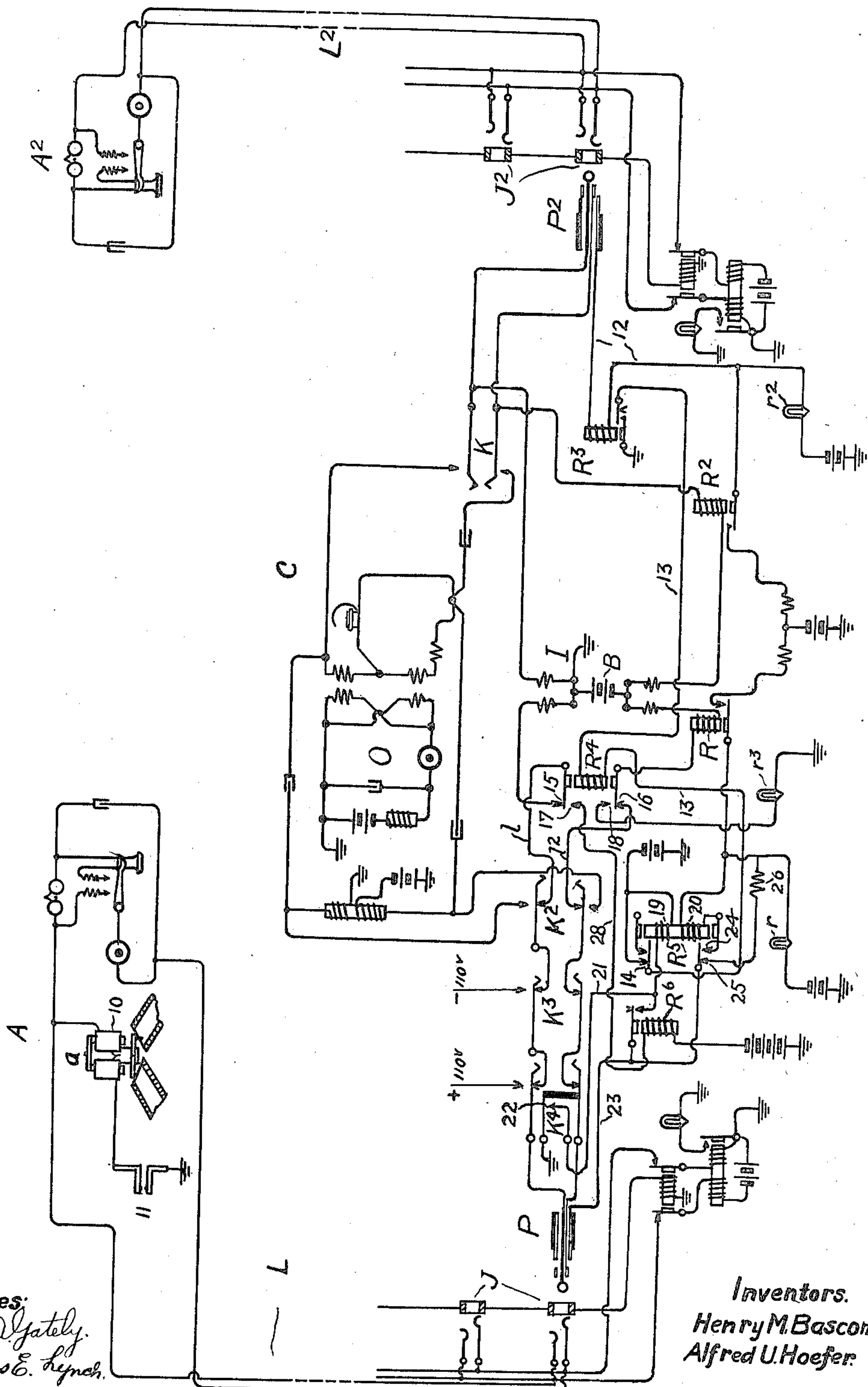


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 TELEPHONE TOLL SYSTEM.
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UNITED STATES PATENT OFFICE.

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TELEPHONE TOLL SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, ALFRED U. HOEFER and HENRY M. BASCOM, residing at East Orange and Brooklyn, in the counties of Essex and Kings and States of New Jersey and New York, respectively, have invented certain Improvements in Telephone Toll Systems, of which the following is a specification.

Telephone toll systems in which it is necessary for subscribers to deposit a coin or token before they can communicate with an A-operator, as in the usual prepayment coin boxes, are sometimes found objectionable, in that there may emergencies arise demanding such calls as for the fire department or police, which make it desirable that communication shall be had with the operator regardless of the possession by the calling subscriber of a coin of the proper denomination. This is met in the present invention, which provides that from substations equipped with toll apparatus instructions may be given to the operator upon the mere removal of the receiver from its hook, but that communication with the wanted substation is impossible until payment is made or until an act of the operator gives the subscriber free service.

The accompanying drawing illustrates the invention diagrammatically.

At A and A² telephone substations are shown, these having the customary apparatus. There is in addition at substation A a coin box *a*, in a branch to ground from one side of the circuit and provided with a polarized magnet 10 through which current may be sent in one direction or the other from the central station to collect or refund a coin introduced by the subscriber. In series with the magnet are contacts 11 adapted to be closed by the deposited coin. The substations are joined to the central station C by lines L and L² and there terminate in the jacks J and J² and the usual line equipment.

At the central station the A-operators are provided with a suitable number of cord or link circuits for connecting the jacks of the calling and called lines. Each of these cord circuits, with respect to the battery B, repeating coil I, answering and calling supervisory relays R and R² and their lamps *r* and *r*², answering and calling plugs P and P², operator's set O, and her listening, split-

ting and coin-collect keys K, K² and K³, involve no departure from well known practice and need not be particularly described.

The characteristic features of the invention are as follows: In the sleeve conductor 12 of the calling end of the cord circuit is the winding of a relay R³ in series with the calling supervisory lamp *r*². Relay R³ at its front contact closes a conductor 13 which includes the winding of a blocking relay R⁴ and the normal contact 14 of a release relay R⁵. At its back contacts 15 and 16, relay R⁴ completes the continuity of the tip and ring sides *l* and *l*² of the cord circuit between the splitting key K² and the repeating coil and between said key and the answering supervisory relay R, respectively. At its front contact 17, relay R⁴ transfers the connection of the answering end of the cord conductor *l* to the winding of a relay R⁶. Front contact 18 of relay R⁴ joins a toll deposit signal in the form of a detector lamp *r*³ in series with the answering supervisory relay R. Relay R⁵ has two windings, 19 and 20. Through winding 19 the relay may be initially energized by either of two paths—over conductor 21 and through the extra or “free” contact 22 of a coin-return key K⁴, and also by way of the front contact of relay R⁶ and the sleeve conductor 23 of the answering end of the cord circuit to ground at the cut off relay of the calling line. The winding 20 of relay R⁵ is a locking winding, its circuit including the answering supervisory lamp *r*, contact 24 and the sleeve conductor 23. When contact 24 is made, contact 25 of relay R⁵ is broken, whereby the winding 20 is substituted for the resistance 26 normally in series with the lamp *r*.

Suppose the subscriber at coin box substation A wishes to converse with the subscriber at substation A², and that the deposit of a toll is necessary to effect this. The receiver is removed from its hook at substation A, the line lamp lights and the making of the connection proceeds in accordance with the usual routine until the calling plug P² is inserted in the multiple jack of the called subscriber's line. Then current flows from battery through the calling supervisory lamp *r*², conductor 12, winding of relay R³, contacts of the calling plug P² and jack J² to ground at the cut off relay of the called line. The lamp *r*² lights and relay R³ is energized. There is now a path

for current from battery through the back contact 14 of relay R⁵, conductor 13, winding of relay R⁴ and front contact of relay R³ to ground at the armature of said relay.

5 Relay R⁴ at once opens both conductors 7, 7² of the cord circuit at its contacts 15 and 16, thereby normally preventing communication between the connected substations in absence of some special act on the part of

10 either the subscriber or the operator. By thus severing of the talking circuit, the answering supervisory relay R would be released, causing the supervisory lamp *r* to give a false indication. This is prevented,

15 however, by the connection of the winding of said relay to ground through front contact 18 of relay R⁴ and the detector lamp *r*³. *r*³ is illuminated by current in this circuit if no coin has been placed in the box *a*. If,

20 instead, the toll has been deposited, or is at this time at the request of the operator, a circuit is completed for relay R⁶ which may be traced from battery through the winding of said relay, conductor 28, contact 17 of

25 relay R⁴, tip conductor 7 of the cord circuit, normal contacts for the splitting, coin-collect and coin-return keys K², K³ and K⁴ in series, tip contacts of the plug P and jack J, tip side of the line L, winding of magnet 10

30 and contacts 11 to ground. Attracting its armature, relay R⁶ furnishes a circuit for the relay R⁵ from battery through winding 19, conductor 21, front contact of relay R⁶, sleeve conductor 23, sleeve contacts of an-

35 swering plug P and jack J to ground at the cut off relay of the calling line. Opening contact 14 in the circuit of the blocking relay R⁴, relay R⁵ releases said blocking relay. The contacts 15 and 16 are therefore closed,

40 connecting through the talking circuit between the substations A and A² so that conversation may proceed. The breaking of contact 18 extinguishes the detector lamp *r*³, informing the operator of the deposit of the

45 coin and the release of the blocking relay. Relay R⁶ is deenergized by the opening of contact 17. When relay R⁵ released relay R⁴, it also locked itself independently of relay R⁶ through winding 20 and contact 25

50 to the sleeve conductor 23. Contact 24 closes before the contact 25 opens and substitutes the winding 20 of relay R⁵ for the resistance 26 in the circuit of the answering supervisory lamp *r*. This signal and the

55 calling supervisory lamp *r*² are now controlled by the relays R and R² in the customary way. Upon the subscribers returning their receivers to the hooks, the lamps *r* and *r*² light, and the operator withdraws the

60 plugs P and P². This deprives the relays R³ and R⁵ of current and they release, returning the apparatus of the cord circuit to its original condition.

65 Instead of the character of call previously assumed, it might have been that the sub-

scriber at substation A wished for a connection for which a toll was not necessary. The operation of the system would be as before until the operator received the number which indicates a privileged communication. She would thereupon press the combined return and free key K⁴. Since no coin was inserted in the box *a*, the coin-return contacts of the key would perform no useful function, but the contact 22 would energize relay R⁵ over the following circuit: battery, winding 19 of relay R⁵, conductor 21 and contact 22 to ground. Relay R⁵ would release the blocking relay and lock itself to ground through the sleeve contacts of the answering plug and jack as before. The action of the system is otherwise as already stated, except that there is no energization of relay R⁶.

There is a peculiar utility in making the deenergization of relay R⁵ depend upon the condition of the answering switch rather than upon that of the calling switch, since when automatic ringing is employed it is the practice for the operator to withdraw and replace the plug to effect repeated applications of ringing current to the called line. Were the release relay locked through the sleeve contacts at the calling end of the cord circuit, it would be necessary, in those cases where a coin was not deposited in the coin box, for the operator to depress the key K⁴ after each ringing to maintain contact 14 of the release relay open. With the present arrangement, this burden is removed from the operator, because the answering plug remains in the jack until connection is taken down, and the relay R⁵ is therefore continuously energized.

We claim:

1. A telephone toll system comprising substations and a central station, lines connecting the central and substations, a toll apparatus at a substation, switching means at the central station for joining substation lines, automatic means acting upon the switching means to prevent communication between substations after the switching together of their lines and before the operation of the toll apparatus, and means under the control of a central station operator for rendering said communication-preventing means ineffective.

2. A telephone toll system comprising substations and a central station, lines connecting the central and substations, a toll apparatus at a substation, switching means at the central station for joining substation lines, automatic means acting upon the switching means to prevent communication between substations after the switching together of their lines and before the operation of the toll apparatus, means under the control of a central station operator for rendering said communication-preventing means

ineffective, and a signal controlled by said communication-preventing means.

3. A telephone toll system comprising substations and a central station, lines connecting the central and substations, a toll apparatus at a substation, switching means at the central station for joining substation lines, a relay operable after the connection of the switching means with the called line and before the operation of the toll apparatus associated with the calling line to prevent communication between the united substations, an operator's signal for indicating the condition of the toll apparatus, and a circuit for the signal controlled by said relay.

4. A telephone toll system comprising substations and a central station, lines connecting the central and substations, a toll apparatus at a substation, switching means at the central station for joining substation lines, automatic means acting upon the switching means to prevent communication between substations after the switching together of their lines and before the operation of the toll apparatus, and means under the control both of a central station operator and a calling subscriber for rendering said communication-preventing means ineffective.

5. A telephone toll system comprising substations and a central station, lines connecting the central and substations, a toll apparatus at a substation, a link circuit for joining substation lines, a relay operable after the connection of the link circuit with the called line and before the operation of the toll apparatus associated with the calling line to open the link circuit, a second relay controlling the first-named relay, and a circuit including a central station operator's key for controlling the second relay.

6. The combination with substation lines and a cord circuit for connecting said lines, said cord circuit being provided with talking contacts and a sleeve contact, of a relay for governing the continuity of the cord circuit through said talking contacts, a circuit for said relay closed upon joining the cord circuit with the called line, and a relay for opening said circuit depending for its energization upon the connection of the cord circuit with the calling line through said sleeve contact.

7. The combination with substation lines, their line and cut-off relays and a cord circuit for connecting said lines, of a relay for governing the continuity of the cord circuit, a circuit for said relay closed upon joining the cord circuit with the called line, a relay having contacts in said circuit, means for initially operating the last-named relay, and a circuit for continuing the ener-

gization of said relay including the cut-off relay of the calling line.

8. The combination with substation lines and a cord circuit for connecting said lines, said cord circuit having talking contacts and sleeve contacts, of a blocking relay and an energizing circuit therefor for governing the continuity of the cord circuit through the talking contacts, a relay energized through the sleeve contacts of the calling end of the cord circuit for closing the circuit of the blocking relay, a relay for releasing the blocking relay, and a circuit for said release relay including the sleeve contacts of the answering end of the cord circuit.

9. The combination with substation lines and a cord circuit for connecting said lines, of a blocking relay for governing the continuity of the cord circuit, an energizing circuit therefor, means for closing the circuit of the blocking relay, a relay for releasing the blocking relay, an initial circuit for the release relay, a relay controlling said initial circuit and operated over the calling line, and a locking circuit for the release relay including the sleeve contacts of the answering end of the cord circuit.

10. In a telephone toll system, substation lines and a link circuit for connecting the same, a coin-controlled apparatus at a substation, automatic means associated with the link circuit for preventing communication thereover between connected substations, and means also associated with the link circuit for both governing the coin-controlled apparatus and operating the communication-preventing means.

11. In a telephone toll system, substation lines and a link circuit for connecting the same, a coin-controlled apparatus at a substation, automatic means associated with the link circuit for preventing communication thereover between connected substations, and an operator's key having contacts governing the coin-controlled apparatus and contacts governing the communication-preventing means.

12. In a telephone toll system, substation lines and a link circuit for connecting the same, a coin-controlled apparatus at a substation, a relay for opening the link circuit, and a coin-return key provided with contacts governing said relay.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses, this twenty-fourth day of October, 1914.

ALFRED U. HOEFER.
HENRY M. BASCOM.

Witnesses:

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