

(No Model.)

T. SPENCER.  
ELECTRIC ANNUNCIATOR.

No. 502,472.

Patented Aug. 1, 1893.

Fig. 1.

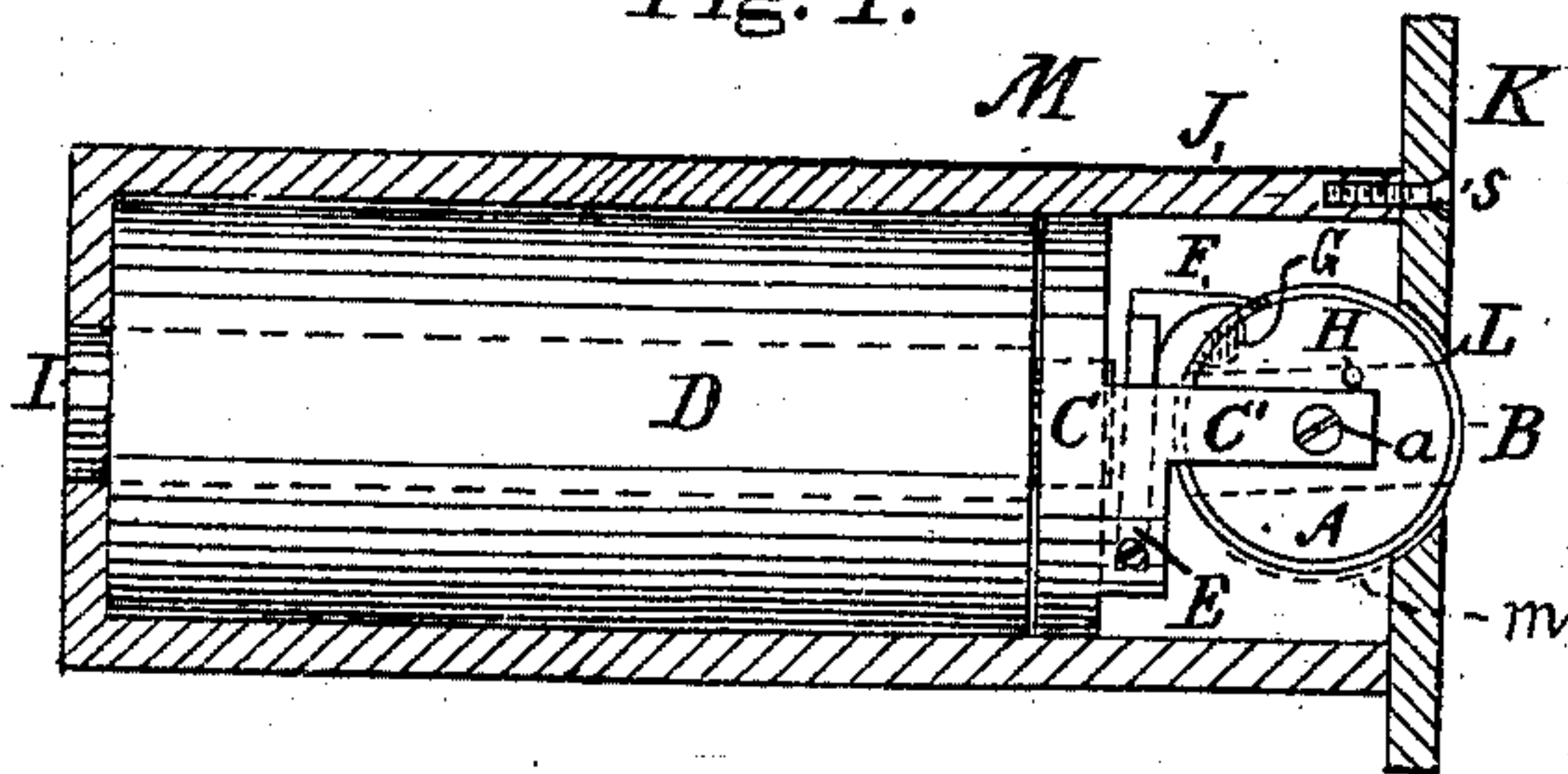


Fig. 2.

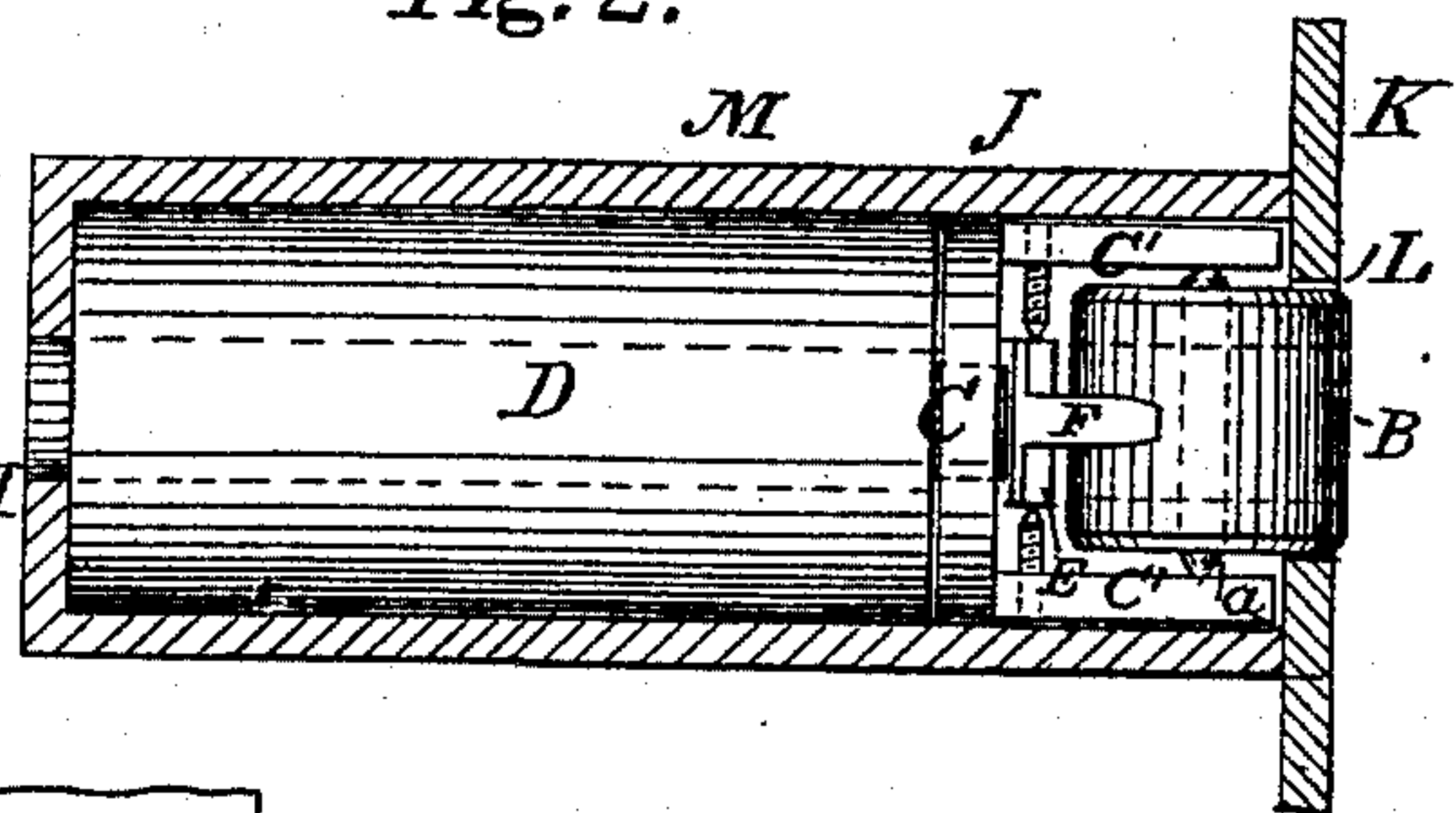


Fig. 3.

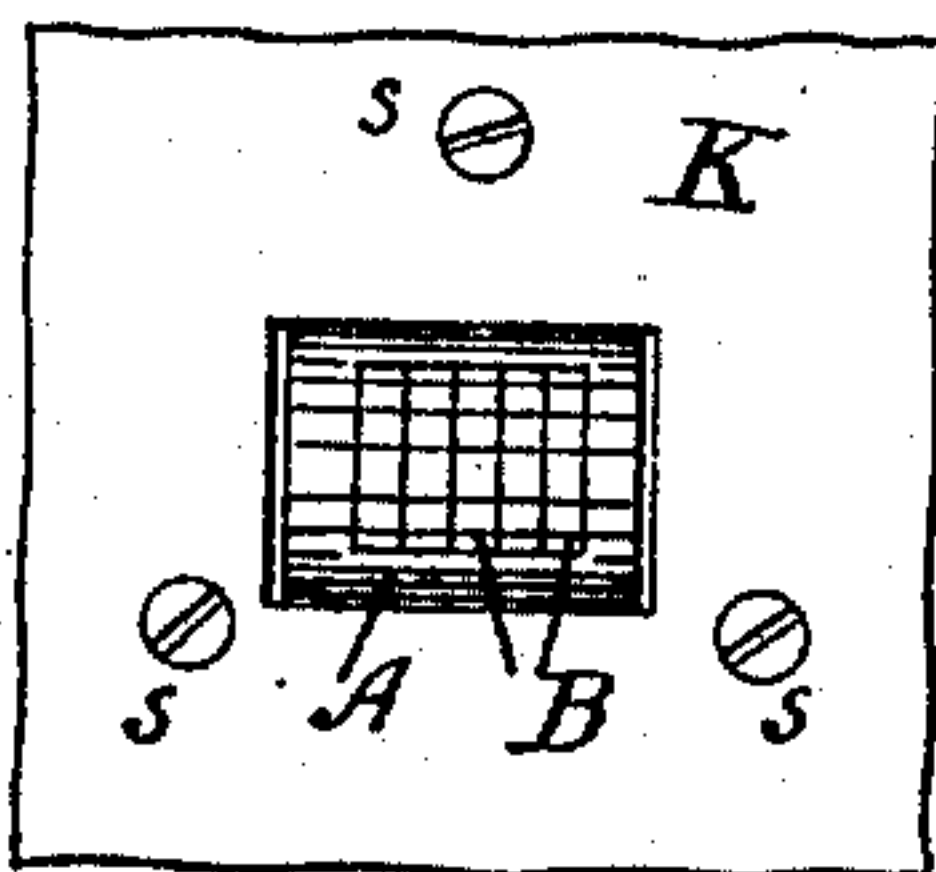


Fig. 4.

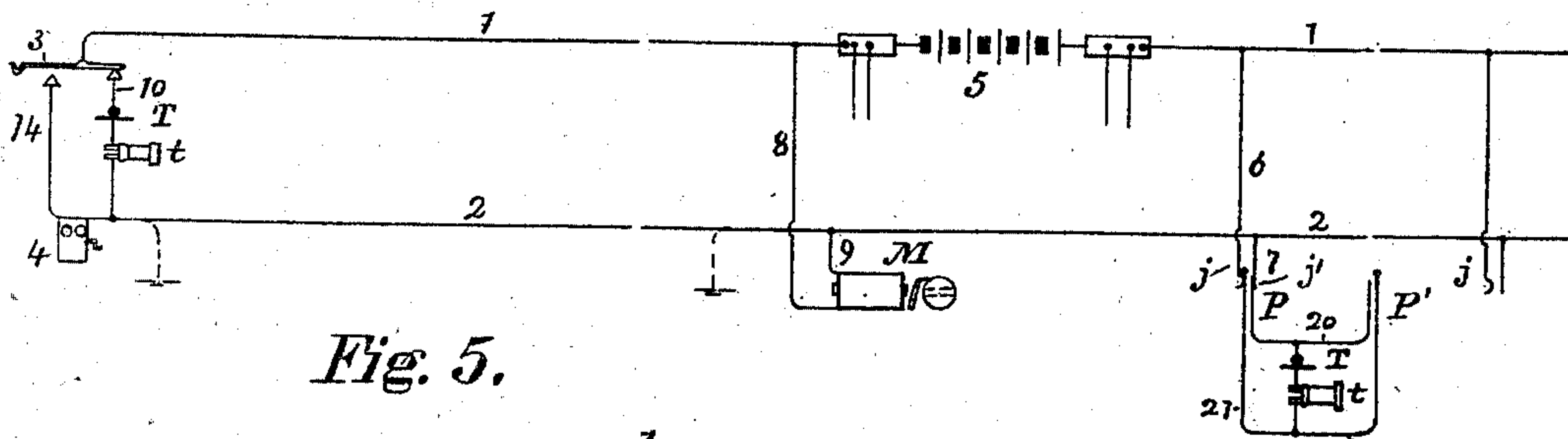


Fig. 5.

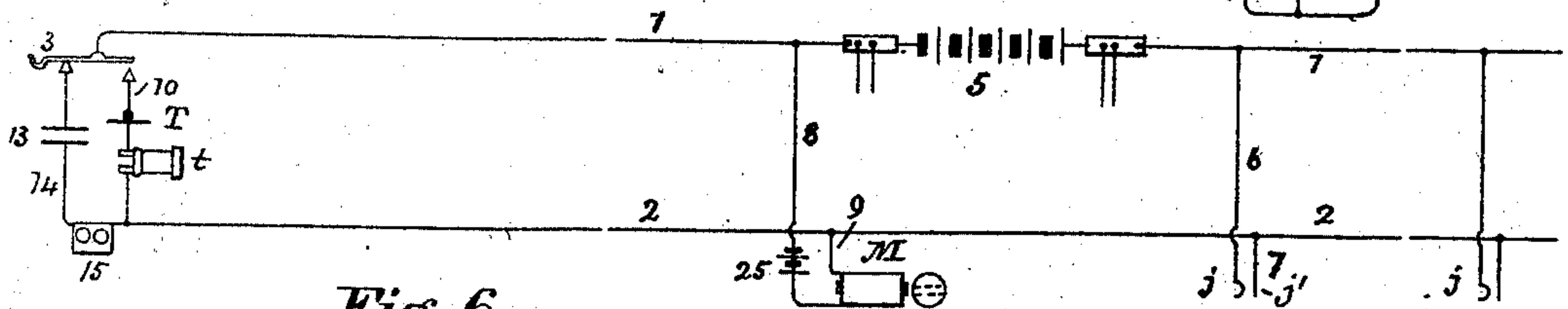


Fig. 6.

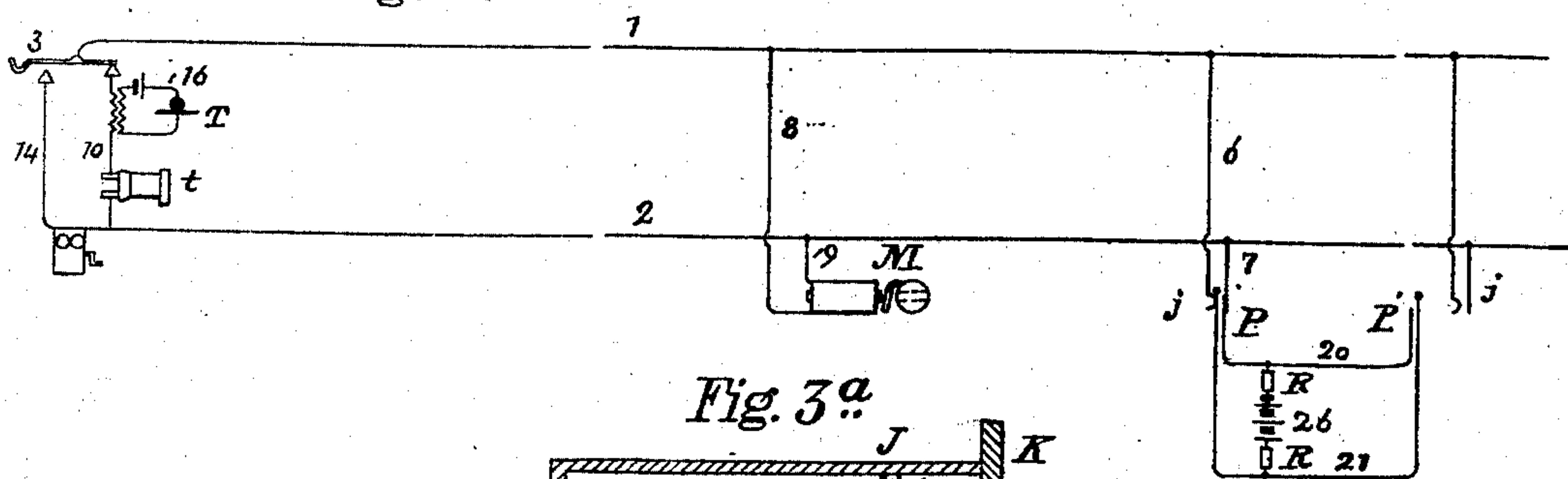
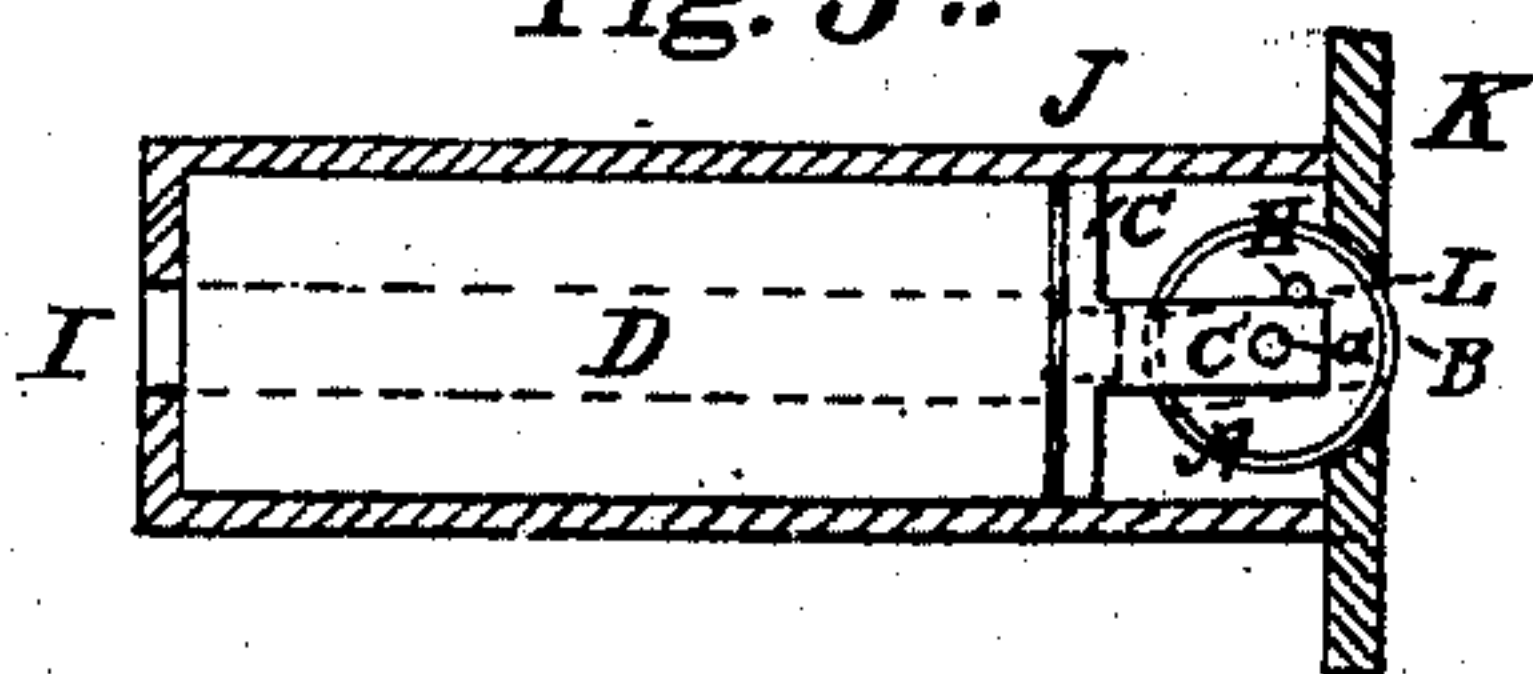


Fig. 3a.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC ANNUNCIATOR.

SPECIFICATION forming part of Letters Patent No. 502,472, dated August 1, 1893.

Application filed February 7, 1893. Serial No. 461,368. (No model.)

*To all whom it may concern:*

Be it known that I, THEODORE SPENCER, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Electric Annunciators, of which the following is a specification.

This invention relates to a new form of line drop or annunciator such as is used in connection with the terminal of a telephone substation line at the central station switchboard.

It also has reference to a form of annunciator whose shutter or target can be automatically returned to its normal position, after it has been displaced by a current of electricity thrown upon the line by any means actuated from the substation.

My invention is applicable to any kind of a main circuit extending between a substation and a central station but I choose to describe it chiefly as associated in a metallic circuit, and in a system of intercommunication in which a common source of electricity located at the central station is employed for vitalizing the telephone transmitters at the several connected substations when looped together for conversation. Such a system of centralizing the vitalizing batteries of substation telephone transmitters is set forth in my application for Letters Patent filed November 19, 1892, Serial No. 452,549.

My annunciator consists of a coil of wire wound upon a bobbin in the usual way, upon one end of the bobbin and attached to the prolonged core thereof is a brass disk having two arms projecting from opposite sides thereof; pivoted between these arms and near the end of the core is an armature having at its upper extremity a brass projection. A rubber cylinder is pivoted between the said arms near their ends, and has inserted in it a series of magnetized steel or hard iron strips extending across the diameter thereof and flush with the circumference; these steel strips are normally in line with the axis of the core of the coil and are held in that position, on one side, by a pin which projects from the end of the cylinder which rests upon one arm of the brass frame; and on the other side, by means

of the brass projection on the upper extremity of the armature which engages in a depression on the face of the cylinder. The side of the cylinder toward the coil is made heavier than the opposite side for a purpose to be described. The coil and cylinder may be inclosed in a suitable case which is secured to a face plate, having an opening opposite the pivoted cylinder, through which the indicator is seen. I locate the annunciator in a bridge at the central station across the limbs or sides of the main circuit, the line terminals of which are open and may appear upon each section of the switchboard as is usual in multiple switchboards.

The armature of the annunciator is attracted to the core, when the coil is vitalized by a current of electricity by any means actuated at the substation, and as it detaches from the cylinder the latter by reason of the additional weight upon its side falls and rotates until it reaches a limiting stop, thus bringing opposite the opening in the face plate a part of the surface of the cylinder which differs in appearance from the part normally seen, either by color or a number to indicate that a call has been made. When the central station operator inserts one of a pair of loop plugs into the line answering jack to ascertain what the substation wants, the central station battery employed to vitalize the substation telephone transmitters is closed to line, and while it affords current for the purpose mentioned, it also serves to energize the coil of the line annunciator whose core thereupon acts inductively upon the steel strips or magnets in the rubber cylinder, and pulls the cylinder around into its normal position, and concealing the part of its surface which bears the call indication and holds it in this position as long as the plug is inserted. When the plug is withdrawn, thus opening the circuit, the armature instantly falls back by reason of gravity and catches the cylinder and holds it, the annunciator being thus automatically reset and locked, all of which I will now proceed to describe in detail, reference being had to the drawings, of which—

Figure 1 is a sectional side view, and Fig. 2 a sectional top view, and Fig. 3 an end view



of my improved annunciator. Fig. 3<sup>a</sup> is a modification of the annunciator in which the armature E is removed and the cylinder A brought near the coil D; the weight G is also removed and the cylinder A is so hung and balanced as to remain in equilibrium. Fig. 4 is a diagram showing the annunciator in a circuit extending between a substation where the calling current is generated by a magneto bell, and a central station employing a common source of electricity. Fig. 5 is a diagram showing the annunciator in a circuit extending between a substation where the calling current is generated by a battery located at the central station, and a central station employing a common battery system; and Fig. 6 is a diagram showing the annunciator in a circuit extending between a substation and a central station the former employing the usual telephone outfit for calling and speaking, and the latter having an arrangement of circuits and apparatus whereby the annunciator is reset.

Referring to Figs. 1, 2 and 3 J is an iron cylinder or case inclosing the annunciator, and has one end secured to the face K by screws s s. The annunciator is composed of a coil of wire D upon a bobbin, and a core of soft iron I, the latter projecting slightly at one end sufficiently to allow the disk C of a brass frame to embrace and be secured to it. The frame C has two projecting arms C' C' one on either side thereof, and pivoted between these arms is an armature E of soft iron, having upon its top part a brass projection F in the form of a pawl. The armature is hung so that it will fall away from the coil by gravity, when not held by the attraction of the core. At the extremity of the arms and between them and at right angles to the axis of the electro magnet D, is pivoted a hard rubber cylinder A, in such proximity to an orifice L in the face plate K that it projects slightly therethrough. A series of steel strips or permanent magnets B extend diametrically across the cylinder in holes prepared for them, their ends being flush with the face of the cylinder; they are held in place by the spindle  $\alpha$  upon whose ends the cylinder rotates. A weight of metal G is inserted in the side of the cylinder nearest the coil D to make that side heavier than the opposite side. The position of the cylinder A which is normally seen through the opening L is of a character to indicate that of "no call," but around in the position indicated by dotted line  $m$  (Fig. 1) the number of the substation is painted or otherwise shown. A pin H projects from one end of the cylinder and strikes upon the arm C' and holds the cylinder from rotating too far; and the brass pawl F resting in a depression in the surface of the cylinder holds it in its normal position.

In Fig. 4 I show the annunciator associated in a circuit extending between a substation and a central station in which the common battery system is employed for vitalizing the

telephone transmitters, as described in my application previously referred to.

1, 2 are the limbs or sides of a main metallic circuit terminating at the substation in the usual apparatus excepting the transmitter battery, the magneto call generator being in one branch and the telephone in another, and terminating at the central station in open branch terminals; the battery is placed in wire 1, as shown, between the branch terminals and the substation, and the annunciator is bridged across the wires 1 and 2 outside of the battery. As the operator's outfit forms no part of the invention beyond the looping plugs and telephones, I have not shown anything more than them. In the operation of calling the subscriber operates the magneto call generator, the current of which energizes the coil of the annunciator, the armature is attracted, and as its pawl leaves the cylinder the weighted side thereof falls and rotates its target surface round opposite the orifice L through which it is displayed; the operator seeing the indication inserts the plug P between the open terminals  $j j'$ ; thus looping in the telephone T and  $t$ . This operation effects two results, first the circuit thus completed (which may be traced from one pole of battery 5 by wire 1 through substation telephones, if the subscriber has removed his receiver from the hook 3, and by wire 2, branch terminal 7 and spring  $j'$ , wire 20 of loop cord, telephone T,  $t$ , other wire 21 of the loop cord, spring  $j$ , and branch terminal 6 to the other pole of the battery) becomes charged from the battery 5, and the substation and central station telephones are thereby vitalized and can be used to transmit speech; and second, a second circuit is also formed as follows, from one pole of the battery 5, wires 1 and 8, annunciator M, wires 9 and 2, branch terminal 7 and spring  $j'$  through the loop cords to spring  $j$  and branch terminal 6 to the other pole of the battery. The result of this is that the coil of the annunciator is energized and its core polarized which then acts inductively upon the magnets B in the cylinder A, causing the same to rotate into the position shown in Fig. 1 (the pin H preventing its further rotation), where it is held reset, as long as the plug P is inserted in the terminals  $j$  and  $j'$ , the armature E being of course attracted to the core I. While the cylinder is thus held inductively, connection may be made by the other plug P' with any other line, whose line annunciator will also be similarly held by the same means, and the two subscribers thus connected may complete their conversation and notify the operator in the usual way who thereupon withdraws the plugs P. This withdrawal opens the two circuits and removes the current from the line; the armature E immediately falls back, and its pawl F catches in the depression in the surface of the cylinder A before it has a chance to fall over and holds it locked and reset. Of course the annunciator of the second line to which this first one



was looped becomes locked and reset in the same manner. When the plug is inserted in the line terminal the annunciator is not disturbed if a current from the substation magneto generator is sent in.

In Fig. 5 I have shown a modification of the annunciator shown in Fig. 3<sup>a</sup> in connection with a circuit similar to Fig. 4, except that the calling from the substation is effected by a small battery at the central station; in this case the magneto is removed from the substation, the bell only being in circuit in one branch with a condenser 13, when the telephone is on the hook; the telephones are in another branch which forms a part of the circuit when the telephone is off the hook; there is a small battery in one side of the bridge 8, 9 which includes the annunciator M, which has its poles opposed to those of the main battery. When the telephone is on the hook at the substation, the circuit is open at the condenser and no current flows from battery 25, and consequently the rotating cylindrical indicator A remains balanced and unaffected. When the subscriber wishes to call the central station, the telephone is removed from its hook 3, which act switches the branch 14 out of and includes branch 10 into the circuit, a continuous circuit now being formed, the current from battery 25 polarizes the core I of the annunciator with the same polarity as that of the ends of the magnets B opposite thereto, the result being that the latter are repelled and the cylinder A is caused to fall or rotate and indicate a call; when the operator inserts the plug P into the open line terminals  $j j'$  of the line to answer, the call current from the main battery 5 circulates in the local circuit which includes the annunciator, as described in Fig. 4, and overpowers the small battery 25 and resets the indicator A, because it polarizes the core I in a direction to attract the poles of the magnets B of the annunciator. When the substation telephone is returned to its hook the line is again opened by the introduction of condenser 13, leaving the battery 5 still holding the annunciator reset, and when the plug P is removed, it is also left reset. In this case the condenser may be substituted by high resistance helices in the bell with the same results.

Fig. 6 shows the annunciator of the first form in a circuit between a substation and a central station, in which the usual transmitter battery is used at the former station, the annunciator being in a branch as in Fig. 4. In this case, the subscriber operates the annunciator by the magneto bell, and when the plug P is inserted in the answering jack, a battery 26 in a bridge between the loop cords with inductive resistances R R on either side thereof, furnishes current to the local circuit formed by the bridge 8, 9, wires 1, 2 and conductors of the loop cord which operates to reset the annunciator.

When the plug is inserted in the line terminal and the rotating armature is reset as

has been described, by current flowing in the coils of the helix D, a magnetic circuit is formed through the core I and the inclosing iron case J, and through the metal strips or magnets B, which operates to remagnetize the latter if they are of hard iron, and tends to prevent gradual loss of magnetism in case they are of steel.

I claim as my invention—

1. An electric annunciator comprising in combination, an electro-magnet, and a magnetized indicator of cylindrical form, rotatable in front of an aperture so as to display different portions of its surface through said aperture, substantially as described.

2. An electric annunciator consisting of an electro magnet, and a locking and releasing armature, with a magnetized rotative indicator in inductive proximity to the helix of said electro magnet.

3. An electric annunciator consisting of an electro-magnet and a magnetized indicator of cylindrical form, journaled in bearings in inductive proximity to the core of said magnet and rotatable upon an axis at right angles to the axis of the magnet, substantially as described.

4. An electric annunciator consisting of an electro magnet and a locking and releasing armature with a magnetized rotative indicator in inductive proximity to the said electro magnet and with its axis of rotation at right angles to the axis thereof.

5. An electric annunciator consisting of an electro magnet and a locking and releasing armature with a magnetized rotative indicator in inductive proximity to the said electro magnet, the said indicator having one side weighted and being provided with means for limiting its rotation in both directions as set forth.

6. The combination of a main telephone circuit extending between a substation and a central station; of an electric annunciator consisting of an electro magnet with a magnetized rotative indicator in inductive proximity thereto in a bridge across the sides of the said main circuit, at the central station; a locking armature normally holding said indicator from rotation, and means at the central station for energizing said magnet and thereby releasing the indicator, substantially as described.

7. The combination with a main telephone circuit terminating at the central station in normally open branches, of an electric-annunciator in a bridge across the sides of said circuit, said annunciator comprising an electro-magnet, an inductive magnetized indicator overweighted on one side so as to rotate when released, and a catch actuated by the armature of said magnet so as to release said indicator when the magnet is energized, substantially as described.

8. The combination with a main telephone circuit extending between a substation and a central station, of an electric annunciator in a bridge across the sides of said circuit and



comprising a rotative magnetized indicator, an electro-magnet adapted when energized to reset and hold said armature, a catch actuated by the armature of said magnet and engaging the indicator when the magnet is de-energized, an answering plug and looping cord at the central station, and a source of electrical energy, whereby upon the connection of said plug to a terminal of the main circuit the magnet of the annunciator will be energized, substantially as described.

9. The combination of a main telephone circuit extending between a substation and a central station, and terminating at the latter station in normally open line terminals; of an electric annunciator consisting of an electro magnet with a magnetized rotative indicator in inductive proximity thereto in a

bridge across the sides of the said main circuit, said indicator being rotated for resetting the same by the attraction of said magnet with a main circuit transmitter battery common to a number of main line circuits, and an answering plug and looping cords whereby the circuit of said magnet is closed through said battery when a plug is inserted in a terminal of the main circuit to which said annunciator belongs, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 30th day of January, 1893.

THEODORE SPENCER.

Witnesses:

GEO. WILLIS PIERCE,  
FRANK C. LOCKWOOD.