F. W. JONES.
Duplex Telegraphs.

No. 225,140. Patented Mar. 2, 1880.

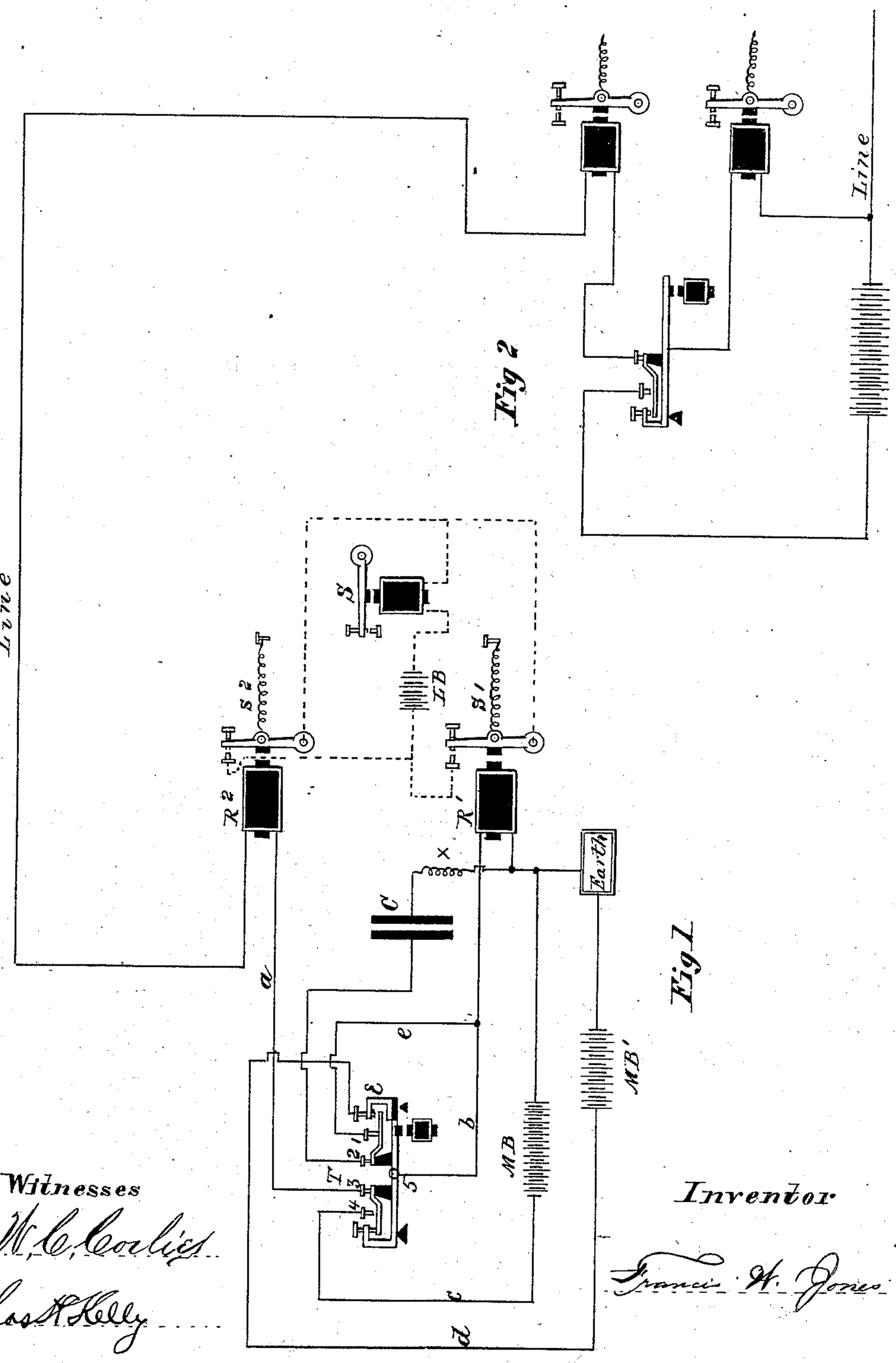

Fig 1

Witnesses
W. C. Curtis
Chas. H. Kelly

Inventor
Francis W. Jones

UNITED STATES PATENT OFFICE.

FRANCIS W. JONES, OF CHICAGO, ILLINOIS.

DUPLEX TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 225,140, dated March 2, 1880.

Application filed October 23, 1879.

To all whom it may concern:

Be it known that I, FRANCIS W. JONES, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Duplex Telegraphs, of which the following is a specification.

In the successful systems of duplex telegraphs heretofore devised the relays of the home or transmitting station have been placed in a neutral position with respect to the outgoing currents, but in an active position with respect to the incoming currents, by the well-known bridge and differential methods, whereby it was possible to transmit two communications simultaneously over a line in opposite directions. By my system, hereinafter to be described, the same result is accomplished without any bridge or differential arrangement, or the use of equating rheostats, artificial circuits, or divided battery-currents, and it is possible to have any convenient number of way-stations connected in the same circuit between the two terminal stations, so that any two stations, either terminal or intermediate, may be transmitting two messages in opposite directions at the same time, as will be hereinafter explained.

A saving of one-half of the cost of main batteries is effected in my system over that of other systems in practical use on account of the absence of artificial or equating circuits.

Figure 1 shows the arrangement of wires, batteries, and instruments for a terminal station. Fig. 2 shows the arrangement for a way or intermediate station, being connected in the diagram, by a line, with Fig. 1.

R′ and R² are ordinary Morse relays. S is an ordinary sounder. M B is a main battery which furnishes the line-currents. M B′ is a battery for charging condenser C. *x* is a resistance-coil. T is a transmitter, whose point *e* is insulated from the lever, but otherwise is of well-known construction.

The line-circuit passes through relay R², via wire *a*, to spring 3 on transmitter T, and via point 5, via wire *b*, through relay R′, to earth. The main battery M B is connected, via wire *c*, to point 4, directly over spring 3, with which it comes in contact when T is closed.

Sounder S is connected in local circuit with both relays R′ and R², and is operated by them either jointly or independently, as will be understood by reference to the diagram, Fig. 1.

The local arrangements in Fig. 2 are not shown, but may be the same as in Fig 1.

The operation of the system is as follows: When T is open the incoming current from distant station will not close R², as its spring is adjusted above the effect of the current, but, passing, via wire *a*, spring 3, wire *b*, via point 5, it goes to earth through R′, which responds and operates the sounder S. When T is closed and distant key is open, 3 and 4 are thrown together, opening the circuit via point 5, wire *b*, through R′, and at the same time current from M B is sent to line via 4, 3, *a*, and R²; but the tension of spring on R² will not allow it to respond. Should the distant battery be put to line at the same time that T is closed R² will respond, being actuated by the combined strength of the home and distant batteries, and a signal will result in S. If M B is withdrawn at the time the distant current is received R′ is instantly thrown into circuit with the line, and completes the signals that otherwise would have been made by R².

On lines over one hundred miles long any system that embraces continuity-preserving keys to change the line from battery to earth, and vice versa, &c., has always encountered a serious difficulty to clear signaling by the return or static discharge of the line through the relays of the transmitting-station. In the differential duplex system of Frischen and Siemens and in the bridge system of duplex J. B. Stearns counteracted this detrimental effect by placing a condenser in the artificial circuit and regulated it to imitate the conditions of the static capacity of the line, and so to return a charge coincident with the line oppositely through the differential relay and destroy each other's effect upon the core. He also devised induction-coils in which extra currents were generated and so applied as to neutralize the effect of the line-discharge on the cores of the differential relay.

In my system relay R², being adjusted high, does not suffer inconvenience from the return discharge from line, but in R′ a false signal is thereby produced. I overcome this difficulty by using a battery, M B′, of small size, to charge a condenser, C, one side of which is

connected to earth through resistance *x* and the other side attached to spring 2 on the insulated end E of T. A wire, *e*, connects point 1 of T with the terminal of R′ nearest to the line.

The operation is as follows: When T is closed M B goes to line and M B′ is put in connection with C via *d*, *e*, and spring 2. When T opens a discharge from the line is received, and at the same time C discharges via 2, 1, and *e*, reaching R′ at the same time with the line-discharge, directly neutralizing one another, batteries M B and M B′ being of opposite polarity. Resistance *x* is to regulate the time of discharge from C, so that it may reach R′ at precisely the same moment as the line-discharge, which varies with the length of line, size of conductor, and condition of the atmosphere.

The arrangement for a distant terminal station is the counterpart of the one above described, excepting if one station has a positive pole of battery to line the other must have a negative pole to line, and way-offices must so have their batteries connected as to agree upon the line with all others.

What I claim is—

1. The combination of a relay, R^2, which is placed permanently in the main circuit, and relay R′, with a continuity-preserving transmitter, T, arranged to place relay R′ in or out of circuit, and also to afford a path for the charge and discharge of condenser C during the transmission of signals, substantially as described.

2. The combination, with relay R^2, placed permanently in the main circuit, a double-spring transmitter, T, and relay R′, placed between transmitter T and the earth, of two main batteries, M B and M B′, of opposite polarity to each other, a condenser, C, resistance *x*, with earth and line, substantially as described.

3. In combination with two relays, their local-circuit sounder S, transmitter T, condenser C, resistance *x*, wires *a*, *b*, *c*, *d*, and *e*, batteries M B M B′, and earth, the line connected to the apparatus of intermediate or terminal stations, substantially as described.

FRANCIS W. JONES.

Witnesses:
W. H. FRENCH,
CHAS. H. KELLY.