R. H. MANSON.

TELEPHONE SYSTEM.

APPLICATION FILED MAY 20, 1907.

1,009,762.

Patented Nov. 28, 1911.

4 SHEETS—SHEET 1.

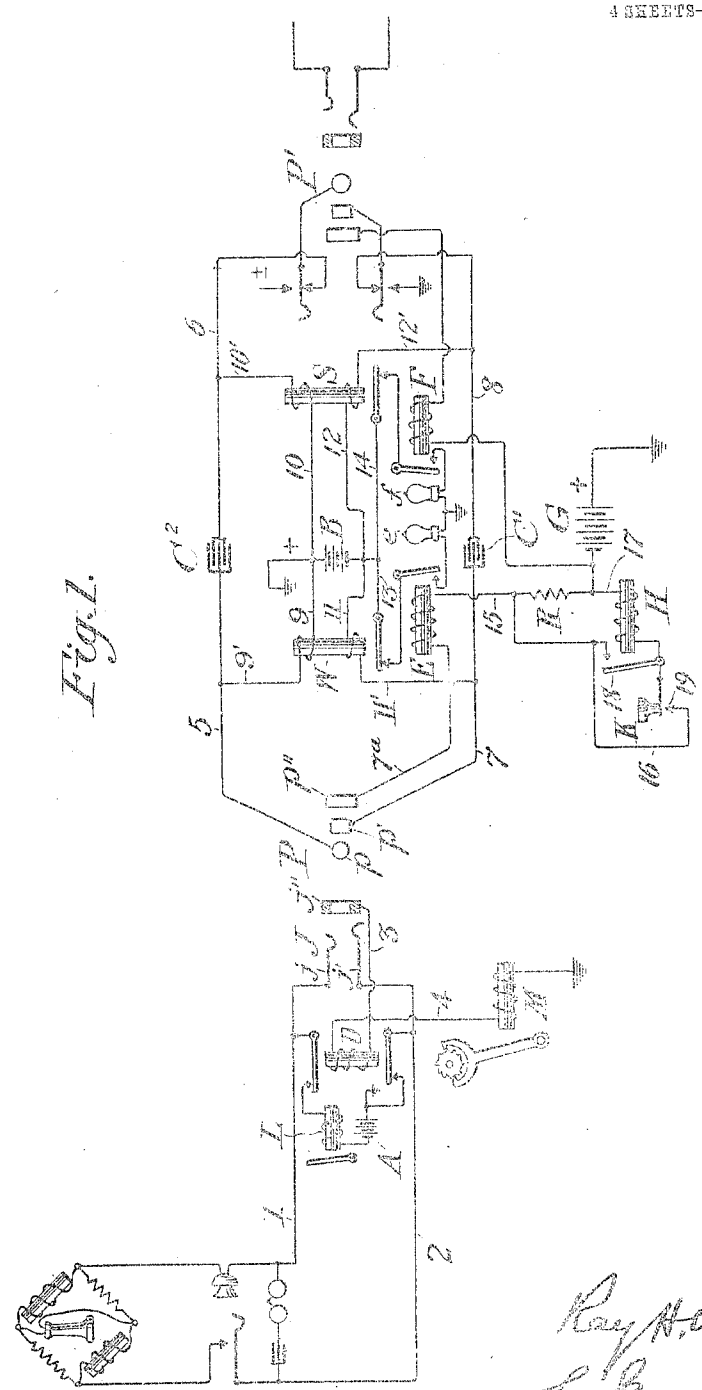


Fig. 1.

Witnesses

W. W. Edelin.

C. A. Stanley

Inventor

Ray H. Manson

by Edward Coleman

Attorney

R. H. MANSON.

TELEPHONE SYSTEM.

APPLICATION FILED MAY 29, 1907.

1,009,762.

Patented Nov. 28, 1911.

4 SHEETS—SHEET 2.

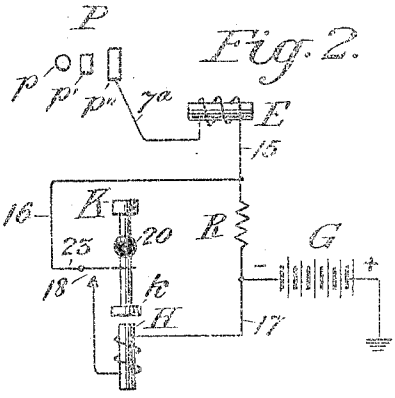


Fig. 2.

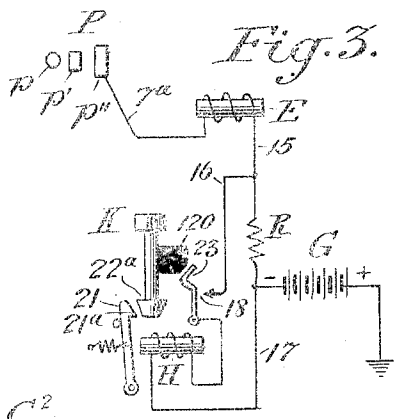


Fig. 3.

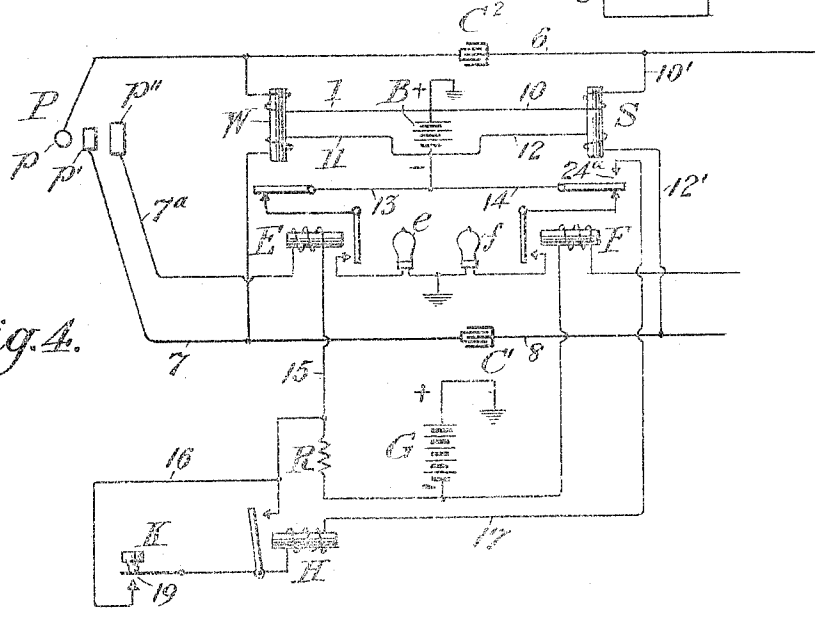


Fig. 4.

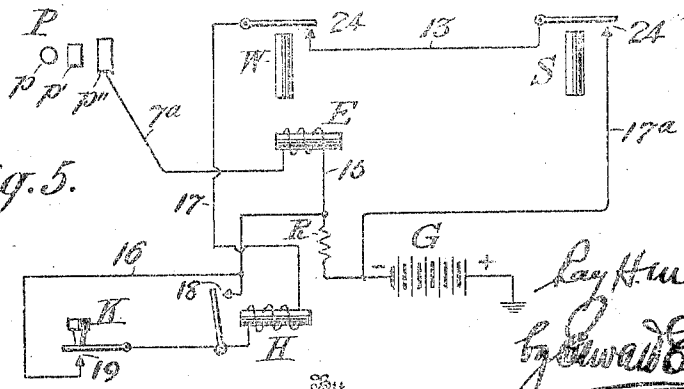


Fig. 5.

Witnesses

W. W. Tibbits.

R. A. Stanley

Inventor

Ray H. Manson

By Edward B. Kennedy

Attorney

R. H. MANSON.

TELEPHONE SYSTEM.

APPLICATION FILED MAY 29, 1907.

1,009,762.

Patented Nov. 28, 1911.

4 SHEETS—SHEET 3.

Fig. 6.

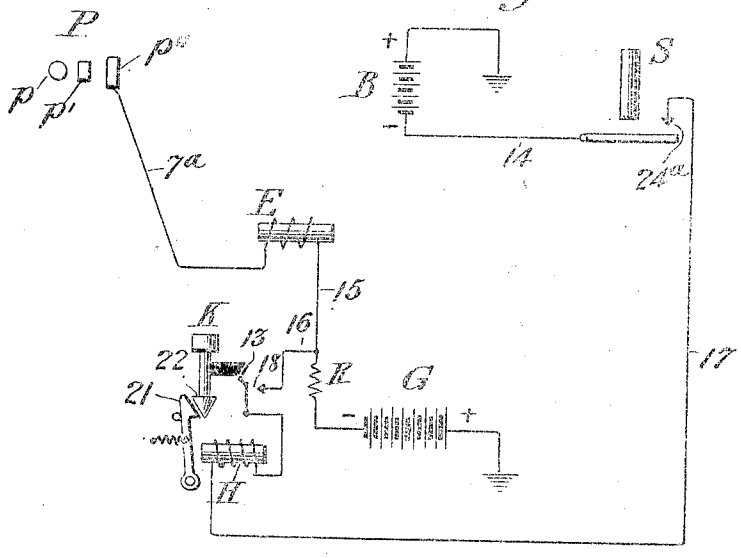
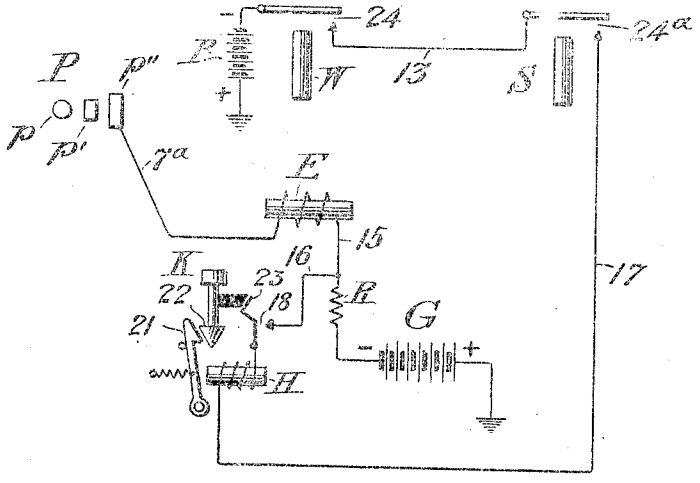


Fig. 7.



Witnesses

O. W. Eddin.

C. A. Stanley

Inventor

Ray H. Manson

By Edward B. Clement

Attorney

R. H. MANSON.

TELEPHONE SYSTEM.

APPLICATION FILED MAY 29, 1907.

1,009,762.

Patented Nov. 28, 1911.

4 SHEETS—SHEET 4.

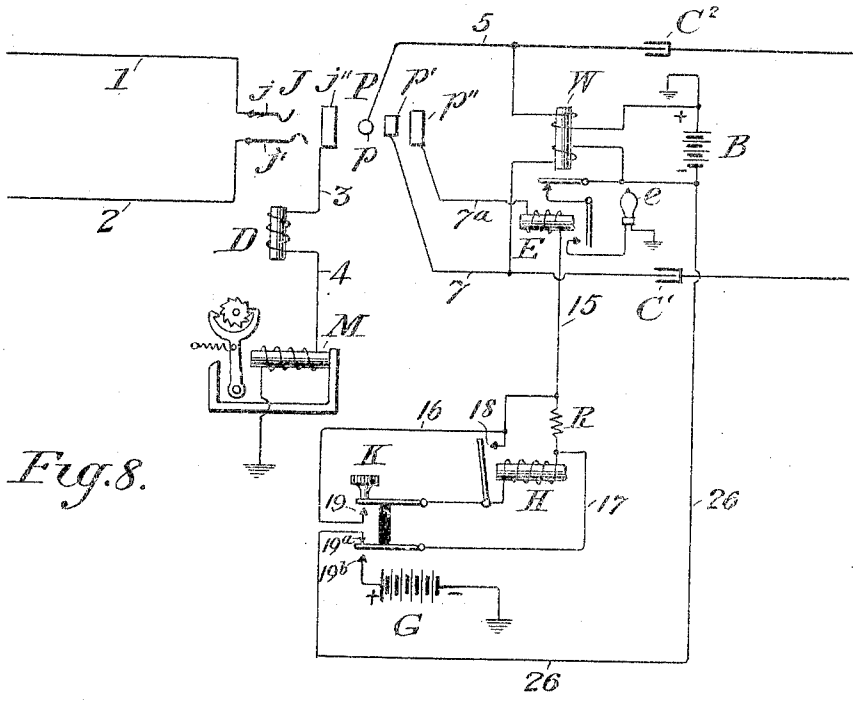


Fig. 8.

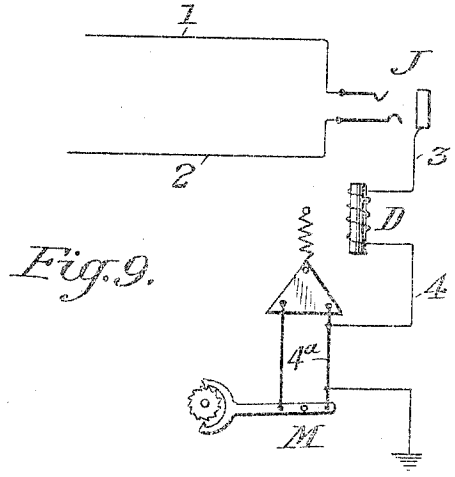


Fig. 9.

Witnesses

O. W. Collin.

R. A. Stanley

Inventor

Ray H. Manson

By Edward C. Edwards

Attorney

UNITED STATES PATENT OFFICE.

RAY H. MANSON, OF ELYRIA, OHIO, ASSIGNOR TO THE DEAN ELECTRIC COMPANY, OF ELYRIA, OHIO, A CORPORATION OF OHIO.

TELEPHONE SYSTEM.

1,009,762. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed May 29, 1907. Serial No. 376,419.

To all whom it may concern:

Be it known that I, RAY H. MANSON, a citizen of the United States, residing at Elyria, in the county of Lorain and State of Ohio, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to telephone systems and especially to such systems as are adapted for what is known as "measured service".

The main object of my invention is in such a system to arrange meters for registering the number of line-calls, with actuating means therefor located in the operators' cord circuits. In most devices of this type which have been heretofore in use, considerable trouble has arisen because of what I may call double registering, that is to say, a proper registration of a call in the first instance, and then because of an accident or error, another registration of the same call. Where the registration is controlled from the subscriber's station, the switch hook may accidentally move and produce this undesirable result. Where the controlling means is connected to the operator's cord circuit, an accidental pressure of the operator's hand may actuate the same.

My present invention contemplates such an arrangement of the controlling device or devices that double registration is impossible.

I provide means whereby the registration is controlled preferably by the operator, and locking means therefor so that the operator is positively locked out or prevented from registering a second time on the same device until after the answering plug has been withdrawn from the answering jack and the connection thereby broken. This practically limits the registration to successive calls, since it would be impossible for the operator to obtain control of the register for a second time without the knowledge of the subscriber.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a diagrammatic view of a 3-wire cord circuit embodying my invention and one end of a subscriber's line circuit provided with a meter. Figs. 2 and 3 are detail views of a modified form of the key and locking means shown in Fig. 1. Fig. 4 is a diagrammatic view showing one end of a cord circuit and a modified arrangement of the meter actuating devices. Figs. 5, 6 and 7 are detail views showing other modifications of the arrangement of the meter actuating devices. Fig. 8 shows another modification involving a polarized meter mechanism. Fig. 9 is a detail view showing the arrangement in the subscriber's line circuit of a thermally operated meter.

Referring to Fig. 1, 1 and 2 denote the line wires of a subscriber's line; 3 the connection between the sleeve of the jack and the winding of the cut-off relay D, the other end of the winding being in circuit through the wire 4 with the meter M. L denotes the line relay and A the battery for actuating the same. P and P′ represent the answering and calling plugs respectively of a 3-wire cord circuit. These plugs are normally connected by way of the conductors 5—6 and 7—8, broken of course by the condensers C' and C^2. The main battery B is bridged in the cord as usual, each end of the cord being typical, the battery being connected to the tip and sleeve sides of the cord on one side of the condensers through the divided windings of the supervisory relay W by means of the conductors 9—9′ and 11—11′ and forming a similar bridge on the other side of the condensers through the relay S and the conductors 10—10′ and 12—12′. In the third strand of the cord are included the supervisory control relays E and F controlling current supplied to the supervisory signal lamps *e* and *f* in the ordinary manner. There is also included in the third strand of the cord circuit a high resistance R, the same adapted to be shunted by a normally open circuit 16, 19, 17, which contains a low resistance relay H and a key K adapted to close the shunt circuit at the contact 19. It will be understood that the key K is located in connection with the cord circuit on the operator's key shelf. A battery G, preferably the main office battery, is provided for actuating the relay H.

The operation of the invention is as follows: When a call has been received by the operator she inserts the answering plug P in the answering jack J. Current then flows through the meter and through the meter actuating devices over the following path; ground side of meter, M, 4, D, 3, j'', p'', 7^a,

E, 15, R, G. Owing to the fact of the high resistance R being in circuit the current which flows through the meter when the answering plug is inserted is not sufficient to cause the meter to register, although of sufficient strength to cause the cut-off relay D to operate in the regular way. The operator now inserts the calling plug P′ and calls the subscriber wanted. As soon as the called-for subscriber responds, the operator presses the key K, placing a low resistance path around the high resistance R, thereby reducing the resistance of the circuit so as to allow sufficient current to flow through the meter M to operate the latter. At the same time the relay H draws up its armature against the contact 18, thus locking the shunt circuit so that any further manipulation of the key K will not cause the meter M to register. It is only when the circuit traced above is broken by the withdrawal of the answering plug from its jack that the armature of the relay H is permitted to fall back, thereby restoring the parts to their normal position.

In Figs. 2 and 3 I have made use of indicating push button keys K and coöperating relays H which may be used in place of the key and the relay shown in Fig. 1. The general arrangement of the circuit in Figs. 2 and 3 is practically the same as that in Fig. 1, with a few changes. In Fig. 2 the key K is held in a normally elevated position by the spring 23 which engages the lug 20 carried by the key. The insertion of the answering plug P permits current to flow through the high resistance and through the meter M in the manner previously described. When the called subscriber answers, the operator presses the key K and the spring 23 makes contact at 18, thus closing the shunt circuit 16, 18 and 17 and energizing the relay H. The key K is provided with an armature *k* on its lower end. The closing of the shunt circuit at 18 locks this armature on the end of the relay magnet H, thus preventing the operator from accidentally pressing the key a second time and thus registering a second call in the meter. If, for any reason, the operator does desire to register a second call as, for instance, when a subscriber has exceeded the time limit allowed for a call, she can forcibly lift the push button so as to open the circuit at 18, after which the depression of the key K will cause a second operation of the meter M.

In Fig. 3 I have shown an indicating push button somewhat similar to that shown in Fig. 2 but provided with locking means which will prevent the operator from registering a second call until the answering plug has been withdrawn from its jack. In this figure the key K is provided with a lug 120 adapted to bear against a spring 23 to close the shunt circuit at the contact 18. When this is done, the relay H is actuated and its magnet attracts the armature 21. The beveled edge of the lower end of the key K coöperates with a similar beveled edge on the armature 21 to press the latter slightly away from the relay H when the key descends. When in its lowest position the key is retained by the engagement of the shoulder 22^a with a corresponding shoulder on the armature 21^a and cannot be raised until the armature is released. The closure of the circuit through the relay H, of course, locks said relay and the latter is only unlocked when the answering plug is withdrawn from the jack.

In Fig. 4 I have shown a meter circuit which depends upon the called subscriber being actually connected before it is possible for the operator to close the meter to register. This circuit is somewhat similar to that shown in Fig. 1, except that the winding of the relay H has its circuit extended by means of the conductor 17 through a series contact 24^a of the supervisory control relay S. This contact is normally open and is closed only when the called for subscriber has his receiver removed from his hook switch. When the called for subscriber takes down his receiver, thus closing his end of the line, the following circuit is completed: B, 10, S, 10′, C, tip side of calling plug, subscriber's line circuit, sleeve side of calling plug, 8, 12′, S, 12. The relay S pulls up, establishing contact at 24^a, the operator presses key K, and current flows through the meter M by the following path: ground side of meter, M, 4, D, *j*″, *p*″, 7^a, E, 15, 16, 19, H, 17, 24^a, 14, battery, ground.

It will be noted that in the above arrangement as shown in Fig. 4, the operator is only able to complete the circuit after the called for subscriber has actuated the relay S, thereby closing the circuit at 24^a, and throwing the battery B in the meter circuit.

Fig. 5 illustrates a meter circuit which depends on both the calling and the called for subscriber being connected before it is possible for the operator to cause the meter to register. The line and cord circuits are the same as shown in Fig. 1 with the exception of the extra wiring shown in connection with the supervisory control relays W and S. These relays W and S are actuated whenever the subscribers have taken their receivers off the hook switches by circuits similar to the one traced in explanation of the action of the relay S in Fig. 4. These relays having pulled up, the circuit is closed through the contacts 24 and 24^a. The operator now presses the key K and the circuit through the meter M is completed thus: ground side of meter, M, 4, D, *j*″, *p*″, 7^a, E, 15, 16, 18, H, 17, 24, 13, 24^a, 17^a, G.

Fig. 6 shows an arrangement similar to that shown in Fig. 4 but which makes use

of an indicating key instead of the contact key shown in the latter figure. As in the arrangement of Fig. 4 it is necessary in the arrangement of Fig. 6 for the called subscriber to have answered, thus operating the relay S and closing the circuit at 24ª. The operator presses the key K and the circuit is closed through the meter by a path similar to that shown in Fig. 4, *i. e.*, ground side of meter, M, 4, D, 3, *j''*, *p''*, 7ª, E, 15, 16, 18, H, 17, 24ª, 14, B. The locking action of this key is the same as that already described in connection with Fig. 3.

Fig. 7 shows an arrangement in which it is necessary that both subscribers remove their receivers from the hook switches before it is possible for the operator to cause the meter to register. When both subscribers are connected the operator presses the key K and the circuit is completed through the meter thus: ground side of meter, M, 4, D, 3, *j''*, *p''*, 7ª, E, 15, 16, 18, H, 17, 24ª, 13, 24, B.

Fig. 8 shows the requisite connections for a polarized meter mechanism which will not operate when the answering plug is inserted in the jack but which is caused to register as soon as the operator presses a meter button which reverses the current through the magnet of the meter and causes the action of the latter. In this figure the relay M consists of an electromagnet provided with an armature of permanent polarity adjacent the end thereof. As is ordinary in meters of this kind, the armature will be attracted only when an unlike pole is induced in the adjacent end of the electromagnet. In the figure the direction of the current has been indicated. When the answering plug is inserted the current through the meter is as follows: ground side of meter, M, 4, D, 3, *j''*, *p''*, 7ª, E, 15, R, 17, 19ª, 26, and B. The operator now presses her key K, breaking the circuit at the point 19ª and closing the circuit at the points 19ᵇ, and 19. The circuit through the meter M may now be traced from the supplemental battery G, 19ᵇ, 17, H, 18, 16, 15, E, 7ª, *p''*, *j''*, 3, D, 4, M, and ground. This reverses the polarity of the meter magnet and causes the actuation of the meter by the movement of the armature. It will be noted that in this case it is necessary to use a separate battery so as not to have a ground common with that of the main battery.

In Fig. 9 I have illustrated diagrammatically a meter thermally operated by the expansion and contraction of wire 4ª which could be effectively used in place of the electromagnetically operated meters shown in Figs. 1 to 7, inclusive. As in the case of the electromagnetically operated meters the registering of the thermal meter depends upon the fact that when the answering plug is inserted not enough current is permitted to flow through the wire 4ª to cause it to vary in length sufficiently to register on account of the high resistance R interposed between the battery and the meter in the third strand of the operator's cord circuit. When, however, the operator presses the meter key, thus providing a low resistance shunt around the high resistance R, enough current is permitted to flow through the wire 4ª of the thermal device to cause the operation of the latter and the registering of the meter. Moreover, the thermally operated meter can be and preferably is arranged and adjusted for a definite amount of current, thereby operating within a close range.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit for interconnecting said lines having calling and answering plugs and provided with a battery, a high resistance in series with said battery, a normally open shunt circuit around said high resistance, a key for closing said circuit to actuate said meter, and a low resistance locking relay in said shunt circuit adapted to maintain a shunt about said resistance until released by the withdrawal of the answering plug.

2. In a measured service telephone system, subscribers' 3-wire circuits provided with cut-off relays, call registering meters in series with said cut-off relays, an operator's cord circuit for interconnecting said subscribers' lines comprising a battery, a high resistance in series with said battery, a normally open shunt circuit around said high resistance, a low resistance locking relay in said shunt circuit, a key for closing said shunt circuit to actuate said meter, said relay acting to maintain said resistance shunted until deënergized.

3. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit provided with a supervisory control relay, a high resistance and a battery in series with the winding of said supervisory control relay, a normally open low resistance shunt around said high resistance, means for closing said shunt circuit to operate said meter, and means for maintaining said shunt circuit closed.

4. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit provided with a supervisory control relay, a high resistance and a battery in series with the winding of said supervisory control relay, a normally open low resistance shunt around said high resistance, said shunt circuit including a low resistance locking re-

lay and a contact key whereby on the manipulation of said contact key the shunt circuit will be closed and locked and the meter actuated by the current from said battery.

5. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit provided with a supervisory control relay, a high resistance and a battery in series with the winding of said supervisory control relay, a normally open low resistance shunt around said high resistance, said shunt circuit including a contact spring, and a low resistance relay having an armature provided with a shoulder, an indicating key provided with a lug adapted to engage said spring to close said shunt circuit and being provided on its lower end with a head having a shoulder adapted to engage the shoulder on said armature whereby on the manipulation of said indicating key the shunt circuit will be closed and locked and the meter actuated by the current from said battery.

6. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit provided with a supervisory control relay, a calling supervisory relay, a high resistance and a battery in series with the winding of said supervisory control relay, a normally open low resistance shunt around said high resistance, said shunt including a spring contact, an electro-magnet having an armature provided with a shoulder, and a second battery and being completed through the armature of the calling supervisory relay, and an indicating push key provided with a lug and adapted to close said spring contact and having a head provided with a shoulder adapted to engage the shoulder on said armature whereby when said calling supervisory relay has been energized and said indicating key depressed, the shunt circuit is closed and locked and the meter actuated by the current from said second battery.

7. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit, a key arranged in said cord circuit for controlling the actuation of said meters, a circuit controlled by said key and means for locking the circuit closed by said key, said circuit uninterrupted by said locking means during the operation thereof.

8. In a measured telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit for controlling the actuation of said meters, a key associated with said cord circuit, a circuit controlled by said key, and means for locking the circuit closed by said key.

9. In a measured service telephone system, subscribers' lines, registering meters connected therewith, an operator's cord circuit including a battery, a high resistance in series with said battery, a normally open shunt circuit around said high resistance, a key for closing said shunt circuit thereby causing said meter to register, and locking means for holding said shunt.

In testimony whereof I affix my signature in presence of two witnesses.

RAY H. MANSON.

Witnesses:
S. J. ROBERTS,
W. C. STRONG.