

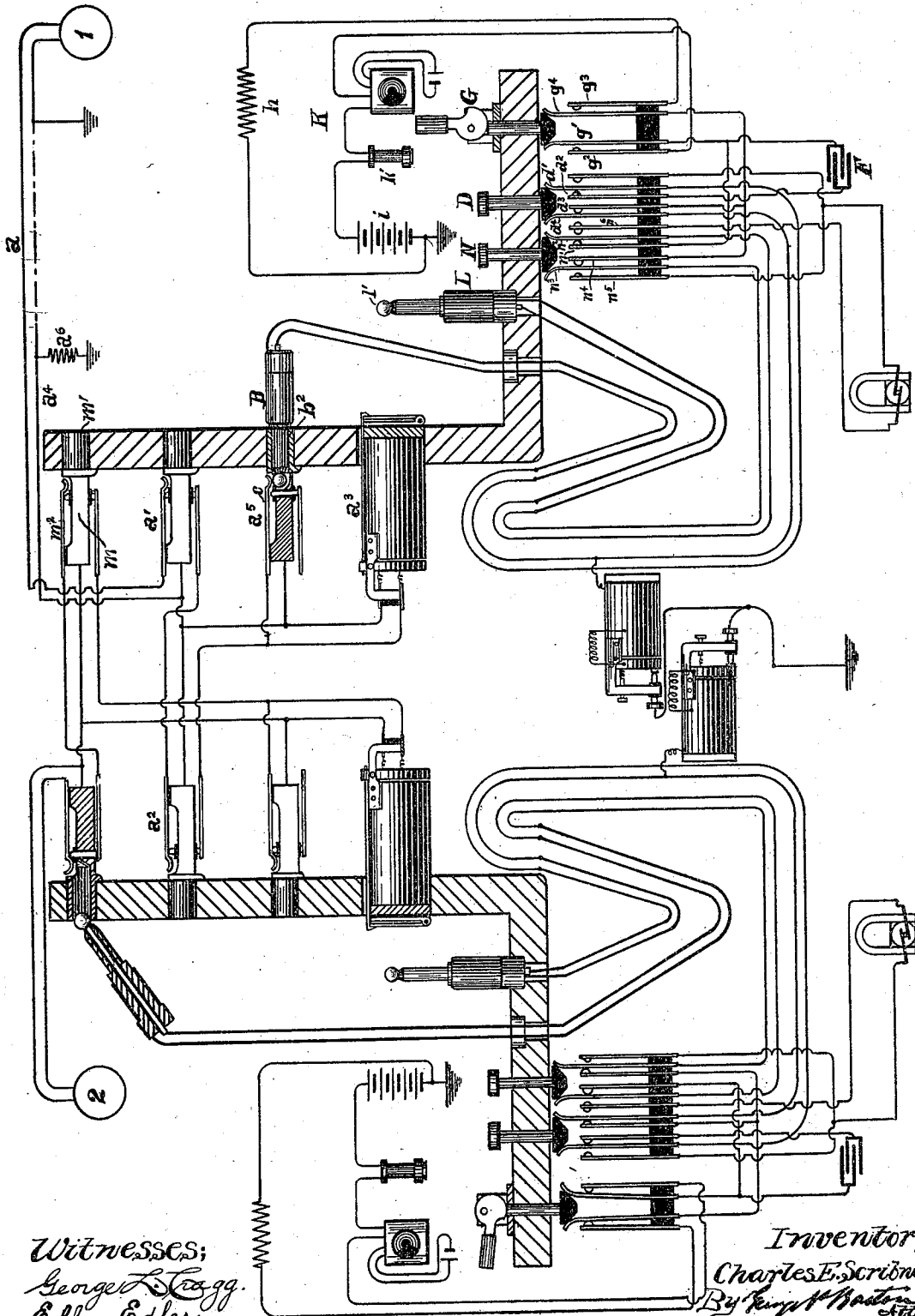
(No Model.)

C. E. SCRIBNER.

VIBRATING CIRCUIT BREAKER AND RETARDATION COIL FOR TEST
SYSTEMS.

No. 504,251.

Patented Aug. 29, 1893.



Witnesses;
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN
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VIBRATING CIRCUIT-BREAKER AND RETARDATION-COIL FOR TEST SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 504,251, dated August 29, 1893.

Application filed March 4, 1891. Renewed December 13, 1892. Serial No. 455,013. (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 Vibrating Circuit-Breakers and Retardation-Coils for Test Systems, (Case No. 247,) 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 test systems for multiple switch boards of telephone exchanges; and its object is to provide a retardation coil through which to ground the test side of a telephone line which shall at the same time serve the purpose of periodically interrupting the test current so as to produce a characteristic sound in the operator's telephone.

Heretofore a vibrating circuit breaker has sometimes been included in one or another part of a test circuit, to produce a tone in the testing operator's telephone when a test was made, but in the systems employing the common mode of completing the test circuit of a line which is in use, a retardation coil must be included in the ground connection or "third leg" to prevent crossing of two or more telephone lines which may happen to be in use at the same time.

My invention provides, included in the circuit from the test rings of a line to ground, a retardation coil provided with an armature normally held at a slight distance from the core of the retardation coil, but free to be attracted thereto, and constants adapted to open the circuit through the retardation coil when its armature is so attracted, whereby the armature is thrown into rapid vibration upon the passage through the coil of a sufficient current, as a testing current; and the rapid interruption of this current will produce a musical tone in the telephone of the testing operator, at another part of the circuit. By this arrangement I am enabled to dispense with the special vibrating circuit breaker.

My invention is illustrated in the accompanying drawing, in which I have shown two subscribers' stations connected one by a grounded line and the other by metallic cir-

cuit lines, with their respective spring jacks and annunciators on two multiple switch boards. The lines from the station shown at the right of the drawing, for example, may be traced through the line spring and contact of its line jack at the first board, thence passing similarly through the line spring and contact of its jack at the second board, thence returning to its individual annunciator at the first board, through the coil of the annunciator, thence returning through the return wire and the earth to station 1. The line is provided with an answering jack at the board on which its annunciator is located, bridged in between the two sides of the line. The return line is connected to the frames of the various jacks of the line.

The operators' outfits for calling, communicating and testing are shown complete at both boards.

The connecting plugs with which each operator is furnished are of the well known type. Their tips and their sleeves are connected through a condenser, and directly, respectively.

Included in the connecting circuits, are two ringing keys, adapted to disconnect both contacts of either plug from the corresponding contacts of the other and connect them to the two poles of a calling generator.

A listening key is provided adapted, when operated, to close the terminals of an operator's telephone set to the tip strand and sleeve strand respectively of the connecting cords, thus bridging in the telephone between two lines connected through the medium of the two plugs.

In connection with the sleeve strand of the connecting cord I have shown my modified retardation coil, included in a "leg" from the sleeve strand to earth, whereby the test ring or frame of any jack into which either plug is thrust, is grounded through the coil.

Included in the circuit of the operator's telephone I have shown a grounded test battery, so that an operator touching a grounded test ring with the tip of that one of her plugs not included in the condenser circuit, would hear a sound in her telephone due to the current from her test battery through the test circuit to earth; and since the circuit is

through the contacts and coil of the retardation coil, and hence is being rapidly interrupted, the sound heard will be a musical tone which is characteristic of that retardation coil.

I will now proceed to describe more in detail the construction of my improved retardation coil.

In constructing my invention I prefer to use that type known as the tubular retardation coil. This consists, as is well known, of a central core of iron, on a spool surrounding which a great length of wire is wound. Outside this coil is placed a tube of iron, completely surrounding the coil and of the same length as the core, and extending from end to end of it, in order to reduce the magnetic resistance of the magnetic circuit. At one end is provided a plate of iron joining the core with the external iron covering. At the other end is provided, in my invention, an armature consisting of a circular disk of iron of the same size as the tube surrounding the coil. This disk is pivoted at its upper portion on pivots extending in a direction at right angles to the axis of the coil, and is so adjusted as to have a slight motion toward and from the presented ends of the core and tube. The disk is normally held against an adjustable insulated stop which serves as a limit of its motion from the core, by a feeble spring, one end of which is attached to the armature, and the other to any suitable fixed support, as an arm rigidly fastened to the tube surrounding the coil. The circuit may be traced through the coil of the retardation coil to the armature, thence through the insulated stop against which the armature normally bears, and to earth.

Having thus fully described the apparatus of the telephone system shown, and my invention as applied thereto, I will now proceed to trace the various operations comprised in that of connecting two subscribers. Suppose, for example, that the subscriber at station 1 wishes to communicate with a subscriber at station 2. Ringing, his calling current passes, as generally traced before, through line a , through the line springs and contacts a' and a^2 at the first and second boards; thence through the annunciator a^3 , thence returning directly over line a^4 through resistance a^5 and earth to the station 1. The operator at the first board seeing the shutter of annunciator a^3 fall, inserts plug B into the answering jack a^5 , and places the listening key G in its alternate position, as shown at the second board, whereby the circuit is extended from the line spring c of the spring jack, through the tip of plug B, through the cord strand connected thereto, through the spring d' and its contact d^2 of ringing key D, thence to one side of the condenser F; from the other side of the condenser, to the spring g' of listening key G, through its contact g^2 , through the operator's telephone set K, test battery i , and resistance h , thence returning

to contact g^3 and spring g^4 of listening key G, thence through contact d^3 and spring d^4 of ringing key D; thence through the other strand of the cord to the sleeve b^2 of plug B, thence through frame of spring jack a^5 to line as before traced. The operator listening at telephone k' receives the order for line 2. She now proceeds to test to determine whether line 2 be already in use or not. This she does by applying the tip l' of her second plug L to the test ring m' of the spring jack of line 2 in the manner shown at the board on the left of the drawing. If now, line 2 be in use, there will be at some one of its spring jacks a connection from the frame of the jack, through the sleeve of the plug thrust into it, and the corresponding cord strand, through a retardation coil, to ground. Hence, the test battery of the operator making the test, will find circuit through her telephone set K, through contact g^2 and spring g' of her listening key G, through the contact n' and spring n^2 of her ringing key N, through one strand of the cord to the tip l' of her plug L, thence through the test ring m' of the spring jack, thence by wire to the test ring of the jack at which the connection already exists, and by the path previously traced, to ground. The test battery i must be of such strength as to operate the retardation coil; and now the operator testing will hear in her telephone k' a musical tone at each application of her plug tip to the test ring. But if the line 2 be not in use, the test rings of that line will be nowhere closed to earth, and the testing operator will perceive no sound in her telephone. Suppose, however, that the operator find the line 2 not busy. She now thrusts the plug L in the jack m ; the circuit from station 1 is thus extended from the tip of plug L through line spring m^2 , over the one line to station 2, thence returning through the other line to the frame m' of spring jack m , thence through the sleeve of plug L, through the spring n^3 and contact n^4 of ringing key N; thence through the contacts of ringing key D; from this point the circuits have already been traced. Now the operator pressing the ringing key N, opens the springs n^2 and n^3 from their normal contacts, and closes them upon the contacts n^5 and n^6 which are connected to the calling generator; thus a calling current flows out over line 2 by a path sufficiently obvious.

It is obvious that my invention may be applied to any other system of switch boards, in which a ground connection is "legged on" to one side of the line by the act of making a connection with another line. Hence I do not limit myself to the precise arrangement shown.

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

1. A retardation coil having a central cylindrical core of iron, a coil of wire surrounding the central core, a tube of iron surround-

ing the coil, and of the same length as the central core, and a plate of iron uniting the central core and the external tube at one end, and an armature pivoted to swing in the direction of the axis of the coil and adapted to close against the presented ends of the core and tube, a spring to hold the armature normally away from the ends of the core and tube and against a fixed insulated stop, in the manner and for the purpose specified.

2. The combination of a retardation coil furnished with an armature and contacts adapted to be separated when the armature is attracted, and when separated to open the circuit of the coil, with a loop plug having a sleeve connected through the retardation coil to earth, and adapted to make contact with the test ring of a line jack into which it is thrust, whereby the test ring of the line jack is grounded through the retardation coil in the manner and for the purpose specified.

3. Two subscribers' lines each extending from a subscriber's station through the line springs and contacts of several spring jacks, each of which is provided with a test ring insulated from the line springs but electrically connected to the test rings of all the other spring jacks of that line, connected together for conversation by means of plugs, having each two points, one of which makes contact with a line spring and the other with a test ring of a subscriber's jack, and their corresponding contacts electrically connected, in combination with a retardation coil furnished with an armature and contacts adapted to be separated when the armature is attracted, and when separated to open the circuit through the coil, included in a connection from earth

to that portion of the connecting plug which is in contact with the test rings of the two lines, and a telephone having its coil connected at one point to earth, and at another point to a test ring of a spring jack, for the purpose and in the manner described.

4. Two subscribers' lines each extending from a subscriber's station through the line springs and contacts of several spring jacks, each of which is provided with a test ring insulated from the line springs, but electrically connected to the test rings of all the other spring jacks of that line, connected together for conversation by means of plugs having each two points, one of which makes contact with a line spring and the other with a test ring of a subscriber's spring jack, and their corresponding contacts electrically connected, in combination with a retardation coil furnished with an armature and contacts adapted to be separated when the armature is attracted and when so separated to open the circuit through the coil, included in a connection extending from earth, through the test battery, through the retardation coil, to that portion of the connecting plug which makes contact with the test rings of the subscriber's jack, and a telephone one point of whose coils is grounded and another is connected to a test ring of a subscriber's spring jack, in the manner and for the purpose specified.

In witness whereof I hereunto subscribe my name this 17th day of February, A. D. 1891.

CHARLES E. SCRIBNER.

Witnesses:

FRANK R. MCBERTY,
GEORGE L. CRAGG.