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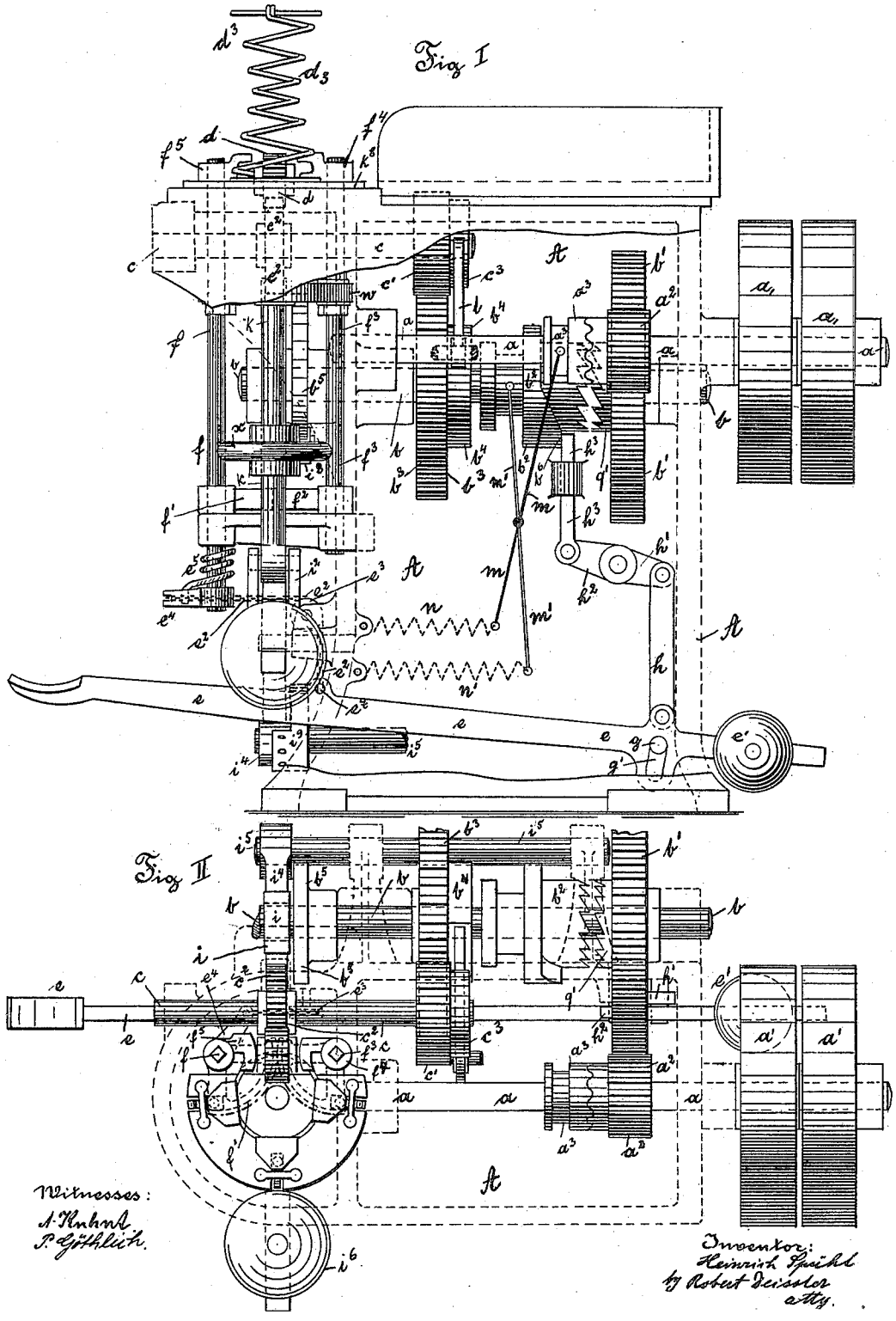
H. SPÜHL.

MACHINE FOR FASTENING THE EXTREMITIES OF SPIRAL SPRINGS.

No. 363,092. Patented May 17, 1887.



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MACHINE FOR FASTENING THE EXTREMITIES OF SPIRAL SPRINGS.

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Fig. III

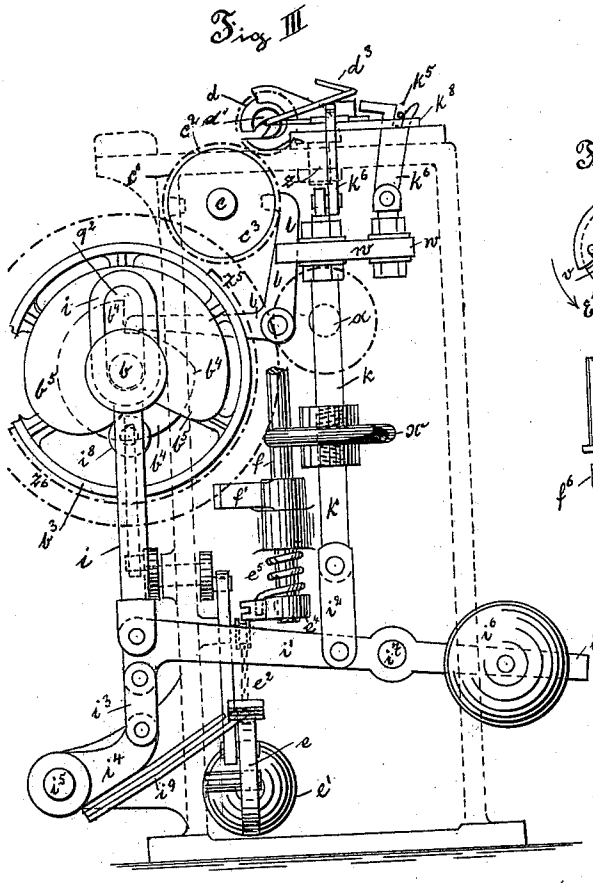


Fig. IV

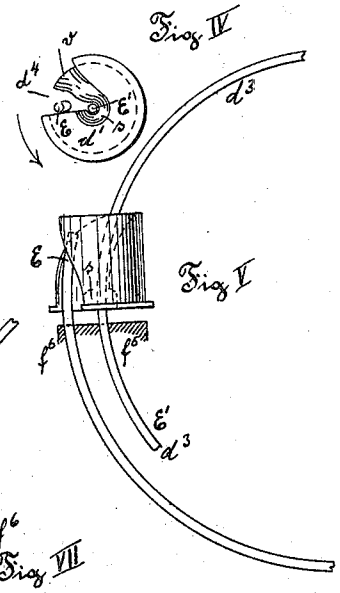


Fig. V

Fig. VI

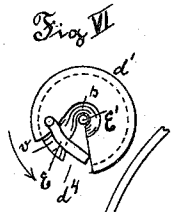


Fig. VII

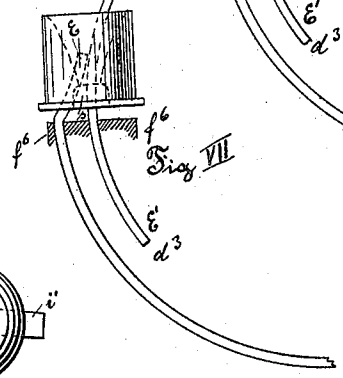


Fig. VIII

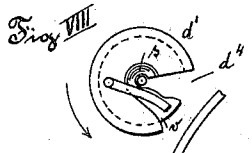


Fig. IX

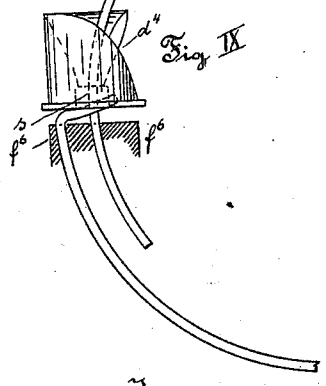


Fig. X

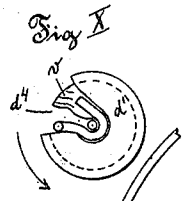
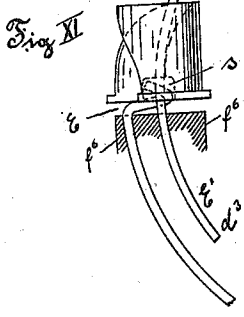


Fig. XI



Witnesses:
A. Pinkert.
P. Göthlich.

Inventor:
Heinrich Spühl
by Robert Deissler
atty.

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H. SPÜHL.

MACHINE FOR FASTENING THE EXTREMITIES OF SPIRAL SPRINGS.

No. 363,092. Patented May 17, 1887.

Fig XII

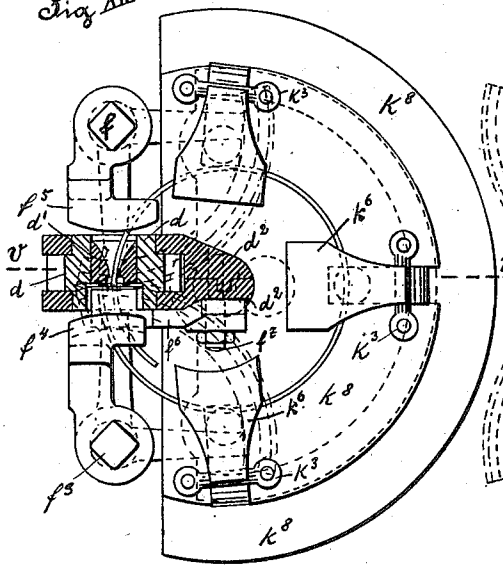


Fig XIII

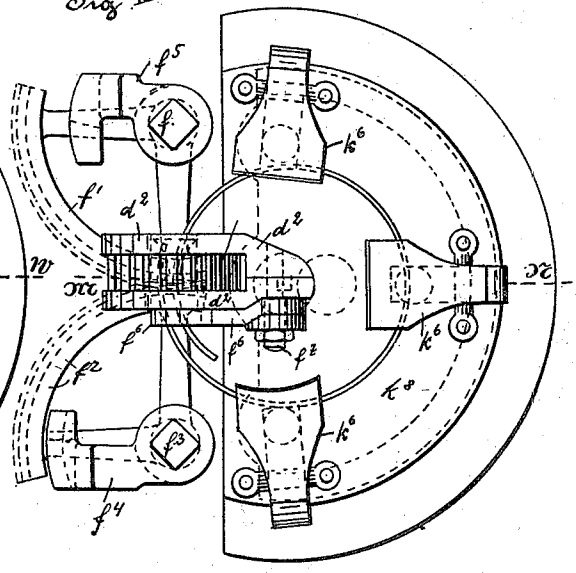


Fig XIV

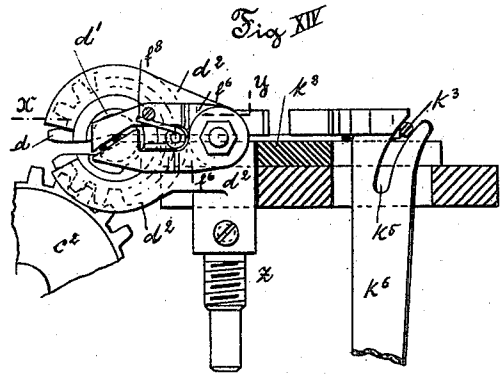
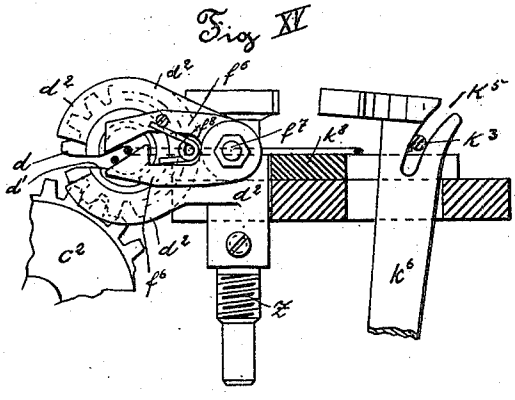


Fig XV



Witnesses:
A. Ruhnke.
L. Göthlich.

Inventor:
Heinrich Spühl
by Robert Heissler
atty.

UNITED STATES PATENT OFFICE.

HEINRICH SPÜHL, OF ST. FIDEN, NEAR ST. GALL, SWITZERLAND.

MACHINE FOR FASTENING THE EXTREMITIES OF SPIRAL SPRINGS.

SPECIFICATION forming part of Letters Patent No. 363,092, dated May 17, 1887.

Application filed August 27, 1886. Serial No. 212,031. (No model.) Patented in England July 31, 1886, No. 9,887; in France July 31, 1886, No. 177,714; in Belgium July 31, 1886, No. 74,055, and in Germany July 31, 1886, No. 38,997.

To all whom it may concern:

Be it known that I, HEINRICH SPÜHL, a citizen of the Federation of Switzerland, residing at St. Fiden, near St. Gall, Switzerland, have invented a new and useful Machine for Fastening the Extremities of Spiral Springs, (for which I have obtained patents in England, No. 9,887, dated July 31, 1886; France, No. 179,714, July 31, 1886; Belgium, No. 74,055, July 31, 1886, and Germany, No. 38,997, July 31, 1886,)of which the following is a specification.

The object of this invention is a machine for fastening down the extremities of spiral springs used in cushions, mattresses, &c., so as to form at each end a continuous ring, said rings being at the same time bent into a plane perpendicular to the axis of the spiral spring, and the knotted extremity of the spring lying toward the interior of the spring, so as to avoid contact of the extremity with the stuff and consequent damage to the latter.

The machine is represented in the accompany drawings, in which—

Figure I is a side elevation of the machines Fig. II, a horizontal view of the same; Fig. III, a front elevation of the machine. Figs. IV, VI, VIII, and X show side elevations of the knotting contrivance in different situations with the extremity to be knotted. Figs. V, VII, IX, and XI show horizontal views of the same mechanisms in different situations. Fig. XII represents a horizontal view and partial section of the knotting contrivance and the closed fastening apparatus, the knotting contrivance being cut through line X Y to show the interior of the same. Fig. XIV shows a side elevation of Fig. XII, the fastening-plate being partly cut through line V W. Fig. XIII shows a horizontal view of the knotting contrivance with revolving fastener, this latter being opened. Fig. XV represents a side elevation of Fig. XIII, the fastener being partly cut through line M N.

My invention consists, first, in the application of a revolving slit cylinder, which is hollow and provided with a helical slot and central recess; secondly, in the application and combination of several devices for holding the spiral spring in proper position and for preventing its getting bent during the knotting operation; thirdly, in the application and combination of the driving mechanisms, which work successively and automatically.

The machine rests on the frame A, generally indicated in the drawings by dotted lines in order not to disturb the distinctness of the various contrivances. This frame carries four parallel shafts, $a\ b\ c\ i^5$, which bear the chief mechanisms of the apparatus. The shaft a bears the pulleys $a'\ a'$, by which the apparatus is set in action, and likewise the loose driving-wheel a^2, which gears into the coupling-box a^3. This coupling-box a^3 may slide longitudinally on the axle a, but it can only rotate if the axle a rotates itself. It is continually pressed against the spur-wheel a^2 by means of a spring, n, and a lever, m, so that if the axle a rotates the coupling-box a^3 will force the tooth-wheel a^2 to rotate likewise. This spur-wheel a^2 gears into the spur-wheel b' on the shaft b. The spur-wheel b' is loosely situated on the axle b, and has a coupling-box, q', Fig. II, which corresponds with the sliding ratchet coupling-box b^2. This ratchet coupling-box is only able to rotate if the axle b rotates. It is likewise pressed by a spring, n', and a lever, m', into the corresponding spur-wheel q', if not prevented from doing so by the stop-pin h^3, Fig. I.

The end of the axle b is surrounded by the vertical rod i, Fig. III, provided with a slot, q^3, and a friction-roller, i^8, on which the cam b^5 operates, this cam being fast on the axle b. Whenever the axle b, and with it the cam b^5, rotates, the friction-roller i^8 and the rod i are forced downward, and the latter operates on the lever i', which has its fulcrum in i^7. The counterpoise i^6 is suspended on one side of lever i', whereas the links i^2 are pivoted on the other side. The links i^2 are in connection with the rod k, which latter operates on a semicircular plate, w, provided with three clamps, k^6. These clamps serve to hold the lower coil of the spring d^3.

The clip i^3 on the lever i' works on the pressing-lever i^4, which is pivoted in i^5, and provided with a very strong spring, i^9, the action of which will be set forth later on. Parallel with the axle i^5 a pedal-lever, e, is applied, which is pivoted on the bolt g. This pivot, however, is not completely closed; but a slot,

g', is arranged in the lever e, as may be seen in Fig. I. The link h laps over the lever e, and connects it, by means of the lever h' h^2, with the stop-pin h^3, which keeps the ratchet coupling-box b^2 in a disengaged position, (hinders it from gearing into the coupling-box q'.) A chain, e^2, is fastened in the eye e^7 on this pedal-lever e, Fig. I, and runs over the pulley e^3, Fig. I, and onto the crank-lever e^4, fixed firmly on the vertical shaft f. This vertical shaft is provided with a spring, e^5, which is applied in such a way that it continually endeavors to turn the axle toward the outside. In addition to this the vertical shaft f has a toothed segment, f', which gears into another similar segment, f^2, fixed to a second vertical axle, f^3. The vertical axles f and f^3 are each provided at their upper ends with a clamping-face, f^4 f^5, serving to hold fast the extremity of the spring, as will be described hereinafter.

The spur-wheel b^3 on the axle b is not provided with teeth along one-third of its circumference, in order to allow the end coil and extremity of the spring to be firmly fixed before the action of the fastening device commences. This spur-wheel gears into the spur-wheel c' on the shaft c. Shaft c carries another spur-wheel, c^2, gearing into a tooth-wheel, d, open on one side, that serves to hold the revolving fastener d'. This tooth-wheel is supported in a very peculiar manner. As it serves to hold the fastening device proper—the slit cylinder d'—it is not fixed on a shaft, but is embraced by a journal-box, d^2, likewise open on one side to allow the spiral spring to be introduced into it. This journal is fixed, by means of a pin, z, onto the frame, Figs. III and XV.

The tooth-wheel receives the slit cylinder d', the peculiar shape of which is represented in Figs. IV to X. Figs. XII to XV show in detail the arrangement of the sleeve-journal d^2, the tooth-wheel d, embraced by it, and the revolving fastener d', fixed in tooth-wheel d.

Before describing the way in which the machine works, it is indispensably necessary to explain the fastening devices represented in Figs. XII to XV. This fastening apparatus consists of the clipping-jaws f^6, pivoted in f^7, and normally kept apart by the spring f^8. The apparatus is fixed to the journal d^2, already described, which embraces the tooth-wheel d. The clipping-jaws f^6 are beveled in front, so that the slit claw f^4 on the vertical axle f^3 catches both parts of the jaws f^6, and can press them together. This occurs when the slit claws f^4 are in the position indicated in Fig. XII, whereas in Fig. XIII the clipping-jaws f^6 are left free. The latter are then opened, as indicated in Fig. XV.

The working of the machine is as follows: The last coil and the extremity of the spring (see Figs. I, III) are introduced into the slit cylinder d' (being open on one side) in such a manner that the extremity E and the next coil E' d^3 of the spring are in the position shown in Figs. IV and V, so that the whole spring is on the side opposite the slit d^4. This done, the workman presses down the pedal-lever e, and as the bolt g is at this time the fulcrum of e, the chain e^2 is drawn down when the lever e descends, Fig. I, as well as the crank-lever e^4, which is turned outward, rotates thereby. The tension of the spring e^5, Figs. I and III, is overcome, and, owing to the shaft f being turned by the two toothed segments f' f^2, the vertical axle f^3 is likewise turned in the opposite direction. The slit claws f^4 f^5 on the upper ends of both shafts assume the position shown in Fig. XII, and the slit claw f^5 presses the last coil of the spring firmly against the table k^8. The other slit claw, f^4, operates as already described herein—that is to say, it catches both parts of the jaws f^6 and makes them assume the position indicated in Fig. XIV, so that they hold both the extremity E and the following coil E' of the spring firmly between them in a certain position. Thus the spiral spring is held on both sides close to the knotting-point.

Whenever the pedal-lever e is pressed down farther, the chain e^2 being already stretched, the fulcrum of the lever, which has been bolt g, is changed, because the chain cannot give way any more, and therefore the eye e^7 gets the fulcrum of the pedal-lever e. Now the lever moves round the eye e^7, and the rear part rises in the slot g'. The counterpoise e' and the link h are lifted, and the lever h' h^2 is turned, while the stop-pin h^3 is moved downward. As soon as this stop-pin h^3 is disengaged from the flange b^6 of the ratchet coupling-box b^2 the latter is pressed into the corresponding coupling-box, q', by means of the spring n' and the lever m', and coupled with the loosely-situated spur-wheel b'. This loose spur-wheel is rotated constantly by the tooth-wheel a^2 and axle a.

At the moment that the coupling-box b^2 gears into the coupling-box q' the shaft b will begin to rotate and the spur-wheel b^3, which is only partly provided with teeth, will also commence to turn. At this moment that part of b^3 which has no teeth faces the spur-wheel c', so that the rotary motion of the spur-wheel b^3 has no effect on spur-wheel c'. When the shaft b begins to turn, and with it the spur-wheel b^3 and cam b^5, the latter alone has an effect. This cam b^5 forces the clip i^8 downward, Fig. III, and presses the left part of the lever i' also downward by means of the vertical rod i. This downward motion of the lever i' has a double effect: first, the spring i^9 is pressed by the link i^3 (and the lever i^4) firmly against the pedal-lever e, which is already pressed down by the workman, and therefore, even if the workman lets go of this lever, it cannot rise itself, but is mechanically fixed in its lowest position; secondly, owing to the descending of the left arm of the lever i', the rods i^2 and k, and with them the semicircular plate w, are pressed downward, and the clamps

k^6 on plate w are drawn down and pressed firmly on the lowest coil of the spring d^3, which is held fast against the plate k^5.

In the descending of k^6, and owing to the upper slotted shape, k^5, of the clamps k^6, and to the action of the guides k^3, these clamps are likewise moved inward. Figs. XIV and XV show both positions of the clamps k^6. When the machine is in the position, Figs. XII and XIV, the lowest coil, E' d^3, of the spring and its loose extremity E are held fast by the following-mentioned devices: first, the clipping-jaws f^6 f^6, by means of the slit claw f^4, Figs. XII and XIV; second, by the slit claw f^5, Fig. XII; and, third, by the three clamps k^6 k^5 k^6, Figs. XII and XIV. The lower coil of the spring is therefore fully secured, and in the following operation of the machine an effect can only be produced on the loose extremity E of the spring lying between the clipping-jaws f^6 f^6 and the slit claw f^5, as shown in Fig. XII. This extremity E of the spring is situated in the interior of the revolving fastener d', Figs. IV and V. The fastening of the coil having been effected by this rotation of the shaft b, that part of the spur-wheel b^3 that is provided with teeth gears now into the spur-wheel c', and the shaft c, carrying the spur-wheel c^2, begins to rotate. The spur-wheel c^2 gears into the tooth-wheel d, embraced by the sleeve-journal d^2. The revolving fastener d' is firmly connected with the spur-wheel d, and is therefore turned. Figs. IV and V show side views and a plan view of the primary position of the spring-wire E E' in the hollow fastener d'.

As may be seen, the wire is held on one side by the clipping-jaws f^6 f^6. When the revolving fastener d' is turned, the projecting extremity E of the coil presses against the beveled surface v of the fastener, and is bent, as is indicated in Figs. VI and VII, after one quarter of a rotation of the wheel d. After half a rotation of this wheel the extremity E has assumed the position shown in Figs. VIII and IX, and after a full rotation the extremity is bent, as seen in Figs. X and XI, half-way round the fixed coil E', which is on one side held fast by the clipping-jaws f^6 f^6 and on the other side by the slit claw f^5. (Not shown in Figs. IV to XI.) Further turning of the revolving fastener causes the extremity to wind still more round the fixed coil. The operation is herewith concluded after one rotation of the shaft b. Now the cam b^5 lets go its hold of the friction-roller i^3, the counterpoise i^6 descends again, and clip i^3, the left arm of the lever i', and the pressing-lever i^4, and the spring i^9 rise again. Owing to this change the rods i^2 and k, the plate k^4, and the clamps k^6 are moved upward. They let go their hold of the coil of the spiral spring, while, on the other hand, the ascending spring i^9 releases the pedal-lever e. The spring e^5 on the axle f then works on the crank-lever e^4, Figs. I and II, by which means and by the aid of chain e^2 the pedal-lever e is moved upward. By this back motion of the shaft f and of the vertical axle f^3 the two slit claws f^4 f^5 are likewise turned back by means of the toothed segments f' f^2, so that they get the position, Fig. XIII. Owing to the effect of the spring f^8, the clipping-jaws f^6 are reopened, and the back-motion makes them let go the bold they had on the coils of the spring E E'; but at the same time, after this one rotation of the shaft b, the spur-wheel b^3 has returned with its toothless part to the position Fig. III. No further turning of the shaft c occurs then; but also the axle b itself, which carries the tooth-wheel b^3, ceases to turn, because by the mounting of the right-hand part of the lever e, Fig. I, the rod h has been lifted, as well as the rod h^3. The turning axle b pushes, by means of its coupling-box b^2, against the rod h^3, and the coupling-box b^2 is moved aside, so that it leaves the corresponding coupling-box, q'. The latter is rotating itself, but, being loose on axle b, it cannot turn this axle. Any further rotating of the spur-wheel b^3 is thus prevented when the apparatus is in this position. The latter would then remain in its original position and be ready for the introduction of another spring. I will describe this stopping and working of the rod h^3 still more exactly.

As already stated, the pedal-lever e is returned to its original position, Fig. I. The counterpoise e' has sunk again on the right hand, for the position of the coupling-box b^2, provided with flange b^5, allows e' to sink and the stop-pin h^3 to rise. The stop-pin could move upward beside the flange b^5 and press against the cylinder of the ratchet coupling-box b^2. In this position the two spur-wheels b^2 q' still gear into each other; but when the shaft b turns still farther the beveled surface of the projecting rim of the ratchet coupling-box b^2 will strike against the stop-pin h^3 and will be driven back until it is quite disengaged from the loose spur-wheel b'. The shaft b then stops and another spring may be introduced.

Some further details must still be given by means of which the revolving fastener d' is set exactly in the position shown in Fig. III. These mechanisms consist in the tumbler b^4 on the spur-wheel b^3, the double pawl l l, and the cam c^3, fixed onto the spur-wheel c' and provided with two notches. Whenever the shaft b has performed a rotation, the double pawl l falls into the notch of the non-circular tumbler b^4, Fig. III, and the other arm of the pawl l catches in the notch of the cam c^3, and thereby the shaft c is stopped in proper position. It must further be mentioned that for the purpose of introducing exactly different sizes of wire the rods i^2 k k are made adjustable as regards their length. Right-hand and left-hand threads are made in the coupling-box x, as shown in Fig. III. The coupling-box a^3 is rounded off, so that in case the machine should be overstrained it disengages itself and thus prevents breakage of the other parts of the apparatus.

There is still to remark that the revolving fastener d' possesses on one side a central re-

cess, *s*. This central recess is necessary as a receptacle for the extremity E of the spring to be bent, for without such a recess it will not be possible to bend the extremity of the spring more than half-way round the fixed coil. When the extremity has been bent half-way round, the effect that the inclined plane *v* has on the extremity of the spring is at an end, and the extremity would be forced right out of the slit cylinder *d'* and would get into the intermediate space between the clipping-jaws f^6 f^6 and the fastener *d'*. Thus the recess *s* completes the work begun by the inclined plane *v*.

What I claim, and desire to secure by Letters Patent of the United States, is: In machines for fastening the ends of spiral springs to the coil next above, so as to form a continuous ring—

1. The rotary fastener *d'*, having a lateral slit extending from the circumference to the center, and also provided with a helical plane, *v*, and a central recess, *s*, combined with the jaws f^6 f^6, for the purpose of twisting the end of the spring round the coil next above and fixing it to the same.

2. The fastener *d'*, with the helical plane *v* and a central recess, *s*, and jaws f^6 f^6, combined with fork f^4 and clamps k^6, arranged to be pressed down against the plate k^8, substantially as and for the purpose described.

3. The fastener *d'*, with helical plane and central recess, *s*, jaws f^6 f^6 and fork f^4, combined with the pedal-lever *e*, with fulcra *g* and e^7, chain e^2, crank-lever e^4, shafts $f f^3$, and clutch-disengaging mechanism *h* h' h^2 h^3, all arranged substantially as described and illustrated, and for the purpose set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HEINRICH SPÜHL.

Witnesses:

MARY M. STAUB,

PAULINE B. STAUB.