(No Model.)

C. SELDEN.

TELEGRAPHY.

No. 358,890. Patented Mar. 8, 1887.

Fig. 2.

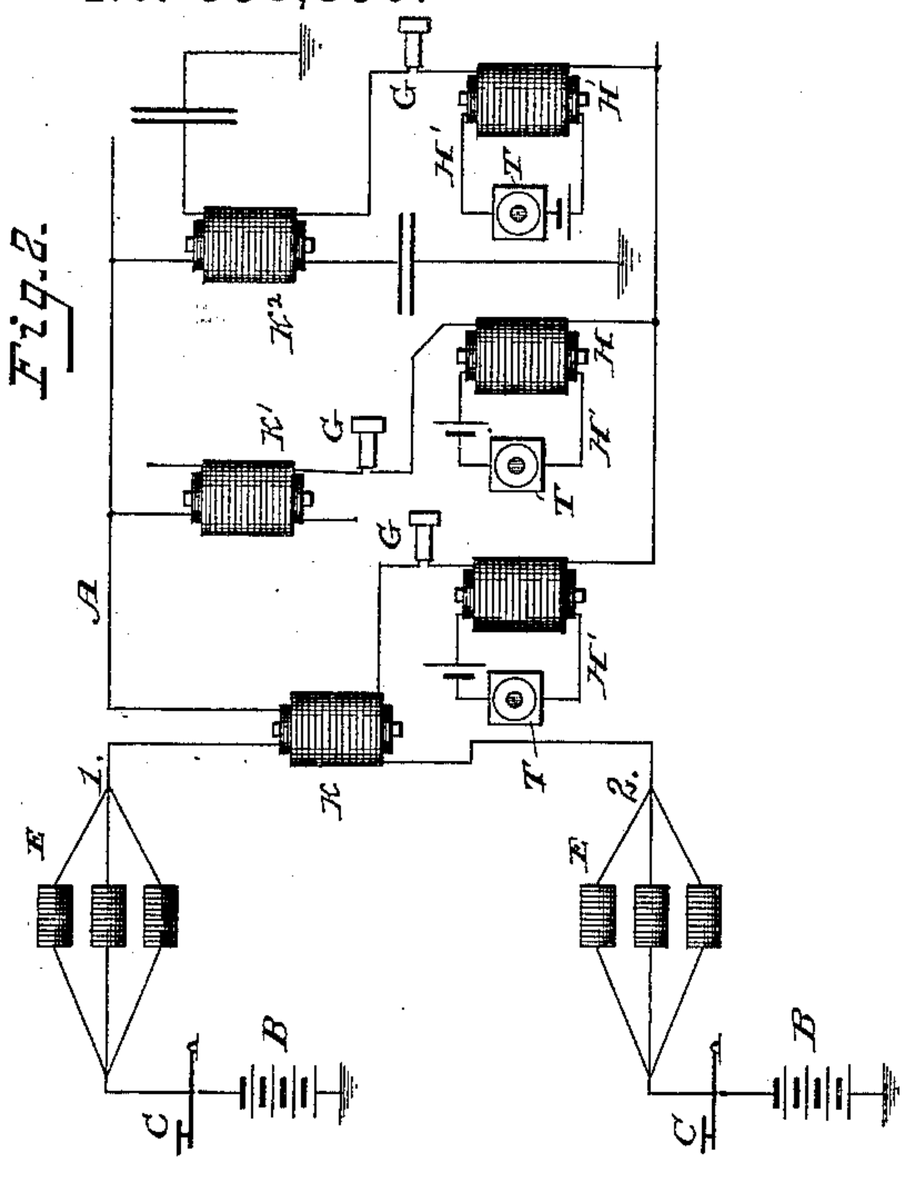


Fig. 4.

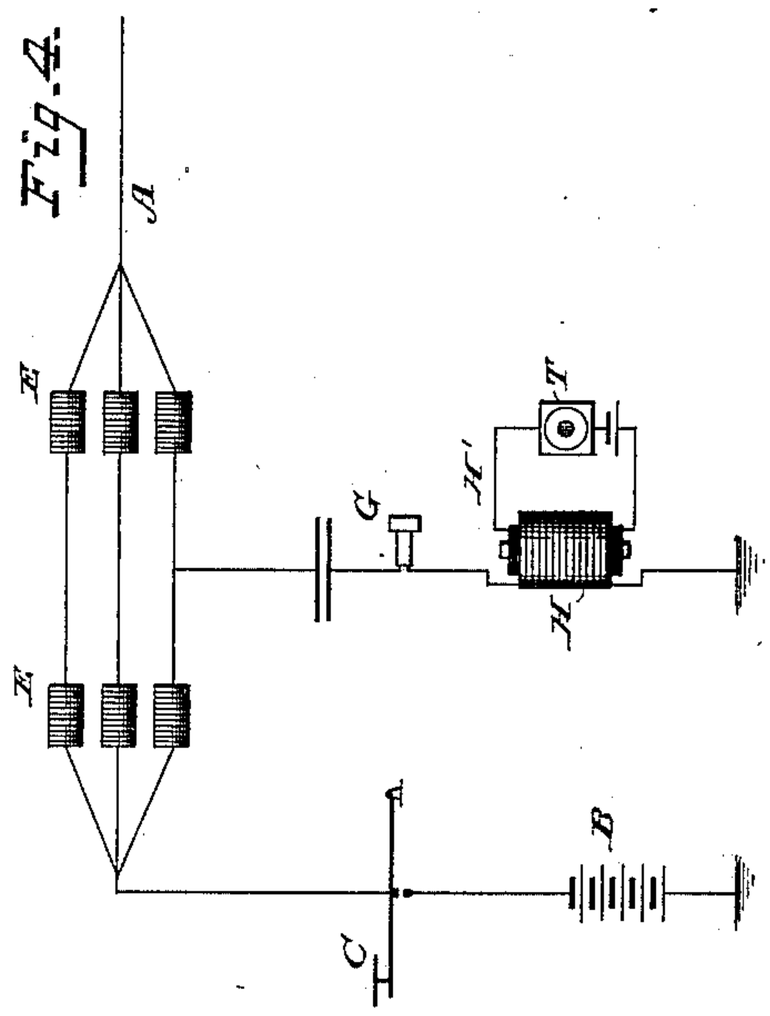


Fig. 1.

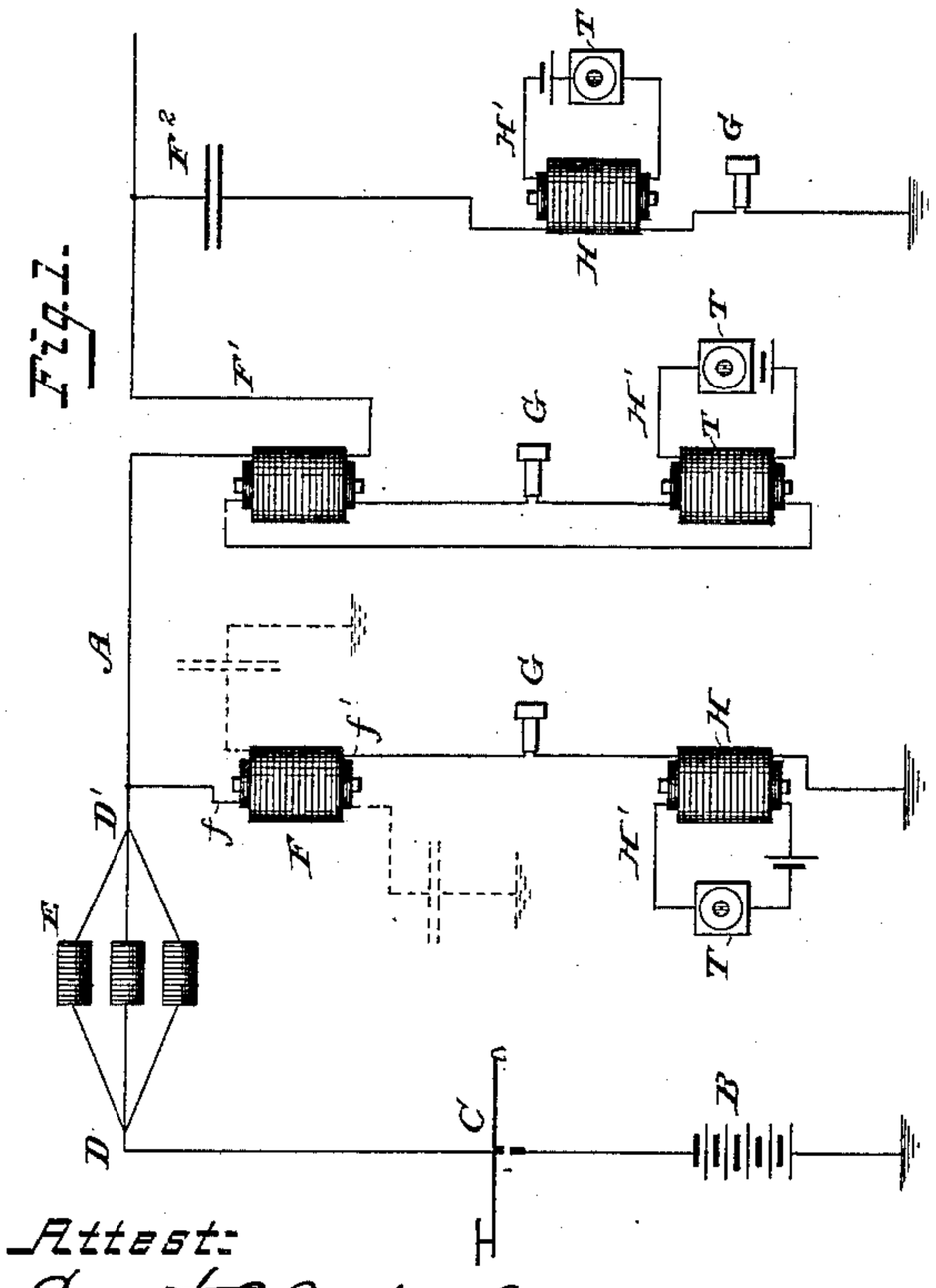
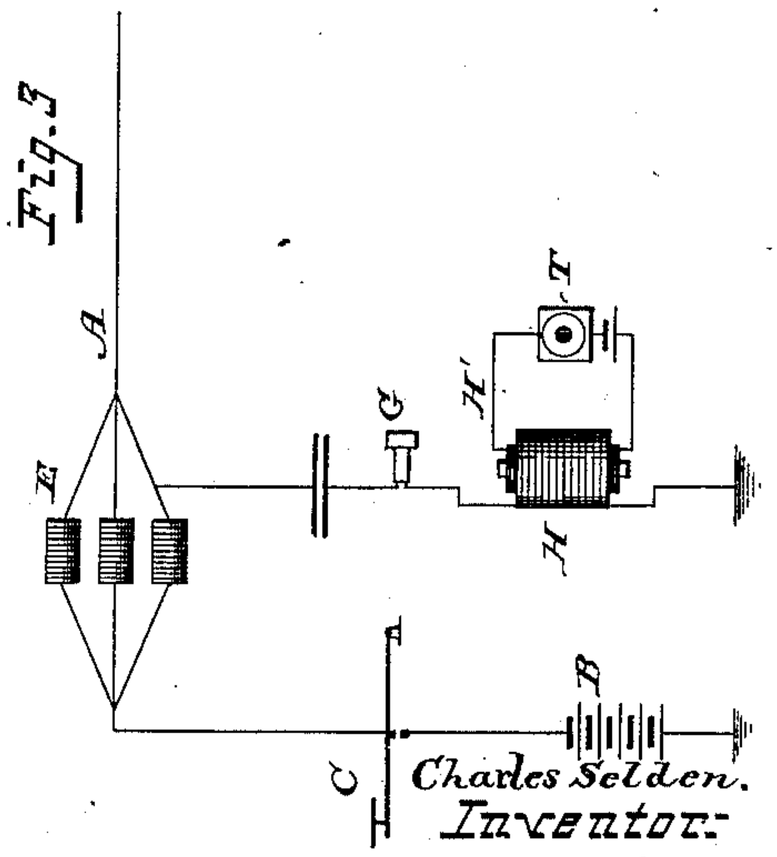


Fig. 3



Attest:
Court. A. Cooper.
Wm. A. Harries

Charles Selden.
Inventor:
By Foster & Freeman
Attys.

UNITED STATES PATENT OFFICE.

CHARLES SELDEN, OF BALTIMORE, MARYLAND, ASSIGNOR TO HIMSELF, WILLIAM T. BARNARD, OF SAME PLACE, AND FRANÇOIS VAN RYSSELBERGHE, OF BRUSSELS, BELGIUM.

TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 358,890, dated March 8, 1887.

Application filed April 21, 1886. Serial No. 199,671. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SELDEN, a citizen of the United States, residing in the city of Baltimore and State of Maryland, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

My invention relates to simultaneous telegraphy and telephony, and has for its object to improve the construction and arrangement of telegraphic and telephonic systems, whereby they are adapted for the simultaneous use of any of the ordinary systems of telegraphy and induced-current systems of telegraphy or telephony over the same line-wire.

Heretofore attempts have been made to make use of the same line-wire for the simultaneous transmission of various kinds of currents, and it has been ascertained that the induced-current signals may be superposed upon a line-wire over which Morse signals are being sent by connecting the said induced-current-signal apparatus to the main line by means of separators or inductors in the form of condensers or inductoriums, which allow the high-tension currents of the induced-current signals to pass, but which are opaque to the passage of the lower-tension, Morse, or other telegraphic signals. Even when this kind of a separator has been used it has been found that the making and breaking of the circuit in producing the Morse signals would cause such an abrupt charge and discharge of the line that the effects thereof would be distinguished in the receiving apparatus of the induced-current apparatus and the reception of signals therein would be more or less interfered with. This objection has been overcome by rendering gradual the emission and extinction of the Morse signal-currents, so that the line would become charged and discharged gradually, thereby lessening the disturbances in the induced-current-signal apparatus. Various means have been suggested for rendering gradual these telegraphic signals, and one of the means consists in placing in the main telegraphic line magnet coils or helices with or without magnet-cores. While such magnets have been found effectual in graduating the currents, they are impracticable for various reasons, and principally for the reason that a large amount of resistance is thereby interpolated in the line, requiring more battery-power to transmit signals over a given length of line, and by the increase of battery-power necessary to be employed the currents were not graduated sufficiently, and, furthermore, the magnetic effects from the cores increased the difficulties experienced in multiplex telegraph working by thus limiting their use to comparatively short circuits or lines.

One of the principal features of my present invention relates to such an arrangement of the graduators in the line-circuit that the objections heretofore encountered are overcome; and it consists in arranging a portion of the telegraphic circuit in multiple arc and interpolating the electro-magnetic or other resistances which act as graduators in the various arc circuits. It is well known that an electric current passing from a battery over a line or series of lines arranged in multiple arc will divide itself between those arc circuits in accordance with well-known laws, depending upon the amount of resistance in each circuit. I make use of this fact and so arrange the number of arc circuits and so distribute the resistance therein that when the current from the battery reaches the point of juncture of the various arc circuits the current will be effectually graduated without such a loss of potential as will interfere with the operation of long lines, and without the detrimetal magnetic effects that exist where electro-magnets are employed in the line direct and not in arc.

Other features of my invention consist in the various arrangements and construction of the separator or inductorium, by means of which the induced-current telegraph or telephone system is connected to the main telegraph-line, while still other features consist in the details of construction, more particularly pointed out hereinafter.

Referring now to the accompanying drawings, forming part of this specification, the various arrangements will be found to be illustrated diagrammatically.

In Fig. 1 A represents the main line of any

ordinary simple or multiplex telegraph, B the main battery, and C the key or other circuit-controller. The telegraph-receiving apparatus is omitted for convenience and clearness.

The main line A is divided at some convenient point, as D D′, into a multiple-arc circuit, shown in this instance as consisting of three divisions, though any convenient number may be used, and in each of the arc circuits is interpolated a current-graduator, E. The graduators may be of any desired or usual construction, as artificial resistances of carbon, coils, or a combination of any or all of these, as the construction of the graduator forms no part of my present invention.

It will be seen that the current from the battery will divide at the point D, where the arc circuits begin, and the amount of the current traversing each of the arc circuits will be directly proportional to the resistance that each one bears to the sum of all. In the present instance, there being three arc circuits of equal resistance, the battery-power employed will divide, one-third of it traversing each arc circuit and meeting again at the junction of said circuits with the main line at D′, and passing on the main line with slightly diminished potential, while at the same time the current will be effectually graduated.

Attached to the line beyond the point D′ is a separator, F. This separator may be formed in various ways, that shown at F consisting of an inductorium with a primary and secondary wire, both of which may be of the same resistance and character, or not, as may be desired. One of the terminals of one coil, *f*, is connected to the line-wire, while the other coil, *f′*, is insulated or connected to a condenser, and the other terminal is connected with an induced-current receiver, as the telephone G, and passing through the secondary circuit of the induction-coil H goes to earth. The induction-coil H has a primary circuit, H′, in which is placed any proper device, T, for controlling or varying the strength of the circuit in said primary.

Another form of separator is shown at F′, in which a loop from the main line forms one coil of the inductorium, the other coil being in the form of a closed circuit, including the receiver and one coil of another inductorium, in the primary of which is placed the transmitter T. At F^2 is shown a condenser used as a separator, one plate of the condenser being connected to the main line and the other to the ground, and including the receiver and one coil of the transmitter-inductorium.

In order to avoid the induction from one telephonic circuit to another, it is often desirable to use a complete metallic circuit for the telephone or induced-current system, and in Fig. 2 I have represented my improved system of graduating the telegraphic currents in the lines 1 and 2 and several ways of connecting said circuits so as to use a round or metallic circuit for the induced currents, the several arrangements being shown at one station or end of the line only, it being understood that the same or a similar arrangement is used at the other end. The Morse or multiple telegraph-circuits 1 and 2 are arranged for graduating the currents, as before described, and at K a portion of each line is used as one circuit of an inductorium. The receiver of the induced-current system is placed in one line, which also forms the secondary of the induction-coil of the transmitter, which is in the primary of said coil. At K′ is shown another manner of connecting the telephone by means of branches from the two lines forming an inductorium, the terminals of the branches being free, and at K^2 is shown a similar manner in which the terminals of the branches are connected to one side of a condenser, the other sides of which are connected to ground. It will be seen that the induced-current signals will pass over one telegraph-line in one direction and over the other in an opposite direction, and by this means disturbances from other adjacent lines will be overcome.

It has been common heretofore to connect the induced-current telegraph-circuit to the main line by placing the separator at some point beyond the operating instruments. In this way the induced-current system is subject to the full effects of the disturbances produced by the variations in the current in the Morse or other system, and as a consequence large graduators had to be used to properly control the emission and extinction of the changing currents. By my system of multiple-arc circuits this objection to the use of great resistances as graduators may be further overcome by connecting the induced-current system to one of the arc branches of the circuit, as shown in Fig. 3. This arrangement will be readily understood, and it will be seen that, as only a portion of the current from the transmitting-battery passes through the branch or arc, even if it were not graduated at all by artificial resistance, the effects upon the induced-current system would be only proportional to the whole current passing through all the arc circuits, and therefore the deleterious effects would be much reduced; but when the resistance or graduator is interpolated into this arc circuit and the comparatively small amount of current flowing through the same is effectually graduated, the effects upon the induction system are fully removed.

It will be readily seen that the amount of resistance of the graduators in each branch may vary, and that the greater resistance may be used in connection with the arc to which the induced-current system is connected.

In Fig. 3 I have shown the separator as consisting of a condenser; but it is evident that any of the forms of separators heretofore described may be used in this connection.

In further carrying out my improvement in dividing up the resistances or graduators, I have shown in Fig. 4 another feature, consist-

ing in interpolating in each arc circuit two separate resistances or graduators and in attaching the separator, connecting the induction-circuit between the resistances. In this arrangement not only the outgoing currents will be graduated, but the incoming currents will meet the resistance just before they reach the separator, and will be graduated at this point also. It is obvious that any of the various forms of graduators and separators heretofore described may be used in this connection.

Various other arrangements of the devices shown will readily suggest themselves to those skilled in the art, and need not be specifically described herein, it being understood that my invention is not limited to the specific arrangements shown, they being illustrated to show the principles of my invention.

Having now described my invention and various means for carrying it out, what I claim is—

1. The combination, with a telegraph-line composed in part of multiple-arc circuits, of current-graduators arranged in said arc circuits, substantially as described.

2. The combination, with a telegraph-line, of current-graduators arranged in branch or multiple-arc circuits, substantially as described.

3. The combination, with a telegraph-line having branch or multiple-arc circuits and current-graduators arranged therein, of an induced-current circuit connected therewith by separators, substantially as described.

4. The combination, with a telegraph-line having branch or multiple-arc circuits and current-graduators arranged therein, of an induced-current circuit connected thereto by means of inductoriums acting as separators, substantially as described.

5. The combination, with two telegraph-circuits, each having branch or multiple-arc circuits containing graduators and portions or branches of said lines arranged in inductive relations to each other, of induced-current instruments connected to said portions or branches, whereby the two lines form a complete metallic circuit for said induced-current instruments, substantially as described.

6. The combination, with a telegraph-line composed in part of branch or multiple-arc circuits and having current-graduators in said branch or arc circuits, of an induced-current circuit connected to one of said branch or arc circuits by means of separators, substantially as described.

7. The combination, with a telegraph-line composed in part of branch or multiple-arc circuits, of current-graduators arranged in each of said branch circuits, the said graduators consisting of two or more separate resistances, substantially as described.

8. The combination, with a telegraph-line composed in part of branch or multiple-arc circuits and having two separate current-graduators in each branch, of an induced-current circuit connected to one of the branch circuits between the graduators, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES SELDEN.

Witnesses:
W. C. DUVALL,
F. L. FREEMAN.