No. 650,915. Patented June 5, 1900.

C. E. SCRIBNER & F. R. McBERTY.

RELAY FOR TELEPHONE LINES.

(Application filed Feb. 14, 1898.)

(No Model.)

Fig. 1

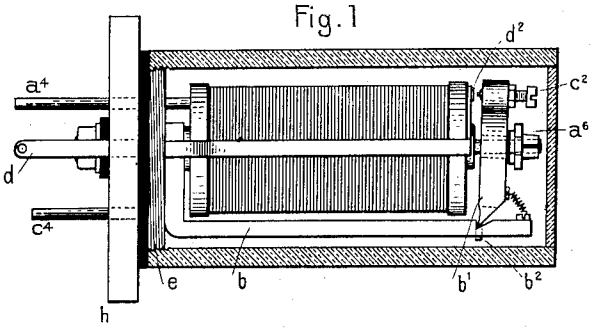


Fig. 2

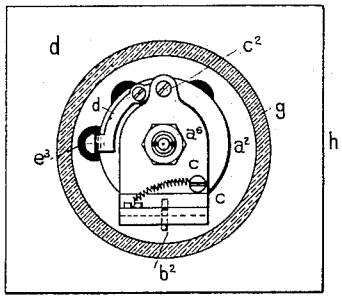


Fig. 3

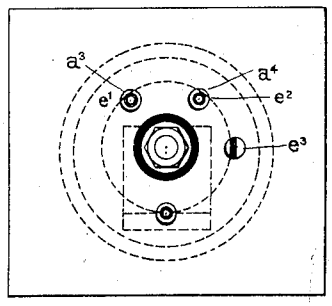
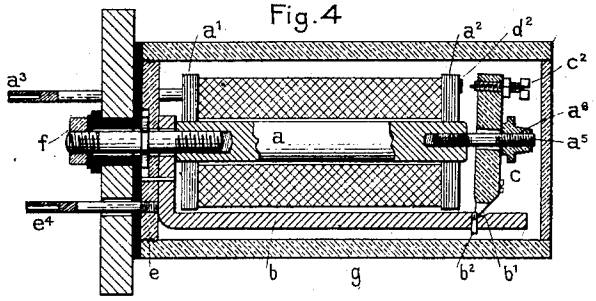


Fig. 4



Witnesses:

C. H. Crawford

Inventors:

Charles E. Scribner and Frank R. McBerty,

by Barton & Brown

their Att'ys

UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, AND FRANK R. McBERTY, OF DOWNER'S GROVE, ILLINOIS, ASSIGNORS TO THE WESTERN ELECTRIC COMPANY, OF CHICAGO, ILLINOIS.

RELAY FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 650,915, dated June 5, 1900.

Application filed February 14, 1898. Serial No. 670,243. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook, and FRANK R. McBERTY, residing at Downer's Grove, in the county of Du Page, State of Illinois, have invented a certain new and useful Improvement in Relays for Telephone-Lines, (Cases Nos. 457 and 464,) of which the following is a full, clear, concise, and exact description.

Our invention relates to the construction of relays for use in telephone-lines or in association therewith to control secondary signals or other appliances in connection with the lines. It consists in details of structure whereby great simplicity and cheapness of construction together with extreme sensitiveness are obtained.

The appliance is illustrated in the attached drawings, of which—

Figure 1 is a side elevation of the relay, its cover, which is designed for protection from dust and as a shield against electromagnetic induction, being shown in section. Fig. 2 is an end elevation of the relay. Fig. 3 is a view of the opposite end of the same. Fig. 4 is a longitudinal central section.

The magnet-spool of the relay consists of a core a, on which two heads a' a^2, of hard rubber or other suitable insulating material, are forced, the space between the heads being wound with wire in the usual way. The terminals of the winding of wire are soldered to terminal extensions a^3 a^4, which are small tubes of metal secured at opposite points in the head a', the extremities of the wire being led through small holes in the head and wound around the terminals. This core is provided with an extended pole-piece b, bent at a right angle and having one limb lying parallel with the core, secured by means of its shorter limb to the core a. The longer limb is provided with a transverse notch b', the vertex of which is approximately in the plane of the free pole of core a. The armature c of the magnet is shaped to an edge at its lower end, which edge rests in the V-shaped channel b'. Lateral movement of the armature is prevented by a small pin b^2, which projects through the pole-piece b at the bottom of the channel and enters a narrow recess in the edge of armature c. The armature is perforated at a point opposite the center of the core a. Through this perforation a stud a^5, of brass or other suitable non-magnetic material, projects freely, being securely screwed into the core. This stud, which is threaded, carries a nut a^6 outside the armature, which serves to limit the movement of armature c. The nut has a short thin sleeve which is slit and compressed upon the stud in order that the nut may move with friction. The armature is reduced in breadth toward its upper extremity, and near its end carries an adjustable contact-screw c^2. This contact-screw is provided with a forward contact-anvil, consisting of a strip d, formed by punching from sheet metal. One end of this strip is led parallel with the core a through suitable openings to the rear of the magnet, where it serves as a soldering terminal for the contact-anvil. A portion of the strip lies against the head a^2 of the magnet and is secured thereto by a screw d'. This strip carries a contact-anvil d^2, preferably of platinum, opposite the contact-screw c^2.

The relay is supported on a disk e. The means for securing the disk, core, and pole-piece together consists of a threaded stud f, passing through openings in the pole-piece b and the disk e and into core a and carrying a nut which when screwed into place binds the core, the pole-piece, and the plate e together. This nut lies in the countersunk opening in the plate e. The stud f extends beyond the nut for a purpose to be presently described. The plate e is provided with openings e', e^2, and e^3, which are bushed with hard rubber or other insulating material, through which pass the terminals a^3, a^4, and d, respectively. The plate also carries a terminal-stud e^4, which is screwed into it and furnishes means for connecting with the frame of the relay. The periphery of the disk e is threaded to engage an interior thread of a tubular cover g for the relay. This is preferably made of copper, closed at the forward end. Its thickness

should be such that the relay when placed in telephonic circuit may be perfectly protected from electromagnetic induction from neighboring circuits, three thirty-seconds of an inch being commonly sufficient for this purpose.

It is customary to mount a number of the relays on a common supporting-plate *h*. For this purpose the stud *f* is passed through an opening in the plate *h* and receives a nut at the outer face of the plate, each relay being preferably insulated from the plate by suitable bushings and washers of hard rubber. The terminals of the relay project freely through openings in the plate *h*.

This relay is designed for connection in telephone-circuits where the magnet of the relay is intended to respond to battery-currents produced in the line during the use of the telephone, the contacts of the relay controlling a local circuit containing a secondary signal or other apparatus. The volume of the battery-current is limited by the carrying capacity of various instruments in the circuit, including the transmitter which it supplies, and in addition to this requirement it is necessary that the impedance of the relay shall be as small as possible. It is thus essential that the relay shall be extremely sensitive while having the minimum ampere-turns in the circuit. The relay herein described is especially sensitive in virtue of the close magnetic contact between the armature and the pole-piece at their bearing-surfaces, the pressure at the contact-surfaces increasing during the excitement of the relay without perceptible increase in the friction between the parts.

It will be noted that this relay can be constructed almost wholly through the exercise of simple and rapid processes, such as turning, punching, and drilling. Thus the heads of the spools, the pole-piece *b*, the plate *e*, the armature *c*, the strap *d*, carrying the contact-anvil, are all formed by punching and bending, together with the openings in them. The edge of armature *c* and the channel in the pole-piece *b* should be milled. The assembly of the appliance is simple and can be quickly and accurately done.

We claim as new and desire to secure by Letters Patent—

1. The combination with the core and the spool thereon, of the flat narrow extended pole-piece parallel with the core, the straight transverse channel therein, the armature placed vertically above the channel formed with an edge resting in the channel, a contact-piece carried by the armature, and a fixed contact therefor whereby a highly-sensitive relay is formed while the contacts are made certain, as described.

2. In combination, the core and the spool thereon, the extended pole-piece parallel with the core, the transverse channel therein, the armature placed vertically above the channel formed with an edge resting in the channel, a recess in the armature, and a projection of the pole-piece entering the recess, whereby lateral movement of the armature is prevented, as described.

3. In combination, the core and the spool thereon, the pole-piece extended parallel with the core having the transverse channel formed in it, the armature formed with an edge resting in the channel, and provided with an adjustable contact-screw c^2, the opposite anvil d^2 carried upon the strip *d*, the armature being perforated, the stud carried by the core projecting freely through the said perforation, and the adjusting-nut on the stud for limiting the play of the armature, as described.

4. The combination with the core of the magnet and the spool thereon, the flat narrow extended pole-piece parallel with the core, and the armature resting on the pole-piece, of the plate *e* carried on the pole-piece of the magnet, and the closed thick tubular envelop of copper carried by the said plate, as described.

5. The combination with a telephone-circuit and a relay having its magnet included in said circuit, of a thick envelop of good conducting non-magnetic material surrounding and inclosing the said relay, substantially as described.

6. The combination with the core and the extended pole-piece thereof, the armature resting on the pole-piece and the contact-point carried by the armature, of the contact-strap *d* having a portion bent at right angles lying against the head of the spool in position to make contact with the said contact-piece of the armature, and having an extended portion lying parallel with the core, the plate *e*, the terminal extension of said contact-strap passing through the bushed opening in the plate and being secured thereby, as described.

In witness whereof we hereunto subscribe our names this 31st day of January, A. D. 1898.

CHARLES E. SCRIBNER.
FRANK R. McBERTY.

Witnesses:
ELLA EDLER,
PEARLE CLENDENING.