(No Model.)

3 Sheets—Sheet 1.

W. F. SWEET.

ELECTRO MAGNETIC DEVICE FOR WINDING CLOCKS.

No. 334,822. Patented Jan. 26, 1886.

Fig. 1.

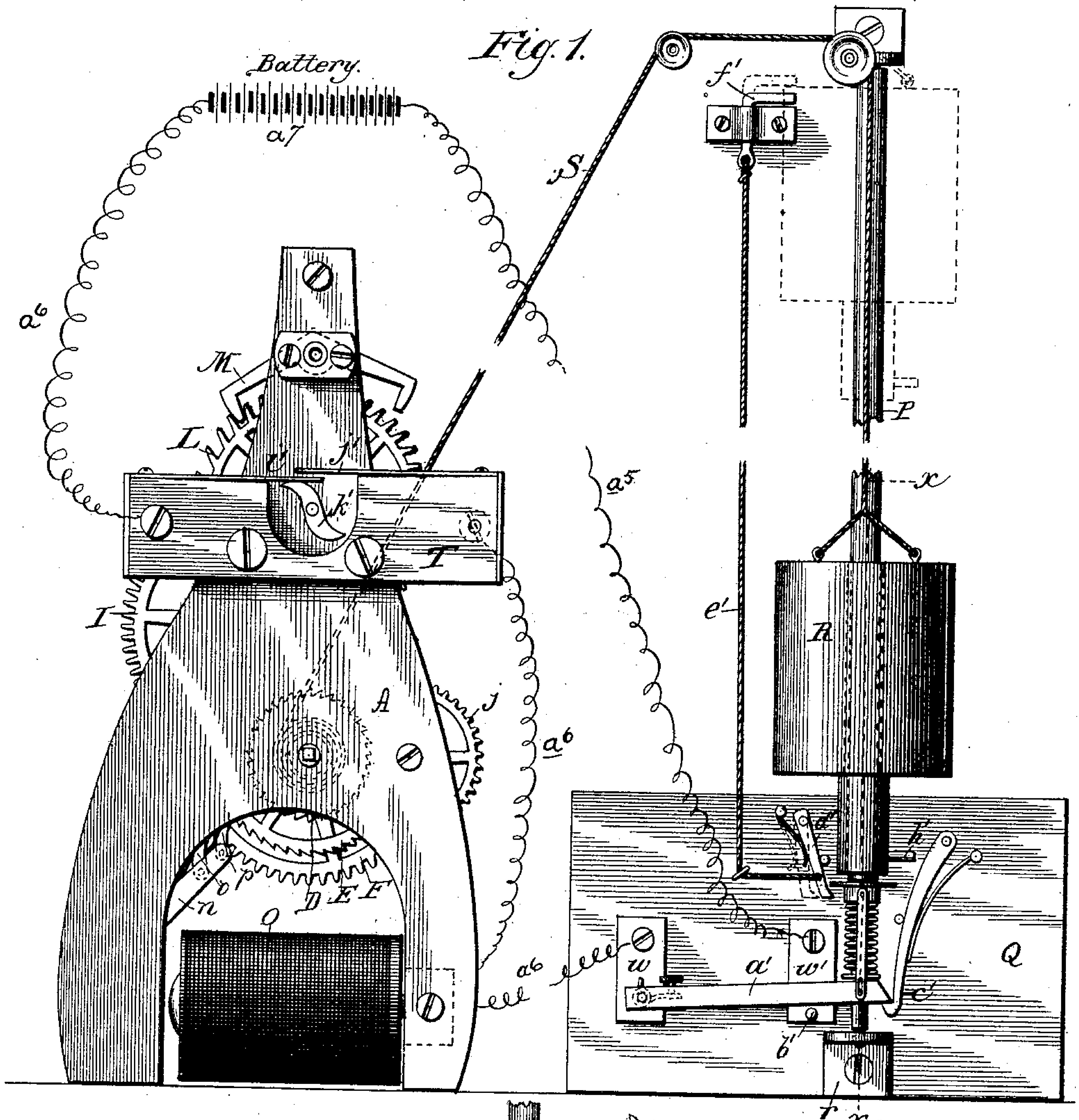


Fig. 3.

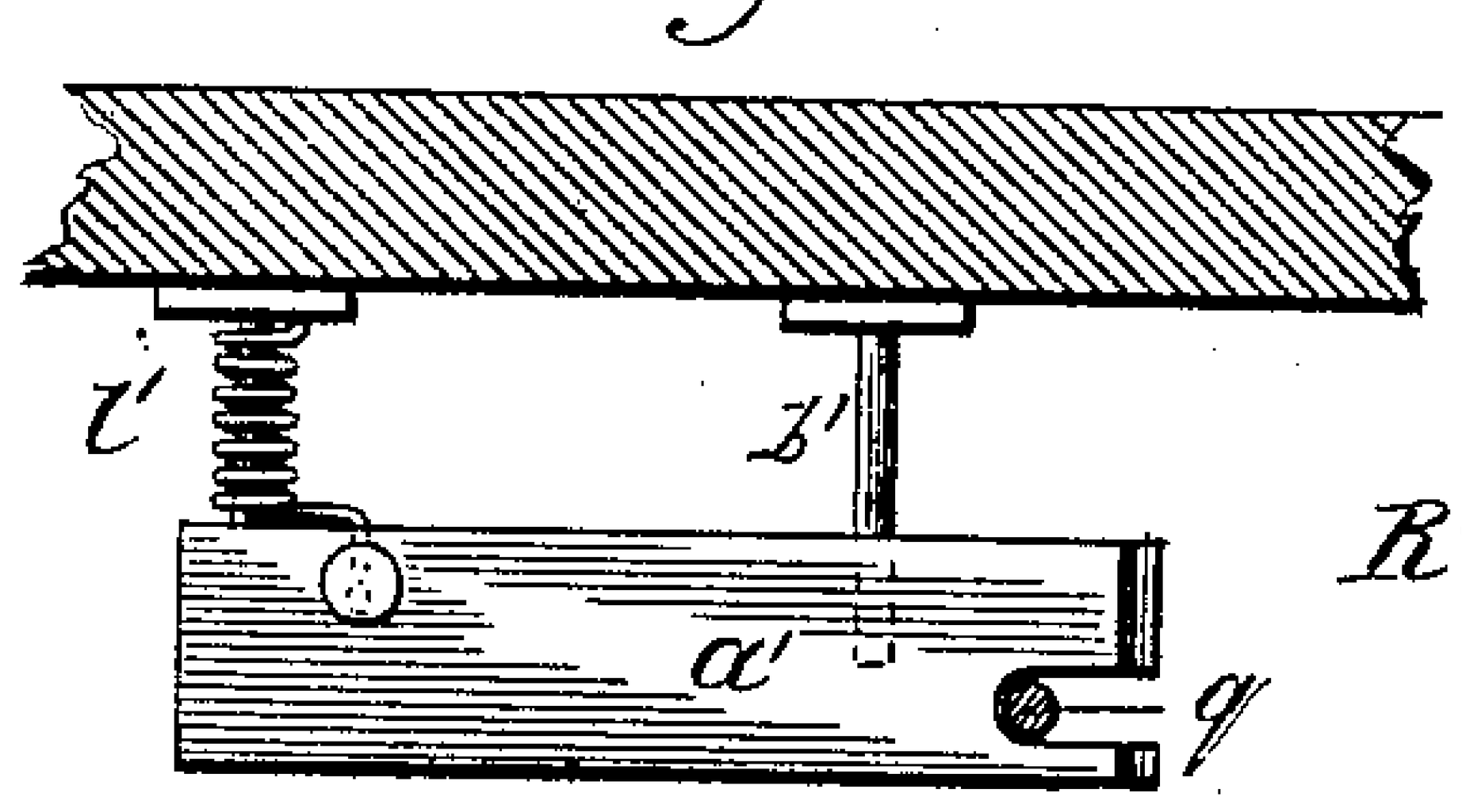
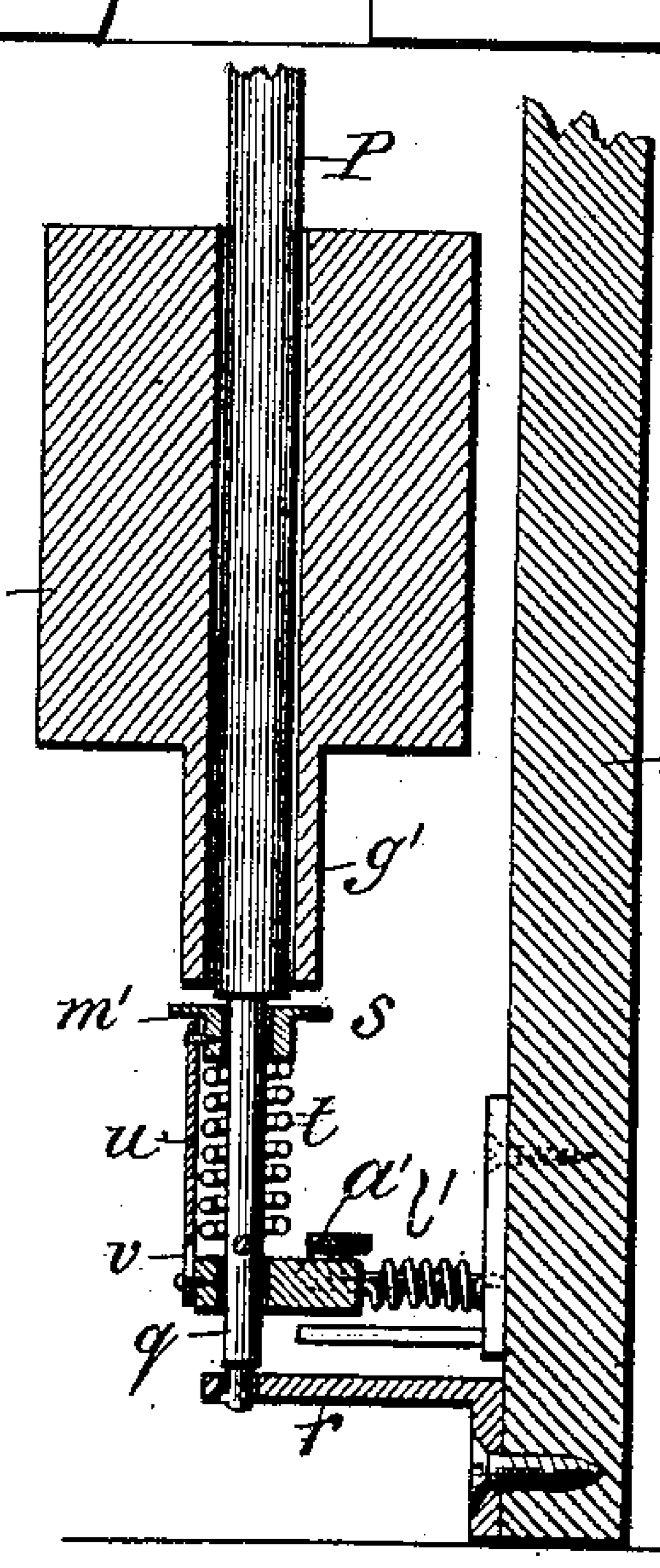


Fig. 2.



Witnesses:

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E. A. West.

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Welcome F. Sweet

(No Model.) 3 Sheets—Sheet 2.

W. F. SWEET.

ELECTRO MAGNETIC DEVICE FOR WINDING CLOCKS.

No. 334,822. Patented Jan. 26, 1886.

Fig. 4.

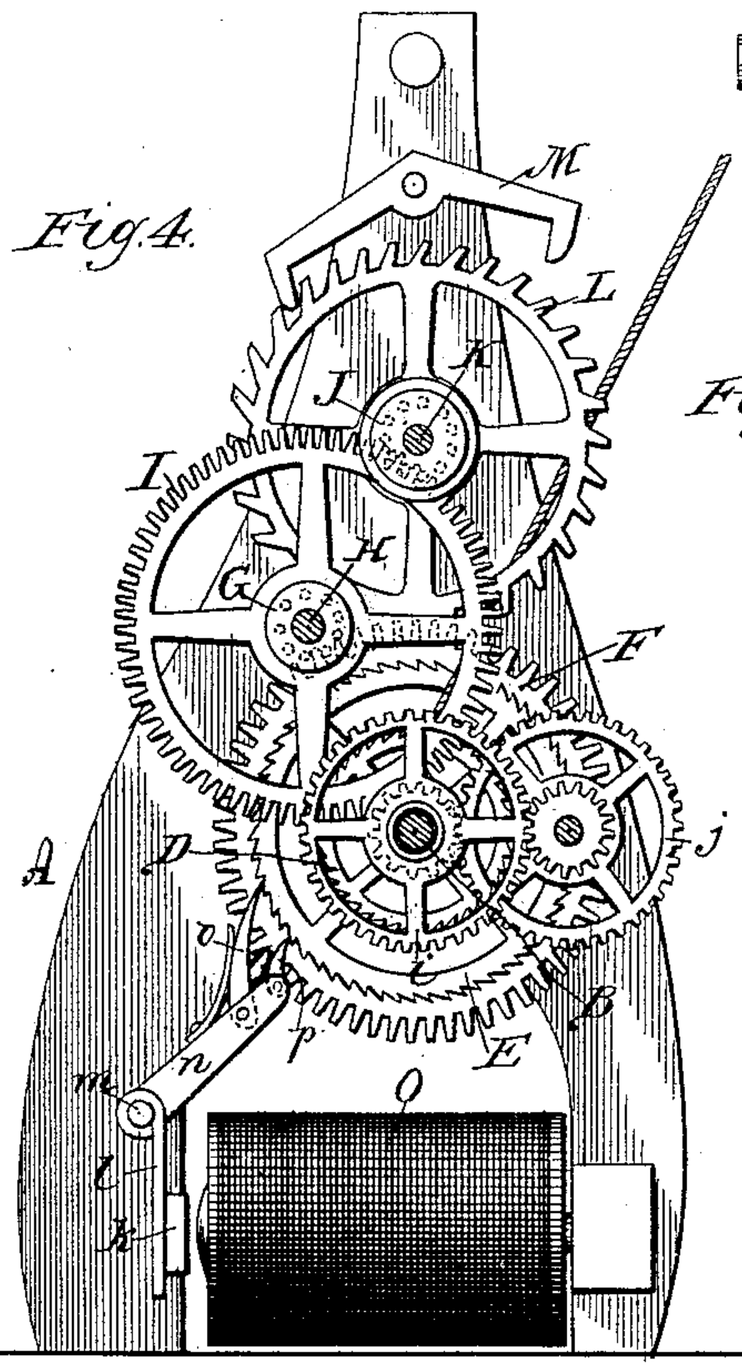


Fig. 5.

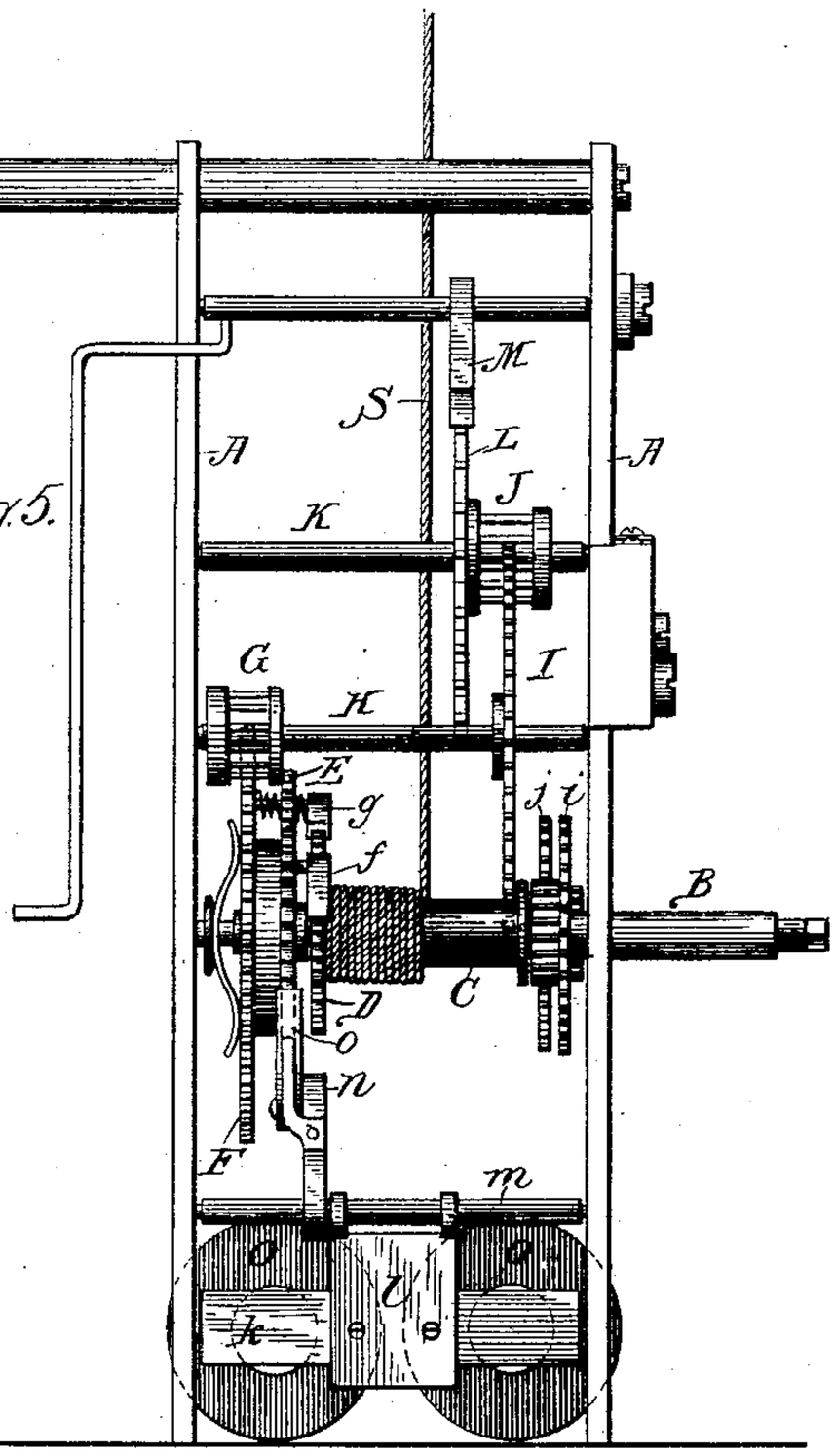


Fig. 6.

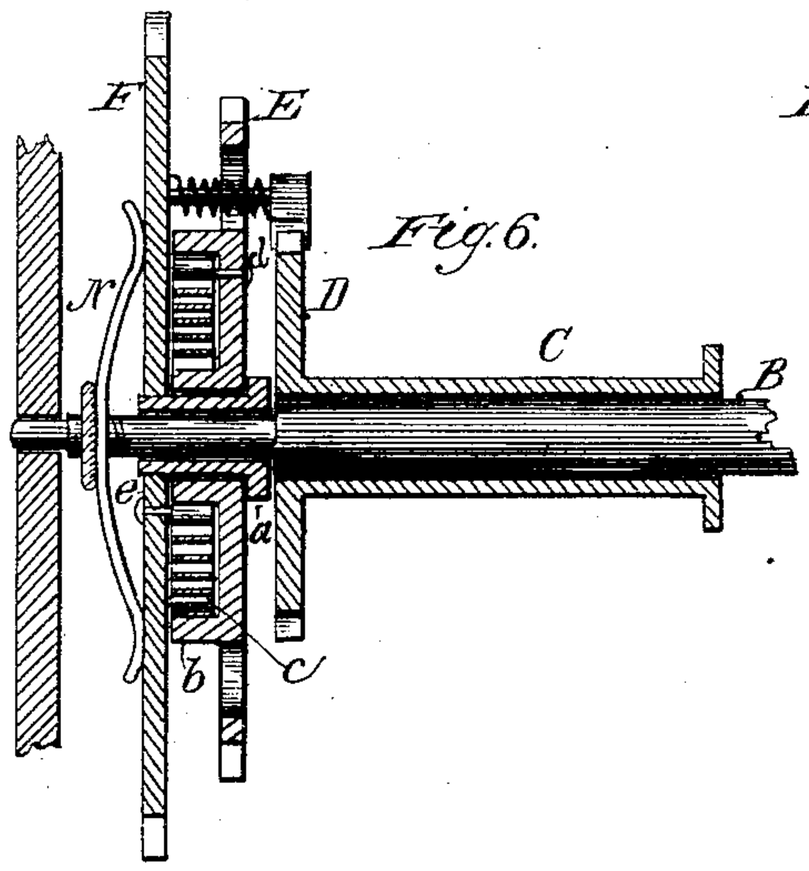
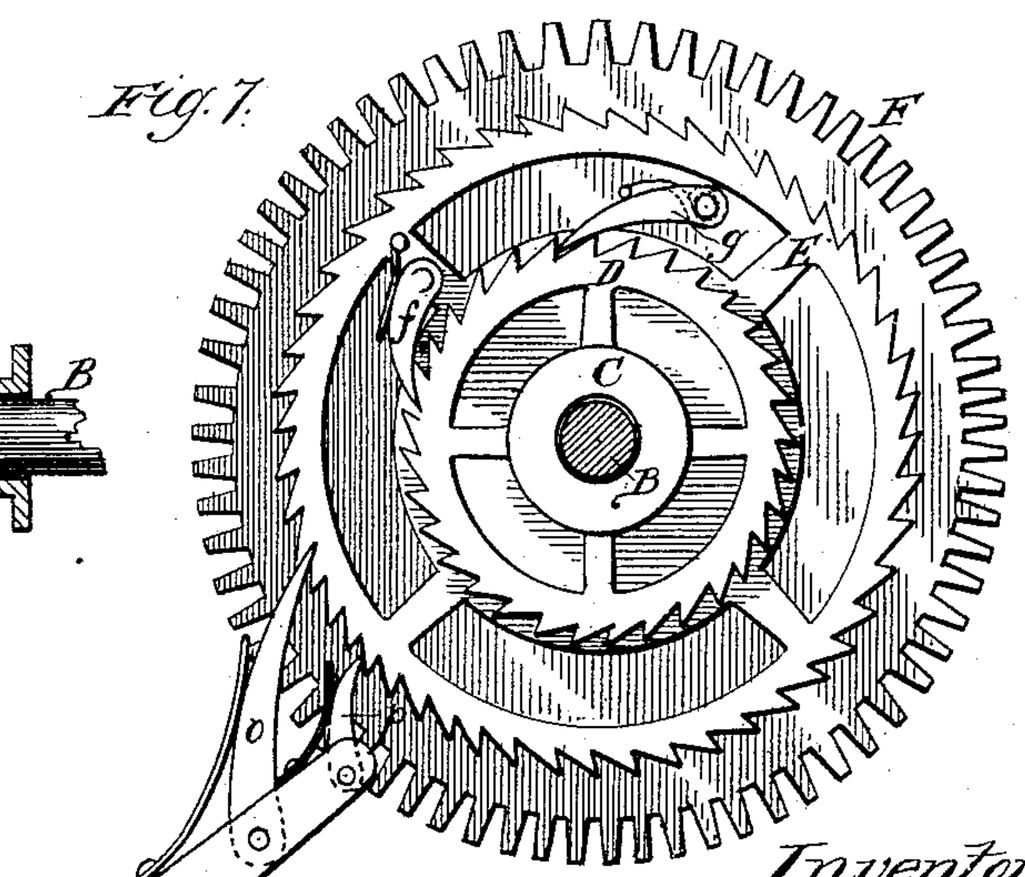


Fig. 7.



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3 Sheets—Sheet 3.

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ELECTRO MAGNETIC DEVICE FOR WINDING CLOCKS.

No. 334,822. Patented Jan. 26, 1886.

Fig. 8.

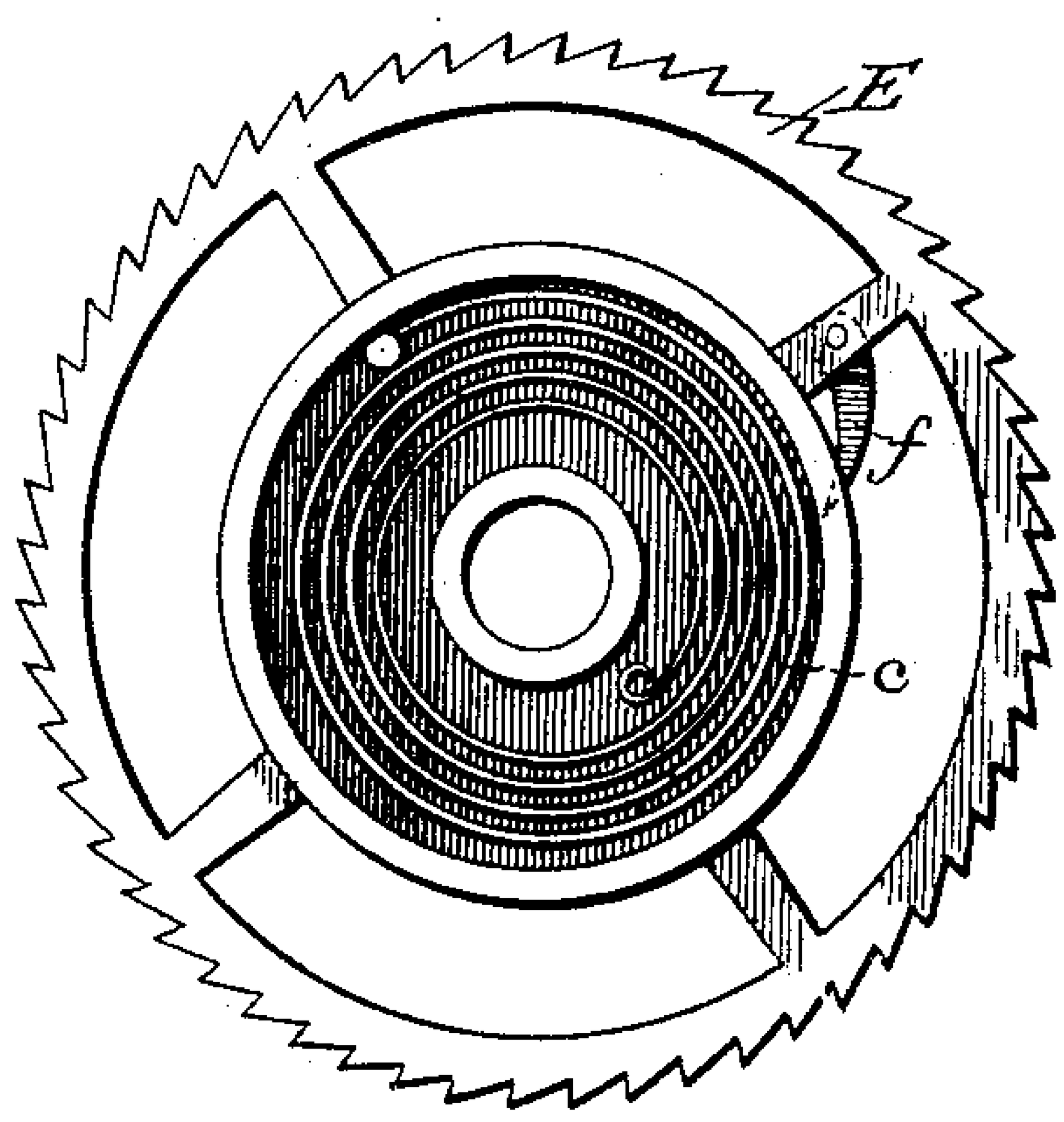


Fig. 9.

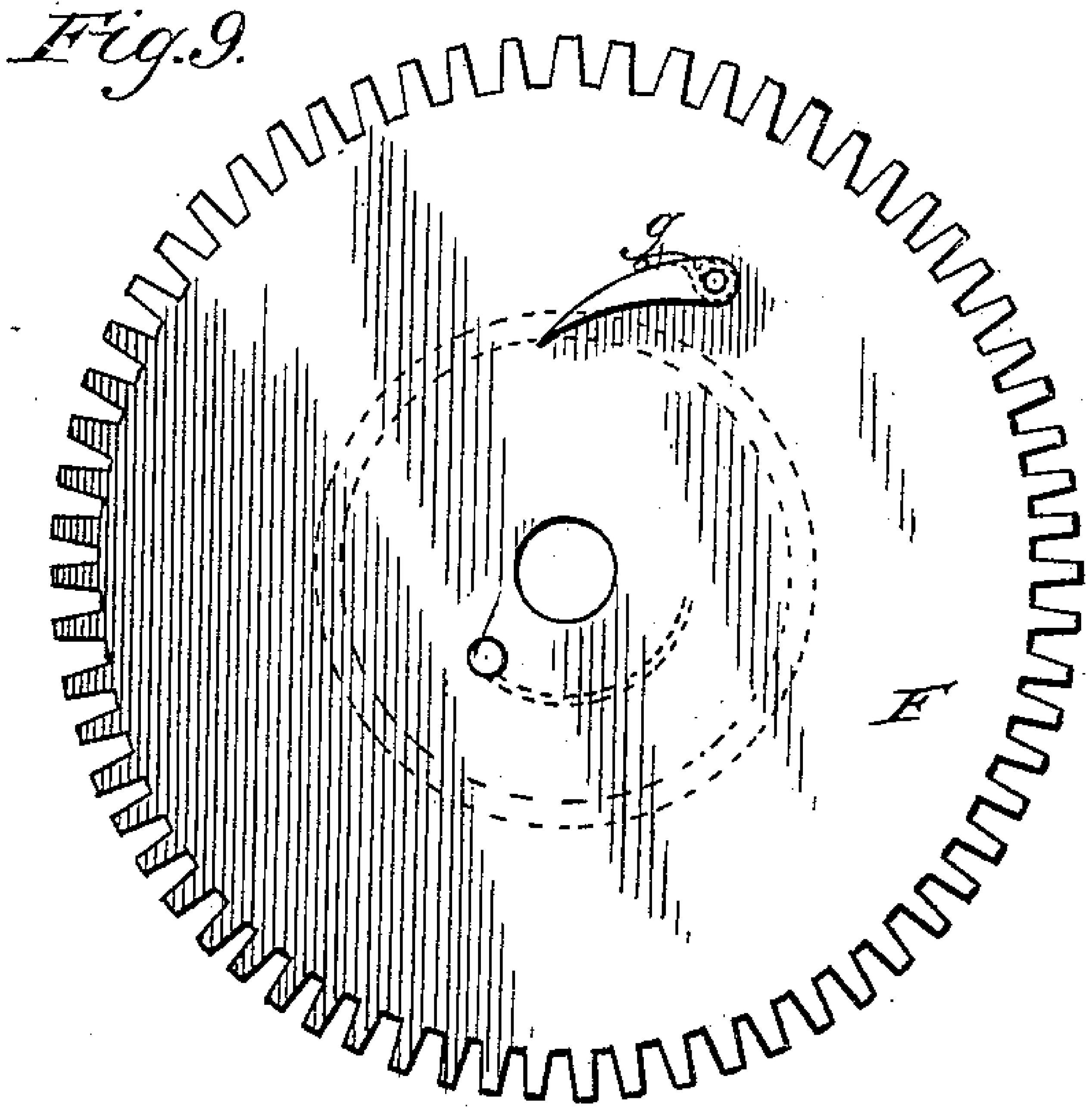


Fig. 10.

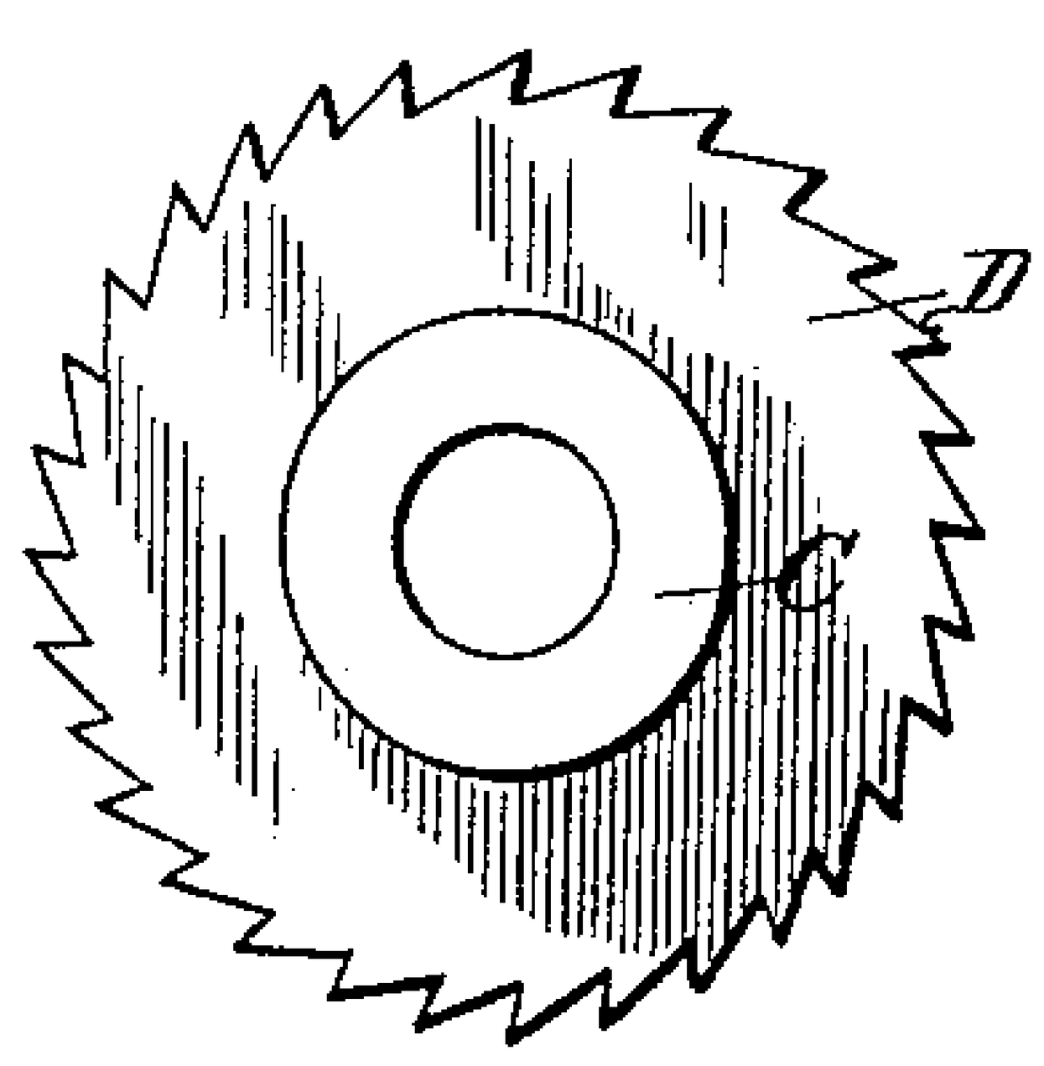
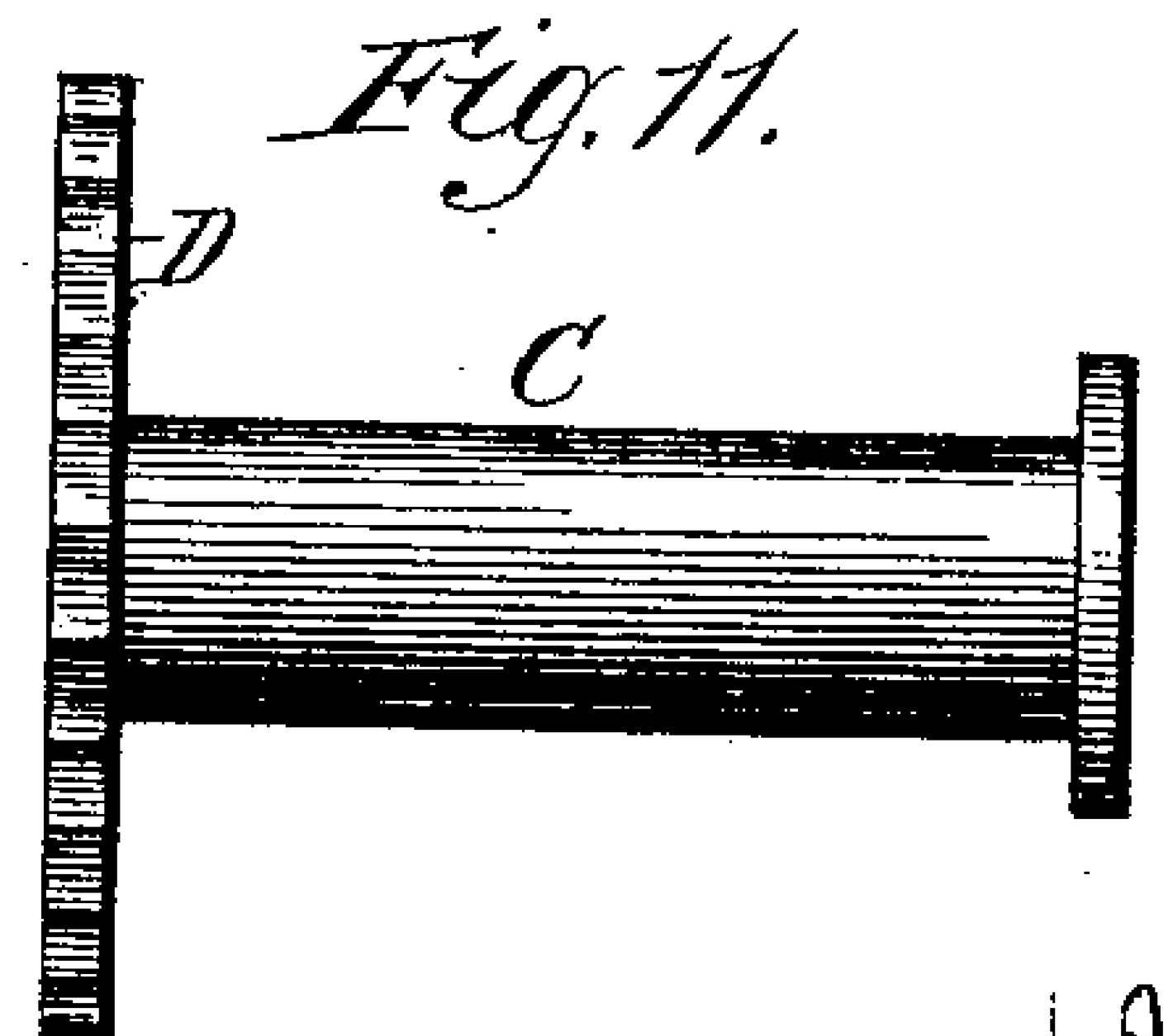


Fig. 11.



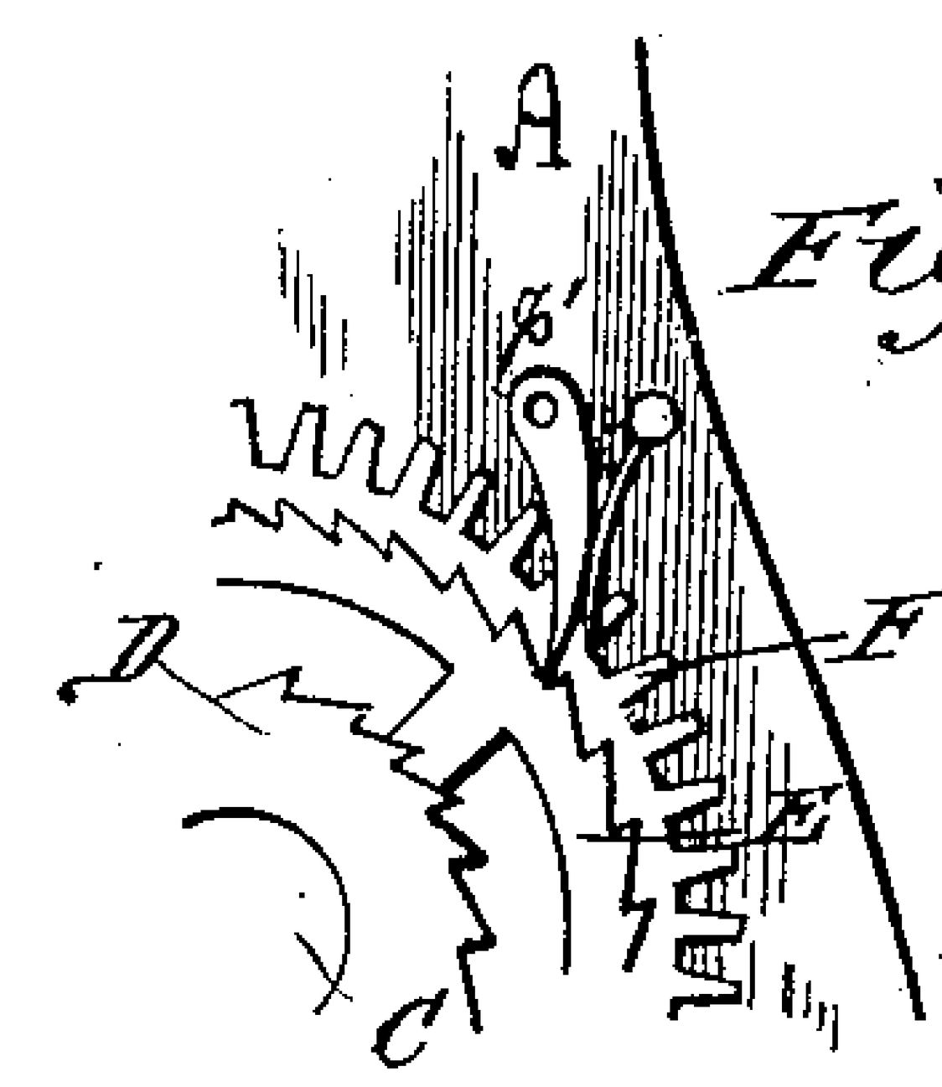
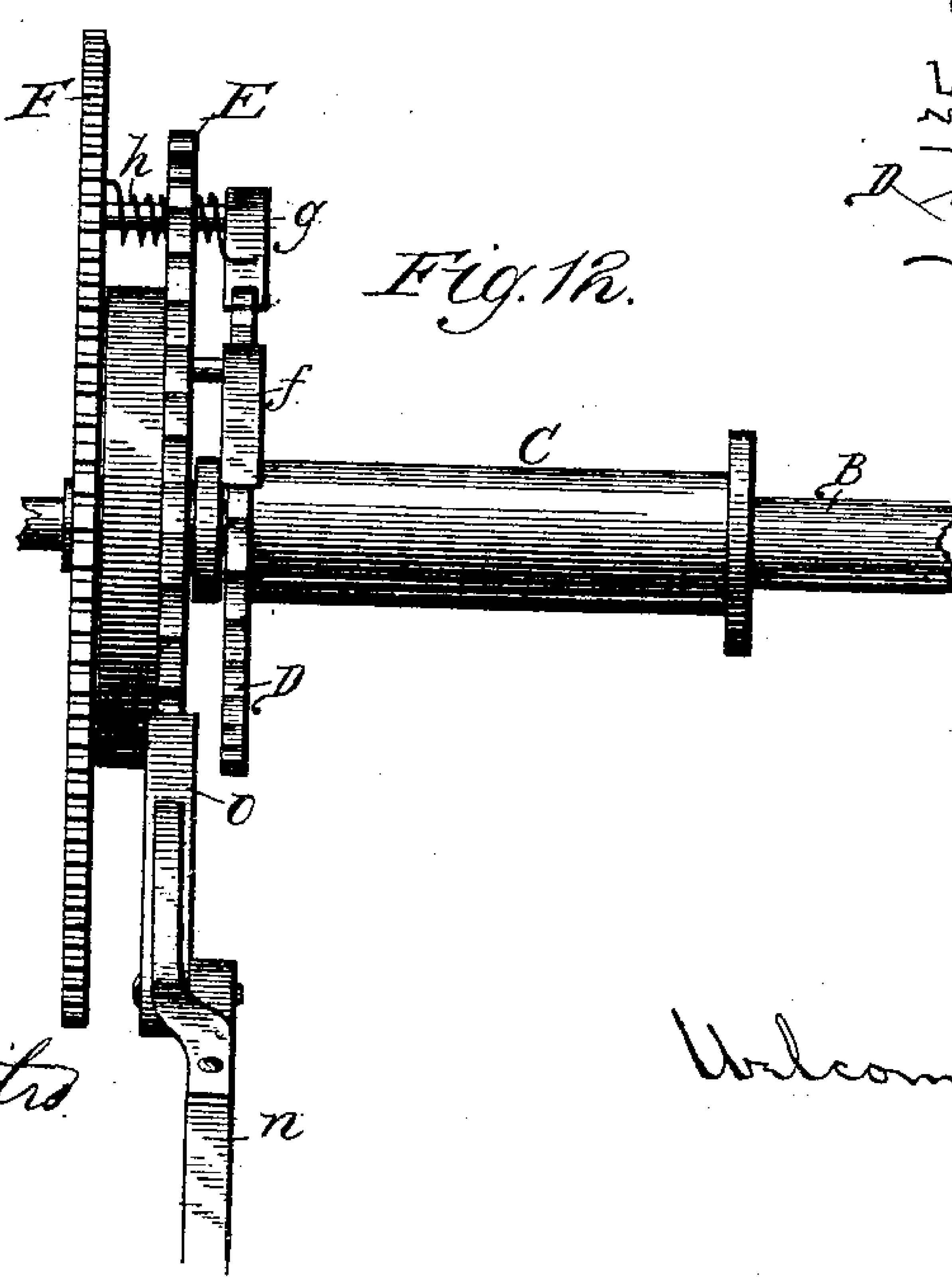


Fig. 13.



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UNITED STATES PATENT OFFICE.

WELCOME F. SWEET, OF GRAND RAPIDS, MICHIGAN, ASSIGNOR TO HIMSELF, AND MICHAEL SULLIVAN, JOHN SAGE, AND STEPHEN SWEET, JR., OF CHICAGO, ILLINOIS.

ELECTRO-MAGNETIC DEVICE FOR WINDING CLOCKS.

SPECIFICATION forming part of Letters Patent No. 334,822, dated January 26, 1886.

Application filed June 30, 1885. Serial No. 170,302. (No model.)

To all whom it may concern:

Be it known that I, WELCOME F. SWEET, residing at Grand Rapids, in the county of Kent and State of Michigan, and a citizen of the United States, have invented a new and useful Improvement in Electric Clocks, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation; Fig. 2, a detail, being a section of the parts represented, taken at line *x* of Fig. 1; Fig, 3, a detail; Fig. 4, a front elevation of the clock-work, the front part of the frame being removed, the magnet also being shown; Fig. 5, a side elevation of the clock-work, also showing the magnet; Fig. 6, a section of the parts represented; Fig. 7, a side elevation of the parts shown; Fig. 8, a detail, being a side view of the barrel which contains the spring, and the ratchet-wheel connected with the barrel; Fig. 9, a side view of the wheel represented; Figs. 10 and 11, details, and Fig. 12, a front elevation of the parts represented, which are those shown in section in Fig. 6, with the addition of certain pawls. Fig. 13 is a detail. Some of the figures are enlarged.

The leading objects of my invention are to provide devices by which a weight arranged to act on the train of a clock can be gradually wound by the action of a magnet, and at the same time provide a maintaining-power acting on the train while the weight is being lifted, and to provide devices for automatically opening the circuit when the weight has been fully wound or reaches a certain height, and holding the circuit open until the descending weight reaches or comes near to its lowest point, and then automatically releasing the devices which hold the circuit open, which objects I accomplish as illustrated in the drawings. Those things which I suppose to be new will be set forth in the claims.

In the drawings, A represents the frame of a clock.

B is a shaft which carries the hands.

C is a winding drum or sleeve on the shaft B.

D is a ratchel-wheel permanently secured to or made with the winding drum or sleeve C.

a is a second collar on the shaft A.

E is a ratchet-wheel upon the collar *a*, but not fast thereon.

b is a barrel on the ratchet-wheel E.

F is a gear-wheel, being what is usually called the "third" wheel in the clock-movement.

c is a spring in the barrel *b*, one end of which spring is secured at *d* to the ratchet-wheel E, and the other end is secured at *e* to the wheel F.

f is a pawl which engages with the ratchet-wheel D, this pawl being supported on a pin secured to the ratchet-wheel E.

g is a second pawl, which also engages with the ratchet-wheel D, which pawl is supported on a pin, *h*, secured to the wheel F. This pin *h*, as shown, passes through an openiug in the wheel E, and as this wheel E has only a limited movement in either direction the pin does not interfere therewith.

G is a pinion on a shaft, H, with which pinion F engages.

I is a gear-wheel on the shaft H, which engages with a pinion, J, on the shaft K, which carries the escape-wheel L.

M represents the pallets.

i is the hour-wheel, and *j* the minute-wheel.

N is a spring acting on the wheel F.

O is a magnet.

k is an armature which, as shown, is secured to a plate, *l*, which plate is rigidly connected with a shaft, *m*.

n is an arm rigidly secured to the shaft *m*, which arm carries two pawls, *o p*, which engage with the ratchet-wheel E.

P is a post or rod, the ends of which are suitably secured in any suitable place. The lower end, *q*, of this rod or post is smaller than the remaining portion, and, as shown, it rests in a support, *r*.

s is a loose collar on the part *q* of the rod, having a flange, *m'*, at its upper end.

t is a coiled spring located between the collar *s* and a pin in the part *q*.

u is a strap, the upper end of which is connected with the collar *s*, and the lower end is provided with a slot, *v*.

Q is a plate, of rubber or other non-conducting material.

w w' are metal plates secured to Q.

a' is a circuit-breaker pivoted at one end to the plate *w*, and at the other end it is provided with a pin which enters the slot *v* in *u*.

b' is a pin at the lower side of the plate *w'*.

c' is a hook pivoted at its upper end to the plate Q and arranged to engage with the circuit-breaker *a'*.

d' is an arm pivoted at its upper end to the plate Q, and its lower end is arranged to engage with the flange on the collar *s* when such collar is pushed down below the lower end of such arm. The hook *c'* and the arm *d'* are held against stops by springs.

e' is a cord, one end of which is connected with the arm *d'*, and the other end is secured to a hook, *f'*, which hook has a little vertical movement in a suitable socket.

R is a weight through which the rod or post P passes. As shown, the lower end of the weight has an extension, *g'*, arranged to engage with the flange upon the upper end of the collar *s*.

h' is a pin in the extension *g'*, arranged to engage with the inside of the shank of the hook *c'*.

S is a winding-cord, one end of which is connected with the weight R, and the other end is secured to the loose sleeve or winding-drum C on the shaft B.

T is a rubber or other non-conducting plate secured to the clock-frame.

i' is a piece of metal secured to the plate T, and *j'* is another piece secured to the same plate T.

k' is a piece upon the end of the shaft K, which passes through the frame, this piece being arranged, as the escape-wheel rotates, to come in contact with and raise the free end of *i'*.

l' is a spring arranged to act upon the circuit-breaker *a'* and force it down upon the pin *b'*, in case its gravity is not sufficient for that purpose.

The operation is as follows: Suppose the parts to be in the position shown in Fig. 1, the circuit-breaker *a'* being lifted away from the pin *b'*, and the circuit being thus opened. When the weight descends a little farther, the part *g'* will come in contact with the flange *m'* upon the collar *s*, forcing it and the bar *u* down a little and compressing the spring *t*, and at the same time the pin *h'*, coming in contact with the latch or hook *c'*, will force it back, releasing *a'*, which will drop by gravity, or be forced down by the action of the spring *l'* upon the pin *b'*, thus closing the circuit at this point. At the same time the flange upon the collar *s* in its downward passage comes in contact with the inside of the arm *d'*, forcing it back a little until the flange passes below the lower end of the arm, when such arm will be returned to its normal position by the spring behind it, the lower end of such arm then being over the flange *m'* upon the collar *s*, and preventing the collar from being forced up by the action of the spring *t*. So long as these parts remain in the position just described the circuit will remain closed, because *a'* will remain in contact with *b'*.

The electric circuit from one pole of battery *a*⁷ is by the wire *a*⁵, plate *w'*, arm *a'*, plate *w*, and wire *a*⁶ to the electro-magnet O; then by the second branch of the wire *a*⁶ to the circuit-closers *j' i'*, controlled by the escapement; and, finally, by the third branch of the wire *a*⁶ to the other pole of the battery, as is clearly shown in Fig. 1.

The clock being in motion, the part *k'* will close the circuit twice with every revolution of the escape-wheel L by bringing *i'* in contact with *j'*. Every time the circuit is thus closed the armature *k* will be drawn to the magnet, which will cause the shaft *m* to rock a little, and through the arm *n*, which is secured to such shaft *m*, one of the pawls *o p* will act upon the ratchet-wheel E, moving it a little, which movement will slightly increase the tension of the spring *c*. As often as the circuit is broken by the return of *i'* to its normal position the pawls *o p* will be returned to their former position, ready to engage again with the ratchet-wheel E when the circuit is again closed, and by repeated movements of these pawls the tension of the spring *c* will be gradually increased. This spring is connected at one end to the wheel F, which is a part of the train, and at its other end to the ratchet-wheel E, so that the tension of the spring in one direction will be acting on the wheel F to move it, and through it the train, while the other end is exerting its force on the ratchet-wheel E. With each movement of this wheel E, by the action of one of the pawls *o p*, the ratchet *f* will ride over the teeth of D. When sufficient power has been accumulated in the spring *c* to overcome the gravity of the weight R, in addition to that required to run the clock, then whenever the pawls *o p* are released the spring *c* will, through the pawl *f*, which is pivoted to the wheel E, act upon the ratchet-wheel D, moving it a little, and thus winding the cord S a little upon the sleeve C and raising the weight R a trifle; and this action of the spring *c* to raise the weight, as described, will be repeated as often as the tension thereof is sufficient. At the same time the spring *c* constantly acts upon the wheel F to keep the train in motion, so that the spring not only raises the weight, but serves the purpose of a maintaining-power to run the train while the weight is being raised, one end of the spring acting to raise the weight and the other end acting on the train.

The pawl *g* is a retaining-pawl, and connects the wheel F with the ratchet-wheel D, so that the weight acts upon the train when free so to do.

When the weight R nearly reaches the limit of its upward movement, it will come in contact with the hook *f'*, raising it a trifle, and through the cord *e'* the latch or arm *d'* will be drawn back away from the flange *m'* on the collar *s*. Then by the action of the spring *t* the collar will rise, and through the strap *u* the

circuit-breaker a' will be lifted and the circuit will be broken at this point, so that the battery will no longer act upon the magnet, and then the weight will operate upon the clock-movement until it again descends and closes the circuit, as before described, after which the operation before described will be repeated. While the weight is descending the spring c will not operate upon the train.

The wheel F has sixty teeth. The wheel E, as shown, has fifty-four, but may have some other number.

As shown, the circuit closes twice a minute, and hence the weight will be wound considerably faster than it runs down. The circuit may be closed oftener, if desired.

I use two pawls, o p, one of which is a little longer than the other to insure action on the wheel E.

The length of the rod D depends upon the distance the weight is to move. As the parts are most likely to be arranged, it will take a number of hours to wind the weight—say about twenty—and when fully wound and the circuit is broken at a', as described, the weight will run the clock until it again closes the circuit a', which will probably be about sixty hours, and while the weight is running the train the battery will not be in action. While the weight is not acting on the train the spring c acts as a maintaining-power. There is to be some tension on the spring c when the parts are first placed in position.

The spring c, operated by a magnet, might be used for running the clock all the time without any weight, in which case the ratchet-wheel D and pawl g would not be required, and a pawl should be arranged upon the frame to engage with the teeth of the ratchet-wheel E to act as a retaining-pawl. In this case the battery will always be in action and the spring will be constantly wound substantially in the manner before described. In Fig. 13 I have shown how the last-mentioned pawl may be arranged, p' being the pawl.

The rod or post P serves the purpose of a guide for the weight. In Fig. 1 I have indicated a battery and connecting-wires.

I do not limit myself to the exact devices shown and described for closing and opening the circuit by the action of the weight, as various modifications can be readily adopted by any one skilled in the art.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a ratchet-wheel, E, a wheel, F, a spring, c, collar C, ratchet-wheel D, and a weight, R, substantially as and for purposes specified.

2. The combination, with a time-train, of a weight, a spring adapted to wind the weight and at the same time act on the train as a maintaining-power, and devices for winding the spring through a battery and magnet, substantially as and for the purposes specified.

3. In combination with a time-train, a weight, R, a battery, magnet, and connecting-wires, devices for winding the weight actuated by said magnet, and devices for closing and opening the circuit by the action of the weight, substantially as herein set forth.

4. The combination of a battery, a magnet, and connecting-wires, a weight, a spring for winding the weight and at the same time acting on the train as a maintaining-power, a circuit-breaker operated by the clock, and devices for closing and opening the circuit by the action of the weight, substantially as and for the purposes specified.

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