No. 713,208. Patented Nov. 11, 1902.

F. H. DANIELS & C. S. MARSHALL.

SPRING CUTTING MACHINE.

(Application filed May 5, 1902.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.

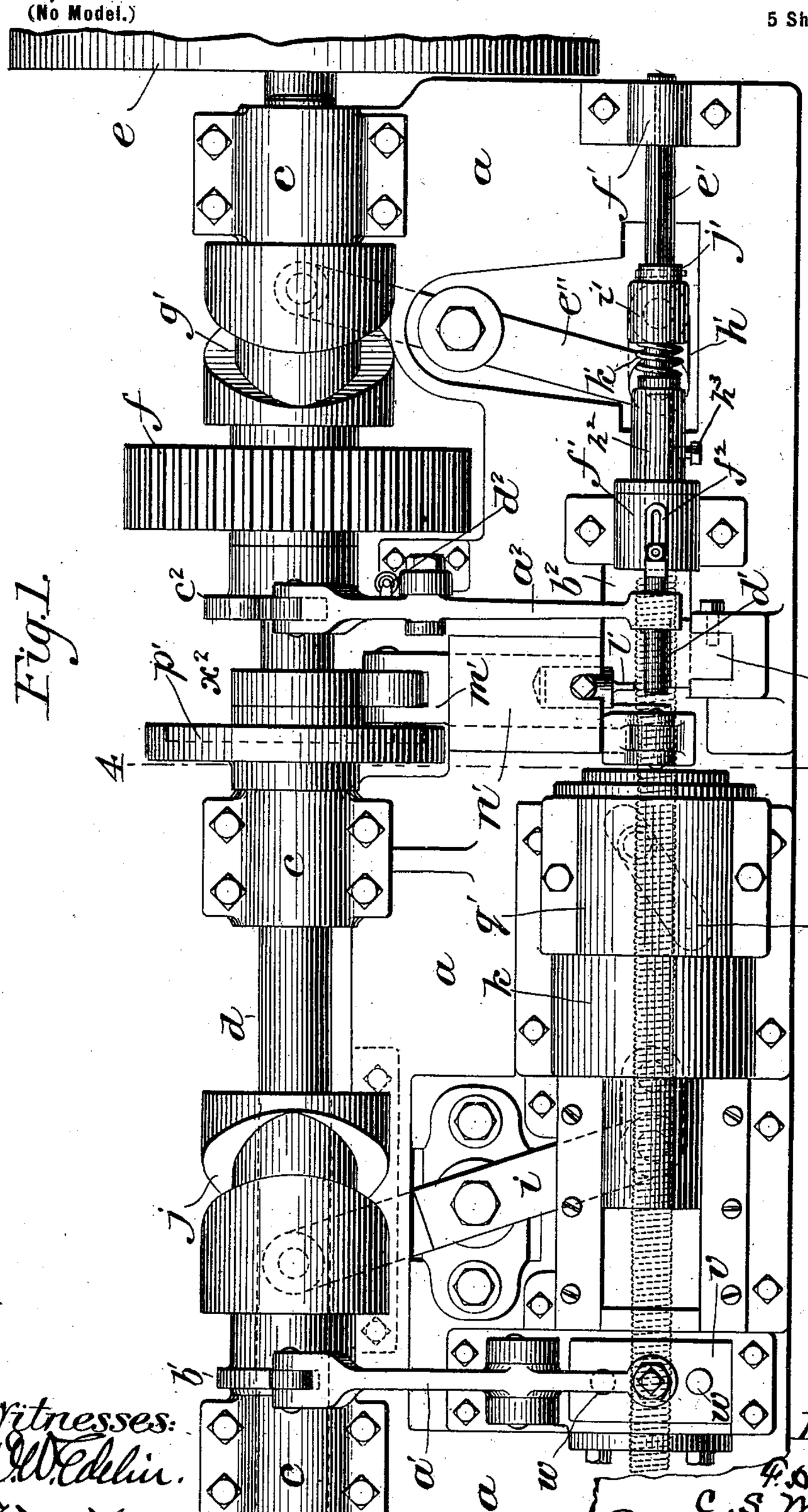
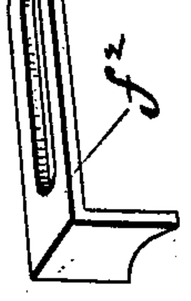


Fig. 1a.



Figs. 1b.

Witnesses:
D. W. Edelin.
J. M. Brown

Inventors.
F. H. Daniels &
C. S. Marshall, by
Pennie & Goldsborough, Attys.

No. 713,208. Patented Nov. 11, 1902.

F. H. DANIELS & C. S. MARSHALL.

SPRING CUTTING MACHINE.

(Application filed May 5, 1902.)

(No Model.) 5 Sheets—Sheet 2.

Fig. 2.

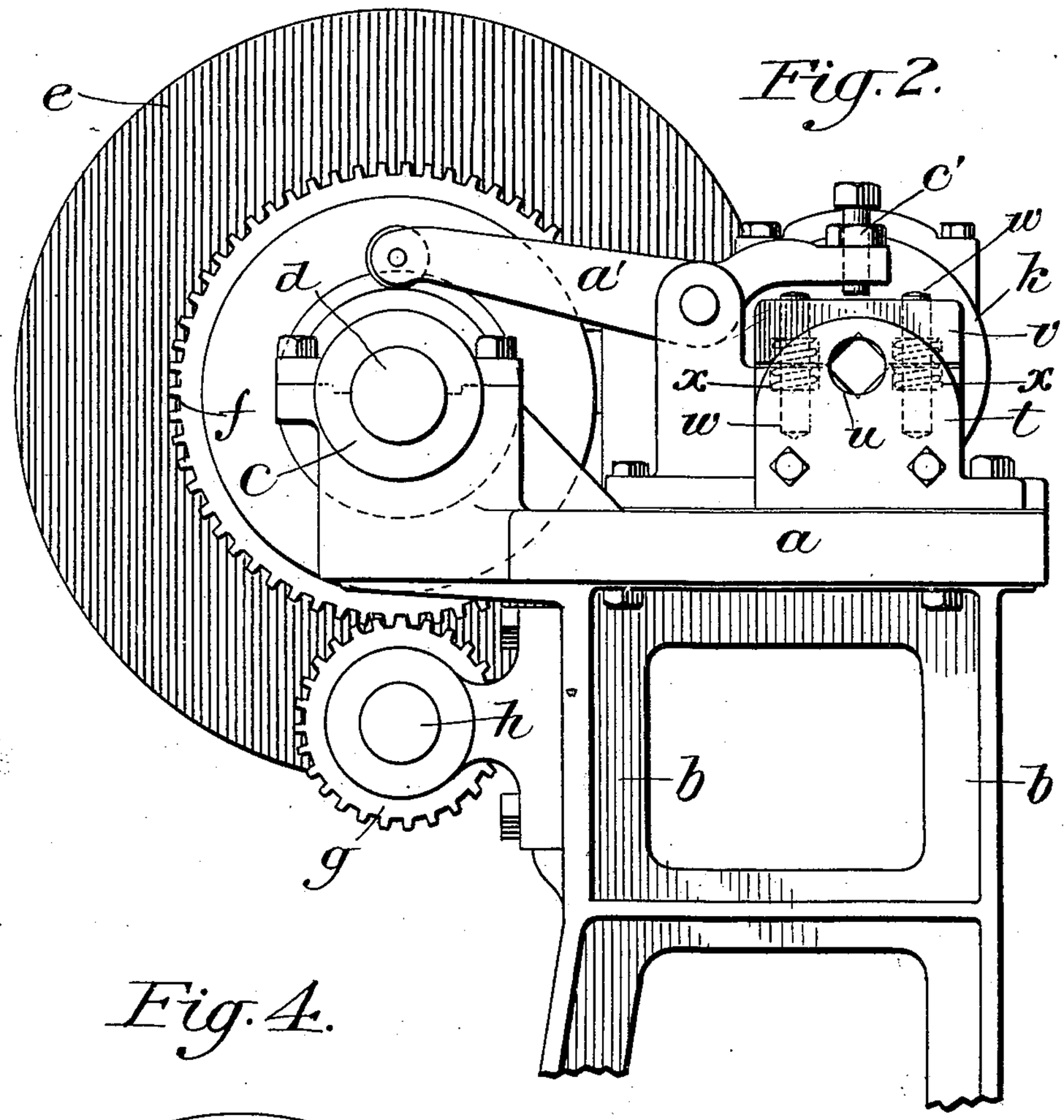
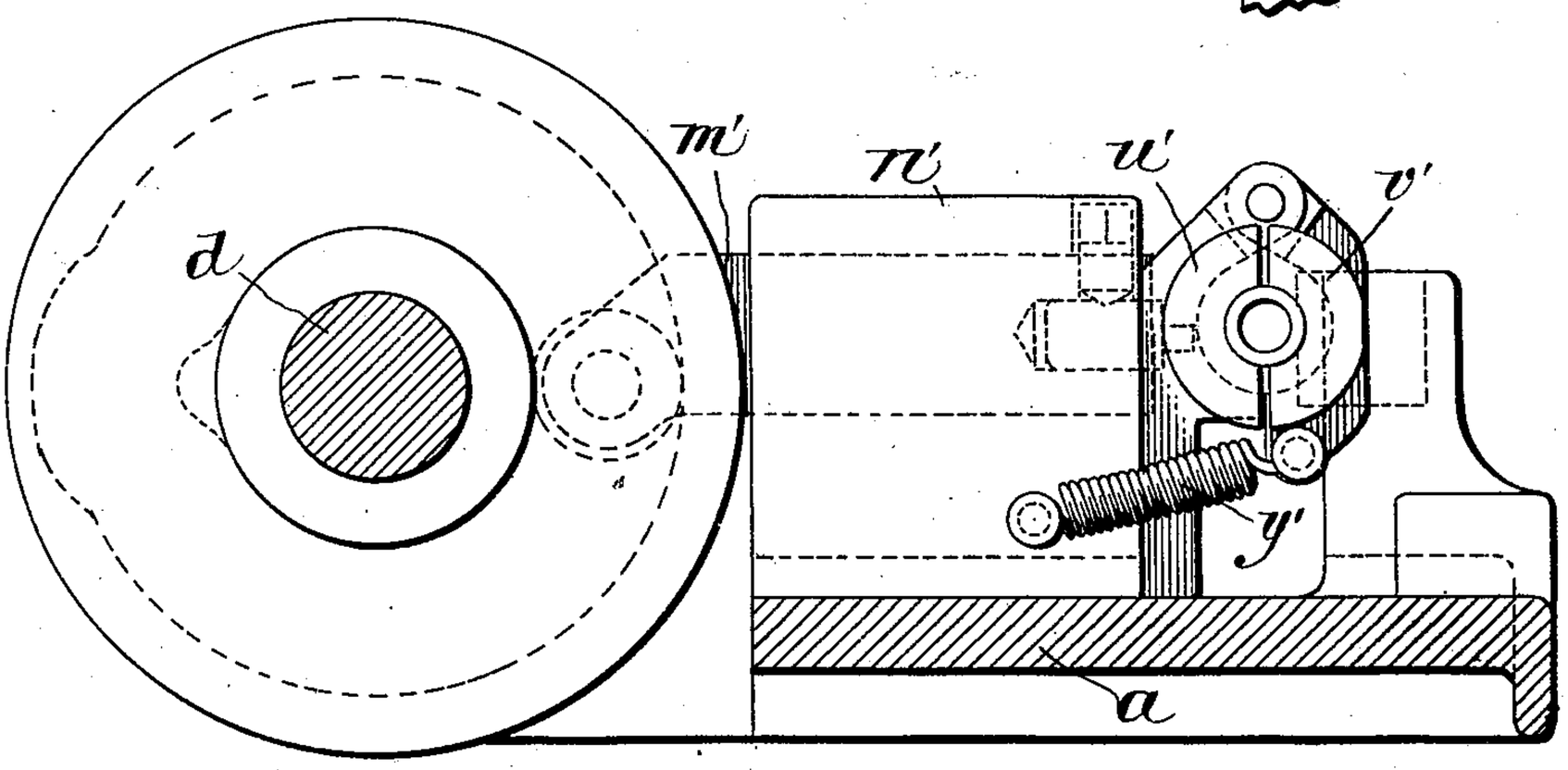


Fig. 4.



Witnesses:
D. C. Edelin.
J. M. Wrenn

Inventors.
F. H. Daniels &
C. S. Marshall, by
Daniel Goodborough,
Atty's

No. 713,208. Patented Nov. 11, 1902.

F. H. DANIELS & C. S. MARSHALL.

SPRING CUTTING MACHINE.

(Application filed May 5, 1902.)

(No Model.) 5 Sheets—Sheet 3.

Fig. 3.

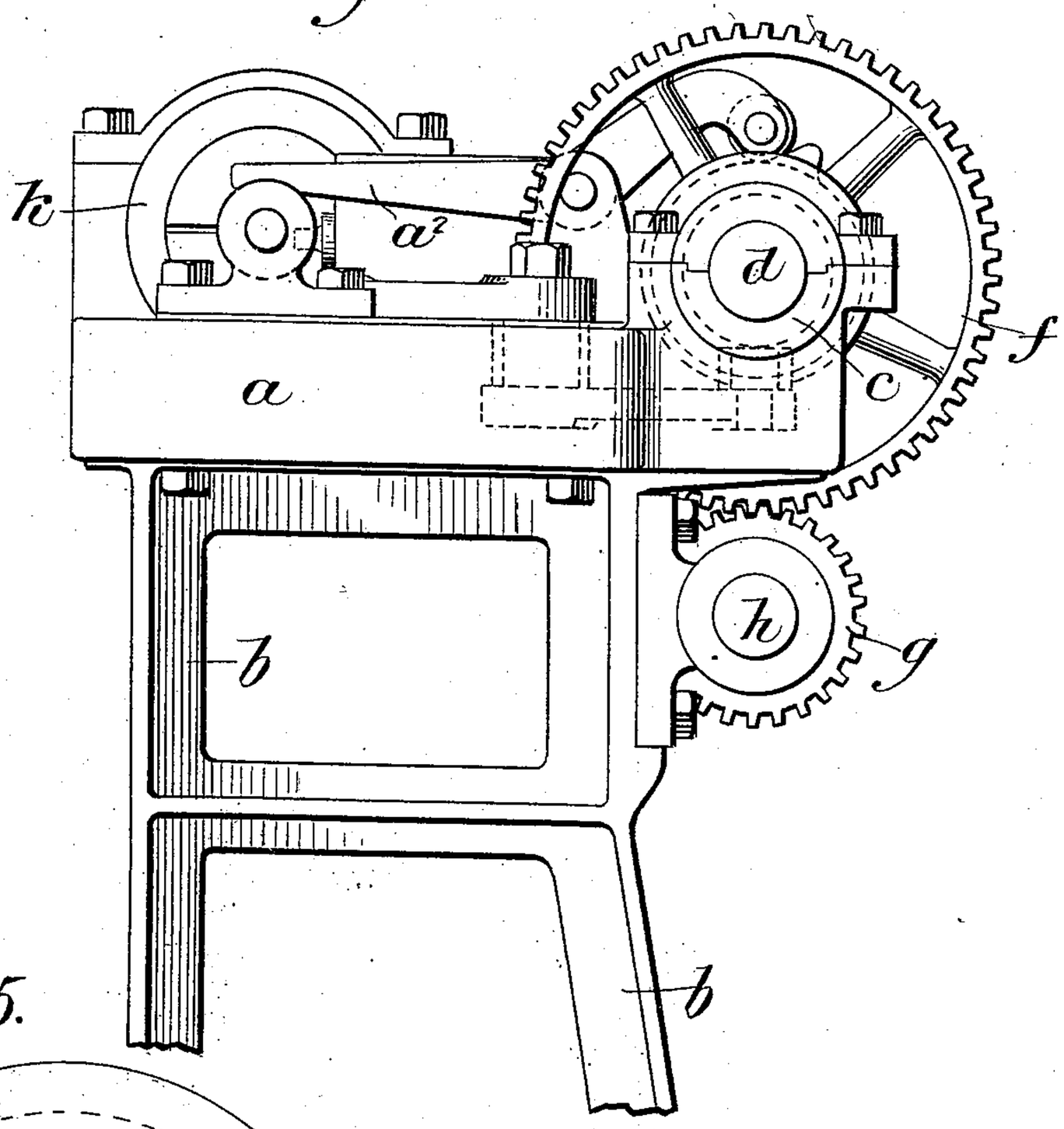
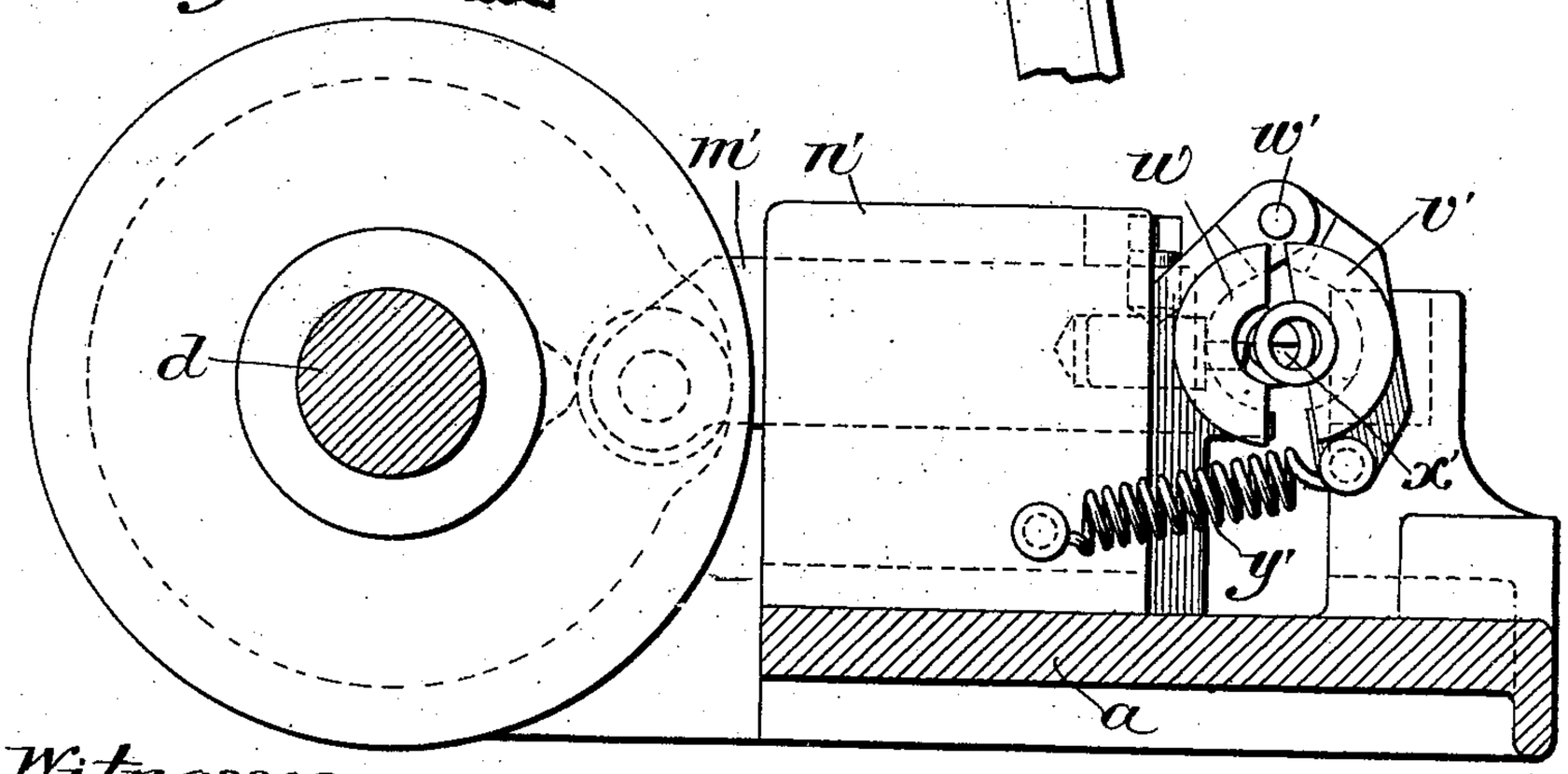


Fig. 5.



Witnesses.
O. W. Edelin.
J. W. Brown

Inventors.
F. H. Daniels &
C. S. Marshall, by
Pennie Goldsborough & Watts

No. 713,208. Patented Nov. 11, 1902.

F. H. DANIELS & C. S. MARSHALL.

SPRING CUTTING MACHINE.

(Application filed May 5, 1902.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 6.

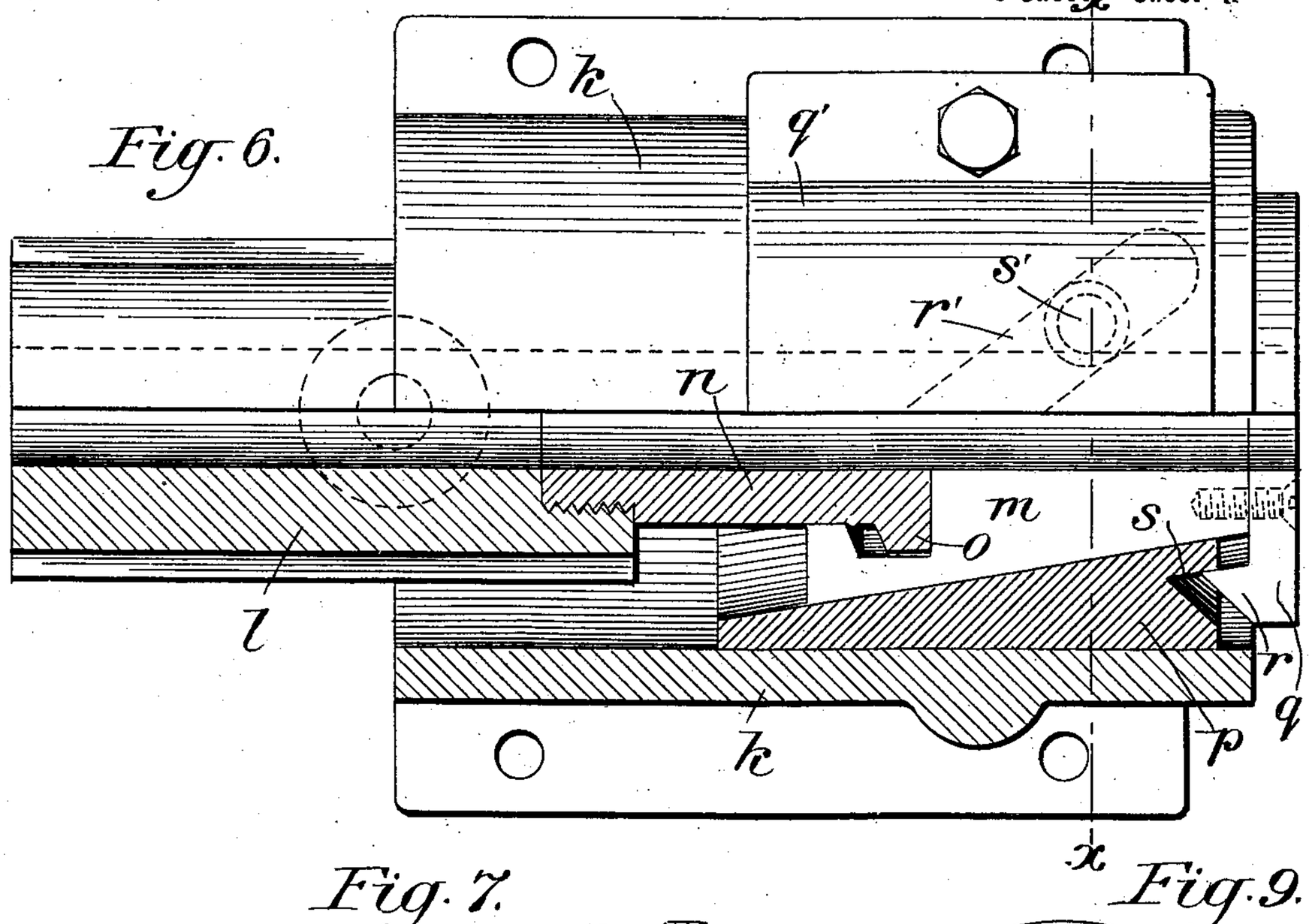


Fig. 7.

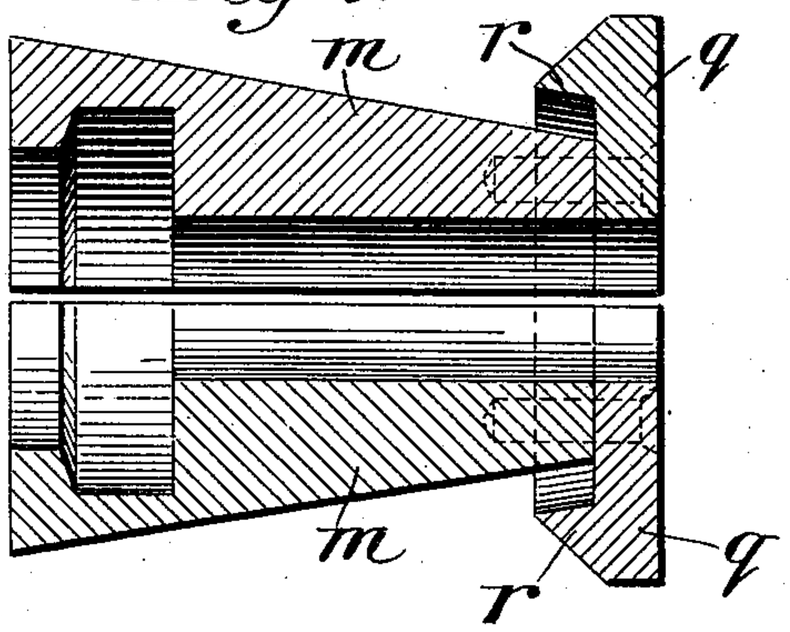


Fig. 9.

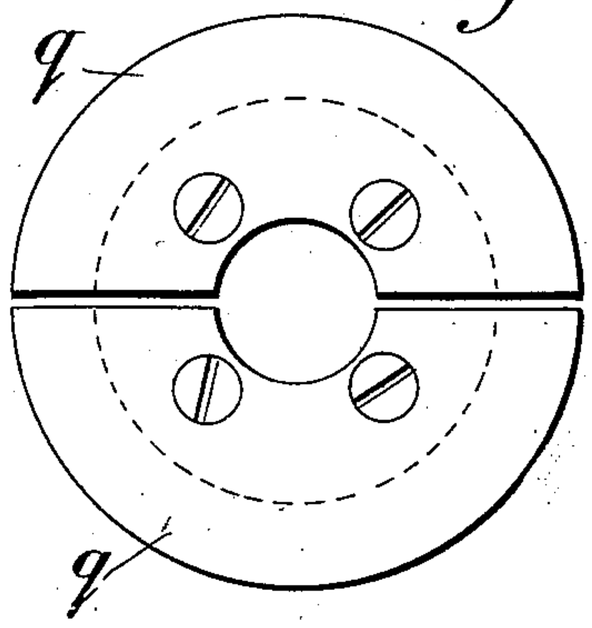


Fig. 10.

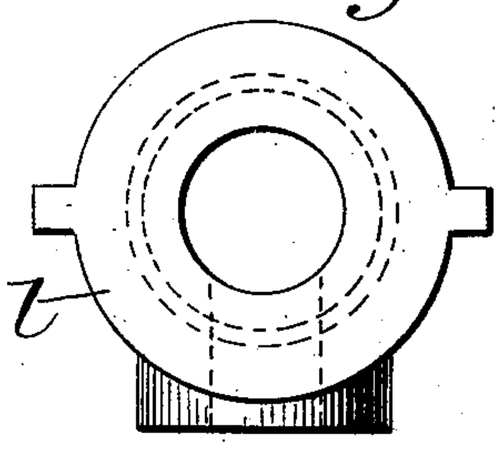
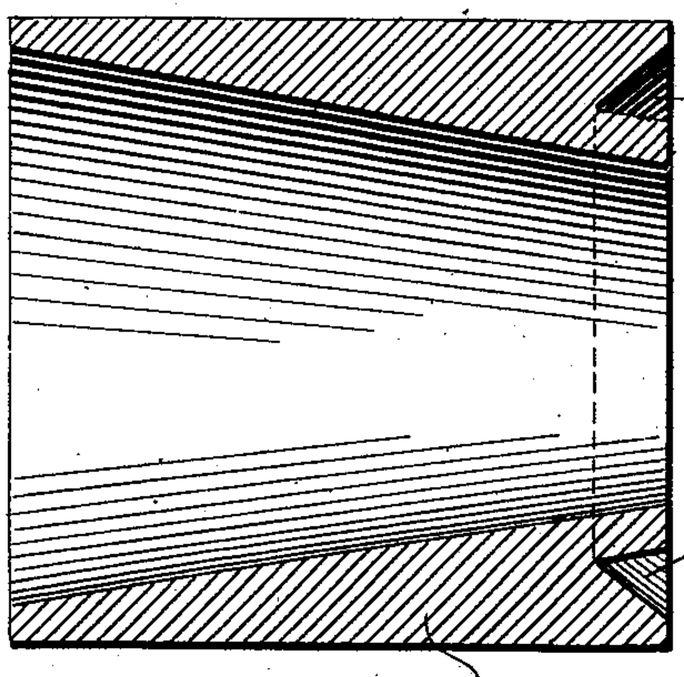


Fig. 8.



Witnesses:
D. W. Edlin.
J. M. Wynn

Inventors.
F. H. Daniels &
C. S. Marshall, by
Pennie & Goodborough.
Attys.

No. 713,208. Patented Nov. 11, 1902.

F. H. DANIELS & C. S. MARSHALL.

SPRING CUTTING MACHINE.

(Application filed May 5, 1902.)

(No Model.) 5 Sheets—Sheet 5.

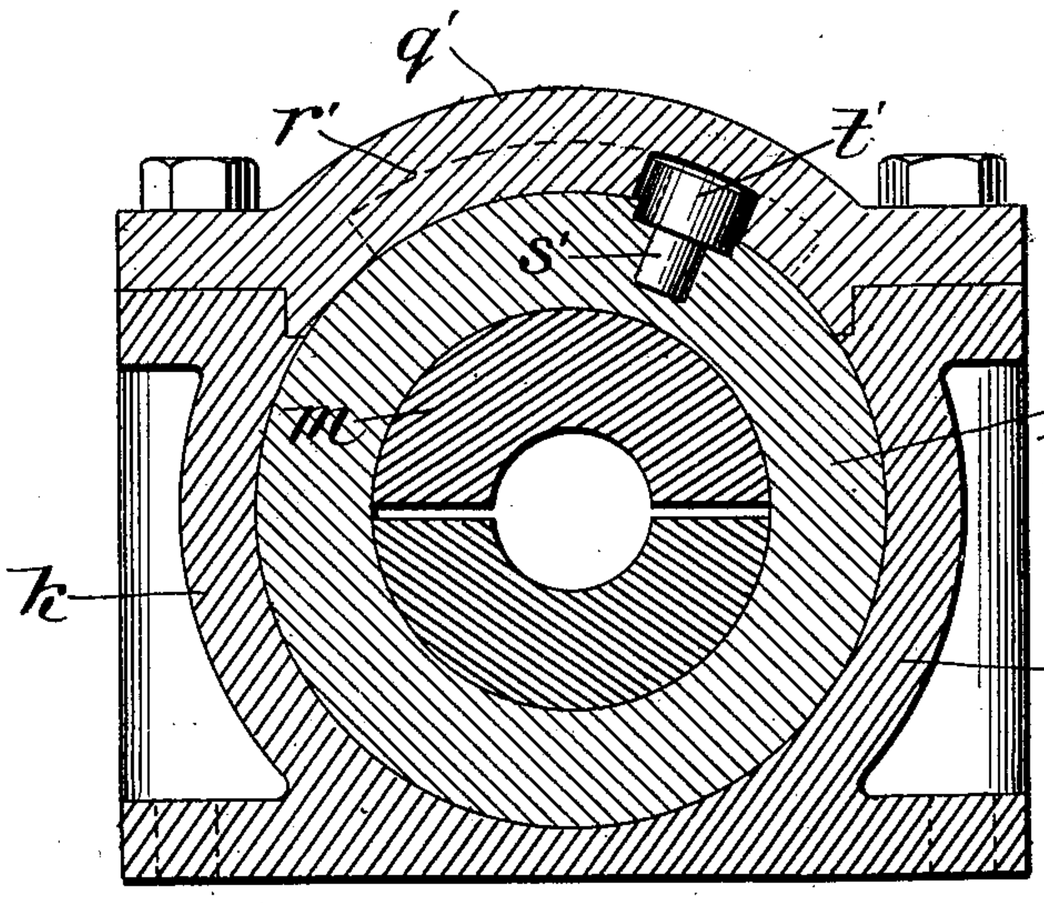


Fig. 11.

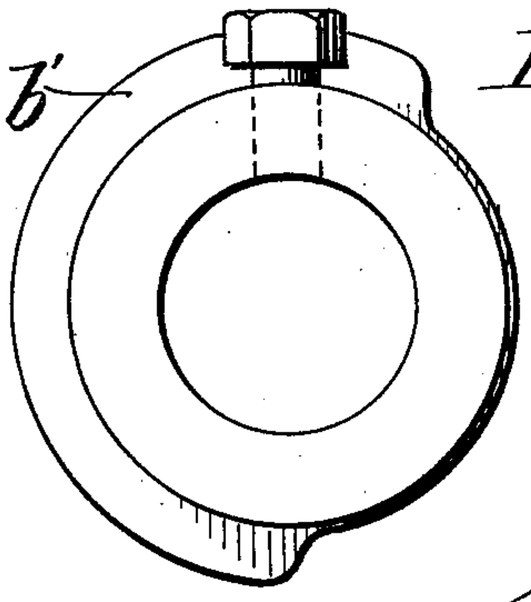


Fig. 12.

Fig. 13.

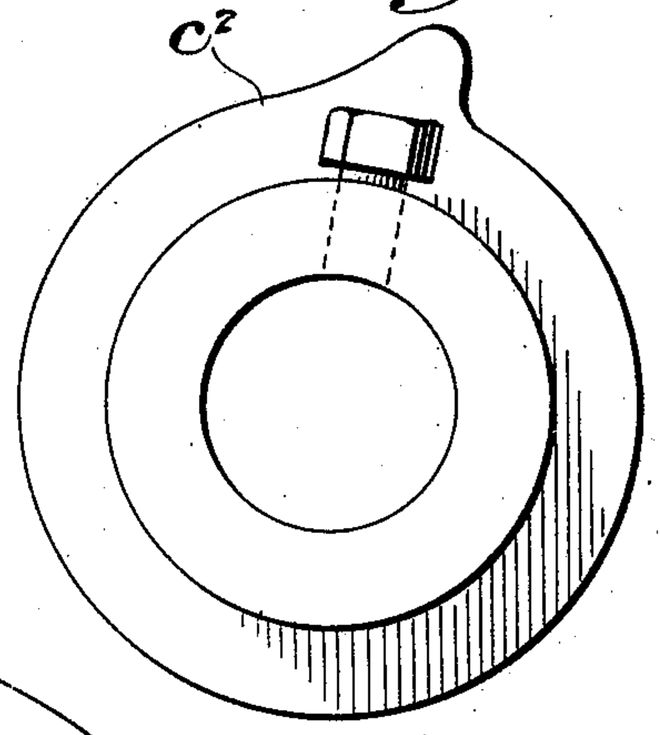
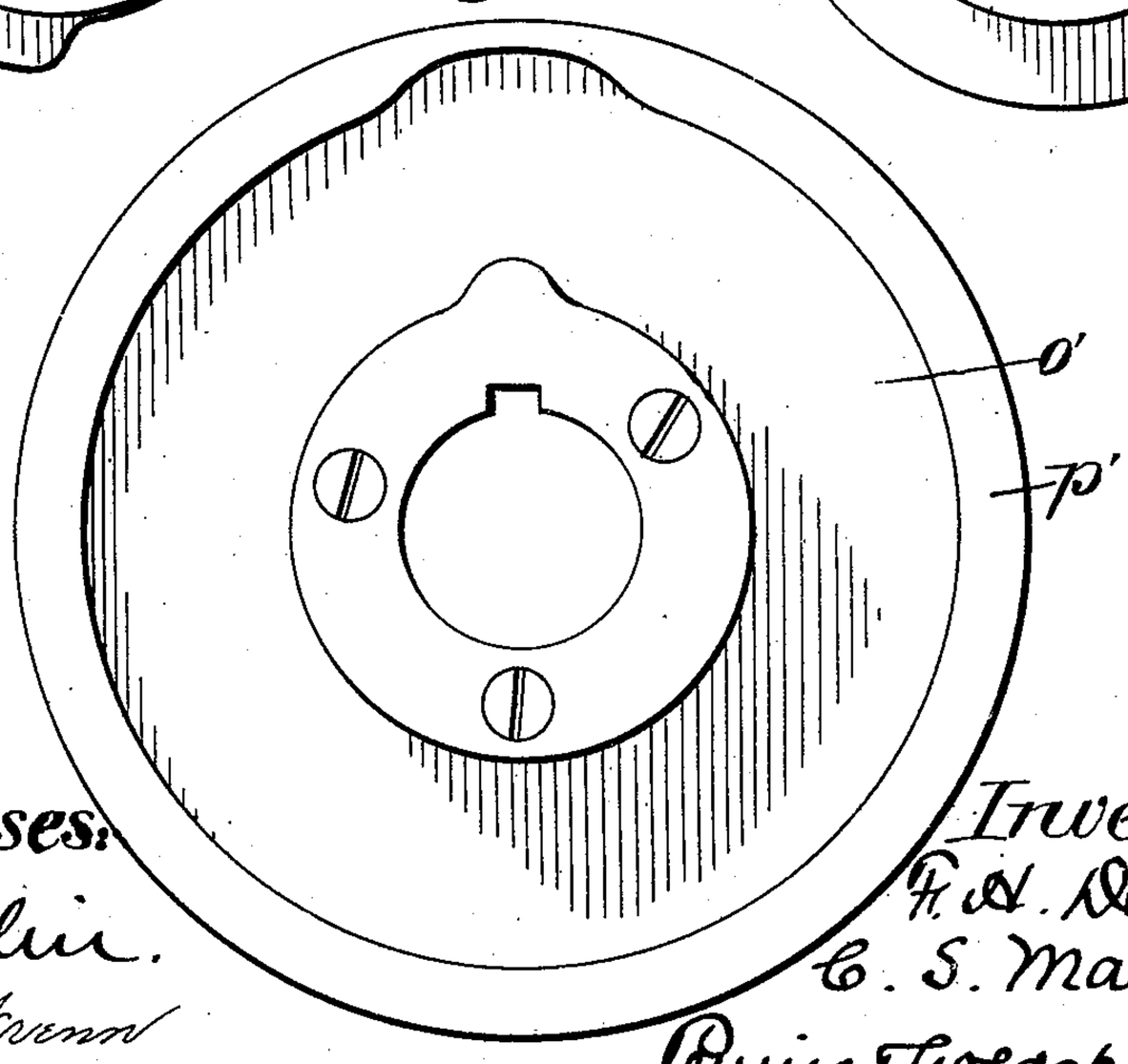


Fig. 14.



Witnesses:
D. W. Edelin.
J. W. Spence

Inventors.
F. H. Daniels &
C. S. Marshall, by
Pennie & Goldsborough Atty's

UNITED STATES PATENT OFFICE.

FRED H. DANIELS AND CLINTON S. MARSHALL, OF WORCESTER, MASSACHUSETTS.

SPRING-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 713,208, dated November 11, 1902.

Application filed May 5, 1902. Serial No. 106,046. (No model.)

To all whom it may concern:

Be it known that we, FRED H. DANIELS and CLINTON S. MARSHALL, citizens of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Spring-Cutting Machines; and we 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.

Spiral springs have long been made by conducting the wire from the reels directly to the coiling-machines, that wind it in continuous coils into long lengths, after which it is cut up into shorter pieces appropriate for the particular uses for which the springs are intended.

The present invention has nothing to do with the coiling of the wire, but only with the separation of the long lengths of coiled wire into springs; and the object of the invention is to provide a machine that will take the coiled wire as it comes from the coiler and cut it up into shorter pieces more expeditiously than has heretofore been done.

The invention is shown in the accompanying drawings, wherein—

Figure 1 is a plan view. Fig. 2 is an elevation of the end where the coil is received. Fig. 3 is an elevation of the opposite end. Figs. 4 and 5 are sections taken on the line 4 4, Fig. 1, the parts being in different positions. Fig. 6 is a plan, partly in section, of the device for feeding the coil to the cutter. Figs. 7 to 10 are details of the gripper forming part of this feeding device. Fig. 11 is a section on the line $x\,x$, Fig. 6. Figs. 12, 14, and 13 are elevations, respectively, of the cams for operating the hold-back-clamp, the cutter, and the knocker. Fig. 15 is a side view of the front end of the spindle d', and Fig. 16 is a perspective of the adjustable stop against which the end of the coil abuts.

Referring to these views, a denotes the table or bed of the machine, which is elevated from the floor on any suitable standards, as b, and carries all the operative mechanism.

In suitable bearings $c\,c\,c$ the main shaft d of the machine is journaled, this shaft being positioned at the rear of the machine and extending lengthwise the bed. This shaft carries at one end a fly-wheel e, and at a point between its ends it has a large gear-wheel f, by means of which it is driven from a short shaft h, that is journaled in bearing-brackets secured to the rear standards.

The coil is fed into the machine at the left-hand end, as shown in dotted lines in Fig. 1, and is advanced with a step-by-step motion by means of a feeding device that is operated intermittently by a lever i. This lever is pivoted on the bed of the machine and is operated by a grooved cam j on the shaft d, into which a roller on the rear end of the lever works.

The feeder slides to and fro in a housing k, that is bolted to the bed-plate. It consists of a tubular stem l, that is pivotally connected by a link to the front end of the lever i, and has a clutch secured to its forward end that grips the coil on the advance stroke and releases it on the return stroke.

The feeder-clutch is shown in detail in Figs. 6 to 9. It consists of a longitudinally-split tubular gripper m, having a cylindrical bore corresponding to the bore of the stem l and connected to the stem by means of a tubular junction n, that is screw-threaded onto the end of the stem and has an annular exterior flange o at its opposite end. The two-part gripper m has an annular interior groove at its rear end into which the flange o of the junction n fits, and the flange is allowed a slight play in the groove, as indicated in Fig. 6, and the stem and gripper are secured together, so that the latter does not begin to move till the flange has traversed the width of the groove, the object of this being to give a slight blow to the gripper to cause it to grip and release the spring quickly. The gripper m is inclosed in a shell p, which fits the cylindrical bore of the housing k and slides to an fro therein as the lever i oscillates. The bore of the shell p is conical, as shown in Figs. 6 and 8, and the exterior surface of the gripper m is correspondingly tapered, so as to fit the shell snugly, yet so as to slide therein without material friction to an extent that is limited by means of a plate q, which is secured to the front end of the gripper. This plate has a rearwardly-extending flange r, which flares

outward toward the rear and fits into an annular groove *s*, having a corresponding flare and extending around the end of the shell *p*. The object of this arrangement is to permit the gripper to close on the coil on the forward stroke of the feeder by the conjoint action of the tapered surfaces of the gripper and shell and to open away from the coil and release it on the return stroke by the action of the flange *r* of the gripper taking into the groove *s* at the end of the shell, the gripper being thus alternately expanded and contracted as the feeder reciprocates.

At the point where the coil is fed to the machine there is a vertical plate *t*, having a circular orifice *u* in line with the bore of the feeding device, so as to guide the coil accurately to the feeder, and as it sometimes happens that the gripper *m* fails to release the coil promptly and the back stroke of the feeder therefore tends to push the coil rearward I provide a holdback-clamp adjacent to the guide-plate *t*. This clamp consists of a top plate *v*, overlying a grooved block that is secured to the bed-plate just inside of the guide-plate *t*. The plate *v* is guided in its movements by pins *w w* and is held normally slightly above the block by springs *x*, encircling the pins and reacting between the block and its top plate. The plate and block are both provided with angular grooves, as shown in Fig. 2, so that when the plate is pressed down, as will be presently described, the coil will be clamped and held against retrograde movement should the gripper not release it promptly. This holdback is herein shown as located adjacent to the point where the spring enters the machine. If preferred, however, it may be located at the exit end of the housing *k* between it and the centering-clamp, to be hereinafter described.

The holdback-clamp is operated by a lever *a'*, that is pivoted on the bed of the machine, and has a roller at its rear end running on a cam *b'* on the shaft *d*, and the operation is timed with respect to the movement of the feeder so that the top plate is forced down by the lever *a'* when the feeder is on the return stroke. It will be understood that the springs *x x* keep the top plate normally sufficiently elevated not to oppose any resistance to the movement of the coil; but as soon as the rearward movement of the feeder begins the top plate clamps the coil and prevents it from being backed out of the machine by the gripper accidentally sticking to the coil and failing to release it promptly. The front end of the lever *a'* is preferably provided with a set-screw *c'* to vary the action of the lever on the top plate. From the feeder the coil passes on through a yielding guide past the cutter and over a spindle or arbor *d'*, which is alternately thrust forward to receive the part of the coil that is to be severed from the main length and withdrawn to permit the short piece to drop into a suitable receptacle under the machine. The spindle is secured to one end of a plunger *e'*, that slides but cannot turn in bearings *f' f'*, bolted to the bed-plate, and is operated by a pivoted lever *e''*, having a roller at its rear end running in the groove of a cam *g'* on the shaft *d*, the front end of the lever being connected to the plunger by means of a link *h'* and a loose sleeve *i'*, that is free to slide on the plunger between a fixed collar *j'* and a spring *k'*, the object of this connection being to allow for inequalities in the cam and to allow the spindle to yield slightly on the forward throw of the lever. The spindle is projected beyond the bearing *f'* into the open end of the long coil, and the latter is fed at each throw of the feeder over the spindle until its end abuts against an adjustable stop f^2 on the bearing *f'* when the wire in the coil is cut at the front end of the spindle by a die or cutter *l'*. This cutter is carried by a stem *m'*, which slides in a bearing *n'*, erected on the bed-plate. The stem has rollers at its rear end and side and is operated positively to and fro by a cam x^2 and a groove *o'* in the wheel *p'*, carried by the shaft *d*. The cutter is projected across the path of the spindle immediately that the forward feed of the coil ceases, while the feeder is returned to take a new grip on it. The under side of the front end of the spindle is cut away, as shown at *x'* in Figs. 5 and 15, so that the upper part forms the edge against which the front end of the cutter shears the wire. It is necessary, therefore, that the front end of the spindle should be accurately positioned with respect to the cutter, and this is effected by adjusting the end of the spindle in the collar h^2 by means of the set-screw h^3, as shown in Fig. 1. It is also necessary that there should be some side support for the front end of the arbor at the time that the cutter shears the wire, and m^4 denotes an anvil for this purpose. It is located opposite the cutter on the opposite side of the arbor and supports the coil and the end of the arbor when the cutter severs the wire. If the coil were fed through so as to present the cutter always at the same radial angle, the two cuts at opposite ends of the springs would be in the same horizontal plane. This, however, is sometimes objectionable, and we therefore provide for giving the coil a slight rotation around its axis, so that the cuts in the ends of the springs will come at different points around the circle described by the wire. For this purpose we provide housing *k* with an inclined groove *r'*, and the shell *p* has a pin *s*, provided with an antifriction-roller *t'*, that plays to and fro in the groove as the gripper *m* reciprocates, thus giving to the coil a slight rotation at each forward movement of the feeding device. The groove *r'* is preferably though not necessarily in the cover *q'* of the housing.

In Figs. 4 and 5 the yielding guide heretofore referred to is shown in detail. The object of this guide is to support the coil between the end housing *k* and the end of the

spindle d' and to return it to and hold it in position to pass accurately over the spindle after each movement of the cutter. The guide consists of two blocks or pieces u' v', one, u', being fixed to the bed-plate of the machine and the other, v', being hinged to it at w' and having a closing-spring y' connecting its lower end with a fixed point on the bed-plate. Normally the parts of this guide are closed, as in Fig. 4, with the grooves in their meeting faces in accurate alinement with the bore of the feeding device and also with the spindle on the other side of the cutter. The coil, however, has no other support on the side of the cutter adjoining the feeding device, and when the cutter severs the spring this part of the coil will be forced slightly out of line with the spindle, and the object of the yielding portion of the guide is to restore this deflected part to its proper position for feeding forward to the spindle. After the cutter has severed the wire of the coil the spindle is immediately and quickly retracted and the cut spring is released. In order to insure the quick and certain discharge of the spring, we provide a knocker or ejector consisting of a pivoted lever a^2, having its front end standing normally above the spindle and over the opening b^2 in the bed-plate, through which the springs fall into the receptacle beneath. At the opposite end the lever carries a roller running on a cam c^2, and a spring d^2 holds the rear end of the lever down on the cam and keeps its front end normally up out of the way of the coil and the spindle d'.

Such being the construction of the machine, the operation is as follows: The coil being fed in at the opening u is advanced with a step-by-step movement by means of the feeding device, the gripper serving also to rotate it slightly on the forward movement and the holdback-clamp catching it as the gripper recedes. The spindle d' is projected to meet the coil as the feeding device advances and the coil is threaded onto the spindle, as indicated in dotted lines in Fig. 1. At the moment the feeder reaches the limit of its forward throw the cutter is projected and severs the wire, as already described, and immediately on the retreat of the cutter the spindle is also withdrawn from the now-severed spring and the knocker is operated to eject the spring from the machine. Of course any length of spring may be cut on this machine by varying the length of the throw of the feeding device and the spindle, and any diameter of spring may be operated on by making slight changes in the sizes and fitting of the various parts.

Having thus described our invention, what we claim is—

1. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination with mechanism for feeding the coil forward in the direction of its axis, a spindle projecting in line with the coil but in the opposite direction to its movement and onto the free end of which the feeding mechanism carries that portion of the coil which is to be cut off, and a cutter for severing the wire on the spindle from the coil.

2. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination with a reciprocating device for feeding the coil with a step-by-step movement, and a holdback-clamp to prevent the return stroke of the feeder from moving the coil backward.

3. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination with mechanism for feeding the completed coil, a spindle over which the coil is fed in the direction of the coil's axis, a cutter for severing the wire on the spindle from the part in the feeding device, and mechanism for withdrawing the spindle from the severed portion of the coil.

4. In a machine for cutting a coil of spirally-wound wire into shorter lengths, the combination with mechanism for feeding the coil, a spindle over which the coil is fed, a cutter for severing the wire on the spindle from the part in the feeding device, a yielding guide between the cutter and the feeding device, and a spring to restore the guide to place in line with the spindle.

5. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination with mechanism for feeding the coil in the direction of its axis, a spindle over which the coil is fed, a cutter for severing the wire on the spindle from the part in the feeding device, mechanism for withdrawing the spindle from the severed portion of the coil, and a knocker operating transversely to the coil for ejecting said severed portion from the machine.

6. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination with mechanism for feeding the coil forward in the direction of its axis, of a spindle projecting in the opposite direction to the coil's movement, mechanism for advancing the spindle to meet the coil, a cutter for severing the portion of the coil that has been fed onto the spindle, and mechanism for withdrawing the spindle from the severed portion of the coil.

7. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination to form a feeding device for the coil, of a tubular stem, a tubular longitudinally sectioned or split gripper, and means for causing said gripper to contract on the advance stroke so as to grip the coil, and to expand on the return stroke.

8. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination to form a feeding device for the coil, of a housing, a tubular longitudinally sectioned or split gripper sliding

to and fro therein, and means for closing the sections of the gripper on the forward stroke and separating them on the return stroke.

9. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination to form a feeding device for the coil, of a reciprocating gripper adapted to seize and advance the coil on the forward stroke, and to release it on the return stroke, and means for giving the gripper a partial rotation on the forward stroke.

10. In a machine for cutting a coil of spirally-wound wire into springs of shorter length, the combination to form a feeding device for the coil, of the stem *l*, the housing *k*, the shell *p* having a tapered bore, and the externally-tapered sectional gripper *m*, connected to the stem so as to permit a limited movement of the stem independently of the gripper.

11. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination to form a feeding device for the coil, of the stem *l* the housing *k* having the groove *r'*, the shell *p* having the pin *s'* playing in said groove, said shell having a tapered bore, and the externally-tapered sectional gripper *m* connected to the stem so as to permit a limited movement of the stem independently of the gripper.

12. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination of mechanism for feeding the coil in the direction of its axis, the spindle *d'* projecting in the opposite direction to the coil's movement and onto which the coil is fed, a cutter *l'*, a plunger *e'* to the forward end of which the spindle is secured, and a cam-actuated lever for reciprocating the plunger.

13. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination of mechanism for feeding the coil in the direction of its axis, the spindle *d'* projecting in the opposite direction to the coil's movement and onto which the coil is fed, a plunger *e'* to the forward end of which the spindle is secured, mechanism for reciprocating the plunger, and an elastic connection between the plunger and its operating mechanism.

14. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination with mechanism for feeding the coil, a spindle over which the coil is fed, a cutter for severing the wire on the spindle from that in the feeder, and a yielding guide consisting of the fixed block *u'*, the movable block *v'*, and the spring *y'* connected to the movable block.

15. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination of mechanism for feeding the coil lengthwise in one direction, a spindle projecting in the opposite direction to and in line with the coil, mechanism for advancing the spindle to meet and receive the coil upon it, a cutter for severing the wire upon the spindle from the coil, and mechanism for withdrawing the spindle from the wire in the direction of the feed of the coil.

16. In a machine for cutting a coil of spirally-wound wire into springs of shorter lengths, the combination of mechanism for feeding the coil, the spindle *d'* having a cut-away end *x'* onto which the coil is fed, a cutter *l'*, and an anvil on the opposite side of the spindle from the cutter.

17. In a machine for cutting a continuous coil of spirally-wound wire into springs of shorter lengths, the combination of mechanism for feeding the coil forward intermittently in one direction a distance equal to the length of the springs to be cut off, a spindle in line with the coil and projecting toward the same, mechanism for advancing the spindle in the opposite direction to the feed of the coil and into the open end thereof, mechanism for cutting off the part of the coil that is fed onto the spindle, and mechanism for backing the spindle out of the cut-off part in the direction in which the coil was fed onto the spindle.

18. In a machine for continuously cutting a coil of spirally-wound wire into springs of shorter lengths, the combination of mechanism for feeding the coil and a spindle in opposite directions, with the spindle in line with the coil until such portion of the coil as is desired to be severed is received upon the end of the spindle, a cutter for severing the wire while the spindle is on the coil, and mechanism for reversing the movement of the spindle and thus withdrawing it from the severed part of the coil.

In testimony whereof we affix our signatures in presence of two witnesses.

FRED H. DANIELS.
CLINTON S. MARSHALL.

Witnesses:
WILLIAM H. MORSE,
JAMES W. SMITH.