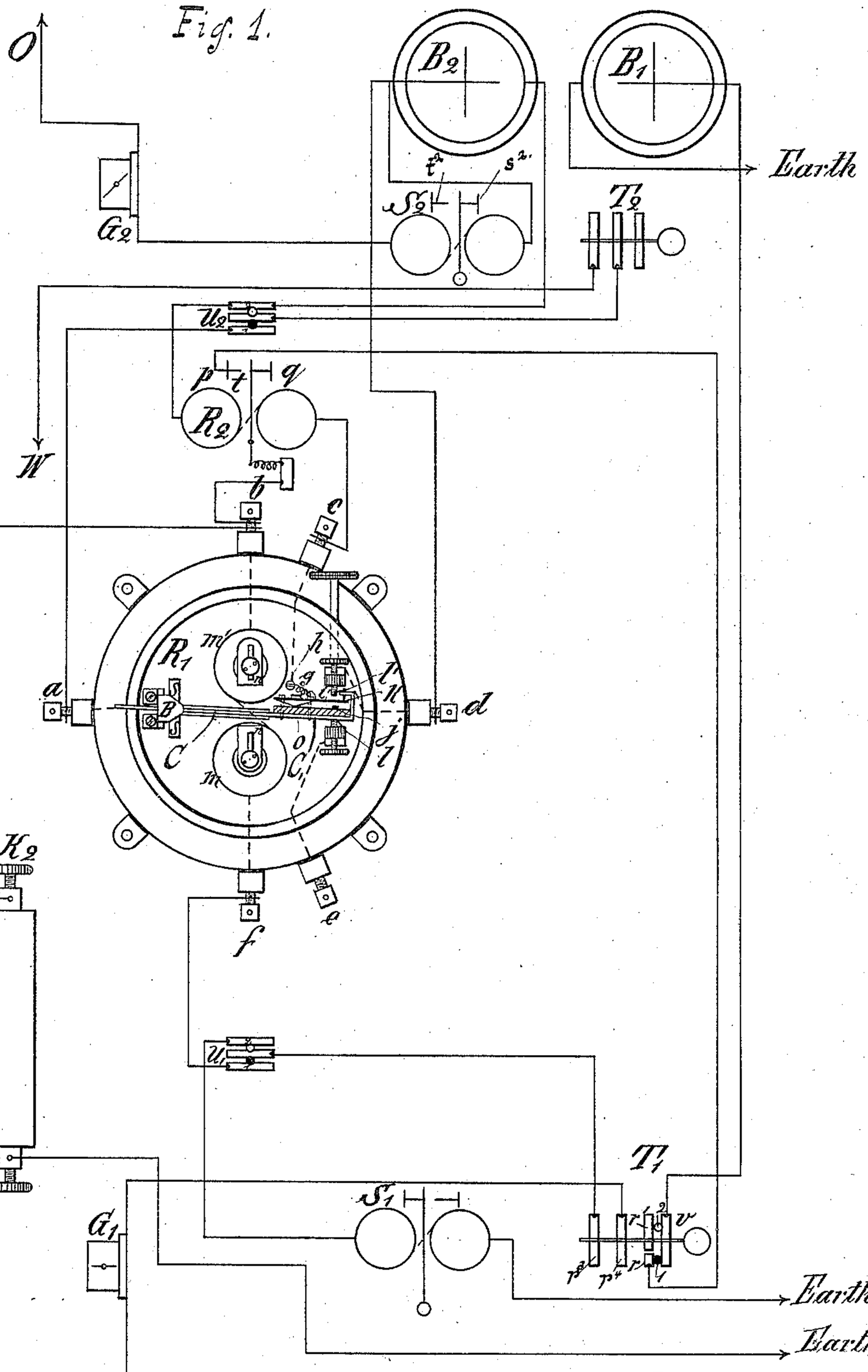
(No Model.) 5 Sheets—Sheet 1.

J. KÖLZER.

TELEGRAPHIC REPEATER.

No. 311,330. Patented Jan. 27, 1885.

Fig. 1.



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(No Model.) 5 Sheets—Sheet 2.

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TELEGRAPHIC REPEATER.

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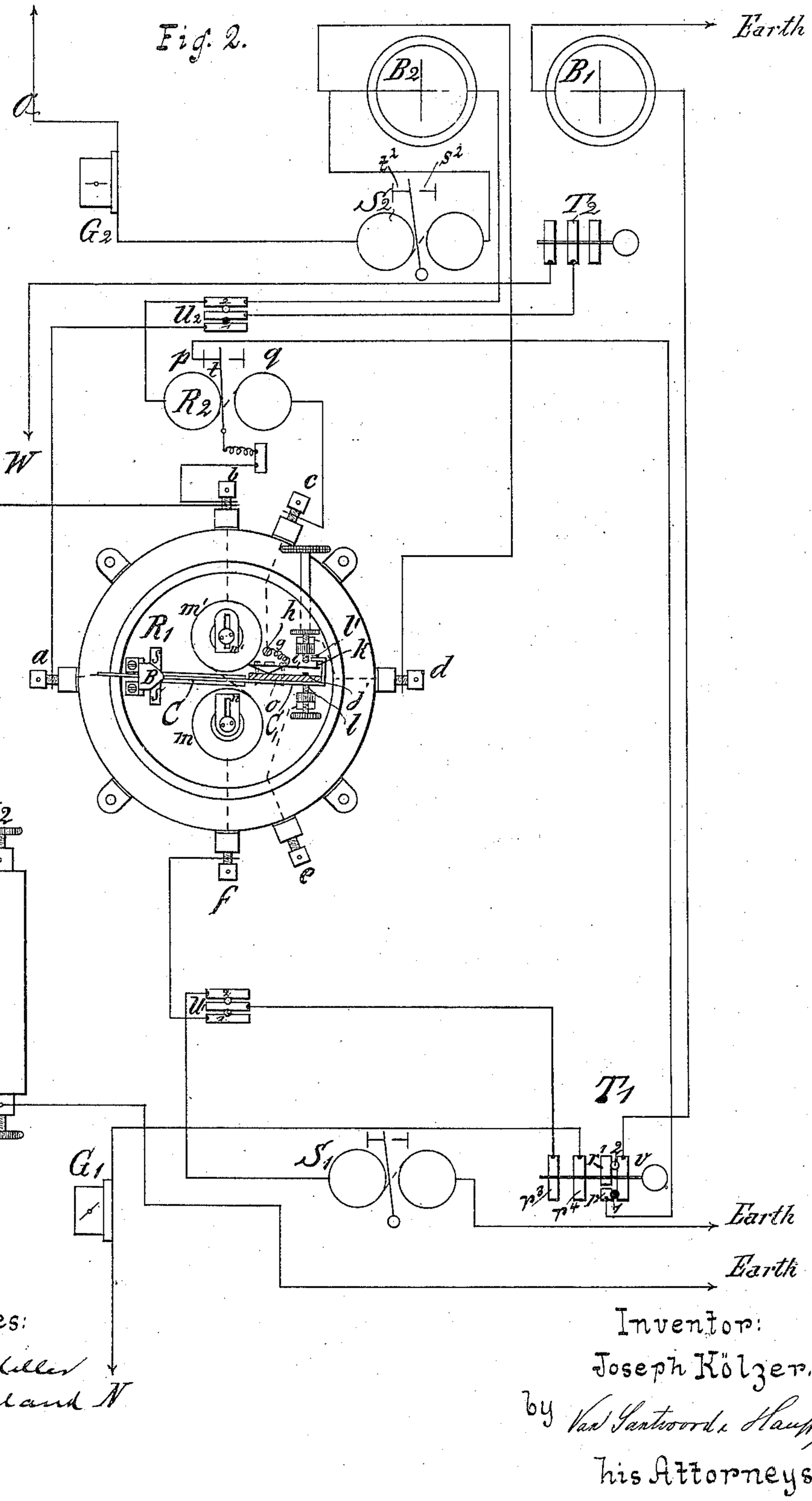
Fig. 2.



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(No Model.)

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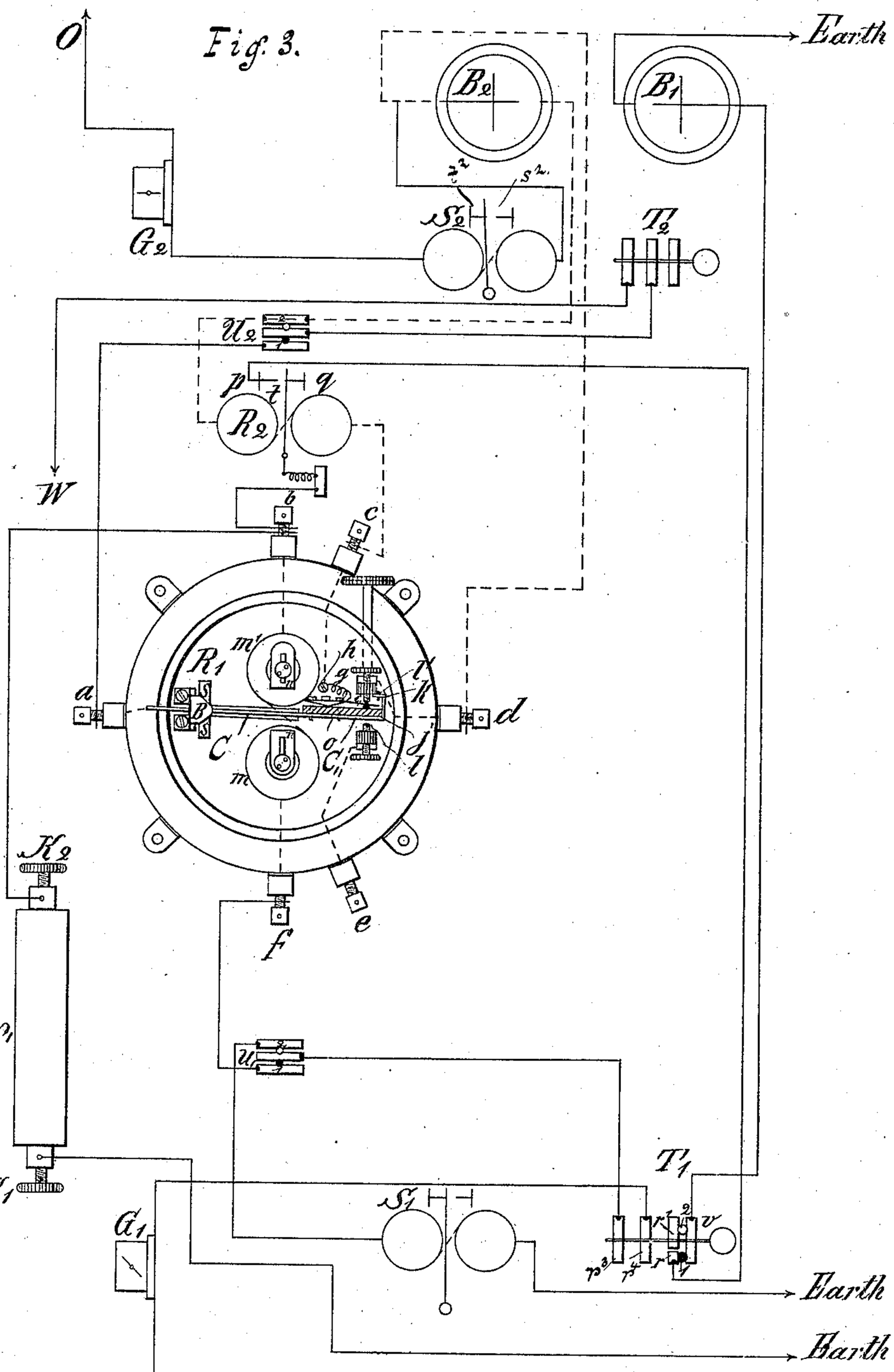
TELEGRAPHIC REPEATER.

No. 311,330. Patented Jan. 27, 1885.

Fig. 3.



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5 Sheets—Sheet 4.

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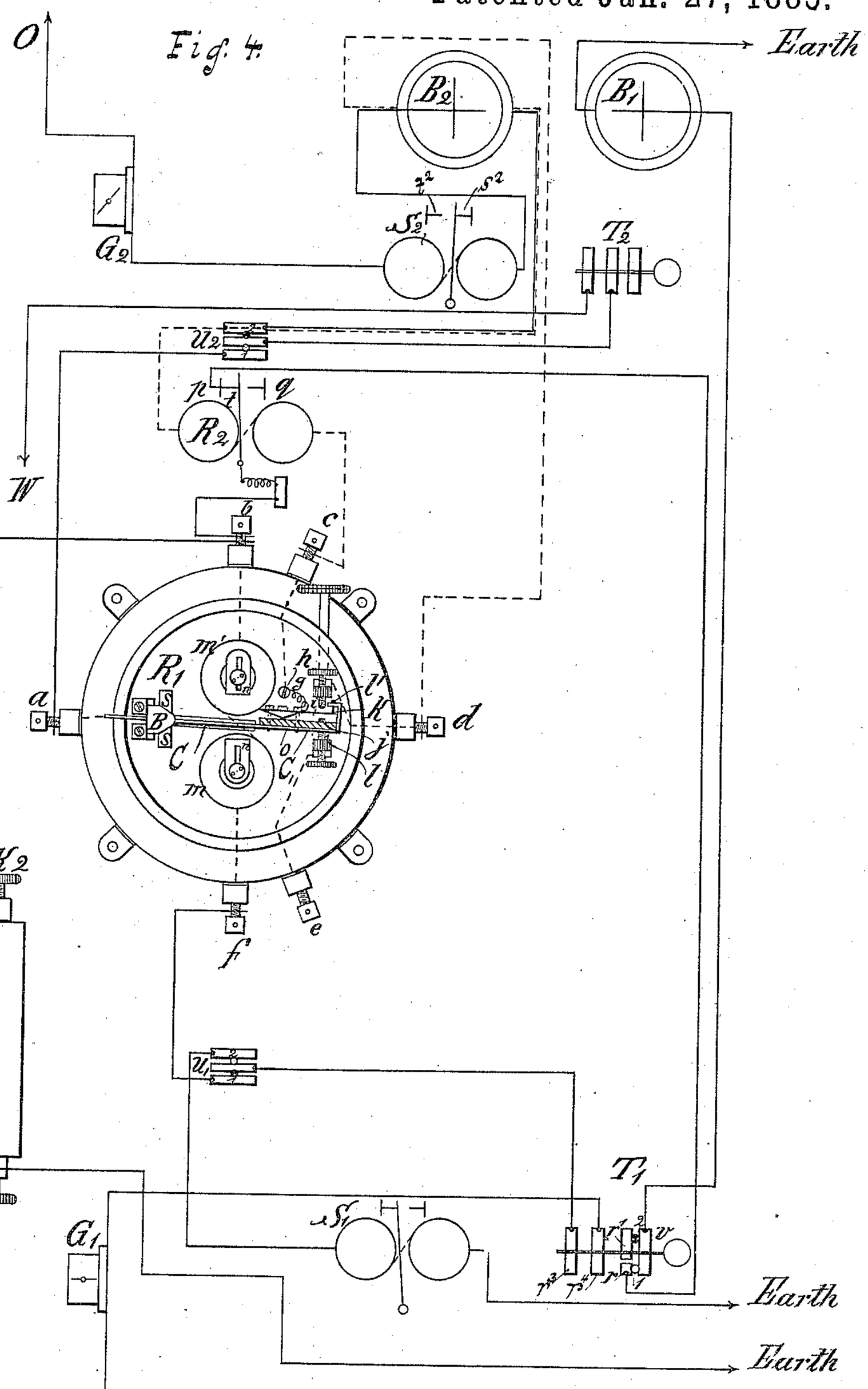
TELEGRAPHIC REPEATER.

No. 311,330. Patented Jan. 27, 1885.

Fig. 4.



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5 Sheets—Sheet 5.

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TELEGRAPHIC REPEATER.

No. 311,330. Patented Jan. 27, 1885.

Armature CC'; Plan View.

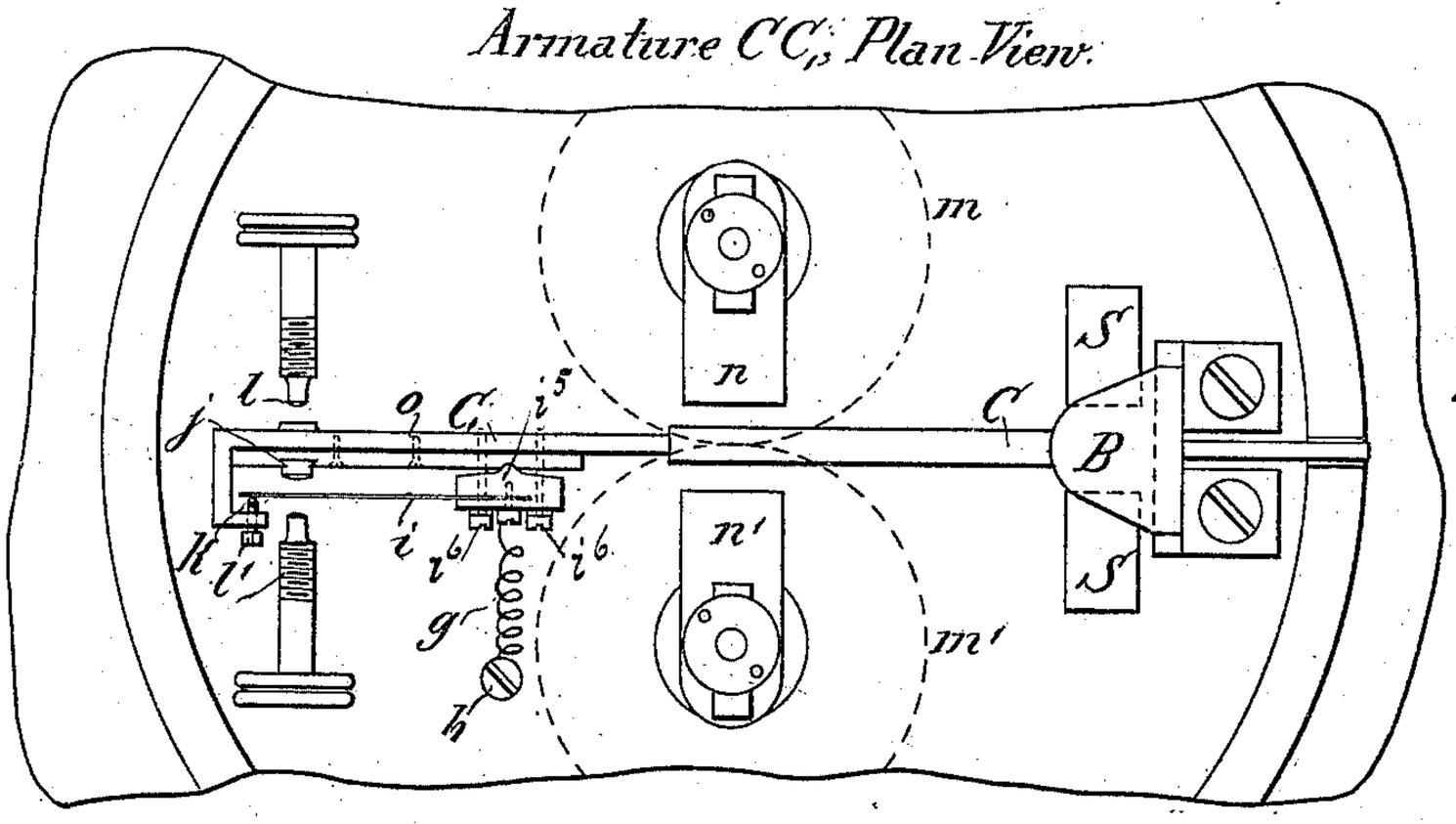
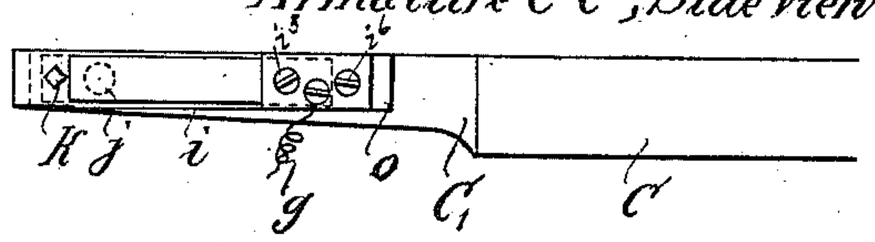


Fig. 5.

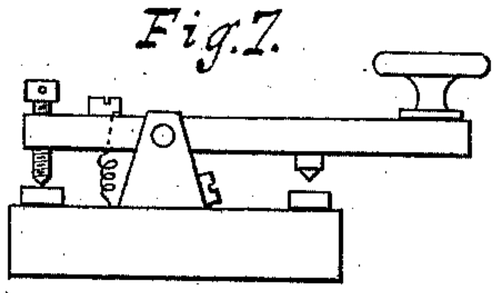
Fig. 6

Armature C'C', Side View.



Finger Key T2.

Fig. 7.



Finger Key T1.

Fig. 8.

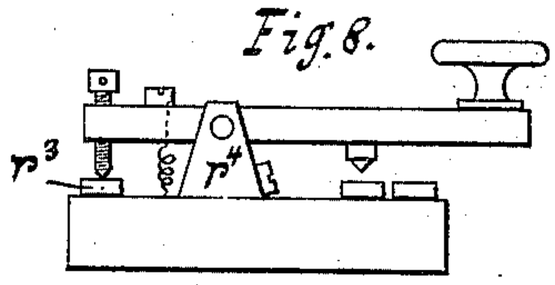


Fig. 9.

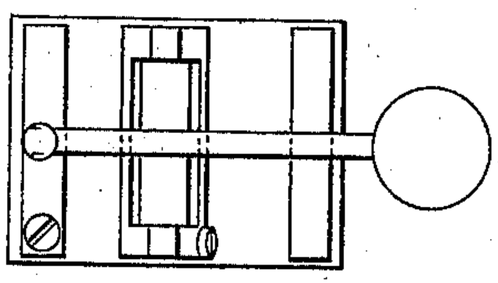
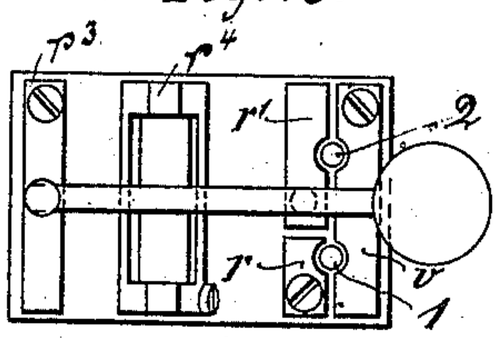


Fig. 10.



Witnesses:
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UNITED STATES PATENT OFFICE.

JOSEPH KÖLZER, OF DUISBURG, PRUSSIA, GERMANY.

TELEGRAPHIC REPEATER.

SPECIFICATION forming part of Letters Patent No. 311,330, dated January 27, 1885.

Application filed March 13, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH KÖLZER, a subject of the King of Prussia, residing at Duisburg, in the Kingdom of Prussia and German Empire, have invented new and useful Improvements in Telegraphic Circuits, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to a telegraphic apparatus whereby messages can be transmitted from a remote station in the main line to a remote station in the branch line, from a remote station in the branch line to a remote station in the main line, and also for sending messages from a station on a branch line to a home or receiving station that has been disconnected from the main line or electrical circuit.

The invention consists in a polarized electro-magnet of a special construction, and an arrangement of circuit-closing or finger keys, commutators, registers, and main-line and branch-line electrical circuits, whereby messages can be transmitted in the manner above briefly indicated, all as will be hereinafter more fully described, and then set forth in the claims.

Figure 1 is a plan view showing the apparatus in the intermediate or home station in its normal position. Fig. 2 is a plan view of the same when a message is to be transmitted from a distant station in the main line to a distant station in the branch line. Fig. 3 is a plan view of the same when a message is to be sent from a distant station of the branch line to a distant station of the main line. Fig. 4 is a plan view of the same when the branch line is to be disconnected from the main line, so that it can be connected with the home station. Fig. 5 is a detached plan view, on a larger scale, of the polarized relay and its armature. Fig. 6 is a side elevation of the same. Figs. 7 and 8 are side elevations of the finger-keys. Figs. 9 and 10 are plan views of the same.

Similar letters indicate corresponding parts.

In the drawings, the letter R designates a polarized relay, the armature C of which is provided with an extension, C′. The extension has a double rectangular inward bend, so as to form a hook, on the end of which is a little projection, *k*, or, in lieu thereof, an adjustable small metal screw. This hook has for its object to limit the rise of the spring *i*, to conduct at the same time the main-line current arriving from O through *i* to C′ C W, and to effect, in connection with the spring *i*, the opening and closing of the main-line circuit O W. The spring *i*, Fig. 5, is secured in a saddle, i^5, which is fastened to the extension C′ of the armature C by two screws, i^6, and which bears against an insulated layer, *o*, secured to the extension C′. This saddle or block i^5 is provided on its inner face with a rib that rests on the insulating-piece *o*, so that it can rock on said rib, as will be readily apparent, thus permitting the saddle and its attached spring to be thrown to or from the relay-lever or the extension C′ thereof. By means of the saddle i^5 and the screws i^6 the spring *i* can be adjusted in relation to the contact *k*. In its position of rest the spring bears against the projection *k* of the hook, so as to form a contact.

On the insulating-layer *o*, in line with the stops *l l′*, is a small projecting button or stud, *j*, which forms a stop for the spring *i*, so that it cannot rub with its entire surface on the insulating-layer *o*.

Near to the extension C′ of the armature, upon the base of the relay R′, is a fine-wire coil, fixed with one end to the spring *i*, and with the other end to the binding-screw *h*. This binding-screw is insulated from the relay and in conducting connection with the binding-screw *c*, which is also insulated from the base of the relay R′. The wire coil *g*, which is almost parallel to the armature of the relay, participates in the movements of the armature without essentially affecting the same.

The operation of the polarized relay is sufficiently known, and more minute description of the same need not be given; only I would state that in regulating the same the adjustable pole-shoes *n n′* are not placed at equal distances from the central position of the polarized armature C C; but the shoe *n*, corresponding to the back stop *l*, is placed nearer than the shoe *n′*. In this case, as long as no current is passing through the helices of the electro-magnets *m m′*, the attraction of the pole *n* for the south-pole armature C overbalances that of the south pole *n′*, in consequence of which the armature C is continuously attracted by the

shoe *n* and bears against the back stop *l*. The spring *i* rests then against the contact *k* and keeps there the main-line circuit closed. In introducing the relay into a main-line circuit the same result will be obtained when the pole-shoes are transposed and the battery-poles changed.

The contact-plate of the finger-keys T′ is made in two sections, *r* and *r′*. (Best seen in Fig. 10.) The section *r* is connected with the front stop, *p*, of the Morse relay R², Figs. 1, 2, 3, 4. On section *r′* is the working-contact, and the key T′ has in addition a battery-plate, *v*.

The connections of the apparatus are as shown in the accompanying drawings. R′ is a polarized relay; R², a Morse relay. S′ and S² are the writing apparatus; U′ U², the two commutators; T′ and T², the finger-keys; G′ G², the galvanoscopes; B′, the local battery connecting with the branch line B². The main battery W′ is a large artificial resistance, the resisting force of which must be greater than the total resistance of the branch-line circuit N. O W is the main line; N, the branch line.

For transmitting messages from the main line O W to the branch line N, and vice versa, the holes 1 are plugged in the commutators U′ U² and the finger-key T′, as is seen in Fig. 1. The course of the current in the main line from the points O to W is now as follows, viz: to the galvanometer G², the writing apparatus S², the battery B², the commutator U², the Morse relay R², and the following parts of the polarized magnet R′, viz: the binding-posts *c* and *h*, the coil *g*, the spring-tongue *i*, the projection *k*, the binding-post *a*, commutator U² over the plugged hole 1, the finger-key T², and from thence to the point W of the main line. When the circuit is established, as above indicated, the armature-levers of the Morse magnet R² and register or writing apparatus S² are attracted by the respective magnets and held against the front stops, *q* and S², as indicated clearly in Fig. 1. The course of the current in the branch line is as follows, viz: from the point N of the wire through the galvanometer G′, the finger-key T, the commutator U′ over the plugged hole 1, the polarized magnet R′, the binding-post *f*, the magnets *m* and *m′*, the binding-post *b*, and from thence to the resistance W′, to the earth. If, now, the main-line circuit O W is broken, by depressing a finger-key, the writing apparatus S² and the Morse relay R² become devitalized, and the armature-lever of the latter falls against the back stop *p*, and the circuit of the battery B′ is closed as follows, viz: One pole of this battery is connected with the earth, causing the current to pass from the other pole to the finger-key T′, through the plugged hole 1, and from thence to the Morse relay R², the back stop *p*, and armature-lever *t* of the latter, and from thence to the polarized magnet R′, the binding-screw *b*, the helices or electro-magnets *m′ m*, the binding-screw *f*, the commutator U′, the plugged hole 1 of the latter, the finger-key T, the contact-plate *r*³, body of the key-plate *r*⁴, the galvanometer G′, and from thence to the branch line N, to actuate the instrument at a distant station. This current must be passed through the helices *m′ m* of the relay R′ in such a direction that in *n′* a south pole is generated, in *n* a north pole, so that the armature is held by *n* and remains resting against contact *l*. The current passing off cannot take its way over the binding-post *b*, resistance W′, and its line-connections to the earth, because it encounters here too large a resistance; but it will take the better way over N with less resistance. If, now, the distant station of the branch line N sends a current into the line of such a direction (see Fig. 3) that in *m′* is generated a north pole and in *m* a south pole, the north-pole magnetism already existing in *n′* will then be increased and the north-pole magnetism existing in *n* suspended, so that now the attraction of *n′* for the armature C predominates. The extension C′ of the armature C throws the spring *i* against the contact *l′*, and closes first the local circuit of the battery B² to relay R², (*l′ d* B² U² R² *c h g i*.) The steel spring *i* being thrown back from the contact *k* breaks the current of the main-line circuit O W. If the current ceases in the circuit N, the armature-lever C′ C falls off. The spring *i* remains in contact with the stop *l′* until it has reached the stop *k* and closes so the main-line circuit O W. Then it leaves the contact *l′*, and the circuit of the local battery B² is opened. The armature-lever *t* of the relay R², during the whole time one is working in the line N, remains on the front stop *q*, whereby a disturbing current cannot enter into the circuit N, because the circuit of the local battery B′ is closed at *l′ i* before the circuit of the main line O W is interrupted. The difficulties which have hitherto made similar transmissions unsuitable for practical use are thus avoided. The system of transmission with the branch-line circuit N is separated from the main-line circuit O W, Fig. 4, when at T′, and at the commutators U² the plug is moved from hole 1 to hole 2. The current of the main-line circuit takes now its way from O through the galvanometer G², the registering or writing apparatus S², the battery B², the commutator U², plugged hole 2, the finger-key T², and the continuation W of the main line. The armature-lever *t* of the Morse relay R² falls off to its back stop *p*, because said relay is now without a current, and a permanent current would enter from battery B′ into the branch line N if at T′ the plug had not been removed from hole 1 to hole 2, whereby the battery B is transferred from the plate of transmission *r* to the contact-plate *r′*. If, now, a station of the branch line N calls, a circuit is closed through the helices *m m′* of the polarized relay R′ from the wire N, through the finger-key T′, the commutator U, plugged hole 1, binding-posts *f b*, and the resistance W′ and its binding-screws K² K′, and the

conducting-wire, to the earth. The local current of the battery B^2 is hereby closed through the connections shown in the dotted lines, and the Morse relay is put in motion, so that it can be heard if stations of the branch line N call stations of the main line O W in order to establish the connections of the two circuits, so that the stations may reach one another. The branch line N is put in connection with the writing apparatus S′, and the two relays R′ and R^2 are cut out, if in the commutator the plug is moved from hole 1 to hole 2. This is done if, for one reason or another, it should be necessary to separate the branch line N from the main line O W and to connect it with a special writing apparatus. The course of the current in the branch circuit N is now as follows, viz: through the galvanometer G′, the finger-key T′, the commutator U′, plugged hole 2, and through the writing apparatus S′, to the earth. The departing current, when the key T′ is pressed down, passes through the battery B′, the finger-key T′, the plugged hole 2, galvanometer G′, and branch line N, the latter having now become independent of the main line O W.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a telegraph apparatus for transmitting messages through a main line and branch line, and vice versa, the combination of a polarized relay having its armature-lever provided with a tongue or extension, C′, a contact, *k*, an insulating-strip, *o*, a block or saddle, i^5, and a spring, *i*, and the yielding conductor *g*, connected with said spring-tongue and binding-post *h*, with the stops *l* and *l′*, line-connections for main and branch electrical circuits, and suitable batteries for the latter, finger-keys T′ T^2, Morse relay R^2, and commutators U′ U^2, all substantially as described.

2. In a telegraph apparatus, the combination of the polarized relay having its armature-lever provided with an extension or tongue, C′, terminating in a contact-point, *k*, a spring, *i*, mounted on the extension of the armature-lever and bearing upon the contact-point *k*, means, substantially as shown, for insulating the spring *i* from the extension C′, and a yielding electrical conductor, *g*, connected with the spring, and a binding-post on the base of the relay with the main and branch electrical circuits, batteries B′ B^2, finger-keys T′ T^2, Morse relay R^2, and commutators U′ U^2, all relatively arranged substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH KÖLZER.

Witnesses:

SAMUEL SPACKMAN,

T. K. PUTMAN.