the loop; Fig. 4, a side view of cam 5 and connections; Fig. 5, a side view of the thrusting-bar E, which shifts the mechanism for long and short loop making; Fig. 6, a side view of the external cam 4, which operates the parallel bar and its connections; Fig. 7, a side view of an inside cam, 3, which operates the main rock-shaft and other parts connected; Fig. 8, a side view of cam 8; Fig. 9, a side view of cam 9; Fig. 10, a side view of rocking lever 8 and connection; Fig. 11, a side view of the upper part of rock-shaft lever L^5 and link; Figs. 12 and 13, side views of the two slides S and S^1 with the covering part X^3. Fig. 14 is an end view, showing the ratchet and pattern wheels. Fig. 15 is a detail, showing the two carriers V V, a section of the bed-plate B, and guide-pins *a a*.

The machine is composed, first, of the mechanism concerned in forming the uniform short loop or loops; and, second, in the mechanism concerned in shifting at intervals and at will, so that the same mechanism which forms the short loop shall be made to form the long loop as and in the places where desired. The wire is fed into the machine, and the looped wire is at intervals carried out of the machine automatically and by the same mechanism assisted by a vibrating feed-lever.

The first act in the operation of the machine to form a loop after the wire is fully introduced consists in griping or pinching the wire at the forward end of so much of the wire as is to form the first loop. The mechanism which gripes or pinches the wire, like the other devices which manipulate it, is placed in a solid plate or bed, B, and it consists of the two slides S and S^1 moving in opposite directions in the same channel C. The griping parts or combs G G^1 of these slides are so shaped as to receive the loops as they pass along and out of the machine, and engage them upon opposite sides without thereby changing their form. It is sufficient to arrange the engaging parts so as to engage two loops at a time, and they should include the last-formed loop. These slides are operated in opposite directions in the same channel by cams Nos. 1 and 2 on the driving-shaft K^1, and after the new loop is formed, as hereinafter described, they are made to open far enough at all times to permit the passage of the longest loops which the griping-surfaces or parts G G^1 must also be capable of receiving, as well as the shorter ones.

The cams 1 and 2 and their method of operation will be described hereafter.

The second act consists in the backing of

the slide S^2, which carries a clamp-lever, L, for the purpose of grasping the wire at the rear end of the loop-length after measuring it off automatically.

This clamp-slide S^2 moves at right angles to the slides S and S^1, previously described, and in the channel C^1 located in the bed-plate B. It is connected to and in turn operated by still another slide, S^3, moving in a line at right angles to its own line of motion through the medium of a bell-crank lever, L^1. This last-mentioned slide S^3 is operated by cam No. 5 on the main shaft, to be described hereafter.

The third act consists in a slight motion given to the clamp-lever L on the clamp-slide S^2 by the parallel bar P operated by the outside cam No. 4. The parallel bar P takes on the roller R, so placed on the end of the clamp-lever L as to travel on the parallel bar as the clamp-slide moves forward, and thus maintain a firm gripe of the wire by the clamp and slide during the forward movement of the slide in assisting to form the loop.

The fourth act consists in the forward movement of the clamp-slide S^2 coincidently and co-ordinately with the fifth act, which consists in a forward motion of the plunger-slide S^4 carrying and operating the plunger P′, which has meantime rested against its stop T in position opposite the center of the measure of wire intended to form the next loop.

The plunger-slide S^4 is operated by cam No. 3, and moves in parallel lines with the two slides S and S^1.

The plunger P′ consists of a lever or arm secured at its opposite extremity or rear end to the slide S^4 by a pin, so as to have a slight vibratory movement limited by a variable spring-stop, T, which, when the short loop is being made, is depressed and detains the plunger by its end, and when the long loops are to be made is elevated to give the plunger more sweep, and then detains it by a shoulder provided for the purpose.

The plunger is under the control, on one side, of a small spring, and on the other of the clamp-slide and forming-loop. As the loop, in the act of formation, swings over toward those previously formed, and the clamp-slide S^2 reaches its utmost forward limit of motion the plunger P′ is swung over, the plunger-spring R^1 being overcome at the time. The plunger then lies between the slides S S^1 on one side, and the clamp-slide S^2 on the other occupying the loop.

The sixth act consists in the forward movement of the clamp-slide S^2, (for the purpose of yielding the wire to the plunger, as described, as its first object,) for the secondary purpose of forming the two bends constituting the projecting center of the loop at the point of the plunger, and at the same time making the first bend of the adjoining rear reversed loop simultaneously with the formation and completion of the second bend of the previous or forward reversed loop, which last takes place near to the point where the first two slides S and S^1 gripe it, the parts in contact with the wire at both these reversed loop-bends being rounded, so as to act as formers of the wire as it is bent.

The seventh act consists in the release, by the clamp-lever L, of its hold on the wire. This release is effected by the slight backward movement of the parallel bar P, which is delivered into the control of a spring, R^5, suddenly at this juncture by the cam, which moves and sustains it in place, as required, to perform the functions described.

The eighth act follows, and consists in the simultaneous and sudden withdrawal of the plunger-point from the loop by the retreat of the plunger-slide S^4, effected by its cam; the sudden advance of the feeding-lever L^2, which is secured to a prolongation of the plunger-slide S^4, so as to advance its point on the outside of the loop just made, and behind it, as the plunger retreats from its inside; and the sudden release and retreat of the outer slide S, speedily followed by the retreat of the inner slide S^1, thereby leaving the looped portion of the wire W free, both as to short and long loops, to pass on a step by the lateral action of the feed-lever L^2, which, just at the close of the movement of the slide S^4, comes in contact with a stud or pin, D, placed on the slide S at its shoulder D^1, (or projection,) arranged so as to slightly tilt the feed-lever L^2 and move the wire along a step, placing a new section of wire, for a new loop, in place, for a repetition of the operations described upon it.

From its forward position the feed-lever L^2 does not move, except to a slight extent laterally, when the shoulder is released from the pin D by the starting of the slide S again, until the plunger and slide S^4 again advance, when it retreats as the plunger advances, riding on the same slide. The wire having been fed along a step, all the parts will have returned to the starting-points, or the positions occupied before the forward movements of the slides S S^1 to gripe the wire; and the movements described being again and again repeated, a loop of like character will be formed at each repetition.

The longer loops of the corset clasp or busk are formed by the same devices, operated and operating in the same manner as hereinbefore described, only the clamp-slide S^2 is automatically given a longer movement, to measure and gripe the greater length of wire required therefor; and the plunger P′, and slide S^4 also, has the required longer motion given, each in its order, by the same automatic mechanism.

This long-loop motion is given by shifting the sockets O O on the under side of the hook-connections H H from the rolls N N placed on the rock-shaft levers L^3 L^4 nearest their centers of motion in the rock-shaft K, and engaging the sockets O^1 O^1 on their upper sides or heads with the rolls N′ N′ on the same levers, placed farthest from their centers, there-

by producing the longer movements of all the connected parts, as described. At the next revolution the hook-connections and rocking-shaft levers L^3 L^4 resume the positions and relations required to produce the short loops again on the rolls O O. These automatic shifting movements are made under the action and control of the pattern-wheel W^1, as follows: Upon the outer end of the main rock-shaft K, and moving with it, is a lever or arm, L^5, provided with a spring-pawl, G^3, which engages with the teeth of a ratchet-wheel, W^2, placed on the stud D^2 in fixed relations to the pattern-wheel W^1, which is operated by it. The outer edge of the inner face of the pattern-wheel W^1 presents a plane surface, separated into sections by studs or lugs D^{10}, rounded to operate on a thrusting-slide, S^5, provided with a roll, O^2, on its end, held in a guide, S^{55}, perpendicularly to the plane surfaces on the pattern-wheel W^1, so as to be operated by the lugs D^{10}. In accordance with any desired number of short loops between long ones, the teeth on the ratchet-wheel are located against or opposite, or so as to divide the space between the lugs D^{10}, but also so that a ratchet-tooth shall correspond with each lug. The number of teeth in each ratchet-wheel used (they may be varied so as to make sets of loops varying in the length of the series) should correspond to the number of loops required in the set, so that one set may be run off after another, out of continuous wire, and cut into lengths without wastage.

The number of lugs D^{10} must correspond and be spaced with the number of long loops required, or the pattern-wheel may be made entirely plane and free from lugs, thereby permitting the production of only uniform loops; or it may be otherwise modified as to the arrangement and spacing of the lugs, so as to produce any desired pattern of looped wire.

The thrusting-slide S^5 bears at the opposite end from the roll O^2 at right angles upon the eccentric rod or thrusting-bar E near its center, which is provided with a jaw at each end. One of these jaws, J, embraces and rests upon a loose collar, I, on the driving-shaft K^1, loosely, and with free side motion of its other end, a plane sliding surface being provided thereon for the purpose, and the side bearings of the bar E presenting curved outlines to the parallel sides of the cuts made in the collar I, whereby the bar E is kept under proper control when in action. Just forward of the jaw J the thrust-bar E has a stud with roll-bearing O^3, on which an outside eccentric cam, No. 6, takes, which gives it its forward motion at the proper time, the back motion being in control of a spring, R^3. The other jaw J′ of the thrust-rod E embraces and rests upon the subordinate rock-shaft K^2, and is provided above and below, but upon opposite sides, with shoulders or studs D^3 D^4, which take on corresponding fixed projections D^5 D^6 from the rock-shaft K^2, above and below, and on either side, when thrust forward by the eccentric cam No. 6. The projections on the rock-shaft K^2 are so placed and spaced with reference to the shoulders on the thrust-bar that only one can be reached and operated at a time by the shoulders. While the roll of the thrust-slide S^{55} is bearing on the plane surface of the pattern-wheel W^1, the thrust-bar is drawn over by the spring R^4, so that the shoulder on the under jaw will strike the under rock-shaft projection, and thus depress the two rock-shaft arms L^6 L^7, which extend backward therefrom, and control the devices for elevating and depressing the slide-rods H H, operating the plunger and clamp-slides. When the lugs D^{10} strike the roll O^2 the bar E is thrown over, so that the shoulder on its upper jaw J′ comes in contact with the projection on the upper side of the rock-shaft K^2, causing these two rock-shaft arms L^6 L^7 to be elevated, and with them the slide-rods of both the plunger and clamp-slides. At the outer ends of these two arms on rock-shaft K^3 are attached two carriers, V V, consisting of two plates slotted to receive pins D^7 D^8, fixed in the two respective slide-rods H H. The lower ends of these carriers are rigidly connected by a bar A, perforated for and having vertical motion on two vertical guide-pins, *a*. As the two rock-shaft arms rise and fall, under the control of the eccentric rod E, the carriers V V and slide-rods H H rise and fall, and in so doing engage the upper or lower rolls N′ or N on the arms L^3 L^4, the slots in the carriers meantime permitting the requisite motions of the slide-rods. The relative numbers and positions of long and short loops may be varied by varying the spacing of the pattern-wheel at will, without other modification of the machine. The pattern-wheel and ratchet-wheel shown and described will cause the machine to make the same size clasp in endless repeated lengths, which must be cut off every thirty loops. To make a shorter length the ratchet-wheel which has thirty teeth must be changed for one having a less number, and with a pattern-wheel spaced to correspond therewith will repeat these shorter lengths in an endless form from continuous wire run through the machine, as shown in Figs. 1 and 3. A similar variation, increasing the number of teeth, &c., will make longer continuous lengths.

The parts already described are all operated by cams placed on a main cam-shaft, which cams operate on levers having their centers of motion in a rock-shaft, K, placed below the bed-plate of the machine. Cam No. 1 is an inside cam, which operates the slide S, and has the requisite form to give it the motions before described through the pin and rock-shaft arm L^8. Cam No. 2 is the same in character and relation to slide S^1. Between each rocking lever and slide a slide-rod connection with knuckle-joint is interposed. Cam No. 3 is an inside cam, and operates the main rock-shaft K by the lever L^3 secured thereto. This lever has the upper and lower rolls which op-

erate the slide-rod of the plunger and feed-slide S^4.

Cam No. 4 is an outside cam on the same shaft, operating a rocking-lever, L^9, on main rocking-shaft K, against which the adjustable pin or set-screw D^9 of the parallel bar slide S^6 rests, in order to give the motions described. Cam No. 5 is an inside cam, operating a rocking-lever, L^4, on the main rock-shaft K, and through it the clamp-slide S^2 and connections. Cam No. 3 controls the rock-shaft lever L^3 and the spring-pawl fixed on the shaft by which the step-action of the pattern and ratchet wheel is obtained. Cam No. 6 is an outside cam, and operates the thrust-bar E. The plunger-stop T is a spring-stop, against the end of which the plunger is brought with its point opposite the center of each new section of wire for every short loop by the spring. The wedge-shaped piece X on the clamp-slide S^2, when this slide takes its long measure for the long loop, passes under the projecting portion X^1 of the spring-stop T, elevating the same high enough to allow the plunger to pass under and strike a shoulder opposite the center of the long loop wire.

The looped wire is guided out of the machine through the channeled guides U, which keep the manufacture flat, and prevent injurious flexure.

The operating ends of the slides S and S^1, as shown in Figs. 1, 2, and 3, are shown with the fingers or points which embrace the sides of the loops exposed. In the machine these are hidden by the continuous tops of the slides which cover them entirely, as shown in Figs. 12 and 13, and press the wire loops firmly from above down upon the plate underneath, and so flatten the loops and keep them so while the new loop is being formed, and afterward pass them on complete and undisturbed.

We claim as our invention—

1. The slide S, provided with the comb G, arranged and operating in the manner shown and described.

2. The slides S and S^1, provided with the combs G G, as shown and described, in combination.

3. The slide S^2, provided with the clamp L, and operating in the manner and for the purposes set forth, in combination with the parallel bar P and the cam No. 4.

4. The slide S^2, clamp L, and parallel bar P, operating in the manner shown and described, and in combination.

5. The slides S and S^1, arranged and operating to grasp and form the wire at the forward side of the loop, in combination with the slide S^2, arranged and operating to grasp, carry, form, and release the wire at the rear side of the loop, as set forth.

6. The combination of the slides S and S^1, the slide S^2, and griping-clamp L, and the plunger P′, all operating in the manner and for the purposes described.

7. The slide S^4, provided with and carrying the plunger P′, and the feeding-lever L^2, each operating alternately in the order and manner shown and described.

8. The combination of ratchet and pattern wheels W^2 and W^1, and the thrusting-slide S^5, when arranged and operated to alter the throw of clamp and plunger slides S^2 and S^4.

9. The slide-rods H H, provided with upper and lower sockets O and O^1, arranged to take on the rolls N N′, placed on the rock-shaft arms L^3 L^4 at different distances from the center of motion, as shown.

10. The spring-stop T, in combination with the wedge X, so placed on the clamp-slide S^2 as to take on and elevate the spring-stop when the slide S^2 makes its long motion to take up a long length of wire.

11. The subordinate rock-shaft K^2, provided with the arms and studs shown and described, in combination with the slide-rods H H and the carriers V V.

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