(No Model.)

# F. W. JONES.

## STATIC COMPENSATOR FOR TELEGRAPHS.

No. 300,781. Patented June 24, 1884.

Fig: 1.

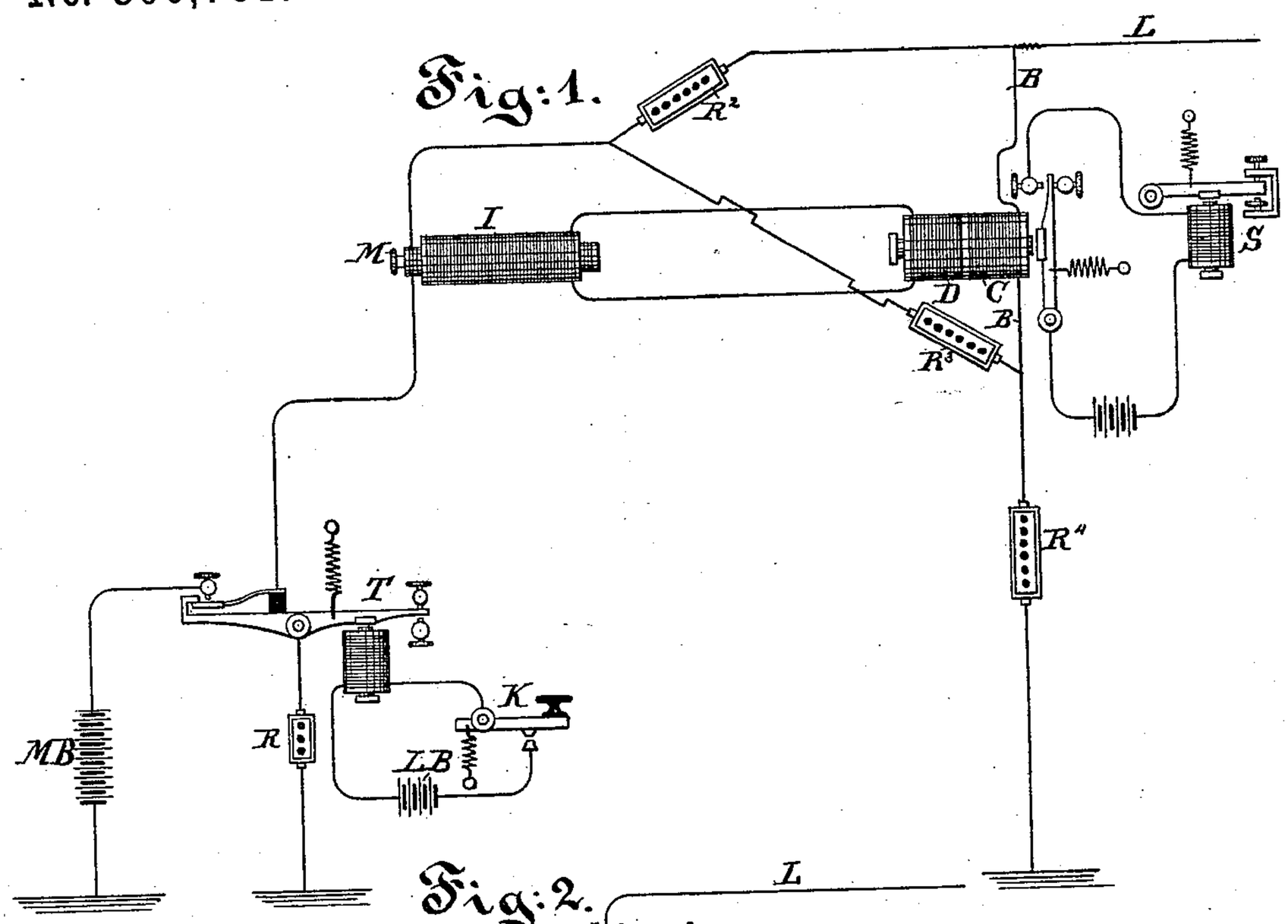


Fig: 2.




Witnesses:

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# UNITED STATES PATENT OFFICE.

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## STATIC COMPENSATOR FOR TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 300,781, dated June 24, 1884.

Application filed September 7, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS W. JONES, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Static Compensators for Duplex and Multiplex Telegraphs, of which the following is a specification.

My invention relates to duplex or multiplex telegraphs, and is designed to afford a simple and effective device for neutralizing or compensating for the disturbing effects upon the home relay, due to the difference between the main and the artificial lines in respect to static charge and discharge. It is well known in the art that at the moment the signaling battery or generator at the home station is put to line there is a momentary want of balance between the main and artificial lines, owing to the greater charge capacity of the main line, although after the current is established no want of balance is observed, provided the proper adjustments of resistance have been made, and the receiving-instrument at the home station is not affected by the outgoing current. The momentary want of balance may, however, produce a false movement of the home relay. Similarly, when the signaling-battery is withdrawn, the discharge-current from the line is liable to produce a false signal, owing to the fact that its strength is greater than that of the discharge from the artificial line, and there is therefore at such time also a want of balance. I propose to avoid the disturbing effects of the static charge and discharge by means of a neutralizing or compensating coil arranged to exert an effect upon the receiving-instrument counter to that consequent upon the static charge and discharge of the line, and connected with the secondary of an induction-coil or inductorium, the primary of which latter is connected into the line-circuit in such a way that when the signaling-battery is placed to line its current will flow through the primary and set up a current in the secondary in one direction, while, vice versa, when the signaling-battery is withdrawn, its current will cease to flow in the primary, and thus cause a momentary induced current in the secondary in the opposite direction. The static charge and discharge currents of the main line being respectively in opposite directions, and their effects upon the relay therefore opposite, the opposite currents simultaneously produced in the inductorium by the action of the signaling-battery may, by the proper arrangement of the connections, be made to counteract or neutralize such effects.

For the purpose of more fully explaining my invention, I will describe the same in connection with the accompanying drawings, illustrating the application of the invention to an ordinary duplex telegraph. Its mode of application to other forms of multiplex telegraph—such as the quadruplex, &c.—will be obvious without further explanation.

In the drawings, Figure 1 is a diagram illustrating the circuits and arrangement of apparatus at one end of a Wheatstone-bridge duplex. Fig. 2 illustrates the application of the invention to an ordinary differential duplex.

Referring to Fig. 1, T indicates an ordinary continuity-preserving transmitter, operated by an electro-magnet in circuit with a local battery, L B, and a Morse key, K, in the usual manner; and M B, the main-line or signaling battery, which is alternately applied to and withdrawn from line, in the usual way, by the operation of the transmitter.

R indicates the ordinary artificial resistance placed in the ground-wire or back contact connection of the transmitter, and approximately equal to the resistance of the battery M B.

At $R^2$ $R^3$ $R^4$ are indicated the usual adjustable resistances placed in the branches of the Wheatstone bridge for the purpose of producing a balance between the main and artificial lines in the well-known manner, so that the receiving relay or instrument in the bridge-wire B shall not be affected by the action of the battery M B. The local sounder for the receiving-relay is indicated at S, while C indicates the coils proper of the relay, which coils are in the bridge-wire, and receive current flowing over the line L from the distant station. Upon the relay is placed an additional set of coils, D, wound in a bobbin placed upon the core of the relay and beside the coils C, or over said coils, or in other way applied to the relay, so that a current flowing in the

coils D in proper direction may tend to produce an opposite effect to that produced by coils C, and may thus, under certain conditions, neutralize or counteract the effects of the latter. Coils D are in a local circuit with the secondary of an inductorium or induction-coil, I, and the primary coils of the latter are, as indicated, in the circuit of the main-line battery M B, so that when the latter is put to line its current will flow through the primary coil and induce a current in one direction in the secondary coil, and when said main-line battery is withdrawn from line the cessation of its current in the primary coil will cause an induced current in the secondary coil in the opposite direction. The proper ends of the coils D are connected to the secondary of the inductorium, so that the current induced in the secondary by the placing of the main-line battery to line shall exert an effect upon the receiving-relay at the home station counter or opposite to that which would be exerted by any current flowing at the same time in the bridge-wire by reason of the difference in static capacity between the main and artificial lines. The core M of the induction-coil is made adjustable in and out of the coils, so that the induced current may be adjusted according to the strength of the static charge or discharge current flowing in the bridge B.

The general operation is as follows: When the main-line battery is put to line, there is at the moment of closing a momentary flow of battery-current in the bridge, owing to the difference in the static capacity of the main and artificial lines; but simultaneously there is induced in the secondary of the induction-coil a current which circulates in the coils D in proper direction to neutralize the effects upon the relay of the current flowing in the bridge-wire B. The relay, therefore, is unaffected, and no false signal is produced. When the current is fully established on both main and artificial lines, the balance is complete, owing to the adjustment of the resistance $R^2$ $R^3$ $R^4$, and the current divides between them in the usual way, without affecting the relay. When the current of M B is withdrawn from line, there is a static-discharge current from line L, which flows in the bridge-wire B in the opposite direction to that flowing when the battery is put to line, and this discharge-current would produce a false signal were it not that the withdrawal of the main-line battery also sets up in the secondary of the induction coil and coils D a current of the opposite polarity from that produced by the closing of the battery, and therefore of the proper direction to neutralize the effects of the static-discharge current by producing counter effects upon the relay.

I do not limit myself to any particular method of causing the current set up in the secondary to act upon the relay in opposition to the static charge or discharge current, and may apply the coil in other ways for this purpose without departing from the spirit of the invention. One such way is illustrated in Fig. 2, in which the magnetizing effects of the coil D are applied to a separate core instead of the relay-core, and are made to exert a counter pull upon the relay armature-lever when the static charge or discharge current tends to draw the latter off its stop. This figure also illustrates the application of my invention to a differential duplex.

$R^5$ indicates an ordinary differentially-wound receiver, one of its coils being in the main line L, and the other oppositely wound or connected coil in an artificial line through the rheostat $R^4$.

H indicates the armature-lever of the relay. The core of compensating-coil D acts on said lever in a contrary direction to the relay-core, and said core is energized at the proper times by the induced current from the coil I, produced simultaneously with the connection and disconnection of the battery M B, and with the action of the static-charge and static-discharge current.

I am aware that it is not new to place a coil and core in the main-line circuit and to employ the discharge from such coils produced by the magnetization and demagnetization of its core for meeting and neutralizing the static charge and discharge current in the line, as this was proposed by C. F. Varley in 1870. My device differs therefrom in that the discharge-current produced by the main-line battery circulating in magnet-coils placed in the main line is not made to circulate in the line as previously, but through the medium of the secondary coils is made to flow in a local or independent circuit, and is made to act in an auxiliary or compensating coil, instead of flowing in the main line in a direction opposite to that of the static charge and discharge current.

I am also aware that it is not new to employ the secondary current from an induction-coil for purposes of compensation; but in no instance of which I am aware has the primary been arranged and operated in the manner devised by me and herein shown, and so that the signaling-current transmitted by the closing of the signaling-key will flow in the primary, and so that the effects in the secondary will be commensurate with and will be automatically adjusted to the strength of said signaling-current, and will vary automatically therewith.

What I claim as my invention is—

1. A static compensator for duplex or multiplex telegraphs, consisting of an inductorium one coil of which is in the circuit, as described, with the signaling-battery and the line, so that the signaling-current sent by the transmitter will flow through said coil, while the other is in a local circuit, including means for counteracting the disturbing effects of the static charge and discharge current upon the receiver.

2. A static compensator for duplex or multiplex telegraphs, consisting of an inductorium

one coil of which is connected directly into the signaling-circuit, so as to be charged and discharged by the alternate flow and removal of signaling-current transmitted to line at every complete movement of the transmitter, while its other coil includes a neutralizing-coil applied to the receiver, so as to counteract the effects of the static charge and discharge current flowing in the coils of said receiver.

3. The combination, with the receiver, in a differential or bridge duplex or multiplex telegraph, of an auxiliary coil adapted to exert upon said receiver an effect counter to that of the static charge or discharge current, and an induction-coil whose secondary includes such auxiliary coil, while its primary is in the circuit of the signaling-battery and line, as and for the purpose described.

Signed at New York, in the county of New York and State of New York, this 25th day of August, A. D. 1883.

FRANCIS W. JONES.

Witnesses:
THOS. TOOMEY,
GEO. C. COFFIN.