(No Model.) 2 Sheets—Sheet 1.

H. C. NICHOLSON.

RELAY FOR QUADRUPLEX TELEGRAPHS.

No. 289,301. Patented Nov. 27, 1883.

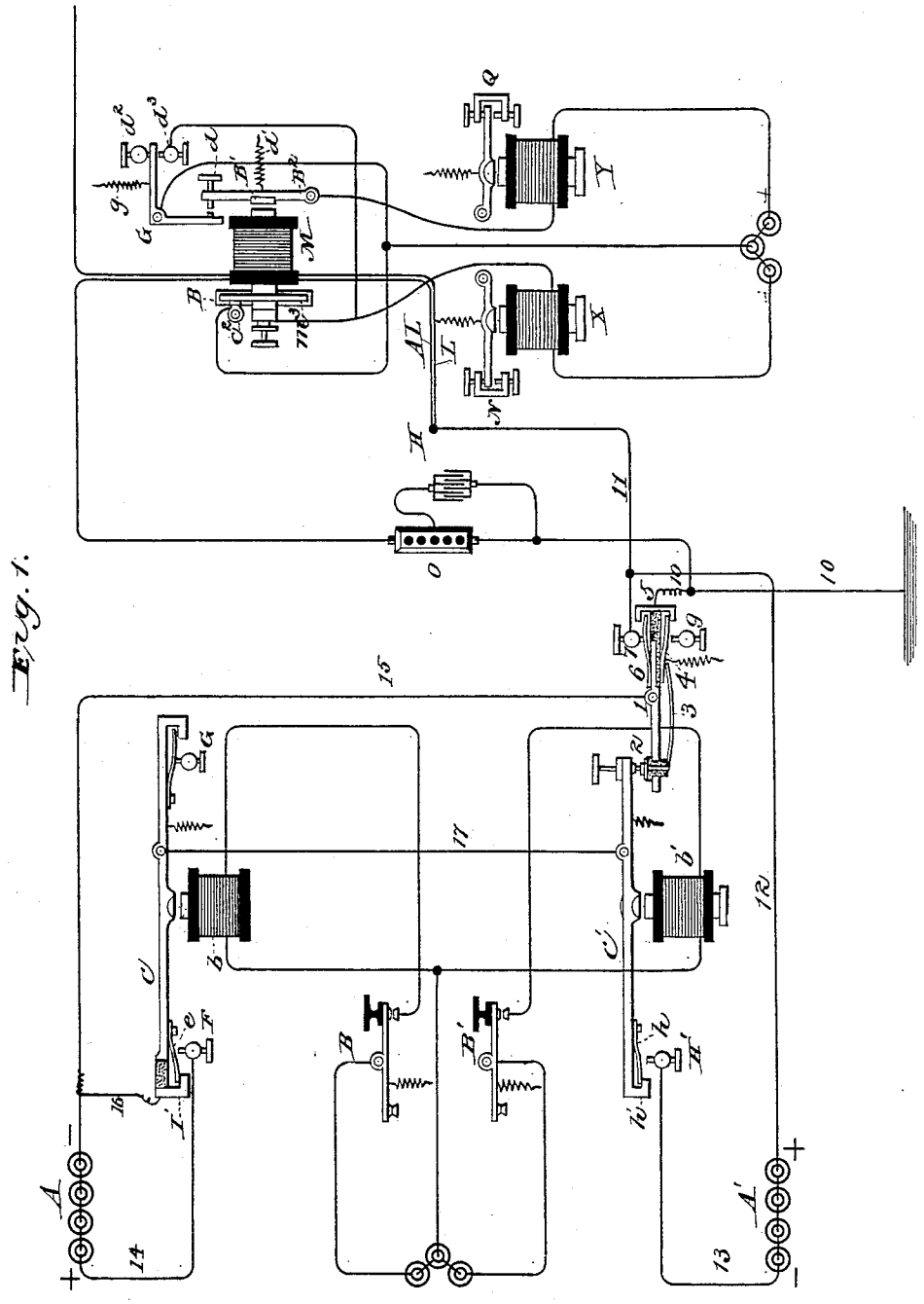


Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

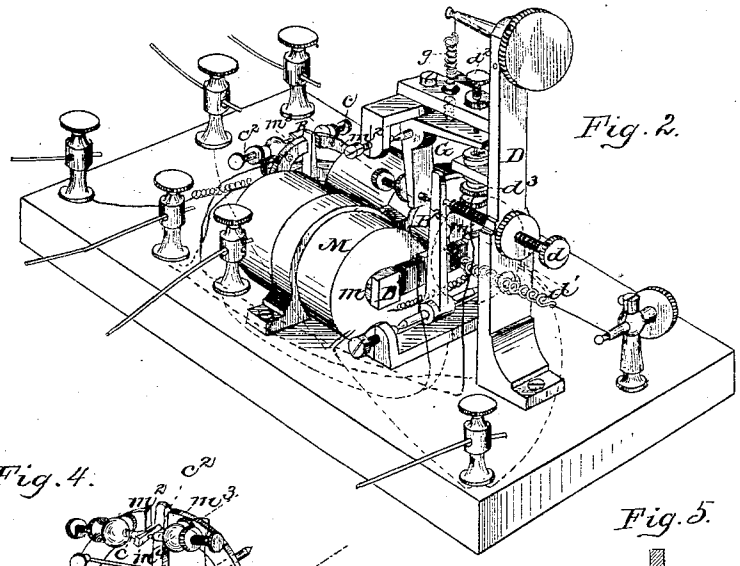


Fig. 4.

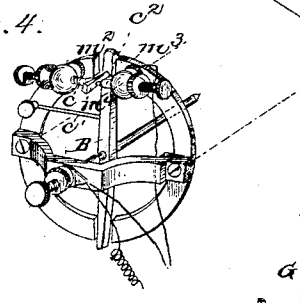


Fig. 5.

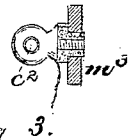
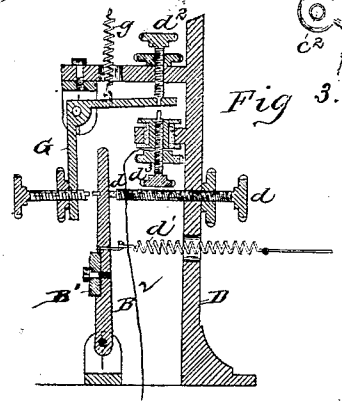


Fig 3.



Attest
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UNITED STATES PATENT OFFICE.

HENRY C. NICHOLSON, OF KENTON, KENTUCKY.

RELAY FOR QUADRUPLEX TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 289,301, dated November 27, 1883.

Application filed June 24, 1882. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. NICHOLSON, a citizen of the United States, residing at Kenton, in the county of Kenton and State of Kentucky, have invented certain new and useful Improvements in Electric Telegraphs; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to electric telegraphs.

The particular invention hereinafter described and claimed is a part of the invention described in my application for United States Letters Patent filed October 14, 1874, which is now in interference with another pending application, and from which this part has been withdrawn under the existing rules of practice in the United States Patent Office.

The part of my invention now under consideration consists of the combination of an armature-lever actuated by line-currents, a yielding contact-lever forming one terminal of a local circuit, and a fixed contact-point or screw forming the other terminal of such local circuit; also, of the combination of two armature-levers actuated by the main-line currents, and a supplemental contact-lever operated by one of said armature-levers, by means of which combination of levers two local circuits are controlled for properly receiving two independent messages at the same time.

In order that the invention may be clearly understood, I have illustrated in the annexed drawings, and will proceed to describe, the form thereof set forth in my aforesaid application.

Figure 1 is a diagram illustrating one station of a quadruplex telegraph. Fig. 2 is a perspective view of the polarized relay thereof. Figs. 3, 4, and 5 are detail views of parts of said relay.

The same letters of reference indicate identical parts in all the figures.

In this quadruplex the signals of two simultaneously-telegraphed messages are transmitted by electrical impulses differing in polarity and in intensity. This is effected by two equal sections, A and A′, of line-battery, and two keys or transmitters, C and C′. These transmitters are provided with armatures, and are actuated in one direction by the electro-magnets *b* and *b′* of two local circuits, controlled by ordinary finger-keys, B and B′, and in the other direction by retractile springs. Transmitter C is at one end provided with an insulated hook, I′, and with a contact-spring, *e*, which is normally in contact with said hook, but is moved away therefrom by the fixed contact-screw F when the transmitter is actuated by its electro-magnet. G refers to the back stop of transmitter C. Transmitter C′ is also provided at one end with a spring, *h*, the movement of the free end of which outward from the transmitter is limited by a hook, *h′*; but the purpose of this spring *h* is solely to preserve the continuity of the circuit during the movement of the transmitter. Spring *h* makes and breaks contact with fixed contact-screw H′. The other end of transmitter C′ carries a contact-screw, the point of which bears on an insulated contact, 2, on one end of a lever, 1, the other end of which carries an insulated double-horned hook, 5, one horn of which limits the outward motion of a contact-spring, 6, conductively secured to the lever 1, while the other horn thereof limits the outward motion of the contact-spring 4, secured by means of an insulation to lever 1, and in electrical connection with contact 2 through wire 3. The contact between the contact-screw of transmitter C′ and contact 2 of lever 1 is preserved by the retractile spring of said lever, which acts in opposition to but is weaker than the retractile spring of the transmitter. In the movements of lever 1 its contact-springs 4 and 6 are alternately moved away from the respective horns of hook 5 by the fixed stop 9 and fixed contact-screw 7.

The batteries and transmitters are connected to earth and line, and interconnected as follows: Double-horned hook 5 of lever 1 is connected directly to earth by wire 10. Contact-screw 7 is connected by wire 11 to post H, from which the line L proceeds. The positive pole of battery A′ is connected by wire 12 to wire 11, its negative pole by wire 13 to the fixed contact-screw H′ of transmitter C′. The positive pole of battery A is connected by wire 14 to the fixed contact-screw F of transmitter C, its negative pole by wire 15 to lever

I. Insulated hook I′ of transmitter C is connected by wire 16 to wire 15. The transmitters are connected by wire 17. When both transmitters are elevated, as shown in Fig. 1, the route from earth to line is by way of 10 5 4 3 2 C′ 17 C *e* I′ 16 15 1 6 7 11, no battery being in circuit. When transmitter C is alone depressed by the action of electro-magnet *b*, the route from earth to line is by way of 10 5 4 3 2 C′ 17 C *e* F 14 A 15 1 6 7 11, battery A being in circuit with its negative pole to line. When transmitter C′ is alone depressed by the action of electro-magnet *b′*, the route from earth to line is by way of 10 5 6 1 15 16 I′ *e* C 17 C′ *h* H′ 13 A′ 12 11, battery A′ being in circuit with its positive pole to line. When both transmitters are simultaneously depressed by action of their respective electro-magnets, the route from earth to line is by way of 10 5 6 1 15 A 14 F *e* C 17 C′ *h* H′ 13 A′ 12 11, the batteries A and A′ being joined and in circuit with the positive pole from battery A′ to line. The condition of the line under these four different positions of the transmitters may be thus tabulated:

C and C′ elevated = no current on line,
C depressed = current 4 — on line,
C′ depressed = current 4 + on line,
C and C′ depressed = current 8 + on line.

At the distant station the batteries and transmitters may be arranged and connected in precisely the same manner, in which case like batteries at the respective stations would oppose each other when simultaneously put in circuit, and the currents from the batteries at the distant station would flow in a direction contrary to that of the flow of the currents from the illustrated station. At each station an electro-magnet or relay, M, is inserted in the circuit constructed with two parallel soft-iron cores wound respectively with two equal helices, one of which forms a part of the line. The other helix of each core forms part of the artificial line A L, one end of which is connected to post H, and the other end to earth-wire 10, a rheostat, O, being inserted to make the electrical resistance of this artificial line equal to that of the main line, so that the currents from batteries A and A′ will distribute from post H in equal proportions to the main line and artificial line, respectively. The helices of the electro-magnet M are so joined respectively to the main line and the artificial line that the outgoing currents circulate in opposite directions around the cores of the magnet, and thus neutralize each other thereon. At one end of the electro-magnet the ends of the cores constitute the poles *m* and *m′*. At the other end the ordinary yoke-piece connecting the cores is omitted, and instead thereof opposed semicircular pole-pieces m^2 and m^3 are secured to the respective cores.

A polarized armature-lever, B, centrally pivoted to the frame, is situated between pole-pieces m^2 and m^3, and is normally held retracted, so that its contact-arm m^4 rests against an insulated stop, *e*, by a retractile spring, *e′*, at the receiving-station. A polarized armature, B′, secured to pivoted armature-lever B^2, is situated opposite poles *m m′*, and is normally held retracted against an insulated stop, *d*, of the metallic standard D by a retractile spring, *d′*. These armatures are so arranged with reference to the respective poles of the electro-magnet that one responds to currents of positive polarity, the other to currents of negative polarity, and the arrangement is such, furthermore, that armature B′ responds to currents from the combined batteries at the distant station. The currents generated at the distant station, not being balanced on electro-magnet M, will excite it, also currents generated by the junction of batteries at the two stations, and it will also be excited by the current flowing through the helix of the artificial line when batteries at the respective stations are opposed. When armature B is attracted, its contact-arm m^4 makes contact with contact-screw c^2. When armature B′ is attracted with a force due to a current from only one of the batteries at the distant station, its lever B^2 makes contact with elbow-lever G, pivoted to standard D, without moving said elbow-lever, which is held retracted against a stop, d^2, by a retractile spring, *g;* but when it is attracted with a force due to the current from both batteries at the distant station, its lever also moves elbow-lever G, and causes it to make contact with contact-screw d^3, supported by but insulated from standard D. These two armature-levers and the yielding contact-lever G control the two local circuits X and Y, in each of which is included a sounder, (marked N and Q, respectively.) Local circuit X has two sets of terminals, contact-arm m^4 of armature B and contact-screw c^2 being one set, and yielding contact-lever G and contact-screw d^3 being the other set, so that said local circuit may be closed either by armature-lever B or by yielding contact-lever G. The terminals of local circuit Y are the armature-lever B^2 and yielding contact-lever G.

From the foregoing description of the relay and its local connections it will be readily seen that sounder Q will always respond when armature B′ is attracted, and that sounder N will always respond when armature B is attracted, as well as when yielding contact-lever G is moved against contact-screw d^3 by armature-lever B^2. In other words, sounder N will respond whenever one of the distant batteries—say A—is in circuit, sounder Q whenever distant battery A′ is in circuit, and both sounders whenever both distant batteries are simultaneously in circuit.

I believe that I am the first to operate a local circuit by a relay armature-lever through the intervention of a yielding contact-lever which forms one terminal of such local circuit, the other terminal of which is a fixed contact point or screw. One of my claims is intended to cover such a mechanism, broadly, while the other two claims are intended to respectively cover its use in receiving devices of telegraphs

for simultaneous transmission generally, and its special adaptation to the hereinbefore-described relays of my newly-invented quadruplex telegraph.

Having thus described my invention, what I claim is—

1. The combination, substantially as before set forth, of two armature-levers actuated by the main-line currents, a yielding contact-lever operated by one of said armature-levers, and two local circuits controlled by the three levers.

2. The combination, substantially as before set forth, of an electro-magnet in the main-line circuit, two polarized armature-levers therefor, a yielding contact-lever operated by one of said armature-levers, and two local circuits controlled by the three levers.

3. The combination, substantially as before set forth, of an electro-magnet in the main-line circuit, an armature-lever actuated thereby, a yielding contact-lever forming one terminal of a local circuit, and a fixed contact point or screw forming the other terminal of such local circuit.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY C. NICHOLSON.

Witnesses:
C. A. NEALE,
B. E. J. EILS.