

No. 882,186.

PATENTED MAR. 17, 1908

G. B. BOWELL.

SECONDARY ELECTRIC CLOCK.

APPLICATION FILED DEC. 14, 1905.

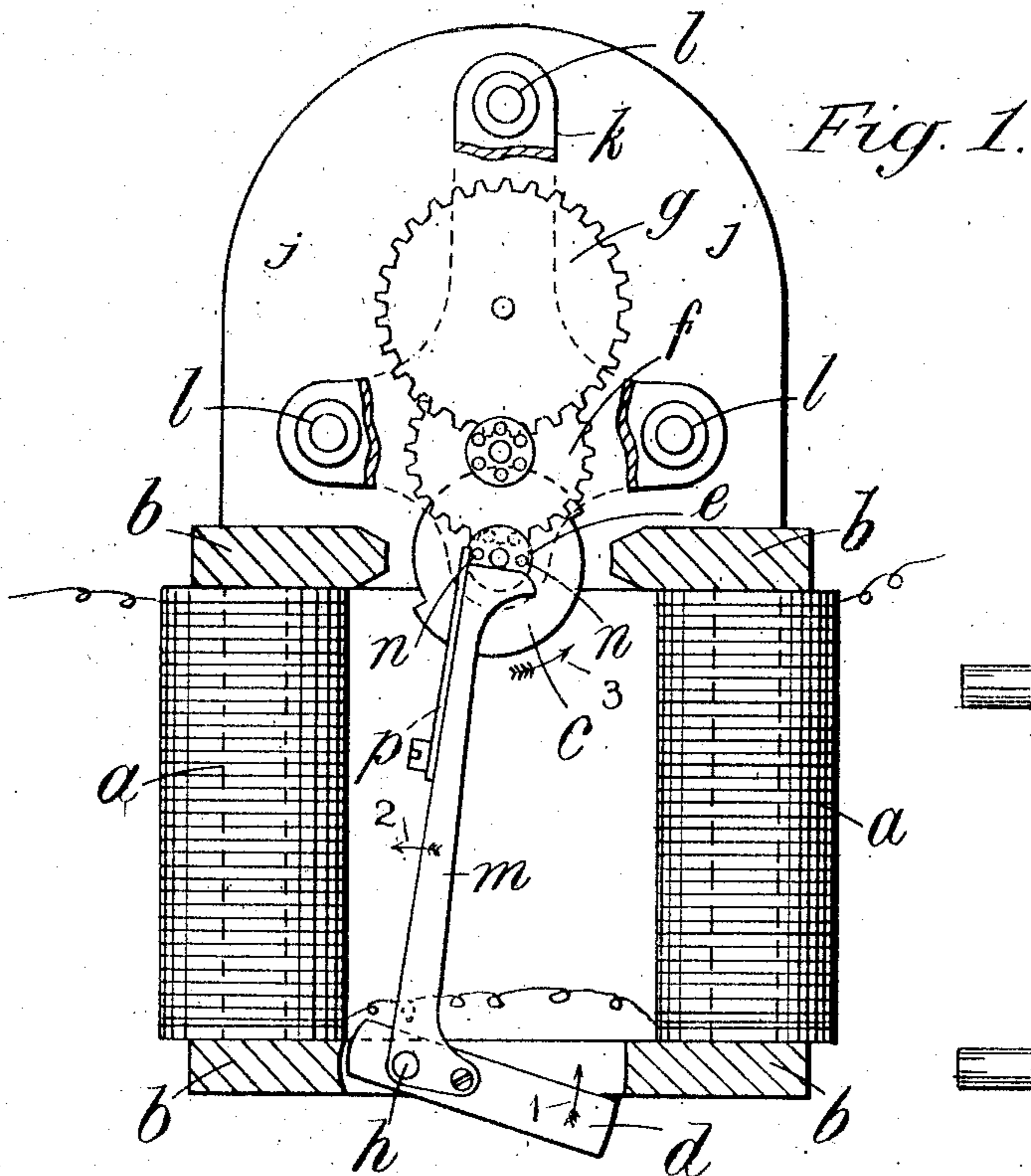


Fig. 3.

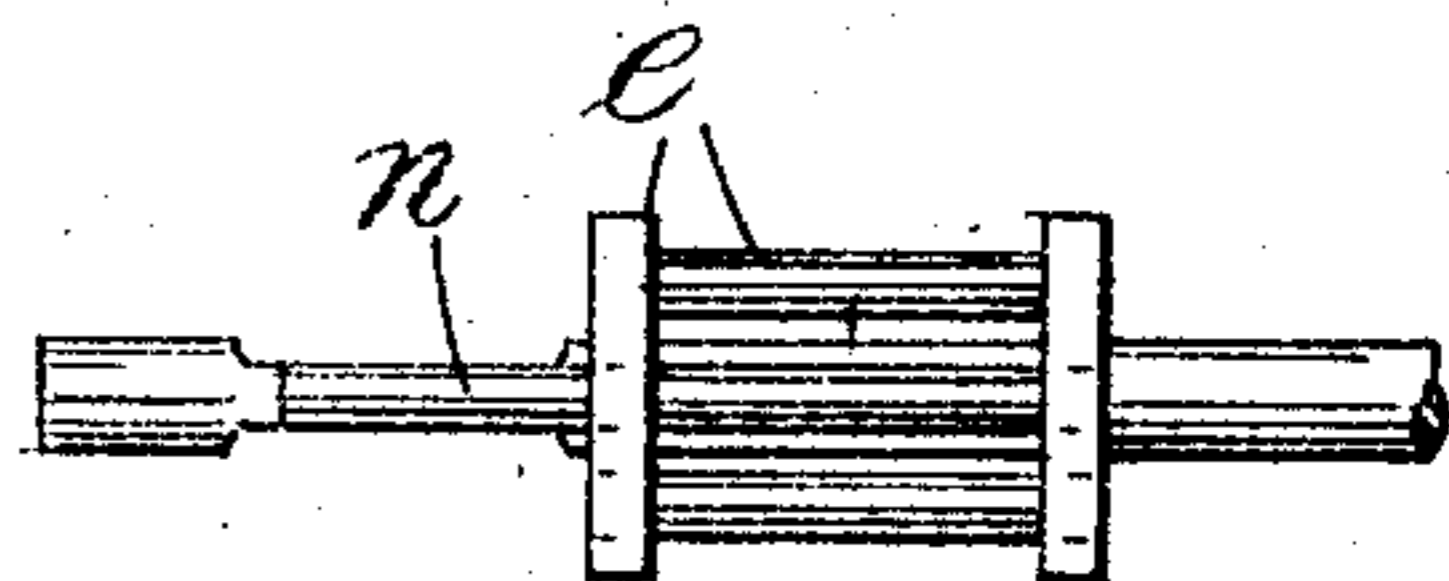


Fig. 4.

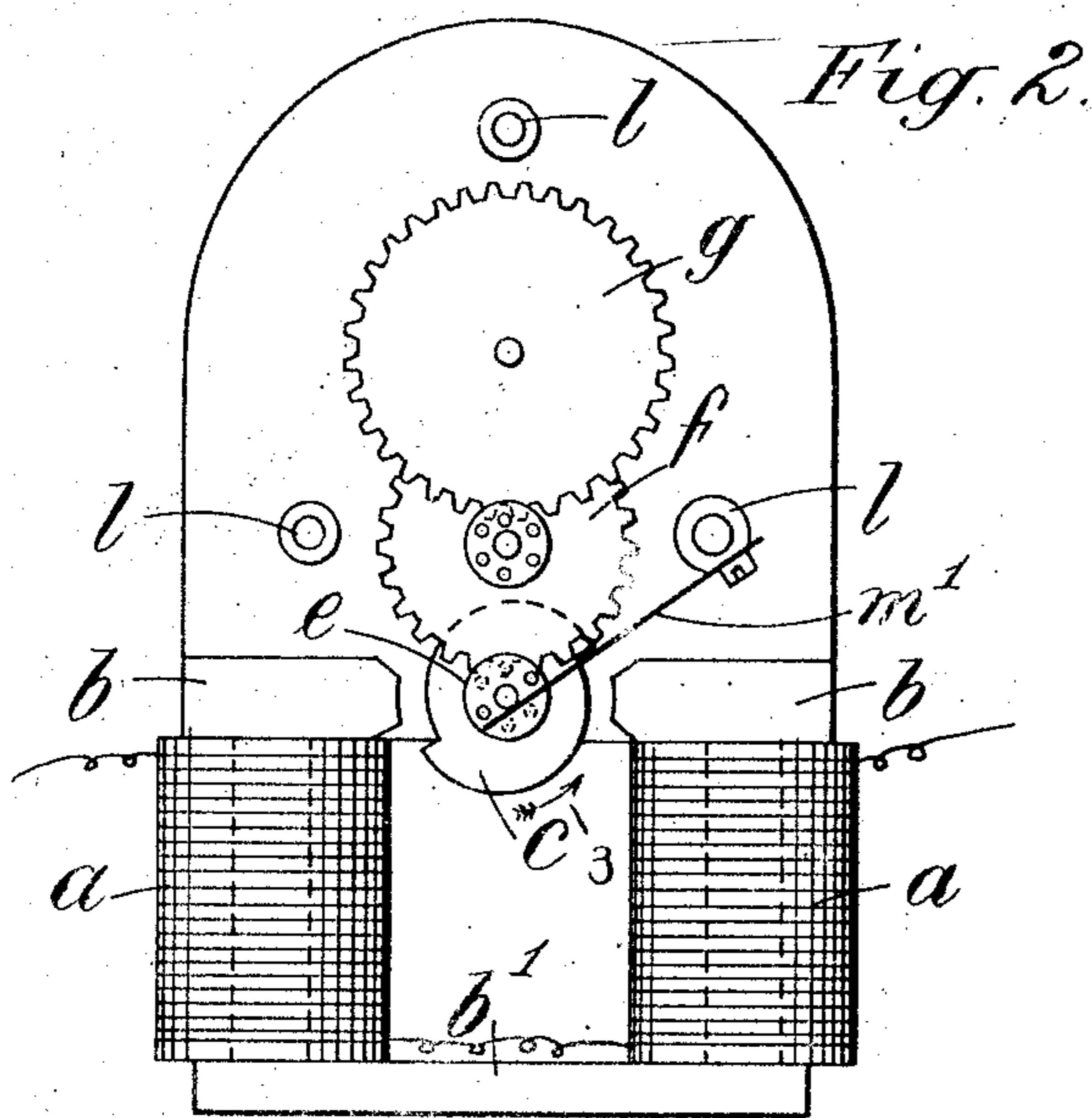
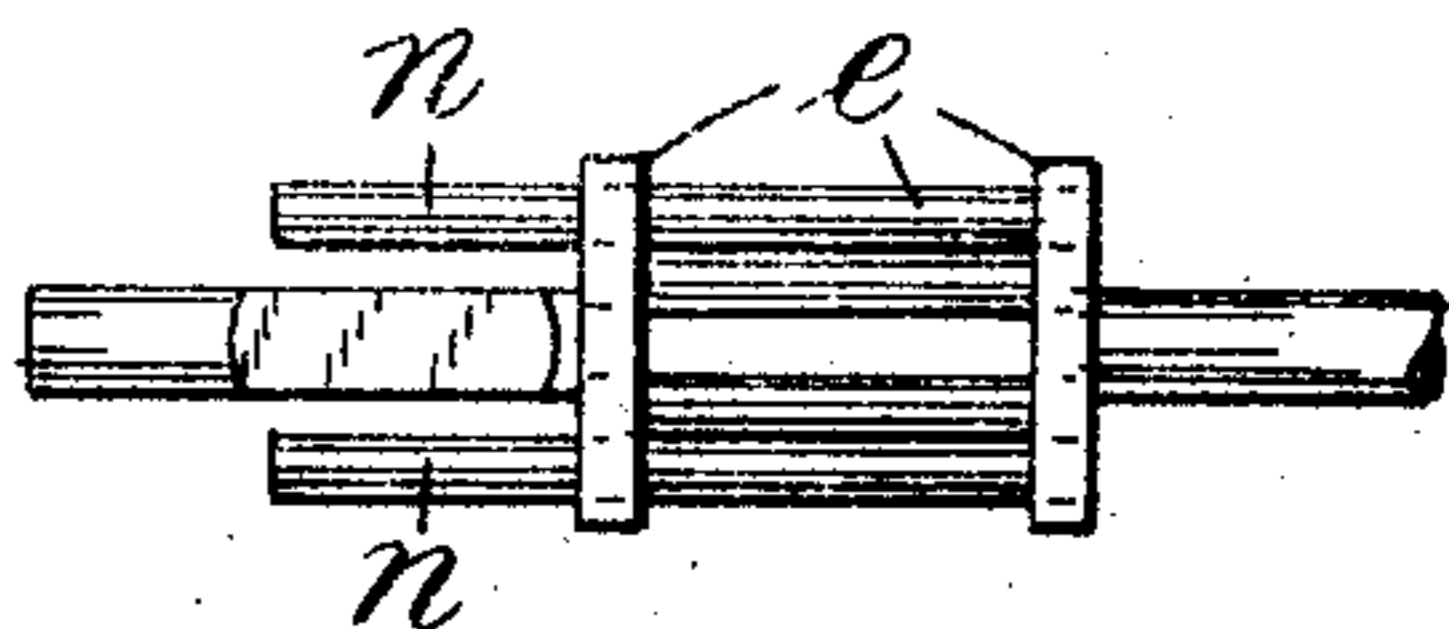
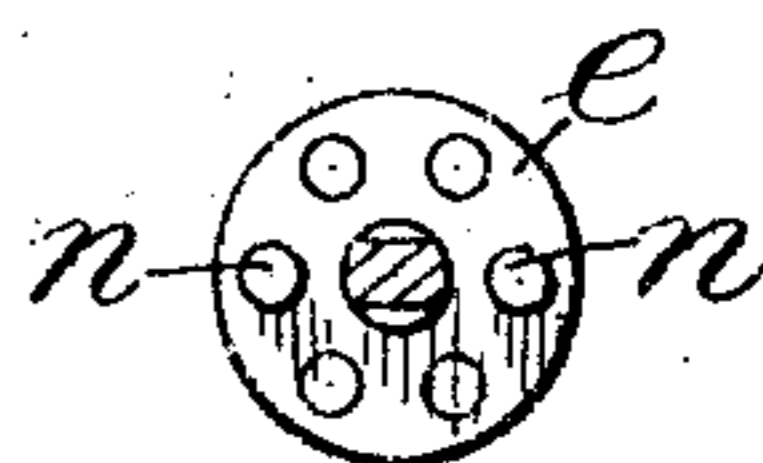


Fig. 5.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

GEORGE BENNETT BOWELL, OF WESTMINSTER, LONDON, ENGLAND.

## SECONDARY ELECTRIC CLOCK.

No. 882,186.

Specification of Letters Patent.

Patented March 17, 1908.

Application filed December 14, 1905. Serial No. 291,776.

*To all whom it may concern:*

Be it known that I, GEORGE BENNETT BOWELL, a subject of the King of Great Britain and Ireland, residing at 5 Palmer street, in the city of Westminster, county of London, England, have invented certain new and useful Improvements in Secondary Electric Clocks and the Like; 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.

Whereas considerable difficulty has hitherto been met with in the matter of electro-magnetically operated secondary electric clocks or such like step-by-step movements owing to the jerky action of the electro-magnets and of the faulty performance of pawls and ratchet-work acting upon ratchet-wheels. Also such contrivances even when constructed to work with comparative success have at best been subject to an objectionable degree of noisiness.

This, my invention, relates to a new and improved electro-magnetic step-by-step action especially suited for use as an indicator dial movement in an electric clock system; its action is rendered silent owing to the total absence of pawls or click-work and owing to the comparatively slow action of the electro-magnet—this slowness also being advantageous in that it results in greater efficiency of the system by increasing the time and diminishing the rate of performing the work. Moreover in my new and improved action it is possible to provide an ample margin of power to turn the hands without resulting in undue wear of the parts or of the objectionable noise of operation.

For the sake of clearness but without wishing to bind myself to detail to the exclusion of modifications which would result in substantially the same arrangement I will describe my present invention in one form: I provide an armature which is of a double cam shape formed approximately by two symmetrical eccentric portions of circumference and having two smaller parts of the circumference cut away. This armature is pivotally mounted in the field of an electro-magnet in such a manner that upon excitation of the magnet the armature is turned through about three-eighths of a revolution. The armature arbor is provided with two pins parallel to the axis and symmetrically dis-

posed therefrom; and the arbor itself is cut away adjacent to these pins. A wheel connected in the usual manner to the minute hand and having sixty or other suitable number of teeth is so placed as to allow these pins in turn to drive the wheel; the "depth" of this combination being such that the wheel is always engaged by one if not both of the pins, and the armature is secured to its arbor in such a manner as to leave the two pins engaging the wheel in the normal condition. In this way the wheel is locked so that no tendency of the wheel to rotate can then be transmitted to turn the armature.

Another electro-magnet is also provided for the purpose of raising a spring or lever or equivalent device away from the two pins so as to leave the armature perfectly free to be rotated by its field magnet. This spring or lever, upon its controlling magnet (which I will call for the purpose of distinction the "locking magnet") ceasing to be magnetized, is adapted to carry forward the armature arbor about one-eighth of a turn and there hold it in readiness for the next periodic operating signal. It will thus be seen that when the magnet is energized, the armature is released and the time gears are operated thereby until the current is broken when the weight or spring continues to operate said gears in the same direction until the magnet is again energized.

In a modified form I may omit the "locking magnet" and provide that the spring or lever above described may be operated by some part of the field magnet being made movable in such manner that upon excitation both functions are effected by the one so modified magnet, or the same magnet may have an extra armature across its pole pieces duly proportioned so as not to unduly handicap the magnetization and attraction of the driving armature, or I may merely employ a spring acting upon a suitably shaped cam on the armature arbor so that during the three-eighth forward movement of the armature the spring is raised and can thus, upon cessation of the signal, drive the armature forward.

In the accompanying illustrations, Figure 1 shows the complete mechanism, and Fig. 2 shows an alternative method of constructing a part. Figs. 3, 4 and 5 represent enlarged detail views of the pinion and pins showing the arbor cut away.

In Fig. 1 the electro-magnet comprises a pair of bobbins *a a* whose interior iron cores are continued in the pole pieces *b b b b* which embrace the armature *c*, also the armature *d*.  
 5 The armature *c* is mounted upon an arbor with pinion *e*, meshing with wheel *f* which in turn also gears with the center wheel *g*. These parts are pivoted between the plate *j j* and the plate *k*, pillars *l l l* being provided  
 10 to support the plate *k*. The armature *d*, which is pivoted at *h*, has attached to it the lever *m*, whose upper end is shaped as shown to engage with the two pins *n n* which project from the pinion; *p* is a "banking" spring,  
 15 which is fixed on the lever *m*.

The action of the apparatus is as follows:—  
 Upon the electro-magnet being excited the armature *d* is drawn up, in the direction of the arrow 1 and the lever *m* consequently  
 20 moves to the left in the direction of the arrow 2 away from the pins *n n* on armature *c*. Armature *c*, as soon as it is thus unlocked, rotates in the direction of the arrow 3 (in Fig. 1) on account of its shape until it has moved  
 25 through nearly half a revolution and presents its maximum diameter to the magnetic circuit. Upon cessation of the magnetizing current the armature *d* falls by its own weight and lever *m* in returning to its normal  
 30 position as shown in Fig. 1 and engages the pins *n, n* again, and prevents further movement in either direction.

Referring to Fig. 2, which shows a modified form for carrying out my invention, the  
 35 electro-magnet comprises a pair of bobbins *a a*, whose interior iron cores are continued in the pole pieces *b b* at their top ends and are connected by the iron yoke *b'* at their lower ends. The pole pieces *b b* embrace the arma-  
 40 ture *c* which is mounted upon an arbor with pinion *e* meshing with wheel *f* which in turn also gears with the center-wheel *g*. These parts are pivoted between plates spaced by the pillars *l l l*. The pinion *e* has two of its  
 45 opposite leaves or pins provided longer than the others and a spring *m'* is fixed as shown in such a manner as to always bring armature *c* into the position shown after it has been re-  
 50 leased by the breaking of the electrical circuit at the master clock.

The action of the apparatus is as follows:—

Upon the electro-magnet being excited, armature *c* is rotated (in the direction of the arrow 3 in Fig. 2) on account of its shape until it has moved through nearly half a rev- 55 olution and presents its maximum diameter to the magnetic circuit. Upon cessation of the magnetizing current the resilient spring *m'* which had previously been deflected by the turning of armature *c*, in returning to its 60 normal position completes the exact half-revolution of armature *c*, and therefore holds the train of wheels in that position until the next periodic working current causes a repetition of this cycle of operations. 65

What I claim and desire to secure by Letters Patent is:—

1. In an electric clock, the combination of a rotary step-by-step operating device comprising an electro magnet, a double cam 70 shaped disk mounted to rotate in the field of the magnet and actuated by the magnet when energized, means for locking said disk against actuation, means for unlocking said locking means and adapted to bring said disk 75 into starting position.

2. In an electric clock, the combination of a rotary step-by-step operating device comprising an electro magnet, a double cam-shaped disk mounted to rotate in the field of 80 the magnet and actuated by the magnet when energized, a detent for locking said disk against actuation, and an armature for releasing said detent to bring said disk into starting position. 85

3. In an electric clock, the combination of a rotary step-by-step operating device comprising an electro magnet, a double cam-shaped disk mounted to rotate in the field of the magnet and actuated by the magnet 90 when energized, said disk having a pinion provided with projecting pins, means for engaging said pins to lock said pinion against actuation and means for releasing said locking means actuated when the magnet ceases 95 to be energized.

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

GEORGE BENNETT BOWELL.

Witnesses:

F. L. RAND,

H. D. JAMESON.