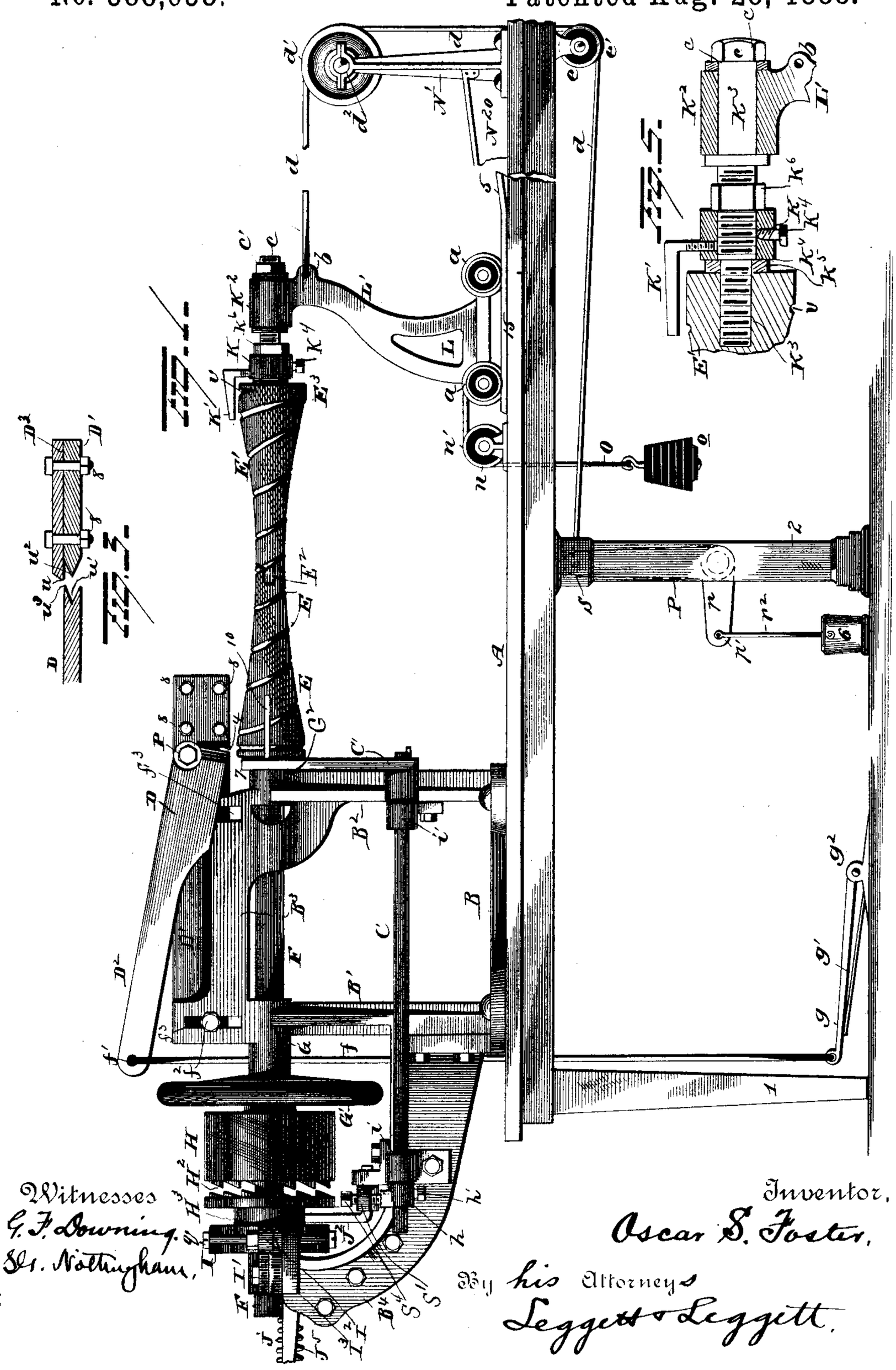
(No Model.) 3 Sheets—Sheet 1.

O. S. FOSTER.

MACHINE FOR MAKING WIRE SPRINGS.

No. 388,658. Patented Aug. 28, 1888.



Witnesses
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(No Model.) 3 Sheets—Sheet 2.

O. S. FOSTER.

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Fig. 2.

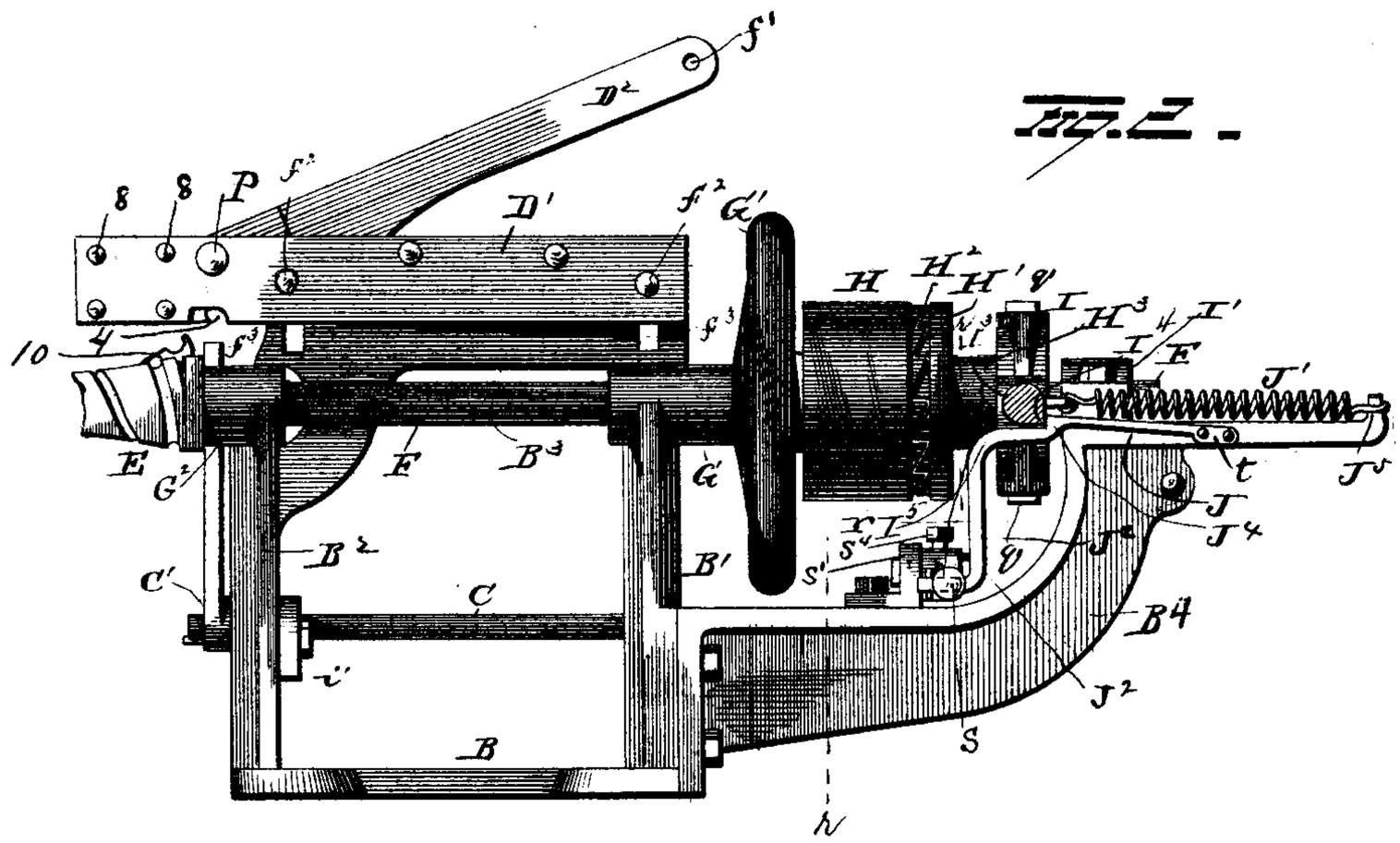


Fig. 9.

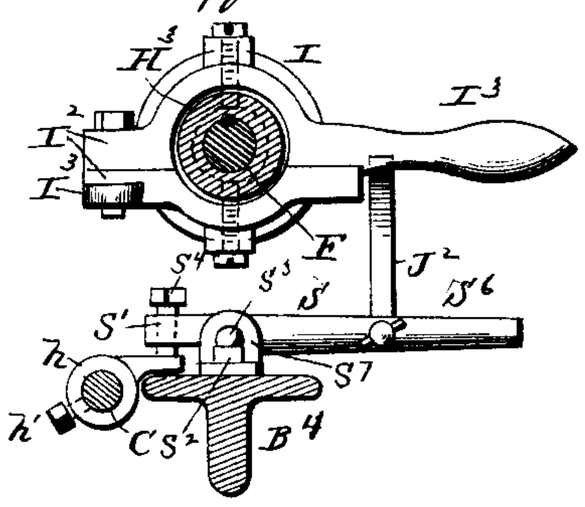
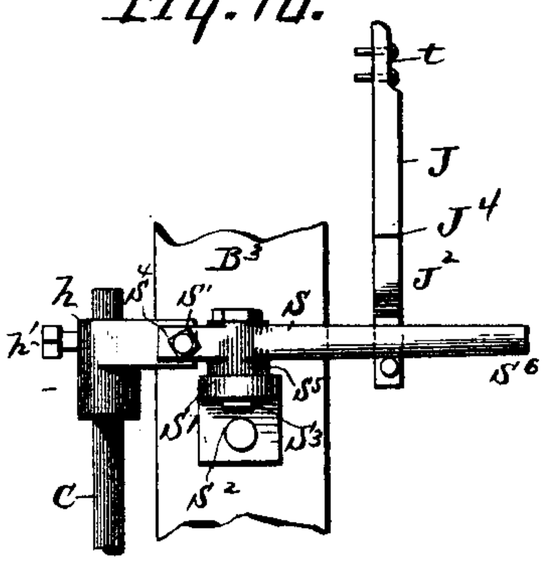


Fig. 10.



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MACHINE FOR MAKING WIRE SPRINGS.

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Fig. 7.

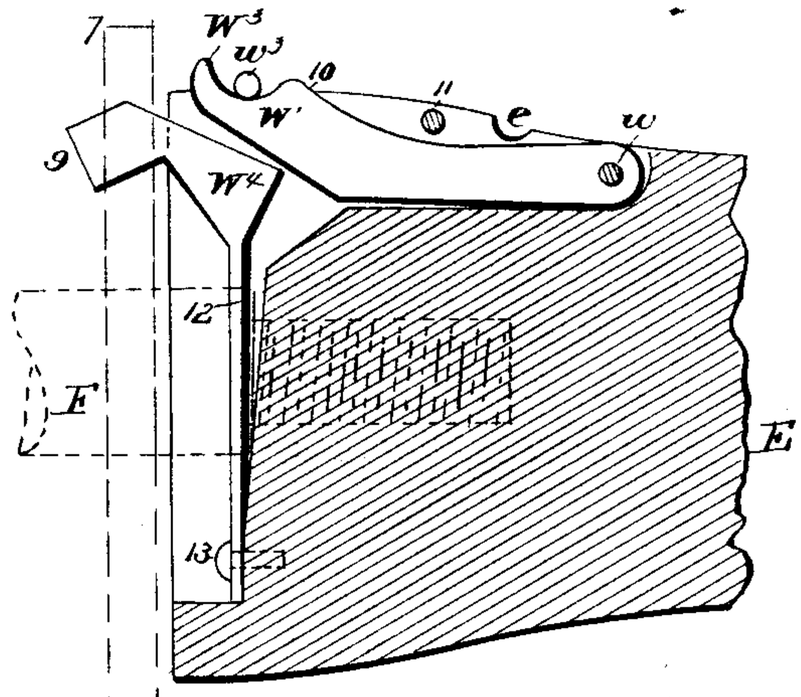


Fig. 8.

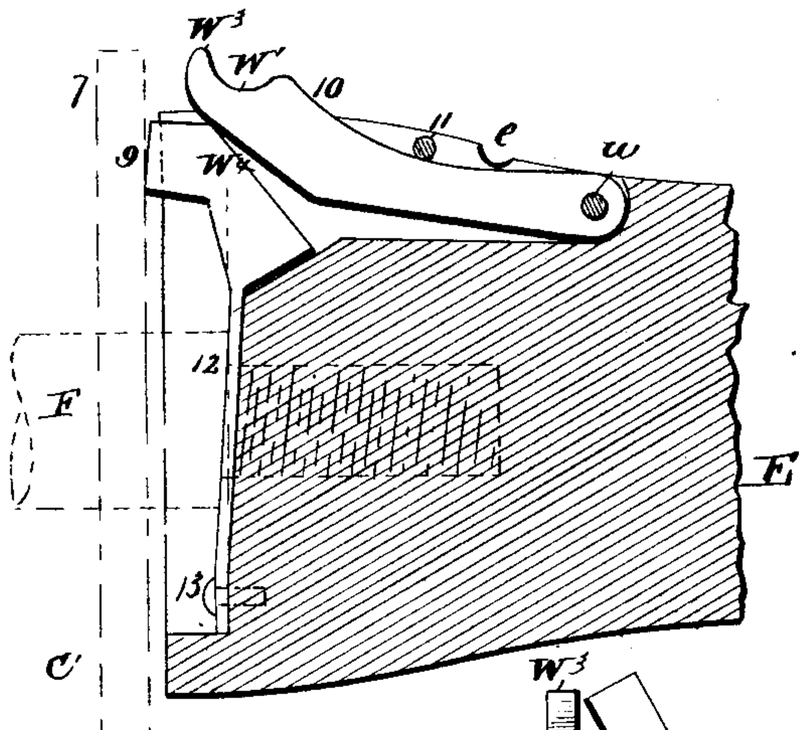


Fig. 5.

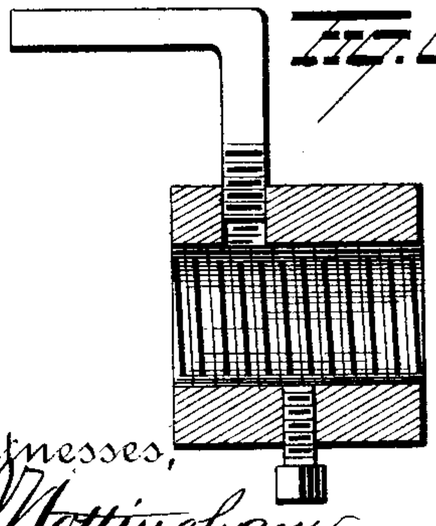
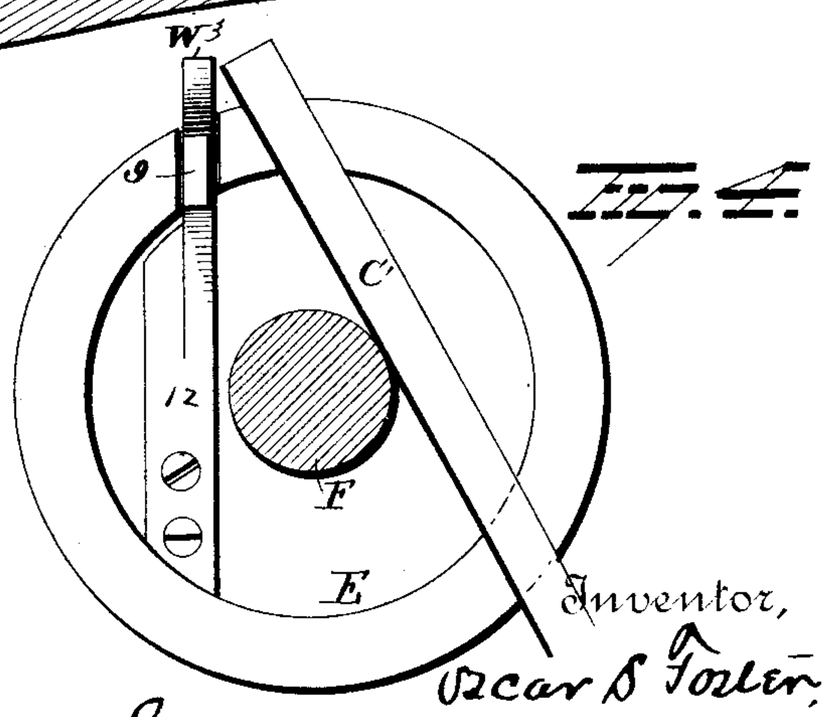


Fig. 4.



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Inventor,
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By his Attorney
Legget & Legget

UNITED STATES PATENT OFFICE.

OSCAR S. FOSTER, OF UTICA, NEW YORK.

MACHINE FOR MAKING WIRE SPRINGS.

SPECIFICATION forming part of Letters Patent No. 388,658, dated August 28, 1888.

Application filed March 31, 1888. Serial No. 269,044. (No model.)

To all whom it may concern:

Be it known that I, OSCAR S. FOSTER, of Utica, in the county of Oneida and State of New York, have invented certain new and useful Improvements in Machines for Making Wire Springs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in machines for coiling wire, and more particularly to such as are employed in the manufacture of cone or double-cone wire springs used in the construction of bed-bottoms or for upholstering purposes.

One object of this invention is to improve the construction of the type of machines that have conical formers on which to wind spring-wire to produce cone or double-cone springs, so that the rotative motion of such a former will be automatically arrested at a predetermined point in the length of the coil, and thus with accuracy determine the length of all springs wound on the machine.

A further object is to furnish an adjustable means for locking the end of the wire at the outer end of a double-cone-spring former, or where the winding operation is begun, so as to permit the length of the coil to be changed on the same former to render a spring end longer or shorter, as may be desired.

A further object is to provide an improved wire cutting and bending implement that is so located with regard to one section of a separable double-cone-spring former that when a spring is wound complete and is to be released from the main coil or bundle of wire the preliminary operation of an arrest of motion of the two cone-sections of the former will throw the wire up into the throat of the cutting-jaws to permit the wire to be severed by a depression of the cutting-jaw.

A further object is to so construct the jaws and cutters of a wire-cutting device used in connection with a spring-winding machine that these parts will be adapted to simultaneously sever the wound spring and bend the cut end of this spring at an angle to the top coil of said spring.

A further object is to provide a clutching device whereby a driving-pulley which is mounted upon the spindle that supports and drives the cone-wire-spring formers may be thrown into or out of operative connection with this spindle, and thus afford means for the employment, under proper control, of adequate power transmitted through the driving-pulley.

With these several objects in view my invention consists in the construction of parts and their combinations, as will be hereinafter specifically described, and pointed out in the claims.

In the annexed drawings, Figure 1 is a rear side elevation of the complete spring-winding machine. Fig. 2 is a front elevation of the head-frame, wire-cutter, and clutch mechanism, a portion of the latter being broken away to expose parts of the latching device employed to hold the clutch-heads in "locked" adjustment. Fig. 3 is a plan view, in horizontal section, of the cutter-jaws of the wire-cutter. Fig 4 is an enlarged view of the end of one cone-section of the wire-spring former. Fig. 5 is an enlarged detached section of the upper end of the truck, the stud mounted thereon, and the bent locking-finger, the latter being in side elevation. Fig. 6 is an enlarged view of the adjustable locking-dog used to clamp the starting end of the spring previous to coiling the same. Fig. 7 is an enlarged sectional view of the one end of a cone-section, taken on a line through the tripping-dog, which by its action arrests the motion of the cone-section, showing the tripping-dog projected to effect such a stoppage. Fig. 8 is an enlarged sectional view of the cone-section shown in Fig. 7, with the tripping-dog in retracted position. Fig. 9 is a view in section on the line *r r* of Fig. 2, and Fig. 10 is a plan view of the lever S and its connections.

It should be premised that certain features of the wire-spring-winding machine herein illustrated have been shown, described, and claimed in Patent No. 303,717, granted to O. S. Foster and W. S. Foster August 19, 1884, consisting of a mechanism for the separation of one half of the double-cone wire-spring former from the other half of the same, and its retraction a proper distance therefrom to release a wound double-cone wire spring. This device is utilized in my present spring-wind-

ing device with other features which are novel. I do not therefore introduce it as a leading feature or a new element, but as a convenient adjunctive appliance to render the spring-winding machine as an entirety more complete, and afford means for its rapid manipulation in the manufacture of double-cone springs.

Referring to the drawings specifically, A, Fig. 1, represents a bench or stable frame sufficiently elevated to afford a proper support for the mechanism and permit certain parts to be moved by treadles.

Upon the upper surface of the bench A the housing-frame B is placed. This consists of a base-plate on which are erected two parallel vertical standards, B′ B², which are connected integrally by the cross-piece B³. An arm, B⁴, is rearwardly extended from the standard B′, said arm being upwardly curved to cause the axial center of a capped box, I′, which is formed on the upper or free end of this arm, to lie in the same plane with hub-boxes G G² on the vertical standards B′ B², respectively. The boxes I′ G G² just mentioned afford revoluble support to the spindle F, which is thus horizontally located to properly support the two cone-sections E E′, which are connected by a square socket and tenon of similar form, (shown at E² in Fig. 1.) Upon the portion of the spindle F which extends beyond the box G a hand-wheel, G′, is securely fixed, and adjacent to it the driving-pulley H is also placed and secured loosely. The rear edge of the pulley H is cut with ratchet-teeth H², which are designed to interlock with similar teeth formed on a clutch-hub, H′, that is mounted so as to slide on the shaft F.

On the clutch-hub barrel H³ a loose sectional ring or yoke, I, is loosely mounted. This is pivoted by its ear I² that projects from one side to the flange I³ of the box I′, and is held engaged to the hub-barrel by the pins *q q*, (see Fig. 2,) which penetrate through the body of the ring and enter an annular groove cut in the hub-barrel H³, so as to allow this barrel to rotate and afford a means for moving it longitudinally.

A spiral spring, J′, is attached by one end to the projecting end J⁵ of the frame-piece B³, and the opposite end of this spring is hooked fast to the handle I³, which projects horizontally from the yoke I, thus adapting the spring J′ by its retractile force to hold the teeth of the clutch-hub H′ out of engagement with the mating teeth on the pulley H.

Upon the bench A, a proper distance from the housing-frame B, an inclined plane, N, is formed, which is furnished with tracks 5 for the accommodation of the flanged wheels *a* of the truck L, which is intended to move on this incline. It will be seen that the pitch of the inclined or sloping track 5 is from a level portion, 15, upwardly to the outer end, 20, as shown in Fig. 1, this pitch being sufficient to aid the movement of the car L by gravity toward the level part 15 of the track when it is free to do so. There is a vertical bracket-stand, N′, placed on the outer end, 20, of the inclined plane N, which stand sustains a grooved pulley, *d′*, that is loosely mounted with its pintle *d²* in the perforated bosses of the bracket-stand.

The upright standard L′ of the truck L is provided with a bearing, K², which has its longitudinal axis in the same horizontal plane with that of the spindle F, so that the double-cone spring-wire former E E′ may be rotatively supported at its outer end by a device which will be further described.

At *b* a wire cord, *d*, or other flexible strand is attached to the upright standard L′ of the truck L, which cord is placed over the grooved pulley *d′*, thence carried down to engage the bracket-supported groove-pulley *c′*, and thence toward the upper end, *s*, of the bell-crank P, to which this cord is attached. This connection of parts is shown in dotted line in Fig. 1. The short horizontal arm *p* of the bell-crank P has its outer end loosely engaged by a connecting-rod, *r²*, the lower end of this vertical rod hooking into an eye on the treadle 6, which is pivoted to vibrate vertically, and this, when depressed, causes the truck L to move up the inclined plane N.

On the end of the truck L nearest the housing-frame B a cord, O, is attached, which is conducted over the grooved pulley *n′* and vertically downward, a weight, *o*, being affixed to the lower end of said cord, which is of sufficient weight to assure the return of the truck L to the level plane 15 when the pressure of the operator's foot is removed from the treadle 6.

To afford a revoluble support to the end E³ of the joined cone-section E E′, a stud, K³, is inserted in the end E³ of cone-section E′, the body of the stud which enters the cone-section being threaded, and the axial perforation provided for its reception being tapped to suit it. The body of the stud K³ is cut to a shoulder, *k⁴*, (see Fig. 5,) which abuts against the end of the cone-section or against a washer when the stud is fully inserted, and upon the stud a collar, K, is mounted, which latter is furnished with a set-screw, K⁴, for locking it in position on the stud K³.

A locking-finger, K′, is provided, which is L-shaped, and is screw-threaded on one limb to engage a tapped hole in the cylindrical collar K, said finger K′ being bent to extend above the peripheral surface of the end E³ of the cone-section E′ and such a proper distance removed therefrom that a free end of the spring-wire which is to be wound into a spring may be inserted between it and the bottom of the semicircular groove *v*, which is cut or otherwise produced in this end of the cone-section of the wire-former, the threaded portion of the finger K′ permitting a proper adjustment to suit different gages of wire.

The outer end of the stud K³ is provided with a threaded end, *c*, which projects outside of the hub K², a round washer and nut, *c′*, being placed on this threaded end of the stud to

hold it so as to permit a rotary movement without end play of the stud in the hub-box K^2. The collar K is mounted on the stud K^3, and is held in position against the adjacent section of the former or against the washer k^5, as shown, by the nut k^6 and set-screw k^4.

The inner or larger end of the cone-section E, which is nearest the standard B^2 of frame B, is secured by any proper means to the end of the spindle F, preferably threaded and screwed to a shoulder, so that they are axially coincident, and this spindle is adapted to rotate both sections E E′ together when it is revolved by power applied to the pulley H.

It is important in the manufacture of coiled-wire springs in quantity for spring-beds or similar uses, where they are all to be of one height, that an accurate means be provided to automatically arrest the winding of the spring at a proper predetermined point. To effect this I have provided a very simple and efficient device, which I will now describe.

The large end of the cone-section E, which is attached to the spindle F, is excavated to receive a flat spring, 12, that is embedded in this recess. Said spring is furnished with a laterally-projecting lug, 9, the outer edge of which corresponds with the periphery of the cone-section E. The lower end of the plate-spring 12 is fastened at 13 to the body of the cone-section on which it is seated, and the spring is thus adapted to have its lug or ear 9 forced outwardly when this lug is pushed against on its inner end.

At *w* a latch, 10, is pivoted in an open slot made in the body of the cone-section E. (See Figs. 7 and 8.) This latch has a projecting guard-toe, w^3, formed on its opposite or free end. The curved lower edge, w^1, of the latch 10 is made to lightly bear upon the rear end of the lug 9, formed on the spring 12, and this spring, when in its normal position, is as shown in Fig. 8. The latch, when thus retracted by spring 12, is held from too great a movement by the stop-pin 11, which is inserted above the edge of the latch, as shown in Fig. 8.

Near the projecting guard-toe w^3, formed on the latch 10, a curved depression, w', is made in the top edge of the latch to receive the wire strand w^2 of a spring which has been completely wound, this groove or depression w' being located so that it will line with the guide-groove in the cone-section, and thus be in position to receive the forcible pressure of the wire strand w^2 when a spring is coiled.

It is evident that when the wire spring has been coiled or wound on the cone-sections E E′ and the same is completed the latch 10 by its depression will project the lug 9 outwardly beyond the end of the cone-section E, so as to engage the lever C′. The lever C′ is mounted on the shaft C, that is supported in a box, *i*′, formed on the standard B^2 near one of its ends, and at the other end in the box *i*, which is affixed to the horizontal portion of the arm B^3 of the frame B. (See Fig. 1.)

Upon the shaft C the cam-toe *h* is secured, its perforated hub being mounted on the end of said shaft, so as to have a limited rocking movement when this shaft is rocked in its supporting-boxes *i i*′ by the engagement of the lug 9 with the vertical lever C′, as will be more fully explained in describing the operation of the machine. The toe of the cam *h* is inwardly projected, so as to lie under an overhanging jaw, S′, which latter is formed on the hub S^5, that is integral with an arm or lever, S, which projects outwardly from the side of the frame-piece B^3 to be convenient for the use of an operator, a handle, S^6, being formed on its free outer end to facilitate its vertical depression manually when occasion requires.

It will be noticed in Fig. 9 that the lever S just mentioned is supported by the engagement of its short journal S^3 with the perforated upwardly-projecting ear S^7 of the bracket-plate S^2, that is seated upon and bolted to the horizontal portion of the frame piece or arm B^3. An adjusting-screw, S^4, is inserted downwardly through a threaded hole made for its reception in the smaller arm, S′, of the lever S, which screw is intended to have forcible contact with the adjacent surface of the cam-toe *h*, and thus permit an adjustment vertically of the arm S.

In Fig. 2 a bent lever, J^2, is shown that has its one end, *t*, secured rigidly to the edge of the flange on box I′. The body of this lever, or portion of it that is near to this secured end, is flattened at J to afford a spring action and permit said lever to be vibrated by reason of its elasticity, the direction of its vibration being vertical deviations from a horizontal plane.

At a proper point close to the side of the handle I^3, that projects from the yoke I upon this side of the coiling-machine, an offset or shoulder is formed by the thickening up of the material and sloping of the thickened portion, so as to produce a spring-latch, J^4, on the lever J. The body of the handle-bar or actuating-lever I^3 is cut away, so as to produce a latching-edge, I^4, on this lever to allow it to readily hook onto the spring-latch J^4, when it and the clutch-hub H′ are simultaneously moved toward the pulley H a sufficient distance to cause the teeth H^3 of the clutch-hub to engage corresponding teeth on the pulley-edge. From a point, I^5, the lever J^2 is bent at a right angle to produce a depending limb, which is again bent to project horizontally and enter a slot in the adjacent body of the lever or handle bar S, through which it extends and is pinned fast, as shown in Fig. 2.

On the upper portion of the housing-frame B a pair of shear-jaws, D D′, is supported. The jaw D′ is secured to the cross-piece B^3 of the frame B, and is rendered capable of vertical adjustment by means of the elongated slots f^3, made through the piece B^3, for the reception of an adjusting bolt and nut, f^2. The other jaw, D, is pivoted at P to the jaw D′, and its limb D^2 extends beyond the rear edge of the frame-piece B^3, so as to permit the depending treadle-bar *f* to be

hooked onto it at f', and extend down to have its lower end loosely engage the free end of the treadle g, which is hinged to proper ears, being secured to the floor of the room in which the machine is placed. The treadle g is pressed upwardly by a spring, g', and through the connecting-bar f the vibrating jaw D of the shears is held away from the cutting-notch 4, made in the lower edge of the fixed jaw D', so that a strand of wire may be inserted readily into this notch. Then the depression of the limb D^2 of the jaw D, by a foot-pressure on the treadle g, will sever the wire instantly.

In Fig. 3 is shown the form of the jaw D D', and it will be seen from inspection of this figure that the jaw D' is really composed of two parts, D' D^3, which are bolted together by the bolts 8. The supplementary piece D^3 has its end u beveled to produce a cutting-edge, the sloping side being toward the outer surface of this plate. The other or main portion of the jaw D' has its end u' located slightly to the rear of the cutting-edge of the plate D^2, and the end u' is beveled to produce a V form, as shown in Fig. 3. The adjacent end of the jaw D is cut away to exactly conform to the V shape of the other piece, D', and by such a form it is adapted to have its edge u^3 slide closely against the cutting-edge u of the plate D^2.

In operation the compound shears just described will engage with the edges u u^3 a strand of wire placed in the notch 4 and held at right angles to the jaws. The downward movement of the limb D^2 will throw these edges together, cutting the wire and causing the edge u^3 to slide past edge u, so as to bend the severed end of a piece of spring-wire into a V form, or nearly in the shape of the female die u', that is formed on the end of the jaw D.

The general operation of the machine may be stated to be substantially as follows: A bundle or coil of spring-wire is located conveniently and in position to pay out without being tangled. The free end of the spring-wire is introduced below the locking-dog K' (see Fig. 1) and embedded in the terminal groove E^3, which is cut spirally throughout the length of the two joined cone-sections E E', the position of this locking-dog having been previously arranged to determine the length of coil end. Motion is now communicated to the cone-sections, which are made to revolve in a direction away from the operator, who is stationed on the side of the machine. (Shown in Fig. 2.) The wire is held in the hands of the workman, who grasps it tightly and holds it with sufficient force to cause the wire to be embedded in the bottom of the groove E^3 throughout the length of the cone-sections. When a spring has been completed as to its winding, the wire will enter the curved notch w', that is formed on the latch 10, and by its pressure thereon depresses the latch, which will project the lug 9, so that it will engage the vertical lever C', which will be pushed toward the rear side of the machine by the rotative movement of this lug. The lever C' will by its motion rock the shaft C, on the end of which it is fastened, and this rocking motion will be transmitted by the cam-toe on hub h to the handle-bar S, depressing the handle S^6 of this bar. The downward movement of the handle-bar S will draw down the bent lever J^2 and release the spring latch-hook J^4 from the yoke-lever I^3, so that the latter, with its attached yoke I, will be moved toward the box I' by the retractile force of the spiral spring J', thus releasing the teeth of the clutch-hub H' from the pulley H, that the latter may run free, it being understood that the pulley H runs loosely on the shaft F, and is held from endwise displacement by collars or other well-known appliances, while the clutch-hub H' is adapted to slide longitudinally on a spline in the well-known manner for constructing such devices.

If the parts of the device are properly constructed so as to avoid lost motion in their several connections, the arrest of the winding movement of the cone-sections E E' will be immediate and always at the same point.

It is apparent that from the construction of the machine any length of cone-sections may be employed without change being necessary to adapt them to operate in conjunction with the automatic clutch shipping device, which will arrest their rotative motion by a depression of their latches 10 from contact with the coil of a single-cone or double-cone spring, as the tripping mechanism is adapted to limit the length of a single-cone spring as well as the kind previously mentioned. When a spring has been wound and winding motion stopped, as has been explained, the tension of the wound spring will reverse the movement of the spindle F, and in consequence the spring will be loosened from the cone-sections, increasing the diameter of its spiral coils. This will carry the attached wire of the main bundle up into the notch 4 in the shear-jaw D', that is located immediately above the notch w' in the latch 10 on the cone section E, as shown in Fig. 1. A depression of the limb D^2 of the jaw D by the foot of the operator applied to the treadle g will sever the spring-wire and bend the free end of the cone-spring, which bend is a preparatory operation to forming an eye on this end of the spring. When a spring is cut off from the main wire coil, it may be quickly removed from the cone-sections by a depression of the treadle 6, which will move the truck L, with its attached cone-section E', away from the other cone-section, E, and thus free the spring in an obvious manner. The automatic return of the cone-section E' to its engagement with the other section, E, will be accomplished by relaxing the pressure that has been applied to the treadle 6, when the operation of winding another spring may be effected by a repetition of the manipulation which has been given in detail.

The hand-wheel G' is utilized to check the reverse movement caused by the tension of the

wound spring and to move the spindle F, and by such a manual movement to place the locking-dog K′ in convenient position, preferably on the top side of the cone-section, so that the end of the spring-wire may be readily inserted into place under its finger when the operation of winding a spring is to be commenced.

It should also be stated that the handle S^6 on the outer end of the handle-bar S is provided to afford a means of arresting motion of the winding operation by hand if at any time it should be necessary, a depression of this handle instantly effecting a disconnection of the clutch-teeth and stopping the machine at once.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a spring-winding machine, the combination, with a shaft and a former secured thereto, of a movable lug mounted on the former, a latch arranged on the former in the path of the wire and caused by the wire to force the lug outward, and a tripping mechanism actuated by said lug for arresting the motion of the shaft, substantially as set forth.

2. In a spring-winding machine, the combination, with a shaft and a former secured thereto and provided with a device arranged to be actuated by the pressure of the spring-wire to be wound on the former, of a clutch on the shaft and intermediate mechanism actuated by the device on the former for operating the clutch, substantially as set forth.

3. In a spring-winding machine, the combination, with a former mounted on a shaft and carrying a spring-actuated lug, of a latch arranged on the former in the path of the wire to be wound and caused by the wire to force the lug outward, and a clutch on the shaft and intermediate mechanism actuated by the lug for moving the clutch, substantially as set forth.

4. In a double-cone-spring-winding machine, the combination, with a shaft, a truck, and a sectional former, one section of which is secured to the shaft and the other section mounted on the truck, of a loose pulley mounted on the shaft, a clutching device arranged to interlock with the pulley, a clutch-operating device, and a lug and a latch arranged on one section of the former, the latch being in the path of the wire to be wound and caused by the wire to force the lug outward to engage the clutch-operating device, substantially as set forth.

5. In a wire-spring-winding machine, the combination, with a housing-frame, a shaft carrying a section of the spring-former, and a movable truck carrying another section of the former, of mechanism for rotating the former, and tripping devices actuated by contact with a projection carried by the former for arresting the motion of the shaft, substantially as set forth.

6. In a cone-spring-winding machine, the combination, with a shaft carrying one section of a spring-former, of a truck, a stud journaled in a bearing on said truck, a section of the spring-former secured to said stud, a collar secured on the stud, and a locking-finger secured to the collar and overhanging the end of the adjacent spring-former section, substantially as set forth.

7. In a cone spring-winding machine, the combination, with a former composed of two separable sections, a shaft to which one of said sections is attached, a stud to which the other section is attached, and a truck having a bearing in which said stud is journaled, of a bent locking-finger attached to the stud and overlapping the end of the adjacent former-section.

8. The combination, with a frame, a shaft journaled therein, a former-section secured to one end of said shaft, a loose pulley mounted on the shaft, a clutch arranged to engage the pulley, a truck having a bearing, a stud journaled in said bearing, and a former-section secured to the stud, of a lug and a latch arranged on one section of the former, the latch being in the path of the wire to be wound and caused by the wire to force the lug outward, and clutch-operating devices actuated by the lug, substantially as set forth.

9. The combination, with the shaft mounted in a stationary frame, a stud journaled in a movable support, and former-sections secured to said shaft and stud, of a pulley loosely mounted on the shaft, a sliding clutch secured on said shaft, a lug and a latch arranged on the former-section secured to the shaft, the latch being in the path of the wire and caused by the wire to force the lug outward, and clutch-operating devices moved by the lug for operating the clutch, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

OSCAR S. FOSTER.

Witnesses:
CHAS. W. FRANK,
N. H. FOSTER.