(No Model.) 2 Sheets—Sheet 1.

J. W. BRENNAN & N. ROUSSEAU.

MECHANISM FOR PREVENTING INDUCED CURRENTS IN TELEPHONE LINES.

No. 287,092. Patented Oct. 23, 1883.

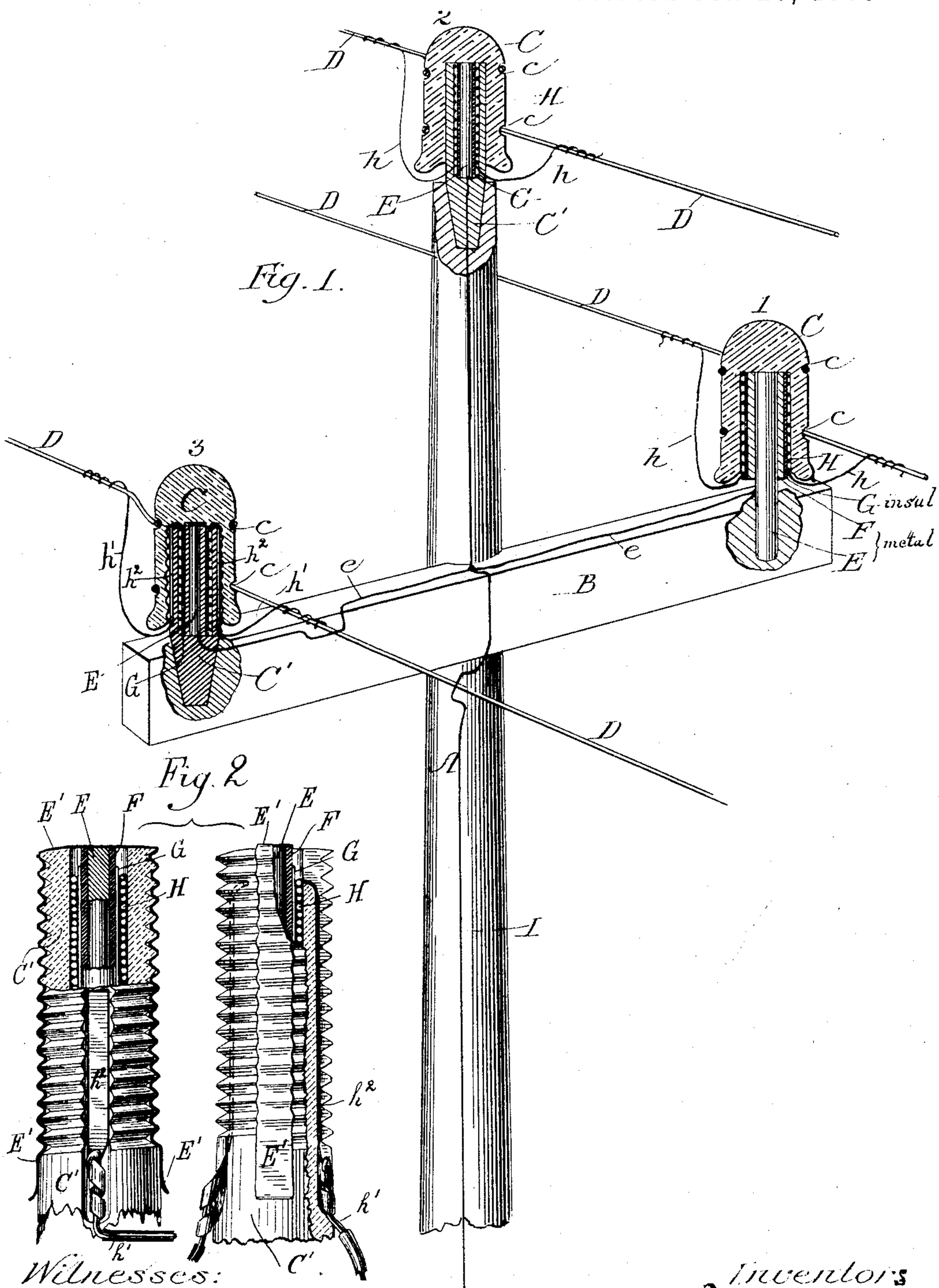

Fig. 1.

Fig. 2

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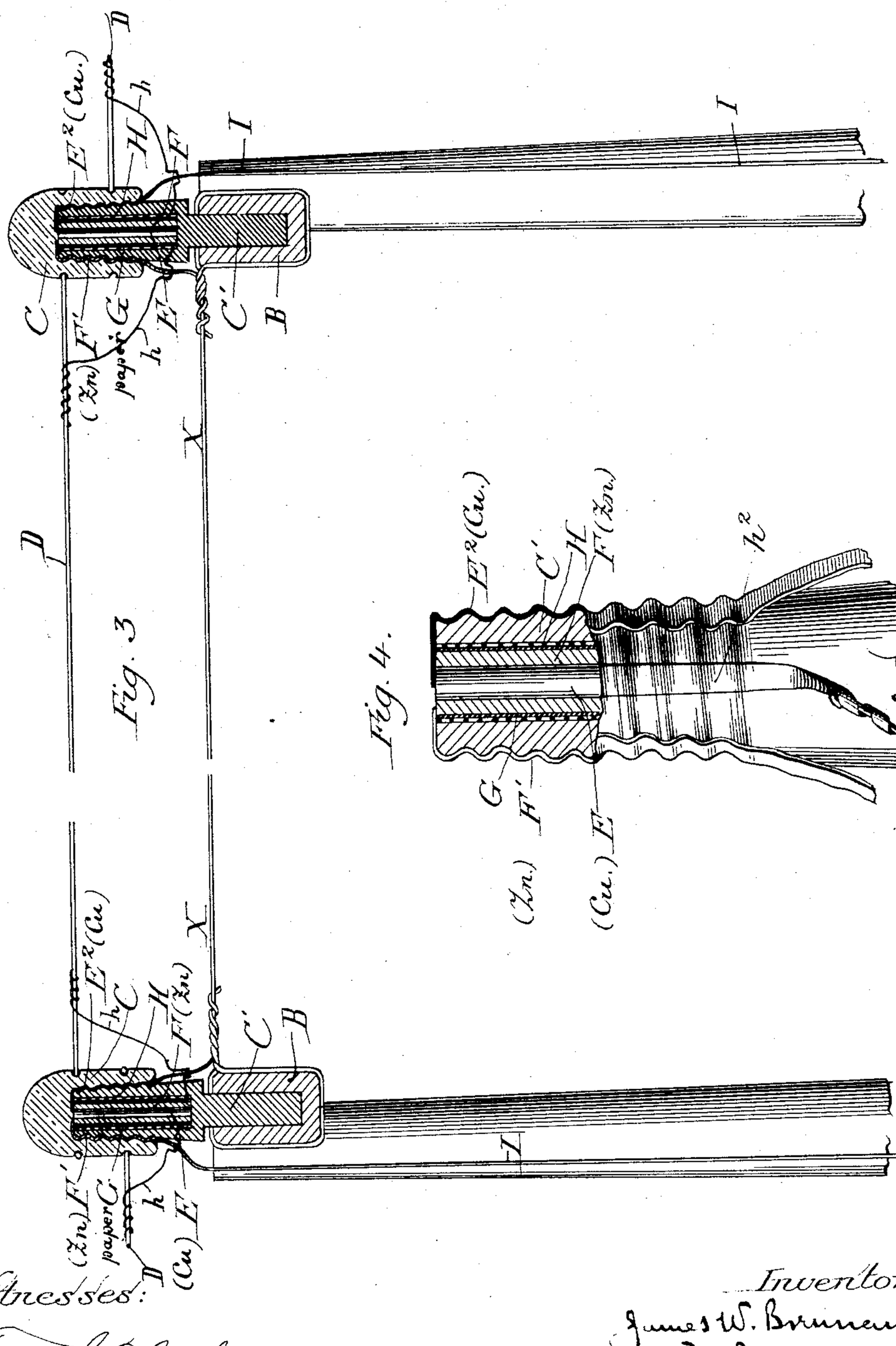

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UNITED STATES PATENT OFFICE.

JAMES W. BRENNAN AND NECTER ROUSSEAU, OF CHICAGO, ILLINOIS.

MECHANISM FOR PREVENTING INDUCED CURRENTS IN TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 287,092, dated October 23, 1883.

Application filed November 4, 1882. (No model.)

To all whom it may concern:

Be it known that we, JAMES W. BRENNAN and NECTER ROUSSEAU, residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Mechanism for Neutralizing Inductive Effects of Extraneous Currents in Telephone-Lines; and we do hereby declare the following to be a full, clear, and exact description of the said invention, sufficient to enable others skilled in the art to which it appertains to make and practice the same.

When operating with the usual instruments over an ordinary telephonic circuit, difficulty is oftentimes experienced at the receiver in obtaining distinct enunciation of the message. Certain confused sounds, articulate or otherwise, more or less in number and of varying loudness, are frequently reproduced with the message, and tend seriously to diminish the clearness of delivery. These sounds are traceable to the fact that the line or ground connection of the telephonic circuit is within the field of some one or more other electric circuits, which, when currents are passing, reflect upon or induce in the highly-sensitive telephonic circuit the peculiarities of impulse pertaining to said extraneous circuits, so that at the receiver these are more or less audibly reproduced, together with that which is strictly singular to the telephonic circuit itself.

The purpose of our invention is to neutralize or to destroy the inductive effects produced by extraneous currents in the telephonic circuit, so that the message will be received with clearness and comparatively free from objectionable foreign sounds. This purpose we have accomplished by the mechanism hereinafter described, illustrated in the accompanying drawings, and particularly set forth in the claims.

Figure 1 represents a view of a pole for telephone-wires, showing in vertical sections modified forms of our invention applied thereto. Fig. 2 is a view, partly in section, of the form of device shown at 3 in Fig. 1, the insulator being removed. Fig. 3 is a view, partly in section and partly in side elevation, of a modified form of mechanism. Fig. 4 is an enlarged view, partly in section, of a modified form of the mechanism with insulator removed.

A represents a pole provided with the usual cross-arm, B. Upon the pole and cross-arm, at Fig. 1, are shown three modified forms of mechanism embodying our invention, designated, respectively, 1, 2, and 3. The insulators C, of glass or other non-conducting material, are provided with two separate grooves, *c*, around each of which passes one end of the divided main-line wire D. In the form of device designated as 1 the insulator C is held upon the cross-arm by means of a central metallic core, E, which enters the insulator and cross-arm. Around this core E fits the metallic sleeve F, over which passes a tube, G, of paper or other insulating material, and around this tube is wound a coil of insulated fine wire, H, the ends of which are connected to the divided main-line wire D. From the central core, E, extends the wire *e*, which connects with the wire I, passing to the ground. When a current of mixed character—that is to say, one having extraneous currents imposed upon the principal current properly pertaining to the telephonic circuit—is traversing the main-line wire D from either direction, said current will be momentarily retarded as it passes from the line-wire D to the insulated coils of fine wire H, by reason of the increased resistance which these coils of much lesser diameter than the main wire D offer to its passage. The relation of the wire coils H to the core E is such that when this retardation or resistance to the main current occurs there is induced in said core E an opposite electric impulse, which constantly drains away to ground through the wires *e* and I. It is plain that this induced current will reflect the peculiarities of the primary from which it is derived, which in this instance being of a composite or mixed nature makes the induced current of like character. Both the telephonic and the extraneous induced currents unite in the production of the induced electric impulse developed in core E, and each suffers diminution because of the constant discharge of the induced current to the ground. Experience has demonstrated, however, that they suffer diminution very unequally, leastwise, that the extraneous induction effects developed in the telephonic current being the weaker are gradually eliminated as a succession of resistance-coils are presented in the main-line circuit, while the primary telephonic current

continues but slightly impaired, and reproduces its message at the receiver practically free from objectionable foreign sounds. The number and distance apart of the several resistance-coils set up in the main line must obviously depend upon the relation of the telephonic circuit to the other electric circuit which develop the induced impulses, and whether these are telegraphic, telephonic, or both, careful observations will readily determine how many coils it is necessary to interpose to accomplish the desired neutralization in any given line.

In the form of device shown attached to the pole at 2 the insulator C is held upon the wooden pin C′, which enters the pole. This pin C′ is bored out, and within it is placed the metallic core E, around which, in this instance, is directly fitted the paper tube G, having the coil H, of fine insulated wire, wrapped thereon. The ends *h* of the coil pass through holes in the pin C′ and connect with the divided main wire D, and from the metal core E extends the wire *e* to the ground-wire I. It will be noticed that in this form we have dispensed with the metallic sleeve F, which, although in practice is found advantageous, is not regarded as absolutely essential.

In the form of device illustrated at 3 in Fig. 1, and in Fig. 2, a wooden pin, C′, supports the insulator C and contains the metal core E, the metal sleeve F, the insulating paper tube G, and fine-wire coil H. The ends of the fine wire extend in this case over the top of or through the wooden pin, and are connected to flat metal strips h^2 on the outside of the same, which are joined to the short insulated wire *h*′, leading to the main line D. To the top of the central core, E, is attached a broad metal strip, E′, which extends down the sides of the wooden pin, between but wholly separate from strips h^2, and through said core E connects with the wire *e* and ground-wire I. In the normal condition of the line the circuit will be from main wire D through insulated wire *h*′, strip h^2, fine-wire coil H, to companion strip h^2, insulated wire *h*′, and thence to main wire D; but should the line become surcharged, as in case of electric storms, endangering the safety of coil H and its connections, the near proximity of the flat strips E′ to the strips h^2 will afford ready means for the excessive or abnormal current to leap or bridge the space between the two sets of strips, passing thus from strips E′ to core E, connecting-wire *e*, wire I, and thence to ground.

In order to prevent induction-currents in telephone-lines, it has been heretofore proposed to place beneath the main-line wire a "dead-wire," the ends of which were grounded. In the modified form of our invention shown in Figs. 3 and 4 it is proposed to use a dead-wire, X, stretched from the cross-arms B of two adjoining poles. The insulator C is supported upon the bored-out wooden pin C′, which contains the metal core E, the metal sleeve F in contact therewith, the paper tube G, and the coil H, of fine insulated wire, heretofore described. In this form, however, the core E is made of copper, and to the top of the core is connected a strip, E^2, also of copper, which extends down the side of pin C′ and connects with the dead-wire X at one pole. The sleeve F is of zinc, and to it is attached the zinc strip F′, which extends down the side of pin C′ and connects with the wire I, leading to the ground. At the adjoining pole the zinc strip F′ is connected to the dead-wire, and the copper strip E^2 is attached to the ground-wire I. By thus constructing the cores E, sleeves F, and strips E^2 F′ of zinc and copper and connecting them up, as described, a slight voltaic current is established, which passes through the supplemental wire and assists in neutralizing the inductive effects of the extraneous currents upon the telephonic circuit. In this modified construction it is to be understood that the main telephonic circuit yet continues in manner heretofore detailed—that is to say, the current passes either from main wire D, as shown at 1 2, Fig. 1, through connecting-wire *h*, coil H, opposite connecting-wire *h*, to line, or else (as in 3, Fig. 1, and Figs. 2, 3, and 4) from main wire D through insulated wire *h*′, strip h^3, fine-wire coil H, to companion strip h^2, insulated wire *h*′, and thence again to line. In this latter instance (3, Fig. 1, and Figs. 2 and 4) it will be understood that the strips h^2 act in conjunction with strips E^2 F′ and their ground-connections to relieve the line from excessive currents which would tend to destroy the fine-wire coils H, as already detailed more particularly in describing 3, Figs. 1 and 2. The induced currents developed in core E by the primary current in coil H will pass (3, Fig. 1, and Fig. 2) by wire *e*, which is joined to core E, as at 2, Fig. 1, to wire I, thence to ground, or else, Figs. 3, 4, will pass from core E by strip E^2 and wire I to ground, or by metal sleeve F, strip F′, and wire I to ground.

While we have set out in the foregoing description what we regard to be the best embodiments of our invention, it is obvious that modifications of the same may be made without departing from the spirit thereof. Thus, for example, good results may be obtained by simply making a coil of the main wire at suitable intervals along the line and passing an insulated core having ground-connections through such coil, although we have found in practice that the fine-wire coil is more advantageous. In fact, a great variety of ways will readily suggest themselves to the person skilled in the art by which the main line can be exposed at intervals to the inductive action of a conducting-body held in close proximity thereto, yet insulated therefrom and having short-circuit ground-connections, which, broadly stated, is the underlying principle embodied in the several forms of our invention.

Having thus described the invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a telephonic circuit, the combination,

with the main-line wire, of a conducting-body arranged at suitable intervals in close proximity thereto, but insulated therefrom and having a ground-connection, substantially as described.

2. In a telephonic circuit, the combination, with the main-line wire, of a wire coil, and a core for said coil, insulated therefrom and having a ground-wire connection, substantially as described.

3. In a telephonic circuit, the combination, with the divided main wire, of a fine-wire coil connecting the parts of said main wire, and a core for said coil, insulated therefrom and having a ground-wire connection, substantially as described.

4. In a telephonic circuit, the combination, with the main wire, of a wire coil, a metallic sleeve insulated from said coil, and a core for said sleeve, having a ground-wire connection, substantially as described.

5. In a telephonic circuit, the combination, with the main wire, of the fine-wire coil, the strip h^2, the core E, strips E′, and ground-wire connection, substantially as described.

6. In a telephonic circuit, the combination, with the main wire, of two separate wire coils each having insulated therefrom a core of zinc and a sleeve of copper, a dead-wire connected at one end to a sleeve and at the other end to a core, and a ground-wire connection for one sleeve and one core, substantially as described.

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