(No Model.)

A. MUIRHEAD.

Duplex Telegraph.

No. 234,490. **Patented Nov. 16, 1880.**

Fig. 1.

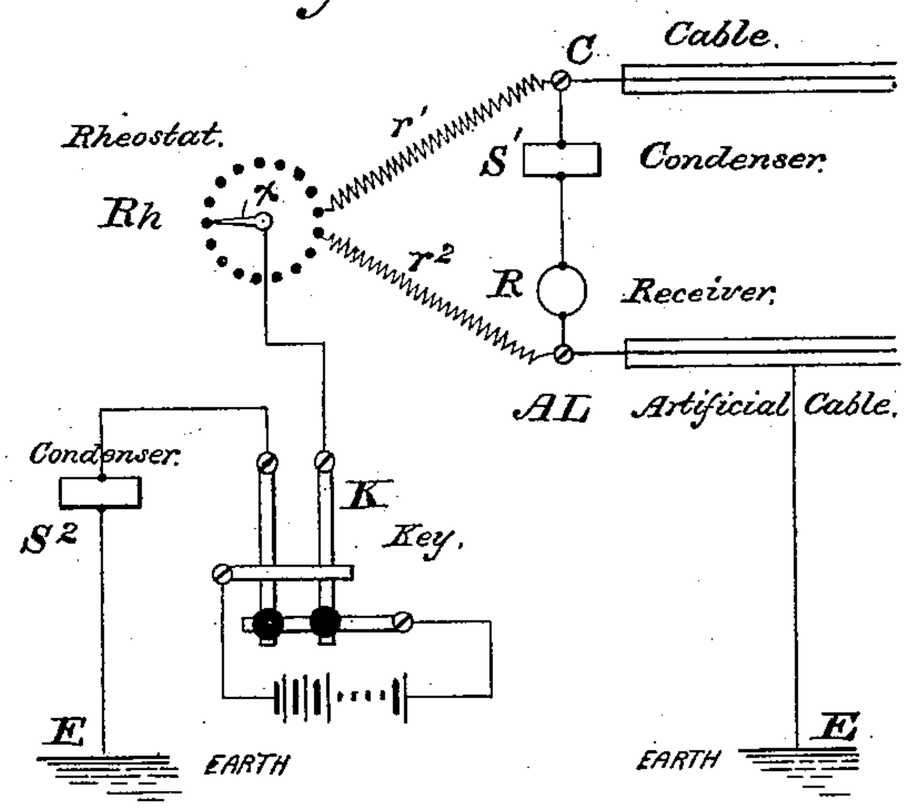


Fig 2

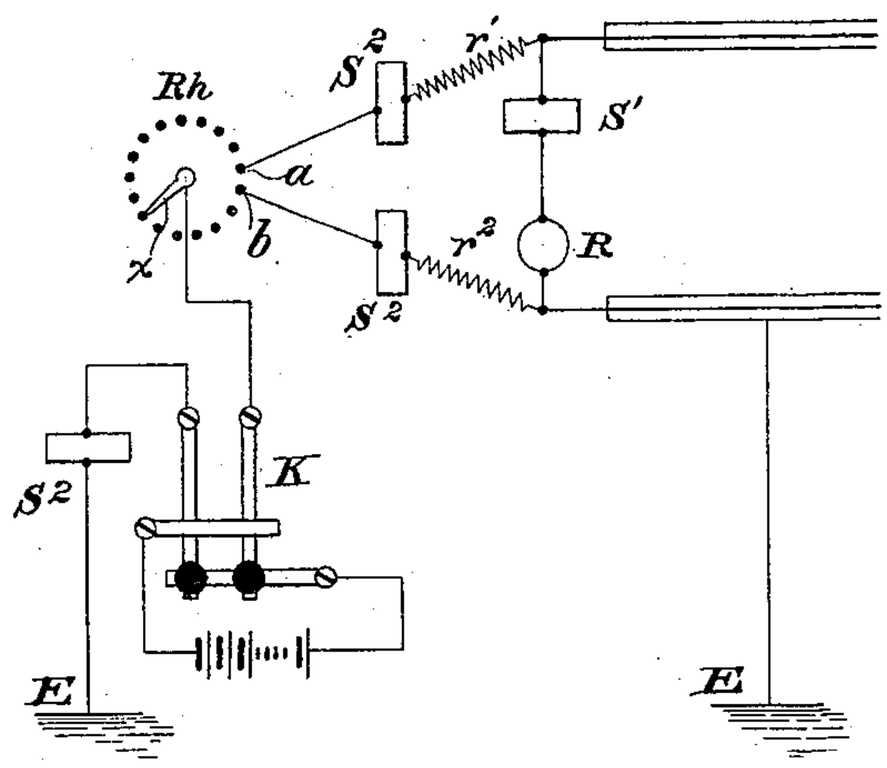


Fig 3

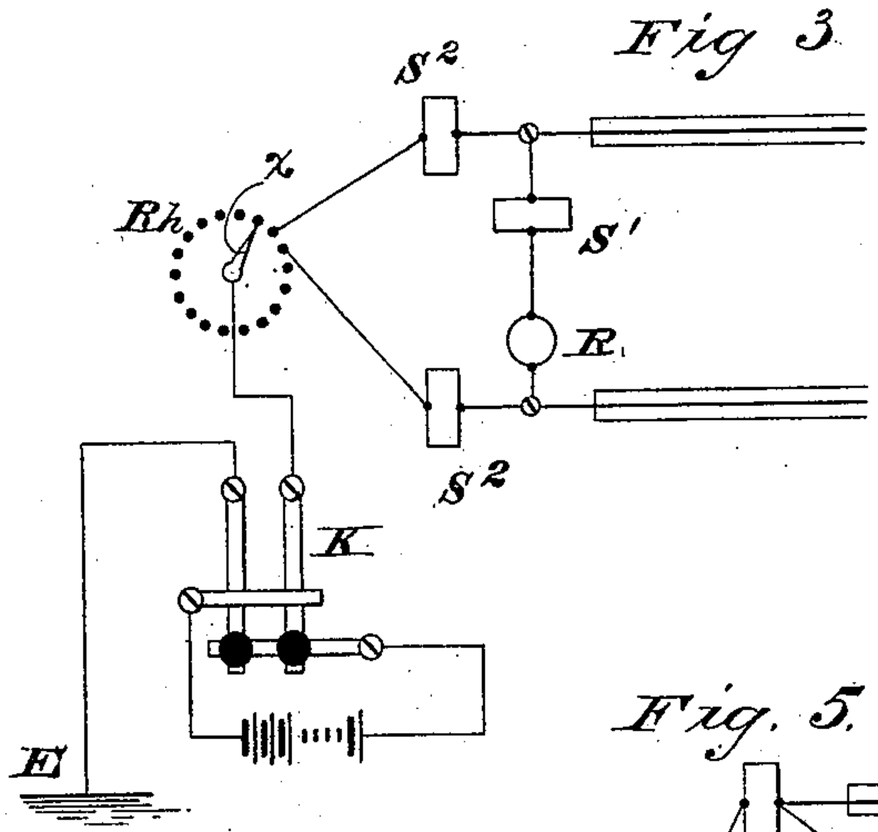


Fig 4

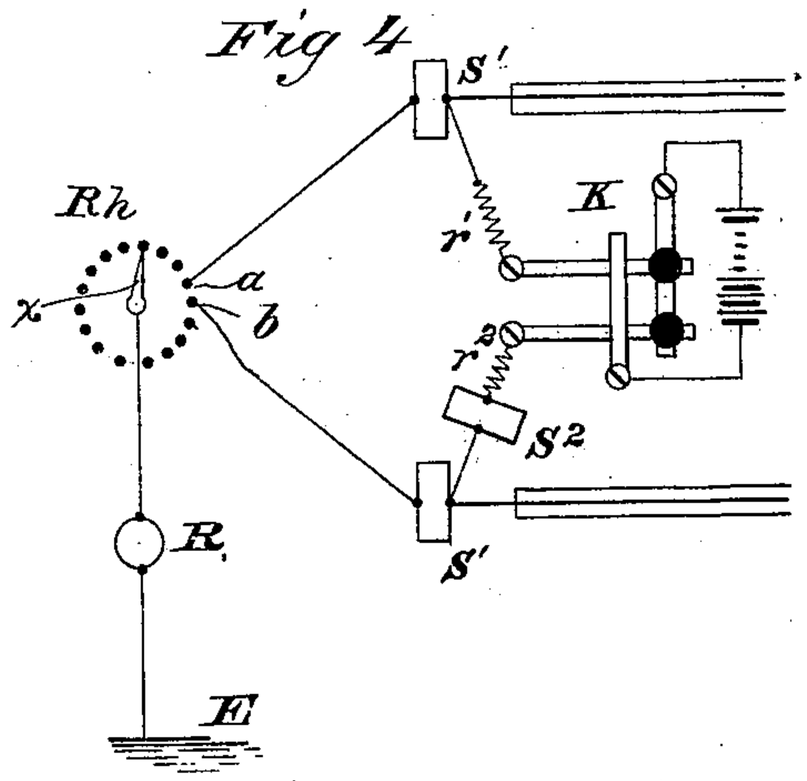
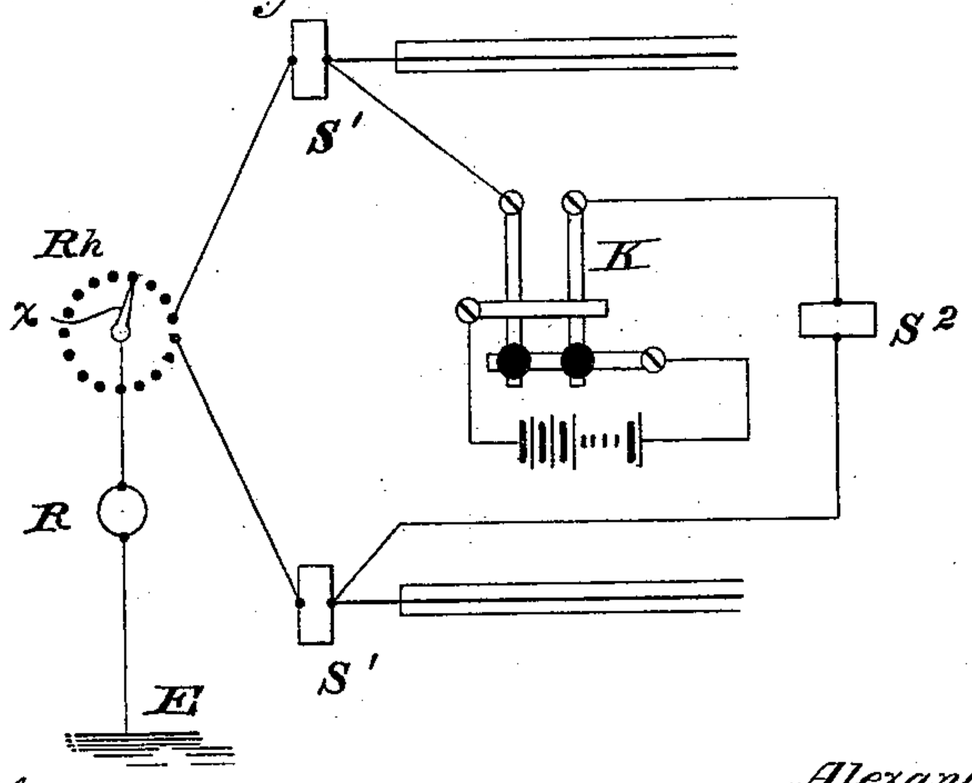


Fig. 5.



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DUPLEX TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 234,490, dated November 16, 1880.

Application filed March 24, 1880. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER MUIRHEAD, a subject of the Queen of Great Britain, and a resident of Oakwood, Farquhar Road, Upper Norwood, London, England, have invented certain new and useful Improvements in Duplex Telegraphy, of which the following is a specification.

My invention relates to duplex telegraphs of the class worked on the bridge or differential system. Its object is more especially to reduce the retardation of the signals, and thereby to increase the speed of transmission of submarine-telegraph lines, which ends I attain by certain novel combinations and organizations of old instrumentalities, set forth, in the claims at the end of this specification.

In the accompanying drawings, Figure 1 is a diagram, showing the organization of the apparatus heretofore generally employed by me in submarine telegraphs. Figs. 2, 3, 4, and 5 illustrate my improved organization of apparatus for carrying out my invention.

The details of construction of apparatus herein specified, being well known, need not be particularly described, especially as they form no part of the subject-matter herein claimed.

The signaling apparatus shown consists of a reversing-key, K, with a battery and a condenser, S^2.

A rheostat, Rh, of low resistance, adjustable to varying resistances, is interposed in the circuit between the earth and bridge-coils r' r^2 for the finer adjustment of the duplex balance. The bridge-coils are connected at one end with the rheostat and at the other with the true and artificial lines or cables C and A L in the bridge-circuit, between which is inserted a receiving apparatus consisting of a condenser or accumulator, S′, and a receiving-instrument, R, generally Sir William Thomson's recorder or mirror.

The condenser S^2 I call the "sending-condenser," and the other, S′, the "receiving-condenser."

In Fig. 1 the bridge wires or coils r' r^2 are shown as arranged between the signaling-key and the true and artificial lines or cables. In order to reduce the resistance of these bridge-wires without increasing their shunting effect on the receiving-circuit between the true and artificial lines, I divide the sending-condenser into two sections, S^2 S^2, and interpose one section in each of the bridge-wires, thus separating them, so as to prevent the shunting of the receiving-circuit instead of leaving the condenser between the earth and the rheostat, as in Fig. 1.

It has been found practicable to establish and maintain a constant balance without the bridge-wires, which reduces the retardation between the cable and the signaling-key to a minimum.

Both the bridge-wires and the sectional condensers S^2 S^2 are made adjustable in well-known ways.

In Figs. 1, 2, and 3 the receiving apparatus is shown as interposed in the bridge-circuit between the true and artificial lines, while the signaling apparatus is interposed between the earth and the rheostat.

Figs. 4 and 5 represent another organization of apparatus, which I prefer on short cables, (up to five hundred knots,) in which the positions of the receiving and signaling or transmitting apparatus are interchanged—that is to say, the receiving-instrument (recorder or mirror) with receiving-condenser, if any, is placed between the earth and the rheostat, while the battery, transmitting-key, and sending-condenser S^2 are arranged in the bridge-circuit between the true and artificial lines. In this organization the receiving-condenser is organized and connected as shown in Figs. 2 and 3.

The key and sending-condenser S^2 may be connected to the true and artificial lines, either directly, as in Fig. 5, or through adjustable resistances r' r^2, as shown in Fig. 4.

I claim as of my own invention—

1. The combination, substantially as herein set forth, in a telegraphic circuit, of the battery, the key, the adjustable rheostat, the sending-condensers, each in a bridge-wire, the cable or true line connected with one section of the condenser and the artificial line with the other, and the receiving-instrument and its condenser.

2. The combination, substantially as herein set forth, in a telegraphic circuit, of the receiving-instrument, the adjustable rheostat, the separate condensers in the bridge-wire, one connecting with the true and the other with the artificial line, with the key, battery, and condenser in the bridge or circuit between the two cables.

In testimony whereof I have hereunto subscribed my name.

ALEXANDER MUIRHEAD.

Witnesses:
THOS. F. CLARK,
B. M. PLUMB.