E. HOLMES & E. T. GREENFIELD.

Telephonic Conductor.

No. 221,170. Patented Nov. 4, 1879.

Fig. 1.



Fig. 2.



Witnesses:

Henry Eichling.

Robt H. Duncan

Inventors:

Edwin Holmes and

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UNITED STATES PATENT OFFICE.

EDWIN HOLMES AND EDWIN T. GREENFIELD, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN TELEPHONIC CONDUCTORS.

Specification forming part of Letters Patent No. **221,170**, dated November 4, 1879; application filed September 29, 1879.

To all whom it may concern:

Be it known that we, EDWIN HOLMES and EDWIN T. GREENFIELD, both of the city of Brooklyn, in the State of New York, have invented a new and useful Improvement in Telephonic Conductors, of which the following is a specification.

The object of the present invention is to prevent or eliminate the effects of induction in electric conductors that are arranged in near proximity to each other, and which is one of the principal disturbing influences in the practical working of ordinary telephonic lines.

It is well known, scientifically, that the intensity of the induced current depends largely upon the parallelism between the conductor in which such current is generated and the primary line, and that such current grows feebler as the parallelism of the lines is destroyed, and becomes inappreciable when the lines cross each other at right angles.

It has been proposed to utilize for a telephonic line a metallic circuit, the return-wire of which shall be made to cross and recross repeatedly the main wire of the circuit, the expectation being that such a line will not be disturbed by induction from a neighboring wire through which an electric current is passing.

One practical objection to this construction is that it requires double the length of wire as compared with a construction which uses an earth-connection, and also is attended with a vastly-increased resistance; moreover, it proposes the protection of a single line only.

The present invention provides a simpler and less expensive mode of utilizing the general fact above noted, and is perfectly adapted to any number of lines arranged in proximity to each other, and following the same general direction; and it consists simply in weaving the lines in and out among themselves, so that they will repeatedly cross and recross at short intervals, each line having an earth-connection, and consequently no metallic return-wire.

The most convenient way of securing this relative arrangement of the wires is to braid them together into a cable, for which purpose, of course, they must be properly insulated to prevent contact of the conducting-surfaces. By braiding them it will be caused that each one of the system will cross and recross each and every one of the others, and if the work is carefully done, as with machinery, the construction will be uniform throughout, the nodes occurring at regular intervals, and the curves rising to uniform heights from the axial line of the cable, which regularity of construction will produce the most complete results.

By braiding, again, each wire is made to act as a support to its neighbors, and while the wires thus serve to support each other the whole cable can be as readily mounted on poles, or otherwise supported or submerged, as a single wire can be.

Figure 1 shows a cable composed of three insulated wires braided together; but, manifestly, the same system would apply to any larger number of wires, which, equally well, might be braided up into a single cable.

If two wires only were to be used they might be braided into a cable by using as a third strand a cord of any non-conducting material, or they might be secured by sewing, or in any other available way, to a strip of tape or any other suitable support, as shown in Fig. 2. In this figure two wires are shown as attached to a narrow strip in such a way as to cross and recross each other at short intervals and with regular curves.

It is found in practice that when conductors are arranged as above described no induced current is formed in any one of them by the passage of an electric current through any of the others, or, if formed, it is so far modified from what it would otherwise be as practically not to interfere with the working of any of the lines in the cable, and the same, measurably, would be true of them with reference to any other line near by, but not included in the same cable.

What is claimed as new is—

1. The arrangement of two or more telephonic conductors with ground-connections, and so that each crosses and recrosses each and all of the others at short intervals, substantially as and for the purpose described.

2. A cable composed of insulated telephonic conductors having ground-connections and braided together, substantially as and for the purpose described.

EDWIN HOLMES.
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Witnesses:
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