(No Model.) 2 Sheets—Sheet 1.

L. VON ORTH.

ELECTRIC SYNCHRONIZER FOR CLOCKS.

No. 522,724. Patented July 10, 1894.

Fig. 1.

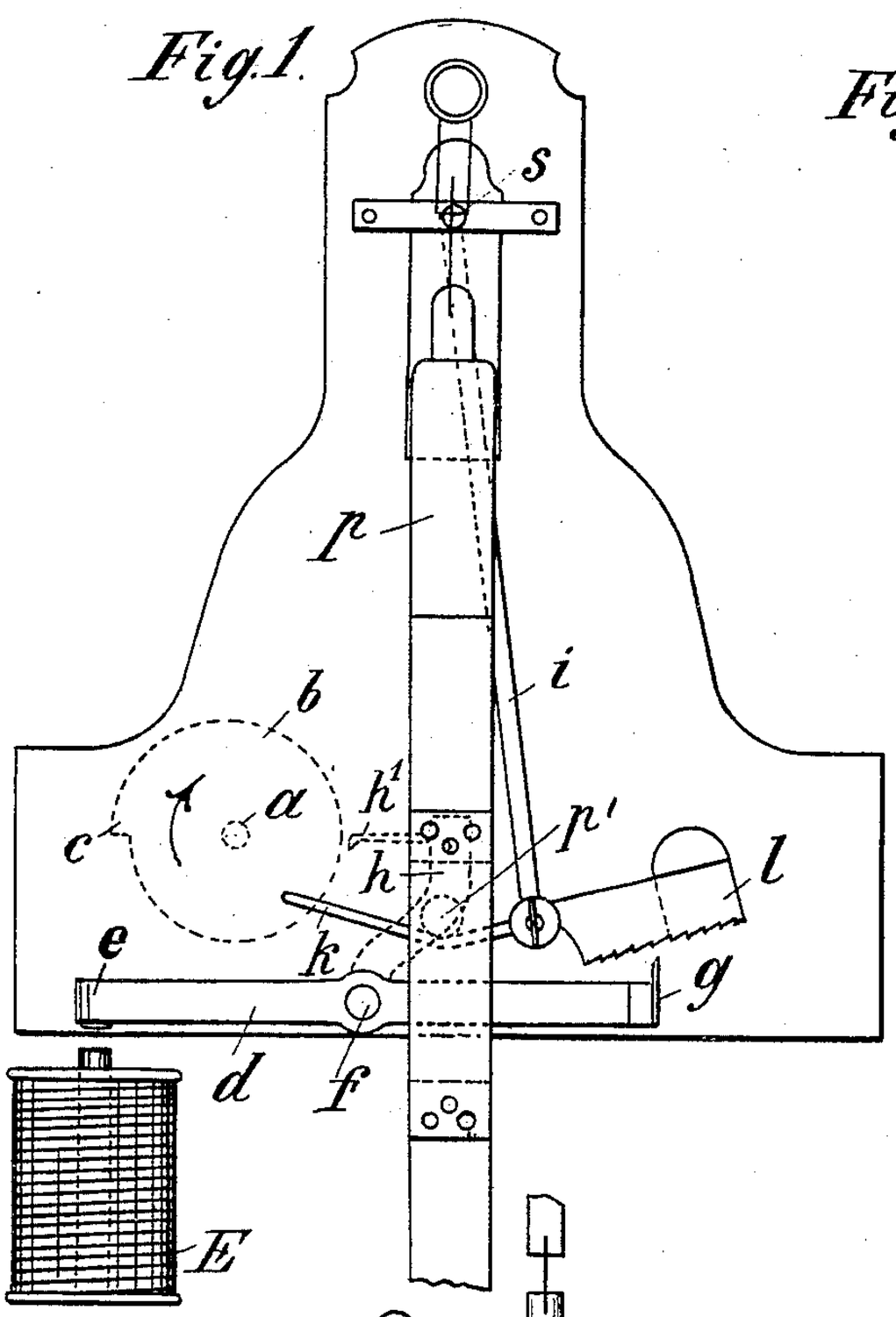


Fig. 2.

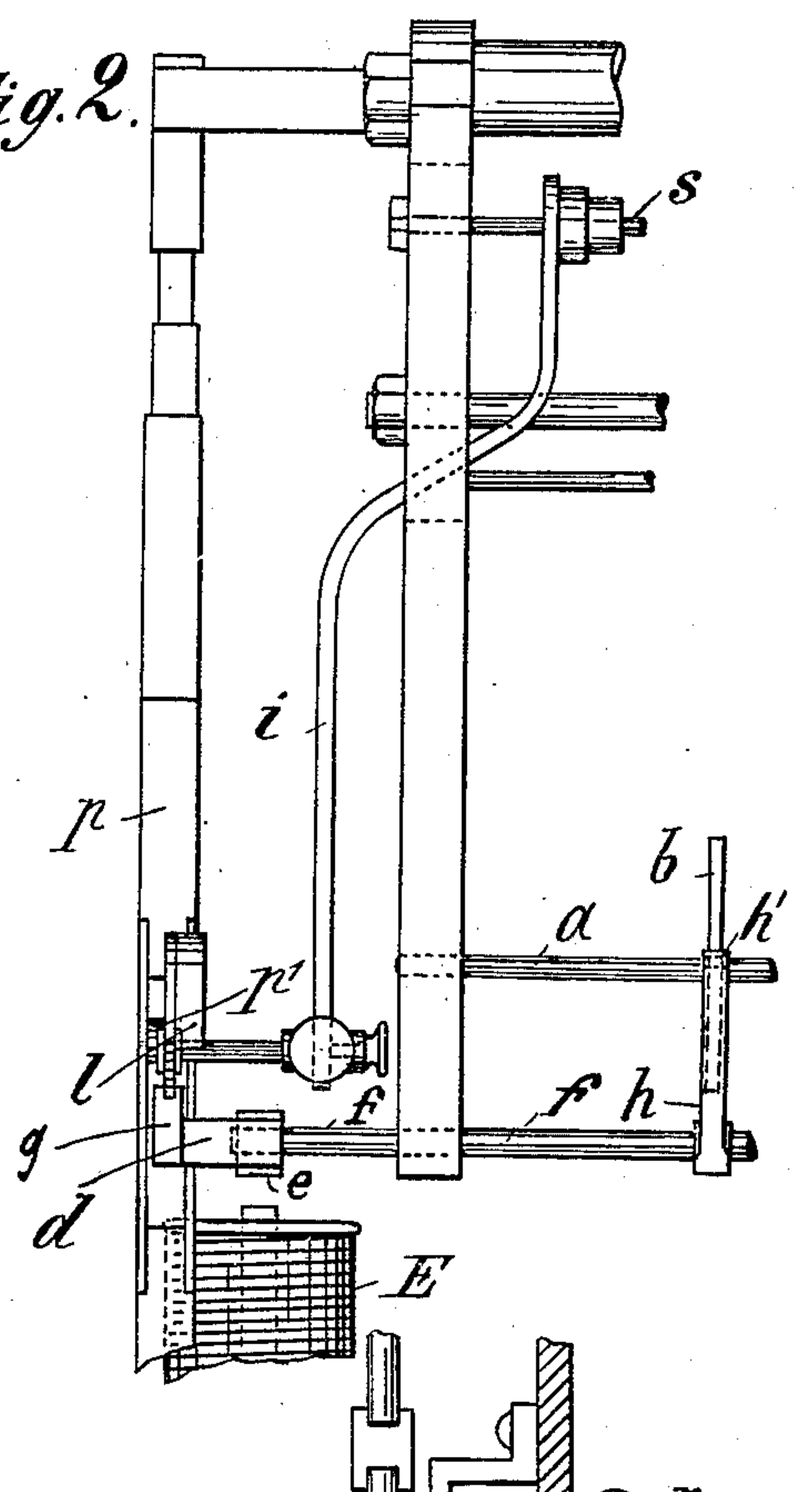


Fig. 3.

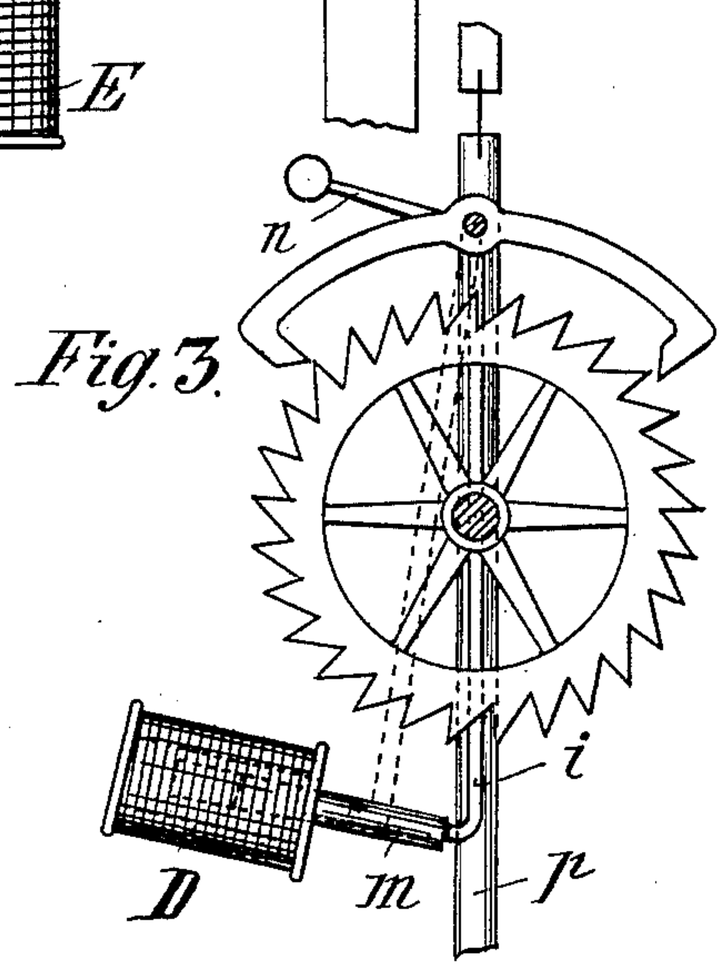
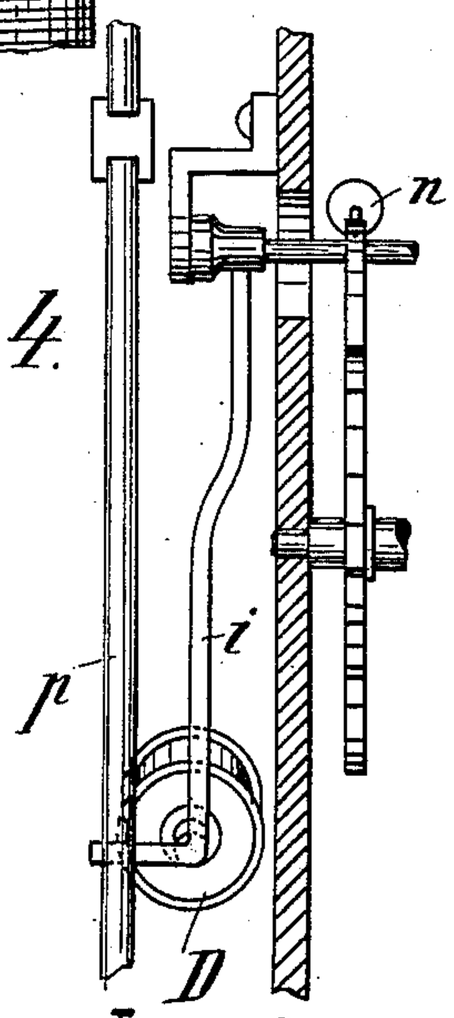


Fig. 4.



Witnesses:
Klas H. Pernstedt
J. J. Malle,

Inventor:
Ludwig von Orth
By A. Faber du Faur & B.
Attorney

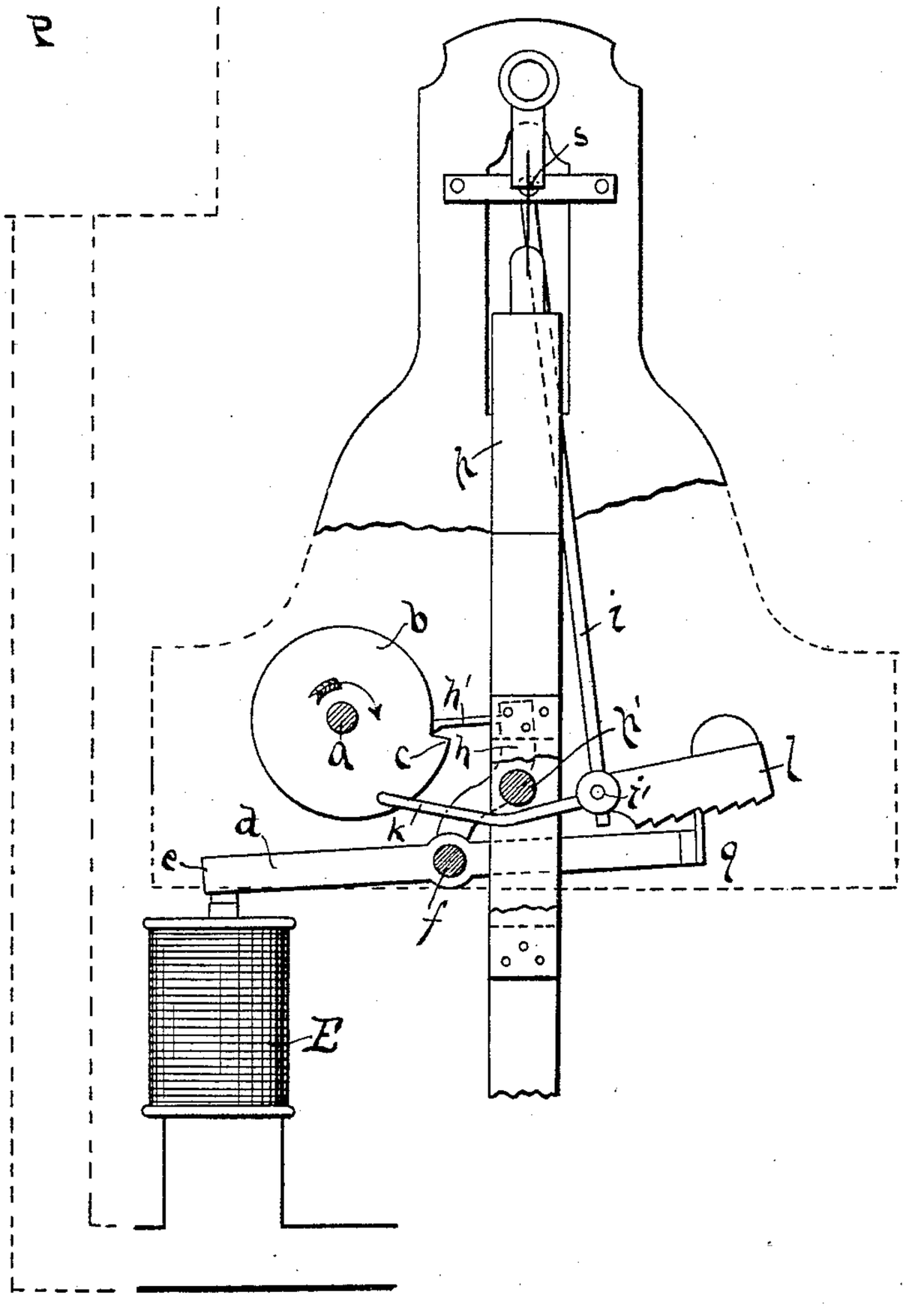
(No Model.) 2 Sheets—Sheet 2.

L. VON ORTH.

ELECTRIC SYNCHRONIZER FOR CLOCKS.

No. 522,724. Patented July 10, 1894.

Fig. 5.



WITNESSES:

Chas. W. Thomas

Percy Isaac Callum

INVENTOR:

Ludwig von Orth,

BY A. Fabyan Taintor

ATTORNEY

UNITED STATES PATENT OFFICE.

LUDWIG VON ORTH, OF BERLIN, GERMANY.

ELECTRIC SYNCHRONIZER FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 522,724, dated July 10, 1894.

Application filed May 6, 1892. Serial No. 432,058. (No model.)

To all whom it may concern:

Be it known that I, LUDWIG VON ORTH, a subject of the King of Würtemberg, residing at Berlin, in the Kingdom of Prussia, Germany, have invented new and useful Improvements in Synchronizers for Clocks, of which the following is a specification.

My invention has for its object to synchronize electrically from a standard or master clock; a series of secondary clocks regulated to run fast,—and it consists in certain novel features in the construction of the secondary clocks to be hereinafter described with reference to the annexed drawings, in which—

Figure 1 represents a rear elevation of a secondary clock embodying my invention, part being broken away. Fig. 2 is a side view of the same. Fig. 3 is a front elevation of a modified form, and Fig. 4 is a side view of Fig. 3. Fig. 5 is a rear elevation showing the pendulum and verge rod disconnected.

Similar letters of reference designate corresponding parts throughout the several views of the drawings.

I will now proceed to describe the construction of the secondary clock, reference being had for the present to Figs. 1 and 2 of the drawings, in which the letter *s* designates the arbor of the pallet lever, *p*, the pendulum, and *i* the verge rod. The connection between the pendulum and the verge rod is made in such a manner that it can be broken while the movement is in operation and the pendulum continues to swing, while the verge rod is held stationary and the motion of the train consequently arrested. To this end the verge rod, instead of terminating in a fork, as usual, has pivoted thereto a lever *k l*, the bent arm *k* of which extends through an opening in the pendulum rod and engages with a horizontal pin *p'* made fast in the pendulum rod. Since normally the bent arm *k* partially embraces the pin *p'*, and the arm *l* being weighted, an operative connection is established between the verge rod and the pendulum rod. Beneath the lever *k l* is located a lever *d*, mounted upon a rock-shaft *f* and carrying at one end an armature *e* arranged opposite to an electro-magnet E. The opposite end of armature lever *d* carries a tooth *g* arranged opposite to the arm *l* of the lever *k l*, which arm is toothed for a purpose hereinafter to be described. On the rock-shaft *f* is also mounted an arm *h* having at its end a nose *h'* arranged opposite to the periphery of a cam *b* mounted on one of the arbors of the train. The cam is so set with respect to nose *h'* that only a limited motion of lever *d* is permitted to take place for some time before the hour;—however when the hands of the clock are at the hour,—at which period the nose *c* of the cam has passed below the nose *h'*—the arm *h*, and consequently, lever *d* can be turned to the full extent.

In practice the secondary clocks are regulated to run fast—say from ten to sixty seconds per day—in case they are to be synchronized once a day.

The electro-magnets E of the several secondary clocks are included in the circuit controlled by the master clock P, Fig. 5. The master clock, which may be of any usual construction, has its circuit closer arranged to close the circuit of the secondary clocks, at a short time—say sixty seconds—before the hour as indicated by said master clock—and to break it at the exact hour.

Assuming the case that the secondary clock is thirty seconds fast, and that the circuit at the master clock is closed at one minute of the hour as indicated by said master clock. The secondary clock being thirty seconds fast at this period, the hands of said secondary clock are at thirty seconds of 12. The position of cam *b* prevents the verge rod from being disconnected from the pendulum; when, however, the hands of the clock (secondary) point to 12, this disconnection takes place and the motion of the secondary clock is arrested Fig. 5. At 12 o'clock, as indicated by the master-clock the circuit through electro-magnet E is broken and the connection of pendulum rod and verge rod re-established by the release of the latter.

The disconnection of pendulum and verge rods is effected by tooth *g* of lever *d* engaging with the toothed arm *l* of lever *k l*, and holding said lever while the pendulum, in view of its inertia, continues to oscillate. If at the instant that tooth *g* engages with the arm *l*, the pendulum is not at the end of its vibration to the right of Fig 1, the next succeeding vibration in that direction forces the verge rod outwardly where it is then held sta-

tionary. When the tooth *g* releases arm *k l*, the latter turns about its pivot and again engages pin *p'*.

In the modification illustrated in Figs. 3 and 4, I have shown the verge-rod *i* constructed to engage with the pendulum rod from one side thereof and to be retained against the latter under ordinary conditions by a weighted arm *n* attached to the arbor of the pallet lever. To the verge rod is secured an armature *m* adapted to enter the solenoid D. As before, the master clock closes the circuit at some time before the hour (12 o'clock) as indicated by said master clock. The solenoid D is, however, cut out of the circuit until the hands of the secondary clock reach 12 m. by means of the circuit closer usually provided for this purpose. When the hands of the secondary clock reach 12 m., the circuit is completed through solenoid D and the armature *m* is attracted, thereby disconnecting the verge rod from the pendulum. At the hour (12 m.) as indicated by the master clock, the circuit is broken by the latter; solenoid D is devitalized and the verge rod again connects with the pendulum rod.

What I claim as new is—

1. In a clock system, a master clock, combined with a secondary clock (one or more) having a separable connection between the verge rod and pendulum and devices, as described, electrically actuated from the master clock before the hour, and in operative connection with the verge rod for disconnecting and holding the same out of connection with the pendulum at the hour as indicated by the secondary clock, substantially as described.

2. In a time-piece, the combination with the pendulum, a verge rod provided with a pivoted lever *k. l* in separable connection with the pendulum, an armature lever *d* adapted to engage with lever *k l*, an electro-magnet arranged to act on lever *d*, and a cam *b* adapted to control the motion of lever *d*, substantially as described.

3. In a time piece, the combination with the pendulum, a verge rod provided with a pivoted lever *k*, *l*, one arm *k* of which is bent and engages a pin on the pendulum rod, and the other arm *l* is provided with teeth, an armature lever *d* adapted to engage with the teeth on arm *l*, an electro-magnet arranged to act on lever *d*, a cam *b*, and an arm *h h'* adapted to engage said cam, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LUDWIG VON ORTH.

Witnesses:
ADOLF FRANKE,
GUSTAV HÜLSMANN.