(No Model.) 3 Sheets—Sheet 1.

L. J. PENNOCK.

SPRING COILING MACHINE.

No. 395,511. Patented Jan. 1, 1889.

FIG. 1.

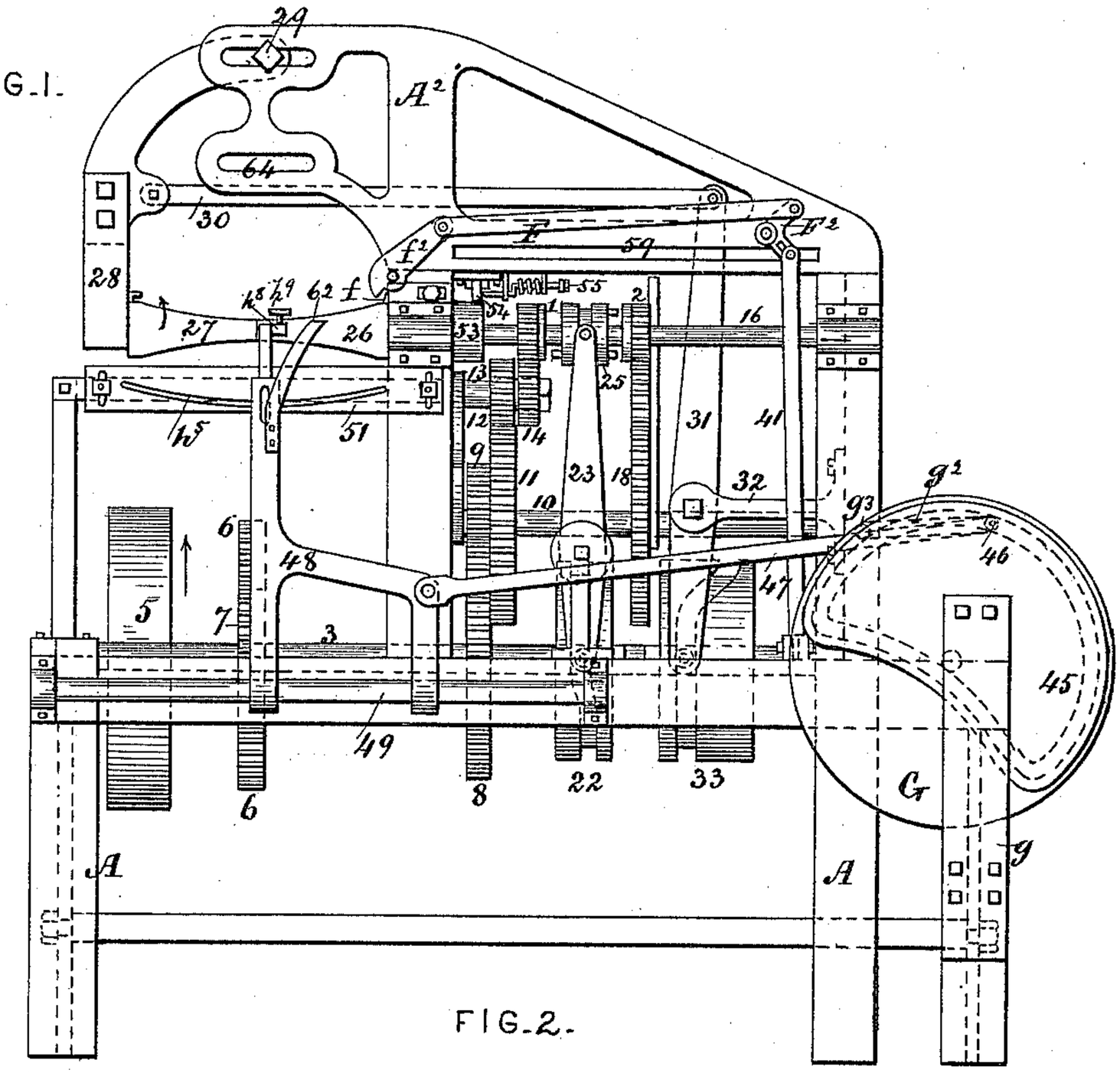

FIG. 2.

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(No Model.) 3 Sheets—Sheet 2.

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FIG. 3.

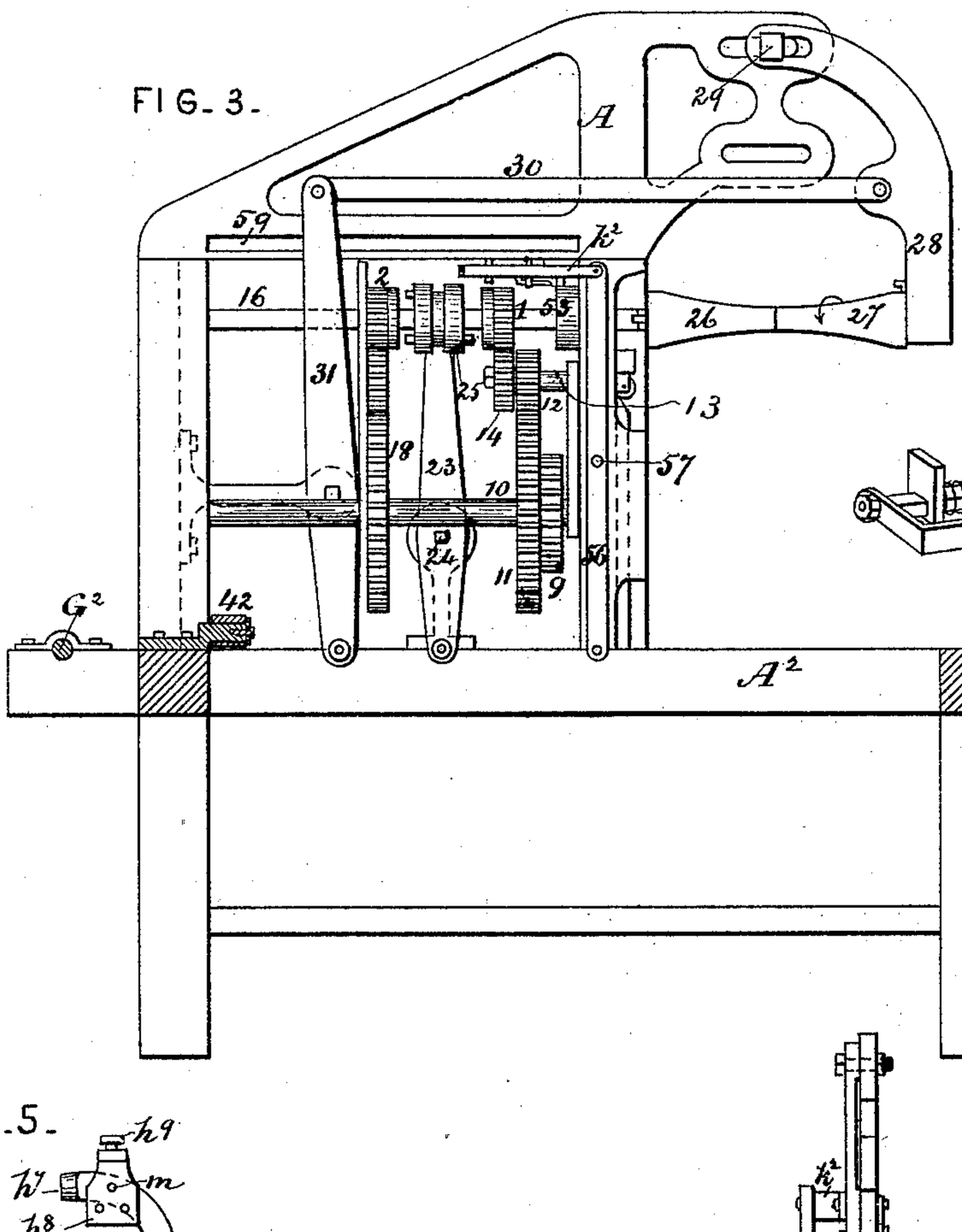

FIG. 3a.

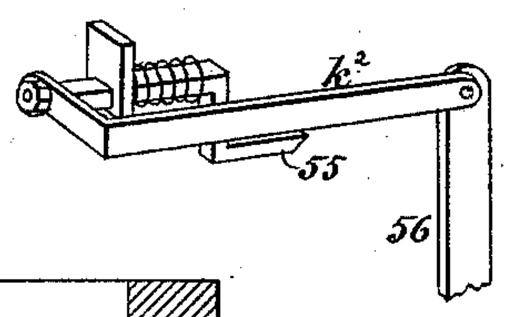

FIG. 5.

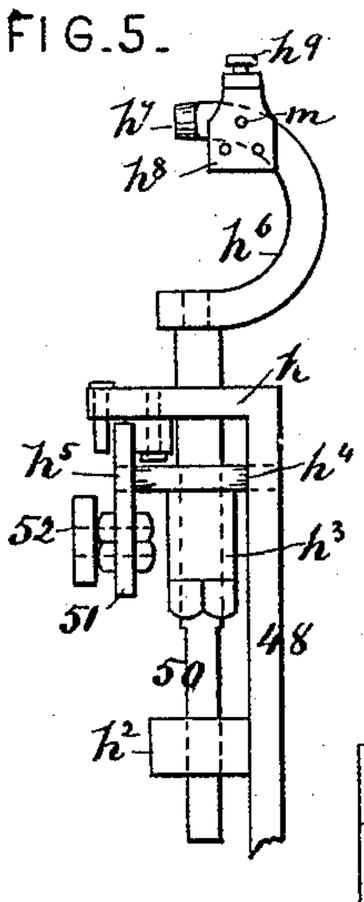

FIG. 4.

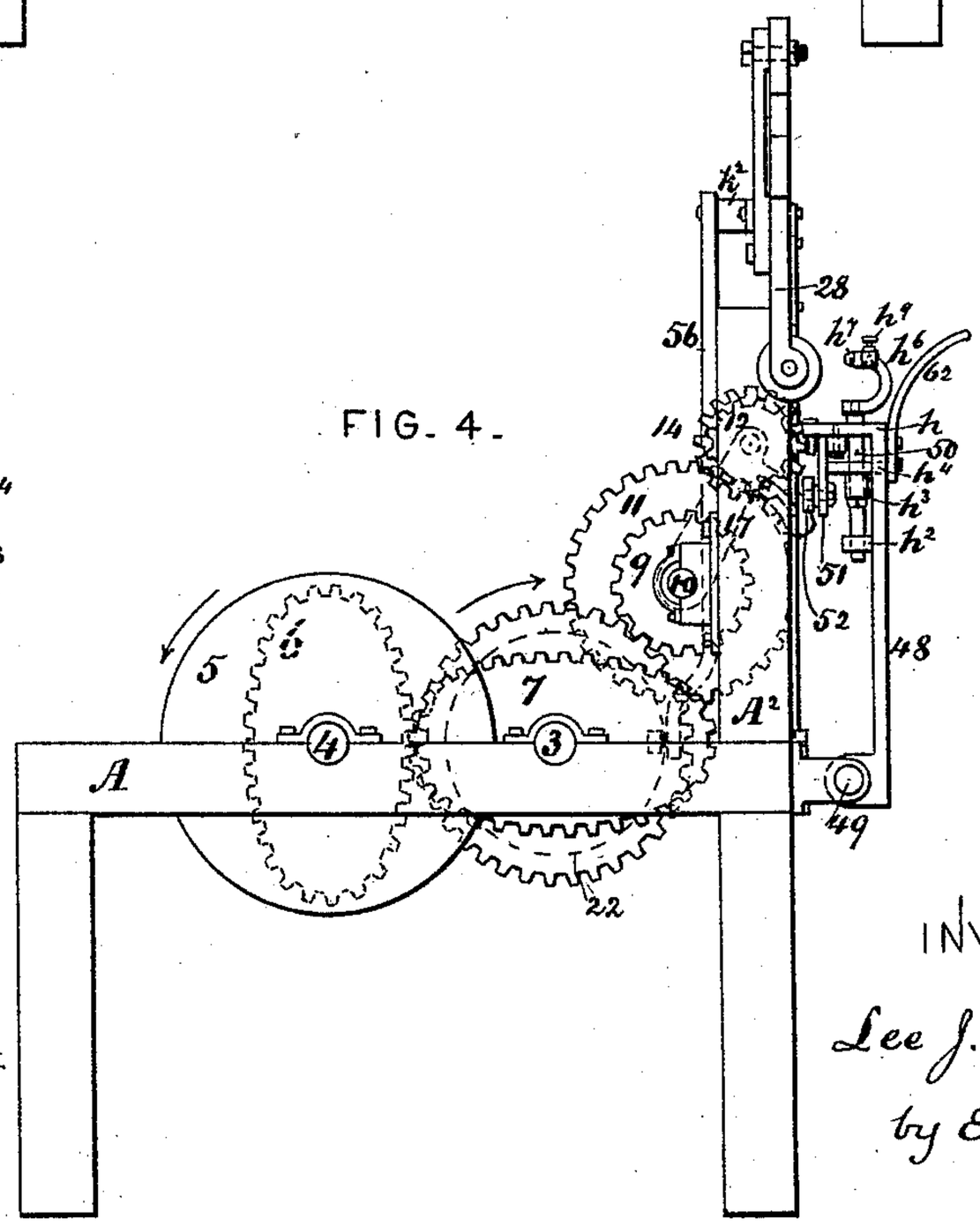

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FIG. 6.

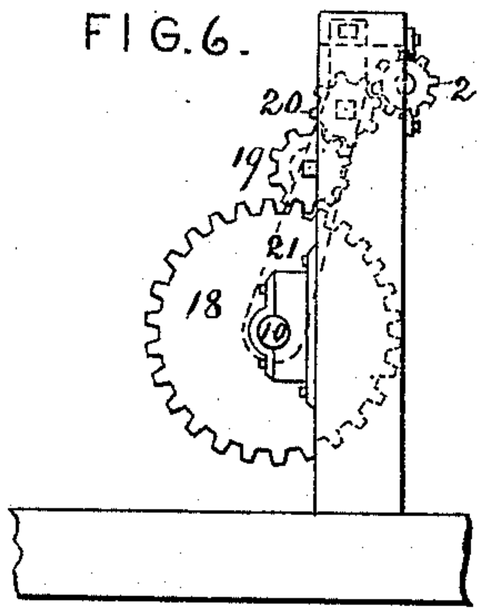


FIG. 7.

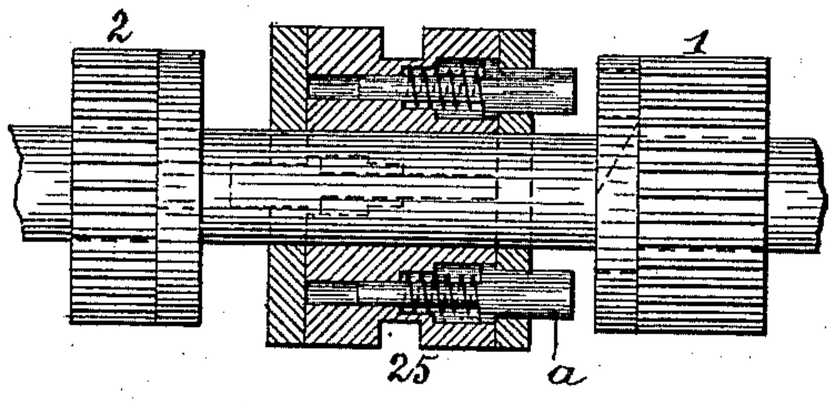


FIG. 8.

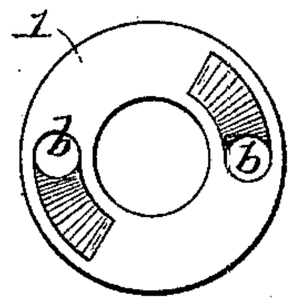


FIG. 9.

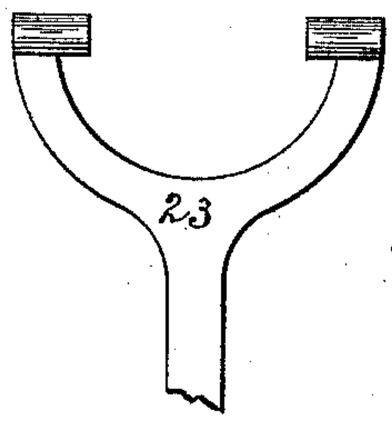


FIG. 10.

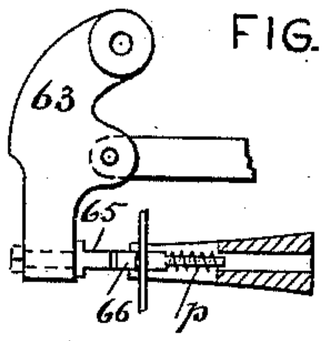


FIG. 11.

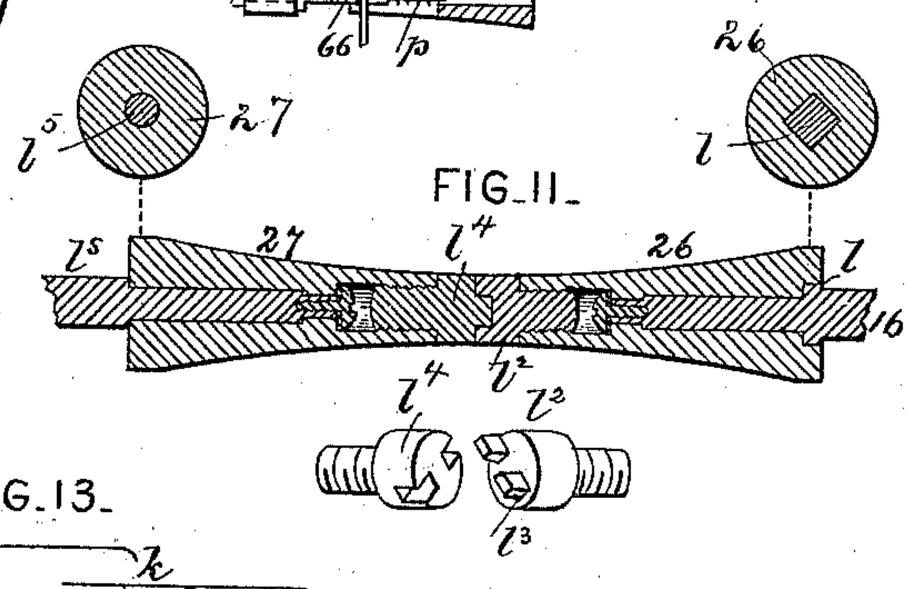


FIG. 12.

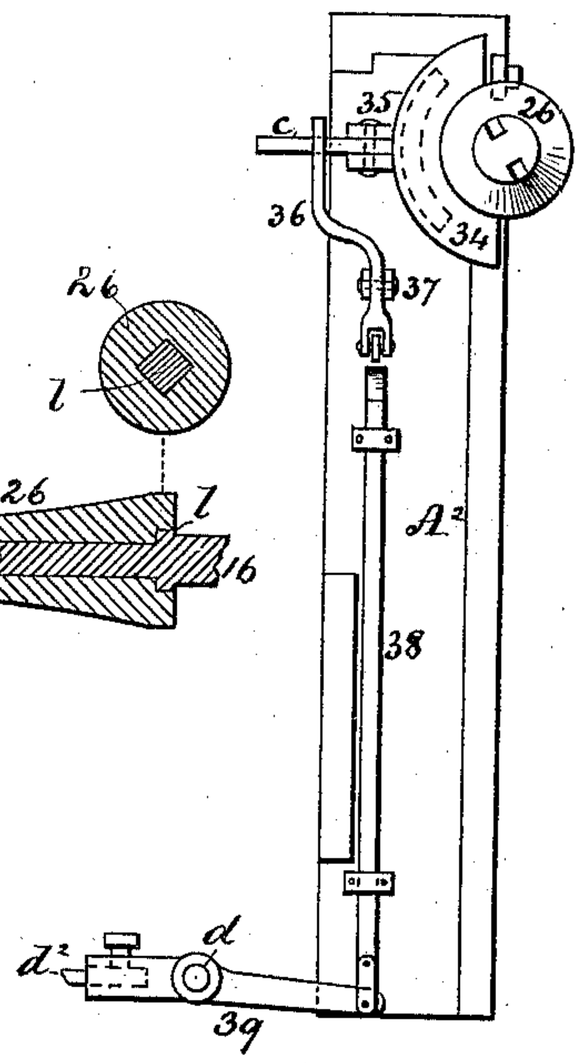


FIG. 13.

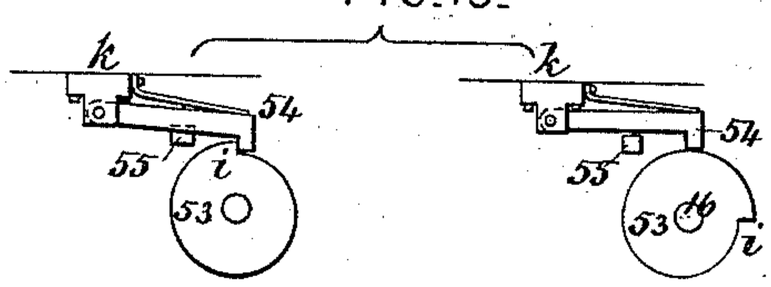


FIG. 14.

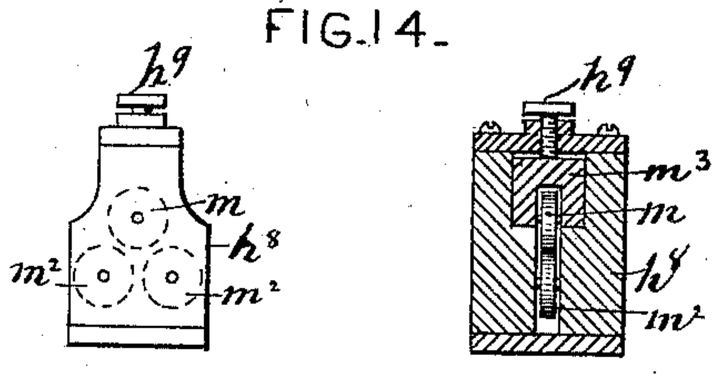
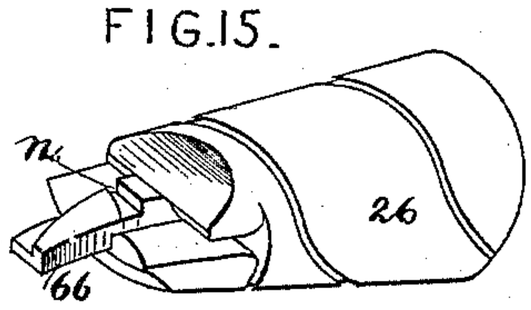


FIG. 15.



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atty.

UNITED STATES PATENT OFFICE.

LEE J. PENNOCK, OF JAMESTOWN, NEW YORK, ASSIGNOR OF TWO-THIRDS TO EDDSON A. TAYLOR AND JESSE W. EROE, BOTH OF SAME PLACE.

SPRING-COILING MACHINE.

SPECIFICATION forming part of Letters Patent No. 395,511, dated January 1, 1889.

Application filed June 8, 1888. Serial No. 276,454. (No model.)

To all whom it may concern:

Be it known that I, LEE J. PENNOCK, a citizen of the United States of America, residing at Jamestown, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Spring-Coiling Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to improvements in automatic spring-coiling machines in which a traveling carriage directs the spring-wire to the conical forming-blocks, upon which it is coiled and one end cut off and the spring removed; and the objects of my improvement are to provide simple means for regulating the tension upon the wire; also, to provide an irregular motion for the feed-carriage and means for stopping the forming-blocks and throwing off the finished spring, as hereinafter described, and specifically set forth in the claims. I attain these objects by the construction illustrated in the accompanying drawings, in which—

Figure 1 is a side view of a spring-coiling machine constructed in accordance with my invention. Fig. 2 is a horizontal section showing in plan the parts supported by the lower half of the frame. Fig. 3 is a longitudinal vertical section on line *x x* of Fig. 2, showing the opposite side of the frame and some of the parts shown in Fig. 1. Fig. 3ª is a perspective view of the cone-shaft, retaining spring-latch, and operating-rod. Fig. 4 is an end elevation of the machine. Fig. 5 is an end view, on a larger scale, of the wire guide and carriage. Fig. 6 is an end view of the mechanism for reversing the motion of the shaft carrying the conical block. Fig. 7 is a side view of the gears mounted loosely upon the shaft of the conical blocks and the clutch in longitudinal section. Fig. 8 is an end view of one of said gears. Fig. 9 is a side view of the clutch-lever. Fig. 10 is a side view of the arm used in connection with a single cone-block, the cone being shown in section. Fig. 11 is a longitudinal section and also transverse sections of the pair of conical blocks and a perspective view of their inner ends. Fig. 12 is an elevation of the mechanism used to remove the furniture-spring from the forming-blocks. Fig. 13 is a side view, in two positions, of the cone-block's stopping-dog and an end view of its spring-latch. Fig. 14 is a side view and section of the wire-clamp to regulate the tension thereon. Fig. 15 is a perspective view of the small end of the single cone shown in Fig. 10.

In said drawings, A represents a frame having legs to support it at the proper height, and adjacent to one edge of said frame is a narrow vertical frame, A^2, that carries the shaft 16 of the spring-forming block 26. This shaft is alternately revolved in one direction by the gear 1 to wind the spring and in the opposite direction by the gear 2 to permit the removal of the spring. These gears are mounted loosely upon the shaft, but are alternately connected with a clutch, 25, adapted to move longitudinally thereon, but united therewith by a spline. To give motion to the various parts of the machine, the main shaft 4 is mounted in suitable bearings upon the top of the frame A. It carries the driving-pulley 5 and the elliptical gear 6, that meshes with a similar elliptical gear, 7, on a counter-shaft, 3. The gears 6 and 7 are preferably of elliptical form, so as to transmit to the forming-blocks a slow motion at the time the wire is inserted into their clamp, so as to prevent any strain or breakage of the wire, said elliptical gears rotating only one revolution for a half-spring or one revolution for a double-cone spring. To rotate the spring-forming blocks, so as to coil a spring, the shaft 3 carries a gear, 8, that meshes with a gear, 9, on a counter-shaft, 10, mounted in suitable bearings on the frame A^2. This shaft 10 has keyed thereon a larger gear, 11, that meshes with a pinion, 12, revolving on a stud, 13, projecting laterally from an arm, 17, and said pinion 12 has a sleeve that carries the pinion 14, that gears with the pinion 1 on the shaft 16 of the spring-forming blocks.

The size of the gears and pinions above stated is such that one-half of a revolution of gear 8 gives six revolutions to the shaft 16.

This is the smallest number of convolutions generally given to furniture-springs; but to produce a larger number of revolutions the arm 17 has its lower end pivoted on the shaft 10, and can be swung inwardly of the machine and a larger gear substituted for the pinion 14. For this purpose the arm 17 has a side extension that is slotted to receive a bolt by which said arm is secured to the frame A^2 at any suitable angle.

To reverse the motion of the cone-shaft 16 by means of its gear 2, there is secured upon the shaft 10 a gear, 18, that communicates motion to a pinion, 19, Fig. 6, that meshes with a pinion, 20, and the latter meshes with the gear 2. These pinions 19 and 20 are mounted on studs projecting laterally from a stationary brace having its lower end mounted on the shaft 10 and its upper end secured to the frame A^2. To shift the clutch 25 into engagement with the gear 1 and start the machine, there is secured on the counter-shaft 3 a cam, 22, that receives the lower end of the lever 23, that is pivoted to a standard at 24, and the upper end of said lever has a fork the branches of which enter the groove in the clutch. Said clutch 25 has yielding clutch-pins *a* projecting from its end to enter recesses *b* in the face of the gears 1 and 2. The pins *a* are supported by springs, and are thus made yielding, so that if they strike the face of the gears and do not immediately enter the perforations *b* they will yield and not strain the lever 23 or the cam 22. As above stated, the clutch is connected to the shaft 16 by a spline, on which it can slide; but the gears 1 and 2 revolve constantly in opposite directions upon said shaft. The gear 1, when in clutch, is to start the coil; but gear 2 is to reverse the motion of the cone-blocks just before the spring is cut.

The shaft 16 carries the cone 26; but the outer cone, 27, is carried by an arm, 28, the length of which is adjustable, and is pivoted at 29 to the frame A^2 in a slot, so that the pivot 29 can always be vertically over the joint between the two cones even if said cones are made either shorter or longer. To remove the spring formed on the cones, they are disconnected by means of the rod 30, pivoted at one end to the arm 28 and at the other end to the upper end of a lever, 31, pivoted to an arm, 32, of the frame, and said lever has its lower end in engagement with the cam 33 upon the shaft 3. The groove is so formed in said cam 33 that the arm 28 will remain swung outwardly for a short amount of time while the spring is being removed. The cam 22 swings the lever 23, so that when the spring is first started it throws the clutch 25 against the gear 1 for six revolutions, (according to the size of gear 14,) and then it throws the clutch back against gear 2 for about two revolutions to unwind or take the recoil of the spring, and then, the lower end of the lever 23 following that portion of the cam equidistant from its two sides, the clutch remains equidistant or unclutched from either gear 1 or 2. The cone 26 is then stationary and the cone 27 swung outwardly. The spring is then cut and removed by means of the half-collar 34, Fig. 12, attached to an arm, *c*, pivoted to the frame at 35, said arm being pushed laterally by a lever, 36, pivoted to the frame at 37, and said lever carries at its lower end a roller, between which and the frame A^2 is forced the beveled upper end of the vertical rod 38. This rod is elevated by the lever 39, pivoted to a stud, *d*, on a bracket secured to the frame. Said lever has an adjustable steel end, d^2, that is acted on by a finger, *e*, on the revolving collar 40, mounted upon the shaft 3.

The cutter consists of a stationary jaw, *f*, secured to the frame, and the pivoted jaw f^2, having its upper end connected to a rod, F, that has one end connected to a bell-crank lever, F^2, and the latter has a pendent rod, 41, that has its lower end hinged to one end of the horizontal lever 42, pivoted upon a stud, 43, projecting from the frame, and the opposite end of said lever is pressed upon by the end of the crank-arm 44, secured to the shaft 3. As the grooves on the cones are closer together near their large ends, the wire has to be fed faster at these points, and consequently an irregular motion of the wire-feed carriage is required. This motion is given by a stationary templet or cam, 45, secured to a standard, *g*, on the side of the frame, and against the irregular periphery of said templet or in the groove of said cam is made to travel a roller, 46, on one end of the rod 47. Said end of the rod is united to one end of a link, g^2, having its opposite end pivoted at g^3 to a disk, G, mounted on the shaft G^2, that is continuously revolved by the gear g^5, meshing with the gear g^6 on the shaft 3. The opposite end of the rod 47 is pivoted to the carriage 48, the latter having two legs perforated at their lower end to receive the guide-rod 49. The upper end of the carriage has a horizontal arm, *h*, and a lug, h^2, on the same side, through which passes a vertical rod, 50 and in which it can move up and down an inch or two, according to the style of spring to be made. This rod 50 carries between a collar thereon and a sleeve, h^3, upon it also a ring having a pin on opposite sides. One of said pins h^4 acts simply as a guide to prevent the ring from rotating upon the rod 50; but the opposite pin follows the curved groove h^5 in the guide-plate 51. The upper end of the carriage is retained connected with the plate 51 by means of a pin and roller pendent from the arm *h*, extending laterally from the carriage. The guide-plate 51 is retained connected at each end to the supporting-bar 52 by bolts and nuts, by which it can be adjusted both vertically or horizontally.

To the upper end of the vertical rod 50 is

secured a bent arm, h^6, carrying at its upper end a steel plug, h^7, perforated for the passage of the spring-wire, and alongside of said plug is secured upon the arm h^6 a head, h^8, carrying three tension-rollers, said head having a cap with a screw, h^9, to press the journal-box of the upper roller, m, down with said roller upon the wire.

To stop the revolution of the shaft carrying the cone 26 at the proper time, when said cone has made its back recoil, the shaft 16 carries a collar, 53, in the form of a cam, Fig. 13, having a portion of its periphery cut away to form a shoulder or stop, i, with which engages a spring-dog, 54, pivoted to a pendent lug, k, on the frame. While the spring is being wound the spring-dog 54 is held up out of contact with the collar-cam 53 by a sliding spring-latch, 55, horizontally suspended from the frame. This latch is advanced by a spring coiled thereon and abutting at one end against one of its hangers, and is retracted by a horizontal rod, k^2, attached to its rear end. The opposite end of said rod is pivoted to the upper end of a lever, 56, by which the latch is retracted. This lever 56 is pivoted to one of the posts of the frame at 57, and has its lower end bent to be nearly in contact with the side of the gear 8, that carries on said side a lug, 8^a, to come at the proper time in contact with the lower end of the lever 56 and move said lower end laterally. When the shaft 16 revolves to wind the spring, the spring-dog 54 will slide over the depressed portion of the cam 53 until it reaches its cylindrical portion, and is elevated by the latter sufficiently for the end of the latch 55, under the impulse of its spring, to engage under the spring-dog and permit the rotation of the cam 53.

The cone 26, secured to the shaft 16, has a square socket, l, at one end, and at the other end a large screw, l^2, having two prongs, l^3, to enter two grooves in the screw l^4 in the end of the loose cone 27, the latter cone being free to revolve on a short shaft, l^5, secured to the arm 28.

The coil or bundle of wire from which the springs are made is mounted on a spindle on the rear side of the machine and passes therefrom through a slot, 59, in the frame of the machine, and thence under an arm, 62, to the tension-rollers m m^2 in the head h^8, the roller m being above the rollers m^2 and its shaft in an adjustable bearing-block, m^3, controlled by a screw, h^9, the position and curve of the arm 61 regulating the bend on the wire before it reaches the tension-rollers.

To form short or half springs, (single conical,) the arm 28 is removed and a shorter arm, 63, substituted and suspended from a bolt passing through a lower slot, 64, in the frame. The lower end of said arm has a steel pin, 65, to push in a plunger, 66, within the cone. Said plunger has a notch, n, to receive the end of the wire before the spring is formed, and the pressure of the pin 65 against the end of said plunger clamps the wire between it and the end of the cone in a groove formed therein, and the same pressure causes the end of the wire to become bent in line with the axis of the cone, and the latter is then revolved. When the spring is completed, the arm 63 swings back and the spring p within the cone pushes the plunger out and releases the spring. The opposite end is then cut and the spring removed by the half-collar 34, as heretofore described for the double-cone spring.

Having now fully described my invention, I claim—

1. The combination of the conical-spring-forming blocks, the wire-carriage, its operating-cam, connecting-rod 47, link g^2, and disk G, substantially as and for the purpose set forth.

2. The combination of the conical-spring-forming blocks and their shaft 16, the gear 1, having perforations in its side, and clutch 25, having spring clutch-pins, with the pinions 12 and 13 upon a stud, the gear 11 and pinion 9 upon one shaft, and the gear 8 upon the counter-shaft 3, with the clutch-lever 23 and cam 22, whereby the coiling of the spring is started, substantially as described.

3. The combination of the conical-spring-forming blocks and their shaft 16, the gear 2, having recesses in its side, and clutch 25, having spring clutch-pins, with the pinions 19 20, and gear 18, whereby a back motion is given to the forming-blocks, substantially as described.

4. The combination of the spring-forming blocks with the cutters f f^2, the horizontal rod F, bell-crank F^2, the vertical rod 41, pivoted lever 42, and revolving collar-arm 40, substantially as described.

5. The combination of the spring-forming blocks, their shaft, and collar-cam 53, the spring-dog 54, and spring-latch 55, with a rod secured to said latch, the pivoted vertical lever 56, and gear 8, having a lug, 8^a, on the side thereof, whereby the forming-blocks are stopped in proper location, substantially as described.

6. The combination of the spring-forming blocks and their shaft, the half-collar 34 on one side of said cone, the pivoted arm c, carrying said collar, the pivoted lever 36, the vertical rod 38, having a wedge-shaped upper end, the pivoted lever 39, and revolving arm E, whereby the spring formed on the cone-block is removed, substantially as described.

7. The combination of the spring-forming blocks, the arm 28, carrying one of them, the connecting-rod 30, lever 31, and cam 33, substantially as and for the purpose described.

8. The combination of the spring-forming blocks, the gears 1 and 2, the clutch between them, its clutch-lever, the gears 14, 12, 11, 9, and 8, and cam 22 on shaft 3, the elliptical gear 7 on said shaft, and the elliptical gear

6 on the main shaft, substantially as and for the purpose described.

9. The combination of two spring-forming blocks, one of which has its inner end provided with a screw having two prongs and the other with two grooves, and a solid central portion between said two grooves, substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

LEE J. PENNOCK.

Witnesses:
D. D. WOODFORD,
A. D. FALCONER.