

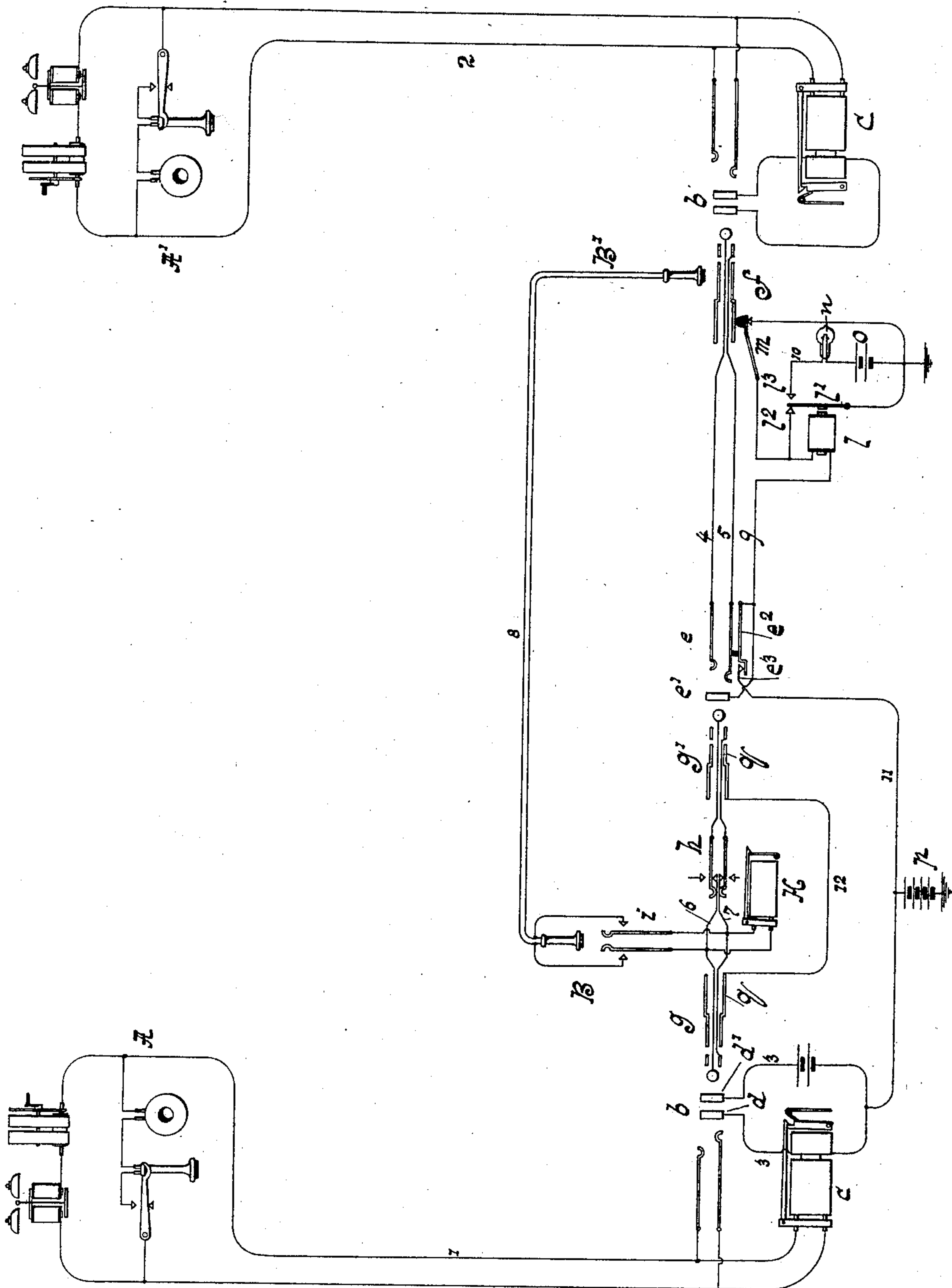
(No Model.)

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SIGNALING SYSTEM FOR TELEPHONE TRUNK LINES.

No. 596,610.

Patented Jan. 4, 1898.



Witnesses:

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By: Barton Brown, his Atty.

# UNITED STATES PATENT OFFICE.

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## SIGNALING SYSTEM FOR TELEPHONE TRUNK-LINES.

SPECIFICATION forming part of Letters Patent No. 596,610, dated January 4, 1898.

Application filed November 24, 1896. Serial No. 613,263. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK R. MCBERTY, a citizen of the United States, residing at Downer's Grove, in the county of Du Page and State of Illinois, have invented a certain new and useful Improvement in Signaling Systems for Telephone Trunk-Lines, (Case No. 49,) 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 is a device for use in association with trunk-lines between switchboards of a telephone-exchange for causing the act of removing a connection at one of the switchboards to display the signal at the other switchboard calling for a disconnection of the trunk-line at that switchboard also.

It is a matter of common practice in telephone-exchanges to unite telephone-lines terminating in sockets on different switchboards through the agency of a trunk-line extending between the switchboards and a pair of plugs and a plug-circuit at one of the switchboards, making connection between the line there and the terminal of the trunk-line. In such systems it is usual to provide operators' telephonic and signaling appliances in connection with the pair of plugs at one of the switchboards and to assign to the operator at that switchboard the work of supervising the connection, calling the required subscriber, ascertaining that connection has been completed, and effecting disconnection at the termination of conversation, the operator at the other switchboard merely obeying instructions from the supervising operator given orally or through the medium of signals.

In a prior application filed September 25, 1896, Serial No. 606,495, (Case No. 43,) I have described a broadly new arrangement of signaling-circuits whereby the removal of one of the plugs of the pair from the spring-jack of the connected line by the supervising operator and the return of the plug to its normal idle condition causes the display of a clearing-out signal before the other operator, instructing her to disconnect the trunk-line from the correspondent subscriber's line.

The present invention is a form of the general invention designed to simplify the cir-

cuits and apparatus and to secure certainty of operation in the system.

The present invention consists generally in a signal-circuit which is normally closed, a signal-controlling instrument designed to display a clearing-out signal when inert in the circuit, and mechanism to break the circuit in the supervising operator's act of withdrawing a plug of the pair from the spring-jack of the subscriber's line, which is connected with another through the agency of the plugs and the trunk-line. Specifically it comprises a signal-circuit which during a connection through the trunk-line is complete from the subscriber's spring-jack through a pair of plugs and a conductor uniting them and the signaling-circuit associated with the trunk-line, means for maintaining the continuity of the circuit when the connecting-plug is withdrawn from the terminal spring-jack of the trunk-line, a signal-controlling electromagnet, and means for causing the signal of the magnet to become and to remain displayed when the magnet becomes inert. This circuit can then be broken only by the withdrawal of the proper plug of the pair from the spring-jack of the subscriber's line, and when so withdrawn it causes the display of the clearing-out signal before the operator having charge of the distant terminal of the trunk-line.

The invention embodies also certain details involved in the operation of the system.

This device is shown in the attached drawing.

The diagram represents two telephone-lines 1 2 from substations A and A', extending to spring-jacks *b* in two switchboards B and B' and connected with line-annunciators *c* in the switchboards. The annunciator used is of the self-restoring type. Its restoring-magnet is included in a local circuit 3, which is normally broken at separated contact-pieces *d* and *d'* in the spring-jack, which are designed to become crossed together through the sleeve of a plug inserted in the spring-jack. The trunk-line 4 5 extends between the switchboards B and B', terminating in a spring-jack *e* at switchboard B and in a plug *f* at switchboard B'. Switchboard B is furnished with a pair of plugs *g* and *g'*, which are united by



conductors 6 7, constituting the plug-circuit. With this plug-circuit are associated the usual calling-key *h*, listening-key *i*, and clearing-out annunciator *k*. An order-wire 8 may  
 5 extend between the switchboards, connected with the telephones of the operators at the switchboards, to permit communication between them.

In this system of switching apparatus the  
 10 connection is supposed to originate with the subscriber at station A, the process of making connection between the lines being effected as follows: The operator at switchboard B answers the call and makes connection  
 15 between spring-jack *b* of the calling-line and spring-jack *e* of the trunk-line by means of plugs *g* and *g'*, inserted into them, respectively, and instructs the operator at switchboard B' to insert the terminal plug *f* of the  
 20 trunk-line into the line spring-jack *b* of the line called for. The operator at switchboard B then rings by means of her calling-key *h*, ascertaining by means of her telephone that the subscribers have entered into communication.  
 25 The same operator, who is termed in practice the "supervising operator," observes the signal for disconnection given by the clearing-out annunciator *k* and removes the plugs *g* and *g'* from the spring-jacks. The invention is designed to cause the act of removing  
 30 plug *g* from the spring-jack *b* to effect the display of the clearing-out signal before the operator at switchboard B' to instruct her to disconnect the trunk-line from the line of the called subscriber. To this end a conductor  
 35 9 is associated with the trunk-line, terminating in a ring *e'* in the spring-jack of the trunk-line and including the magnet *l* of the signal-controlling relay at the switchboard B'. The  
 40 circuit from magnet *l* is normally completed to earth through switch-contacts of a plug-seat switch *m* in the normal resting-socket of plug *f*, being closed through the pressure of the plug in its socket. The relay is provided  
 45 with an armature-lever *l'*, which plays between two switch-contacts *l<sup>2</sup>* and *l<sup>3</sup>*. The lever *l'* is connected to earth. The forward contact *l<sup>2</sup>* is connected with the conductor 9. The contact *l<sup>3</sup>* forms the terminal of a local  
 50 branch 10, which includes a clearing-out signal *n*, (a small lamp,) together with a battery *o*. The spring-jack *e* is provided, in addition to the line-contacts and the ring *e'*, with a switch-spring *e<sup>2</sup>* and its anvil *e<sup>3</sup>*, upon which  
 55 the spring closes when no plug is in the spring-jack. The anvil *e<sup>3</sup>* forms the terminal of a wire 11, led to a grounded battery *p*.

The plugs *g* and *g'* are provided with the usual contact sleeves or shanks *q*, these being adapted to register with the contacts *d*  
 60 and *d'* of the spring-jack *b* and with the thimble *e'* of spring-jack *e*, respectively. The contacts *q* of the two plugs are united by a wire 12. The free pole of battery *p* is connected with circuit 3 at any convenient point,  
 65 preferably in such a way that a direct connection with the wire 12 is effected when the

plug *g* is inserted in the spring-jack *b*. In the idle condition of these appliances the circuit from battery *p* is complete through wire  
 70 11, switch-contacts *e<sup>3</sup>* and *e<sup>2</sup>*, wire 9, and thence to earth either through the switch-contacts of the plug-seat switch *m* or through the contact *l<sup>2</sup>* of the relay, the relay being excited  
 75 by the current flowing. The relay should of course have a high resistance in order that the operation may be effected with a minimum strength of current.

The operation of the signaling-circuit is as follows: Answering the call from the station  
 80 A, the operator at switchboard B first inserts plug *g* into the spring-jack *b* and then places plug *g'* in the spring-jack *e*, having learned the subscriber's order. The insertion of plug  
 85 *g* into the spring-jack *b* completes a circuit from battery *p* to conductor 12. The insertion of the plug *g'* into spring-jack *e* separates the spring *e<sup>2</sup>* from the anvil *e<sup>3</sup>* and hence cuts  
 90 off the wire 11 from the signaling-circuit, but at the same time brings the wire 12 into connection with wire 9, so that the signaling-circuit is not interrupted and the relay remains  
 95 still excited. When the operator at switchboard B' inserts the plug *f* in the spring-jack of the line called for, the ground branch controlled by the plug-seat switch *m* is broken, but  
 100 that controlled by the relay remains complete. Having received the signal for disconnection, the supervising operator first removes plug *g* from spring-jack *b* and later plug *g'* from  
 105 spring-jack *e*. The first act breaks the connection between wire 12 and battery *p*, interrupting the signaling-circuit and permitting relay *l* to become inert. The armature of this instrument then falls back and closes a  
 110 local circuit through wire 10, leading to the clearing-out-signal lamp *n*, as a signal to the operator at switchboard B to disconnect the trunk-line from the subscriber's line. The  
 115 withdrawal of plug *g'* from spring-jack *e* and the replacement of plug *f* in its socket return the circuits to their normal conditions and cause the extinction of lamp *n*.

It will be observed that if at any time during the connection plug *g'* should be removed  
 120 from the spring-jack *e* the clearing-out signal would not be displayed, since the same act would effect the connection of conductors 9 and 11.

In the process of withdrawing the plugs *g*  
 125 and *g'* from the spring-jacks the first must be invariably withdrawn from the spring-jack of the calling-line in order to display the clearing-out signal.

This form of signaling-circuit has in practice several advantages, among which the  
 130 chief is a saving in apparatus over the systems which have been commonly in use.

I claim as my invention—

1. The combination with a subscriber's line  
 135 terminating in a spring-jack, a trunk-line and a plug connected with the trunk-line and adapted for insertion into the spring-jack, of a signaling-circuit including a clearing-out



signal at the distant terminal of the trunk-line, said signal being adapted to be displayed when its controlling-magnet is inert, the signaling-circuit being completed through registering contact-pieces of the subscriber's spring-jack and the plug therein, and a source of current permanently connected with the signaling-circuit to excite the said signal-controlling magnet whereby the withdrawal of the plug from the spring-jack causes the display of the clearing-out signal, as described.

2. The combination with a subscriber's line terminating in a spring-jack, a trunk-line also terminating in a spring-jack, and a pair of plugs and a plug-circuit for uniting the spring-jacks, of a signaling-circuit associated with the trunk-line including an electromagnet controlling a clearing-out signal at the distant terminal of the trunk-line, the signaling-circuit being completed through registering contacts of the plugs and spring-jacks, respectively, a source of current permanently included in the signal-circuit and a conductor uniting the contacts of the plugs, whereby the withdrawal of the plug from the subscriber's spring-jack may cause the display of the clearing-out signal by interrupting the circuit, as described.

3. The combination with a subscriber's line and a trunk-line, said lines terminating in spring-jacks, a pair of plugs for uniting the spring-jacks, and a clearing-out annunciator connected with the plug-circuit thereof, of a signaling-circuit associated with the trunk-line and completed through registering contact-pieces of each of the spring-jacks and the plug therein, and a conductor uniting the contact-pieces of the plugs, switch-contacts in the trunk-line spring-jack adapted to close the signaling-circuit normally independently of the said registering contacts, a magnet in the signaling-circuit, and a clearing-out signal controlled thereby adapted to be displayed when the magnet becomes inert, whereby the withdrawal of the plug from the spring-jack of the subscriber's line operates the signal for disconnection, as described.

4. The combination with a telephone-line and a trunk-line, said lines terminating in spring-jacks in a switchboard, a pair of plugs and their plug-circuit for uniting the spring-jacks, and a clearing-out annunciator connected with the plug-circuit, of a signaling-circuit associated with the trunk-line completed through registering contacts of each spring-jack and the plug therein, and a conductor uniting the contacts of the plugs, a

relay-magnet in the signaling-circuit, switch-contacts of the relay adapted to interrupt the signal-circuit when the relay is inert, a switch associated with the terminal appliance of the trunk-line and adapted to bridge the break at the relay when the trunk-line is not in use, a subsidiary clearing-out signal and a circuit including the signal closed by the relay when inert, substantially as described.

5. The combination with a subscriber's line and a trunk-line, each of said lines terminating in a spring-jack, said trunk-line terminating in a plug at another switchboard, a pair of plugs uniting the lines, and a clearing-out annunciator in connection with the plug-circuit thereof, of a signal-circuit associated with the trunk-line completed through registering contacts in each of the spring-jacks and the plug therein, and a conductor uniting the contacts of the plugs, a switch in the trunk-line spring-jack adapted to complete the signal-circuit and constructed to be opened by the insertion of a plug in the spring-jack, a signal-controlling relay in the signal-circuit, said signal being located at the distant terminal of the trunk-line, the switch-contacts of said relay being adapted to control the signaling-circuit, a plug-seat switch for the terminal plug of the trunk-line, and switch-contacts closed thereby connected to bridge the break of the signal-circuit at the relay, substantially as described.

6. The combination with a subscriber's line provided with a self-restoring calling-annunciator and a local circuit terminating in normally-separated contact-pieces in the spring-jack, of a trunk-line terminating in a spring-jack, and a clearing-out signal associated therewith, plugs for uniting the spring-jack of the line with that of the trunk-line, a clearing-out-signal circuit associated with the trunk-line and including an electromagnet controlling the clearing-out signal at the distant terminal station thereof, said signaling-circuit being formed in part of the local restoring-circuit, a contact thereof in the spring-jack, and a contact of the plug registering therewith, and a source of signal-current permanently connected with the signal-circuit to operate the signal therein, substantially as described.

In witness whereof I hereunto subscribe my name this 16th day of October, A. D. 1896.

FRANK R. McBERTY.

Witnesses:

ELLA EDLER,  
LUCILE RUSSELL.