

(No Model.)

2 Sheets—Sheet 1.

A. S. CRANE.
ELECTRIC CLOCK.

No. 311,234.

Patented Jan. 27, 1885.

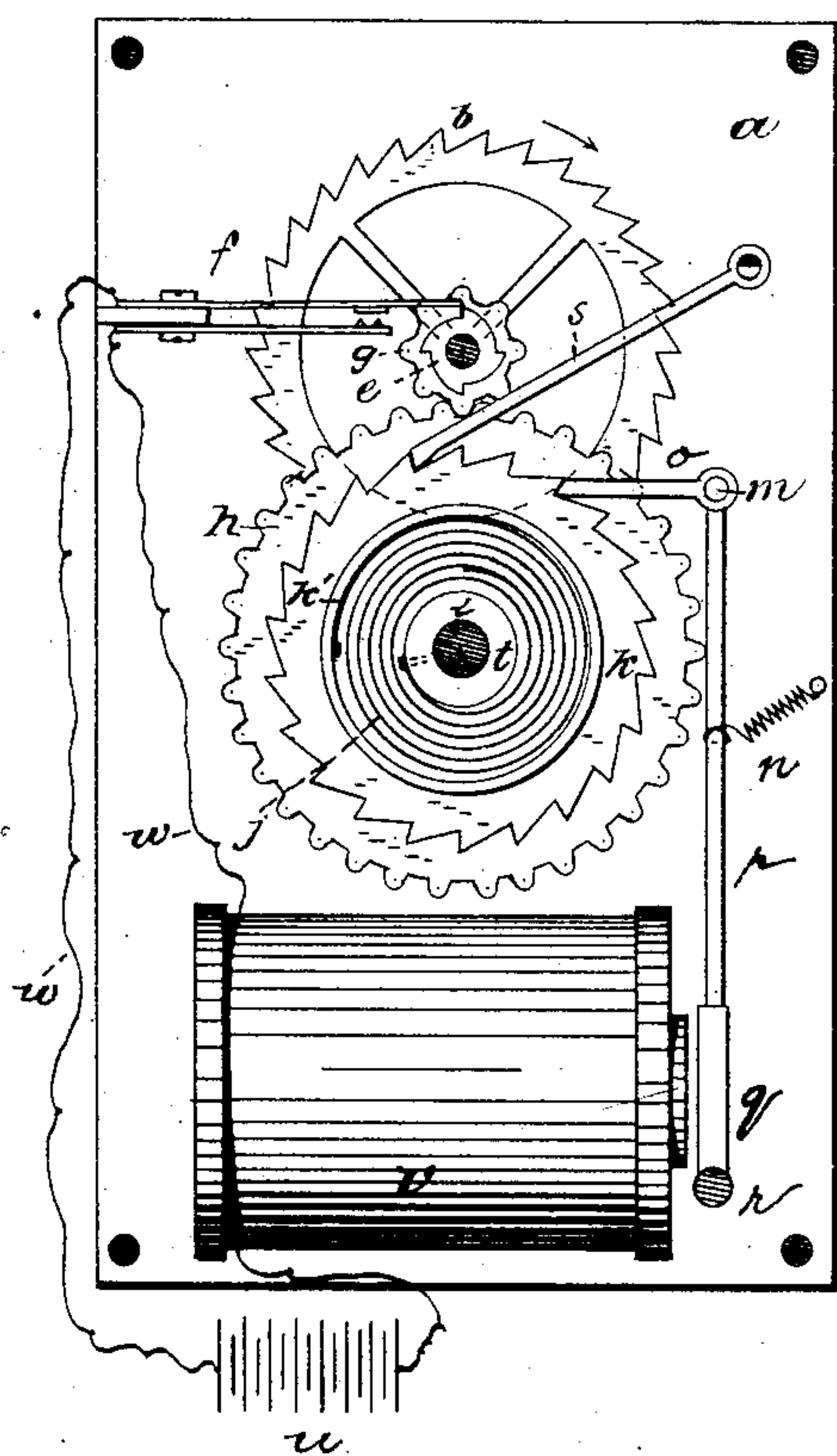


Fig. 1.

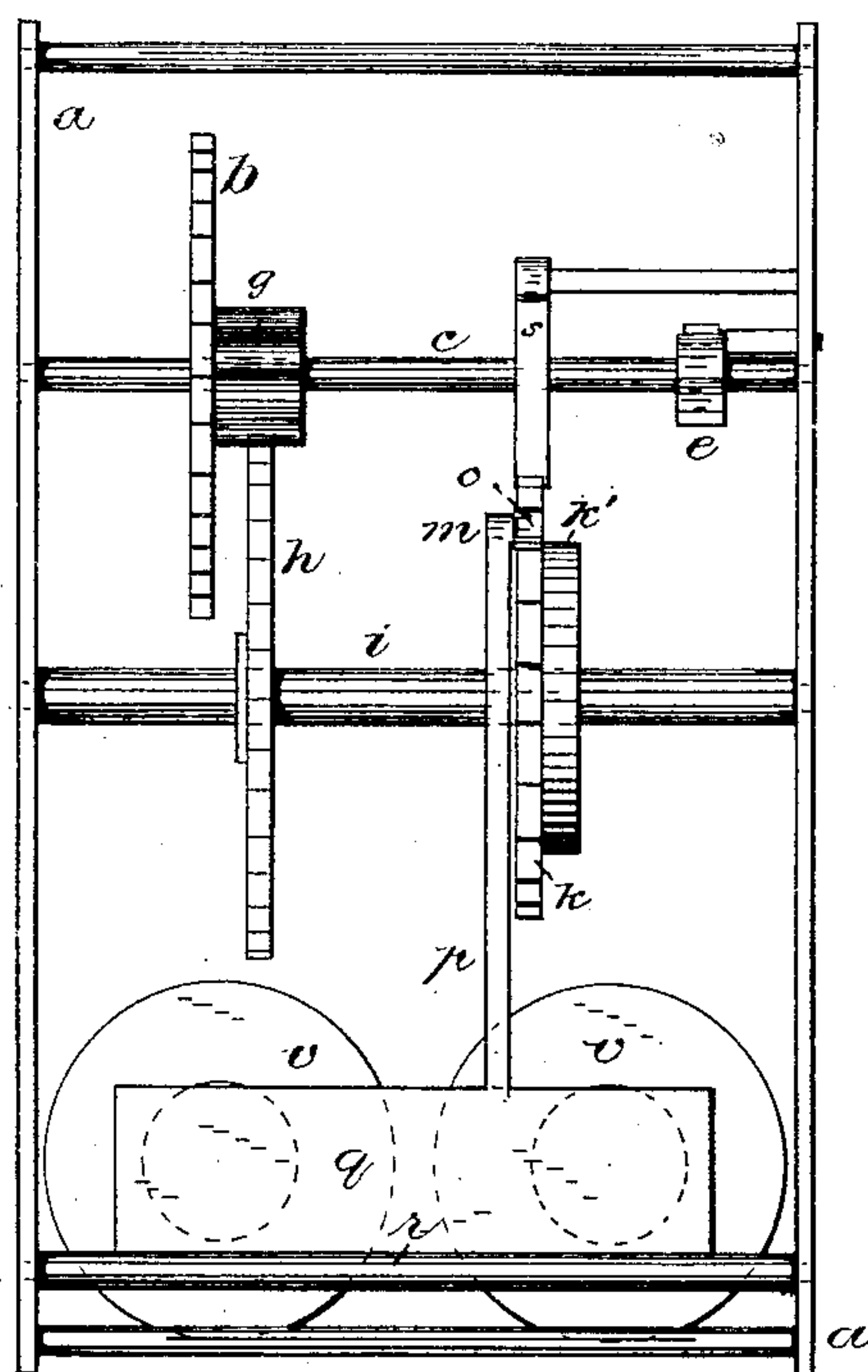
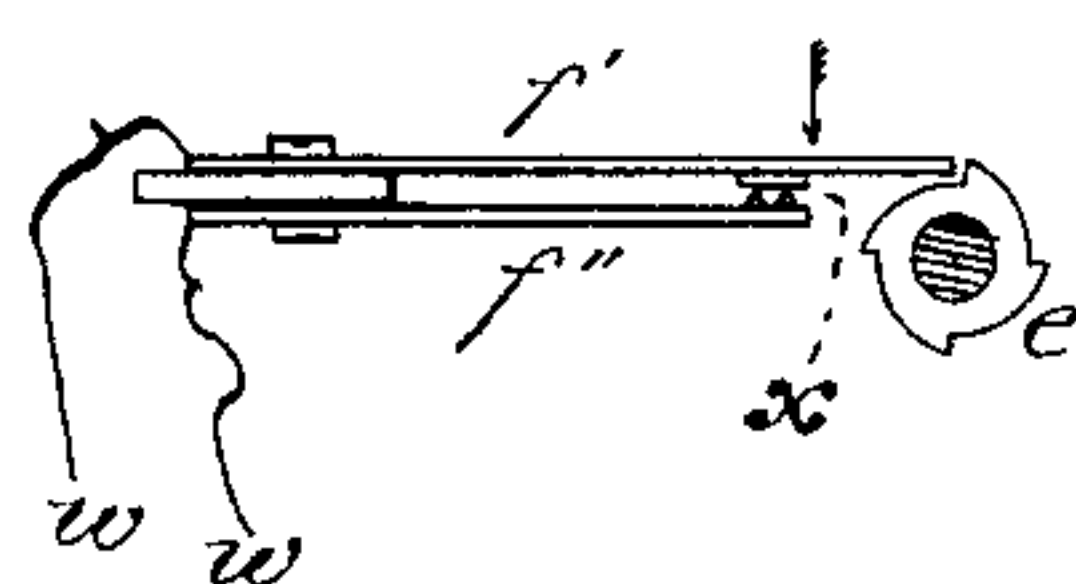


Fig. 2.



 Section through ↓

Fig. 3.

Attest:

J. H. Campbell.
Edward G. Kempf.

Inventor:

Augustus S. Crane,
by Drake & Co. attys.

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2 Sheets—Sheet 2.

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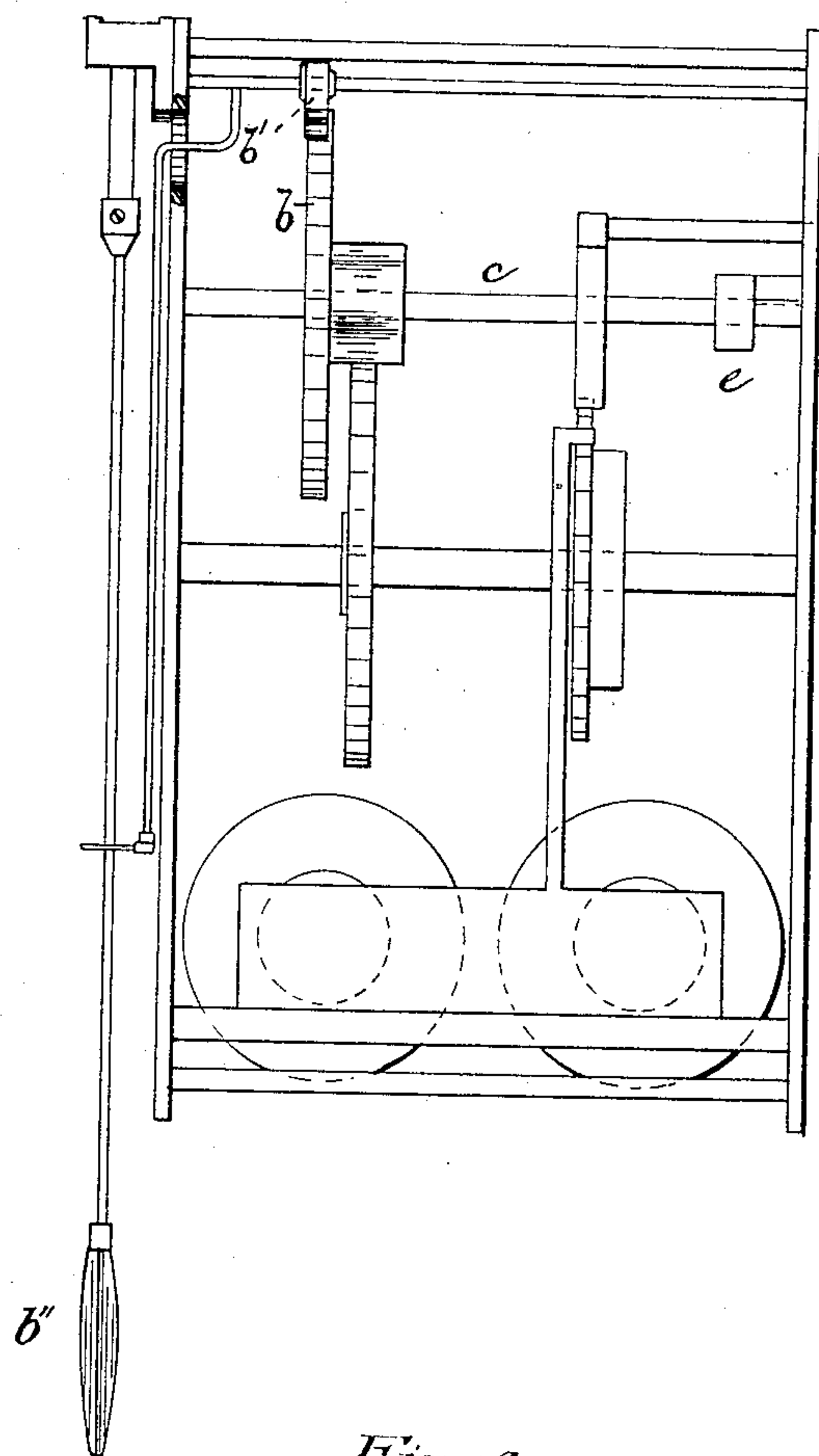


Fig. 4.

Witnesses:
J. H. Campbell
Edward G. Kempf

Augustus S. Crane,
Inventor:
by Drake & Co. Attys.

UNITED STATES PATENT OFFICE.

AUGUSTUS S. CRANE, OF NEWARK, NEW JERSEY.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 311,234, dated January 27, 1885.

Application filed January 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS S. CRANE, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electric Clocks; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of this invention is to provide an electric clock of increased simplicity of construction, and of greater accuracy and reliability of movement.

It consists in the combinations and arrangements of parts, substantially as will be hereinafter set forth, and finally embodied in the clauses of the claim.

Referring to the accompanying drawings, in which similar letters of reference indicate like parts in each of the several figures, Figure 1 is a front elevation of the clock mechanism, the front plate of the frame being removed to show said mechanism more clearly. Fig. 2 is a side elevation of the same. Fig. 3 is a detail view of a circuit-closer forming a part of the device, and Fig. 4, Sheet 2, is a side view showing the relation of the escape-wheel to the escape mechanism.

In said drawings, *a a* illustrate a suitable frame, on which the several operating parts have their bearings. *b* is an escape-wheel, the action of which is controlled by an anchor or any other suitable escapement, of which *b'* is a verge, and *b''* is a pendulum, operating in any usual way and of any suitable construction. Said wheel *b* revolves on the escape-wheel arbor *c*, which also carries a cam or toothed wheel, *e*, adapted to engage with a circuit breaker or closer, *f*, said cam having a number of projections, considerably less than the teeth on the escape-wheel, although in proper proportions. By this construction several pulsations of the pendulum are occasioned to every movement of the pawl *o*, the action of the said pawl being controlled by the said cam through the medium of the arms of the cir-

cuit-closer, the magnet, and armature. I am thus enabled, in what is termed an "open-circuit clock," to allow the circuit to remain open for a large proportion of the time, and by this means effect a great saving in battery materials. The relation of the cam with the escape-wheel is unchangeable or fixed, whether the said cam be on the same arbor with the said wheel, as shown, or upon an intermediate arbor, so that the power supplied to said escape-wheel will invariably be the same as that expended by said wheel.

To secure a regularity of impulse and a uniform tension upon the spring *j*, hereinafter mentioned, I arrange or form the cam projections at equal distances apart. I prefer to employ but a few projections on the cam, four being shown for illustration. The minute-interval is thus divided into a corresponding number of parts. As the circuit is closed only for a moment after the extremity of the cam projection passes the arm of the circuit-breaker and allows the latter to drop into contact, the circuit is closed but for, say, four seconds in the minute, the circuit being held open the remainder of the minute. As the power of the battery is not on the clock but for the moments mentioned, and but little force is thus required to operate said clock, such force is readily supplied by a single cell. The pinion *g* of the escapement-wheel engages with a cog-wheel, *h*, upon the arbor *i*. Said cog-wheel is actuated by a spring, *j*, secured at one end to said arbor or to a collet, *t*, arranged thereon, and at the other to the ratchet-wheel *k* or barrel *k'*, connected therewith, said barrel and ratchet-wheel revolving upon but independent of said arbor *i*. The ratchet-wheel *k* is operated intermittently by the pawl *o*, pivoted at *m* to the arm *p*, formed integral with or connected to the armature *q*, pivoted at *r* to the frame.

To draw the pawl back prior to engaging a second tooth of the ratchet I arrange a spring, *n*, in such a relation thereto as to produce the result. I also provide a detent, *s*, Fig. 1, to prevent back action of the ratchet when the pawl *o* is being actuated by the spring *n*. When the circuit is closed and the armature is attracted by the magnet, the pawl *o*, en-

gaging a tooth of the ratchet *k*, throws the latter forward, which action tends to wind the spring *j*, secured thereto. The tension of the spring *j* causes the shaft *i* and cog *h* thereon to revolve, the motion being communicated to the escape-wheel *b* and cam *e*, operating the circuit-closer. The amount of power imparted to the spring *j* by means of the ratchet and pawl is equal to that expended in actuating the escape-wheel. The spring having a certain amount of force stored therein, should the contact-points ever fail to make a contact, and the pawl consequently fail in actuating the ratchet, the energy of the spring will be sufficient to continue the action of the escape-wheel, so that the clock will not fall behind the correct time.

I do not wish to be understood as limiting myself to the exact arrangements and combinations shown, inasmuch as many changes can be made without departing from the spirit of the invention. For example, a helical spring may be employed in lieu of the coiled spring *j*; or I may substitute for the spring a weight and suitable mechanism whereby the same may be "wound up" or raised by the magnet.

The circuit breaker or closer above mentioned is composed of insulated arms *f' f''*, Fig. 3, which are attached to conducting-wires *w w*, so that when in contact the electrical fluid passes through both of said arms, and one of which arms is a spring that engages with the cam *e* on the escape-wheel arbor *c*. As the said cam revolves it raises the said arm to an abnormal position, after which the latter drops with considerable energy and makes a contact with the lower or co-operating arm. The latter arm being of similar construction to the first, when the contact is made, instead of a series of vibratory rebounds being occasioned, as would be if the second arm were of a more substantial character, a continuous contact is produced, securing an unbroken flow of electricity. The arms are provided with knife-edged contact-points *x*. These cross one another at an angle substantially as shown. Thus constructed, the force of the contact clears the contact-points of any accumulation of dust or oxidized metal, that would tend to create a resistance.

To prevent the blades from being dulled by the continuous impingement of the points, the same are preferably formed of iridium. The spring-arm *f'* projects beyond the arm *f''*, so that the cam *e* may be lubricated without any danger of the lubricant interfering with contact. The intermittently opened and closed circuit, influenced by the cam working upon the circuit-closer, causes the armature *g*, influenced by the magnet, to act-

uate the pawl intermittently, as will be understood.

The action of the battery *u* and conducting-wires *w w* is as usual, and needs no particular description.

Having thus described my invention, what I claim as new is—

1. In combination, the escape-wheel *b*, pinion *g*, arbor *c*, cam *e*, cog-wheel *h*, arbor *i*, ratchet *k*, spring *j*, pawl *s*, pawl *o*, connected to the armature *g*, magnet *v*, battery *u*, conducting-wires *w*, and circuit-closer *f*, all arranged and operating substantially as set forth.

2. In combination, in an electric clock, the escape-wheel, the pinion, cam, and contact-arms, the cog *h*, spring *j*, and ratchet and pawl, the magnet, armature, and battery, all arranged and operating substantially as and for the purposes set forth.

3. In an electric clock, the combination of a spring receiving power from a magnet and expending the same to actuate an escape-wheel, said escape-wheel and magnet, a circuit breaker or closer, and a cam engaging with said circuit breaker or closer, all said parts being arranged and operating substantially as and for the purposes set forth.

4. In an electric clock, the combination of an escape-wheel, a spring or its equivalent for actuating said escape-wheel, a magnet for supplying power to said spring, contact-points for controlling the magnet, and a cam having a fixed relation to said escape-wheel, and adapted to separate said points, said parts being arranged and operating substantially as and for the purposes set forth.

5. In an electric clock, the combination of an escape-wheel, a cam having a fixed relation thereto and having a series of cam projections disposed around the periphery thereof, and adapted to hold the contact-points apart during a major portion of a given interval, and said contact-points, said parts being arranged and adapted to operate substantially as and for the purposes set forth.

6. The combination, with the actuating-spring of a clock-movement, of an electromagnet having attached to its armature lever a pawl engaging a ratchet-wheel to wind the spring, and contact-points operated by a cam connected with the movement to close the circuit and vitalize the magnet at regular intervals.

In testimony that I claim the foregoing I have hereunto set my hand this 21st day of January, 1884.

AUGUSTUS S. CRANE.

Witnesses:

F. F. CAMPBELL,
OLIVER DRAKE.