(No Model.)

F. VAN RYSSELBERGHE.

MEANS FOR PREVENTING INDUCTION IN TELEPHONE AND TELEGRAPH LINES.

No. 321,404. Patented June 30 1885.

Fig. 1.

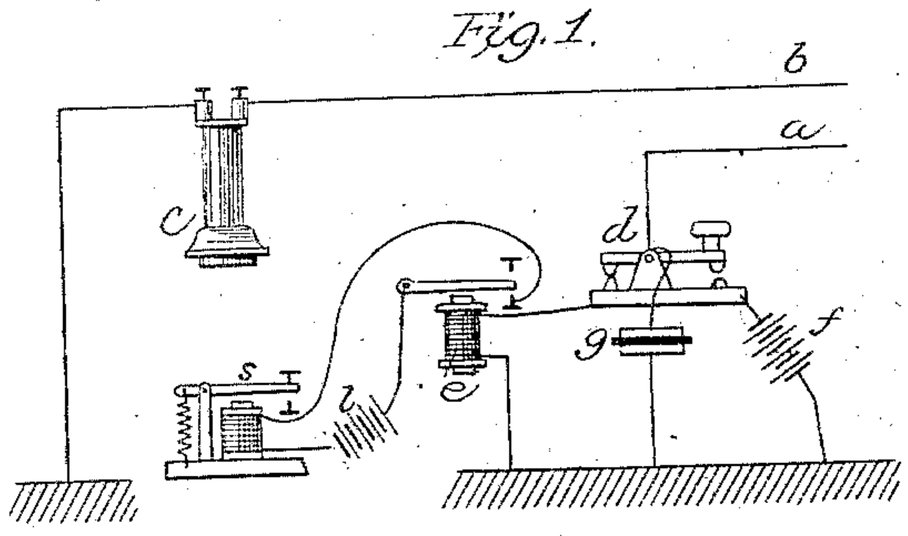


Fig. 2.

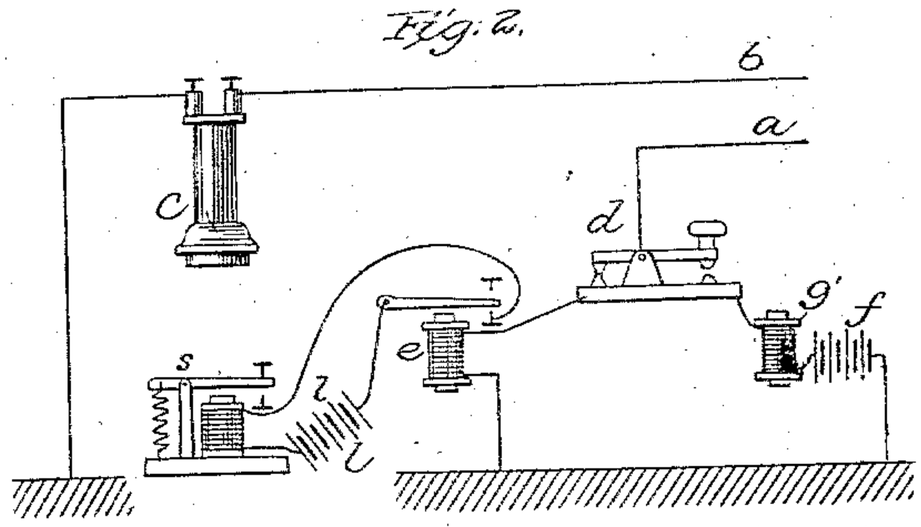


Fig. 3.

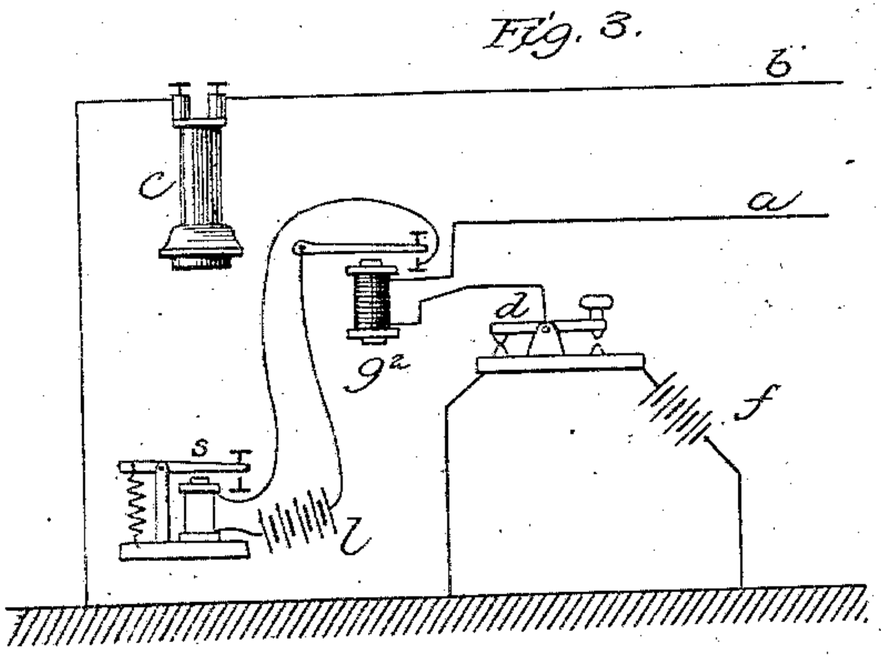
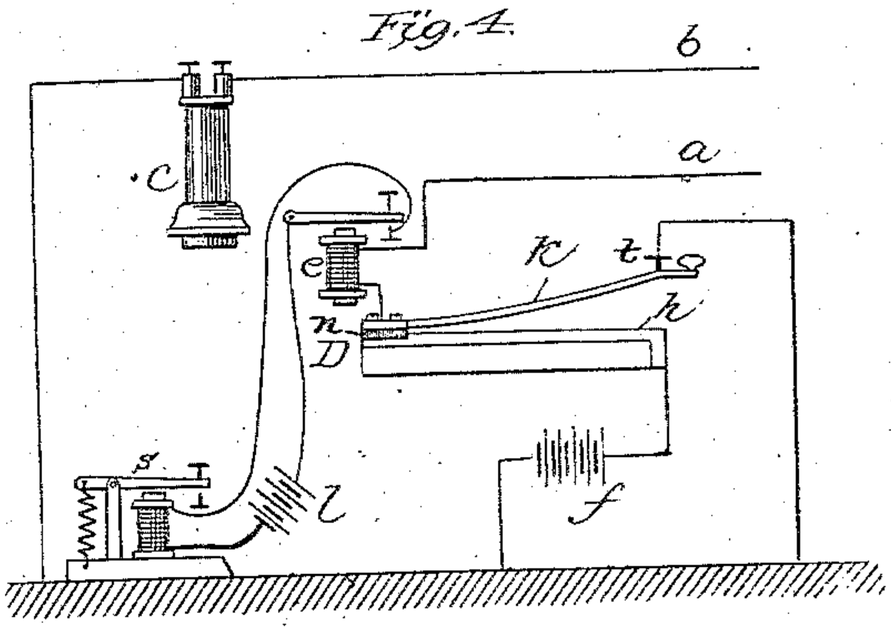


Fig. 4.



Attest:
Walter Donaldson
F. L. Middleton

Inventor
F. Van Ryssellberghe
by
Ellis Spear
Atty's.

UNITED STATES PATENT OFFICE.

FRANÇOIS VAN RYSSELBERGHE, OF SCHAERBEEK, BELGIUM.

MEANS FOR PREVENTING INDUCTION IN TELEPHONE AND TELEGRAPH LINES.

SPECIFICATION forming part of Letters Patent No. 321,404, dated June 30, 1885.

Application filed April 29, 1882. (No model.) Patented in Belgium February 20, 1882, No. 57,121; in France February 26, 1882, No. 147,515; in England March 17, 1882, No. 1,303; in Italy March 29, 1882; in Germany June 17, 1882, No. 21,451; in Austria July 9, 1882; in Canada August 17, 1882, No. 15,333; in Luxemburg December 8, 1883; in Portugal January 18, 1884; in India January 29, 1884; in Sweden February 12, 1884; in Spain April 23, 1884; in Denmark June 18, 1884; in Brazil July 5, 1884; in Argentine Republic July 19, 1884, and in Uruguay December 12, 1884.

To all whom it may concern:

Be it known that I, FRANÇOIS VAN RYSSELBERGHE, a subject of the King of the Belgians, residing at Schaerbeek, in the Kingdom of Belgium, have invented a new and useful Improvement in the Method of and Apparatus for Preventing Induction in Telegraphic and Telephonic Systems, of which the following is a specification.

The same invention has been patented to me in Belgium February 20, 1882, No. 57,121; France, February 26, 1882, No. 147,515; Great Britain, March 17, 1882, No. 1,303; Italy, March 29, 1882; Germany, June 17, 1882, No. 21,451; Austria, July 9, 1882; Canada, August 17, 1882, No. 15,333; Luxemburg, December 8, 1883; Portugal, January 18, 1884; India, January 29, 1884; Sweden, February 12, 1884; Spain, April 23, 1884; Denmark, June 18, 1884; Brazil, July 5, 1884; Argentine Republic, July 19, 1884, and Uruguay, December 12, 1884.

My invention relates to combined telegraphic and telephonic systems in which the wires used for telegraphy and those used for telephony are arranged within inductive distance of each other, the object of my improvement being to prevent the strong electric currents used in telegraphy from inducing upon the telephone-wires induced currents of a character to interfere with telephonic communication.

It is well known that when telegraph and telephone wires are supported on the same poles or posts, are in the same cable, cross each other, or are otherwise in inductive relation to each other, it has hitherto been extremely difficult and often impossible to use the telephone-wires for their intended purpose, the difficulty arising from the fact that the strong telegraphic currents induce upon the telephone-wires currents which operate the telephonic receiving-instruments independently of the telephone-currents, (which are comparatively very feeble,) and cause such instruments to emit harsh, rattling sounds, which mix with, confuse, and frequently render indistinguishable the telephonic communications.

My invention is based upon my discovery that currents induced by telegraphy upon telephone-wires are hurtful to telephony in proportion to their abruptness—the more abrupt the more hurtful. Induced currents correspond in abruptness to the primary currents which cause them, and, therefore, in combined systems only gradual currents should be used in telegraphic transmission—that is to say, currents which during their emission increase gradually and during their extinction diminish gradually in strength—and when such gradual primary telegraphic currents are used I have found that the resulting induced currents on telephones will, in passing through telephonic receivers, cause the diaphragms or sound-producing vibrators of such receivers to simply inflect without vibrating in a manner to produce sound.

In order to practically utilize my discovery I employ, in connection with the telegraphic transmitting-instruments, certain devices which I call "current-graduators," or I so construct the transmitting-instruments that they will, when manipulated, throw upon the line impulses which increase and decrease gradually in strength. The current-graduating devices may be of various forms, some of which are illustrated in the accompanying drawings, from which and the following particular description and explanation the invention may be fully understood.

Figure 1 is a diagram illustrating the use of a condenser as a current-graduator in connection with a transmitting-key in a telegraph-circuit of a mixed telegraph and telephone system. Figs. 2 and 3 are similar diagrams showing electro-magnets used as current-graduators. Fig. 4 is another diagram showing a transmitting-key constructed to graduate the impulses it sends.

Referring to Fig. 1, the letter *b* indicates a conventional representation of a telephone line-wire, including a telephonic receiver, *c*, and arranged adjacent to a telegraph line-wire, which is indicated by *a*. The telegraph-wire is connected in the usual manner to a transmitting-key, *d*, one of the contacts or anvil of which is connected to one pole of a main battery, *f*, the other pole of which is connected to ground.

The letter *e* indicates a relay connected with the other contact of the key in the ordinary manner, and arranged to make and break the circuit of a local battery, *l*, which includes a sounder, *s*, or other telegraphic receiving-instrument. When the key is depressed, it connects the main battery directly to the line, and at the same time breaks the connection between the line and the relay *e*.

The letter *g* indicates a condenser which serves as a current-graduator. It has one side connected directly to the key and the other to the earth. When the key is first depressed for rendering a telegraphic impulse upon the line, the main portion of the battery-current is diverted from the line to charge the condenser, and as the charging is gradual the full force of the battery-current is not felt immediately upon the line, but reaches its maximum only when the condenser is fully charged. When the key rises and the battery is disconnected, the condenser begins immediately to discharge upon the line, and as its discharge rapidly weakens a gradual fall of potential occurs in the line, instead of an abrupt "break," the effect of induction upon the telephone-line being harmless, as hereinbefore pointed out. I have found that a condenser of ten microfarads capacity will ordinarily be sufficient.

In Fig. 2 the current-regulator is lettered *g'*, and in this case is an electro-magnet. It has one coil-terminal connected to the anvil of the key and the other to one pole of the main battery *f*. the other pole of which is to ground. The other parts are arranged as in Fig. 1. An electro-magnet having a core fifteen millimeters in diameter and fifty millimeters in length, and of which the resistance is one hundred ohms, is suitable to serve as a "current-graduator." In the first moment after depression of the key a portion of the current is absorbed in magnetizing the core of the magnet, and consequently the flow into line is by so much the less, and the full flow is not experienced until this magnetization is complete. On the other hand, when the key cuts out the battery the core, in losing its magnetism, sets up a current in its coils which, passing into the line-wire, prevents the fall of potential being so rapid as it otherwise would be.

Fig. 3 shows a like arrangement to Fig. 2, but the electro-magnet serving as the current-graduator differently placed. It is indicated by g^2, and in this case serves also the usual function of the electro-magnet in a relay. The relay, however, is connected differently from the usual way, having one coil-terminal directly to line and the other to the key, the back-stop of which is connected directly to earth. The graduating action of the magnet is the same as in Fig. 2.

In Fig. 4 the transmitting-key D is of peculiar construction, being arranged to produce graduation of the impulses by putting in and taking out of the line a variable resistance. The letter *h* indicates a plate of some material having a low conductivity. It is at one end connected with the main battery, and through it to ground. On its other end, but insulated therefrom by a thin plate, *n*, of non-conducting material, is mounted a curved metallic spring, *k*, curving away from the plate *h*, and bearing against a metallic stop, *t*, which is connected to ground. The other end of the spring is connected to one terminal of the ordinary relay, *e*, which has its other terminal connected to line. The spring serves as a finger-key. When it is against the stop *t*, it connects the line to ground. When it is depressed, it will come in contact with plate *h*, first near its fixed end, and gradually through nearly its whole length. At first the battery-current is resisted by nearly the whole length of plate *h*. As the depression of the key continues the point of contact between the spring and plate *h* approaches nearer and nearer to the battery-connection at the end of said plate, and consequently the current experiences less and less resistance to its passage. As the key rises the resistance increases progressively until the circuit is actually broken.

Having now fully explained the principle of my invention, and described the means for carrying it into practice, I claim—

1. In a combined system of telephony and telegraphy, the combination, with telephonic line-wires and included telephonic receivers, of telegraphic wires, including telegraphic transmitters, and a condenser, or the equivalent thereof, for causing the impulses thrown on the line by said transmitters to increase and decrease gradually in strength, essentially as set forth.

2. The combination, with a telephonic line-wire, of an inductively-adjacent telegraph-wire equipped with make-and-break telegraphic transmitters and a condenser or its equivalent, as described, for causing the telegraphic impulses to increase in strength gradually from a make and diminish in strength gradually from a break, for the purpose set forth.

3. The combination, with a telegraphic line-wire equipped with make-and-break transmitters and arranged inductively adjacent to a telephone-wire, of current-graduating devices, such as a condenser or its equivalent, arranged to cause the telegraphic impulses to increase in strength gradually from makes and to diminish gradually from breaks, for the purpose set forth.

4. The combination, with a telegraph line-wire, a normally-open key connected therewith, and a main battery connected with the circuit-closing contact of the key, of a condenser or its equivalent included in a derivation from the line, substantially as and for the purpose set forth.

FRANÇOIS VAN RYSSELBERGHE.

Witnesses:
C. PRAU.
F. CLEIRENS.