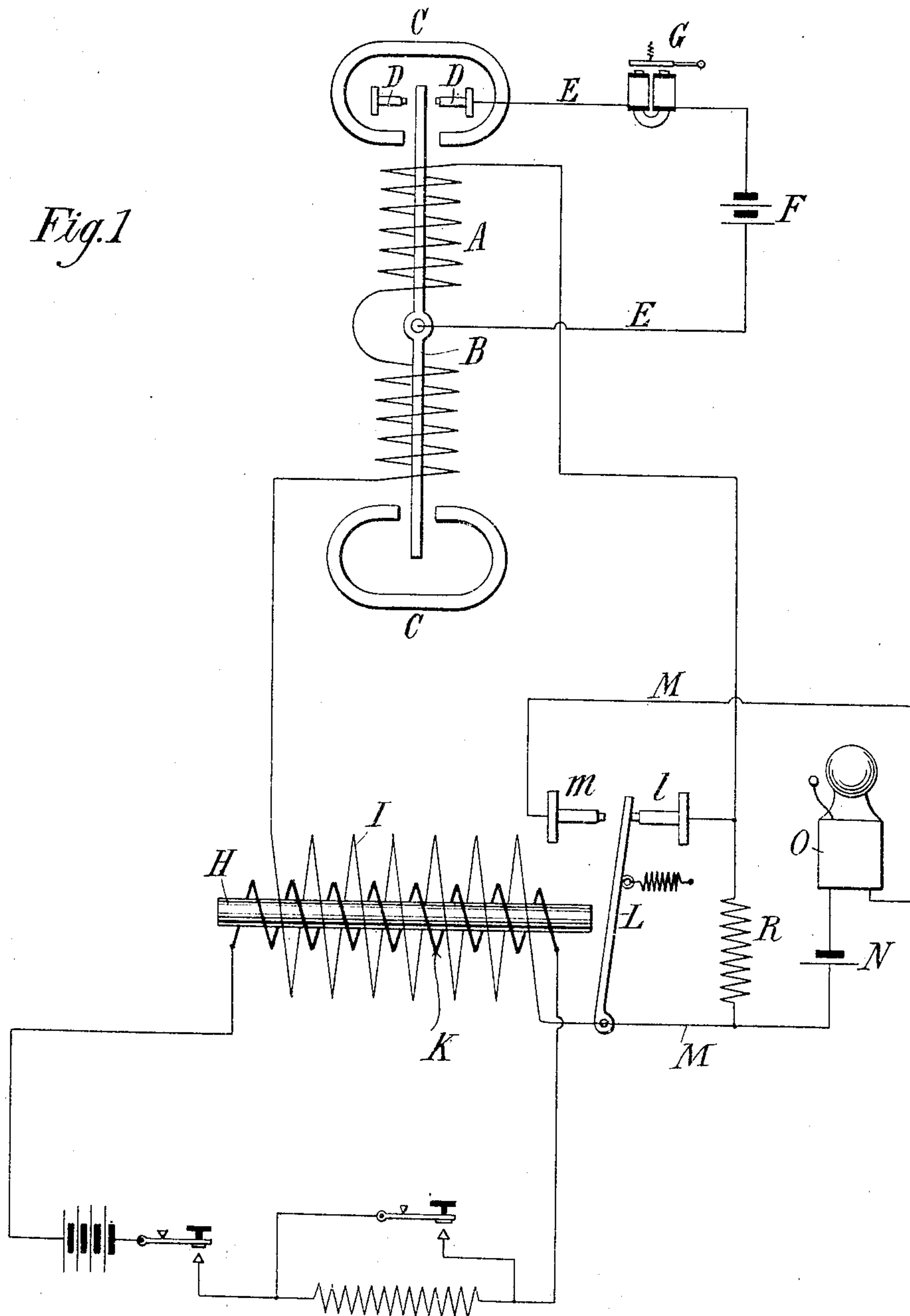


J. W. LARISH.  
TELEGRAPH RELAY.  
APPLICATION FILED AUG. 18, 1904.

2 SHEETS—SHEET 1.



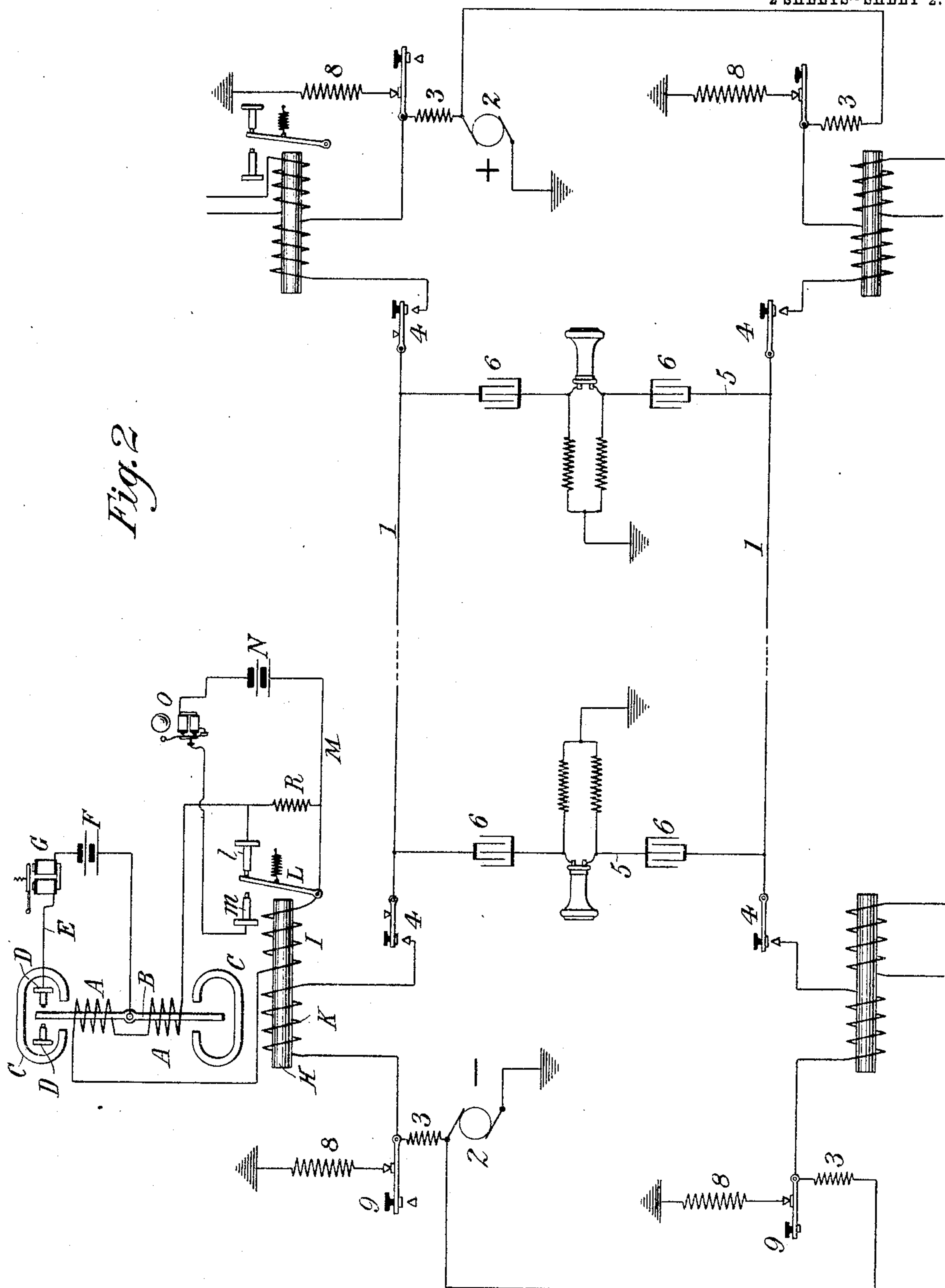
Witnesses  
Raphaël Ketter  
John C. Kerr

Joseph W. Larish, Inventor  
by Kern Page & Cooper, Attys.

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2 SHEETS—SHEET 2.



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Raphaël Ketter  
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# UNITED STATES PATENT OFFICE.

JOSEPH W. LARISH, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO  
THE UNITED PRESS, OF NEW YORK, N. Y., A CORPORATION OF  
NEW JERSEY.

## TELEGRAPH-RELAY.

SPECIFICATION forming part of Letters Patent No. 782,254, dated February 14, 1905.

Application filed August 18, 1904. Serial No. 221,211.

*To all whom it may concern:*

Be it known that I, JOSEPH W. LARISH, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Telegraph-Relays, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

My invention resides, primarily, in a novel relay for telegraph systems which possesses the capability of automatic or self adjustment and of recording simultaneously two distinct and independent signals.

While applicable generally for telegraphic purposes, and particularly on long lines, by reason of its sensitiveness, my improvement was especially designed for use in composite telegraph and telephone systems, in connection with which I have illustrated it, that its nature and purpose may be more readily understood.

The improved instrument as a whole comprises, first, a relay of peculiar and novel construction having a polarized armature responsive to reversals of current irrespective of their strength; second, a neutral relay adjusted to respond only to current impulses of a predetermined increased strength, and, third, an induction-coil having its primary in the line and its secondary closed through the polarized relay. In practice I combine the neutral relay and induction-coil in a single instrument, utilizing the primary and core of the latter as the controlling-magnet for the armature of the former, and adjust the retractile force of the armature so that it will be drawn over toward the core of the induction-coil only when the latter is energized by a current impulse of increased strength. The polarized and neutral relays are, moreover, so combined that while each is capable of performing its allotted function the neutral relay when set in operation by an increased current on the line will throw into the secondary circuit, including the coils of the polarized relay, a compensating resistance, which reduces the current actuating the latter to normal or minimum. Each relay-ar-

mature controls a local circuit with signaling devices connected therewith, so that the local circuit under the control of the polarized relay may be operated without affecting the other, or both may be operated simultaneously by sending to line currents of the proper strength.

The polarized relay which I have devised consists, in general terms, of a solenoid or helix, through which extends longitudinally a centrally-pivoted bar of soft iron, the projecting extremities of which play between the poles of magnets oppositely disposed, so as to combine their effects in oscillating or deflecting the bar to one side or the other, according to the polarity imparted to it by the current flowing in the solenoid. The play of the bar is limited by the usual adjustable contact-stops, one of which, together with the bar itself, is connected with the local circuit controlled by its oscillations.

My invention involves other details of construction, which will be described by reference to the drawings, illustrating, as I have stated above, a combined telegraph and telephone system and the manner of using the instruments above described.

Figure 1 is a view, partly diagrammatic, illustrating the details of construction of the relay instrument. Fig. 2 is a diagram illustrating by conventional figures a combined telegraph and telephone system with the relay connected therewith.

Referring to Fig. 1, A designates a helix of insulated wire, such as ordinarily employed in the construction of relay instruments. B is a soft-iron bar which constitutes the armature and which extends longitudinally through the helix A, being pivotally supported at its center within the coil. The extremities of the bar B extend beyond both ends of the helix and between the poles of permanent magnets C C, which are oppositely disposed at the two ends. Stops D D are placed on opposite sides of one end of the armature B and limit its movement, preventing contact with either magnet-pole. E is a local circuit connected to one of the stops D and to the armature B through its pivotal support. It in-



cludes a battery F and a sounder or similar instrument G. H is the core of an induction-coil, the secondary I of which includes the helix or coil A. When, therefore, the current is made through the primary K, an impulse in one direction is developed in the secondary; but when the current in the primary is broken an opposite impulse is set up in the secondary which, with the connections and arrangement shown, will operate to throw the armature B on and off its contact-stop and produce a corresponding signal in the sounder G. The secondary circuit is normally made through a neutral armature L and a back contact Z. This armature is operated by a magnet in the line, preferably the induction-coil itself, and is so adjusted by means of a retracting-spring that it does not respond to impulses of normal strength, but only to those of a predetermined increased strength. It controls a local circuit M, containing a battery N and a call-bell or other instrument O, the ends of the local circuit being connected to the forward contact m and to the armature, respectively. Around the point of contact between armature L and the stop Z is a resistance R, which is thrown into the secondary circuit the instant that armature L leaves said stop. Thus although the armature L is set in operation by an increased current the polarized relay receives only the normal or weak current by reason of the compensating effect of the resistance thus introduced.

Referring now to Fig. 2, the numerals 1 2 designate the wires of a combined telegraph and telephone circuit; 2 2, the line-batteries or constant-voltage generators, with opposite poles grounded and the others connected to the two line-wires through compensating resistances 3 3. Each line is provided with the usual transmitting-key 4. The telephones are connected in shunts 5 5, containing condensers 6 6 in the usual way, so that the system may be simultaneously operated for Morse signals and for the transmission of speech.

The relays above described are connected with the lines in the usual manner, Morse signals being sent by the keys 4 and received by the sounders G. The current impulses for this operation are reduced to the desired strength by resistances 8 8, which shunt a definite proportion of the current to ground. When, however, it is desired to call up the telephone at the distant end of the line, the home resistance 8 is disconnected by the depression of a key 9, thus throwing an increased current to line when key 4 is operated. This increased current without interfering with the operation of the polarized relay and sounder at the distant end attracts the armature L and closes the local circuit containing the call-bell. Any other well-known means may be employed to send the increased current to line.

I have not regarded it as necessary to an

understanding of my improvement to describe in greater detail the arrangement of the system which permits both Morse instruments and telephones to be used simultaneously. As this is well known and largely used, I may remark, however, that the metallic line, which is desirable for the use of telephones, affords two lines for Morse work and that my improved relays may be used in both lines, together with the usual keys, sounders, switches, and other appurtenances.

The specific character of the induction-coil may be greatly varied; but inasmuch as a certain inductance is required in combined telegraph and telephone systems in the portions of the circuit beyond that used for telephonic transmission the induction-coils are conveniently made to supply this inductance. They should, therefore, be constructed in any well-known way to have a relatively high self-induction. In other respects the details of the system may be greatly varied without departure from the invention.

What I claim is—

1. A telegraphic instrument comprising in combination a polarized relay, a neutral relay responsive to increased currents only, a local circuit controlled by each of said relays, and an induction-coil, the secondary of which is in circuit with the polarized relay, and its primary in the line, as set forth.

2. A telegraphic instrument comprising in combination a polarized relay, a neutral relay responsive to increased currents only, and a local circuit for each, an induction-coil having its secondary in circuit with the polarized relay, and a resistance, adapted to be included in the secondary circuit by the operation of the neutral relays, as set forth.

3. A telegraphic instrument comprising, in combination, a polarized relay, a local circuit controlled thereby, an induction-coil, the secondary of which is in circuit with the polarized relay, and its primary in the line, a neutral armature operated by the attraction of the core of the induction-coil when energized by an increased current, and a local circuit controlled thereby, as set forth.

4. A telegraphic instrument comprising in combination a polarized relay, a local circuit controlled thereby, an induction-coil, the secondary of which is in circuit with the polarized relay and the primary in the line, a neutral armature operated by the magnetism of the core of the induction-coil and adjusted to respond to increased currents only, a local circuit controlled by said armature, and a resistance adapted to be included in the secondary circuit by the movement of said neutral armature, as set forth.

5. In a combined telegraph and telephone system, the combination of a polarized relay, and a local signaling-circuit controlled thereby, an induction-coil having its secondary in circuit with the polarized relay and its pri-



mary in the main line, a neutral armature and magnet in the main line, said armature being adjusted to respond to increased current only, a local call-circuit controlled by said armature, 5 and a resistance adapted to be included in the secondary circuit of the induction-coil by the movement of the armature, as set forth.

6. In a combined telegraph and telephone system, the combination of a polarized relay, 10 composed of a helix, a soft-iron armature centrally pivoted therein and extending longitudinally through the same, and magnets with oppositely-disposed poles between which the ends of said armature play, a local sounder-

circuit controlled by said armature, an induction-coil having its primary in the main line, 15 and its secondary in circuit with the helix of the relay, a neutral armature operated by the core of the induction-coil and adjusted to respond to increased currents only, a local call- 20 circuit controlled by said armature, and a resistance adapted to be included in the secondary circuit by the movement of said armature, as set forth.

JOSEPH W. LARISH.

Witnesses:

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