

No. 619,240.

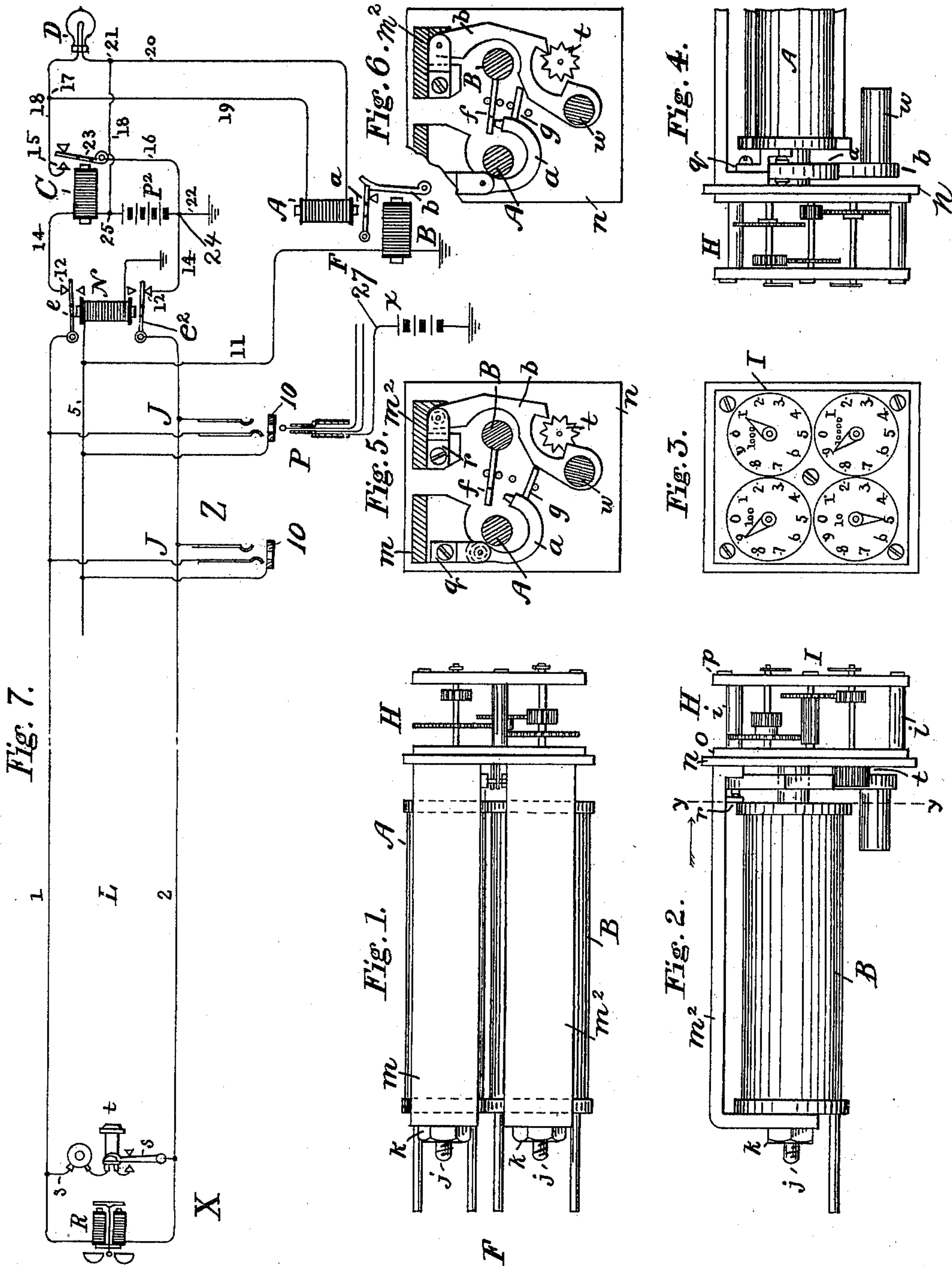
Patented Feb. 7, 1899.

G. K. THOMPSON.

TOLL COUNTER OR REGISTER FOR TELEPHONIC CIRCUITS.

(Application filed June 21, 1898.)

(No Model.)



Attest,
Frank C. Lockwood,
Notary Public

Inventor,
George K. Thompson.

UNITED STATES PATENT OFFICE.

GEORGE K. THOMPSON, OF MALDEN, MASSACHUSETTS, ASSIGNOR TO THE
AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

TOLL COUNTER OR REGISTER FOR TELEPHONIC CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 619,240, dated February 7, 1899.

Application filed June 21, 1898. Serial No. 684,090. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. THOMPSON, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Toll Counters or Registers for Telephone-Circuits, of which the following is a specification.

This invention relates to electric registering devices associated with telephonic circuits and located at the central station, where they terminate, and more particularly to that class of devices which register all of the calls made from a substation to the central station.

The invention is described in connection with the form of central-station switching apparatus known as the "relay-switchboard," at which the substation-circuits are connected with a common signaling-battery, each circuit being provided with a line-signal in a local circuit adapted to be displayed when the substation-telephone is removed from its hook-switch and also with a switching-relay adapted to open the main circuit and withdraw the line-signal when the operator's answering-plug is inserted in the jack of the line-circuit.

The improved registering device consists of two independent electromagnets each provided with an armature, one adapted to rotate the registering mechanism, while the function of the second armature is to hold the first armature and the said mechanism normally locked and under appropriate conditions to unlock the same to permit the registration to take place. The first electromagnet is connected in parallel with the local-circuit line-signal and in a branch of the said circuit and becomes energized and unlocks the armature of the second electromagnet when the said circuit is closed by the act of the calling subscriber in removing his telephone from its hook-switch, and the second electromagnet is in the circuit of the test-conductor or a branch thereof and becomes energized and actuates the counting mechanism when the answering-plug is inserted in the jack of the calling-line. Thus to cause the device to register one unit two movements are required, one by the calling substation and the second by the answering operator.

In the operation of the invention when a subscriber calls the line-signal circuit is closed, the signal displayed, and the armature of the locking-electromagnet attracted to its pole, thus unlocking the counting mechanism, and when the answering-plug is inserted in the line-jack the armature of the second electromagnet is attracted to its pole, and in moving thereto advances a ratchet-wheel, with which a pawl carried by it engages, and causes the device to register one unit. Now when the plug is inserted in the jack the switching-relay is operated and the calling-battery, signal, and the first electromagnet cut off, so that the armature of the latter tends to fall away, lock the armature of the second electromagnet, (were there no provision to forestall such action,) and prevent it from actuating the ratchet-wheel. To prevent this falling away of the locking-armature, its electromagnet is made more sluggish than the registering-electromagnet, and the pole of the latter electromagnet is provided with a prolongation extending toward the vicinity of the locking-armature in its attracted position, and as the locking-electromagnet is demagnetized simultaneously with the magnetization of the registering-electromagnet when the answering-plug is inserted in the line-jack the locking-armature is held attracted to the said prolongation of the registering-armature and does not fall off and lock the latter armature.

The invention relates also to matters of detail which will be amplified in the following description.

Figure 1 of the drawings is a top view of the registering device. Fig. 2 is a side view. Fig. 3 is a front end view. Fig. 4 is an opposite side view, and Figs. 5 and 6 are sections on line *y y*, looking in the direction of the arrow. Fig. 7 is a diagram of a substation relay-circuit and of the registering device to show the operation of the same.

Referring to the drawings, F represents the registering device as a whole, and it consists of the electromagnets A and B, each secured to iron bars *m* by the screws *j*, extending from the cores upon which are fitted the nuts *k*. The bars *m* extend beyond the opposite ends

of the electromagnets A B and are secured to the square brass plate *n*, in which the prolonged poles of the electromagnets rest.

The armature *a* of the electromagnet A is in the shape of a curved arm and is pivoted between the plate *n* and the brace *g*, which is secured to the end of the bar *m*, being, moreover, so hung as to fall away from the pole of the electromagnet by gravity and bearing upon the side of its outer end a locking-pin *g*. The electromagnet A and its armature *a* constitute the locking feature of the device.

The armature *b* of the electromagnet B is pivoted below the bar *m* between the plate *n* and the brace *r*, which is secured to the end of the said bar. It bends around the core of the said electromagnet, and its free end is formed into an escapement or pawl for the ratchet-wheel *t*. A soft-iron prolongation *f* extends from the side of the pole of the electromagnet B toward the end of the armature *a*.

Fig. 5 shows the normal position of the armatures *a* and *b* fallen away from the cores of their electromagnets, the pin *g* of the former armature resting against the straight side of the latter armature and locking it or preventing it from engaging the ratchet-wheel *t*. The armature *b* has a weight *w* at its end to give it sufficient inertia to actuate the ratchet when it falls away by gravity.

H is the counting or registering mechanism, consisting of the square brass plates *o* and *p*, secured to each other by the pillars *i i*, one at each corner. Several spindles extend between the two plates, carrying pinions and spur-wheels which mesh with one another, one of said spindles extending through the plates *o* and *n* and bearing on its end the ratchet-wheel *t*, and four of said spindles extend through the center of four dials upon the face of the front plate *p* and are provided on their ends with rotating pointers.

Fig. 7 illustrates the operation of the registering device with a relay-circuit L extending from a substation X to a central station Z. 1 and 2 are the conductors connecting with armatures *e e*² of the switching-relay N, which normally rest upon their back contacts 12. 14 is a wire connecting the contacts 12 12 and including in circuit relay C and battery P² and is provided with a grounded branch 22. 18 is a local circuit connecting contact 15 with wire 14 at point 25 and including in circuit the line lamp-signal D. A wire 16 connects armature 23 with wire 14 at point 24. 5 is a test-wire connecting with the test-rings 10 in each jack and extending to ground through the relay N. The electromagnet A of the registering device is connected in parallel with the local lamp-circuit 18, and the wire 19 extends from one coil-terminal to the point 17 on the wire 18 and from the other by the wire 20 to the wire 18 at the point 21. P represents the answering-plug of a cord-circuit, from whose test-ring contact extends the grounded wire 27, which includes the battery *x*. The electromagnet B is shown as included in the ground-

ed wire 11, which is connected to the test-wire 5, but may be in series with said test-wire. The register mechanism H is not shown in this diagram, but its operation will be readily understood from the other figures. When a subscriber removes the telephone *t* from the hook-switch *s* to make a call, the latter rises automatically and closes a low-resistance bridge 3 around the bell R, the relay C becomes magnetized, and its armature is attracted and closes the local circuit 18, thereby lighting the line lamp-signal D as current circulates therein from the battery P², all in a manner well understood. At the same time the local circuit 18 is closed the electromagnet A in the parallel circuit becomes magnetized and attracts the armature *a*, thereby unlocking the armature *b* of the electromagnet B. The operator to answer the call inserts the answering-plug P in the jack J, and current from battery *x* circulates through relay N and causes its armature *e e*² to be attracted to the cores of the relay N, thereby opening the line-circuit and demagnetizing the relay C and extinguishing the signal D in a manner well known in the art. At the same time, however, the electromagnet A loses its magnetism and ceases to attract its armature. Current from battery *x* also flows from the test-conductor 5 into the branch 11 to ground and energizes the electromagnet B, causing its armature to be attracted and to rotate the ratchet-wheel one tooth and the lower left-hand pointer one space or unit. As the electromagnet B is magnetized by current from battery *x* at the same time that the sluggish electromagnet A is demagnetized by reason of the battery P² being cut off, the armature *a* has not time to fall away and lock the armature *b* before it is attracted by the prolongation *f* of the pole B and retained in its upward position. Therefore the said armature *b* makes its full movement and operates the registering mechanism.

Having explained my invention, I claim—

1. In a telephone-call-signal-registering apparatus, the combination of two electromagnets one of which is provided with an armature carrying or adapted to operate a pawl or escapement, the second being relatively sluggish in operation and having an armature adapted to lock the first armature while both armatures are in their unattracted position; with a counting mechanism provided with a ratchet-wheel arranged to be rotated by said pawl or escapement, and one or more dials with pointers impelled by the said ratchet-wheel, as set forth.

2. In a registering apparatus the combination of two straight electromagnets one being relatively sluggish in operation both having armatures pivoted to swing at a right angle to the poles thereof and to hang away therefrom by gravity, the one having a projection adapted to lie in the path of the second and lock the same when so retracted and the latter terminating in a pawl or escapement; with

a counter mechanism provided with a ratchet-wheel, as set forth.

3. The combination of a telephone-substation relay-circuit; with a call-registering apparatus, consisting of two electromagnets, the first of which is in the circuit of the test-conductor or a branch thereof of said circuit, and the second being in a normally open local circuit of the said relay-circuit, the armature of the first electromagnet adapted to operate a pawl or escapement, and the armature of the second electromagnet operating to lock the said first armature when both are unattracted, and a counter provided with a ratchet-wheel adapted to be operated by said pawl or escape-

ment, and with one or more pointers and dials; whereby when the substation-telephone is removed from its hook-switch the registering-armature is unlocked and when an answering-plug is inserted in a jack of the relay-circuit the counter is operated, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 16th day of June, 1898.

GEORGE K. THOMPSON.

Witnesses:

GEO. WILLIS PIERCE,
JOSEPH A. GATELY.