(No Model.) 3 Sheets—Sheet 1.

W. W. BRADLEY & W. N. PACKER.

ELECTRIC HAND SETTING MECHANISM FOR CLOCKS.

No. 444,482. Patented Jan. 13, 1891.

FIG. 1.

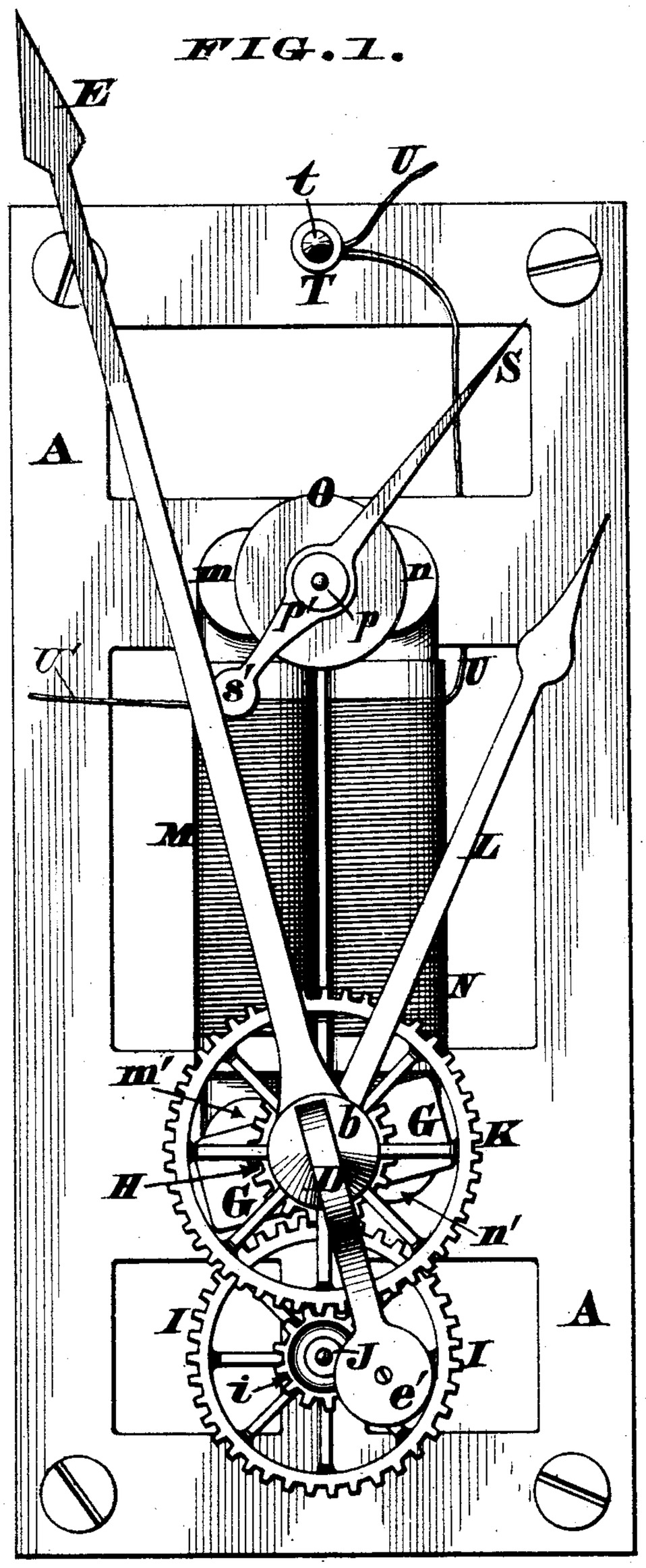

FIG. 2.

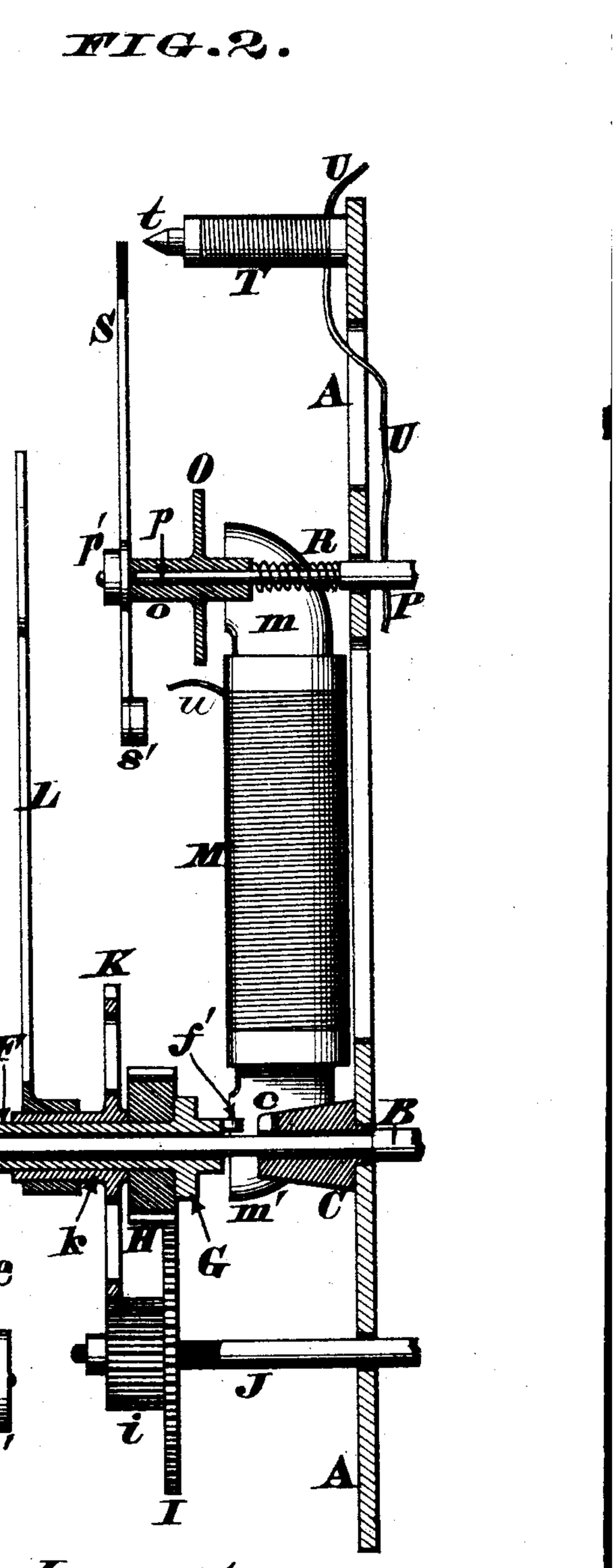

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FIG. 3.

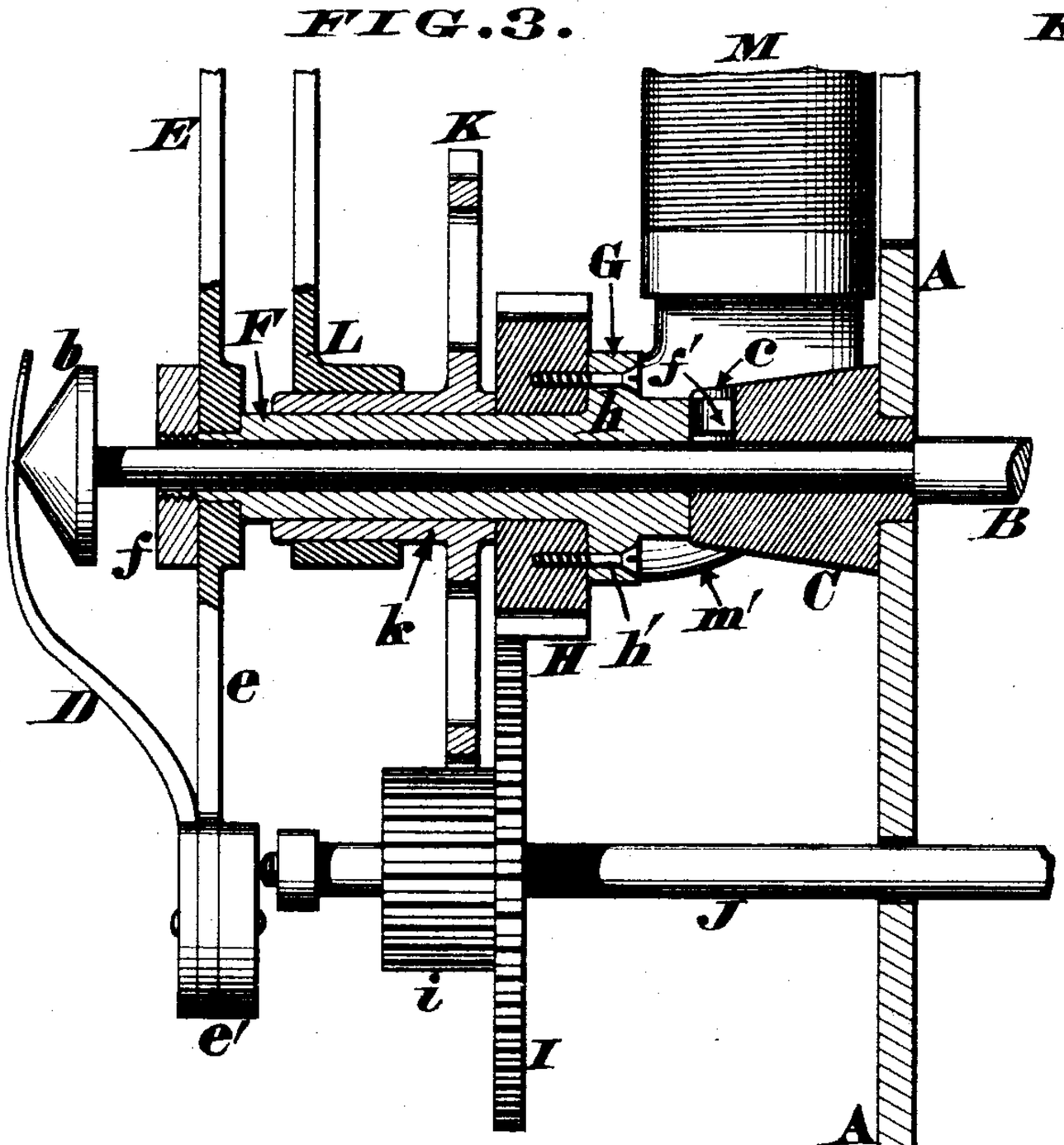

FIG. 6.

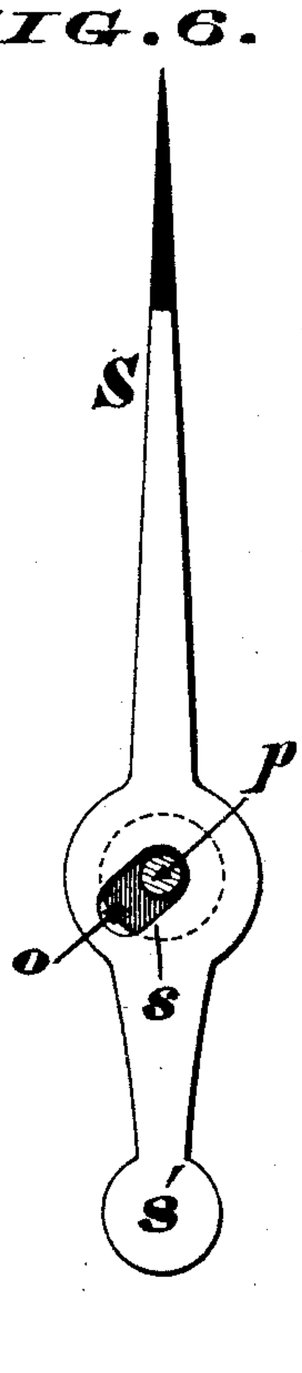

FIG. 4.

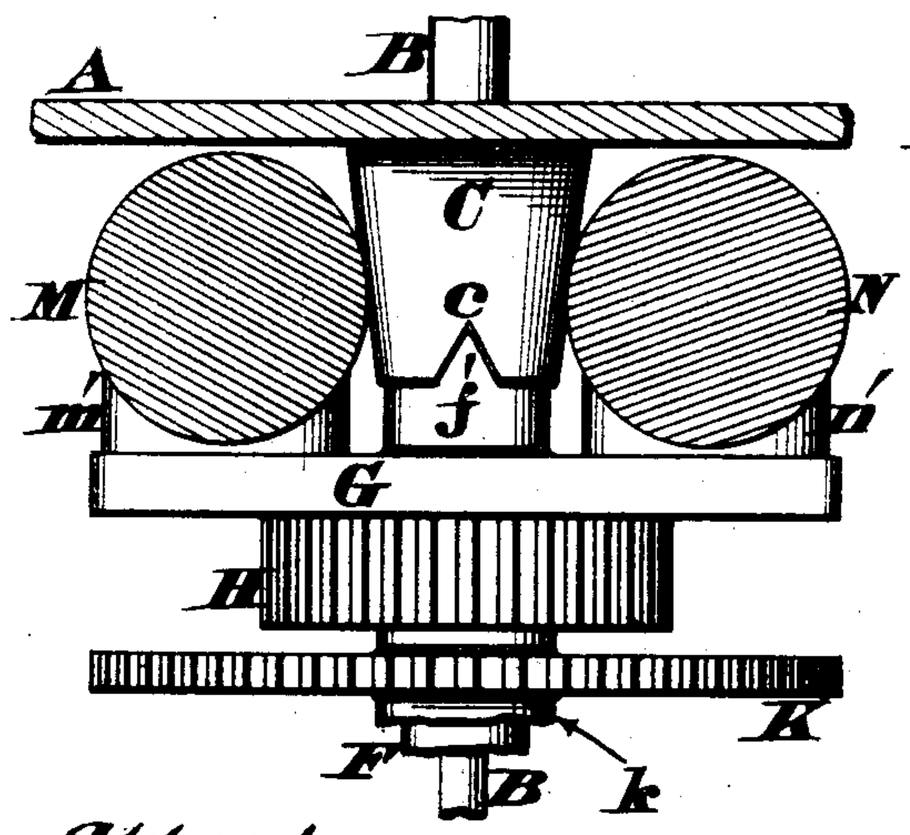

FIG. 5.

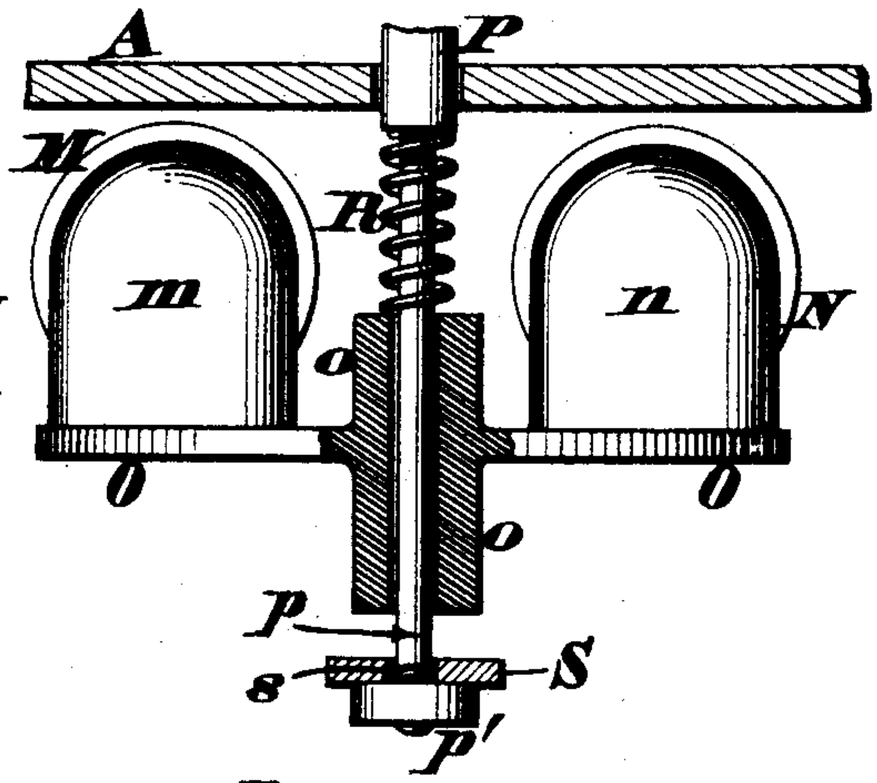

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FIG. 7.

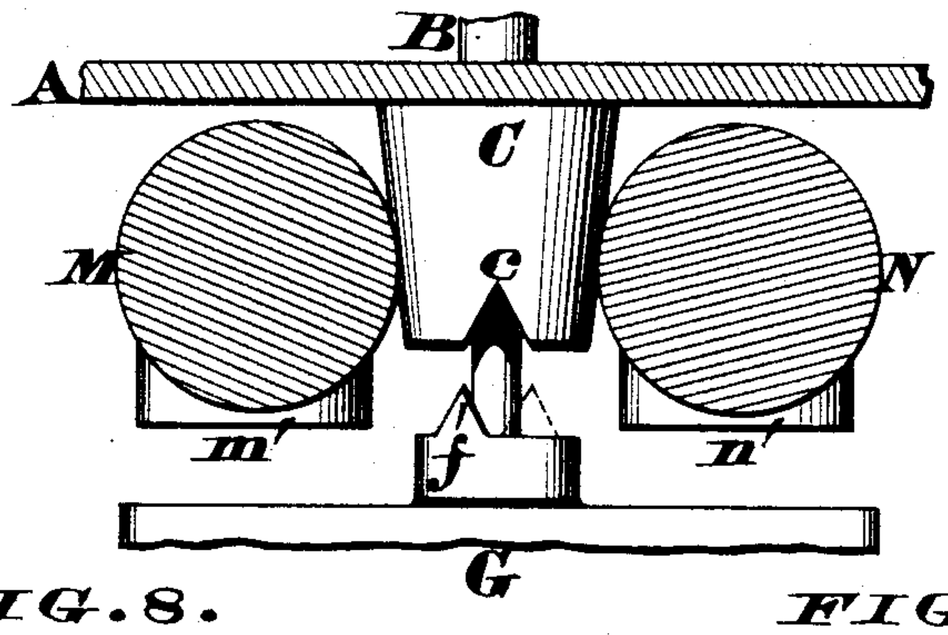
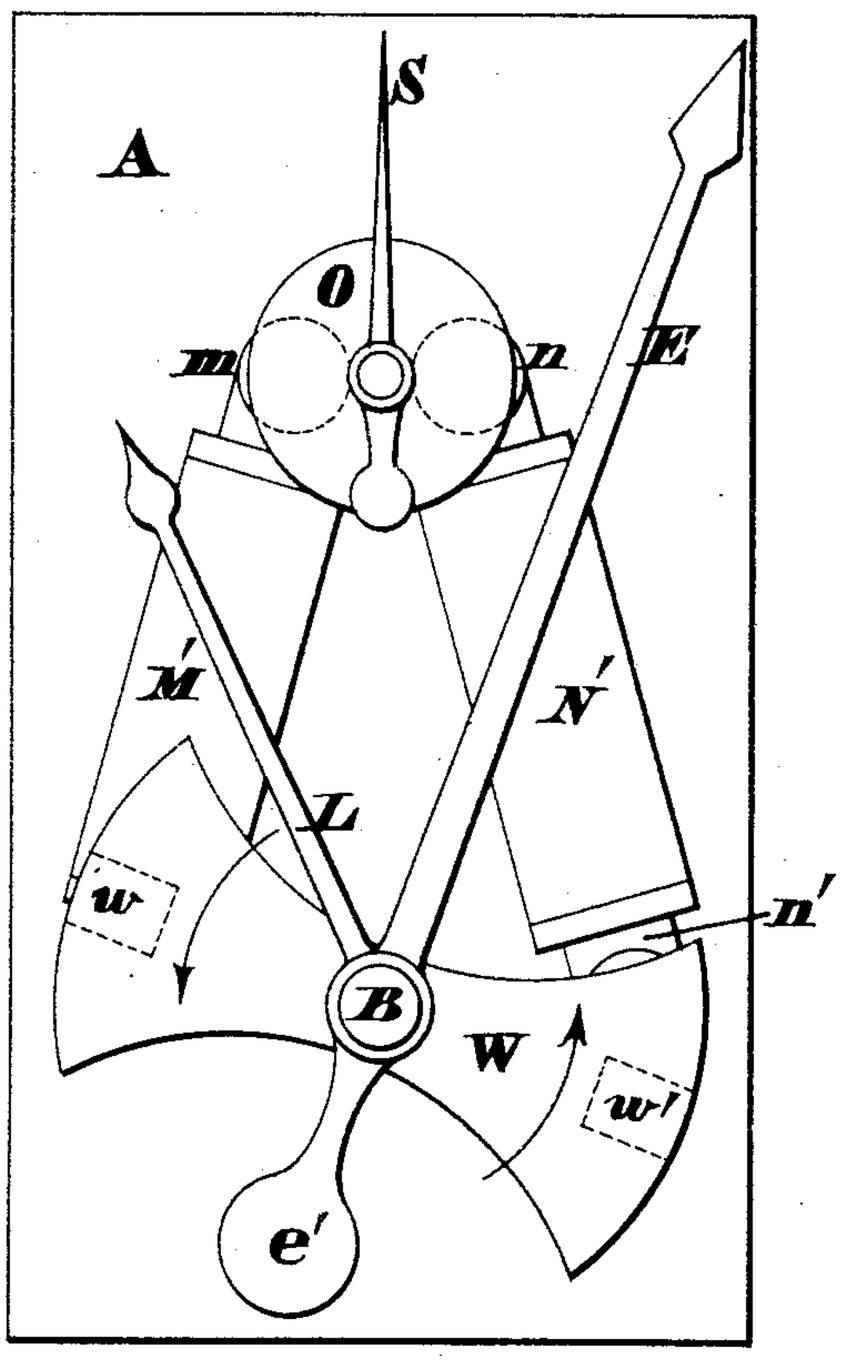


FIG. 8.

FIG. 9.



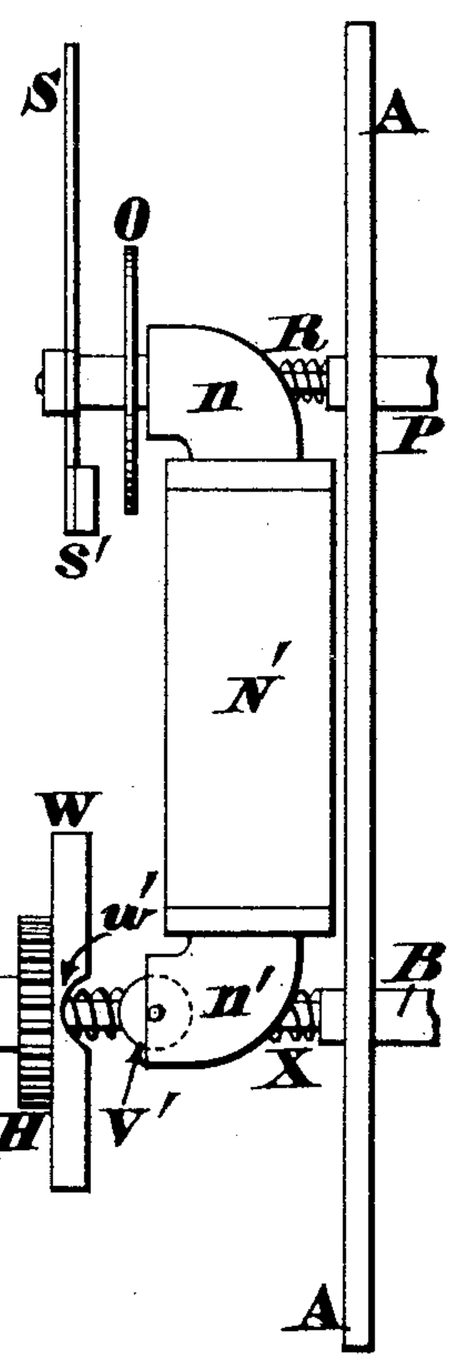
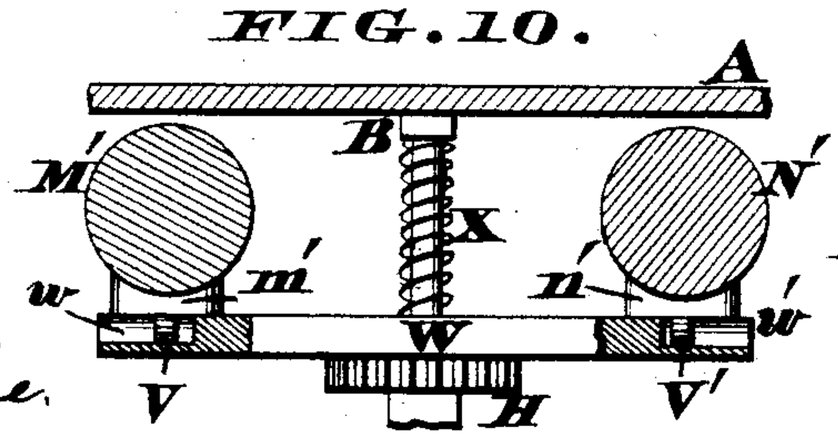


FIG. 10.



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UNITED STATES PATENT OFFICE.

WILLIAM W. BRADLEY AND WILLARD N. PACKER, OF CANTON, OHIO.

ELECTRIC HAND-SETTING MECHANISM FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 444,482, dated January 13, 1891.

Application filed March 28, 1890. Serial No. 345,690. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM W. BRADLEY and WILLARD N. PACKER, both citizens of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Clocks; and we do 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 the letters of reference marked thereon, which form a part of this specification.

The object of our invention is to provide a clock that can be synchronized or set by a central or standard clock, which act is accomplished by a current of electricity that is turned on at certain regular intervals of time, as hereinafter more fully described.

In the annexed drawings, Figure 1 is a front elevation of the essential parts of a clock embodying our improvement, the hour, minute, and seconds hands of the same being seen in different positions. Fig. 2 is a vertical section of the clock, said section being taken in the plane of the main spindle and the three hands being in a position to indicate twelve o'clock. Fig. 3 is a greatly-enlarged vertical section of the main spindle and its accessories, the hour and minute hands thereof being synchronized. Fig. 4 is a horizontal section showing the lower armature of the clock in contact with the poles of a pair of magnets, said section being taken directly above said armature. Fig. 5 is a horizontal section showing the upper armature in contact with the other poles of said magnets, said section being taken in the plane of the seconds-hand spindle. Fig. 6 is a front elevation of said seconds-hand. Fig. 7 is a plan showing the tooth of the magnet in position for engagement with the notch of the tubular bearing. Figs. 8, 9, and 10 show a modification of our invention.

A represents the front pillar-plate of any form of clock whose running and striking trains may be operated either by weights, springs, or otherwise, as these details constitute no part of our invention.

B is the main spindle of the clock, which spindle traverses a tubular bearing C, projecting horizontally from the pillar-plate A, and having at its front end a conical knob *b*, which is constantly pressed by the free end of a bent plate-spring D, the fixed end of the latter being attached to the shank *e* of minute-hand E, which shank carries a counterbalance *e'*, as more clearly seen in Fig. 3. *f* is a nut that retains this minute-hand on the outer extremity of a sleeve F, that is preferably integral with the lower armature G, although it may be attached thereto, if desired, the inner end of said sleeve being provided with a V-shaped tooth *f'*, adapted at the proper moment to enter a similar shaped notch *c* of the tubular bearing C. This notch may be located at any place that will correspond with the hour for synchronizing the clock; but in the present case it is shown on the upper side of said bearing, in order that the setting operation may take place at twelve o'clock.

H is the cannon-pinion, which may be secured either to the sleeve F or armature G; but in Fig. 3 said pinion is attached to said armature by screws *h h'*. This pinion drives a gear-wheel I, mounted upon a stud-shaft J, and said wheel I has a pinion *i*, that meshes with another wheel K. Wheel K turns upon the sleeve F and has an extended hub *k*, to which the hour-hand L is attached. These devices, however, are precisely the same as in all ordinary clock-movements, with the slight exception of the pinions H and *i* being somewhat longer than usual to permit them being properly shifted at the right time.

Secured to the front of pillar-plate A is a pair of vertical magnets M N, having, respectively, upper poles *m n* and lower poles *m' n'*, which lower poles are arranged to attract the armature G, while said upper poles are designed to attract another armature O, secured to or forming part of a sleeve *o*, adapted to travel along a reduced portion or shank *p* of the seconds-hand spindle P. Furthermore, it is preferred to make the lower armature G a plain bar, as seen in Figs. 1 and 4, and to make the upper armature O a simple disk; but the forms of these devices may be varied to suit circumstances.

R is a spring surrounding the shank *p* and

serving to press the front end of sleeve *o* against the rear side of seconds-hand S, the latter having an oblique slot *s*, through which said shank passes, as seen in Fig. 6. Seconds-hand S must be made of some non-magnetic material, so as not to be affected by the lower magnets M N; but its extreme point must be tipped with iron or steel, in order that said hand may be attracted solely by the magnet T. (See black point of said hand in Fig. 6.) This spring R should be stiff enough to produce sufficient friction, and thereby cause the hand S to turn in unison with the spindle P, while at the same time said spring must yield and allow the armature O to be retracted the instant the current of electricity is let on. Hand S has a counter-balance *s'*, and is prevented slipping off the shank *p* by a nut *p'*.

T is a small magnet projecting from pillar-plate A and having its pole or core *t* in line with the point of hand S when the latter is exactly vertical, as seen in Fig. 2.

U is a wire leading from the central station or standard clock to the upper magnet T, and after being wound around the core of the same is carried down and attached to either one of the magnets M or N. *u* in Fig. 2 is a wire connecting these magnets, and U' in Fig. 1 is the return-wire leading from them.

When our clock is in its normal or ordinary running position, as seen in Fig. 2, the spring R forces the sleeve *o* outwardly, thereby clamping the seconds-hand S between the end of said sleeve and nut *p'*, by which simple expedient the sleeve *o*, armature O, and hand S are caused to turn in unison with spindle P. Furthermore, in this normal position the spring D exerts sufficient force against the conical knob *b* of main spindle B to draw the sleeve F and its attachments E K H G L *f'* forward along said spindle and cause the hands E L to indicate the minutes and hours in the ordinary way. Therefore, it is evident that at every complete hour the minute-hand E is vertically above the main spindle B and the tooth *f* accurately in line with the notch *c;* but there can be no engagement of said tooth with said notch until the electrical current is turned on.

In constructing the clock the notch *c* is made sufficiently wide to cause the tooth *f'* to occupy about ten minutes' time in passing from one side to the other of said notch, thus allowing ten minutes variation, when the synchronizing process is effected. Now, assuming that it is desired to perform this operation precisely at twelve o'clock, and presuming that the clock is but a few minutes slow, it is evident the tooth *f'* will be in line with one side of the V-shaped notch *c*, as seen in Fig. 7. At the very instant the central or standard clock indicates twelve the electrical current is let on, either by an attendant or automatically, which current acts in the following manner. The upper poles *m n* first attract the armature O and draw it back against them, as seen in Fig. 5, thereby leaving the seconds-hand S at liberty to assume the vertical position seen in Fig. 2, which position is at once reached, because its slotted bearing *s* is inclined and the end *s'* of said hand is loaded; but if this loaded end should be vertically above the shank *p* when the current is let on the hand will not remain inverted, but will swing around to its proper position on account of the inclined slot *s*, the attraction of the small magnet T *t* preventing said hand vibrating back and forth until it gradually stops. Hence it is apparent the seconds-hand is arrested in a vertical position the instant the magnets are thus charged from the central office or standard clock. Reference to Fig. 2 shows that the distance between the armature O and poles *m n* is somewhat less than the distance between the armature G and poles *m' n'*, which arrangement enables said armature O to close up slightly in advance of the lower armature G. The armature G being thus powerfully drawn against the magnet-poles causes all the attachments of said armature to retract accordingly, as seen in Fig. 3. This retraction compels the tooth *f'* to wedge against the inclined side of notch *c*, thereby affording sufficient power to turn forward the cannon-pinion H and its connected gears I *i* K, and thus set the hands E and L to precisely twelve o'clock, at which moment said tooth completely fills said notch, as seen in Fig. 4. While this synchronizing process is being carried on, the spring D bears against the apex of knob *b*, and thus offers but little resistance to the turning of the various parts, as just described. Therefore this apex of the knob serves as a fulcrum against which the spring is bent, an exaggerated view of this bend being seen in Fig. 3; but if the clock should be a few minutes fast when the current is let on the operation of the tooth is exactly reversed—that is to say, the retraction of the armature then causes said tooth to bear against the opposite side of the notch, as indicated by the dotted lines in Fig. 7, and turn the pinion H and its gearing and hand connections back to twelve o'clock. The current is simply turned on for the fractional part of a second to produce the above-described results, and immediately on the breaking of said current the springs R D exert their force and restore the various devices to their normal positions, the act of setting the clock either forward or backward being accomplished without stopping or giving any indication while the work is being done, the ten minutes variation provided for by the width of notch *c* being more than sufficient for a clock that is set daily.

From the above description it is evident thousands of our clocks could be located in the various States of the Union, no matter how remote, and simultaneously synchronized from a central or standard clock at Washington, D. C., or any other desired place.

In the modification of our invention seen in Figs. 8, 9, and 10 the magnets M′ N′ converge toward each other at their upper ends, and their lower poles *m′ n′* have small rolls V V′ journaled in them, which rolls are adapted when the clock is synchronized to enter grooves *w w′* on the rear face of a swinging armature W, the latter being attached to the main spindle in the same manner as the sliding armature G. X is a spring so coiled around the main spindle B as to force the armature W and its attachments outwardly or to their normal positions. The arrows in Fig. 8 show the direction the armature swings when the current is let on. Finally, it is evident the vibration of the seconds-hand S could be arrested by a suitable magnet placed beneath it, and we reserve the right of so changing the construction of the clock or of dispensing entirely with the seconds-hand.

We claim as our invention—

1. The combination, with a synchronizing-clock, of a magnet or a pair of magnets which when charged will first set the seconds-hand and then set the hour and minute hands, substantially as herein described.

2. The combination, in a synchronizing-clock, of spindle P *p*, armature O *o*, mounted upon the shank *p* of said spindle, spring R, forcing said armature outwardly, a seconds-hand S, applied to said shank and clamped between the sleeve *o* and nut *p′*, and a magnet or magnets, as M *m* N *n*, for retracting said armature, as herein described.

3. The combination, in a synchronizing-clock, of the freely-swinging seconds-hand S and a magnet, as T, for arresting the vibrations of said hand when released from its driving-spindle, substantially as herein described.

4. The combination, in a synchronizing-clock, of the main spindle B, having a conical knob *b*, the tubular bearing C, having a V-shaped notch *c*, the armature G, having a sleeve F and V-shaped tooth *f′*, the minute-hand E, attached to said sleeve and having a shank *e*, to which is secured the bent plate-spring D, that bears against said knob *b*, a cannon-pinion H, that turns in unison with said armature and drives the hour-hand gearing, and a magnet or pair of magnets, as M *m′* N *n′*, that retract said armature and its attachments and cause said tooth to engage with said notch, as herein described, and for the purpose stated.

5. In a synchronizing-clock arranged to operate as herein described, the spring-pressed seconds-hand S, mounted upon the spindle-shank *p* and having an oblique slot *s*, for the purpose stated.

6. The combination, in a synchronizing-clock, of a sleeve shiftable along the main spindle, which sleeve is in constant geared connection with the clock-train and carries the hour and minute hands, and an armature that operates said sleeve and thereby sets the clock when the electrical current is let on, substantially as herein described.

7. The combination, in a synchronizing-clock, of a seconds-hand spindle, a stop or bearing secured thereto, a seconds-hand turning freely upon said spindle, and a spring-pressed armature that normally forces said hand against said stop and causes said hand to revolve in unison with said spindle, substantially as described.

8. A synchronizing-clock provided with a tubular guide or bearing for the main spindle, a V-shaped notch in the front end of said bearing, and an armature having a V-shaped tooth that is drawn into said notch when the electrical current is let on, substantially as described.

9. A synchronizing-clock having a magnet for setting the hour, minute, and seconds hands and an auxiliary magnet that arrests the seconds-hand when the clock is set, substantially as described.

10. A synchronizing-clock having hour and minute hands which are simultaneously shifted to set the clock by means of a charged magnet and then automatically restored to their normal positions when the electrical current is broken, said hands being carried by a sleeve having constant geared connection with the clock-train, as herein described.

11. A synchronizing-clock having hour, minute, and seconds hands which are simultaneously shifted to set the clock by means of a charged magnet or magnets and then automatically restored to their normal positions when the electrical current is broken, said hands being carried by a sleeve having constant geared connection with the clock-train, substantially as herein described.

12. A synchronizing-clock having one armature for setting the seconds-hand, another armature for simultaneously setting the hour and minute hands, and a magnet which attracts said armatures when charged, the seconds-hand armature being located near the pole of said magnet and the other armature more remotely from the opposite pole, for the purpose stated.

13. The combination, in a synchronizing-clock, of a main spindle, a longitudinally-shiftable sleeve mounted thereon, which sleeve carries the hour and minute hands and is in constant geared connection with the clock-train, an armature at the inner end of said sleeve, an electro magnet or magnets to attract said armature and draw back said sleeve and its attachments, whereby positive contact is made with a device that causes said sleeve to turn on said spindle, and a spring that restores the operative parts to their normal positions when the current is broken, substantially as herein described.

14. A synchronizing-clock having hour and minute hands carried by a sleeve having constant geared connection with the clock-train and a revolving armature attached to said sleeve for the purpose of simultaneously re-

tracting and setting said hands, as herein described.

15. A synchronizing-clock having hour and minute hands carried by a sleeve having constant geared connection with the clock-train, an armature attached to said sleeve and revolving therewith, a seconds-hand frictionally coupled to a spindle by a revolving spring-pressed armature, and a magnet or pair of magnets whose opposite poles attract said revolving armatures when the electrical current is let on, substantially as herein described.

In testimony whereof we affix our signatures in presence of two witnesses.

WILLIAM W. BRADLEY.
WILLARD N. PACKER.

Witnesses:
ALLEN CARNES,
ALBERT HINE.