(No Model.) 3 Sheets—Sheet 1.

W. WHITEHEAD.

ELECTRIC CLOCK.

No. 604,508. Patented May 24, 1898.

Fig. 1.

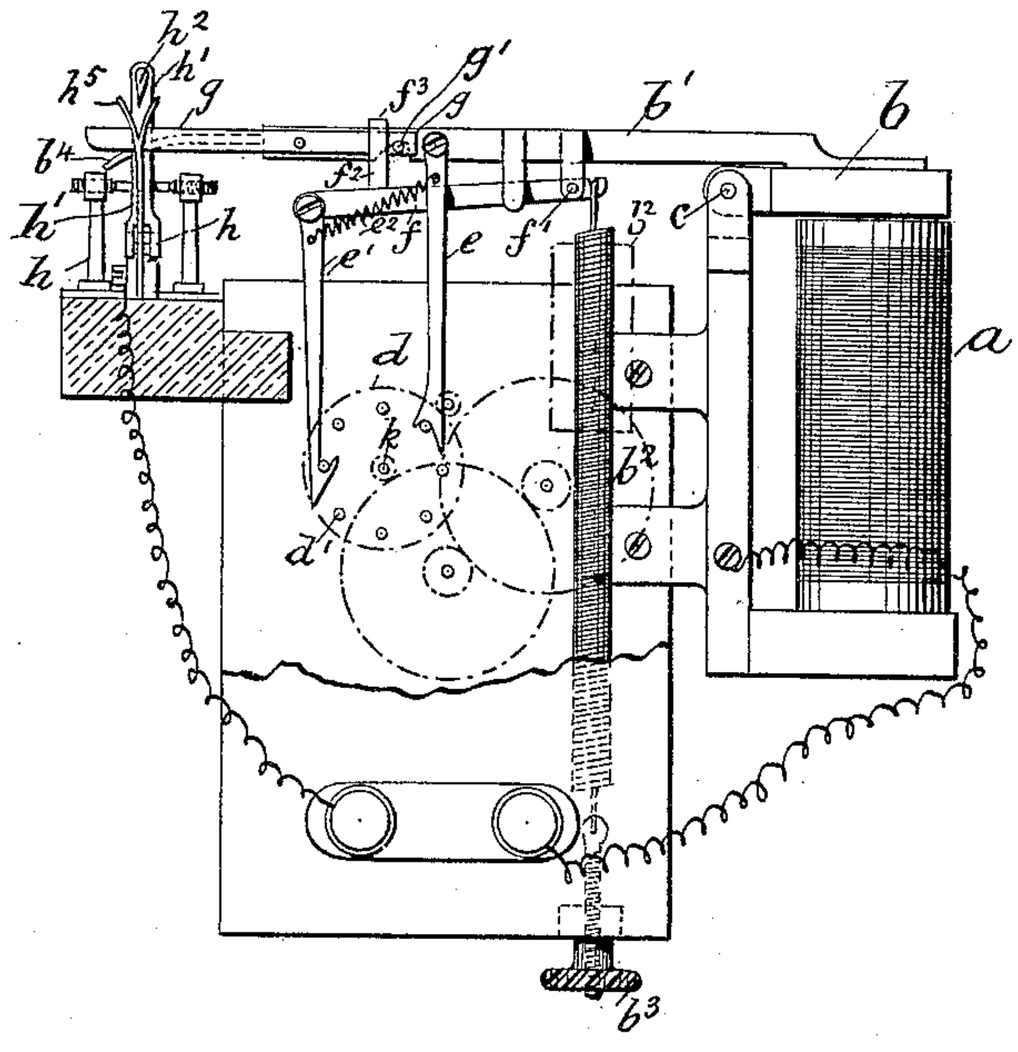


Fig. 2.

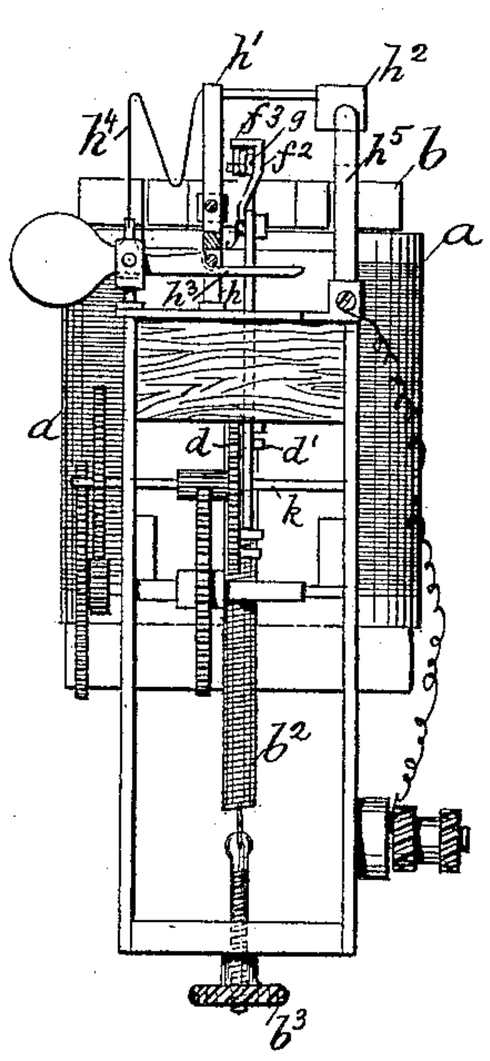


Fig. 3.

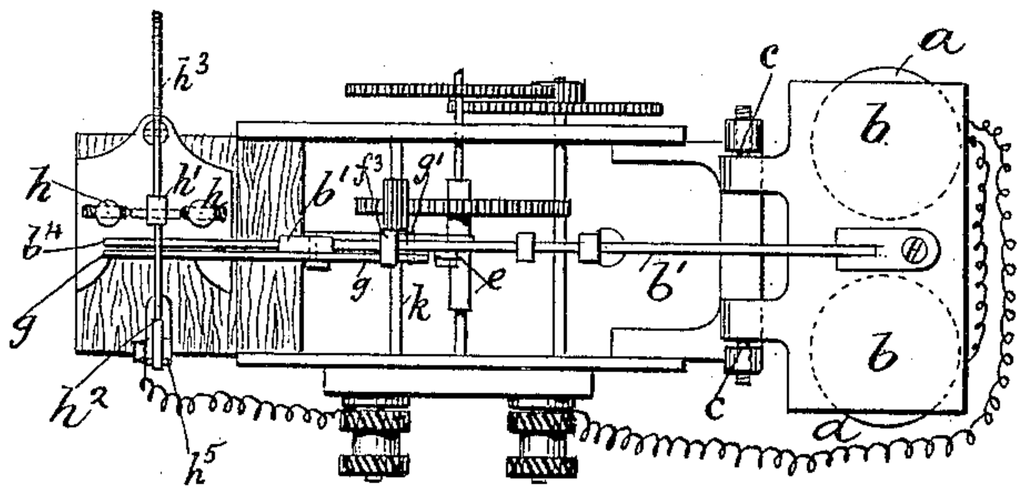
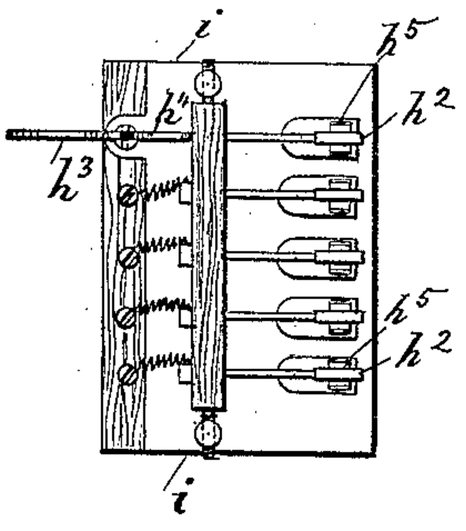


Fig. 4.



Witnesses:
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Otto Munk

Inventor:
William Whitehead
By Pennington & R
his Attorneys.

(No Model.)

3 Sheets—Sheet 2.

W. WHITEHEAD.

ELECTRIC CLOCK.

No. 604,508. Patented May 24, 1898.

Fig. 1×.

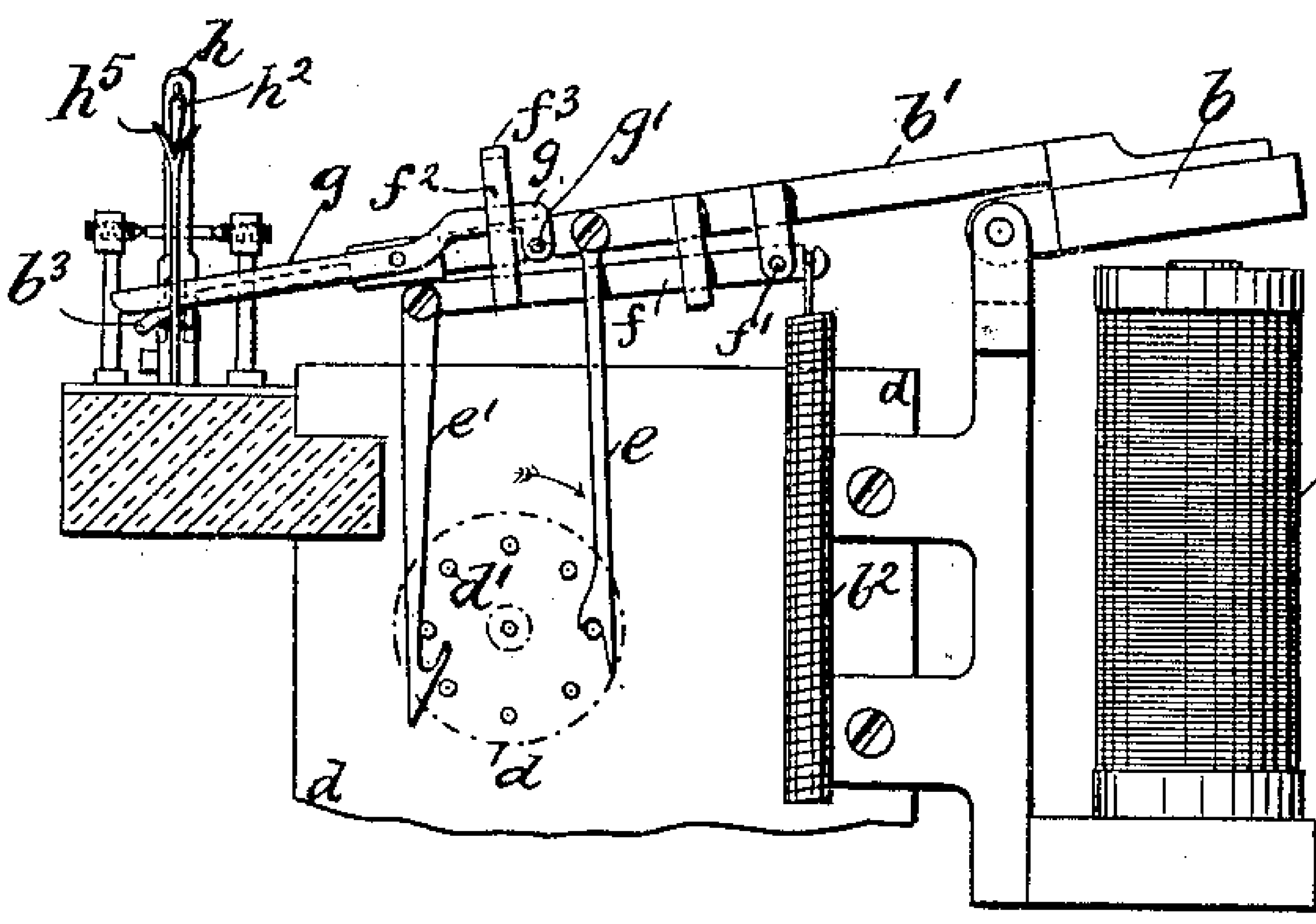
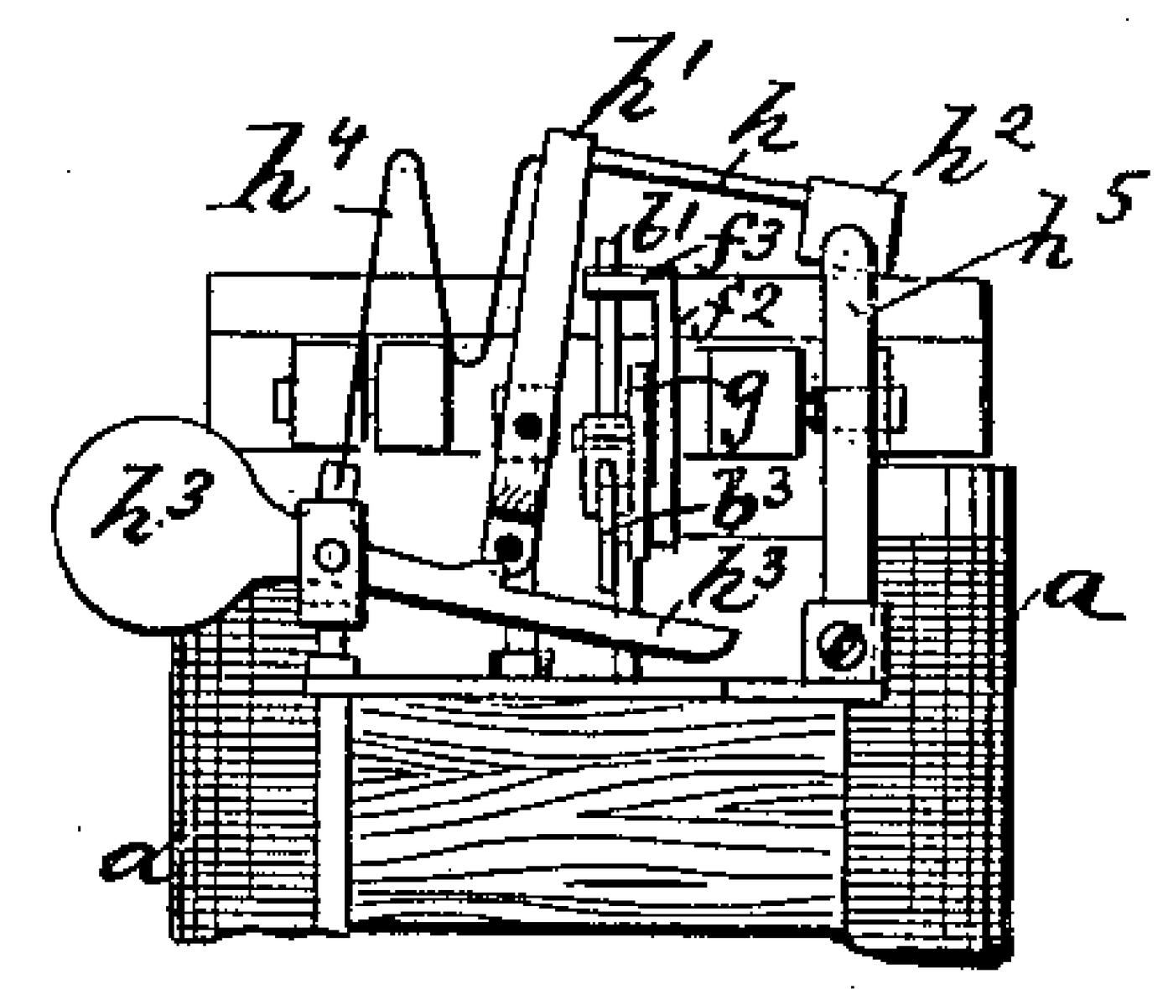


Fig. 2×.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

W. WHITEHEAD.

ELECTRIC CLOCK.

No. 604,508. Patented May 24, 1898.

Fig. 5.

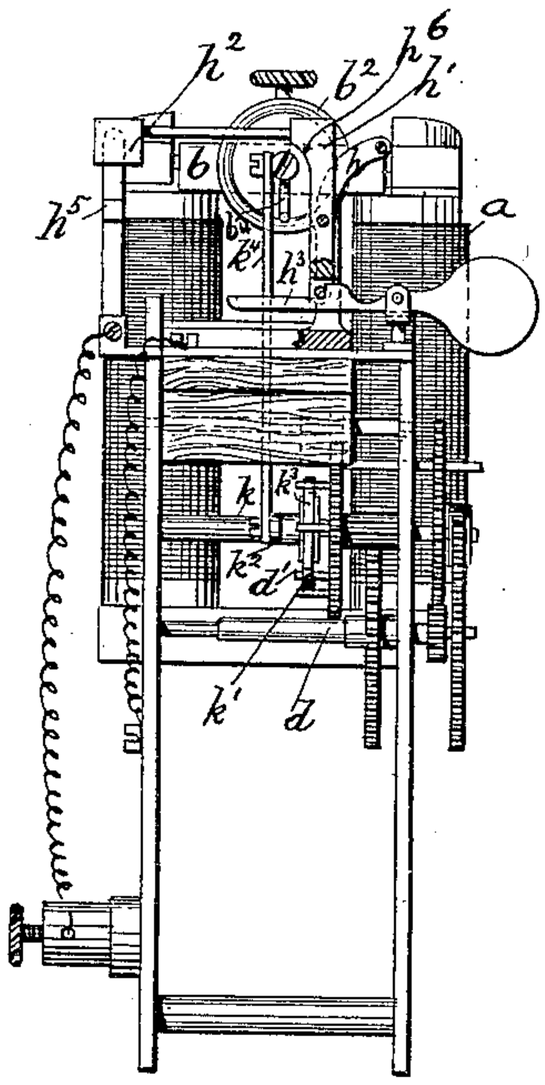


Fig. 6.

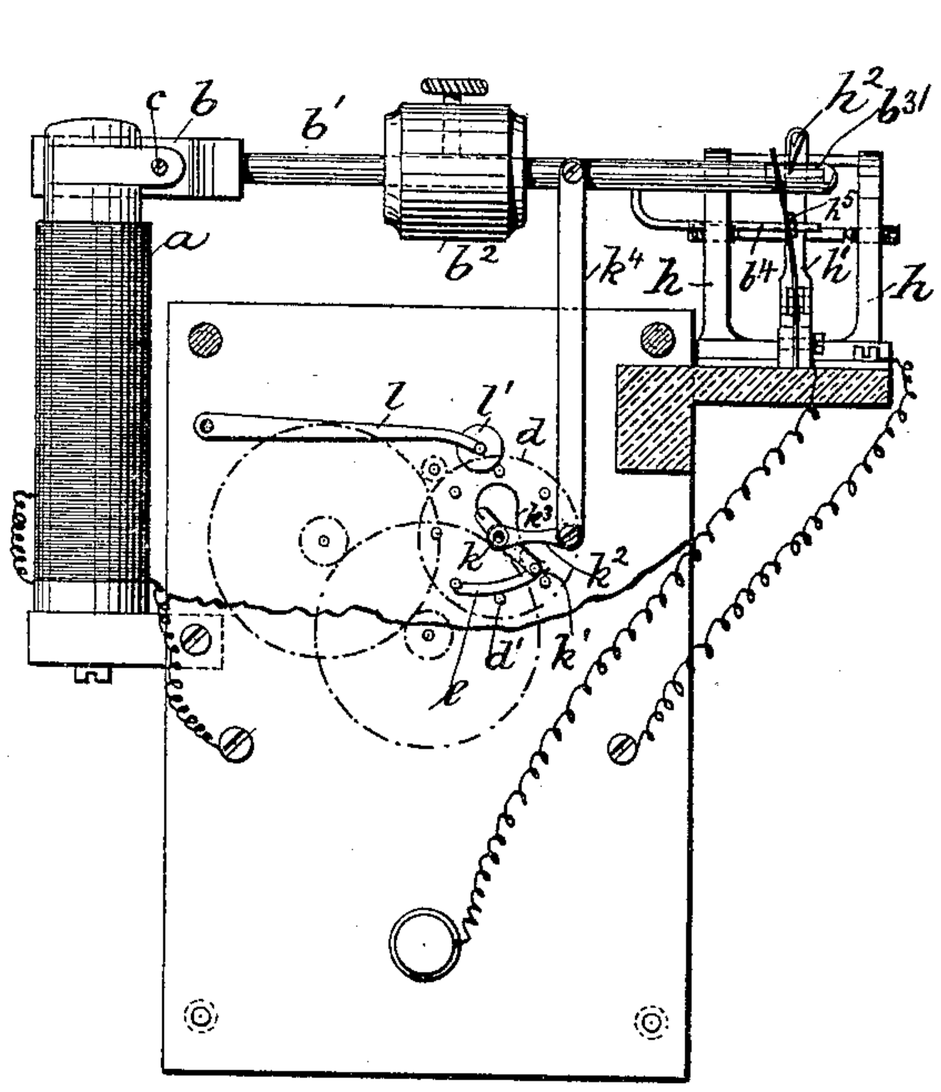
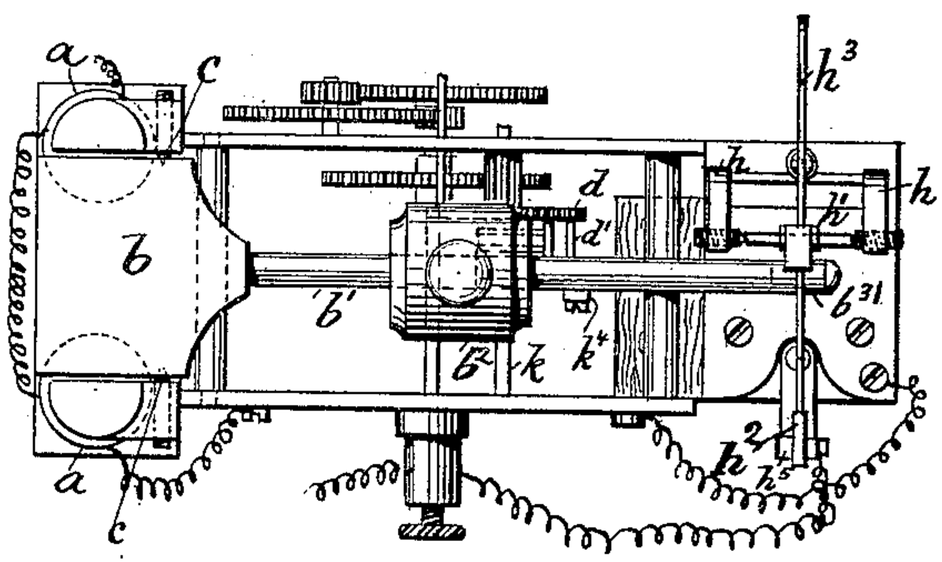


Fig. 7.



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Otto Munn

Inventor:
William Whitehead
By Pennington & R
his Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM WHITEHEAD, OF MANCHESTER, ENGLAND.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 604,508, dated May 24, 1898.

Application filed June 7, 1897. Serial No. 639,734. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WHITEHEAD, a subject of the Queen of Great Britain, residing at Manchester, in the county of Lancaster, England, have invented new and useful Improvements in and Connected with Electric Clocks, of which the following is a specification.

This invention relates to improvements in and connected with electric clocks, and has for its object to provide means whereby an electric current can be sent through a clock to perform work in the same or in an apparatus connected therewith in such a manner that the electric current is allowed to flow only during the time actual work is performed, thus saving the current of the electric source. I attain this object by the mechanism illustrated in the accompanying three sheets of drawings, in which—

Figure 1, Sheet I, is a side view, Fig. 2 an end view, and Fig. 3 a plan, of my improvements in electrical clocks. Fig. 4 is a plan, and Figs. 5, 6, and 7, Sheet II, are respectively an end view, sectional side view, and plan, of some modifications thereof. Figs. $1^{\times}$ and $2^{\times}$, Sheet III, are respectively a side view and an end view identical with Figs. 1 and 2, Sheet I, but showing the moving parts in a different position.

Similar letters refer to similar parts throughout the several views.

In carrying out my invention and referring to Figs. 1, 2, and 3, Sheet I, I employ in the clock, as usual, an electromagnet and its armatures *a* and *b*, respectively. The armature *b* has an arm *b'* and is mounted between centers *c c'*, placed under the influence of a weight or spring—in the present instance under that of a spring b^2—and adapted to operate in conjunction with a hatchet-switch, hereinafter more fully described.

In my improved electric clock the drum, spring, and wheel in gear with the drum ordinarily employed are dispensed with and one of the wheels—in the present instance the next or third wheel *d*—furnished with a number of teeth or pins *d*, which in the present instance each represent a minute.

In connection with the tooth or pin wheel *d* two pawls *e* and *e'* are employed, hereinafter called the "thrust-pawl" and "pull-pawl," respectively. Through the movement of the armature-lever and pawls the wheel *d* is moved step by step, the armature-lever *b'* being drawn down by the spring or weight b^2.

The thrust-pawl *e* is directly pivoted to the armature-arm *b* and the pull-pawl *e'* indirectly—*i. e.*, to the longer arm of a rocking lever *f*, fulcrumed at *f'*—to the armature-arm *b'*. The pawls *e* and *e'* are tied together by a coiled spring e^2, (or each separately placed under the influence of a spring,) which serves to retain the said pawls always in contact with the teeth or pins *d'* of the wheel *d*. The long arm of the rocking lever *f* is formed with a projection f^2, having at its upper end a lip f^3, and the short arm is placed under the influence of a spring b^2 (see full lines, Fig. 1) or under that of a weight (see dotted lines) the tension of which can be altered by means of a nut b^3 and which spring or weight furnishes the power to work the clock. To the free end of the armature-arm *b'* I pivot another lever *g*, which at its inner end has a pin *g'* bearing against the under side of and causing it to remain parallel with the arm *b'* until the lip f^3 contacts with the inner end of the lever *g*. The position of the pawls *e* and *e'* as shown in Fig. 1 is that just after the armature *b* is attracted by the magnet *a*. Immediately after the pull-pawl *e* has taken up its position under its tooth or pin *d'* the armature *b* is attracted, its arm *b'* lifts the thrust-pawl *e* to the next following tooth or pin *d'*, and the pull-pawl *e'* on the rocking lever *f* engages the adjacent wheel tooth or pin *d'*. The pull-pawl *e'* is then in position for its maximum amount of pull; but as the tooth or pin wheel *d* rotates it alters its position while the thrust-pawl *e* is descending, and finally arrives in position for its maximum amount of thrust, (see Figs. $1^{\times}$ and $2^{\times}$, Sheet III,) which occurs when the pull-pawl *e* leaves its tooth or pin *d'* owing to the long arm of the lever *f* contacting with the armature-arm *b*, thus equalizing the work of the two pawls *e e'* and insuring uniform working of the clock. When the armature *b* has been attracted by the magnet *a*, the armature-arm *b'* has risen to near its highest position, and the inner end of the lever *g* contacts with the lip f^3 on the

rocking lever *f*, which causes the outer end of the lever *g* to fly up and operate the switch and thus break contact.

The switch which I use consists of a frame *h*, in which is pivoted between centers a lever *h'*, carrying at its upper end a contact h^2 and retained out of contact with the contact-piece h^5 by a back pawl h^3, which engages its lower end. The back pawl is furnished with a spring h^4, which serves to throw off the contact h^2 at the right moment when required to make contact with the contact-piece h^5 and also to assist in raising the free end of the back pawl h^3 to its former position. The free end of the armature-lever *b'* has an extension b^3, which when the armature-arm *b'* arrives at its lowest position (see Figs. $1^\times$ and $2^\times$) contacts with and depresses the back pawl h^3, thus releasing the lever *h'* and allowing its contact h^2 to drop into contact with the piece h^5.

The clock-circuit may be closed either through its own magnet or through any other apparatus—say a time-stamp, checking apparatus, or primary or secondary clock. When used as a single clock, the said switch closes through the magnet in the clock only.

Referring to Fig. 4, when working a series of time-stamps or other apparatus through one switch I duplicate the number of contacts h^2 in the switch and their contacts h^5 on an insulated base *i*, as will be readily understood.

Referring to Sheet II, a modification of my invention consists in operating the tooth or pin wheel *d* by one pawl only instead of by two, as described, in the following manner: Upon the arbor *k* of the tooth or pin wheel *d* is mounted a small rocking lever having two arms *k'* and k^2, the arm *k'* carrying the pawl *e* under the influence of a light spring k^3, which latter serves to keep the said pawl always in contact with the teeth or pins *d'*. To the armature-arm *b'* is pivoted a rod k^4, the lower end of which is jointed to the rocking-lever arm k^2 and adapted to impart motion to the pawl *e*, while the weight b^2 (or spring) on the armature-arm *b'* furnishes the power to work the clock. In connection with the tooth or pin wheel *d* is employed a lever *l*, carrying a roller *l'*, in diameter larger than the distance of two teeth or pins *d'* and adapted to form a back pawl which assists the armature-arm *b'* in pushing off its switch, the lever *h'* of which in this case is formed with a cam-face h^6, and the lever pivoted to the free end of the armature-arm *b'* is replaced by an antifriction-bowl b^4, which when the armature-arm *b'*, Sheet I, has fully descended (or a wire b^3 attached thereto) contacts with the gravity-pawl h^3, depresses it, and releases the contact h^2, which owing to its weight falls into contact with the insulated contact-piece h^5, thus closing the circuit, energizing the electromagnet aforesaid, which instantly breaks the circuit and sets the said contact-switch by the action of the bowl b^4 to its normal position.

In lieu of employing the teeth or pins *d'* on the clock-wheel a disk carrying the same may be fixed upon the respective arbor.

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

1. In an electric clock, the combination of an armature-arm *b'* under the influence of a spring b^2 with a switch consisting of a lever *h'* having at its upper end a contact h^2 adapted to make and break contact with an insulated contact-piece h^5 and its lower end being alternately engaged and released by a pawl h^3, all substantially as and for the purpose set forth.

2. In an electric clock, the combination with a pin-wheel *d*, *d'*, and the armature-arm *b'* of a rocking lever *f* pivoted to the armature-arm *b'* and placed under the influence of a spring b^2 and two pawls *e*, *e'*, the "thrust-pawl" *e* of which is pivoted to the armature-arm *b'* and the "pull-pawl" *e'* to the rocking lever *f*, which pawls are adapted to engage the pins *d'* and rotate the respective wheel *d'*, all substantially as and for the purpose set forth.

3. In an electric clock, the combination with the armature-arm *b'* of a two-armed lever *g* pivoted to the free end of the said arm, the inner end of which lever is controlled by a lip f^3 on the rocking lever *f* and the outer end adapted to operate a switch, all substantially as and for the purpose set forth.

In testimony whereof I have affixed my signature in the presence of two witnesses.

WILLIAM WHITEHEAD.

Witnesses:

ALFRED BOSSHARDT,

STANLEY V. BRAMALL.