

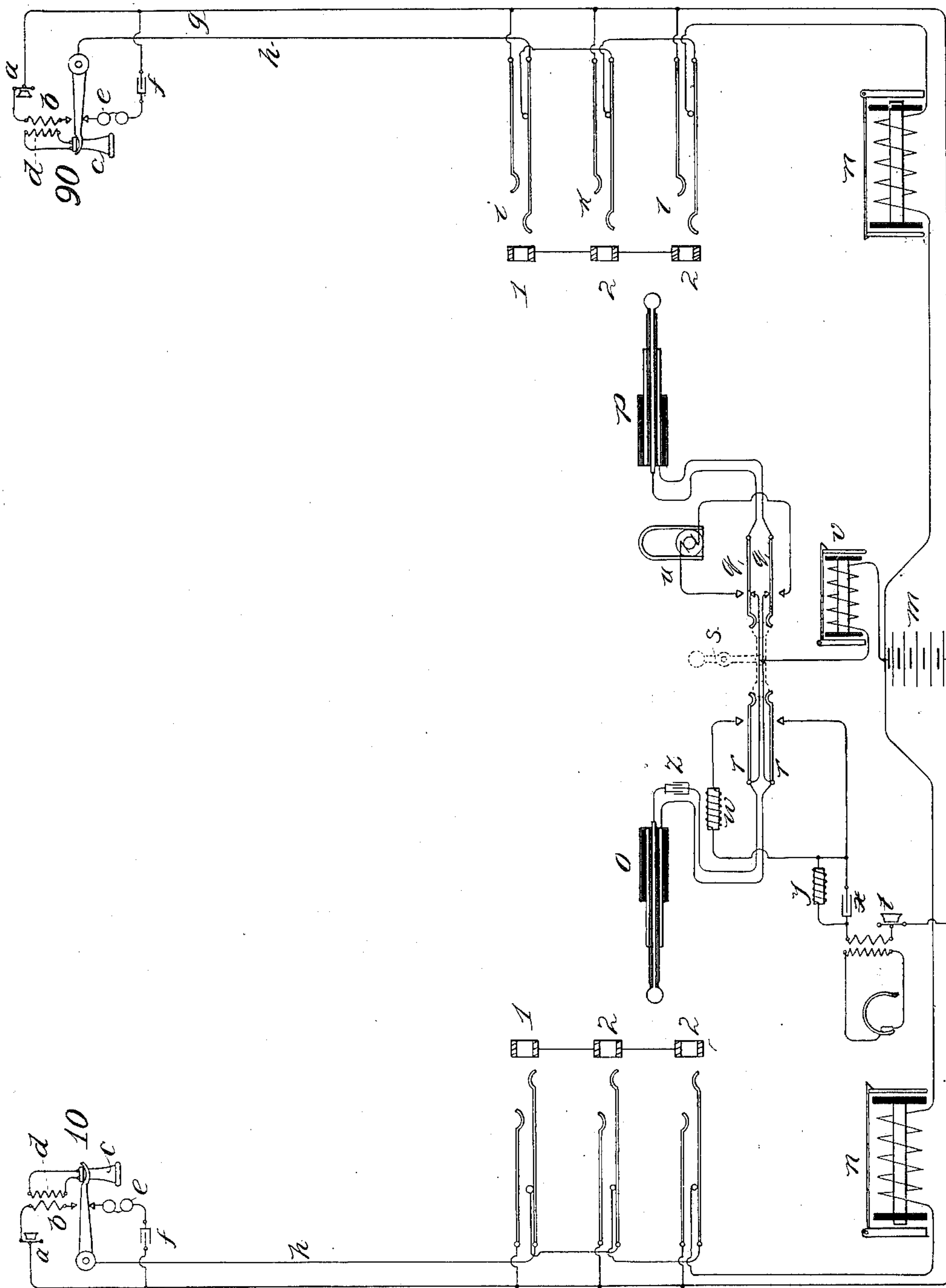
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Patented Oct. 16, 1900.

W. M. DAVIS.  
TELEPHONE EXCHANGE SYSTEM.

(Application filed June 28, 1900.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 659,959, dated October 16, 1900.

Application filed June 28, 1900. Serial No. 21,899. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM M. DAVIS, 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 Telephone-Exchange Systems, (Case No. 7,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to multiple-switchboard telephone-exchange systems, and has for its object the provision of improved means for testing the condition of use of called-subscribers' telephone-lines.

In accordance with my invention the test-thimbles are connected with one terminal of a test-battery through the sleeves of the plugs inserted within the spring-jacks. The other terminal of the battery is adapted for connection with the tip of the testing-plug through the agency of the operator's listening-key. The battery that is used for testing may also be used as a common battery for supplying the transmitters at the subscribers' stations with current. When the battery thus performs this double function, the tip of the answering-plug is also in electrical connection with the latter terminal of the battery, whereby the test may be rendered inoperative, as the battery-current may follow the tip-strand instead of being diverted across the operator's telephone set connected in a bridge of the cord-strand. I therefore make that portion of the tip-strand between the operator's telephone set and the answering-plug discontinuous to battery-current, so that in effecting the test the current will have to find path through the operator's telephone.

I will explain my invention more fully by reference to the accompanying drawing, illustrating the preferred embodiment thereof, in which a multiple-switchboard telephone-exchange system is diagrammatically illustrated.

The apparatus at substations 10 and 90 is well known to those skilled in the art. A battery-transmitter *a*, with its coil *b*, and a receiver *c*, included in local circuit with a secondary coil *d*, are illustrated at these stations, the primary coil *b* at each station being adapted for inclusion directly in circuit

with the limbs of the corresponding telephone-line through the agency of the telephone switch-hook when the receiver is removed therefrom. A call-bell *e*, preferably included in circuit with a condenser *f*, is adapted for inclusion across the limbs of the telephone-line when the receiver at the corresponding station is upon its hook. Other substation apparatus, however, may be employed, if desired. The limbs *g* and *h* of each telephone-line extend to line-jacks *i* and *k* at sections 1 and 2 and an answering-jack *l* at section 2. A common battery *m* is connected in bridge between the sides of the telephone-line, having one terminal preferably permanently connected with the limbs *g* and the other terminal connected with the limbs *h* through line-indicators *n n* and the longer or sleeve line-springs of the spring-jacks and their back contacts. The shorter or tip line-springs are connected with the limbs *g*. The cord-connecting apparatus preferably comprises an answering-plug *o* and a connecting-plug *p*, which constitutes the testing-plug, a sleeve-strand and a tip-strand uniting the sleeves and tips of the plugs. Ringing-key springs *q q* and listening-key springs *r r* are included in these cord-strands and are normally connected, as illustrated. A key *s* is provided, which when actuated in one direction serves to include in the circuit operator's telephone set *t*, which is the preferred test-indicator, while when actuated in the other direction it serves to include the calling-generator *u* in circuit with the called-subscriber's signal-bell. A clearing-out indicator *v* is included in a bridge connection between the sleeve-strand and the terminal of the battery *m*, that is immediately connected with the line-indicators, this battery and clearing-out indicator being included in a bridge of the telephonic circuit when the plugs are inserted in the jacks. One terminal of the operator's set is connected with that terminal of the battery that has permanent connection with one side of each telephone-line. The other terminal of the operator's telephone set is adapted for electrical connection with the tip-strand of the cord-circuit when the handle of the switch-lever *s* is moved to the right. A retardation-coil *w* is included between the operator's telephone set and the spring *r* of her telephone-key that



is included in the tip-strand, the testing-current being passed through the coil  $w$  to the operator's telephone set. A condenser  $x$  may also be employed by which a resistance  $y$  may be shunted. The test-thimbles of the spring-jacks are electrically connected and are charged with current from the battery  $m$  through the agency of the sleeve-strand connected with one terminal of said battery and the sleeves of the inserted plugs.

A test of a busy line is manifested by a click in the operator's telephone, the test-circuit being completed from the terminal of the battery that is connected, through the agency of the sleeve-strand and sleeve, with the engaging thimble, to the tip of the testing-plug, the tip-strand, the retardation-coil  $w$ , the operator's telephone being cut into circuit, the operator's telephone, to the other terminal of the battery. The remainder of the tip-strand from the corresponding spring  $r$  to the tip of the answering-plug may be made discontinuous to battery-current by means of condenser  $z$ , included in this portion of the tip-strand, which condenser prevents the battery-current from being shunted away from the operator's telephone. If the called-for line is idle, the thimbles will not be charged and no noise will manifest itself in the operator's telephone.

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

1. In a multiple-switchboard telephone-exchange system, the combination with telephone-lines, each extending from a subscriber's station to a plurality of sections of multiple switchboard, sides of the telephone-circuits being connected with tip-contacts of jack-switches, a common battery having one terminal also connected with the said sides, a cord-circuit having sleeve and tip strands, the sleeve-strands being connected with the remaining terminal of the said common battery, the jacks of the switchboard being provided with electrically-connected test thimbles or contacts adapted for electrical connection with the sleeve-strand through the agency of the inserted plugs, an operator's telephone set, and a telephone-key adapted to include the operator's telephone set in circuit between the tip-strand and the terminal of the battery connected with the tip-contacts of the jacks, the tip-strand being continuous to battery-current between said telephone-key and the tip of the connecting-plug, but discontinuous to said current between the telephone-key and the answering-plug, substantially as described.

2. In a multiple-switchboard telephone-exchange system, the combination with telephone-lines, each extending from a subscriber's station to a plurality of sections of multiple switchboard, sides of the telephone-circuits being connected with tip-contacts of jack-switches, a common battery having one terminal also connected with the said sides,

a cord-circuit having sleeve and tip strands, the sleeve-strands being connected with the remaining terminal of the said common battery, the jacks of the switchboard being provided with electrically-connected test thimbles or contacts adapted for electrical connection with the sleeve-strand through the agency of the inserted plugs, a testing appliance, and a key adapted to include the testing appliance in circuit between the tip-strand and the terminal of the battery connected with the tip-contacts of the jacks, the tip-strand being continuous to battery-current between said key and the tip of the connecting-plug, but discontinuous to said current between the key and the answering-plug, substantially as described.

3. In a multiple-switchboard telephone-exchange system, the combination with telephone-lines each extending from a subscriber's station to a plurality of sections of multiple switchboard, sides of the telephone-circuits being connected with tip-contacts of jack-switches, a common battery having one terminal also connected with the said sides, a cord-circuit, electrically-connected test-thimbles for the jacks, the plugs of the cord-circuit serving to connect the test-thimbles with the remaining terminal of said battery, an operator's telephone set and a telephone-key adapted to include the operator's telephone set in circuit between the tip-strand and the terminal of the battery connected with tip-contacts of the jacks, the tip-strand being continuous to battery-current between said telephone-key and the tip of the connecting-plug, but discontinuous to said current between the telephone-key and the answering-plug, substantially as described.

4. In a multiple-switchboard telephone-exchange system, the combination with telephone-lines each extending from a subscriber's station to a plurality of sections of multiple switchboard, sides of the telephone-circuits being connected with tip-contacts of jack-switches, a common battery having one terminal also connected with the said sides, a cord-circuit, electrically-connected test-thimbles for the jacks, the plugs of the cord-circuit serving to connect the test-thimbles with the remaining terminal of said battery, a testing appliance, and a key adapted to include the testing appliance in circuit between the tip-strand and the terminal of the battery connected with tip-contacts of the jacks, the tip-strand being continuous to battery-current between said key and the tip of the connecting-plug, but discontinuous to said current between the key and the answering-plug, substantially as described.

In witness whereof I hereunto subscribe my name this 18th day of June, A. D. 1900.

WILLIAM M. DAVIS.

Witnesses:

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HARVEY L. HANSON.