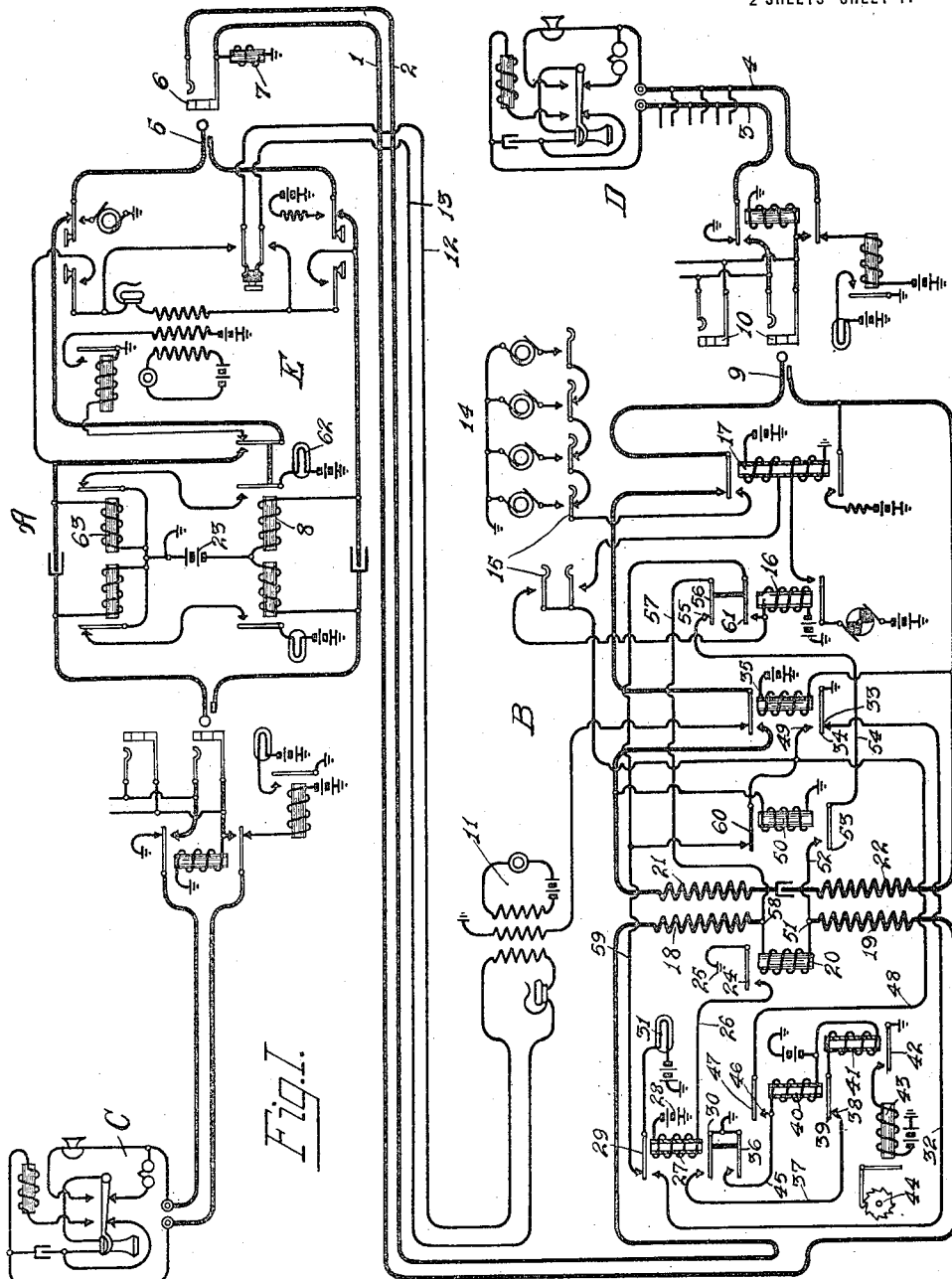


R. I. UTTER.
METER SYSTEM FOR TELEPHONE EXCHANGES.
APPLICATION FILED JUNE 22, 1914.

1,281,106.

Patented Oct. 8, 1918.

2 SHEETS—SHEET 1.



Witnesses:

George E. Mueller
Wm. Berghahn

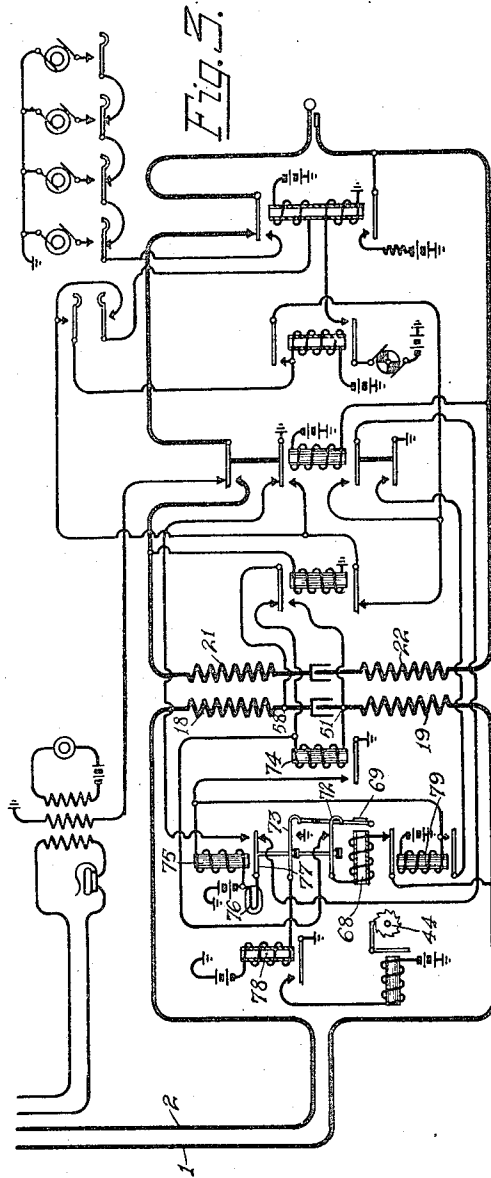
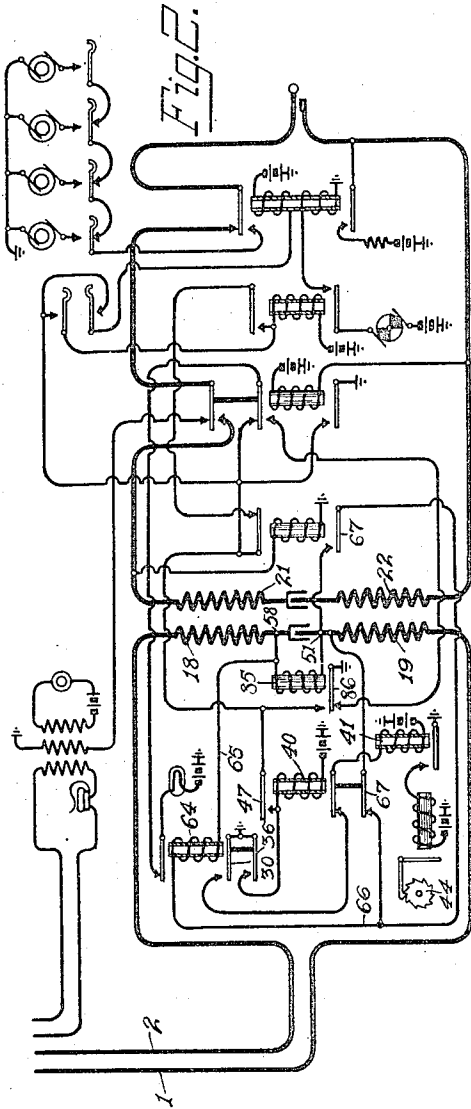
Inventor:

Richard I. Utter.
By Curtis Blaup
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UNITED STATES PATENT OFFICE.

RICHARD I. UTTER, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

METER SYSTEM FOR TELEPHONE-EXCHANGES.

1,281,106.

Specification of Letters Patent.

Patented Oct. 8, 1918.

Application filed June 22, 1914. Serial No. 846,417.

To all whom it may concern:

Be it known that I, RICHARD I. UTTER, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Meter Systems for Telephone-Exchanges, of which the following is a specification.

My invention relates to meter systems for telephone exchanges and has for its object the provision of a meter system adapted more particularly for use in connection with the measuring of calls on trunk circuits.

My invention in the form disclosed herein provides means whereby a meter is associated with the B end of a trunk circuit and is so arranged that a call is registered whenever the plug is inserted into the jack at the A operator's position of the trunk circuit. The devices for registering the call are entirely automatic in character and so adjust themselves after the call is registered that a second registration does not take place until after the trunk circuit has been entirely disconnected and is again connected for another call.

I will explain various forms of carrying out my invention more in detail by referring to the accompanying drawings illustrating the same in which:

Figure 1 is a diagrammatic view of a complete telephone system including the trunk circuit arranged with the meter system of my invention;

Fig. 2 is a similar trunk portion of a like circuit with a modified metering system, and

Fig. 3 is a view similar to Fig. 2 showing another modified meter system.

Referring more particularly to Fig. 1, I show a subscriber's substation apparatus of the ordinary form at the substation C, which extends to the central station A where a cord circuit is provided for interconnecting purposes to extend the connection from the substation C through the trunk circuit comprising the conductors 1 and 2 to the second central station B, from whence the call is continued through the subscriber's line consisting of the conductors 3 and 4 to the subscriber's station D. The trunk circuit of course extends between the A exchange and the B exchange as is customary, and my improved metering mechanism is provided at the B exchange in connection with this trunk circuit.

My invention is not concerned with the particular subscriber's station equipment or the apparatus at the exchange end of the terminating lines, nor with the cord circuit E at the A switchboard, except in so far as the supervision at the A exchange for the trunk end is concerned as will appear in the later description.

The cord circuit E is utilized to continue the connection through the A exchange from the subscriber's station C by having the plug 5 inserted in the jack 6 forming part of the trunk line 1, 2. A magnet 7 is provided with conductor 1 of the trunk line to operate the sleeve relay 8 of the cord circuit E as is readily apparent. The trunk circuit then extends as stated to the second central station B, where this trunk circuit ends in a plug 9 adapted for connection with jacks 10 of the subscriber's line D or others. The trunk circuit has the operator's set 11 which also is connected by means of order wires 12 and 13 with the operator at the station A. The trunk circuit is provided with the selective ringing equipment 14 controlled by a suitable key 15, slow acting ringing relay 16, and initially manually controlled ringing relay 17, the operation of all of which it is thought are readily apparent, and form no particular part of the present invention.

The conductors 1, 2, of the trunk circuit terminate at the B exchange in a transformer or repeating coil having the split windings 18 and 19. These two coils 18 and 19 are serially included before the talking circuit is established through a 15000 ohm relay 20. The coils 18 and 19 are of course in suitable inductive relation with coils 21 and 22, through which the trunk circuit is extended to the tip and sleeve conductors of the plug 9. Initially when connection is ordered up by the A operator the B operator designates the trunk to be used, whereupon the A operator inserts the plug 5 into the jack 6 of the designated trunk line, whereupon circuit is established which extends from the battery 23, over the trunk conductors 1 and 2, and through the coils 18, 20 and 19 in series, thus energizing the 15000 ohm relay 20, which thereupon attracts its armature 24 to establish a circuit which can be traced from the ground 25, through the armature 24, conductor 26, slow release relay 27, battery 28 to ground. The relay 27 thus actuates its armatures 29, 36, and 30, the arma-

ture 29 connecting the indicating lamp 31 in circuit to thereby indicate to the B operator that the right trunk has been selected by the A operator. This circuit through the lamp 31 can be traced from the ground through battery, through the lamp 31 by way of armature 29, conductor 32, back contact 33, armature 34 of the sleeve relay 35 to ground. The relay armature 30 is attracted and makes contact with its front contact sooner than the armature 36 of the same relay 27 makes contact with its front contact. Armature 30 being thus first to close a circuit, circuit is thus established which can be traced from the ground, through armature 30, conductor 37, back contact 38, armature 39 of slow acting relay 40, through relay 41, through battery, to ground. Relay 41 is thus established which actuates its armature 42 to thereby close a circuit through the relay 43 to operate the meter or counter 44. Immediately this call is registered the armature 36 engages its front contact, thereby establishing a circuit from the ground, through armature 36, through conductor 45, relay 40, battery, to ground. The relay 40 thereupon attracts its armature 39 and breaks the circuit through the relay 41, thus disconnecting the magnet 43 from circuit. When the plug 5 is inserted in the jack the circuit of the supervisory relay 63 extends over the trunk line 1 and 2 with the 15000 ohm relay 20 in series. This relay does not permit sufficient current to pass through the relay 63 to efface the clearing out signal 62. However, when the called subscriber at the station D responds a short circuit is established about the relay 20, the relay 63 then operates to break the circuit through the lamp 62. The B operator upon receiving the signal through the lamp 31 immediately inserts the plug 9 into the jack 10, for instance, of the desired line. The insertion of the plug causes the sleeve relay 35 to be actuated as readily apparent and the actuation of this sleeve relay among other things establishes a locking circuit for the relay 40 which can be traced from the ground, through battery, through relay 40, front contact 46, armature 47, conductor 48, front contact 49, armature 34 to ground. The relay 40 is thus held up until the plug 9 is finally withdrawn, so that no further registration of the meter 44 takes place. The actuation of this relay 35 also breaks the connection to the lamp 31 by breaking the circuit at the contacts 33 and 34, thus extinguishing the lamp 31. The B operator then actuates the ringing key 15 in the ordinary way and when the called subscriber at the station D responds, tip relay 50 is energized as readily apparent, thereby establishing a short circuit about the relay 20 which can be traced from the junction point 51, conductor 52, armature 53, conductor 54,

back contact 55, armature 56, conductor 57, to the junction point 58. Relay 20 is thus deenergized, whereupon the relay 27 is deenergized. Relay 40 however remains attracted due to the locking circuit as before explained. The circuit through the lamp 31 even though the armature 29 is now in engagement with its back contact, is not reestablished as the circuit through the conductor 59 is open both at the armature 60 and at the armature 61.

As soon as the subscriber at station D hangs up, relay 50 is deenergized, thereby again causing energization of the relay 20 to again energize the relay 27, thus attracting its armature 29. A further result due to the removal of the shunt from about relay 20 is the deenergization of the answering tip supervisory relay 63 associated with the A-operator's link circuit. This actuates the supervisory lamp 62, whereupon the A operator withdraws the plug 5, releasing the relays 20 and 27, thereupon establishing a circuit which can be traced from ground through battery 28, lamp 31, armature 29, conductor 59, armature 60, front contact 49, armature 34 to ground as the sleeve relay 35 remains drawn up so long as plug 9 is within the jack. This lights the lamp 31 and notifies the B operator to disconnect the cord circuit, which she thereupon does by removing the plug 9.

In Fig. 2, I have shown a modification of the circuit in which when the circuit at the A board is established, the circuit through relay 64 is completed, which can be traced from line conductor 2 through the coil 18, junction point 58, conductor 65, relay 64, conductor 66, armature 67, junction point 51, coil 19, to the line conductor 1. Armatures 30 and 36 are thereupon actuated, completing circuit first through the electro magnet 41 to register upon the meter 44, and then completing circuit through the electromagnet 40 to break the circuit through the electromagnet 41. The actuation of the electromagnet 40 breaks the circuit through the relay 64 which is in shunt of the relay 85, thereby permitting relay 85 to become energized and the circuit through relay 40 is thereupon again locked by its armature 47 and armature 86.

In Fig. 3, I show a further modification of the meter circuit in that a completion of the trunk circuit at the A board establishes a circuit through the relay 68, which thereupon attracts its armature 69 to thus establish a circuit through the relay 78. The actuation of the relay 78 causes a registration upon the meter 44 as will be obvious. At the same time the circuit through the relay 68 is broken by the contact spring 72, the armature 69 remaining however in an attracted position on account of the peculiar construction of the springs 73 and 72.

Thereupon the relay 74 operates on account of the breaking of the shunt circuit about this relay by the contact springs 72, thus causing an actuation of the relay 75. The actuation of this relay 75 besides controlling the actuation of the lamp 76, also causes a restoration of the springs 72, 73 and the armature 69 by the actuation of its own armature 77, lifting the said springs 72 and 73 away from their holding position. Simultaneously with the actuation of the relay 75, relay 79 operates opening circuit through relay 68.

The coöperation of the parts thus described with the rest of the apparatus in Figs. 2 and 3 it is thought will be clearly apparent.

From what has been described it is thought the nature and objects of my invention will be readily clear to those skilled in the art, and also that changes will readily suggest themselves to those skilled in the art within the scope of my invention. Having however thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a system of the character described the combination with a trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter.

2. In a system of the character described the combination with two exchanges and a trunk circuit uniting them, of a meter associated with said trunk circuit, a link circuit at one of said exchanges, and means associated with said trunk circuit and controllable thereover, operable immediately upon the connection of said link circuit with said trunk circuit to effect a registration on said meter.

3. In a system of the character described the combination with a plug ended trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, an entering subscriber's line at the other switching station, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter irrespective of the subsequent association of said trunk circuit with said subscriber's line.

4. In a system of the character described the combination with a plug ended trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, an entering subscriber's line at the other switching station, a meter associated with said trunk circuit, means opera-

ble over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter irrespective of the subsequent association of said trunk circuit with said subscriber's line, and means associated with said trunk circuit and operable upon association of said trunk circuit with said subscriber's line to lock said first aforesaid means against further registration until disconnection of said interconnecting instrumentalities.

5. In a system of the character described the combination with a trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said means including a meter controlling relay, a second relay for controlling said first aforesaid relay, and means for successively actuating said relay.

6. In a system of the character described the combination with a trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said meter including a slow acting meter controlling relay, a second slow acting relay for controlling said first aforesaid relay, and means for successively actuating said slow acting relays.

7. In a system of the character described the combination with a trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said meter including a slow acting meter controlling relay, a second slow acting relay for controlling said first aforesaid relay, and a relay having a pair of successively actuated switching devices to successively actuate said slow acting relays.

8. In a system of the character described the combination with a trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said meter including a slow acting meter controlling relay, a second slow acting relay for

controlling said first aforesaid relay, and a slow acting relay having a pair of successively actuated switching devices to successively actuate said slow acting relays.

- 5 9. In a system of the character described the combination with a plug ended trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, and entering subscriber's line at the other switching station, a meter associated with said trunk circuit, means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said means including a meter controlling relay, a second relay for controlling said first aforesaid relay, and means for successively actuating said relays, and means associated with said trunk circuit and operable upon association of said trunk circuit with said subscriber's line to lock said first aforesaid means against further registration until disconnection of said interconnecting instrumentalities.
- 25 10. In a system of the character described the combination with a plug ended trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, an entering subscriber's line at the other switching station, a meter associated with said trunk circuit, means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said meter including a slow acting meter controlling relay, a second slow acting relay for controlling said first aforesaid relay, and means for successively actuating said slow acting relay, and means associated with said trunk circuit and operable upon association of said trunk circuit with said subscriber's line to lock said first aforesaid means against further registration until disconnection of said interconnecting instrumentalities.
- 45 11. In a system of the character described the combination with a plug ended trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, an entering subscriber's line at the other switching station, a meter associated with said trunk circuit, and means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said meter including a slow acting meter controlling relay, a second slow acting relay for controlling said first aforesaid relay, and a relay having a pair of successively actuated switching devices to successively actuate said slow acting relays, and means associated with said trunk circuit and operable upon association of said trunk circuit with said subscriber's line to lock said first aforesaid means against further

registration until disconnection of said interconnecting instrumentalities.

12. In a system of the character described the combination with a plug ended trunk circuit extending between two switching stations, of a link circuit at one of said switching stations, a meter associated with said trunk circuit, an entering subscriber's line at the other switching station, means operable over said trunk circuit and immediately upon connection of said link circuit with said trunk circuit to record a registration upon said meter, said meter including a slow acting meter controlling relay, a second slow acting relay for controlling said first aforesaid relay, and a slow acting relay having a pair of successively actuated switching devices to successively actuate said slow acting relays, and means associated with said trunk circuit and operable upon association of said trunk circuit with said subscriber's line to lock said first aforesaid means against further registration until disconnection of said interconnecting instrumentalities.

13. A telephone system comprising an A-operator's link circuit and a B-operator's link circuit, a meter associated with said B-operator's link circuit, and means responsive to the connection of said A-operator's link circuit to the said B-operator's link circuit for operating the said meter.

14. A telephone system comprising a pair of switching stations, a trunk circuit terminating in manual terminals at said stations, a meter associated with said trunk circuit, and means responsive to a connection to one end of said trunk circuit for operating said meter to register such connection.

15. A telephone system comprising a pair of switching stations, a trunk circuit extending from one to the other of said stations and terminating in manual terminals at said stations, a recording device associated with one end of said trunk circuit, and means responsive to a connection with the other end of said trunk circuit for operating said recording device.

16. In a telephone system, an A-operator's board and a B-operator's board, a trunk circuit extending from said A-board to said B-board, a meter associated with said trunk circuit, and means responsive to the connection of an A-operator's link circuit with the said trunk circuit for causing the operation of said meter.

17. In a telephone system an A-operator's board and a B-operator's board, a trunk circuit extending between said boards, a meter associated with said trunk circuit at the said B-board, an A-operator's link circuit, means responsive to the connection of said A-link circuit to the said trunk circuit for operating said meter device, and means for preventing further operations of said meter device.

18. In a telephone exchange system, the

combination with a jack-ended trunk circuit and a plug-ended link circuit, of a meter for said trunk circuit responsive to the connection of said plug to said jack for registering such connection, and means for connecting the other end of said trunk circuit to a subscriber's telephone line.

19. A telephone system including manual switchboards, manual link circuits, a trunk circuit terminating in manual terminals of said switchboards, a registering device for said trunk circuit responsive to a connection of one of said link circuits to said trunk circuit, and means for manually connecting said trunk circuit to a subscriber's telephone line.

20. In a telephone system, a manual trunk circuit, a manual link circuit for connecting thereto in extending a call, a call registering device, a relay for said trunk circuit responsive to such connection for actuating said call registering device, and means for preventing further actuations of said call registering device until the apparatus of said trunk circuit is returned to normal.

Signed by me at Chicago, county of Cook and State of Illinois, in the presence of two witnesses.

RICHARD I. UTTER.

Witnesses:

GEORGE E. MUELLER,
M. R. ROCHFORD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."