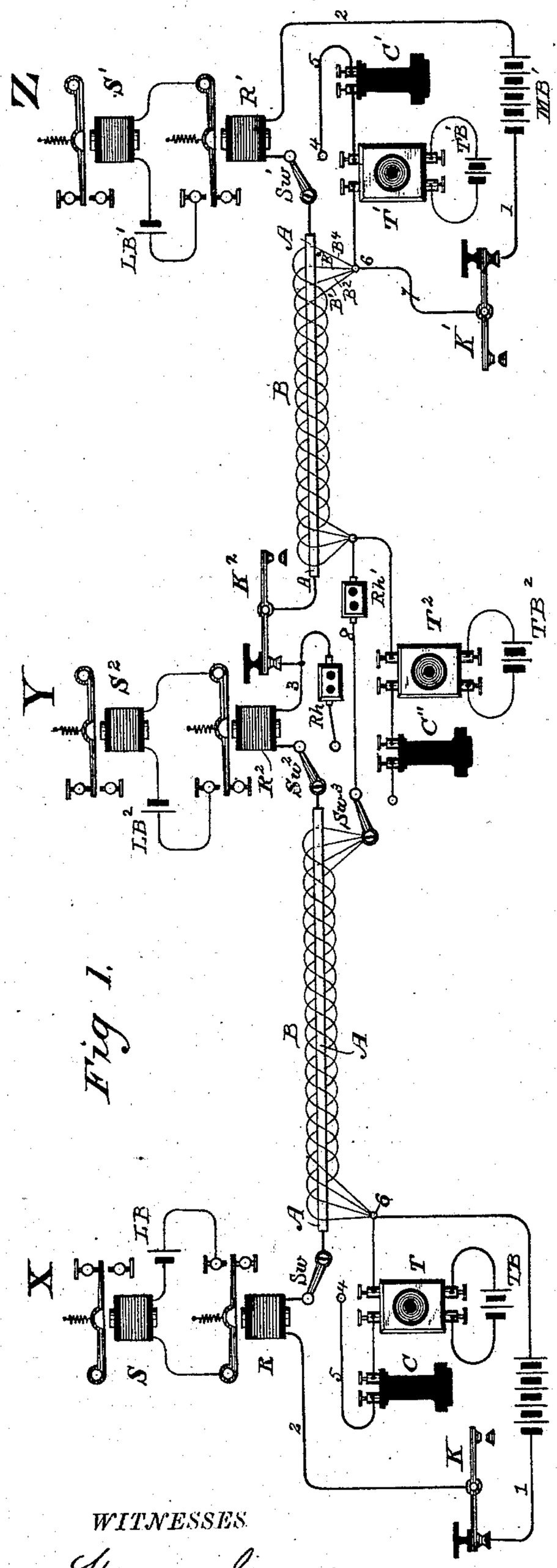
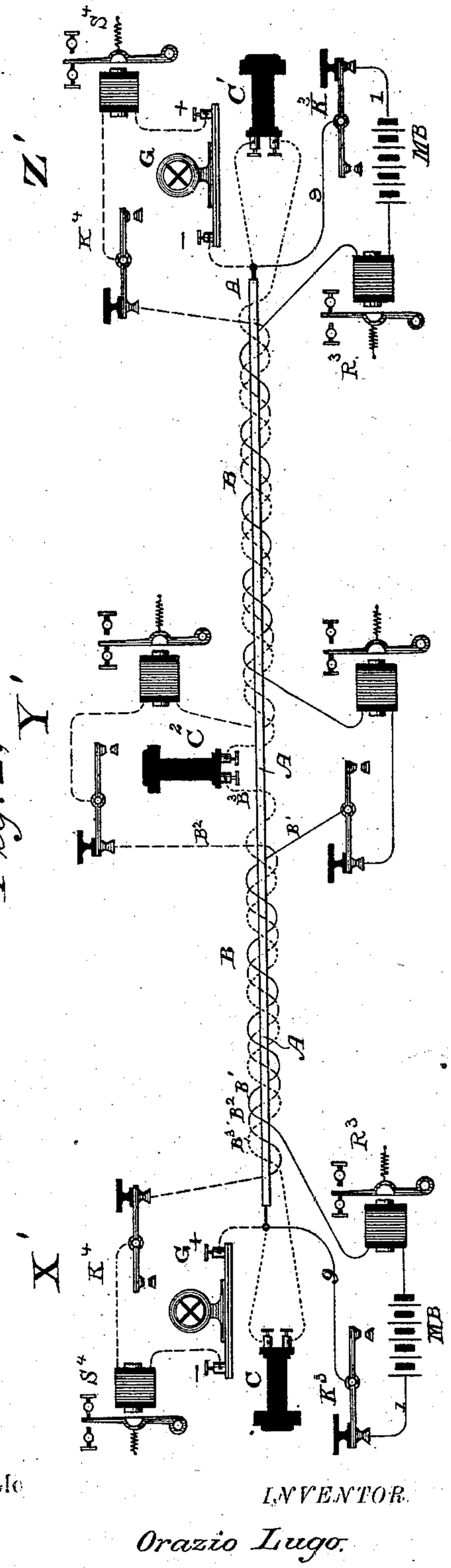
(No Model.)

O. LUGO.

Telegraphic Circuit.

No. 238,941. **Patented March 15, 1881.**





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TELEGRAPHIC CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 238,941, dated March 15, 1881.

Application filed February 9, 1881. (No model.)

To all whom it may concern:

Be it known that I, ORAZIO LUGO, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Telegraphic Circuits, of which the following is a specification.

In a pending application for Letters Patent of the United States, filed by me February 1, 1881, I have shown, described, and claimed a novel method of transmitting electrical pulsations through a telegraphic or telephonic circuit constituting a solenoid. This solenoid is shown as consisting of a direct insulated conductor passing longitudinally through the mathematical axis of a helical conductor or conductors, also insulated. Where more than one helical conductor is described, such helical conductors are shown with their terminals united in multiple arc, so as in effect to constitute a single compound conductor. That apparatus, as organized, shows terminal stations only.

My present invention is based upon that above referred to, and constitutes an improvement thereon. Its objects are so to organize the apparatus that any desired number of intermediate stations may be employed besides the terminal ones, and that where a number or series of helical conductors constitute a part of the circuit, each one of them may be utilized for work independently of the others, so that currents of different character may simultaneously be sent through the same compound conductor—that is to say, one conductor may be employed for the transmission of dynamo-electric currents, another for battery-currents, and another for telephonic transmission.

My invention contemplates the employment of the most approved apparatus of the present day; but as the details of such apparatus are well understood they need no description here, especially as such details constitute no part of the subject-matter claimed, my improvements constituting new organizations of old instrumentalities.

The accompanying drawings show these organizations in the best way now known to me; but the arrangement of apparatus may be varied in well-known ways without departing from the principle of my invention, the distinguishing characteristic of which is the transmission of all the currents, impulses, or pulsations in one direction through a conductor constituting the longitudinal axis of a solenoid, and in the other through a series of conductors coiled helically around said direct conductor, their circuits, of course, passing through the generator and receiving and transmitting apparatus. The conductors, it will be understood, are properly insulated from each other, and are adapted for submarine or subterranean uses by being armored or inclosed in conduits or pipes in well-known ways.

Figure 1 represents a theoretical diagram of my improved apparatus organized for the transmission of both voltaic and magneto currents, with a portion of the apparatus at each station constituting a part of the direct conductor, and other portions constituting parts of the helical conductor, the helical conductors in this figure being shown as united in multiple arc at their terminals, so as to constitute, in effect, but one conductor. Fig. 2 represents a similar diagram, showing the apparatus as organized for the transmission of dynamo-electric, galvanic, and magneto currents, with generating, receiving, and transmitting apparatus interposed in the helical circuits, and with each of the helical conductors organized for the transmission of currents or pulsations differing in character from the others.

The drawings show two terminal stations and one intermediate station, which is sufficient for the purpose of illustration; but, obviously, the number of intermediate stations may be varied to any desired extent.

Under the organization shown in Fig. 1 the apparatus employed at each of the terminal stations X Z is as follows: The direct conductor A is enveloped by the helical conductor B, both being properly insulated. A battery, M B, M B′, at each station is connected by a wire, 1, with a Morse key, K K′, a wire, 2, being connected with the helix of an ordinary relay, R R′, provided with a local battery, L B, L B′, and with a sounder, S S′. A switch, S *w*, S *w′*, connects the helix of each receiver with the direct conductor A above mentioned. At the intermediate station, Y, a corresponding switch, S *w″*, connects the direct conductor with the helix of the receiver R″, pro-

vided with its local battery L B″ and sounder S″. The wire 3 of this helix passes through a transmitting-key, K″, connected by the direct conductor A with the terminal station Z, as already described. The switch S *w*″ can be turned so as to connect directly with the rheostat R *h*, and cut out the relay and sounder R″ S″, as will be readily understood from the drawings, the rheostat affording a means of compensation for disturbances caused by cutting the relay and sounder into or out of circuit. An ordinary microphone-transmitter, T T′ T″, and its local battery, T B, T B′, T B″, are shown as included at each station in circuit with a receiving-telephone, C C′ C″. At the terminal stations X Z this circuit starts from the switch-point 4, through the wires 5 and through the telephones, to the point 6, where it connects with the local conductors B′ B″ B‴ B⁗ in multiple arc. The switches afford a means of cutting the relays, keys, and battery out of circuit, leaving the direct conductor A short-circuiting the relay in a way which will be obvious from an inspection of the drawings. The telephone-circuit at station Y is provided with a rheostat, R *h*′, to enable its resistance to be adjusted relatively to that of the direct conductor. The switch S *w*‴ in the helical conductor enables the current to be switched from the telephone-circuit to the shunt-wire 8, thus enabling the operator to cut out the telephones at the intermediate station when desired. This shunt-wire connects with the helical conductors at a point beyond the intermediate station, which conductors are again connected in multiple arc at their terminal stations in a manner similar to that above described. It will thus be seen that under the organization shown the direct conductor may be utilized for the transmission of galvanic or voltaic currents or pulsations, and that the helical conductor may be used for telephonic transmission, one or the other set of instruments being thrown out of circuit by the switches, as desired. It is also obvious that this arrangement could be reversed. Of course both sets of apparatus cannot be used at the same time as a telephone and telegraph; but the telephone-receiver could be made to act as a telegraph-receiver, either alone or at the same time that the relay and sounder are operating on the direct conductor.

The following is a description of the apparatus shown in Fig. 2, that at each terminal station X′ Z′ being alike. The direct conductor A extends from station to station without a break, while each of the helical conductors B′ B″ B‴ is connected with a different generator, transmitter, and receiver at each station. For instance, the solid black lines show the direct conductor A as connected by a wire, 9, with a key, K‴, battery M B, and relay R³ at each terminal station, with a corresponding key and relay at the intermediate station, this conductor being marked B′. The helical conductor B″ is shown in long dotted lines as connected through a dynamo-electric machine or generator, G, with a key, K⁗, and sounder S⁗ at each station. The third helical conductor, B‴, is shown in short broken lines as connected in circuit with ordinary magneto telephones C C′ C″. The terminals of all these helical conductors are connected in multiple arc with the direct conductor, thus forming metallic circuits normally open or closed, according to the position of the keys.

Under the above organization it is not essential that the resistance of the various conductors should be exactly equal or balanced; but the apparatus, on the contrary, will work with quite a wide range of adjustment.

I do not broadly claim herein an electric circuit constituting a solenoid, nor the method of transmitting currents therethrough, as these constitute the subject-matter of another pending application.

I am also aware that it has been proposed to use a closed metallic circuit consisting of parallel or twisted wires insulated from each other; and I disclaim such organization as differing radically in principle, construction, and function from mine.

I claim as of my own invention—

1. The combination of the direct conductor of a solenoid provided with an electric apparatus (such as telegraphic signaling apparatus) and the helical conductor provided with another electric apparatus, (such as telephonic signaling apparatus,) or vice versa, substantially as set forth.

2. The combination, substantially as herein set forth, of the direct and helical conductors forming a telegraphic circuit, a telegraphic and telephonic or any two different electric signaling apparatus in the same circuit, and a short-circuiting switch for each signaling apparatus to throw it in or out of circuit.

3. The combination of the direct and helical conductors forming a telegraphic circuit, a telephonic and telegraphic or any two different electric signaling apparatus in the same circuit, a short-circuiting switch for each signaling apparatus, and a rheostat for the same, to compensate for variations in the resistance of the conductors occasioned by switching apparatus into or out of circuit, substantially as described.

4. The combination of a direct conductor with two or more helical conductors, connected with the first in multiple arc, each helical conductor being provided with a different apparatus for producing electric currents, as described.

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Witnesses:
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