

A. M. CHURCH.  
ELECTRIC SYNCHRONIZING DEVICE FOR CLOCK HANDS.  
No. 452,424. Patented May 19, 1891.

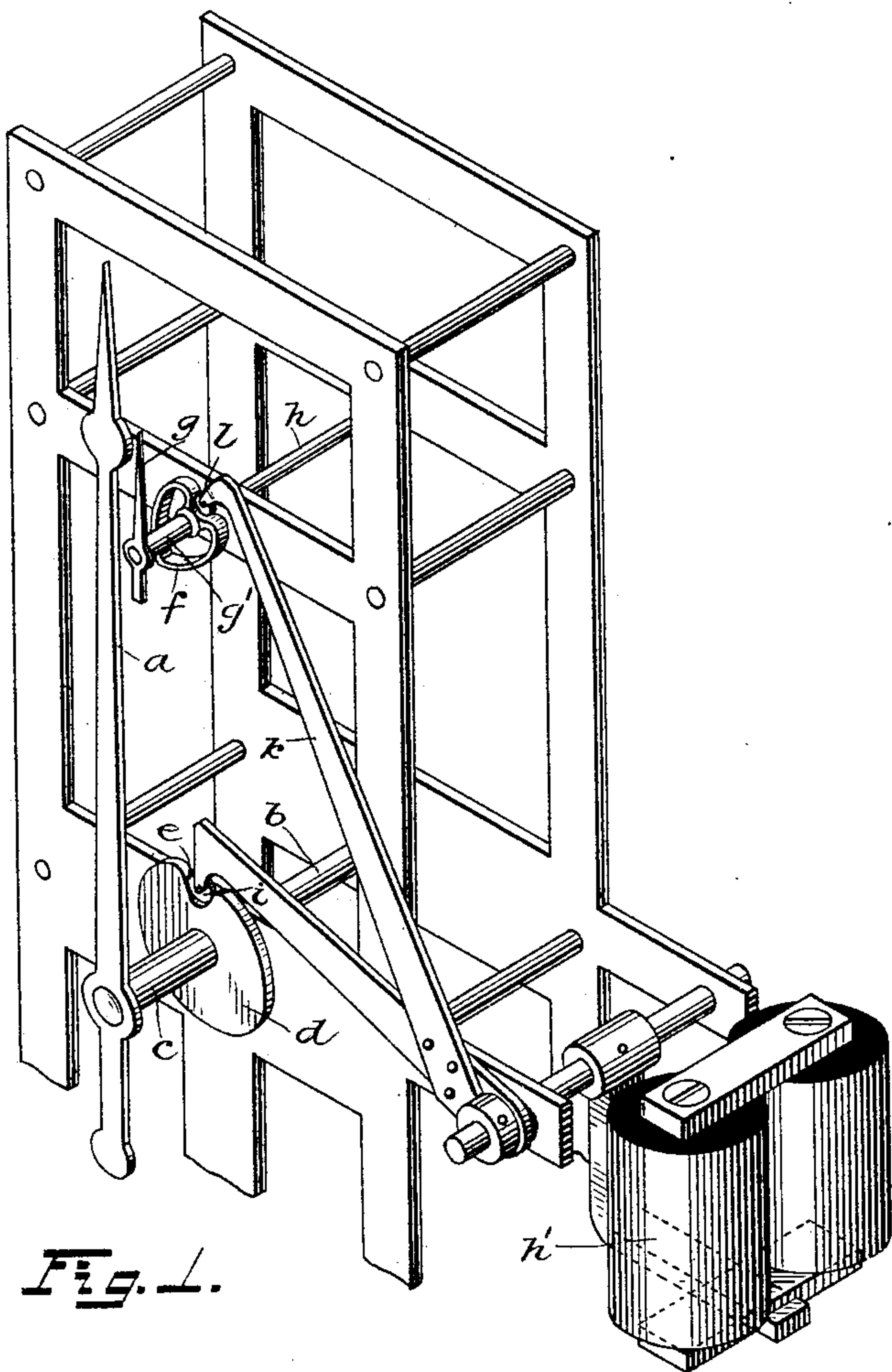


Fig. 1.



Fig. 5.

Witnesses.  
Charles E. Hawley.  
Geo. R. Parker.

Inventor.  
Albert M. Church  
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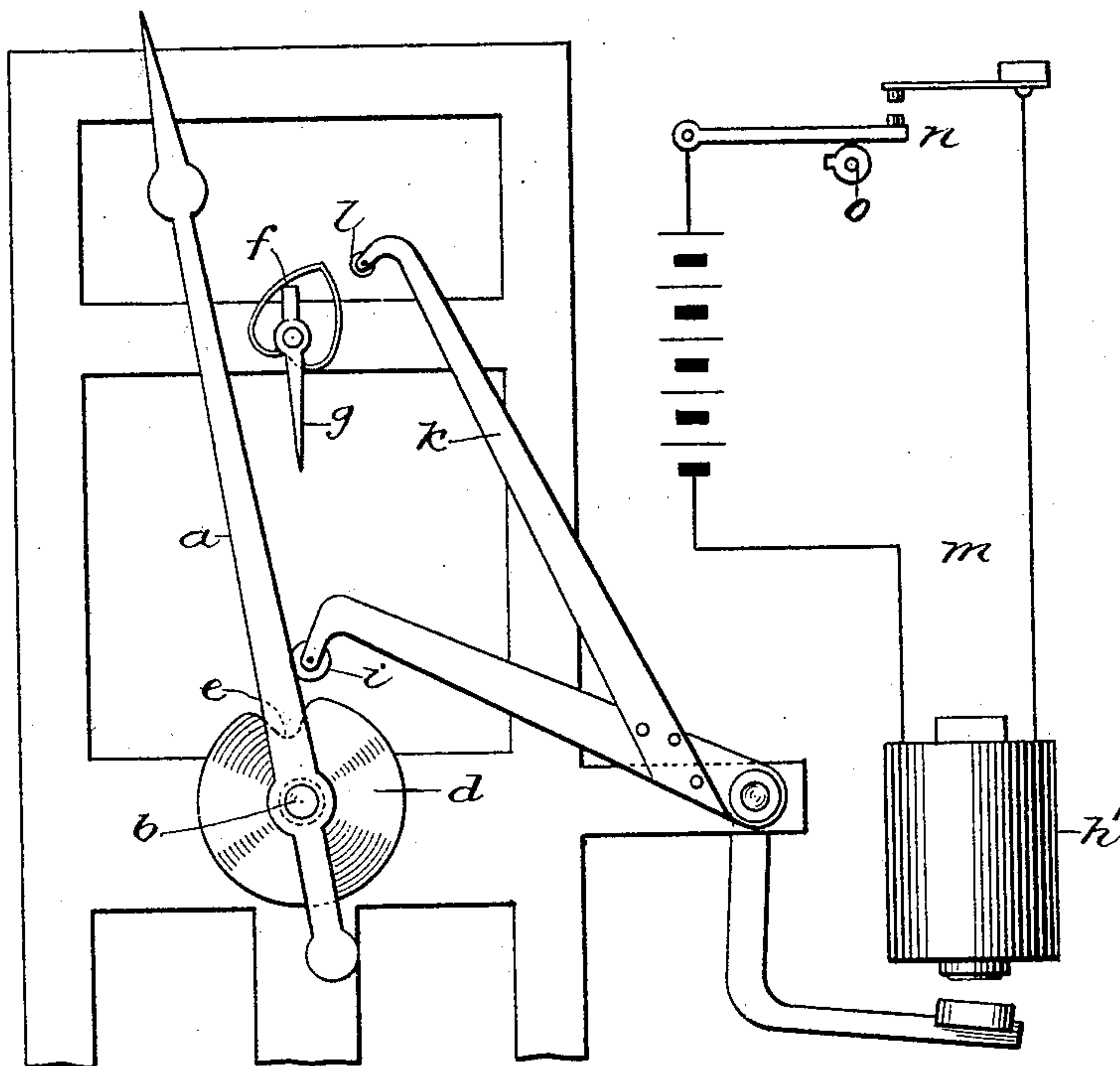


Fig. 2.

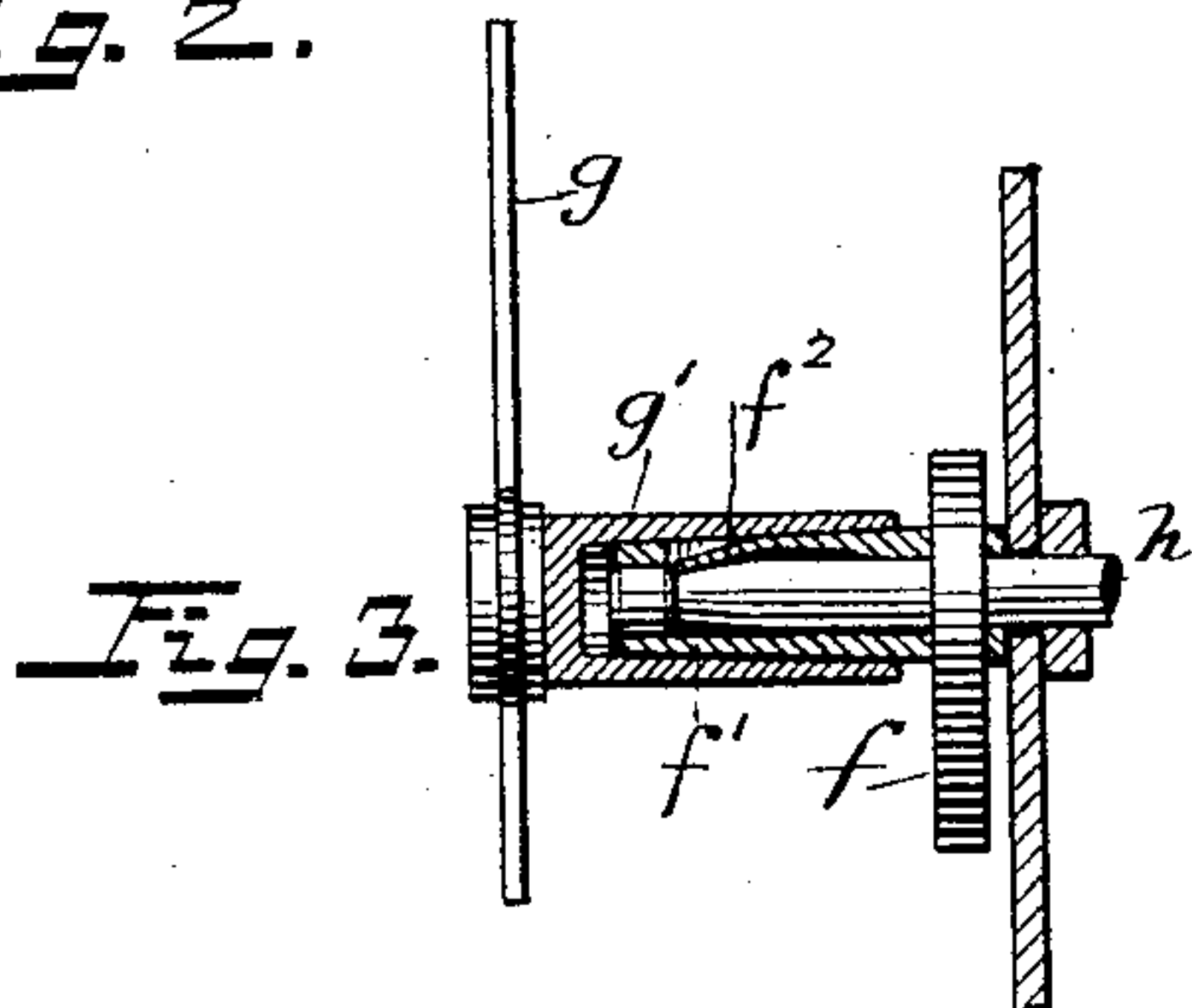


Fig. 3.

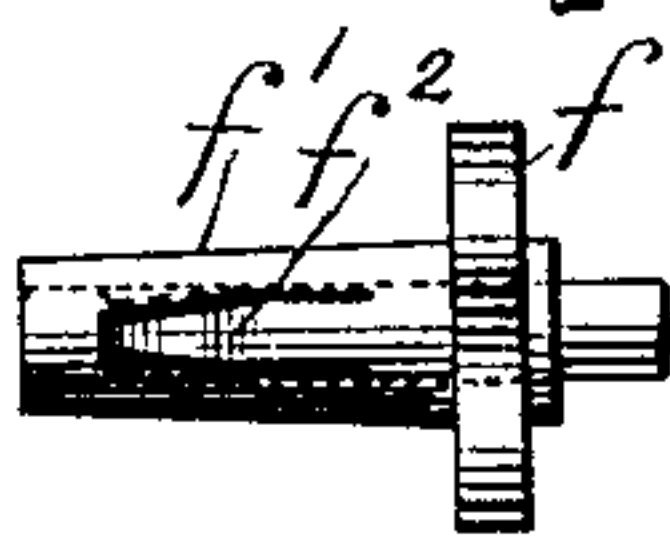


Fig. 4.

Witnesses.

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# UNITED STATES PATENT OFFICE.

ALBERT M. CHURCH, OF CHICAGO, ILLINOIS.

## ELECTRIC SYNCHRONIZING DEVICE FOR CLOCK-HANDS.

SPECIFICATION forming part of Letters Patent No. 452,424, dated May 19, 1891.

Application filed November 18, 1889. Serial No. 330,720. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT M. CHURCH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Electric Synchronizing Devices for Clocks, (Case 1,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electric synchronizing apparatus for clocks; and its object is to provide for synchronizing or setting a large number of clocks automatically by the standard clock. When clocks are thus set, it is desirable that the seconds-hand should be "synchronized," as it is usually called, with the minute-hand. It is also desirable that the seconds-hand should have a frictional engagement with the shaft upon which it is mounted.

My invention consists, first, in an electro-magnetic device adapted to be operated automatically to force a frictional wheel into a curved notch or seat provided in a disk or plate connected with the shaft of the minute-hand of a clock to turn the minute-hand backward or forward if too fast or too slow to bring the minute-hand to indicate the correct time, as shown upon the standard-clock which operates the electro-magnetic apparatus.

My invention consists, second, in the combination, with automatic electro-magnetic devices for setting the minute-hand, of a heart-cam operated by a supplementary lever carried by the electro-magnetic device to bring the seconds-hand into unison with the minute-hand when the minute-hand is set.

My invention consists, third, in the manner of mounting the heart-cam and the seconds-hand upon the same shaft. The notch or seat provided in the disk should be curved or V-shaped, and is so placed that it will be in the path of the friction-wheel only at or near the end of an hour—that is, when the minute-hand is, say, within two or three minutes of the zero-minute. Thus in case of an accidental closing of the circuit at any other time than at or near the zero-minute the friction-

wheel would come against the periphery of the disk, and so would not occasion a false or accidental setting of the clock.

I have not deemed it necessary in connection with this description to illustrate the clock mechanism in detail. I have therefore simply indicated a circuit-closer adapted to be closed at the desired moment by the standard clock and an electro-magnet included in this circuit, the armature-lever of this magnet having two arms, each carrying a small roller or friction-wheel and adapted to act together when the circuit is closed to set the minute-hand and at the same time to bring the seconds-hand into unison therewith.

I have illustrated in detail the manner of mounting the second-hand and its heart-cam upon the shaft. It will be understood, however, that all the necessary parts of the standard clock are supplied as well as the mechanism of the clock, which is synchronized therewith and thereby through the medium of the electro-magnetic apparatus. It will also be understood that a large number of clocks may be synchronically synchronized at stated intervals with the standard clock simply by providing each of the clocks to be synchronized with similar electro-magnetic apparatus, all to be included in the same circuit. Thus, for example, all the clocks upon a railway line may be set and synchronized once a day or once every hour or as often as it may be thought necessary or desirable.

In the drawings, Figure 1 is an isometric view showing the frame-work of a clock, the minute and seconds hands thereof, and the cams and electro-magnetic apparatus for setting and synchronizing the same. Fig. 2 is a side elevation of the same in connection with the circuit and circuit-closer of the standard clock for operating the electro-magnetic device. Fig. 3 is a detailed sectional view through the sleeve carrying the seconds-hand and the sleeve of the heart-cam as they are mounted upon the same shaft. Fig. 4 is a plan view showing the tongue provided in the sleeve of the heart-cam and the form of the seat or bearing therefor upon the shaft. Fig. 5 shows a snail-cam, which might be used in place of the heart-cam.



Like parts are indicated by similar letters of reference throughout the different figures.

The minute-hand *a* is preferably mounted upon its shaft *b* by means of a sleeve *c*, passing over the end of said shaft, said sleeve having a frictional engagement with said shaft, as is usual. Upon this sleeve *c* is provided the disk or plate *d* of the form shown, the curved notch *e* of the disk being of such shape and size that when the friction-wheel is within range thereof, on closing the circuit, the cam will be turned either backward or forward, as the case may be, to bring the minute-hand to zero if either too fast or too slow—say within a range of two or three minutes in either direction. The heart-cam *f*, connected with the seconds-hand *g*, has been heretofore used in horse-timers as a fly-back for the seconds-hand to bring the same to zero. The means of mounting the cam, however, upon the shaft, as shown herein, and a roller upon a lever for acting upon the cam, I have invented specially for the purposes of this invention. The shaft *h* is driven by the clock-work in the usual manner. The cam *f* is provided with the sleeve *f'*, in which is cut the tongue *f''*. This tongue *f''* is bent inwardly and rests in its seat formed in the shaft, this seat being tapering inwardly and outwardly, the incline outwardly, however, being somewhat abrupt, so as to form a shoulder against which the end of the tongue normally rests, so as to prevent the sleeve from being pulled off from the end of the shaft except by considerable force. The incline of the seat or groove inwardly is comparatively slight and gradual, but sufficient to prevent the sleeve from working off from the shaft. The pointer *g* is carried upon the sleeve *g'*, which is in frictional engagement with the sleeve of the cam. Hence the cam and the second-hand by their frictional engagement will be carried with the shaft as the shaft is rotated, their frictional bearing, however, being such that either may be rotated independent of the shaft without twisting or breaking the shaft or the gearing by which the shaft is driven.

The electro-magnetic device consists of the electro-magnet *h'*, its armature and armature-lever, and the friction wheel or roller *i* carried thereby and adapted to be forced into rolling frictional engagement with the curved notch in the disk or plate *d* to bring the minute-hand to zero. With this same electro-magnetic device is preferably also connected an arm *k*, carrying, also, a frictional roller *l*, adapted to act upon the heart-cam at the same time the minute-hand is set. This electro-magnetic device is included in the circuit *m*, which contains a circuit-closer *n*, adapted to be closed momentarily by the standard clock. I have deemed it only necessary to illustrate the cam *o* of the standard clock. This cam *o*, we will say, is connected therewith in the usual manner, so as to close the circuit-closer *n* to complete the circuit of

the battery through the electro-magnet at the zero-second of each hour. Thus automatically at the last second of the last minute of each hour this circuit will be closed and all the electro-magnetic synchronizing devices included in this circuit will be simultaneously operated thereby to synchronize all the clocks connected with this circuit.

In Fig. 1 it will be observed that the circuit of the electro-magnet having been closed its armature is attracted, and the friction-wheels carried by the two arms connected with said armature are forced into the notches of the cams of the minute and seconds hands, respectively, to bring both of said hands to zero.

In Fig. 2 the minute-hand may be considered as having gone slow about three minutes and the seconds-hand may be considered as at the half-minute. Now, when the circuit is closed and the armature attracted, both hands will be moved by the action of the electro-magnetic synchronizing device upon said cams, and, as described with respect to Fig. 1, the minute and second hands will be brought into unison. The closing of the circuit, it will be understood, is so timed that when this action takes place—that is, when the hands are brought to the zero-points—they will indicate the correct time. The circuit being immediately thereafter opened, the clock will continue to run as usual. The disk *d* acts as a safety-stop in case the clock is out of range of the notch *e* therein, and hence in case the circuit should be closed by accident or otherwise when thus out of range the roller *e* will ride upon the periphery of said disk and serve to keep the roller *l* from coming into engagement with the cam upon the shaft of the second-hand.

The standard clock may be included in the circuit, as is well known, only at such times as it may be desired. Instead of working the circuit-closer *n* automatically by the standard clock, it might be operated by simply pressing the finger thereon.

The hour-hand, as is well understood, is usually connected with the minute-hand by suitable gearing, so as to be moved therewith at the desired rate of speed.

My invention admits of various modifications that would readily suggest themselves to those skilled in the art, and I therefore do not limit myself to the precise details of construction herein illustrated and described.

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

The combination, with the seconds-hand of a clock provided with a sleeve *g'*, of a heart-cam provided with a sleeve *f'*, over which said sleeve *g'* is placed to be in frictional engagement therewith, said sleeve *f'* of the heart-cam being placed upon the shaft carrying the same and being provided with a tongue *f''*, cut in said sleeve, said tongue being



bent inwardly and resting in its seat formed  
in the shaft, said seat or groove tapering  
slightly inwardly and somewhat abruptly  
outwardly, and an electrical operating-arm  
5 *l*, provided with the wheel *l*, adapted to be  
brought periodically against said heart-cam,  
whereby the seconds-hand may be carried  
upon the shaft, turned thereon, or removed

from the same and set periodically, substan-  
tially as and for the purpose specified. 10

In witness whereof I hereunto subscribe my  
name this 14th day of November, A. D. 1889.

ALBERT M. CHURCH.

Witnesses:

GEORGE N. BARTON,

ELLA EDLER.