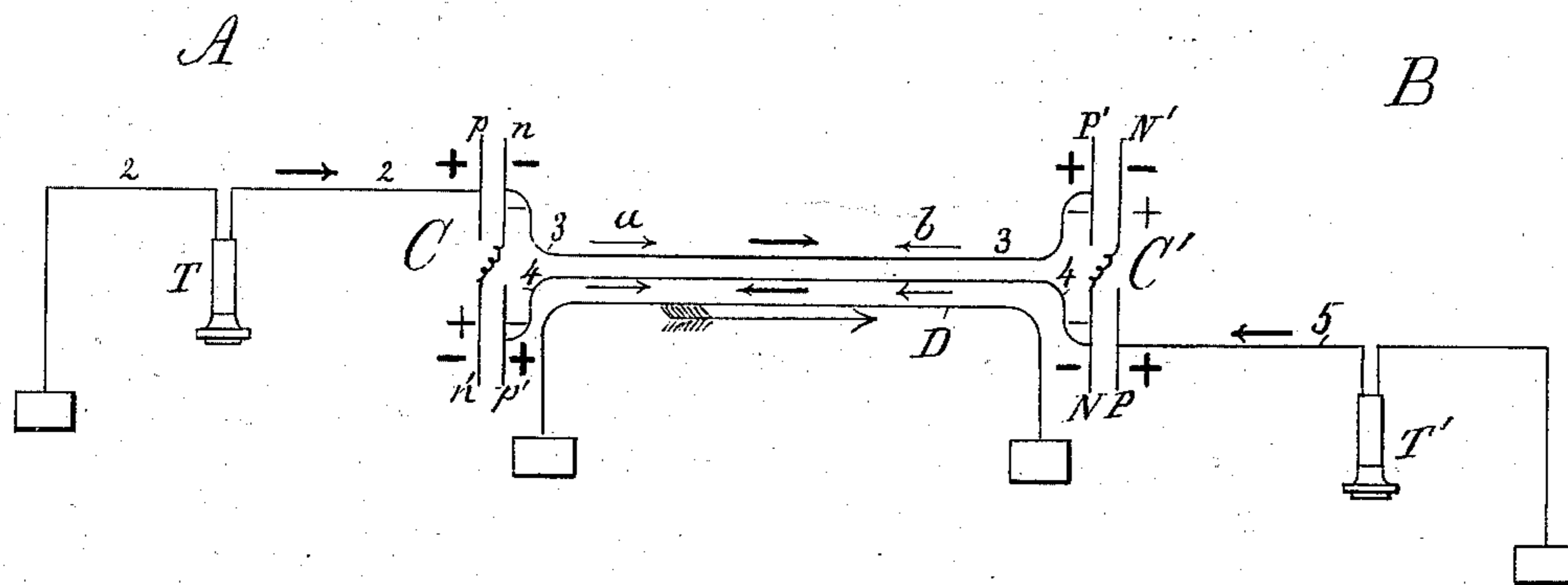


(No Model.)

W. W. JACQUES.
Electric Circuit.

No. 241,371.

Patented May 10, 1881.



Witnesses
Arthur Reynolds.
Bernice J. Vogel

Inventor.
William W. Jacques.
by Crosby Gregory Atty.

UNITED STATES PATENT OFFICE.

WILLIAM W. JACQUES, OF BOSTON, MASSACHUSETTS.

ELECTRIC CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 241,371, dated May 10, 1881.

Application filed March 25, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. JACQUES, of Boston, county of Suffolk, and State of Massachusetts, have invented a new and useful Improvement in Electric Circuits, of which the following description, in connection with the accompanying drawing, is a specification.

My invention relates to an electric circuit or arrangement of conductors and other apparatus, as hereinafter described, forming a continuous line of communication for the transmission of electric impulses, and has for its object to prevent inductive disturbances from neighboring parallel lines, and is especially intended to be used where the line is exposed to disturbing influence only for one or more detached portions of its length not starting from either terminal thereof.

The inductive disturbances have been neutralized effectively by a plan involving the use of a circuit wholly metallic in the region exposed to inductive disturbance, and in order to make a complete operative circuit the said metallic or double-wire circuit has to be extended from one terminal station through all the exposed regions, at the end of which one wire may be grounded and the other extended onto the other terminal station and there grounded, or, by another plan, suitable apparatus is employed to transmit the electrical impulses from a single wire or grounded circuit to a double wire or metallic circuit traversing the disturbed region, and from this again to a grounded circuit, as shown and described in the Patent No. 232,788, dated September 28, 1880, to which reference may be had, in which induction-coils were employed to transmit the impulses from one circuit to another.

In the present invention two separate insulated wires are employed in the disturbed region, and single wires are employed outside of the said region, and suitable transmitting apparatus, as hereinafter described, is interposed between the single and double wire portions of the entire line by which an electric impulse in the single wire will impart substantially equal and opposite impulses to the two wires in the disturbed region, and these equal and opposite impulses in the two wires will again impart a single impulse to the single wire at the other

end of the disturbed region. The equal and opposite impulses will produce no effect by induction upon a neighboring wire equally exposed to both, and consequently the transmission of messages over the line will produce no disturbance, and the transmitting apparatus is of such nature that equal and similar impulses in the two wires (such as produced by induction from a neighboring wire) will not impart any impulse to the single wires outside of the disturbed region.

The transmitting apparatus consists of a condenser system which may conveniently be described as consisting of two condensers of common construction, one coating of one of the said condensers being connected with the single line, and the other coating connected with one wire of the double line traversing the exposed region, and also connected with one coating of the other condenser, the other coating of which is connected with the other wire of the double line.

The arrangement of wires or conductors and condensers is illustrated in the drawing, in which the heavy signs and arrows show how an electric impulse produced at one end of the line produces a similar impulse at the other end, and the light arrows and signs showing the manner in which similar impulses in the two wires, such as produced by induction from a neighboring wire in the exposed region, are neutralized in their action on the single wire, thus producing no effect therein.

The main line 2 is grounded at the terminal station A, where it passes through the telephone T, or other instrument for producing electrical impulses, and thence passes to the region exposed to inductive disturbance, which may be, for example, traversed by a cable including several wires. The line-wire 2 is there connected with one of the coatings or series of plates *p* of a condenser apparatus, C, the other coating, *n*, of which is connected with a line, 3, traversing the disturbed region, and also with another coating, *n'*, arranged to act on still another coating, *p'*, connected with another line, 4, traversing the exposed region, and insulated from the wire 3 and other parallel conductors. The wires 3 4 will be twisted together or otherwise arranged so that the mean or average distance of each from any

neighboring conductor is the same, and they are connected at their other ends with the coatings P' N' of a condenser apparatus C' similar to the one C already described. The coating N is connected with another coating, N', affected by the coating P' connected with the wire 3 and a coating, P, under the inductive influence of the coating N is connected with the line 5 leading toward the other terminal station, B, where it is grounded after passing through the instrument T'.

The coatings N N' and $n n'$ may be considered as two portions of the same set of connected surfaces, and it is obvious that a single condenser of ordinary construction may be employed, having a portion of one set of leaves—*i. e.*, p —connected with line 2, and the rest of that set—*i. e.*, p' —connected with the line 4, while the whole other set, $n n'$, is connected with the line 3.

The operation in transmitting an impulse from one station to another, as from A to B, is as follows, the currents being indicated by the heavy arrows which represent positive electricity: A positive impulse or current generated by the instrument T charges the coating p with positive electricity, and this, in the well-known manner, acts on the coating n to charge it with negative electricity which has to be drawn from the line 3, the electricity of which is decomposed, the positive being sent, as indicated by the arrow, to the coating P', which it charges positively, as indicated by the heavy sign +. The negative electricity drawn to the coating n will also charge the connected coating n' , and this in acting on the coating p' will draw a charge of positive electricity from the line 4, as indicated by the heavy arrow, and will send the negative electricity to charge the coating N, this effect being also increased by the action of the coating p' on the one N' connected with the one N. The negative charge on the plate N attracts a charge of positive electricity from the earth through the line 5 and instrument T' therein, as indicated by the arrow. A negative impulse produced at T will, in like manner, be reproduced at T', and impulses produced at T' will be reproduced at T, and in the transmission equal and opposite currents or impulses will be produced in the lines 3 4, which will just balance and neutralize one another as far as any effect on neighboring lines is concerned. An impulse in any neighboring line, as D, will produce, by induction, like currents in the wires

3 4, the direction or polarity of which will depend on the polarity of the current in the disturbing line and whether the charge is increasing or decreasing at a given point. If the two currents be such as represented by the light arrows at a —that is, positive currents away from the condenser apparatus C—they will leave the plates p' and n charged with negative electricity, and that in the plate p' acts on the plate n' to produce positive electricity in the plate n' , which neutralizes the negative charge in the coating n , so that no effect is produced in the coating p and line 2. In a similar manner the currents represented by the arrows at b produce unlike charges in the coatings N N', which neutralize one another, so that no effect is produced in the line 5.

It is obvious that there might be two or more exposed portions of the line provided with double wires and suitable condenser apparatus, and that the line may be employed to transmit or reproduce any kind of variable, undulatory, or intermittent impulses, such as telephonic or magneto-electric currents produced by any suitable generator.

I claim—

1. In a line of electric communication, the single wire or conductor and double wire or conductor combined with condenser apparatus, the coatings of which are connected with the said conductors, as described, whereby an impulse or current in the single wire will produce equal and opposite impulses in the two wires of the double conductor, and equal and opposite impulses in the double conductor will produce a single impulse in the single conductor, and equal and similar impulses in the double conductor will produce no effect in the single conductor, substantially as described.

2. The single wire and double wire combined with the condenser, having one set of coatings connected with the said single wire, and a portion of a second set of coatings affected thereby connected with one of the double wires, and a third set of coatings affected by the other portion of the said second set and connected with the other one of the said double wires, substantially as and for the purpose set forth.

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

WILLIAM W. JACQUES.

Witnesses:

JOS. P. LIVERMORE,
BERNICE J. NOYES.