No. 678,953. Patented July 23, 1901.

G. HOOKHAM.

ELECTRIC CLOCK.

(Application filed Dec. 15, 1900.)

(No Model.)

3 Sheets—Sheet 1.

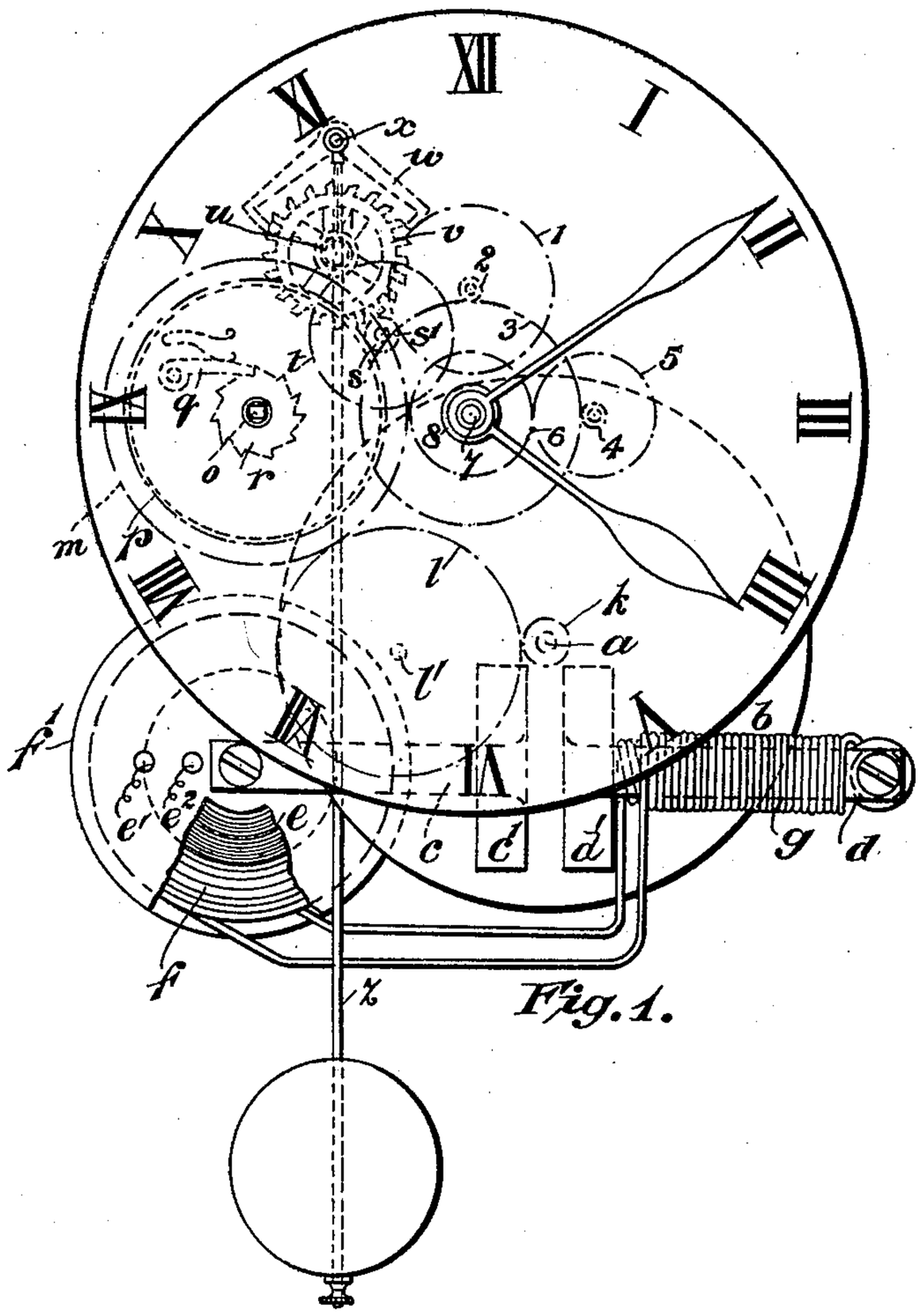

Fig. 1.

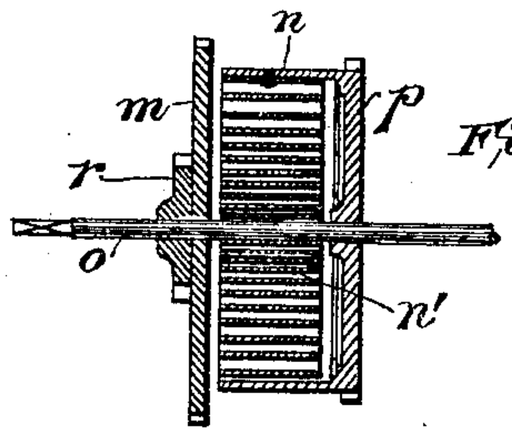

Fig. 2.

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3 Sheets—Sheet 2.

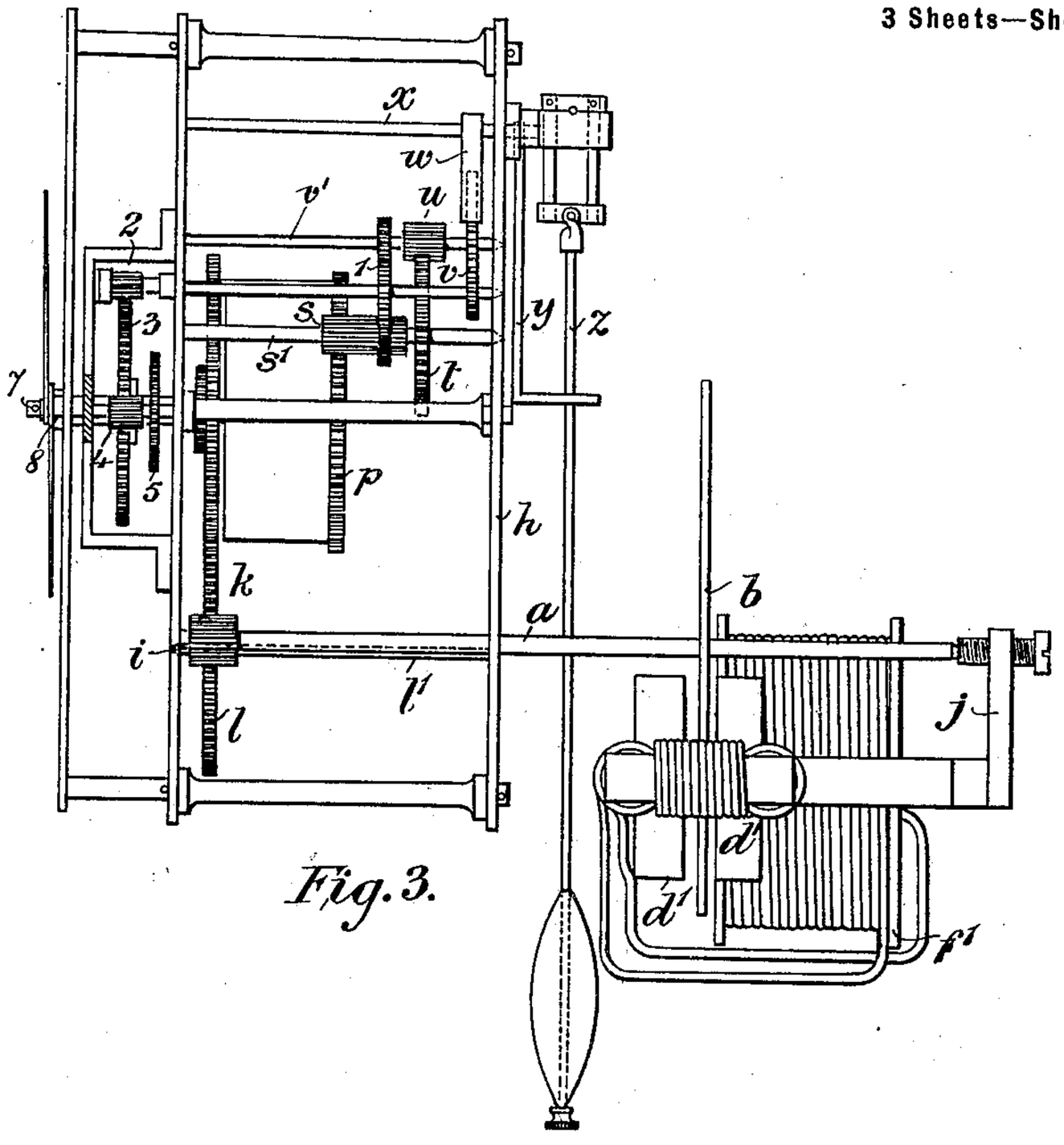

Fig. 3.

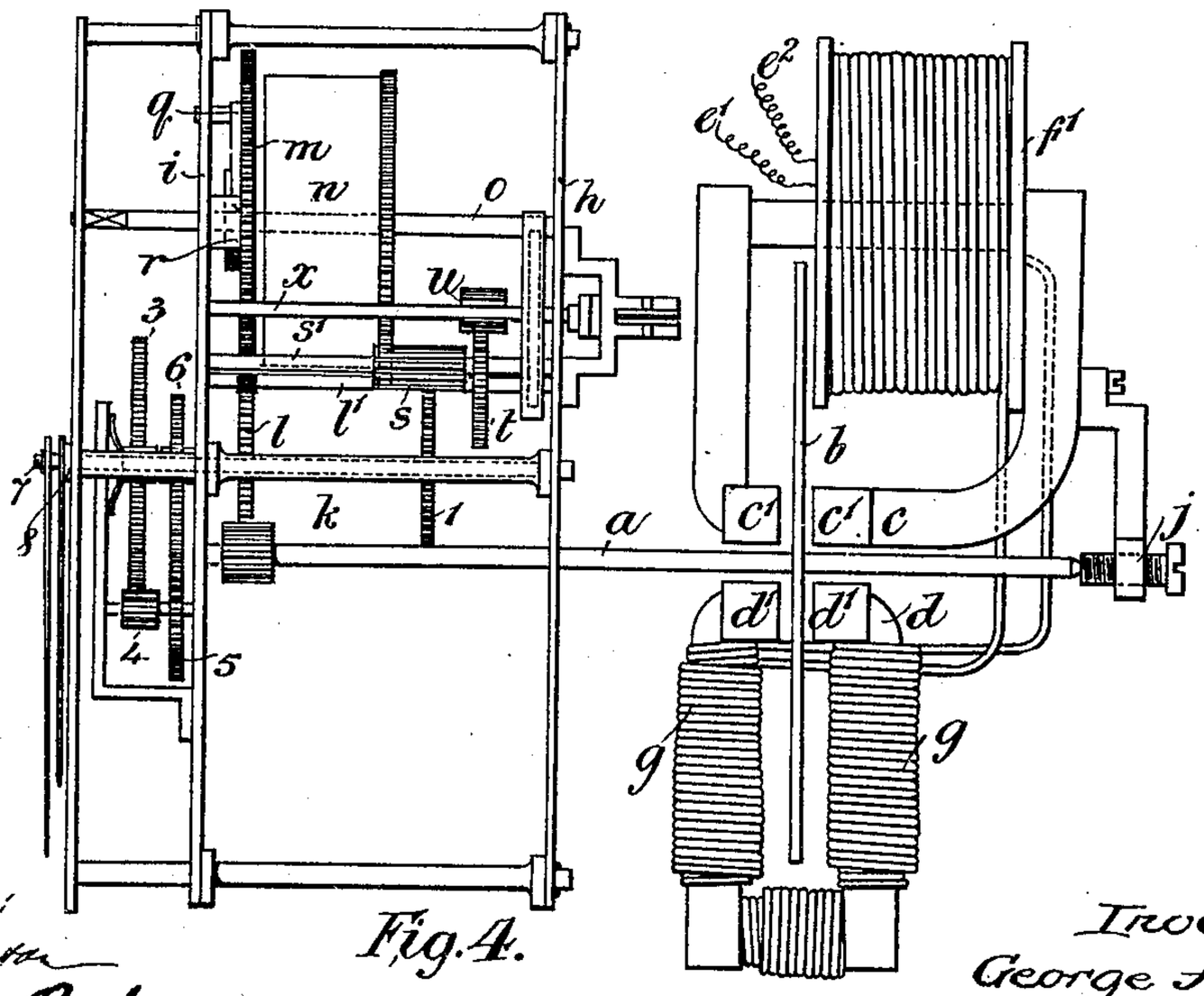

Fig. 4.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

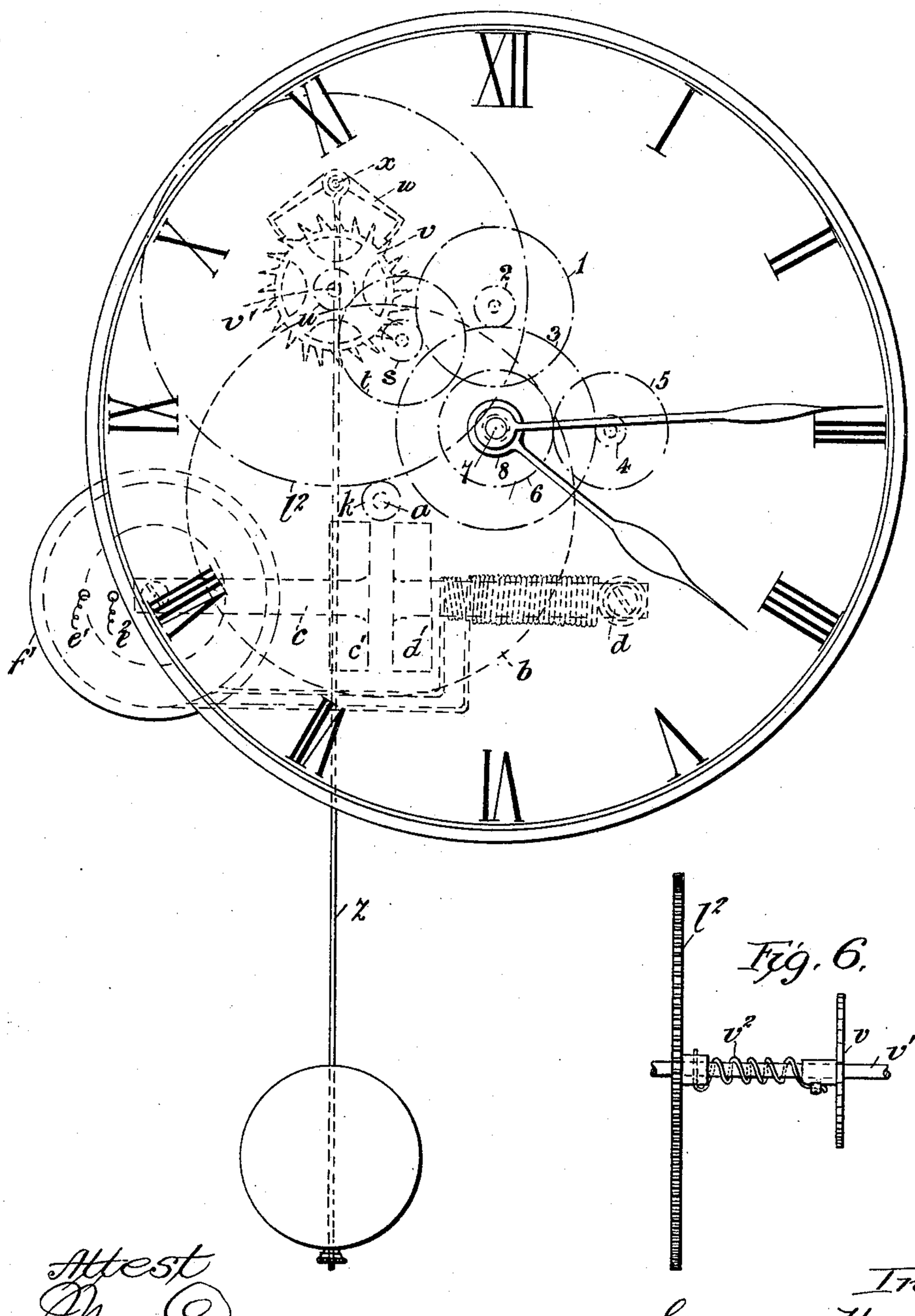

Fig. 6.

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UNITED STATES PATENT OFFICE.

GEORGE HOOKHAM, OF BIRMINGHAM, ENGLAND.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 678,953, dated July 23, 1901.

Application filed December 15, 1900. Serial No. 39,980. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HOOKHAM, electrical engineer, a subject of the Queen of Great Britain and Ireland, residing at 7 and 8 New Bartholomew street, Birmingham, in the county of Warwick, England, have invented certain new and useful Improvements in Electric Clocks, (for which I have made application for patent in Great Britain, No. 3,535, dated February 22, 1900,) of which the following is a specification.

My invention consists in the features and combination of parts hereinafter fully described, and particularly pointed out in the claim.

In the accompanying drawings, which illustrate the method of carrying my invention into effect in constructing a clock in which the motor is driven by alternating currents, Figure 1 is a front elevation of the clock. Fig. 2 is a section of the mainspring and going-barrel, and Figs. 3 and 4 are respectively a side elevation and plan of the clock. Fig. 5 is a front elevation of a modified form of clock, and Fig. 6 is a detail view showing the method of mounting the escapement-wheel.

In all the above figures similar characters of reference indicate similar parts.

Referring to Figs. 1 to 4, a spindle *a* is provided, upon which is mounted a disk *b* of highly-conducting metal, preferably copper or aluminium. This disk forms the armature of the electric motor and is arranged to revolve between the poles *c' d'* of the two field-magnets *c d*. The cores of these magnets are preferably laminated and are situated with their pole-pieces lying parallel to each other and very close to the disk, thereby producing an intense magnetic field perpendicular to the disk. The pole-pieces are formed of oblong configuration, so as to extend radially over a large portion of the disk in order to increase the effective driving torque of the motor. The magnet *c* is provided with a winding or coil *e*, having a large number of turns on the bobbin *f'*. The extremities of this coil are shown at *e'* and e^2, Figs. 1 and 4. Over the coil *e*, which may be connected in parallel with a current-supply circuit and carries a constant current, is placed a secondary winding *f*, which is continuous and forms a closed circuit with a winding *g* on the magnet *d*. The current in the shunt-coil *e* and the induced current in the windings *f* and *g* produce a shifting magnetic field, which interacts with the eddy-currents induced in the disk *b* to produce rotation of the disk in a manner well understood. The shunt-coil is arranged so as to produce a driving force as nearly constant as possible, and the armature of the motor is caused to revolve at a uniform speed.

The motor-spindle *a* passes through the back plate *h* of the clock and has a bearing at one extremity in the face-plate *i*. The other extremity is pivoted in a support *j*, fixed to the magnet *c*. A pinion *k*, fitted to the spindle *a*, gears with a toothed wheel *l*, which in turn gears with a toothed wheel *m*, mounted loosely upon the arbor *o* of a spring going-barrel *n*. This wheel carries a pawl *q*, adapted to engage with a ratchet-wheel *r*, fixed to the arbor *o*. The inner end of the spring *n'* is attached to this arbor, so that when the wheel *m* is driven in the proper direction by the motor the pawl and ratchet-wheel enter into engagement and winding up of the spring is effected. The ratchet-wheel and pawl are provided so that the spring may be wound independently by hand, if desired, the outer extremity of the arbor *o* being formed with a square, to which a key can be fitted for the purpose.

The outer end of the spring *n'* is attached to the going-barrel *n*, the side of which is formed by a toothed wheel *p*, mounted loosely on the spring-arbor *o*. This wheel gears with a pinion *s*, fixed to a spindle *s'*, which also carries a toothed wheel *t*, meshing with a pinion *u*. This pinion is fixed to the shaft *v'*, upon which the escapement-wheel *v* is mounted. The usual rocking shaft *x* is provided, which is fitted with escapement-pallets *w* and carries the crutch *y*, which actuates the pendulum *z*.

The requisite movement of the hands of the clock is obtained from the pinion *s* through the wheel-trains 1 2 3 and 4 5 6, the axis 8 of the hour-hand being sleeved on the axis 7 of the minute-hand in the usual manner. The wheel 6 is fixed to the axis of the hour-hand and is driven at the desired speed by the wheel 5, which is fixed upon the axis of the pinion 4, gearing with the wheel 3 of the minute-hand train.

The operation of the clock is as follows: A continuous rotation is imparted to the motor-spindle a by the electric current, thereby causing rotation of the wheel n through the train $k\ l\ m$. The pawl q then engaging with the ratchet-wheel r transmits the rotation to the arbor o and winds up the mainspring, which continuously unwinds and drives the clock-train, the regulation of the movement being effected in the usual manner by the pendulum z. The trains of wheels are so proportioned that for a given speed of the motor the spring is capable of maintaining the motion of the pendulum for some time after the motor has stopped.

In some cases I may dispense with the spring going-barrel and drive the escapement by the motor in the manner illustrated in Fig. 5, where a gear-wheel l^2 is fixed to the escapement-wheel arbor v' and meshes with the pinion k, secured to the motor-shaft. The escapement-wheel v is in this case mounted loosely on its arbor v' and is connected therewith through a spring v^2. This spring is provided in order that the motor may at starting make several free revolutions without actuating the escapement, thereby enabling the momentum of the motor to be utilized for starting the movement of the pendulum.

It is obvious that in the place of the alternating-current motor above mentioned I may employ any suitable form of continuous motor for driving the clock.

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

The combination with a clock including escapement mechanism and pendulum, of an arbor, electrical means for continuously rotating the same and a spring interposed between said arbor and escapement mechanism whereby said arbor will rotate the escapement-wheel after the spring is tightened, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

GEORGE HOOKHAM.

Witnesses:

BEATRICE GAYLE,

DORA HOOKHAM.