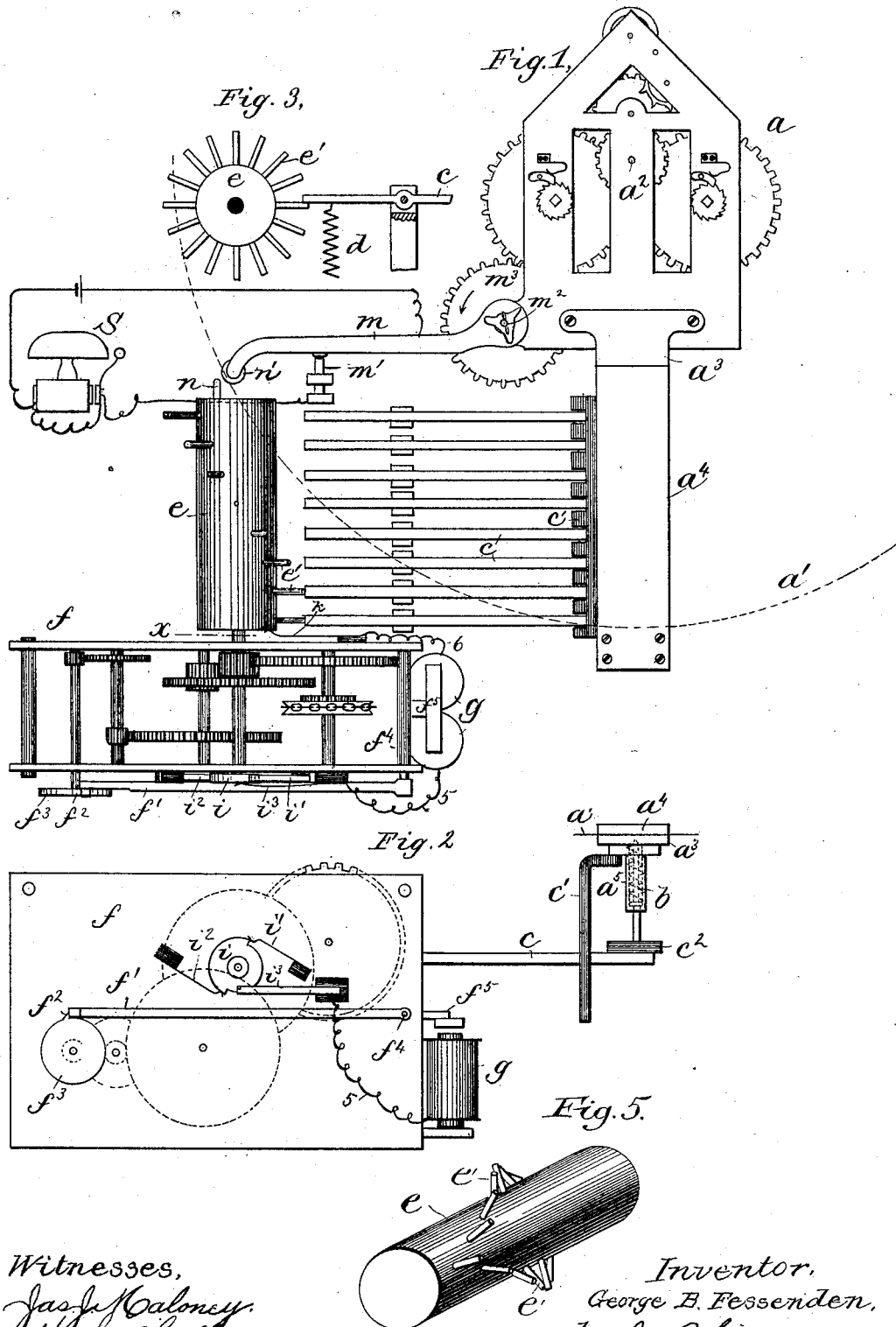


G. B. FESSENDEN.  
WATCHMAN'S TIME DETECTOR.

No. 381,993.

Patented May 1, 1888.



Witnesses,  
Jas. H. Caloney,  
W. C. Hill.

Inventor,  
George B. Fessenden,  
by Jas. P. Livermore,  
Att'y.



# UNITED STATES PATENT OFFICE.

GEORGE B. FESSENDEN, OF BOSTON, MASSACHUSETTS.

## WATCHMAN'S TIME-DETECTOR.

SPECIFICATION forming part of Letters Patent No. 381,993, dated May 1, 1888.

Application filed December 22, 1886. Serial No. 222,329. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE B. FESSENDEN, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Watchmen's Time-Detectors, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to a watchman's time-detector of that class in which the watchman visits the different stations and, by means of an electric circuit connecting each station with a clock or recording apparatus, causes a record to be made of the time at which he visits the stations. In apparatus of this class as heretofore generally made the clock or recording apparatus is connected with the different stations by a series of normally-open circuits having a common return-wire containing a battery or other source of electricity, so that when the proper branch is closed by a suitable key or button at any station a current will be caused to flow, which, through suitable electro-magnetic devices at the clock, causes a record to be made on a traveling recording-surface having a uniform time-movement. The record or mark on the traveling surface has usually been made by the direct action of an electro-magnet or its retractor, thus requiring a sufficiently-strong current to do the work of making the record, which is usually made by pricking or punching a hole through the traveling surface, which is usually a sheet of paper.

In another application, Serial No. 136,055, filed June 26, 1884, I have shown and described an apparatus having the source of the electric current placed in the branch circuits leading to the station, instead of in the common return-wire, and thus removing the possibility of producing a record by connecting a branch wire with the return-wire at any other point except at the station to be visited. In that apparatus electric generators were employed, instead of batteries, in the branch circuits, and the said generator each operated a circuit-changer, by which the circuit at any time operated is immediately thereafter opened and the circuit leading to the next station of the series immediately closed, but one station-circuit being closed at a time. The said circuit-changer in its movement that shifted the circuit from one

station to the next also operated another circuit containing the recording-instrument, which thus produced a record of each movement of the circuit-changing instrument, and the apparatus so constructed did not produce a separate independent record for each station.

The present invention consists partly in a novel arrangement of the branch and return circuits, whereby two or more series of stations may be connected with and controlled by a single circuit-changing instrument.

The invention also consists in the employment of an independent recording device for each station or for the corresponding stations of each series of stations, in connection with branch circuits leading from the recording-instrument to the different stations and independent electric generators at each station.

The invention also consists in details of construction of the apparatus and arrangement of the circuits, to be hereinafter pointed out.

Figure 1 is a plan view of the recording apparatus of a watchman's detector embodying this invention; Fig. 2, an end elevation of a portion thereof; Fig. 3, a detail in section on line *x*, Fig. 1; Fig. 4, a diagram representing the circuits, and Fig. 5 a perspective view of the circuit-changing shaft or drum.

The recording apparatus comprises a clock-work or time-movement, *a*, of usual construction, for actuating the recording-surface, which consists of a dial of paper, (indicated in dotted lines at *a'*, Fig. 1,) which is rotated with a uniform time-movement by the arbor *a''* of the said clock-work, and has its periphery supported at the point where the record is to be made by guides *a'''* *a''''*, in the usual manner. The record is made by a series of pins, *b*, working in guides *a'''* (see Fig. 2) at the under side of the paper-guide *a'''*, said pins being operated to pierce the paper by levers or hammers *c*, corresponding to the different stations. The said hammer-levers *c* are acted upon by springs *d*, (see Figs. 3 and 4,) tending to throw their ends against the recording-pins, and the said levers are all insulated from one another, working in guides *c'*, of insulating material, connected with the paper-guide *a'''*, and being provided with striking-faces *c''*, of insulated material, to prevent them from becoming electrically connected through the pins *b* and guide

<sup>a3</sup>. The said levers *c*, which with the pins *b* constitute the recording devices, are operated by a drum, *e*, provided with a series of pins or projections, *e'*, (see Figs. 1 and 3,) arranged spirally around the said drum, so that the latter in rotating through an angle equal to that between two consecutive pins, as shown in Fig. 3, will depress the striking end of one of the hammers *c*, straining the springs *d*, and then releasing the said hammer, so that it will be acted upon by the spring *d* and caused to strike a blow against the corresponding pin, *b*, sufficient to force the latter through the paper and make the record, and at the end of the angular movement the drum will come to rest with the next pin in contact with the next lever to the one which was thus operated to make a record, and will always have one pin in contact with one lever, making an electrical connection between the said lever and the drum *e*, while all the other levers are electrically insulated from the said drum.

The drum *e* is actuated and controlled in its angular movements by a mechanical motor or clock-work, *f*, driven by a weight or spring and provided with a detent-lever, *f'*, which normally engages a projection, *f<sup>2</sup>*, on a detent-wheel, *f<sup>3</sup>*, and when disengaged therefrom permits the said wheel to make one rotation, which is sufficient to turn the drum *e* through the space between two consecutive pins. The detent-lever *f'* is connected with a rock-shaft, *f<sup>4</sup>*, provided with an armature-lever, *f<sup>5</sup>*, carrying the armature for an electro-magnet, *g*, which in this instance is so proportioned as to be operated by the comparatively-weak currents produced by a small magneto-generator, as the mechanical work of disengaging the detent is very small.

The drum *e*, besides serving to operate the hammer-levers *c*, also controls the branch circuits leading from the recording apparatus to the various stations to be visited, so that a circuit will be afforded only from the station corresponding to that one of the levers *c* which happens at any time to be engaged by one of the pins *e*, as shown in Fig. 3.

The arrangement of circuits is best shown in Fig. 4, the different branches 2, 3, &c., leading to the different stations *h<sup>2</sup> h<sup>3</sup>*, &c., being connected with the different levers *c*, through their springs *d*, or otherwise, so that the said branches are in open circuit at all the said levers *c*, except the one which happens to be at any time in contact with one of the pins *e'*. A common return-wire, 4, leads from all the stations to the recording apparatus, where it is connected with the drum *e*, as shown, after passing through the magnet *g* and the commutator *i*, carried by the shaft of the drum *e*, the purpose of which will be hereinafter explained. The magnet *g* is thus included in circuit with any branch, 2 3, which happens to be closed; but instead of also placing the generator or source of electricity, usually a battery, in the said return-wire 4, as usually practiced, the electric current is in

the present invention applied in each of the branches, which are shown as provided with magneto electric generators, of usual construction, at each of the stations *h<sup>2</sup> h<sup>3</sup>*, &c. By this means it is impossible for a watchman who wishes to shirk his duty to produce a record by connecting one of the branches 2 3 with the return-wire 4 at any point, as can usually be and frequently is done; but it is necessary for him to go to the station in order to cause a current to pass through the magnet *g*, so as to produce a record.

It is obvious that instead of the magneto-generators at the stations local batteries might be used; but the generators are preferable, as they cause the branch circuits to be connected with the return-wire through their armatures, which may be of low resistance relative to that of the magnet *g*, so that even if a watchman had a battery or other generator at command he could not produce a record by placing it in circuit between one of the branches and the return-wire, as the generator would shunt the said magnet or withdraw so much of the current from it as to prevent it from operating. As shown in this instance, there are double the number of stations that there are of hammers *c*, and the pins *e'* are arranged in two reversed spirals around the drum *e*, so that in visiting the different stations the watchman will be obliged to go successively to those connected with the levers *c* in one order—that is, from one to the other end of the series of levers—and will have to visit the next series of stations in the reverse order with relation to the levers *c*. The branch wires 2 3 from each lever *c* are subdivided, having other branches, 20 30, leading to stations *h<sup>20</sup> h<sup>30</sup>*, the said stations forming two series, as it were, each corresponding to one set of spiral pins *e'* on the drum *e*, and in order to prevent a record from being transmitted from a station of one series that should be transmitted from the station of the other series connected with the same lever, there is an independent return wire, 40, for the second series, which also passes to the commutator or circuit-changer *i* on the drum *e*. The said commutator is shown as composed of a disk insulated from the drum and having one half its periphery cut away, while the other half projects so as to make contact during the different halves of the rotation of the shaft and drum with springs *i<sup>1</sup> i<sup>2</sup>*, respectively connected with the return-wires 4 40. The said disk is continuously connected by spring *i<sup>3</sup>* with the magnet-wire 5, leading to one terminal of the magnet *g*, the other terminal of which is connected by wire 6 with the spring *k* in electrical contact with the drum *e*. Thus during one-half rotation of the drum the return-wire 4 is connected, through the spring *i<sup>1</sup>*, disk *i*, spring *i<sup>3</sup>*, wires 5 and 6, including the magnet *g* and spring *k*, with the drum *e* and pins *e'* thereof, so that when one of the said pins comes in contact with one of the levers the corresponding branch—as 2, for instance, Fig. 4—is closed,

and by operating the generator  $h^2$  a current will pass through the magnet  $g$ , releasing the motor  $f$  and causing the shaft to turn sufficiently to operate that lever and bring the next pin in contact with the next lever. The generator  $h^{20}$  will at this time produce no effect, because its return-wire 40 is open at the spring  $i^2$ . The station  $h^2$  will then be the only one in circuit, and when a current is generated there it will cause the second lever of the series to make a record, and so on until all the stations of the first series have been visited, making a series of records which follow one another in one direction on the recording-surface, each succeeding one being, for instance, nearer the center of the said recording-surface than the preceding one. Then, after all this series of stations have been visited, the drum  $e$  will have made a half-revolution, by which the uncut portion of the disk  $i$  comes in contact with the spring  $i^2$ , leaving the spring  $i^2$ , so that the return-wire 4 and first series of stations will be in open circuit, while the return-wire 40 is connected, through the spring  $i^2$ , disk  $i$ , and spring  $i^3$ , with the wires 5 6, including the magnet  $g$ , and with the drum  $e$ , so that the different branches 20 30, and so on, are brought into circuit in the rotation of the drum  $e$ , but in the reverse order to that followed for the first series of stations, so that the records for the second series of stations are successively more remote from the center of the paper disk, and there is thus no difficulty in distinguishing the different stations on the recording-disk, which shows the time that the watchman visited each station in each series.

When desired, the apparatus may be provided with means for operating a local alarm in case the watchman fails to visit the different stations for any reason, as described in patent to E. T. Quimby, No. 236,257, dated January 4, 1881. In the said patent to Quimby the circuit closer controlling the local-alarm circuit is operated by the clock and by the magnet which actuates the recording-marker; and the present invention, so far as relates to the local alarm, consists in operating the circuit-closer by the clock or time movement and by a mechanical actuator operating in connection with the recording mechanism. This part of the apparatus is shown in Fig. 1, and consists, essentially, of a circuit-closer,  $m m'$ , the movable member  $m$  of which is frictionally connected with an arbor,  $m^2$ , rotated by a gear,  $m^3$ , meshing with one of the slow-moving wheels of the clock  $a$ , which may be the same that actuates the recording-surface and which moves the member  $m$  slowly toward the member  $m'$ , so that unless this movement is arrested the members will come together and close the local circuit of the alarm  $S$  at the end of a definite period of time, depending on the distance the members  $m m'$  are separated at the beginning of such movement.

In order to prevent the members  $m m'$  from coming together as long as the watchman is attending to his duty, the member  $m$  is acted upon by a mechanical actuator tending to move it in the opposite direction to the movement produced by the clock, and shown in this instance as consisting of a pin or cam projection,  $n$ , connected with the drum  $e$ , and arranged to strike a roller,  $n'$ , at the end of the lever  $m$  in the rotation of the drum  $e$ , and thereby move the lever  $m$  a definite distance from the co-operating member  $m'$ , so that a definite period of time will have to elapse after the projection  $n$  passes the roller  $n'$  before the circuit can be closed, which period is made by adjusting the member  $m'$  a few minutes greater than the time allowed for the watchman to make his round of visits.

If desired, there might be a series of the projections  $n$  corresponding to each station, and the time shortened so that the alarm would be sounded if the watchman delayed too long between the visits to any two stations.

It is obvious that the arrangement of the current-generators at the stations, instead of in the common return-wire, the said generators co-operating with corresponding recording devices, is not limited to the specific construction of said recording devices herein illustrated.

I claim—

1. The combination, with a moving recording-surface, of a series of recording devices and an electro-magnet controlling the operation thereof, and a series of branch circuits corresponding with said recording devices, and each being subdivided and leading to two separate stations, a return-wire common to one series of stations connected with one set of subdivided circuits and another return-wire for the other series of stations, and a commutator controlling the said return-wires, whereby the controlling electro-magnet is connected with one return-wire while records are being made from one series of stations and with the other return-wire while records are being made from the other series, substantially as and for the purpose described.

2. The combination, with a time-motor or clock and recording-surface moved thereby, of a series of recording devices and a number of branch circuits leading from said recording devices, respectively, to the different stations to be visited, and a return-wire common to said stations, and a magneto-electric generator included in the branch wire at each of the stations, substantially as and for the purpose described.

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

GEO. B. FESSENDEN.

Witnesses:

JOS. P. LIVERMORE,  
JAS. J. MALONEY.