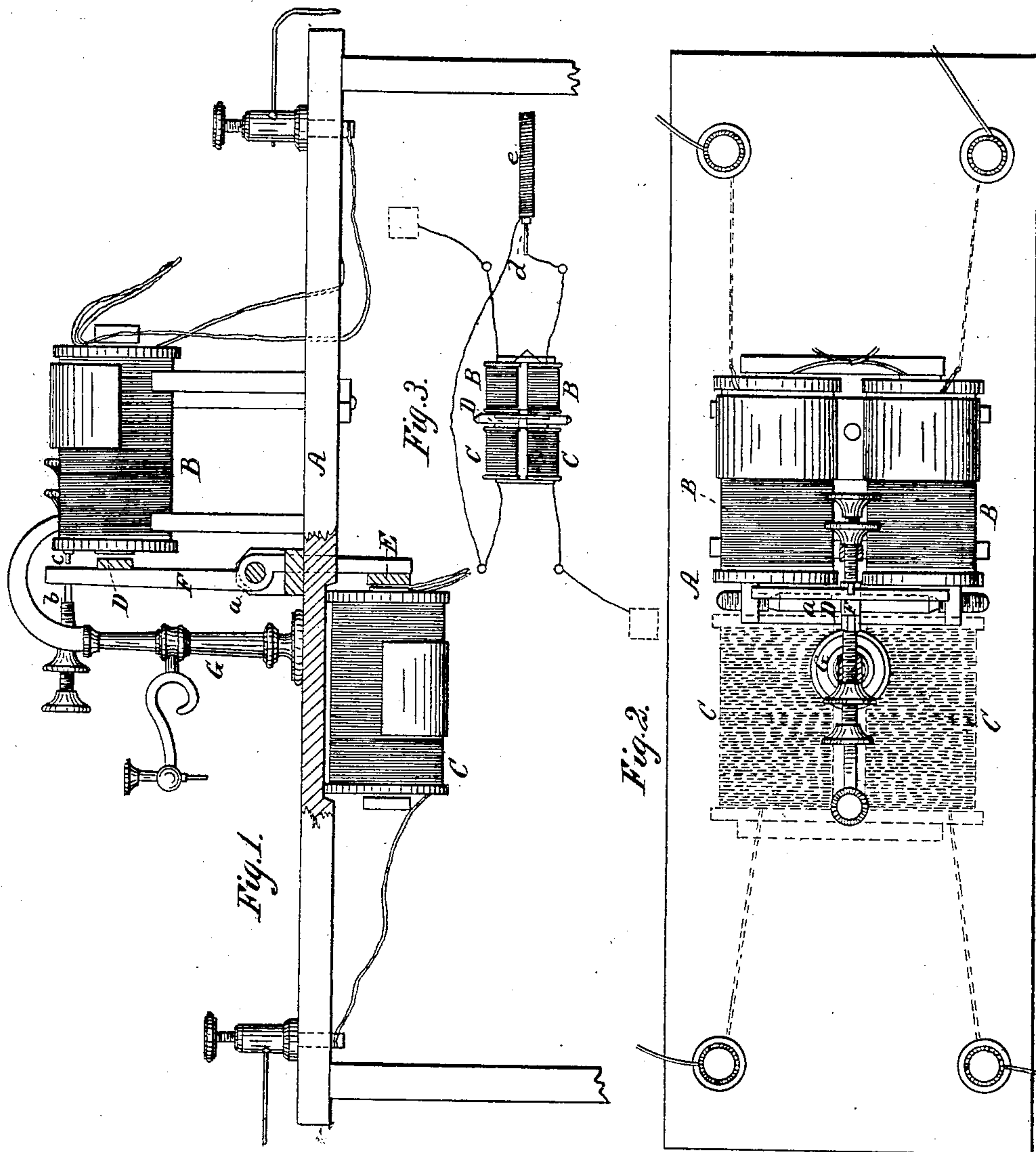


G. DOYLE.  
Telegraphic Relay.

No. 26,973.

Patented Jan. 31, 1860



Witnesses:

*Mr. Truick*  
*Henry T. Brown*

Inventor:

*George Doyle*

# UNITED STATES PATENT OFFICE.

GEORGE DOYLE, OF OTTAWA, ILLINOIS.

## IMPROVEMENT IN ELECTRIC TELEGRAPHS.

Specification forming part of Letters Patent No. **26,973**, dated January 31, 1860.

*To all whom it may concern:*

Be it known that I, GEORGE DOYLE, of Ottawa, in the county of La Salle and State of Illinois, have invented a new and useful Improvement in Electric Telegraphs; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompany drawings, forming part of this specification.

My invention relates to the use for submarine and other electric telegraphs of wires or conductors which are incased with gutta-percha or other insulating material and have such insulating material enveloped with a sheathing of metal. When the wire or other primary conductor is thus incased and sheathed the current passing through it induces a current in the metal sheathing; and my invention consists in collecting this current and using it, either in connection with the primary current passing along the inner wire or conductor or alone, for the purpose of working telegraphic instruments.

Figure 1 in the accompanying drawings represents a side elevation, partly in section, of the instrument I propose to employ for using the induced current in connection with the primary current in Morse's system of telegraphy. Fig. 2 is a plan of the same, and Fig. 3 a plan view, on a smaller scale than Figs. 1 and 2, showing the connection of the apparatus with a cable.

Similar letters of reference indicate corresponding parts in the several figures.

A is a board or table having secured above it an electro-magnet, B, and below it an electro-magnet, C, the said magnets being provided with armatures D and E attached to the same lever F, working on a fixed fulcrum, *a*, the arrangement of the magnets and armatures relatively to the lever being such that the magnets when charged act upon the two armatures in concert upon the lever. The upper part of the armature-lever F works between two screws, *b* and *c*, in a standard, G, which limit the movement of the said lever and prevent the armatures coming in actual contact with the magnets. The magnet B, with its armature and part of the lever F, above the fulcrum *a*, and the post G, with its screws *b*

and *c*, correspond with the receiving-magnet and its appendages used in Morse's system of telegraphy, the helices of the said magnet forming part of the primary conductor, being connected with the inner wire, *d*, Fig. 3, of the cable, and the lever F, screw *c*, and standard G being parts of the local circuit, and the screw *b* having its point insulated.

The magnet C is employed for rendering available the induced current of the sheathing *e*, Fig. 3, of the cable, its helices being connected with the termini of the said sheathing, and its cores being magnetized by the said current passing through its helices. The action of the said magnet C upon its armature E aids the action of the magnet B on its armature D to close the local circuit.

It may be found in practice that the magnet B is unnecessary, and that the only magnet required is the magnet C, or its equivalent, in the circuit of the induced current.

The cores of the magnet C should be of hardened steel, as a soft-iron core surrounded by a helix through which an induced current is caused to pass is only magnetized for an instant after the circuit is closed, while a steel core similarly surrounded remains charged until the current is broken, and hence by the use of hardened-steel cores in C, I am enabled to produce an alphabet of strokes, while with an iron one I could only produce an alphabet of dots.

The cores of the magnet B in primary circuit should be made of soft iron, as in Morse's receiving-magnet, for if cores of hardened steel are used in a coil charged with a primary current they remain charged after the circuit is broken, but cores of soft iron used in similar coils remain charged only until the circuit is broken.

In applying my invention I propose to use for the metal sheathing *e* a compact series of copper wires running longitudinally, or as nearly so as practicable, with the cable, such wires being kept together in compact form by an outer covering of fibrous material wound around them, or I may use a thin copper tube.

For submarine or underground telegraph-lines the sheathing should be covered externally with gutta-percha or other good water-



proof insulating material; but for telegraph-lines suspended in the air such external covering will not be necessary.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. Collecting a current induced by a current passing through a primary conductor in a metal sheathing, surrounding but insulated from the primary conductor, and employing such induced current, either in connection with the primary current or alone, to work telegraph-instruments, substantially as herein described.

2. Combining the action of the primary and

induced currents by means of two electro-magnets, one in each circuit, so applied, in combination with a lever carrying both their armatures that both magnets act in concert to move the said lever, substantially as herein specified,

3. Combining the use of hardened-steel cores in the electro-magnet of the induced current with the use of soft-iron cores in the electro-magnet of the primary current, substantially as and for the purpose herein specified.

GEORGE DOYLE.

Witnesses:

W. TUSCH,  
HENRY T. BROWN.