

(No Model.)

2 Sheets—Sheet 1.

H. S. PRENTISS.
ELECTRIC SYNCHRONIZER FOR CLOCKS.

No. 506,936.

Patented Oct. 17, 1893.

Fig. 2.

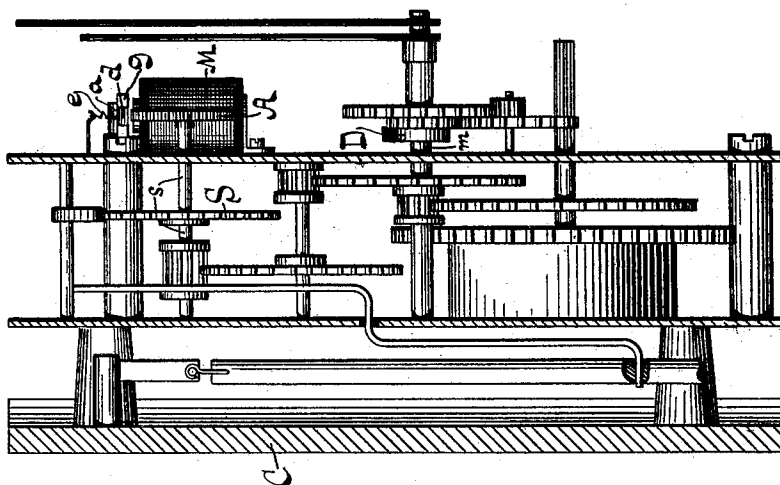


Fig. 1.

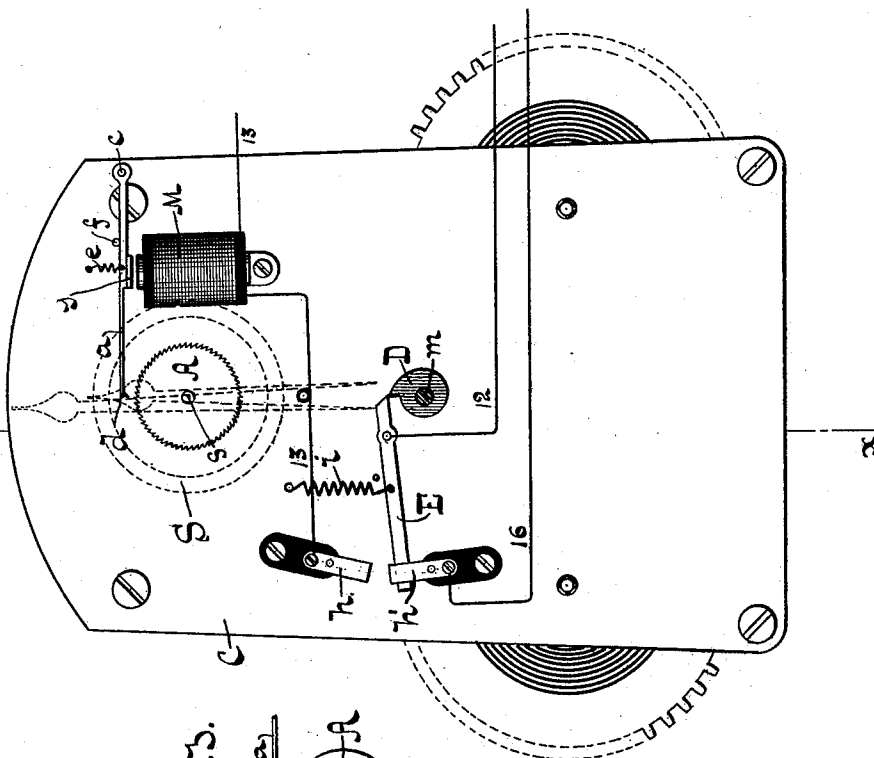
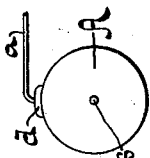


Fig. 3.



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INVENTOR
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(No Model.)

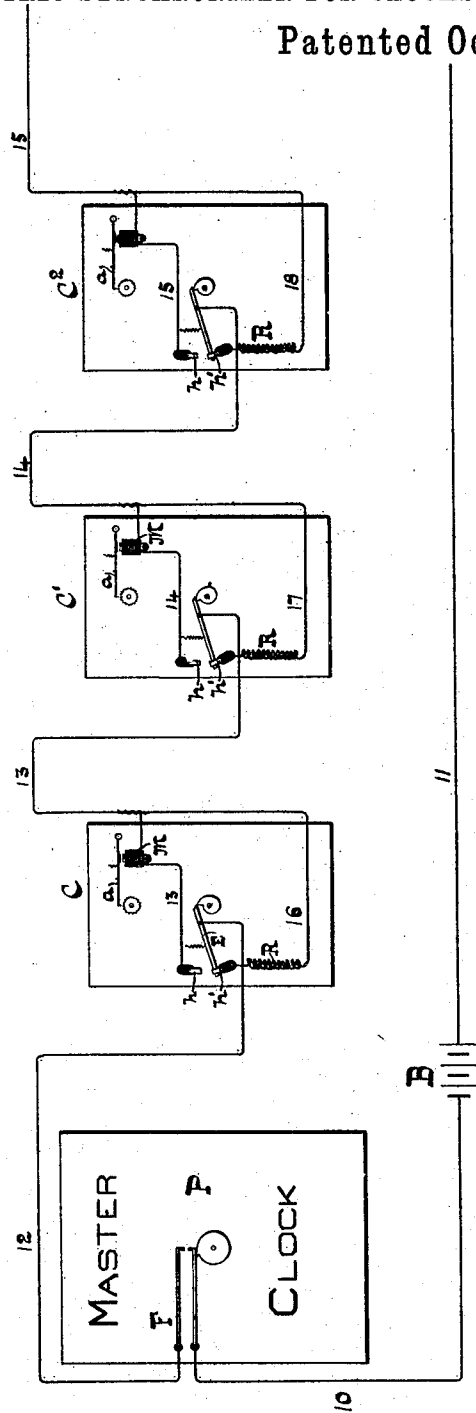
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Fig. 4.



WITNESSES:

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J. J. Calle

INVENTOR:

Henry S. Prentiss

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UNITED STATES PATENT OFFICE.

HENRY S. PRENTISS, OF ELIZABETH, NEW JERSEY.

ELECTRIC SYNCHRONIZER FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 506,936, dated October 17, 1893.

Application filed November 3, 1892. Serial No. 450,895. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. PRENTISS, a citizen of the United States, and a resident of Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Synchronizers for Clocks, of which the following is a specification.

My invention has reference to improvements in apparatus for synchronizing time-pieces, and it consists essentially in regulating the several secondary clocks to run slightly fast and providing each of the same with a detent adapted to engage with a moving member of the train to arrest the motion of the latter, an electro-magnet adapted to throw the detent into engagement with said member, and a switch, actuated from the train, adapted to close the circuit through the electro-magnet at the hour as indicated by the secondary clock, and to maintain a closed circuit for a pre-determined period thereafter; combined with a circuit closer at the master clock adapted to close the circuit through the synchronizing line at a predetermined period before the hour and to break it at the hour, whereby the several clocks are held at the hour as indicated by the same until the exact hour, and clocks whose error widely exceeds the duration of the period of synchronization have their error reduced by increments at each period of synchronization, and are finally brought to the correct time;—all of which is hereinafter more fully pointed out; reference being had to the annexed drawings, in which—

Figure 1 represents an elevation of a secondary clock constructed according to my invention. Fig. 2 is a vertical section in the plane $x x$, Fig. 1. Fig. 3 is a detail of a modified form of the detent. Fig. 4 is a diagram illustrating the clocks arranged in a system.

Similar letters and figures indicate corresponding parts throughout the several views of the drawings

In the drawings the letter C designates one of the secondary clocks which may embody any suitable well known movement, such for instance, as a pendulum or lever movement. In the drawings I have shown a pendulum movement, in which m is the arbor of the

minute hand, S the scape-wheel and s its arbor, all as usual. Upon the arbor of the scape-wheel is rigidly mounted a notched disk A.

a is a detent made in the form of an arm pivoted at c to the frame of the movement and provided with a tooth d arranged in a position to engage with the disk A when the detent is turned downwardly about its pivot. Normally the detent is held out of engagement with the wheel A by a spring e , which holds said lever against a stop f .

M is an electro-magnet secured to the frame of the movement, its armature g being carried by the detent a . When the electro-magnet is vitalized the detent is thrown into engagement with the notched disk and the motion of the train of the secondary clock is arrested. On the arbor m of the minute hand is mounted to turn therewith, a cam D, which operates a switch lever E that is arranged to play between two contacts h and h' . A spring i holds the switch lever in contact with the cam.

The parts of the switch are electrically so connected, that when the lever is in contact with contact h , the circuit is closed through the electro-magnet M, and when in contact with h' the electro-magnet is switched out of the circuit.

The cam D is so set that the circuit through the electro-magnet is closed at h at the hour as indicated by the secondary clock and remains closed for a predetermined period, say for half an hour.

Referring to Fig. 4, in which I have shown the clocks arranged in a system, P designates the master clock, which is provided with a circuit closer F adapted to close the circuit at a predetermined time before the hour, say ten seconds, and to break it at the hour as indicated by said clock.

C, C', &c., designate the several secondary clocks. B is the battery and 10 and 11 are the line wires. Wire 10 is connected to one member of the circuit closer F at the master clock, the other member being connected by wire 12 to the switch lever E. The contact h of the several secondary clocks are respectively connected with the switch levers of the next succeeding clocks by wires 13, 14, 15, &c., and include the respective electro-magnets M. The

contacts h' are respectively connected to the wires 16, 17, and 18, and include resistances R, to balance the line.

In the operation of the system according to my invention, all the secondary clocks are regulated to run a little fast, say from one-tenth to three seconds per hour, or for the synchronizing period. The master clock, as before stated, closes the circuit, say ten seconds before the hour as indicated by the same.

If we assume the clock C to be five seconds fast, the current closed by the master clock ten seconds before the hour, passes through the resistance R, since the circuit is broken at Eh' . When, however, the circuit is closed at Eh , which takes place at the hour as indicated by the secondary clock, or actually five seconds ahead of the exact time, the circuit is closed through the electro-magnet M, and the motion of the clock is arrested for a period of five seconds, whereupon the circuit is broken at the master clock, and the secondary clock resumes its motion.

It will be noticed that by constructing the switch E to close the circuit through the electro-magnet at the hour as indicated by the secondary clock and maintaining a closed circuit, clocks whose error is greater than the time during which synchronization takes place (time during which the circuit is closed at the master clock), have their error reduced by increments and are finally brought to the correct time. Thus, as an example, assuming that the secondary clock is ten minutes fast, it will be seen that at the first period of synchronization approximately ten seconds of this error will be removed, at the second approximately ten seconds more, and so on until the clock is brought to the correct time.

In practice I prefer to construct the cam so as to maintain a closed circuit for half an hour, so that the secondary clocks, if half an hour fast, or slow, must always be brought to the correct time. It will be noticed that changes in time at the master clock will not affect the individual secondary clocks, and the necessity of setting the same by hand in case of such changes is avoided. Furthermore should any of the secondary clocks stop, they

can be set without taking special care as to setting them to the correct time, since whether set ahead or behind the correct time, they will ultimately be brought to the correct time, as they are adjusted to run fast.

To prevent the line from being broken—in case one of the clocks of the system stops, the contacts h h' and the switch lever E are so arranged that the latter closes the circuit at one contact before it breaks it at the other.

It is evident that any other suitable means in place of a cam could be used to actuate the switch in the manner described, and that in place of the notched disk, a friction disk A', could be substituted and a corresponding shoe d' , placed on the detent a , (see Fig. 3.)

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

1. In a clock system, a master clock provided with a circuit closer adapted to close the circuit at a predetermined period before the hour and to break it at the hour, and a secondary clock (or clocks) provided with a detent adapted to arrest the motion of the train, an electro-magnet adapted to be vitalized by the closing of the circuit at the master clock to act on said detent, and a switch operated by the secondary clock to close the circuit through the electro-magnet at the hour as indicated by the secondary clock and to maintain a closed circuit for a predetermined period thereafter, substantially as described.

2. A time-piece provided with a detent composed of a member actuated by the train of the movement and a second member actuated by electro-magnet, the two co-operating to arrest the motion of the train, and a switch actuated by the train to close the circuit through the electro-magnet at the hour as indicated by said time-piece and to maintain a closed circuit for a predetermined period thereafter, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 28th day of October, 1892.

HENRY S. PRENTISS.

Witnesses:

KLAS H. TERNSTEDT,
J. J. MALLE.