

(No Model.)

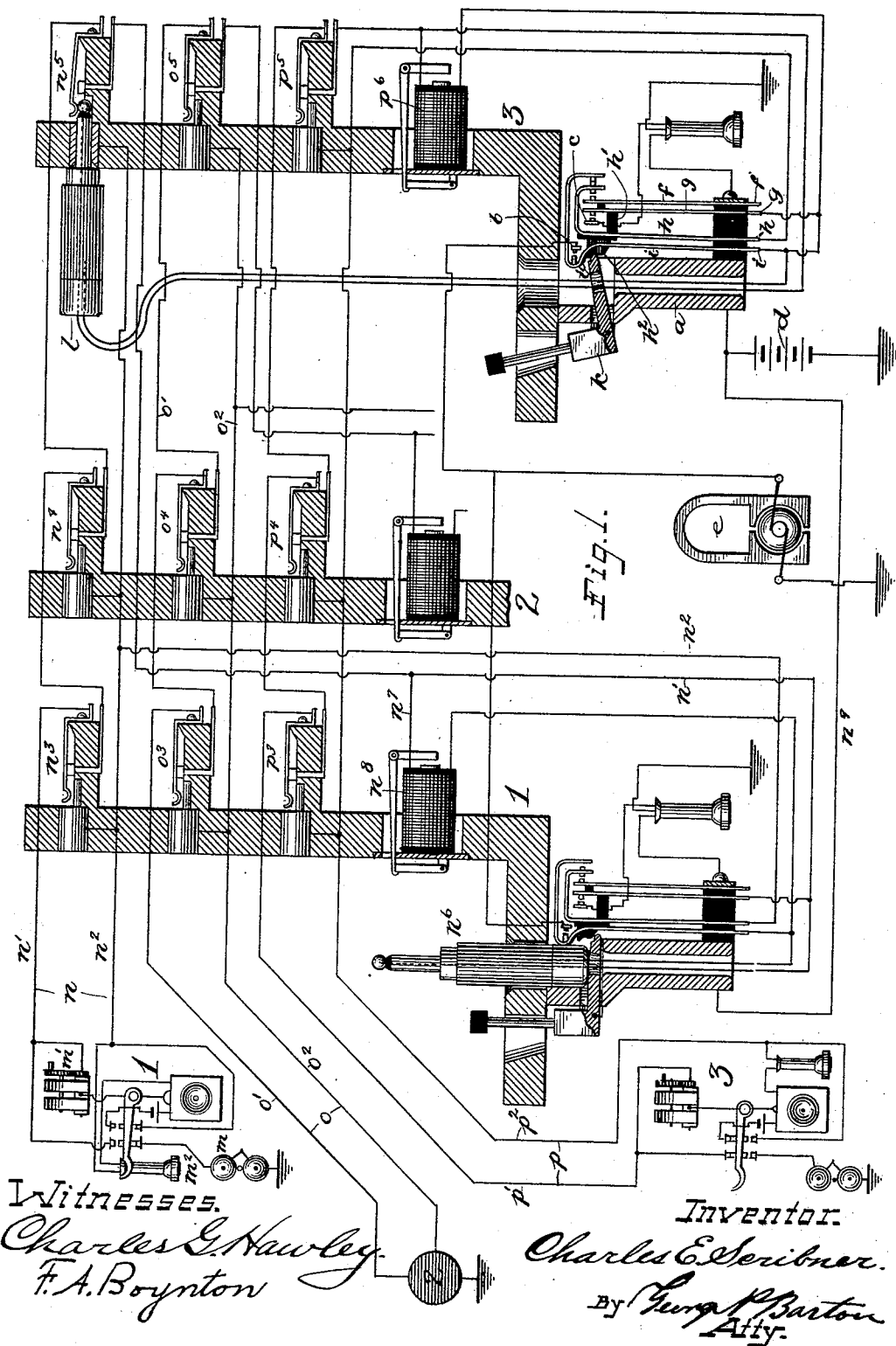
C. E. SCRIBNER.

2 Sheets—Sheet 1.

MULTIPLE SWITCHBOARD SYSTEM.

No. 496,905.

Patented May 9, 1893.



Witnesses.

Charles E. Hawley.  
F. A. Boynton

Inventor.

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(No Model.)

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2 Sheets—Sheet 2.

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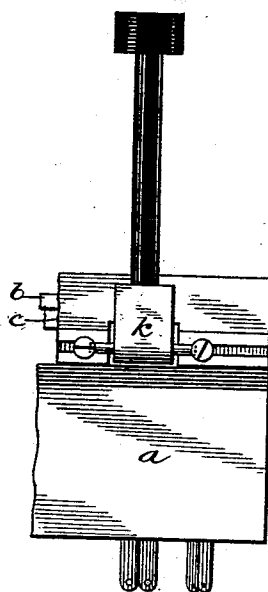


Fig. 2.

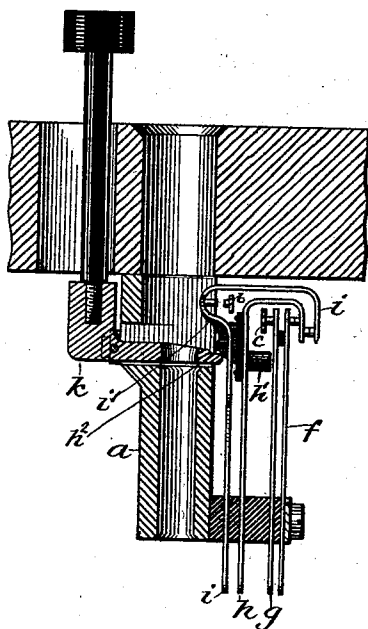


Fig. 3.

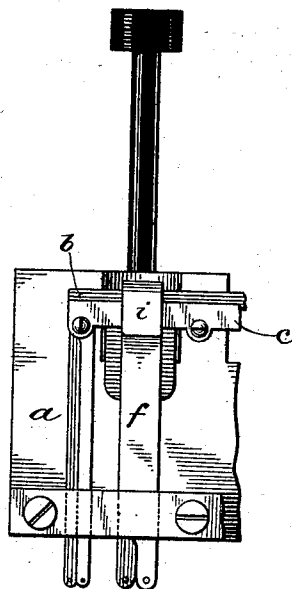


Fig. 4.

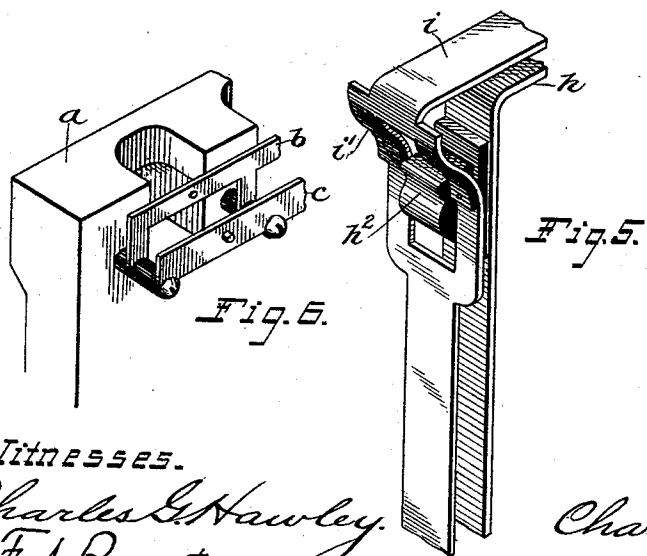


Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## MULTIPLE-SWITCHBOARD SYSTEM.

SPECIFICATION forming part of Letters Patent No. 496,905, dated May 9, 1893.

Application filed March 1, 1890. Serial No. 342,276. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES E. SCRIBNER, 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 Multiple-Switchboard Systems, (Case No. 221,) 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 herein relates to metallic circuit multiple switch board systems and embraces the following features. First, the subscriber's bell is placed in a normally closed ground branch and the subscriber's generator and telephone are so arranged that when the telephone is on the switch the telephone will be shunted and the generator included in the circuit, while on removing the telephone from the switch the generator will be shunted and the telephone brought into circuit, the ground branch through the bell being opened also by the removal of the telephone. Second, the resistance of the subscriber's bell in the ground circuit serves to divert the test current in the proper direction to cause the click in the telephone when the test is made at one of the test pieces of the line. Third, the generator in one limb of the metallic circuit diverts calling current through the other limb to avoid throwing clearing out drop when called subscriber is rung. Fourth, the cord switch consists of four springs and special contacts, the contacts and one spring being common to several switches and connected the one contact with the generator, the other contact and the common spring with the telephone. A bell crank lever is provided which is adapted to be forced against one or the other of two of the springs so as when forced against one of the springs to open the telephone contacts and when forced against the other spring to close the generator to line in one direction and open the circuit in the other direction.

In my application, Serial No. 339,597, filed February 7, 1890, (Case No. 225,) for multiple switch board apparatus, I have described and claimed certain broad or general features of a multiple switch board system, which are also exemplified in this application; I therefore disclaim as to this application such part of

subject matter, limiting myself to the specific claims presented herein.

My invention will be understood by reference to the accompanying drawings, in which—

Figure 1 is a diagram illustrative of three telephone lines connected with spring jack switches on each of three switch boards with operators' outfits at two of the boards. Figs. 2, 3 and 4 are front, side and rear views of my cord switch. Figs. 5 and 6 are detailed views of certain portions thereof.

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

I will first describe the construction and operation of the cord switch. The frame *a* of a strip of cord switches may be of brass and is provided with plug sockets and the common contact pieces *b c*; when this cord switch is used in connection with the system shown in Fig. 1 the frame *a* is connected to ground through a test battery *d*; the contact *b* is connected with the central office generator *e*; the contact strip *c* is connected with one side of the operator's telephone while the spring *f* which may be common to all the cord switches of one board is connected with the other side of the telephone. The spring *g* which may be connected with one limb of a circuit is adapted to close upon the telephone contact *c* while the spring *h* which may be connected with the other limb of the metallic circuit is adapted to close upon spring *f*; this spring *h* is provided with a stud *h* projecting toward spring *g* and with a block of rubber *h*<sup>2</sup> which protrudes so as to be accessible from the front of spring *i*; the spring *i* is provided also with a bearing surface *i'* of insulating material. These two springs *h* and *i* are adapted to be changed in position by the movement of a lever *k* which is adapted, as it is vibrated, to take the surface *h*<sup>2</sup> of spring *h* in the first place and upon further movement to pass over the said surface or projection *h*<sup>2</sup> and come against the surface *i'* of spring *h*. The lever *k* when forced against the surface *i'* moves the spring *i* against the contact *b* at the same time separating said spring *i* from its contact with spring *h*; the surface *i'* is of such form with respect to the end of the lever *k* coming against the same that on letting go the handle of lever *k*

the tension of spring  $i$  will carry the lever  $k$  back into the notch in the bearing surface of insulating piece  $h^2$ . A plug  $l$  which may be provided with a metallic heel is adapted to rest in the socket of its cord switch and to force the spring  $i$  backward so as to separate the contact thereof from spring  $h$  and at the same time the telephone contacts are opened; that is to say, the spring  $g$  will be separated from contact  $c$  and spring  $f$  from its contact with spring  $h$ . It will be noted that the spring  $i$  when thus moved by the insertion of the plug will come against the shoulder or base of the rubber block  $h^2$  interposed between said springs  $h$  and  $i$  and that the force of spring  $i$  thus exerted upon spring  $h$  serves to carry the contact of said spring  $h$  away from its contact with spring  $f$  and at the same time the pressure of the stud  $h'$  against the spring  $g$  carries said spring  $g$  away from its contact  $c$ . Although the spring  $i$  is moved by the insertion of the plug in its socket, as above described, in a direction toward the generator contact  $b$  the movement is not sufficient to actually close this generator connection, such closing of the generator contact being effected by the vibration of the lever  $k$  to bring the working end thereof against the surface  $i'$ . When, however, the arm  $k$  is tilted to press the spring  $h$  backward the contacts of springs  $h$  and  $i$  will be pressed together, the stud  $h'$  will come against the spring  $g$  and hold the same separated from the contact  $c$  while spring  $f$  will be separated from spring  $h$ , that is to say, when the springs of the switch are in the position shown in Fig. 3 the stud  $h'$  will be at a short distance from the spring  $g$ , say about one half the distance which the spring  $h$  is moved when the lever  $k$  is tilted as shown at board 3, Fig. 1, so that when the lever is thus tilted the telephone contacts will stand open.

I will now describe the telephone line circuits in connection with the operators' outfits and subscribers' apparatus as shown in Fig. 1. The subscribers' outfits at stations 1 and 3 are shown somewhat in detail. The subscriber's bell  $m$  is included in a normally closed ground branch; the generator  $m'$  is included in the circuit when the telephone is on the switch as shown at station 1, but is shunted when the telephone is removed from the switch as shown at station 3. The telephone  $m^2$  in like manner is included in the circuit when off the hook and shunted therefrom when upon the hook. The telephone line  $n$  of station 1 extends in two branches  $n'$  and  $n^2$  to the central office, the branch or limb  $n'$  passing through the springs and contacts of the switches  $n^3$   $n^4$   $n^5$  and from the contact of the switch on the last board to the tip of the terminal plug  $n^6$  of the line. A branch  $n^7$  including individual annunciator  $n^8$  extends at the central office as shown from limb  $n'$  to the spring  $i$  of the cord switch and thence when the plug  $n^6$  is resting in its socket as shown through the metallic heel of said plug to the

frame of the cord switch, and thence by branch  $n^9$  through the battery  $d$  to ground. The limb  $n^2$  is connected as shown with the test pieces of switches  $n^3$   $n^4$   $n^5$  and extends thence to the spring  $h$  of the switch and thence by spring  $i$  when the two springs are in contact to the sleeve of the plug  $n^6$ . Thus it will be seen normally the two limbs of the circuit are open at the central office except that a connection is made by a bridge or branch  $n^7$  from limb  $n'$  through the annunciator, spring  $i$  of the cord switch, the ring or metallic piece upon the plug, the frame of the switch, connection  $n^9$  and battery  $d$  to ground. Telephone line  $o$  of station 2 is connected in like manner by limbs  $o'$   $o^2$  through the switches  $o^3$   $o^4$   $o^5$  of the different boards and through similar cord switch apparatus at board 2 which I have not deemed it necessary to illustrate. Station 3 is connected by line  $p$  in branches  $p'$   $p^2$  in like manner with switches  $p^3$   $p^4$   $p^5$  and thence with the terminal plug  $l$  and the cord switch at board 3.

At board 3 I have shown telephone line  $p$  in connection with telephone line  $n$ , the cord switch at board 3 being in position to maintain contact between springs  $h$  and  $i$  and thus to maintain closed the connection between the test rings of line  $p$  and the strand of the cord connecting with the sleeve of the plug, while at the same time the annunciator  $p^6$  is bridged across the united circuit of the two lines and the operator's telephone circuit is disconnected. At board 1 I have shown the plug  $n^6$  resting in its socket in its normal position.

I will now describe somewhat in detail the manner of calling the central office, answering the call, testing the line called for, completing the connections and clearing out and disconnecting the lines. Subscriber at station 3 by operating his generator will send current over limb  $p'$  through the annunciator  $p^6$  and thence through the spring  $i$  of the switch at board 3 and, when the plug is in its socket, through its metallic heel and thence through the frame of the cord switch to ground through battery  $d$ . The operator seeing the shutter of annunciator  $p^6$  fall will lift plug  $l$  from its socket, the simple act of lifting this plug bringing her telephone into connection with line  $p$ . It will be noted that the circuit first formed is from ground at the subscriber's station through the branch containing the bell to the subscriber's switch, thence through the generator and thence over the limb of the circuit containing the circuits and contacts of the switches to the branch containing the individual annunciator and thence through the cord switch to ground as before traced. On lifting the plug from the socket the telephone is brought into circuit and the ground circuit through the test battery is opened; the operator while thus holding the plug which has been lifted receives the order for some other line; in this instance the order was for the line  $n$  of subscriber 1. The operator having received the order applies the plug to the test

piece of the switch of this line, that is, to the test piece of switch  $n^5$ . Now if the line is free when the test is made battery circuit will be closed from the test battery  $d$  to test piece of switch  $n^5$ , thence to the tip or sleeve of plug  $l$ , we will say the tip, and thence to the spring  $g$  of the cord switch and thence through half the coil of the telephone to ground. The test circuit which is thus formed when the line is free will be understood by tracing the test circuit of line  $n$ , the cord switch and operator's telephone outfit of said line being shown in detail. Thus tracing from ground through battery  $d$  the battery will find circuit over branch  $n^9$  to the frame  $a$  of the cord switch and thence through the metallic portion of the plug  $n^5$  to spring  $i$  thereof and thence by branch  $n^7$  to limb  $n'$  and thence through the contacts and springs of switches  $n^5$   $n^4$   $n^3$  over said limb  $n'$  through the generator and thence to the telephone switch at station 1 and thence back over limb  $n^2$  to the test portion of the line. It will be noted that the bell  $m$  is in a ground branch connected with the metallic circuit and hence its resistance will divert current over the limb  $n^2$ . Now the test being made by plug  $l$  at switch  $n^5$  and the line being found free the operator will insert plug  $l$  into switch  $n^5$  as shown, thus completing the connection between the two lines  $p$  and  $n$ . In order to signal sub-station 2 the operator pulls forward the handle of lever  $k$  to cause the foot or presser of said lever to take the surface  $i'$ , thus forcing spring  $i$  into contact with the generator connection  $b$ , while at the same time contact between springs  $i$  and  $h$  is broken. When thus forced against the generator contact the current from the generator will be directed to the strand of the cord of plug  $l$  connecting with the sleeve thereof and thence over limb  $n^2$  to the telephone switch at station 1 and thence through the subscriber's bell to ground. When the generator is thus closed to line the contact between springs  $i$  and  $h$  is broken as is desirable to prevent ringing in both directions and the current is sent over the limb  $n^2$  through the subscriber's bell to ground. The generator of the subscriber which is included in the limb  $n'$  will prevent current from being diverted through the annunciator  $p^6$  to the strand of the cord connecting with the tip of the plug and thence through limb  $n'$  and generator  $m'$  in sufficient quantity to operate said annunciator  $p^6$ . The call having been thus sent the operator will release the lever  $k$  which will be carried back by the force of the spring  $i$  so as to take the notch in the piece  $h^2$ . In this position the telephone will be disconnected from the circuit, the generator contact  $b$  will be opened while the circuit will be closed between springs  $h$  and  $i$ . When the subscribers are through talking and the telephones are restored to their hooks one or the other operates his generator, thus throwing down the shutter of annunciator  $p^6$  which is bridged into the circuit when the

contact between springs  $h$  and  $i$  is closed as just described. Now the generator of the subscriber who does not send the clearing out signal being included directly in the circuit it is evident that its resistance and retardation will act to cause more current to be diverted through the bridge containing the annunciator  $p^6$  so that the current through the annunciator will be sufficient to operate the same. The clearing out signal being thus received the operator will withdraw plug  $l$  from switch  $n^5$  and return it to the socket of its cord switch, the act of restoring the plug to its socket serving to bring the lever  $k$  back to its normal position.

The cord switch is provided with a set of springs which are adapted to be moved when the plug is inserted in the socket, the spring against which the plug impinges acting through suitable stops or studs upon the other springs of the set. The pivoted lever is adapted to be pressed against either one of two of the springs to effect different commutations or changes in the spring connections. Thus by means of the plug and the pivoted lever three distinct commutations or positions of the springs may be effected.

I have shown a telephone having a ground connection in connection with a flexible cord and plug at each of the switch boards to serve as a current indicating device in testing a line. It is evident that any form of current indicating device would answer the purpose though the telephone thus included in a normally open ground branch is most convenient.

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

1. The combination, with the subscriber's telephone switch, of a ground branch containing the subscriber's bell, adapted to be closed to the switch when the telephone is hung thereon, the subscriber's telephone and the subscriber's generator each in a separate branch circuit, and contacts; whereby the telephone is shunted when hung upon the switch, leaving the generator and bell in circuit; and whereby, on removing the telephone from the switch, the shunt around the generator is closed, and the telephone brought into circuit, while at the same time a ground branch containing the bell is opened.

2. A telephone line connected in two branches with switches on different switch boards at the central office, said limbs being normally open at the central office, a branch or bridge from one of said limbs normally closed through an individual annunciator and switching device to ground at the central office and the subscriber's generator included in the limb with which said annunciator branch is connected and a ground branch at the subscriber's station normally closed to the subscriber's telephone switch, whereby the subscriber's generator is brought into a ground circuit between the subscriber's bell and the individual annunciator to operate the

same, substantially as and for the purpose specified.

3. A telephone line extending in metallic circuit to switches on different switch boards at the central office, one limb of said metallic circuit being branched through a switching device to a test battery and ground, the subscriber's telephone switch normally included between the subscriber's bell which is in a ground branch and the subscriber's generator included in that limb of the metallic circuit which at the central office is provided with the branch connections through the test battery, in combination with an operator's telephone included in a ground branch having a cord and plug terminal, whereby on applying said plug terminal to the test piece of a switch of the line current is diverted by the resistance of the subscriber's bell in its ground branch to the test piece at which the plug terminal is applied, thereby indicating by the sound in the operator's telephone that the line is free.

4. A subscriber's outfit connected with a metallic circuit extending in two limbs from the subscriber's station to the central office, said outfit consisting of a generator, a telephone, a bell and an automatic switch, the generator and telephone being in different limbs of the metallic circuit and the bell in a ground branch which is closed when the telephone is hung upon the switch to bring the said bell and generator into circuit and disconnect the telephone therefrom.

5. A telephone line extending in metallic circuit in two limbs or branches to the central office, one limb being connected with the springs of the switches of the line on different switch boards and through a branch containing a test battery to ground, the other limb extending to the test pieces of said switches and being normally open, in combination with a bell included in a normally closed ground branch at the subscriber's station and current indicating devices at the different

switch boards adapted to be applied to the test piece of a line thereat, whereby the resistance of the subscriber's bell in the ground circuit serves to divert current from the test battery to the test piece to which the current indicating device is applied.

6. A telephone line consisting of two limbs or branches extending each from the subscriber's station to the central office, both branches being connected with the telephone switch and a ground branch containing the subscriber's bell, which branch is closed to the switch when the telephone is not in use, in combination with an annunciator bridged between the two limbs at the central office, the calling generator, and switching apparatus for connecting the same with the limb, which is directly connected through the subscriber's bell, substantially as and for the purpose specified.

7. In a cord switch the combination with a set of contact springs, of a plug adapted to bear upon one of said contact springs to move the same and thereby the other contact springs of the switch to alter their connections and a lever adapted to bear upon either of two of said contact springs, whereby three different commutations may be effected by the said cord switch.

8. The combination with the pivoted lever, of two springs having bearing surfaces against which said lever is adapted to be forced when vibrated, one of said bearing surfaces being notched and the other being curved, whereby the tension of the spring having the curved bearing surface, when the lever is released after being forced against the same, causes the lever to take the notch of the other spring, substantially as and for the purpose specified.

In testimony whereof I hereunto subscribe my name this 17th day of February, A. D. 1890.

CHARLES E. SCRIBNER.

Witnesses:

CHARLES G. HAWLEY,  
F. A. BOYNTON.