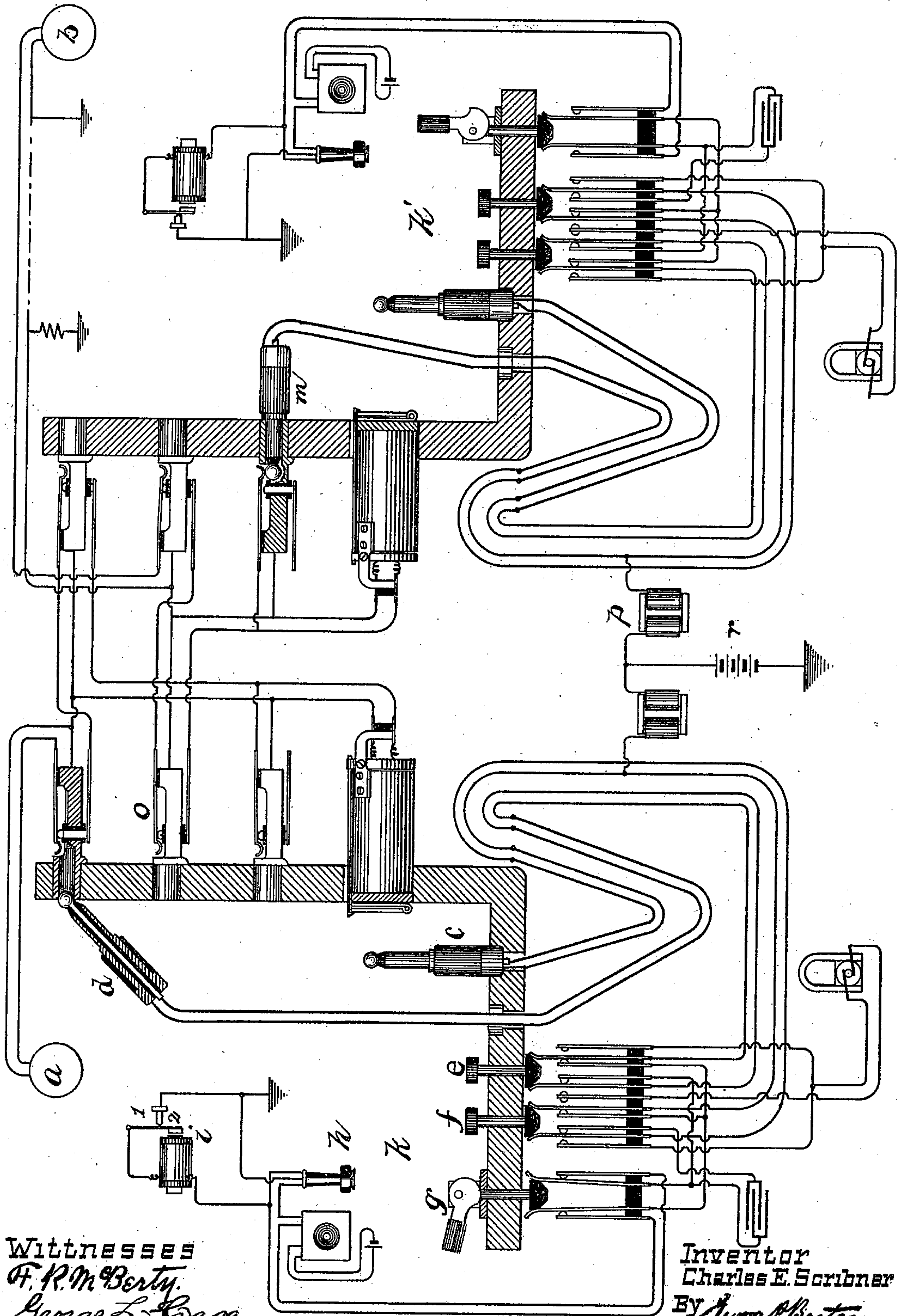


(No Model.)

C. E. SCRIBNER.  
TEST SIGNAL FOR MULTIPLE SWITCHBOARDS.

No. 502,772.

Patented Aug. 8, 1893.



Witnesses  
F. R. M. Bertie.  
George L. Lagg.

Inventor  
Charles E. Scribner  
By *August A. Barton*  
Atty.



# UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN  
ELECTRIC COMPANY, OF SAME PLACE.

## TEST-SIGNAL FOR MULTIPLE SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 502,772, dated August 8, 1893.

Application filed February 24, 1891. Serial No. 382,358. (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 Test-Signals for Multiple Switchboards, (Case No. 250,) 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 multiple switch board systems for telephone exchanges, and its object is to provide a test signal which shall not readily be confused with sounds due to accidental and extraneous causes.

In the testing system commonly in use, an operator upon applying her testing plug to a test ring of a telephone line, hears a click in her telephone if the line be in use; but when a telephone line is run parallel or in proximity to electric light lines, or other wires carrying heavy currents, currents, varying in their intensity and character according to their source, are induced upon the telephone line; and these currents escaping to ground through the operator's testing circuit, produce false test signals and thus cause confusion. To obviate this difficulty, I place in shunt around the testing operator's receiver, a rapidly vibrating circuit breaker, actuated by that portion of the testing current which passes through the shunt, the rapid interruption of which current produces in the testing operator's telephone a continuous musical tone which is easily recognized and distinguished from clicks and buzzes, caused by static discharges, induction, or stray currents.

In most testing systems for multiple switch boards means are provided whereby the act of thrusting a connecting plug into any spring jack, shall cross with the frame of that jack one pole of a battery whose other pole is grounded; and since the frames of all the spring jacks of one line are connected together by wires, an operator touching the frame of a spring jack of that line at another board, with one terminal of a telephone whose other side is grounded, will hear a click in her telephone if the line be in use as before described.

In the accompanying drawings which are illustrative of my invention I have shown two multiple switch boards, equipped with well known circuits and apparatus for calling and communicating, and a system for testing such as that described.

*a* and *b* represent two subscriber's stations, having lines, metallic and grounded, respectively, terminating in the usual spring jacks and annunciators of two multiple switch boards.

*c* is an answering plug, *d* a testing and connecting plug.

*e* and *f* are ringing keys adapted to ring out over the lines of the answering and calling subscribers, respectively.

*g* is a listening key, by means of which the operator may connect her telephone set to or disconnect it from the lines of two talking subscribers.

*h* is the operator's talking set, having the usual transmitter and induction coil, and a "split" telephone, that is, one the terminals of whose coil are connected to the lines, but the center of the coil is connected to earth by a leg, as shown.

*i* is a vibrating circuit breaker of well known pattern. The current after traversing its magnet coil, passes through the flexible spring and the fixed contact 1 and 2; when the current is of sufficient strength, the magnet attracts the armature attached to spring 1, and interrupts the current at contact 2; thus a continuous rapid vibration is maintained as long as the electro motive force exists between the terminals of the instrument.

In order that several operators may make use of a common battery for testing purposes, a retardation coil is included between the battery and the sleeve of each plug to which the battery is connected; thus, as is well known, talking currents are prevented from escaping from one line to another.

The operations of calling and communicating are conducted in an obvious and well known manner.

I will now describe in greater detail the process of testing to determine at any board whether any line is busy at another board.

If operator *k* should test the jack of sub-



scriber *a* at her board, by applying her test plug *d* to the frame of the jack in the manner shown in the drawings, although her circuit from the tip of the plug through her telephone is complete, she would hear no sound in her telephone, there being no battery anywhere in circuit. But when a connection is made to a line by thrusting a plug into a jack, as plug *m* of *k'* is set, obviously, difference of electrical potential is set up between the connected frames of all the jacks of that line and the earth, due to the electro motive force of the grounded battery *r*. Now if operator *k* should test such a jack, as for instance the jack *o* of line to station *b*, by applying to it the tip of testing plug *d* a current will flow from the battery, through retardation coil *p*, through sleeve of plug *m*, to frame of jack *o*, through tip and cord of plug *d*, through listening key, to the junction of the wires leading through her telephone to ground, and through the vibrating circuit breaker to ground. Here, as long as the vibrating spring 1 remains closed on its contact 2, the current divides, a part passing through the telephone and a part through the circuit breaker. But at once under the magnetizing influence of the current in its coil, the circuit breaker opens its own circuit, causing a greater current to pass through the telephone. Thus there flows through the telephone an undulatory current, whose variations are complementary to the interrupted currents through the circuit breaker, and a continuous musical tone is produced in the telephone.

It is obvious that the operation of my invention is in no wise dependent upon the keyboard connections. Hence I do not limit myself to its employment in connection with the keyboard circuits shown in the drawings. It is moreover obvious that my device might be employed in connection with many other test systems without affecting the substance of the invention; thus, the test system might be so arranged that the signal should be given only when the line was not busy, and the absence

of any sound in the telephone would be indicative that the line tested was busy.

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

1. For providing a sonorous test-signal for multiple switch boards, the combination of a telephone, with a vibrating circuit breaker placed in shunt around the telephone and actuated by a shunted portion of the test current, substantially in the manner specified.

2. For providing a sonorous test signal, the combination of a test circuit, with a telephone, a vibrating circuit breaker placed in shunt around the telephone, and actuated by a portion of the test current, and a battery or other source of electricity included in the test circuit, substantially in the relation specified.

3. The combination of electrically connected test rings, means for crossing the test rings to earth, and a battery or other source of electricity included in circuit between the test ring and earth, with a telephone connected at one side to earth, a vibrating circuit breaker in shunt around the telephone, and actuated by a shunted portion of the test current, and means for connecting the other side of the telephone to a test ring, for the purpose and in the manner described.

4. The combination of electrically connected test rings, means for crossing the test rings to earth, a battery and a retardation coil included in circuit between the test ring and earth, with a telephone connected at one side to earth, a vibrating circuit breaker in shunt around the telephone, and actuated by a shunted portion of the test current, and means for connecting the other side of the telephone to a test ring, for the purpose and in the manner described.

In witness whereof I hereunto subscribe my name this 30th day of January, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,  
GEORGE L. CROGG.