(No Model.) 3 Sheets—Sheet 1.

H. S. HALL.

MACHINE FOR SECURING THE ENDS OF SPIRAL SPRINGS.

No. 313,495. Patented Mar. 10, 1885.

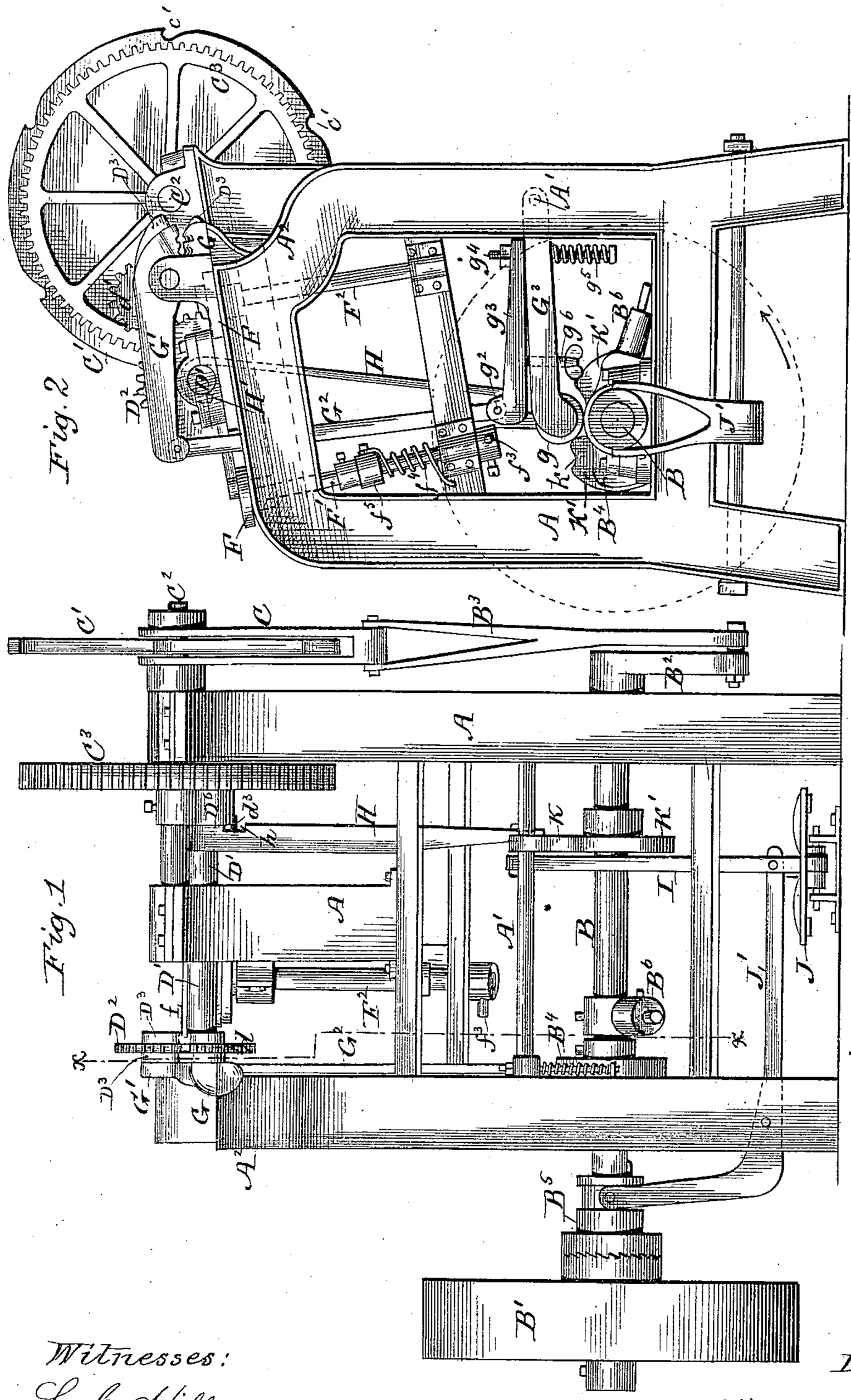

Fig. 2

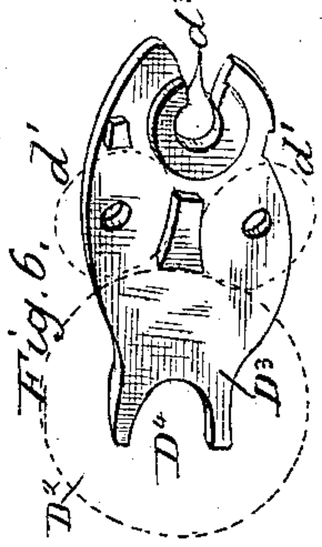

Fig. 6.

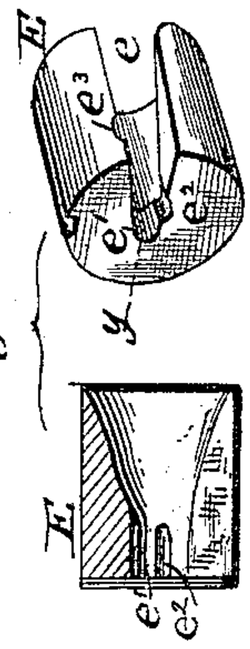

Fig 8

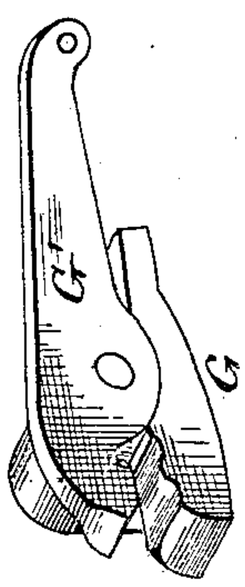

Fig. 5.

Fig. 1

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Fig. 4.

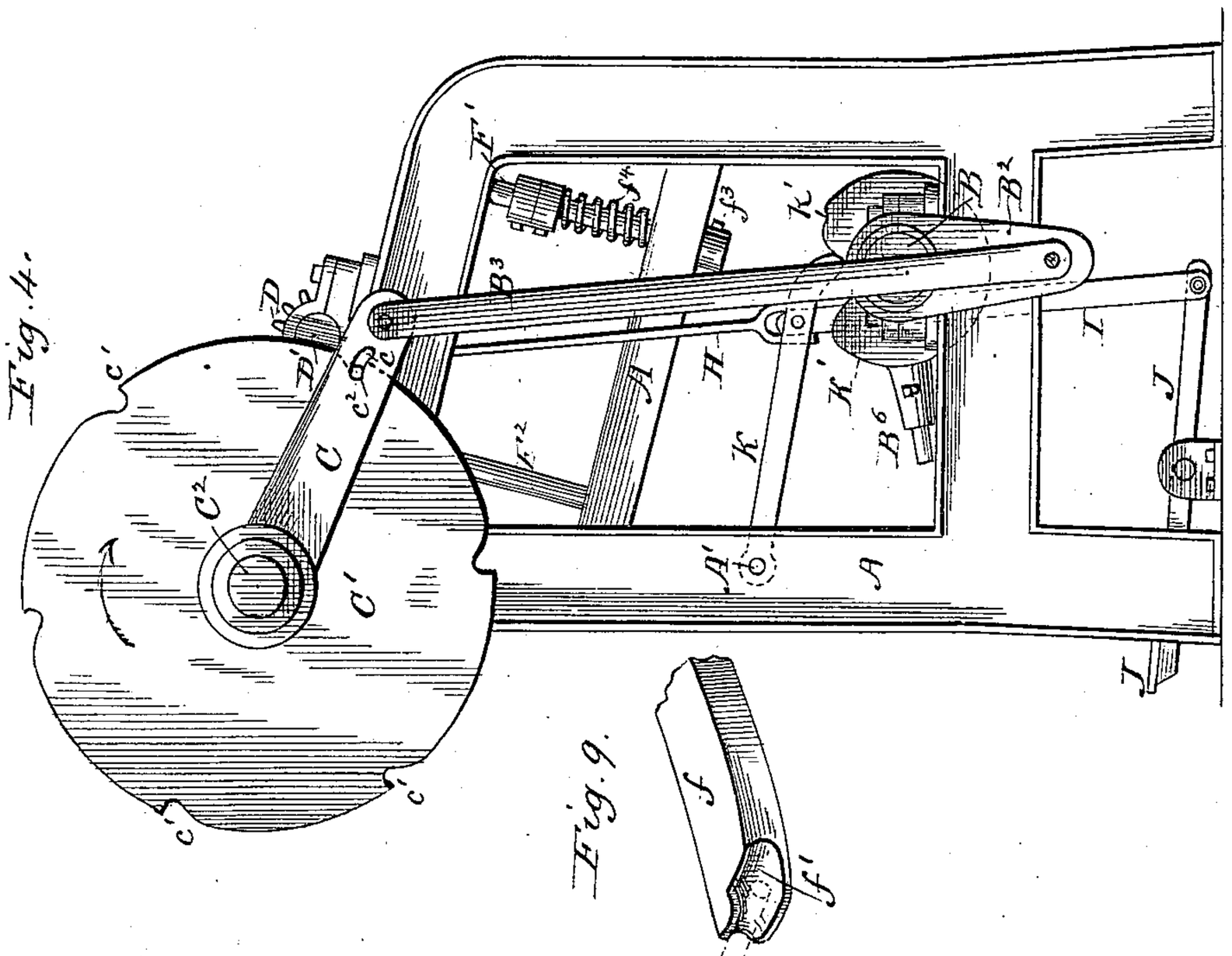


Fig. 9.

Fig. 3

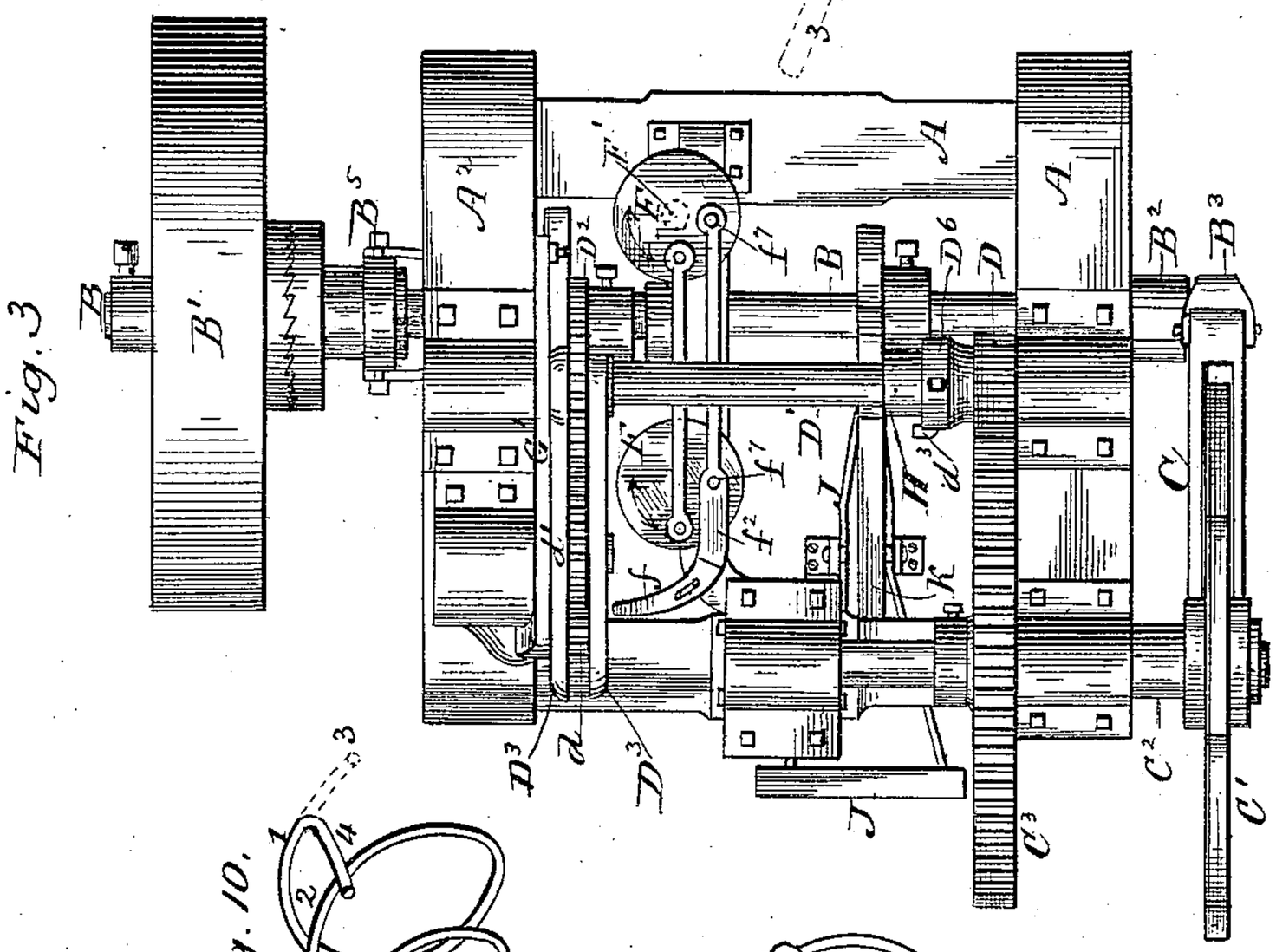


Fig. 10.

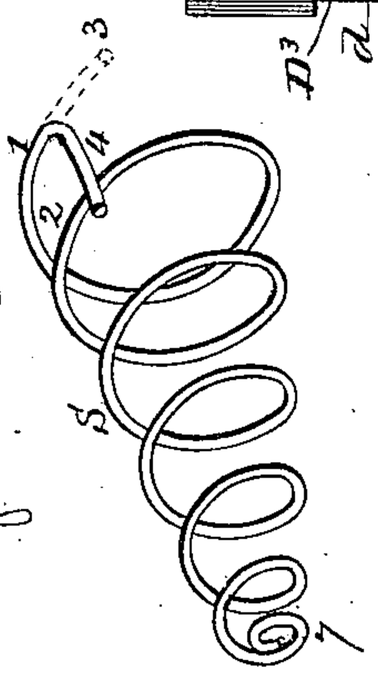
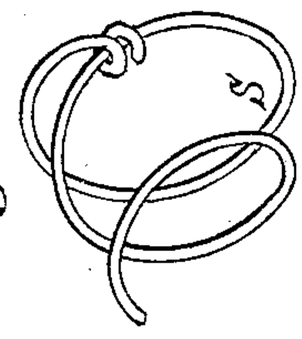


Fig. 11.



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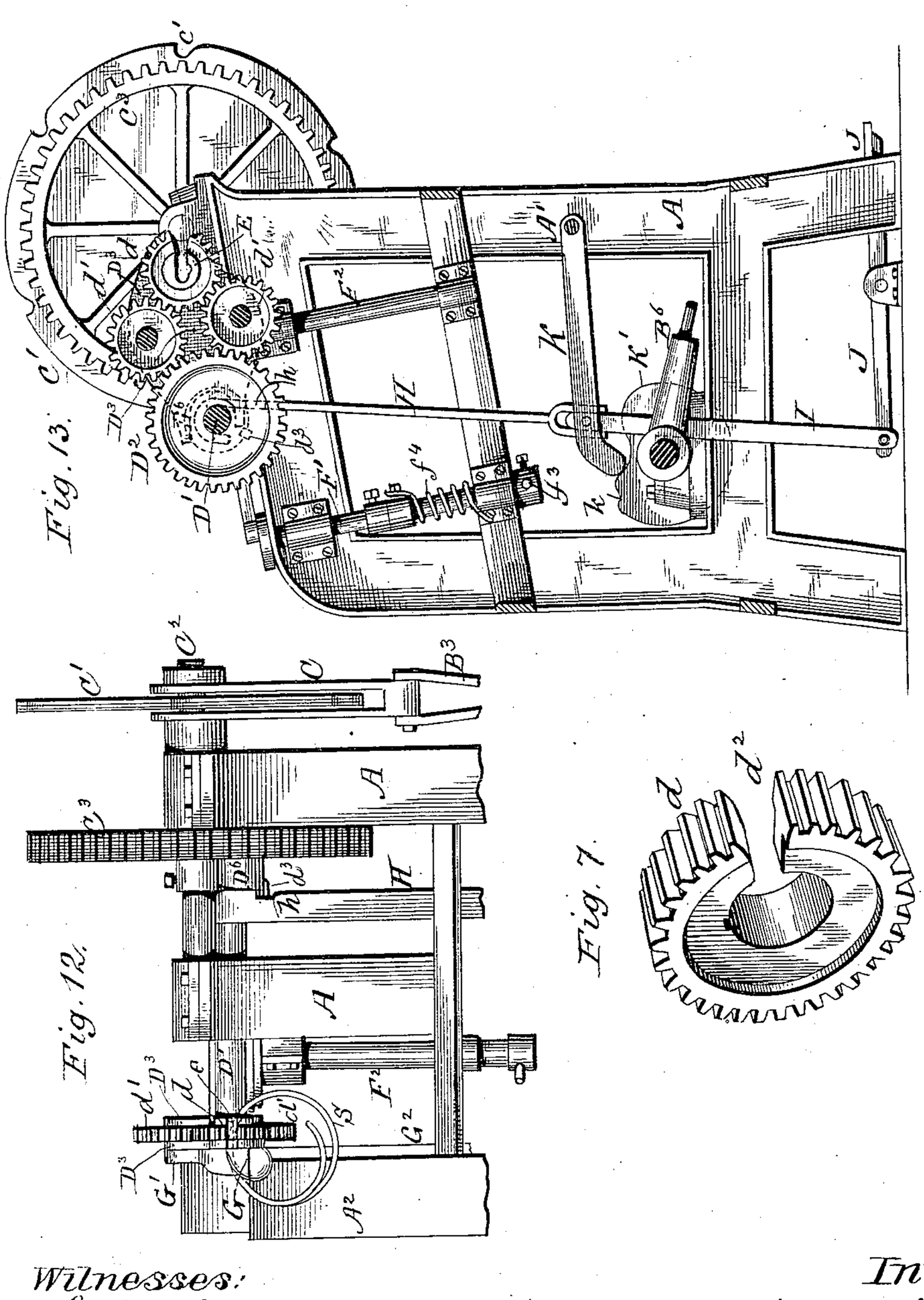

Fig. 13.

Fig. 12.

Fig. 7.

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UNITED STATES PATENT OFFICE.

HIRAM S. HALL, OF JAMESTOWN, NEW YORK, ASSIGNOR TO ALANSON CARY AND EDWARD F. MOEN, BOTH OF NEW YORK, N. Y.

MACHINE FOR SECURING THE ENDS OF SPIRAL SPRINGS.

SPECIFICATION forming part of Letters Patent No. 313,495, dated March 10, 1885.

Application filed May 8, 1884. (No model.)

To all whom it may concern:

Be it known that I, HIRAM S. HALL, a citizen of the United States, residing at Jamestown, in the county of Chautauqua and State of New York, have invented certain new and useful Improvements in Machines for Securing the Ends of Spiral Springs, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a front view of the machine. Fig. 2 is a side view of the same. Fig. 3 is a top view. Fig. 4 is a view of the opposite side of the machine shown in Fig. 2. Fig. 5 is a perspective view of the spring-clamping jaws. Fig. 6 is a perspective view showing the inside of the frame carrying the wire-twisting pinion. Fig. 7 is a perspective view of said pinion. Fig. 8 represents on a large scale, in longitudinal section on line *y* and in perspective, the twisting-head ordinarily keyed within the twisting-pinion. Fig. 9 represents on a still larger scale the recessed extremity of the wire-bending finger. Fig. 10 represents a coiled spring before the end of its largest coil is wrapped around the adjoining coil. Fig. 11 represents the end of the spring wrapped or secured around the adjoining coil by a machine constructed in accordance with my invention. Fig. 12 is a front view of the upper portion of the machine, showing a portion of the two largest coils of a spring in position to be operated upon. Fig. 13 is a vertical section on line *x x* of Fig. 1.

My invention relates to improvements in machines for securing one end of spiral springs to the adjoining coil thereof; and the objects of my improvements are to provide a simple and inexpensive machine capable of rapidly finishing in a uniform manner spiral springs for beds and other furniture.

The invention will first be described in connection with the drawings, and then be pointed out in the claims.

The frame of the machine is represented at A. Upon said frame is mounted in suitable bearing the main shaft B, having at one end the pulley B′, mounted loosely thereon, and at the other end the crank B^2. The latter is connected by means of the forked rod B^3 with the link C, straddling the ratchet-wheel C′, secured upon the shaft C^2, to intermittently rotate it. For this purpose the two branches of the link C are longitudinally slotted at *c*, and within the slots is placed a cylindrical pin, c^2, that can roll freely from one end of the slot to the other, so that when the outer end of the link C is lower than the other end thereof pivoted on the shaft C^2 the pin c^2 will roll out of one of the notches *c* of the ratchet-wheel C′ and be in position to be carried to the next notch, *c′*, above by the rod B^3 and its crank B^2.

Upon the shaft C^2 is mounted a large cog-wheel, C^3, to rotate a pinion, D, secured upon the shaft D′. This shaft carries a gear-wheel, D^2, that transmits motion to the wire-twisting pinion *d* through two intermediate pinions, *d′*, placed one above the other. (Shown in Fig. 3 and by dotted lines in Fig. 6.) As the pinion *d* is mutilated and slotted transversely at d^2 for the admission of the two largest coils of the spring operated upon, the two pinions *d′* are required to keep the pinion *d* at all times connected with the gear-wheel D^2.

Within the body of the pinion *d* is keyed or otherwise secured the wire-twisting head E, Fig. 8, having a radial slot, *e*, extending beyond its center, for the reception at *e′* of the last coil of the spring S operated upon. The slot *e* has also a depression at e^2 centrally within the head E, for the reception of the second spring-coil, around which the end of the last coil is to be wrapped. Said end, while under operation and after it has received its first bend, rests in a depression, e^3, extending radially from the interior of the head E. One end of said head is made interiorly cup-shaped to give clearance for the circular form of the coil in rotating, and to receive the end of the finger *f*, Figs. 3 and 9, that gives the first bend to the end of the spring, as shown by full lines in Fig. 10, as will be hereinafter described.

The wire-twisting pinion *d* and its operating-pinions *d′* are retained by parallel bearing-plates D^3, one of which has a loop on its rear end to receive the shaft D′, and the other a recess, D^4, which is shown in Fig. 6. Alongside one of the plates D^3 is placed the clamping device that retains the spring in position while it is operated upon. This clamping de-

vice is composed of a stationary lower jaw, G, and an upper jaw, G′, pivoted to a bar projecting from the jaw G, and the latter is provided with two transverse grooves to receive the two last coils of the springs.

To the rear end of the jaw G′ is pivoted a pendent rod, G^2, to which a vertical motion is transmitted by means of a cam, B^4, secured upon the shaft B.

To prevent any undue strains upon the jaws G G′ in case the spring operated upon should not be placed properly within the grooves, a yielding compensating device is placed between the lower end of the rod G^2 and the cam B^4. This device is composed of an arm, G^3, having one end pivoted to the frame on a transverse rod, A′, while the other end is provided with a roller, *g*, to travel upon the periphery of the cam B^4. Upon the arm G^3 rests a lever, g^3, having one end pivoted at g^2 to the pendent rod G^2, while the other end is clasped upon the arm G^3 by a bolt, g^4, and coiled spring g^5 thereon, and the middle portion of the lever g^3 rests upon the adjustable fulcrum-bolt g^6 passing through the arm G^3.

In using this machine the operator brings with his left hand the coils 1 and 2, Fig. 10, close together, the end 1 being yet straight, as shown by dotted lines, with the part 7 resting in his right hand or against his body, and places the parts 1 and 2 across the openings d^3 in the bearing-plates D^3, and into the head E of the mutilated gear *d*, and between the jaws G G′, with the end 3 of the spring abutting within the recess *f′* in the end of the finger *f*, and at the same time places his foot upon the treadle J, and this starts the machine as it throws, by means of the lever J′, the clutch B^5 into gear with the clutch upon the hub of the pulley B′. The shaft in its revolution causes the cam B^4 to elevate the rod G^2 of the clamping-jaw G, and cause the latter to retain in position the spring placed between the clamping-jaws. The next operation is to bend the end 3 of the spring over, as shown at 4. This is done by the finger *f*. This finger is adjustably mounted upon the end of an arm, f^2, pivotally secured at two points to the crank-pins f^7, projecting from the upper face of disks F, carried by nearly vertical shafts F′ F^2, capable of having an intermittent semi-circular motion. This motion is given to the shaft F′ by means of an arm, B^6, secured to the shaft B, coming in contact with a pin, f^3, Fig. 2, projecting from the side of a collar secured to the lower end of the shaft F′. This causes the finger *f* to describe a segment of a circle, and forces the end 3 of the spring into the position shown at 4, and this is accomplished within the head E. As soon as the arm B^6 has passed the pin f^3, a part of a revolution in an opposite direction is given to the shaft F′ by the torsion-spring f^4, wrapped around said shaft, having one end secured to the frame and the other to an adjustable collar, f^5, secured upon the shaft F′. During this time the crank B^2 has become elevated and the pin c^2 of the link C has rolled into engagement with the next notch, *c′*, of the ratchet-wheel. The gear D^2 begins to revolve, and with it the mutilated pinion *d* and the twisting-head F thereof, giving thereby two revolutions to the mutilated gear and twisting-head, and causing the end of the spring to be wrapped around the adjoining coil, as shown in Fig. 11.

If the speed is not too great, the mutilated gear *d* will stop with its opening d^2 in front of the operator; but to prevent the momentum of the revolving parts from carrying it too far, a vertical bar, H, having its lower end forked, is made to straddle a pin on an arm, K, projecting from the side or the upper end of the rod I, pivoted at one end to the treadle J. The upper end of the bar H is bent to form a hook, H′, to rest upon the shaft D′, and said bar has a notch, *h*, on one side, that permits the passage of a pin, d^3, projecting endwise from the hub D^6 of the pinion D when said hooked bar is somewhat elevated by the treadle; but when the treadle is released and the bent end of the lever K is resting within the depression in the periphery of the cam K′, the notch *h* becomes too low for the passage of the pin d^3, and said pin, coming in contact with the face of the hooked bar H, arrests the pinion D and the main gear C^3. There are two depressions in the face of the cam K′. The bent end of the lever K enters first the small depression *k*. This allows the hooked bar H to drop sufficiently to arrest the pinion D, as above stated, while the main shaft B continues to revolve a little farther, and is only arrested when the bent end of the lever K, entering the deepest depression, allows the rod I and lever J′ to reach their lowest point, and the clutch B^5 becomes disconnected from the hub of the revolving pulley B′. One of the end pieces of the frame A is depressed at A^2, adjoining to the clamping-jaws, to give room for the insertion of the spring operated upon between said jaws and into the twisting-head E within the mutilated gear.

Having now fully described my invention, I claim—

1. In a machine for securing the ends of spiral springs, the combination of the parallel plates D^3, and between said plates the gear D^2, pinion *d′*, mutilated pinion *d*, and the slotted head within said pinion, substantially as and for the purpose described.

2. The combination of the slotted pinion *d*, finger *f*, arm f^2, and two disks having crank-pins connected with said arm, substantially as and for the purpose described.

3. The combination of the arm f^2, crank-pin f^7, connected therewith, the shaft F′, and side projecting pin, f^3, with the revolving arm B^6, substantially as and for the purpose described.

4. The combination of the arm f^2, carrying finger *f*, disks F, having crank-pins connected with said arm, the shaft F′, and means for giving thereto a part of a revolution in one

direction, with adjustable collar thereon, and spring f^4, secured thereto, substantially as and for the purpose described.

5. The combination of the slotted pinion *d*, the clamping-jaws G G′, pivoted together alongside thereof, the rod G^2, pendent from the jaw G′, and the cam B^4, for operating said jaws, substantially as described.

6. The combination of the jaws G G′, the pendent rod G^2 of the latter, and its operating-cam, with the arm G^3, having the fulcrum-pin g^6, the lever g^3, and the spring-connection, substantially as and for the purpose described.

7. The combination of the slotted pinion *d* and its operating-gears, the shaft D′, and projecting pin d^3, secured thereto, with the vertical bar H, lever K, and its operating-cam, substantially as and for the purpose described.

8. The combination of the slotted pinion *d* and its operating-gears with the shaft D′, collar D^6, and pin d^3 thereon, the vertical bar H, rod I, and treadle J, substantially as and for the purpose described.

9. The combination of the slotted pinion *d* and its operating-gears with the shaft D′, collar D^6, pin d^3 thereon, the bar H, rod I, lever K, lever J′, and its clutch, with the controlling-cam K′, substantially as and for the purpose described.

10. The combination of the main shaft B, its crank, connecting-rod, and slotted link C, carrying the rolling pin c^2, with the ratchet-wheel C′, slotted pinion *d*, its head E, and the intermediate mechanism between said ratchet-wheel and slotted pinion, substantially as and for the purpose described.

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

HIRAM S. HALL.

Witnesses:

GEO. R. BUTTS,

FREDERICK W. HYDE.