(No Model.) 2 Sheets—Sheet 1.

P. B. DELANY.

TELEGRAPHY.

No. 553,957. Patented Feb. 4, 1896.

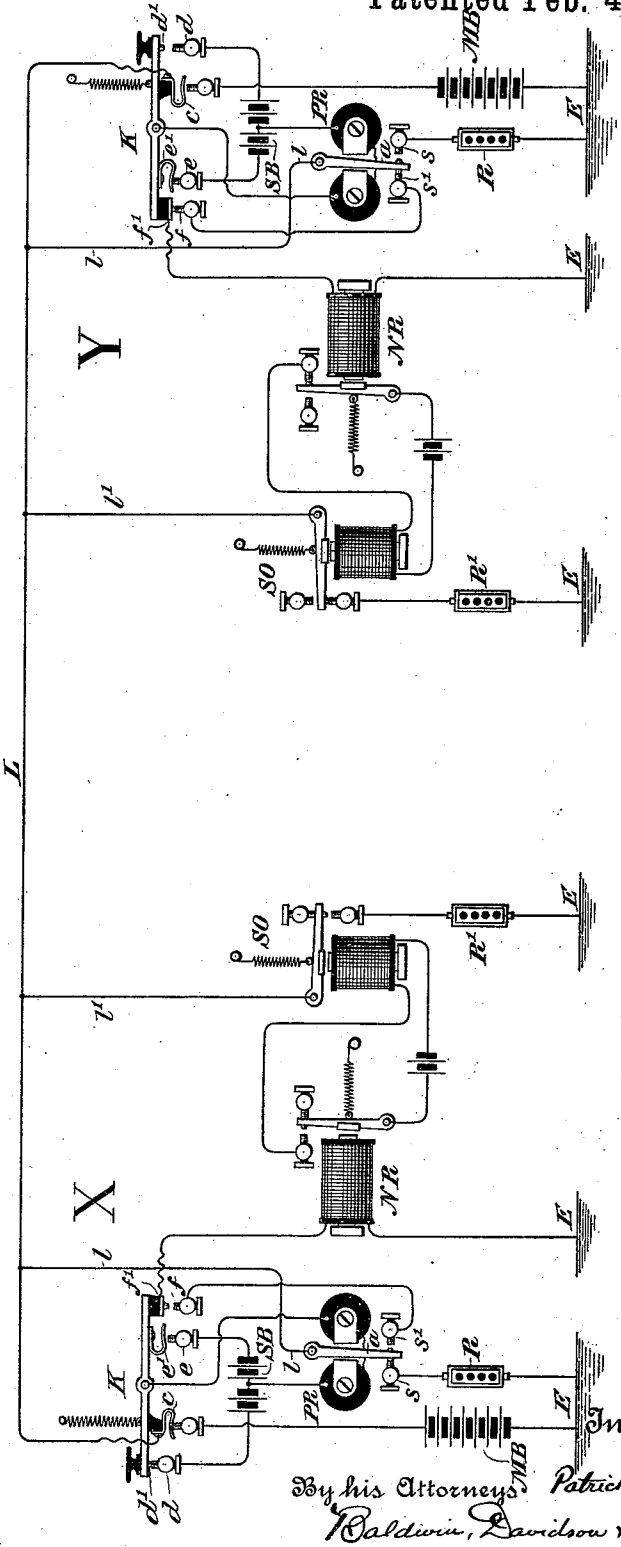

Fig. 1.

Witnesses
C. E. Ashley
S. F. Macpeak

Inventor
Patrick B. Delany
By his Attorneys
Baldwin, Davidson & Wright

(No Model.) 2 Sheets—Sheet 2.

P. B. DELANY.

TELEGRAPHY.

No. 553,957. Patented Feb. 4, 1896.

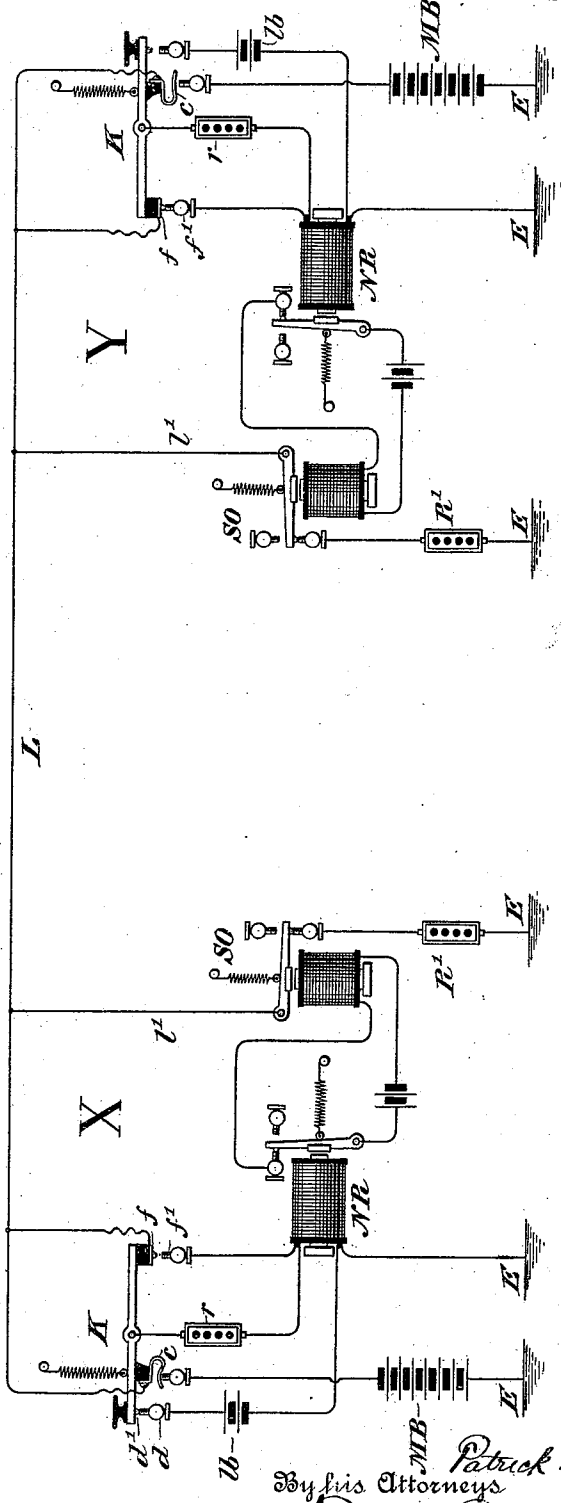

Fig. 2.

Witnesses
C. E. Ashley
S. F. Macpeak

Inventor
Patrick B. Delany
By his Attorneys
Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

PATRICK BERNARD DELANY, OF SOUTH ORANGE, NEW JERSEY.

TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 553,957, dated February 4, 1896.

Application filed July 25, 1891. Serial No. 400,741. (No model.)

To all whom it may concern:

Be it known that I, PATRICK BERNARD DELANY, a citizen of the United States, residing at South Orange, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

The invention is applicable more especially to submarine or underground cable lines, where signaling over long distances is slow and difficult, because of electrostatic capacity and retardation. It may be also applied with advantage to long aerial circuits.

It is well known that on such lines the equilibrium of the circuit is not reached as quickly as on shorter circuits, and that the longer currents representing dashes charge the conductor more than shorter currents representing dots, and consequently bring about a greater and slower discharge of static or tailing currents from the line. It is also well known that the receiving-instrument of whatever form is more thoroughly magnetized by a current representing a dash than by a current representing a dot, and that because of the heavier charge of current representing a dash the movable part of the receiver is more reluctant in returning to its normal position. With an adjustment suitable for the reception of dots the receiving-instrument will not respond quickly after a dash, as the current which continues to run out of the line at the receiving end after the circuit has been broken at the transmitter holds the movable receiving armature or coil in its attracted position for an undesirable time. Should the retractile force applied to the movable part of the receiver be increased to overcome this reluctance or tendency of the receiver, then the instrument will respond imperfectly to shorter and lighter impulses of current representing dots. Hence it is that heretofore the use of dots and dashes and transmitting-currents of uniform polarity have been impracticable on long cable circuits. These objections have in part been overcome by an arrangement heretofore proposed, in which after the receiving-relay armature has been attracted the current passing through the coils of the relay is depleted or diminished by the establishment of a shunt around the coils. The relay-armature therefore responds more quickly when the circuit is opened at the transmitter. With such an arrangement, however, the full transmitting-current traverses the line while the circuit is closed and the electrical disturbance or unfavorable condition of the circuit due to static conditions or tailing currents is as great as though the relay were not shunted in the manner suggested.

My invention comprehends the depletion or diminishing of each impulse of current entering the line at the transmitting-station after a period of uniform duration for all impulses during which the full strength of the current has passed into the line sufficiently to actuate the receiving-instrument. The current entering the line having been depleted the comparatively light current traversing the line and passing through the receiving-instrument will be sufficient to hold the movable armature or coil of the receiving-instrument in its attracted position, and yet the current on the line and in the coils of the relay at the receiving-station will be so light that the receiving-relay will immediately respond when the circuit is opened.

The invention also comprehends the depletion or diminishing of the current in the coils of the receiving-relay, substantially as hereinbefore suggested, in connection with the depletion of the current entering the line at the transmitting end.

The invention also comprehends the continuance of the current-depleting connections or shunts at either or both ends of the line for a brief period after the opening of the circuit so as to eliminate or neutralize the effects of the static and tailing current.

In my system, as is the case in most telegraphic systems, an all-metallic circuit may be employed, or the line may be grounded at each end and the shunting connections for depleting the current and eliminating static and tailing currents may lead to earth; and I have so shown the system in the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating one organization for carrying out my invention, and Fig. 2 a similar view showing another organization.

X represents the transmitting-station, Y the receiving-station, and L the main line.

In Fig. 1 the main line is at each end connected with an insulated yielding contact *c* on the transmitting-key K. This contact

works against an opposite contact connected with one pole of the main battery M B. The opposite pole of the battery is connected at E with the earth. In each instance E represents the ground connection. The main line is also connected by a wire *l* with the armature *a* of a polarized magnet or relay P R. One terminal of the coils of the polarized relay is connected with the middle of a split battery S B, and its other terminal with the key-lever K. One pole of the split battery is connected with a contact *d* against which a contact *d'* works, the latter contact being at the front of the key and electrically forming part of the key-lever. The other pole of the split battery is connected with a contact *e* located in rear of the pivot of the key, and against which a contact *e'*, forming electrically a part of the key-lever, works. The battery-contact *c* carried by the key-lever is between the contacts *d e*. On the rear of the key-lever is an insulated contact *f'* that is connected through the coil of the neutral receiving-relay N R to earth. The contact *f'* works against a contact *f* connected with the stop *s'* of the polarized relay-armature *a*. The opposite stop *s* of this armature is connected through an adjustable resistance R with the earth. The local circuit of the neutral relay N R is closed at the front stop of the relay and includes the coils of the sounder S O and a local battery. The armature-lever of the sounder is connected by wire *l'* directly with the main line and the bottom stop of the sounder-armature lever is connected to earth through an adjustable resistance R'.

With the key in its normal raised position, as shown at Y, the circuit of the split battery, including the coils of the polarized relay, is closed at *e e'* and the armature *a* of the relay is against its stop *s'*. The main-line circuit is therefore completed through the wire *l*, armature *a*, stop *s'*, contacts *f'* and *f* through the coils of the neutral relay N R to earth. The transmitted currents become effective in the coils of the relay N R, causing it to attract its armature and close its local sounding-circuit, whereby the transmitted signals are reproduced. Each time that the sounder-armature lever comes against its bottom stop a shunt around the relay is completed through the wire *l'*, sounder-armature, and resistance R' to earth. The resistance is so adjusted that the depletion of the current in the coils of the relay N R is such that the relay is only sufficiently charged to hold its armature against its front stop, and when the circuit is opened at the transmitting-station the relay-armature promptly flies back. The brief interval during which the relay-armature is leaving its front stop and the sounder-magnet discharges sufficiently to permit its armature to leave its bottom stop affords a time during which static or tailing currents will run out of the line to earth. This period might be prolonged by causing the sounder to control a local circuit, including a magnet whose armature effects the shunting of the relay N R, and the grounding of the main line in the same manner as the sounder-armature effects this operation. This is an arrangement ordinarily adopted where a delayed action is required, and it as well as other methods are well known to electricians.

At the sending end of the line the operation is as follows: When the key is depressed, the contacts *f f'* are first opened; then the contacts *e e'* open, but the armature *a* remains against its stop *s'*; then the contact *c* is connected with the main battery M B and the full strength of the current passes over the line to operate the receiving instrument, as already described, and finally the contacts *d d'* are completed, the armature *a* passes to its stop *s*, and a portion of the current on the line is therefore shunted through *l*, *a*, stop *s*, and resistance R to earth. The signal, whether a dot or a dash, having been completed, the key is raised, the contacts *d d'* are first opened, then the connection of the line with the main battery is broken at *c*, and during the brief interval before the contacts *e e'* are closed and before the armature *a* leaves its stop *s* static currents from the line are being discharged to earth. Finally the contacts *f f'* are completed, and the armature *a* having passed to its stop *s'* the line is still to earth through the neutral relay N R and any small amount of static current remaining in the line will be discharged to earth through the relay, but will not be sufficient to cause the relay to attract its armature to its front stop.

As the sending operator's relay is always in circuit when his key is raised, the receiving operator can readily "break" him. Of course the key K may be the armature of a magnet included in a local circuit with an ordinary Morse key. This may be desirable with operators who are accustomed to working with an ordinary key and have not sufficient adaptability to accustom themselves to a new form of key.

In Fig. 2 the armature of the sounder is connected with the main line by wire *l'* and the main line is grounded through resistance R', as already described. The coil of the neutral relay N R is connected with the contact *f'*, and the insulated contact *f* carried by the key K is connected directly with the line. When the key is raised, therefore, the main line is to earth through the coils of the relay N R and the depletion of the current or the shunting of the relay is accomplished in precisely the manner already described. The main line is also connected with the contact *c* so that at the transmitter when the key is depressed the contacts *f f'* are first opened, thereby disconnecting the neutral relay N R from the line and the main battery is then connected with the line. The contacts *d d'* are immediately thereafter closed, thus completing a local circuit connected with the terminals of the neutral relay N R and including a resistance *r* and a local battery *l b*, so

that immediately after the sending of a current into the line the relay N R at the transmitting-station is caused to attract its armature and effect the shunting of part of the current from the line. The resistance *r* is made adjustable so that it may be adjusted to suit the adjustment of the neutral relay N R for reception. With this organization the receiver may always "break" the sender as the relay of the sending operator is always in circuit when his key is raised. The sounder S O may be polarized and operated by split battery controlled at the stops of the relay.

I claim as my invention—

1. The combination, substantially as set forth, of a main line, a source of electrical energy for signaling, a transmitter controlling contacts normally connecting said main line to earth, contacts controlled by said transmitter for sending signals into said main line, other contacts controlled by said transmitter for locally actuating a relay, an electromagnetic instrument actuated by said relay, and contacts controlled by said electromagnetic instrument for connecting said main line to earth each time that a signal is transmitted.

2. The combination, substantially as set forth, of a main line, a source of electrical energy, a transmitter controlling contacts for sending impulses into said main line, other contacts controlled by said transmitter for actuating a receiving-instrument through a local circuit, contacts controlled by said receiving-instrument for connecting said main line to earth after each impulse, and an adjustable resistance in said local circuit whereby the strength of said local circuit may be regulated to the strength of the main-line current so that the said receiving-instrument will respond alike to both without change of adjustment.

3. The combination of a centrally-pivoted transmitting-lever, a contact thereon connected with the line, a contact against which it works connected with one side of a main battery, a polarized magnet or relay, its circuit and local battery, its contacts arranged on one side of the pivot of the transmitting-lever, its contacts arranged on the other side of said pivot beyond the line-contact thereon, a branch or shunt connection from the line leading to the armature of said relay, and a stop against which the armature works connected with the other side of the main battery, substantially as set forth.

4. The combination of a centrally-pivoted transmitting-lever, a contact thereon connected with the line, a contact against which it works connected with one side of a main battery, a polarized magnet or relay, its circuit and local battery, its contacts arranged on one side of the pivot of the transmitting-lever, its contacts arranged on the other side of said pivot beyond the line-contact thereon, a branch or shunt connection from the line leading to the armature of said relay, a stop against which the armature works connected with the other side of the main battery, the opposite stop of said armature, a contact with which it is connected at the rear of the lever, an insulated contact on the lever working against the last-named contact and the receiving-relay connected with the insulated stop on the lever, substantially as and for the purpose set forth.

5. The combination, substantially as set forth, of the transmitting-lever, the main-line contacts and circuit connections controlled thereby, a main battery from which currents are sent into the line on the actuation of said lever, a coil or magnet included in a local circuit whose contacts are controlled by said lever, the armature of said magnet and a shunt or branch circuit completed thereby after each main-line impulse has entered the line and before the battery is disconnected therefrom, and a second derived or shunt branch including the receiving-relay through which the line is discharged after the battery has been disconnected from the line and before the next depression or actuation of the transmitting-lever, for the purpose set forth.

6. The combination, substantially as set forth, of a source of electric energy, a line, a transmitting device, a distant receiver, contacts and connections whereby impulses of current are sent from said source into the line to actuate the receiver upon the actuation of the transmitting device, a shunt-circuit at the transmitter, its contacts, means constructed and arranged to close the shunt-circuit after each impulse has been sent into the line, and before the source of electrical energy is disconnected therefrom whereby a part of the current is shunted from the line after the full strength of each impulse has entered the line, and circuit connections and contacts controlled by the distant receiver whereby part of the received current is shunted from the receiver after it has responded to the current.

7. The method in telegraphy of approximately equalizing the duration of signals and clearing the line, of its static change after each impulse, the same consisting of actuating the receiving-instrument at the transmitting end of the line by a local current and the receiving-instrument at the receiving end by a main-line current, both currents being applied by contacts controlled by the same transmitter, and both receiving and transmitting instruments controlling contact devices for putting the main line to earth at either end when an impulse is sent into the line.

In testimony whereof I have hereunto subscribed my name.

PATRICK BERNARD DELANY.

Witnesses:
EDWARD C. DAVIDSON,
M. J. KELLEY.