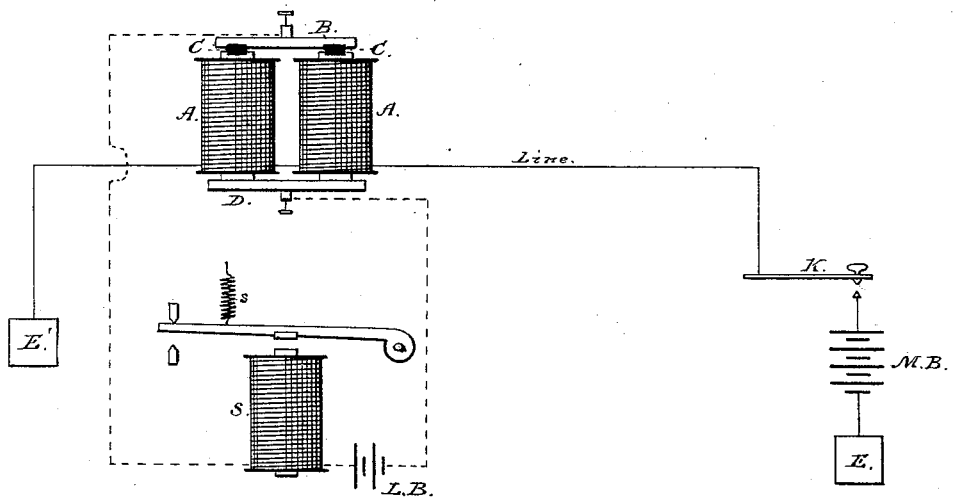
(No Model.)

T. A. EDISON.

TELEGRAPH RELAY.

No. 434,585. Patented Aug. 19, 1890.



Attest:
F. W. Howard
F. C. Hall

Inventor:
T. A. Edison per
Dyer & Miller.
Attys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

TELEGRAPH-RELAY.

SPECIFICATION forming part of Letters Patent No. 434,585, dated August 19, 1890.

Application filed August 9, 1880. Serial No. 15,032. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Telegraph-Relay; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

This invention relates to an improved construction of telegraph-relays, embodying therefore a new principle of operation.

I have discovered that the resistance and, of course conversely, the conductibility of imperfect conductors of electricity—*i. e.*, conductors of relatively high resistance—varies as the intimacy of contact of the particles varies, which latter variation may be produced by pressure; or, in other words, that if a piece of an imperfect conductor be included in an electrical circuit and, other conditions remaining the same, pressure be applied, so as to compress the material, its resistance is lessened and an effect obtained equivalent to strengthening the current. This effect is due to the bringing of the particles into more intimate contact or relation with each other. The same effect is observed, also, when there is interposed in a circuit two metallic conductors provided with roughened contact-surfaces, so that the contact between them is by numerous points. Pressure forces more and more of the points into contact, and thereby lessens the resistance in the circuit.

The object of this invention is to utilize this principle in a telegraph-relay, to the end that a relay simple in construction, easily managed, and regulable shall be produced.

In the drawing is shown a relay embodying my invention in connection with proper main and local circuits and sounding device.

A A are the spools or coils of an ordinary electro-magnet whose cores are connected by the usual yoke D. Upon the outer ends of the cores are placed blocks C C of some material of considerable resistance, upon which is laid the iron or steel bar B, acting as the armature to the electro-magnets. Preferably the ends of the cores and the bars are recessed, as shown, but not sufficiently to permit them to contact, the carbons being placed in the recesses, the carbons, cores, and bar being secured thereby in the proper position. This device is placed in the main-line circuit, (shown in full lines and marked "line,") at one end of which is shown a station, at which are a key K and battery M B, typifying the usual equipment of a sending-station. At the receiving-station is the local circuit, (shown in broken lines) containing the local battery L B and sounder S, one terminal of the circuit being connected to the back yoke D and the other to the bar B of the electro-magnet. The path of the circuit then is from L B through S to B, through the carbons and the cores of the electro-magnet to D, and thence back to L B, the resistance of the carbons weakening to the extent of that resistance the current of L B. The spring *s* is adjusted so that its resilience shall just overcome the magnetic attraction exercised by *s* upon its armature when the current of L B is weakened by the normal resistance of C C—*i. e.*, its resistance when no pressure is put upon it by B being attracted to A or when a pressure is exerted due to a normal charging of the wire which is to be increased when a signal is to be given.

In the drawing the devices are represented as arranged for a line on which a current is to be sent to cause a signal. It is evident then from the foregoing if the key *k* be closed, closing circuit of M B through A A, the bar B will be attracted by A A, compressing the carbons C C and diminishing the resistance in circuit L B, and that thereupon and owing thereto the sounder S will attract its armature.

Instead of C being pieces of carbon, slips or blocks of platinum having roughened faces adjacent to the cores and to the bar could be used, the pressure of the bar causing contact through an increased number of points, and thereby lessening the resistance.

The carbons C might be inclosed in insulating-covers and the local circuit pass directly to and through one, thence by a metallic connection to the other, and thence to battery again. In this case the resistance in the circuit is that of both carbons, and the resistance is diminished twofold by the movement of B. This construction makes a very delicate and effective relay, working reliably under great variations on the line without adjustment,

and one in which all means of adjustment, pivots, or bearings and fixed or adjustable stops are dispensed with, any regulation required due to changes of electrical tension on the line arising from change of condition of battery or from leakage, or from any other causes being made upon the sounder only.

The relay itself may be boxed up and placed away in any part of an office, giving that much more room at the operating-table for other uses.

What I claim is—

1. The combination of an electro-magnet, a magnetic armature, and a conducting material whose resistance is varied by pressure situated between the core of said magnet and said armature and adapted to be compressed by said armature upon its attraction by said magnet, substantially as set forth.

2. The combination of a U-magnet the coils of which are in an electric circuit, a local circuit containing electrical instruments, and a battery, one pole of which is connected to the yoke of the U-magnet, the other pole being connected to the armature, and a variable resistance material between the armature and magnet-poles, substantially as described.

3. The combination of a magnet in a main electric circuit, a local circuit containing an electrical instrument, and a battery, one pole of the battery being connected to the main-magnet core and the other pole being connected to the main-magnet armature, and variable resistance material supported in a socket in the end of the magnet-core, substantially as described.

4. The combination, with a main-line circuit and a magnet therein, of a local circuit, including as a part thereof the main magnet and armature, and a conductor whose resistance is varied by pressure supported between said magnet and armature, substantially as described.

This specification signed and witnessed this 29th day of July, 1880.

THOS. A. EDISON.

Witnesses:

WM. CARMAN,

S. L. GRIFFIN.