(No Model.) 2 Sheets—Sheet 1.

D. KUNHARDT.

TELEGRAPHY.

No. 458,585. Patented Sept. 1, 1891.

Fig. 2.

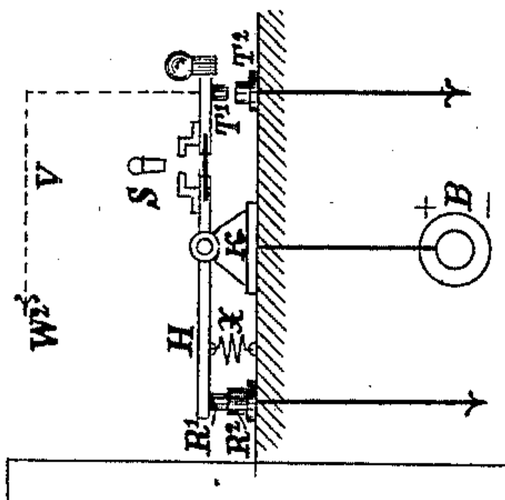
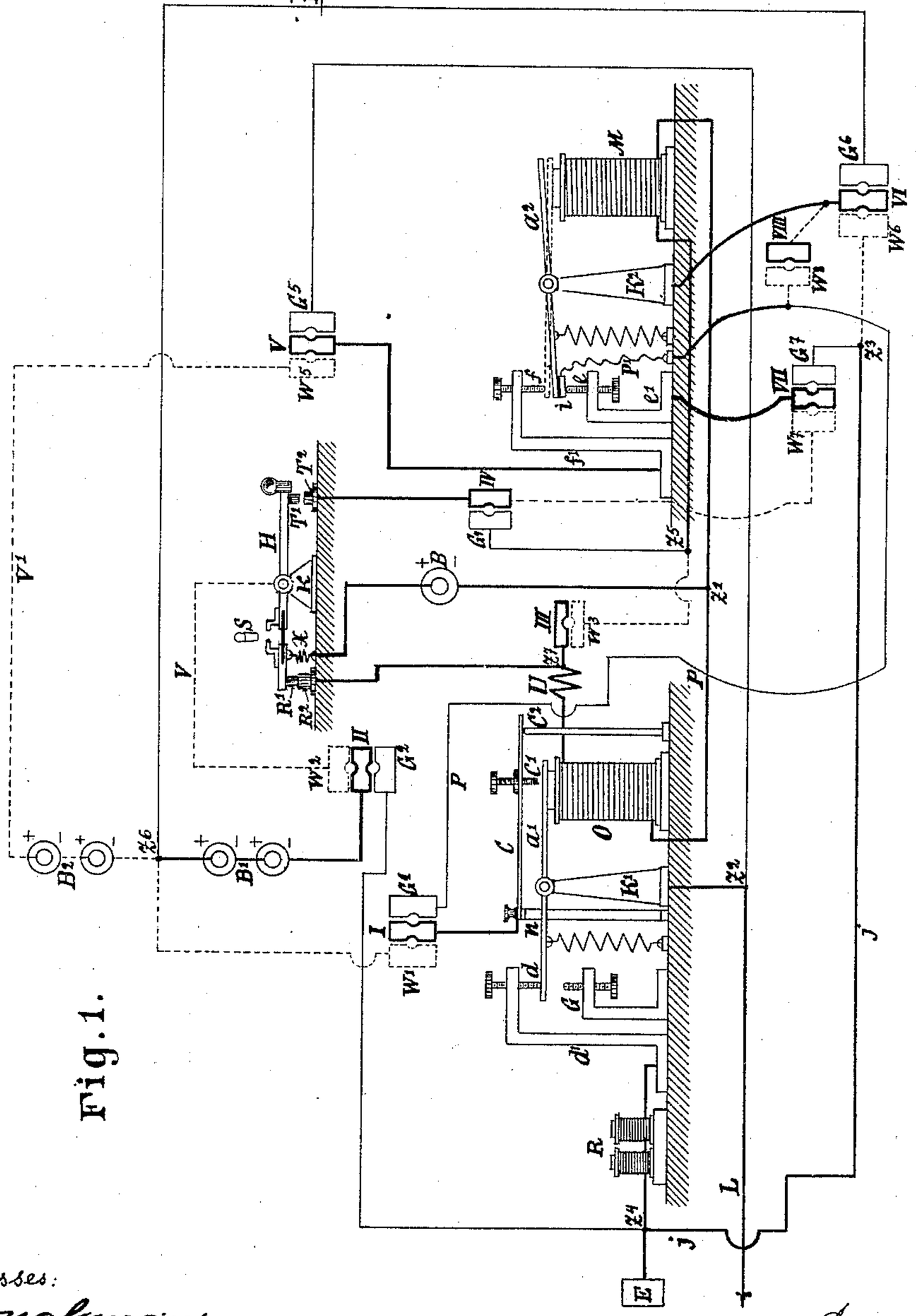


Fig. 1.



Witnesses:
A. Longhmans.
J. Swan.

Inventor:
D. Kunhardt
by his attorneys
Roeder & Briesen

(No Model.) 2 Sheets—Sheet 2.

D. KUNHARDT.

TELEGRAPHY.

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Fig. 3.

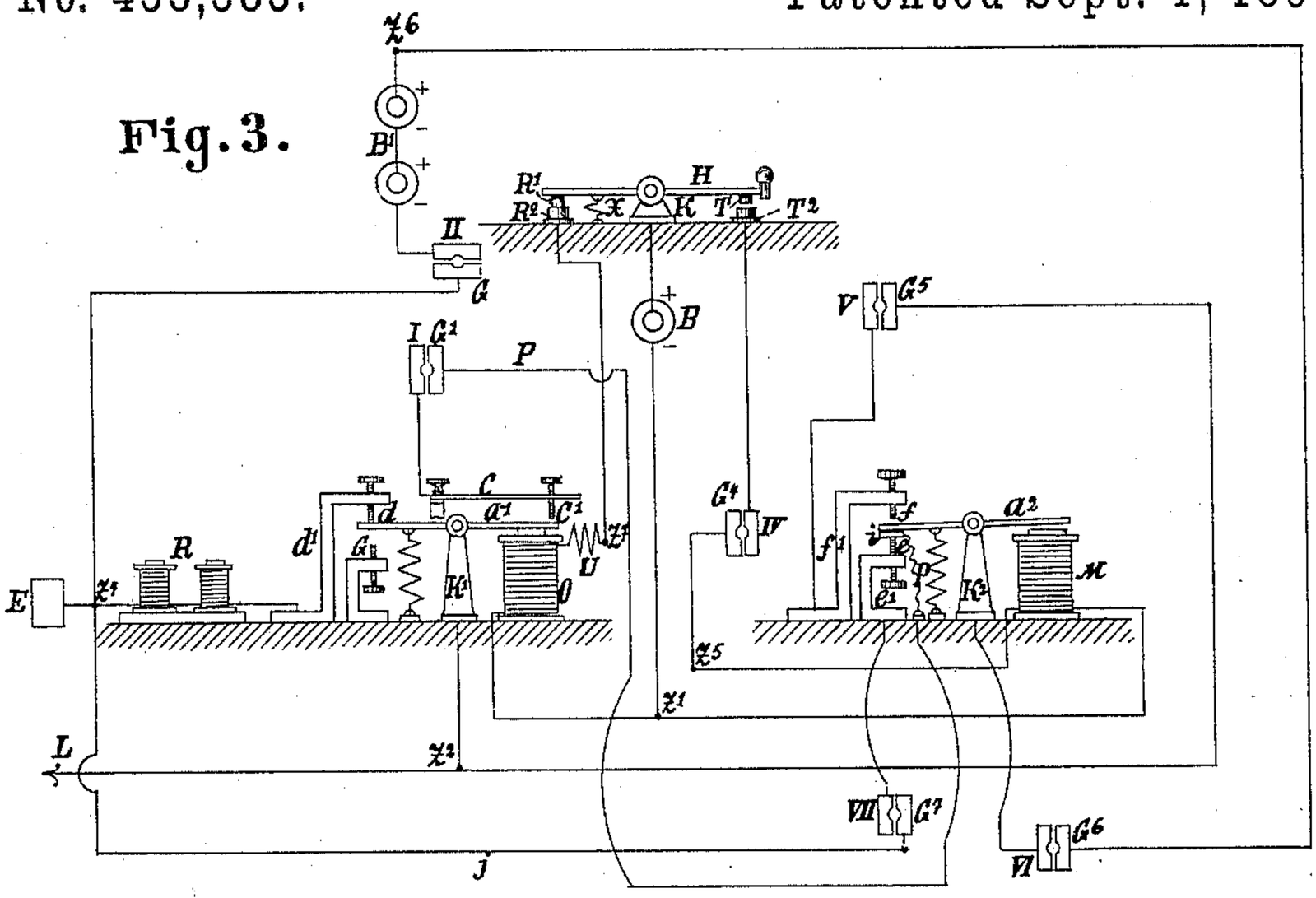
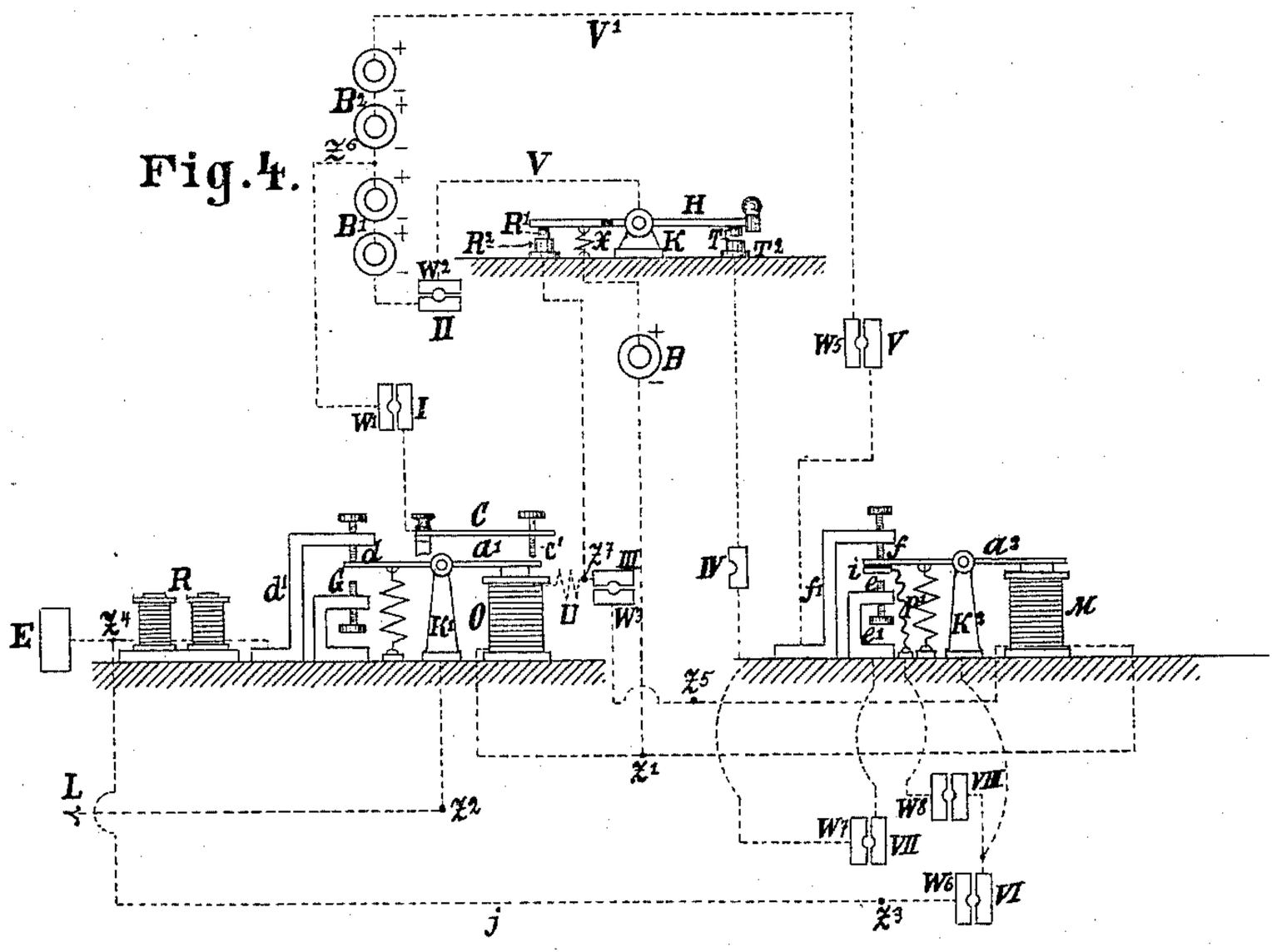


Fig. 4.



Witnesses:
A. Honglmann
J. Egan.

Inventor:
D. Kunhardt
by his attorneys
Roeder & Briesen

UNITED STATES PATENT OFFICE.

DAVID KUNHARDT, OF AACHEN, GERMANY.

TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 458,585, dated September 1, 1891.

Application filed March 26, 1891. Serial No. 386,425. (No model.)

To all whom it may concern:

Be it known that I, DAVID KUNHARDT, a subject of the Emperor of Germany, residing at Aachen, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Apparatus for the Transmission of Telegraphic Messages by Means of Direct or Alternate Electrical Currents, of which the following is a specification.

This invention relates to an apparatus by means of which signs can be transmitted by direct currents of electricity—that is to say, currents passing in the same direction and earth connections—or by alternate currents, according to the interpositions of a contact-plug, the necessary relay being switched in after each sign.

In the accompanying drawings, which are in illustration of the invention, Figure 1 is a general view of an installation for direct and alternate currents. Fig. 2 is a separate view of a modification of the double lever illustrated in Fig. 1. Fig. 3 is a general view showing separately the installation when the transmission is effected by direct current. Fig. 4 is a general view showing separately the installation when the transmission is effected by alternate currents.

In Fig. 1 the wires and clamps or binding-screws common to both arrangements are shown in thick lines, whereas they are shown in thin lines and the clamps shaded when the apparatus is operated by means of direct currents and earth connections. Furthermore, the wires and clamps, as well as the alternative position of rest of one of the armatures of the electro-magnets, are shown in dotted lines for alternate currents, while in order to show more clearly the different arrangements and circuits according to the two methods these are reproduced separately in Figs. 3 and 4.

Referring to Fig. 1, H is a double lever or key having its fulcrum upon the block K and carrying at one end the contact-piece R′, which forms with the contact-piece R^2, placed below it, a normal contact, the spiral spring X constantly holding the lever-arm down, while the other end of this lever or key is furnished with a knob and a contact T′, forming with the contact T^2, placed beneath it, the contact for telegraphing a sign. The double lever or key H consists of two insulated pieces which can be metallically connected together by means of the plug or stop S. For operating by means of direct currents—that is to say, currents proceeding in the same direction—the plug S is interposed, whereby the key H, practically, is made to consist of a single solid piece, as shown in Fig. 3.

Fig. 2 shows a modification of the construction and arrangement of the key H, as represented in Fig. 1. In the arrangement shown in Fig. 1 the positive current of the local battery passes through the spiral spring X and the normal contacts R′ R^2, while the wire V, leading to the line or distance battery, is connected to the block or support K of the key H. In the arrangement shown in Fig. 2 the current of the local battery passes through the spiral spring X and the normal contacts R′ R^2, while the wire V, leading to the line or distance battery, is connected to the block or support K of the key H.

When commencing operations with direct currents, all the binding-screws (designated by roman numerals) are metallically connected with the several pieces C, having corresponding italic numerals. The local battery B then actuates the electro-magnet O, the current passing from the said battery to the spiral spring X, (or through the block K in Figs. 2 and 3,) the key H, the normal contact R′ R^2, the junction Z^7, the resistance U, proceeding round the electro-magnet O and to the junction Z′ of the negative current, and the electro-magnet attracts its armature *a′*. The sign being now transmitted by depressing the key H, the electro-magnet releases its armature *a′*, while the normal contact R′ R^2 is opened and the armature *a′* makes contact with the set-screw or terminal *c′* of the metal piece *c*. This elastic metal piece which has the form of a flat spring, as shown, is fixed to the pillar *n*, its outer end resting upon the rod c^2, which limits its motion. The armature *a′*, which raises, by means of the screw *c′*, the spring *c*, is raised to a sufficient height, but is limited in its movements by the screw G.

In the position resulting from the release of the armature the circuit is directly con-

nected to earth without any relay R being interpolated, the current passing through the line-wire L, the junction Z^2, the pillar K′, the armature a', the set-screw c', the spring c, the binding-screws I and G′, the wire P, the conductor P′, the metallic piece i, (resting upon the armature a^2, but insulated therefrom,) the contact-point e, the block e', the binding-screw VII and G^7, the junction Z^3, the wire j, the junction Z^4, and thence to earth at E. When the telegraphing-contact T′ T^2 is closed, the electro-magnet M is actuated by the local battery B, the current passing through the spiral spring X, (or the block K in Figs. 2 and 3,) the key H, the plug S, Figs. 1 and 2, the telegraphing-contact T′ T^2, the binding-screws IV and G^4, the junction Z^5 and Z′, so that the electro-magnet M attracts its armature a^2, which has a very short stroke, and the other end of which then presses against the contact-point f, whereby the connections hitherto existing between the circuit and the earth by means of the contact i e is broken, while the circuit from the line-battery B′ and the wire L is established, the current passing through the junction Z^6, the binding-screws G^6 and VI, the pillar K^2, the armature a^2, the screw f, and the pillar f', the binding-screws V and G^5, the junction Z^2, the line-wire L, and returning through earth E, the junction Z^4, and the binding-screws G^2 and I. After the telegraphing-contacts T′ T^2 are opened the armature a^2 falls back with its insulated contact-piece i upon the set-screw e, and thereby establishes connection to earth, through which the current passes. The normal contact R′ R^2 is now closed, whereby the armature a' is attracted by the electro-magnet O. This attraction of the armature a' is retarded by suitable mechanism and means influencing the action of the current, such as a further spring-tension, the movement of a running weight connected to the armature, the interposition of the resistance U in the local circuit connected with the electro-magnet O or the like. In this way the armature may not fully follow in consequence of the rapid making and breaking of the normal contact R′ R^2, or the attracting impulses of the electro-magnet O, so that the contact of the armature a' against the set-screw c' remains—that is to say, the discharge-current is continuously connected to earth—the connection being only broken, as above described, when transmitting a sign, and hence making the contact a^2 f. If the contact R′ R^2 remains a little longer in its closed position, the armature a' is fully attracted by the electro-magnet O, whereby the contact of the armature a' with the screw c' is opened, the connection to earth is broken, and the relay R is inserted. It is therefore left to the operation of the operator whether he allows this relay to be inserted or not after each elementary sign, whole letter, or full word. As in practice the insertion of a relay after each full word fully suffices to prevent the possibility of a break, the operator need not look after each sign to the complete closure of the normal contact R′ R^2; but this closure may be allowed with full security after each complete word. When telegraphing by means of alternate currents, Figs. 1 and 4, the plug S is withdrawn from the key H and all the binding-screws G are connected with the binding-screws W. Another battery B^2 is connected, as shown in the general view, with the battery B′. When the key H is at rest, both the electro-magnets O and M are actuated as, being parallel, the current passes as regards the electro-magnet O through the spiral spring X, the key H, the contacts R′ R^2, the junction Z^7, the resistance U, round the electro-magnet O to the junction Z′, and the negative pole of the battery B, and as regards the electro-magnet M through the spiral spring X, the key H, the normal contact R′ R^2, the junction Z^7, the binding-screws III and W^3, and the junction Z^5 Z′. As the sign is transmitted, the normal contact R′ R^2 is first opened, whereupon the armature a', as above explained, presses against the set-screw c', raises the spring c, and strikes the set-screw G. At the same time the electro-magnet M releases its armature a^2, which, having a short stroke, allows the contact-piece f to fall upon the screw e. When operating with alternate currents only, the insulated contact i is not required, the armature a^2 falling directly upon the contact e, the wire P′ and the binding-screws W^8 and VIII being likewise dispensed with. When the telegraphic contact T′ T^2 is closed, a current is sent into the circuit, passing from the battery B′ through the junction Z^6, the binding-screw W′ and I, the spring c, the set-screw c', the armature a', the pillar K′, and the junction Z^2 to the line-wire L, and back through earth at E, junction Z^4, wire j, junction Z^3, binding-screws W^6 VI VIII W^8, conducting-wire P′, insulated contact-piece i, set-screw e, pillar e', binding-screw VII W^7 IV, telegraph-pieces T^2 T′, wire V, and binding-screws W^2 II. Telegraphic contacts T′ T^2 being now opened, the apparatus remains inoperative; but the closure of the normal contacts R′ R^2 causes a current to be sent in a contrary direction to that of the former one from the battery B^2 into the circuit, while in consequence of the above-described limitation of the mobility of the armature a' or of the attractive capability of the electro-magnet O the contact between the armature a' and the set-screw c' is not immediately broken by the closure of the normal contacts R′ R^2; but the armature a^2 is immediately attracted by the magnet M and brought against the contact-point f. A current is thus generated in an opposite direction by the positive pole of the battery B^2, this current passing through the wire V′, the binding-screws W^5 and V, the pillar f', contact-point f, armature a^2, pillar K^2, binding-screws VI and W^6, junctions Z^3 Z^4 to earth E, and back through the line-wire L,

junction Z^2, pillar K′, armature a', set-screw c', spring c, binding-screws I and W′, junction Z^6 to the negative pole of the battery B^2. If further work is carried on, this negative current is immediately broken, owing to the separation of the normal contacts R′ R^2 and the resulting opening of the contact between the armature a^2 and the contact-point f, while the contact between the armature a' and the set-screw c' is only broken, as above described, when the closure of the contact R′ R^2 is of somewhat longer duration.

When operating by means of alternate currents, an absolutely secure closure of the normal contact R′ R^2 should be effected after each elementary sign. When the apparatus remains without working for any length of time, the current from the local battery can be broken by withdrawing the plug, while the break occurring at the same time between the circuit, the relay, and the earth, in consequence of the movement of the armature a', can be remedied by a suitable insertion of plugs between the circuit or line-wire L and the pillar d'. The receipt of signs is effected in a similar manner in both cases through the circuit L, junction Z^2, pillar K′, armature a', set-screw d, pillar d', relay R, junction Z^4, and earth E.

Having now particularly described and ascertained the nature of the said invention and the manner in which the same is to be performed, I declare that what I claim is—

An apparatus for telegraphing either with direct currents and earth connections or with alternate currents, consisting of a key or lever H, with normal and telegraphing contact-points R′ and T′, which are either electrically connected together or separate from one another and the contact of which with the contact-pieces R^2 or T^2 (or the separation therefrom) successively or simultaneously actuates or puts out of action two electro-magnets O and M, the armature a^2 of the former having a short stroke, while the armature a' of the latter has a long stroke, for the purpose of making and breaking contact at different times by the common action of the rapid movements of the armature a^2 and the retarded movements of the armature a', whereby at each sign either a circuit from the apparatus to earth is formed or a current having an opposite direction to that of the sign-current is sent into the circuit, substantially as set forth.

In testimony whereof I hereunto sign my name, in the presence of two subscribing witnesses, this 9th day of March, 1891.

DAVID KUNHARDT.

Witnesses:

JOHN HECKMAUNS,

TH. WITTNICH.