(No Model.)

S. D. FIELD.

RECEIVING INSTRUMENT FOR QUADRUPLEX TELEGRAPHY.

No. 275,181. Patented Apr. 3, 1883.

Fig 1.

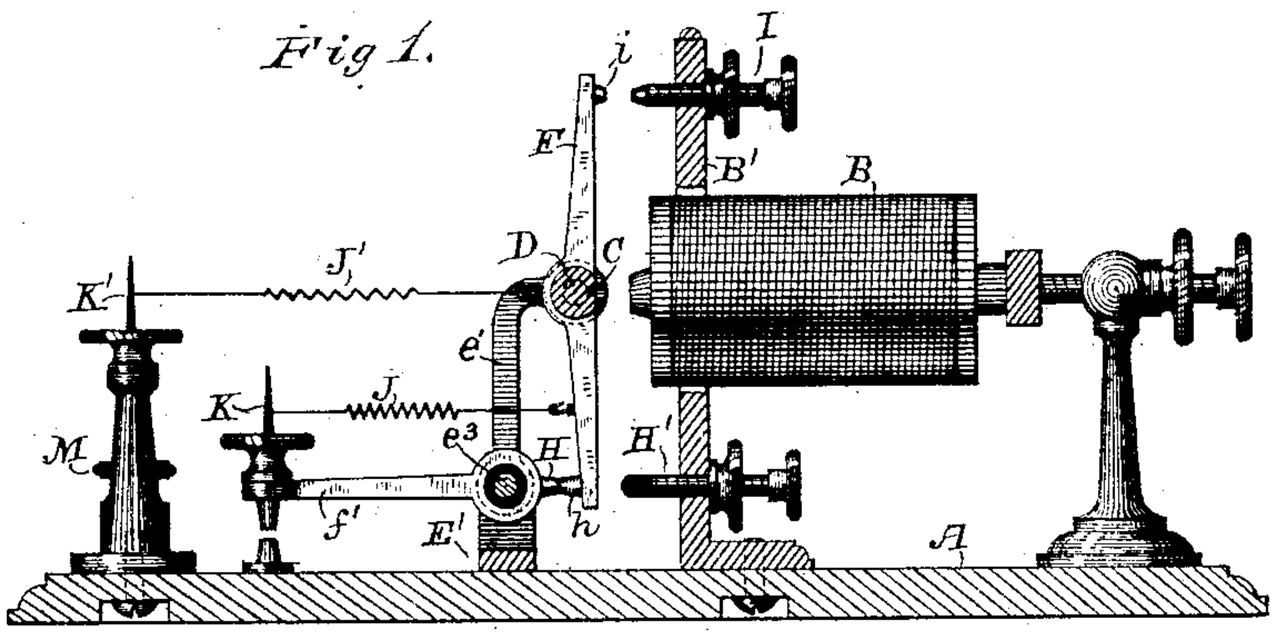


Fig 2.

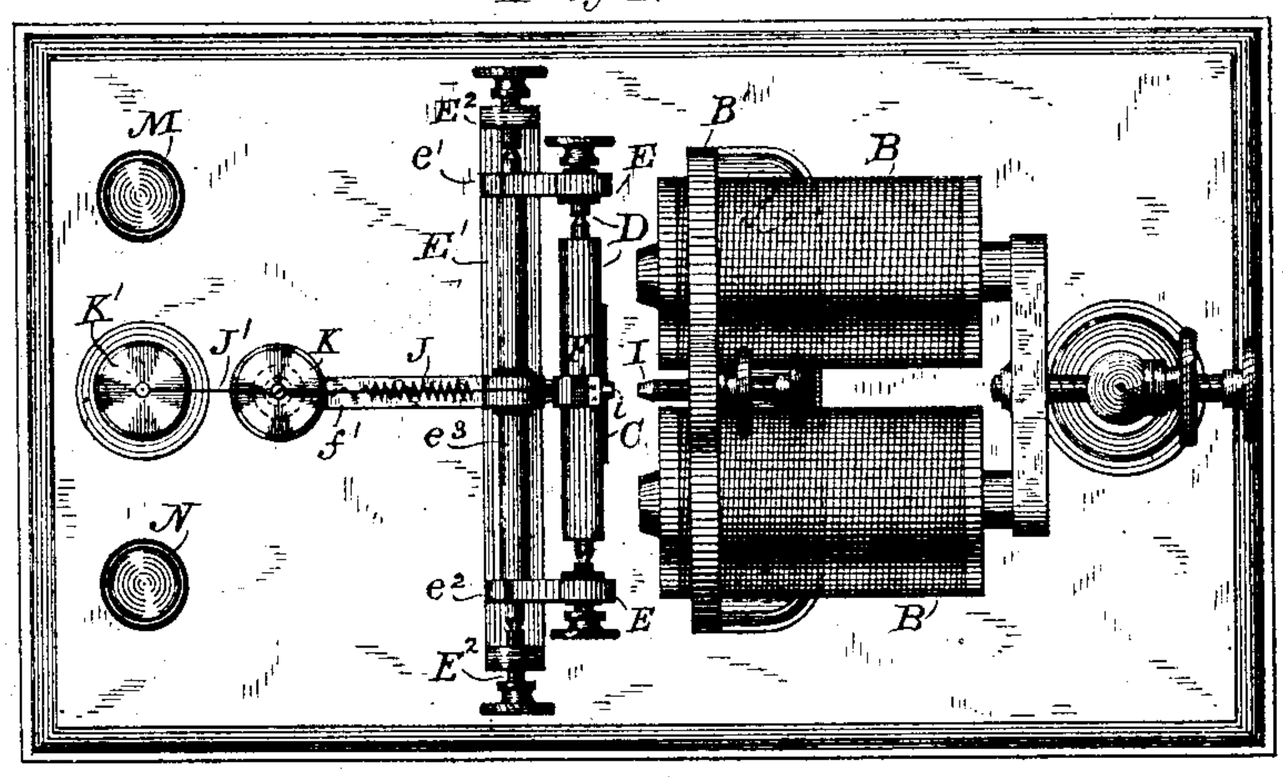


Fig. 3.

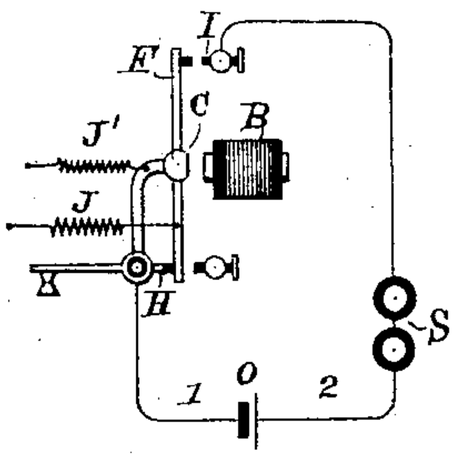


Fig. 4.

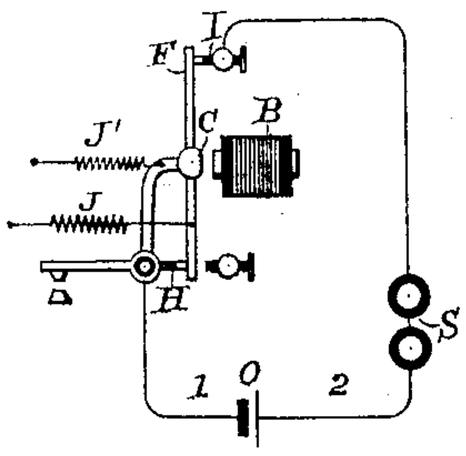
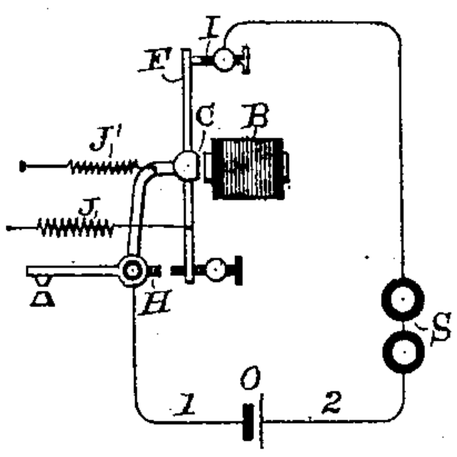


Fig. 5



WITNESSES

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RECEIVING-INSTRUMENT FOR QUADRUPLEX TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 275,181, dated April 3, 1883.

Application filed December 9, 1882. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN D. FIELD, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Receiving-Instruments for Quadruplex Telegraphy, of which the following is a specification.

My invention relates to certain improvements in the apparatus employed in telegraphic systems for receiving two or more independent communications simultaneously transmitted over a single conductor.

The object of the invention is to construct an instrument capable of responding to electric currents having strengths ranging within prescribed limits, but which shall be at the same time irresponsive to currents of a greater strength.

To this end my invention consists in applying to the armature of an electro-magnet a retractile force of constant value, and varying the leverage through which said force acts to withhold the armature from the poles of the magnet.

In carrying out my invention I arrange the various parts of a relay-instrument in the following manner: The armature of the relay-magnet is mounted upon an armature-lever, which is pivoted at or near its center to a yielding or pivoted support. Two contact-stops are placed adjacent to the opposite extremities of the armature-lever, one in front and the other at the back of the same, these being designed to be respectively connected with the opposite poles of a local battery. One of these contact-stops is carried upon the pivoted support of the armature-lever near its axis, while the other one is adjustably mounted upon the frame supporting the electro-magnet or other convenient stationary support. A retractile spring normally holds the armature-lever against its back contact-stop, and the pivoted support is in like manner held in its backward position away from the electro-magnet, thereby maintaining the opposite extremity of the armature-lever apart from the front contact-stop. The retractile spring is so adjusted that electric currents of a given strength will, by traversing the coils of the electro-magnet, induce sufficient magnetism therein to attract the armature forward until the armature-lever rests against its front contact-stop, while the opposite extremity is still retained by the retractile force against its back contact-stop, thereby completing the circuit of the local battery through the armature-lever. A like current, however, having a predetermined increase of strength will cause the armature to be drawn still farther toward the electro-magnet, causing the armature-lever to break its connection with the back contact-stop, thereby interrupting the local circuit.

The details of construction and the operation of the instrument will be more fully explained in connection with the accompanying drawings, in which—

Figure 1 is an elevation, partly in section, of an instrument embodying my invention, and Fig. 2 is a plan view of the same. Figs. 3, 4, and 5 are diagrams representing the instrument in the three different positions which it assumes in the course of its operation, together with its local-circuit connections.

Referring to Figs. 1 and 2, A represents the base of the instrument, upon which is mounted, in the usual manner, an electro-magnet, B. An armature, C, is horizontally placed upon a shaft or trunnion, D, pivoted at its respective ends in a support, E. An arm, F, constituting the armature-lever, is secured at a central point to the trunnion D and extends in both directions at right angles thereto. The support E consists of two vertical arms, e' and e^2, rigidly attached to a longitudinal trunnion, e^3. The trunnion e^3 is adjustably mounted in bearings E^2, carried in a stationary support, E'. Two contact-points, *h* and *i*, are fixed upon the respective extremities of the armature-lever F. The contact-point *h* is normally held against a contact-stop, H, carried upon the trunnion e^3 by the action of a retractile spring, J, attached to the lower arm of the lever F, and extending to an adjusting-spindle, K, carried at the remote extremity of a rearward extension or heel, f', of the support E. The second contact-point, *i*, impinges upon an adjustable contact-stop, I, preferably attached to the supporting-frame B' of the electro-magnet. The contact-point *i* touches the contact-stop I when-

ever the armature C is attracted with sufficient force by the electro-magnet B. At other times it is held apart therefrom by the force exerted by an auxiliary retractile spring, J′, extending from the lever F at a point near its attachment to the transverse trunnion D to a tension-adjusting spindle, K′. An insulated limiting-stop, H′, is placed in front of the lower extremity of the lever F. When the armature is attracted into its extreme forward position the lower extremity of the armature-lever F rests against this stop. Two binding-posts, M and N, are provided for making the necessary local-battery connections with the contact-stops H and I, respectively.

The operation of the instrument will be best understood by reference to the diagrams, Figs. 3, 4, and 5. In these figures I have shown a local battery, O, with its respective poles connected through conductors 1 and 2 with the contact-stops H and I. A sounder, S, or other equivalent translating device is included in the circuit of this battery. Assuming the instrument to be placed in a telegraphic system equipped at the sending-station with devices for transmitting therethrough currents from batteries of twenty-five, fifty, and seventy-five cells at will, and the tensions of the retractile springs J and J′ to be so adjusted that the latter will be overcome by the attractive influence exerted by a current from a battery of twenty-five cells traversing the coils of the electro-magnet B, while both will yield to a like current from seventy-five cells, but not from fifty cells, then the following results will be obtained: The circuit of the local battery O will normally be interrupted at the point I. A current from twenty-five cells will be sufficient to draw the armature C forward until the lever F rests against the contact-stop I. The retractile spring J, however, still retains the lower extremity of the lever F against its contact-stop H, as shown in Fig. 4. The circuit of the local battery O will thereupon be closed through the wire 1, contact-stop H, armature-lever F, contact-stop I, wire 2, and sounder S. The further movement of the armature in that direction is opposed by the force exerted by the retractile springs J and J′ through the lever having the fulcrum at the point I. A current from fifty cells will not be sufficient to overcome the force exerted through this increased leverage and the further movement on the part of the armature and armature-lever in the direction of the electro-magnet is arrested. The circuit of the local battery O will consequently remain closed while the current from the battery of fifty-battery cells traverses the coils of the instrument. The current from seventy-five cells, however, will be sufficient to overcome not only the tension of the spring J′, but also the force exerted by the spring J, and to separate the lower extremity of the armature-lever F from the contact-stop H and carry it against the insulated stop H′. The instrument now assumes the position indicated in Fig. 5. The circuit of the local battery O will therefore be interrupted and the sounder S rendered inactive.

Any suitable well-known system of transmitting devices may be employed for transmitting currents of the necessary strengths from the distant station.

In some instances it is found desirable to dispense with the auxiliary retractile spring J′ and to employ the spring J, both for the purpose of retracting the armature-lever F and the support E. This may be readily accomplished by attaching the remote extremity of the spring J to the stationary support K′ instead of to the support K. The operation will be practically the same in this construction as that already described, with the exception that instead of overcoming the tension of the spring J′ the currents from twenty-five and fifty cells are required to overcome the tension of the spring J sufficiently to allow the lever to be placed in the position shown in the diagram Fig. 4, but not to further actuate the same. This may be readily accomplished by taking advantage of the difference in the leverage through which the spring acts to oppose the further movement of the armature C when the upper extremity of the armature F rests against the stop I.

It will be evident, upon an examination of the figures, that the first movement of the armature lever in response to the magnetization of the electro magnet will be such as to cause the support E to turn upon its trunnion e^3. The leverage through which the spring J acts to oppose this movement will therefore be equal to the distance from the point of its attachment to the armature-lever to the trunnion. Immediately after the contact of the armature-lever F with the stop I, further movement of the armature will involve, in addition to the movement of the support E upon its trunnion, a movement of the armature-lever upon the point *i* as an axis. The leverage through which the spring J acts to oppose this movement is equal to the distance from the point of its attachment to the armature-lever to the point *i*.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, with the helix and core of an electro-magnet, of an independent armature and armature-lever carried upon a yielding supporting-arm.

2. The combination, substantially as hereinbefore set forth, with an electro-magnet and its armature, of an armature-lever, a retractile spring, and a contact-stop against which one extremity of said lever is placed under the influence of a given attractive force exerted upon the armature, and which serves to increase the leverage through which said retractile spring opposes a further movement of said armature.

3. The combination, substantially as hereinbefore set forth, with an electro-magnet and its

armature, of a centrally-pivoted armature-lever, a pivoted arm upon which said lever is supported, and a retractile spring normally withdrawing said arm and lever from the poles of said electro-magnet.

4. The combination, substantially as herein-before set forth, with an electro-magnet and its armature, of an armature-lever centrally pivoted to a pivoted arm, a retractile spring attached to one arm of said lever, a back contact-stop against which the corresponding end of said lever is normally held by said spring, and a front contact-stop against which the opposite end of said armature-lever is caused to impinge under the influence of electro-magnetism of predetermined strength induced in said electro-magnet.

5. The combination, substantially as herein-before set forth, with an electro-magnet and its armature, of an armature-lever centrally pivoted to a pivoted arm, a retractile spring attached to the lower arm of said lever, a back contact-stop against which the corresponding extremity of said lever is normally held through the influence of said retractile spring, and means for producing a separation of said arm from said back contact-stop under the influence of magnetism of predetermined strength induced in said electro-magnet.

6. The combination, substantially as herein-before set forth, with an electro-magnet and its armature, of an armature-lever centrally pivoted to a yielding support, a contact-point against which one arm of said lever is normally held, a second contact-point against which the remaining arm of said lever is brought under the influence of magnetism of a given strength induced in said electro-magnet, and an insulated contact-stop against which the first-named arm is caused to impinge under the influence of a determinate increase in the strength of said magnetism.

7. The combination, substantially as herein-before set forth, with an electro-magnet and its armature, of a pivoted armature-lever, a pivoted supporting-arm, an adjustable retractile spring attached to one arm of said lever, and a second retractile spring attached to said pivoted arm.

In testimony whereof I have hereunto subscribed my name this 6th day of December, A. D. 1882.

STEPHEN D. FIELD.

Witnesses:
MILLER C. EARL,
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