(No Model.)

I. KITSEE.

TELEGRAPHY.

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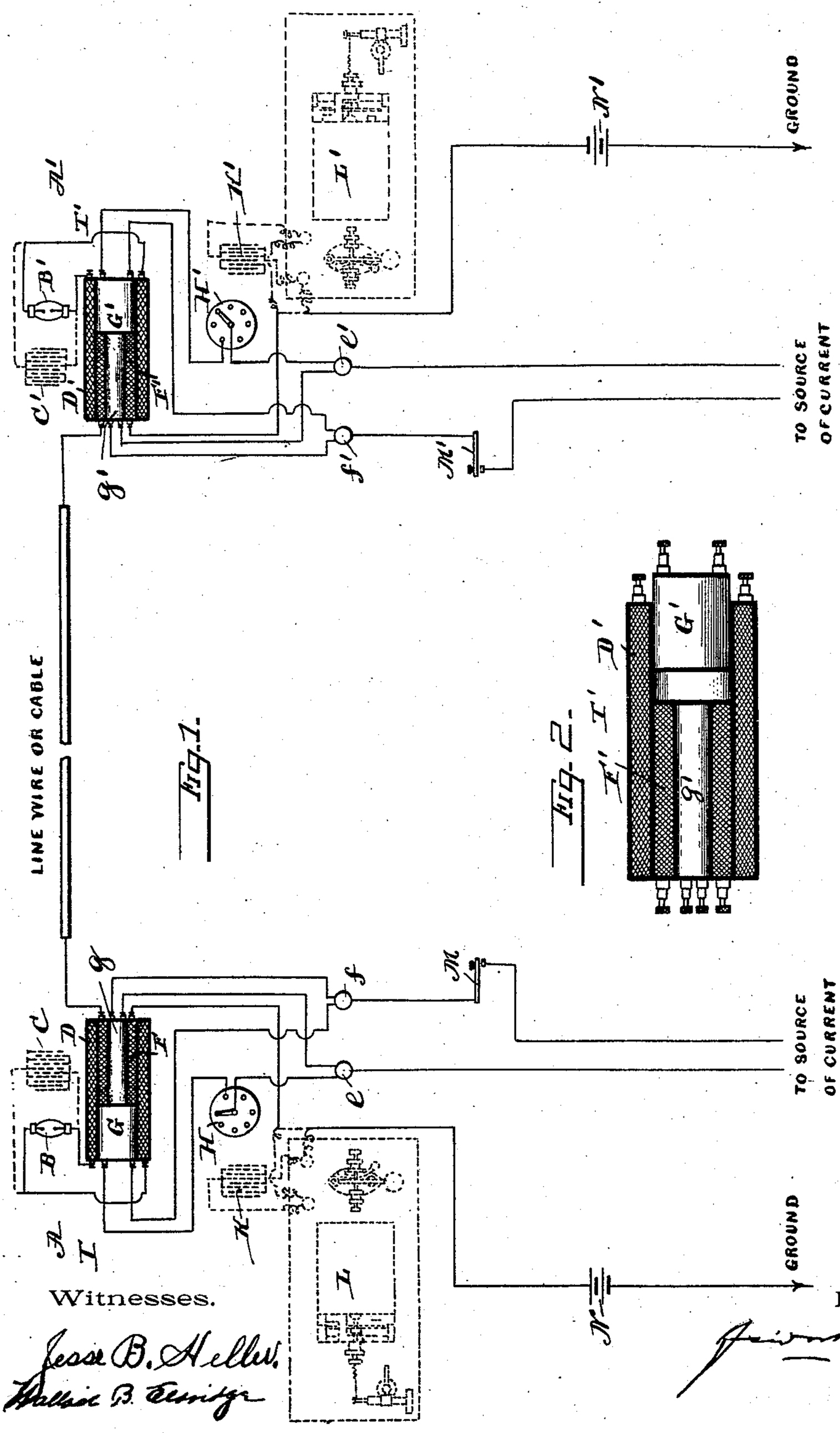

Fig. 1.

Fig. 2.

Witnesses.

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To all whom it may concern:

Be it known that I, ISIDOR KITSEE, of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Electric Telegraphy, of which the following is a specification.

My invention relates to electric telegraphy, and more especially to telegraphy with rapidly recurring or alternating impulses.

The object of my invention is to duplex a telegraphic system in which transmitted impulses are induced or rapidly recurring or alternating.

Referring to the drawings, Figure 1 is a diagram of a telegraphic system embodying my invention. Fig. 2 is a section of the coils I preferably employ as sending instruments, one of the primaries of said coils being partially drawn out.

In Fig. 1, A and A′ are two stations, each being equipped with similar instruments, similar parts of the station A′ being designated by similar letters as station A, with the exception that such parts are also designated by the numeral 1. B is a vacuum-tube to be used as a receiver, which vacuum-tube can be displaced by the condenser C. T is the sending instrument, consisting of the two primary coils G and *g*, which primaries are locally connected through the binding-posts *e* and *f*, with the interposition of the key M, to the source of current, (not shown,) which source of current should be a rapidly recurring or alternating one. In the circuit of the coil G is inserted a rheostat H. Around the coil *g* is wound a coil F, which is connected in series to the line-wire. D represents a tertiary coil which completely surrounds the coils G *g* when they are inserted to their full extent. The receiving instrument or instruments are included in closed circuit with this tertiary coil. I have also illustrated in this figure in dotted lines one of the sending and receiving instruments now in use, for the purpose of demonstrating that my invention may be used either alone or in conjunction with the usual electromagnetic receiving devices, it being obvious that other instruments or sets of instruments or other necessary appliances may be added or substituted for the one illustrated.

I will first describe the *modus operandi* for sending messages.

At the sending-station the operator connects coil *g* through his sending-key with the source of electricity. With the aid of this key he sends through the primary coil *g* currents of electricity. These impulses in *g*, which are recurring or alternating, induce impulses in F corresponding in time to the time of the flow of impulses in *g*. It will be understood that the operator in closing and opening the key once does not send a single impulse only through *g*, but a series of such impulses, the flow time of which corresponds with the closing time of the key, a dot with its short closing time sending impulses through *g* for a shorter period than a dash with its longer closing time. As far, therefore, as the operator is concerned he has to manipulate the key as if the current-flow were straight and not an interrupted or alternating one. These recurring or alternating impulses in *g* induce alternating impulses in F. These impulses travel over the line-wire or cable and through the coil F′, inserted in the line at the receiving-station. We therefore have as a result of the sending of a message traveling over the line rapidly-alternating impulses of such short duration that the other sending or receiving instruments, depending, as they do, on the movement of the armature of an electromagnetic device, cannot respond and remain practically unaffected by the flow of these impulses. As around each of the coils F—sending as well as receiving station—the tertiary coil D is wound, it follows that the alternating impulses traveling through F will induce alternating impulses in D, and as the coils are wound to the necessary high potential the generated tertiary impulses will, if the terminals of the coil are connected to a vacuum-tube or device similar in its action, produce in said tube or similar device a glow corresponding in time to the time of the electric impulses generated through induction—shorter glow time for dot and longer glow time for dash—and if the terminals are connected to a condenser then the impulses will produce in the same for each one transmitted sign one continuous whistling sound, a longer one for a dash, a shorter one for a dot.

I have so far not taken into consideration the office and function of the primary coil G, and if this system is used only as a simplex

one then the addition of this coil is not necessary, but, as set forth above, the object of this my invention is to contraplex such method of telegraphy, and the first conditions to be fulfilled in practically carrying out the method of simultaneous transmission in opposite directions are, first, that the receiving instrument at the home station shall remain entirely unaffected by the movements of the transmitting-key at that station, while at the same time it shall remain free to respond to the currents transmitted by the key at the distant station; second, if this induced system shall be used in conjunction with the usual receiving and sending instruments, which are liable to be opened just at the time of transmission with induced currents, that the same currents shall always be provided with an uninterrupted passage to the ground, at the home station as well as at the distant station. To fulfil the first condition is the office and function of the primary coil G. This coil is so wound or connected to the source of current that the rapidly recurring or alternating impulses flowing through it are capable of inducing in the tertiary coil D impulses of opposite direction from the impulses induced therein through the action of the secondary coil F.

In the drawings one terminal of the primary coil *g* is connected to the binding-post *f*, the other terminal being connected to the binding-post *e*. To these binding-posts are also connected in multiple arc the terminals of the primary coil G, and as the binding-posts *e* and *f* connect with the source of electricity through the key M it follows that the manipulation of key M will at one and the same time transmit the impulses generated in the source of electricity through both the coils G and *g* and the current will divide, all other conditions being equal in reverse proportion to the resistance of said coils.

The necessary adjustment of the inducing influence of coil G on coil D can be accomplished, first, through the manipulation of the rheostat H, through the action of which more or less resistance can be thrown into the circuit of G, or, second, the coil G can be partially withdrawn from the inner space of the coil D.

In practice it is of the utmost importance that the inductive influence of both coils G and *g*, the latter through the intervention of F, on the coil D should be equal, and in calculating the inductive influence of the sending-coil the resistance of the line-wire as well as receiving-coil has to be included, but with the double method of equalizing, first, through the insertion of a resistance, and, second, through the partial withdrawal or insertion of the coil itself the adjustment is easily accomplished.

Supposing now, the adjustment being perfected, the operator at station A is transmitting a message to the station A′. In depressing his key M he sends a multitude of impulses through the coil *g*, inducing thereby a multitude of impulses in coil F, which multitude of impulses will induce tertiary impulses in D and will flow over the line into the secondary F′ of the distant station, inducing also impulses in D′. Ordinarily the receiving instruments of both the coils D and D′ would answer, but as the depression of the key M at the station A also sends simultaneously with the sending of the impulses through *g* impulses starting at the same time and at the same frequency through G, and as the inducing influence of such impulses is opposite from the inducing influence flowing through coil F, it follows that both the influence of F and G on D are neutralized, and that therefore the receiving instrument B or C, as the case may be, will not respond. If now at the same time that the key M is depressed at the station A the key M′ at the station A′ is depressed or closed, one of two electrical conditions arises, to wit: First, if the transmitted impulses are flowing in opposite direction, then they will oppose each other and will therefore nullify their respective influences on both the coils D and D′, and both of these coils therefore will be free to respond, the coil D to the inductive influence of the coil G and the coil D′ to the inductive influence of the coil G′; second, if the simultaneously-transmitted impulses are flowing in the same direction, then their combined influence upon the home coil as well as the coil at the distant station will be greater than the influence exerted in these coils through the coil G or G′, and they are again free to respond.

The proviso of an uninterrupted passage for the induced current is fulfilled by shunting the key and instrument of such usual devices through a condenser, and in the drawings this condenser is designated by the letter K and the instrument by the letter L.

It is obvious that the proportions of the coils as an entirety or the proportions of the separate coils as to each other has to be determined in conjunction with the line in which they are to be placed and the service they should render.

In Fig. 2, *g* and G′ are the two parts of the primary coil, respectively, F′ the secondary coil, connected to line, and D′ the tertiary coil, connected locally to the receiving instrument. This figure clearly illustrates one method of equalizing the influence of the coils G′ and *g*′ on the coil D′. If this system should not be used in conjunction with the usual sending and receiving devices, then the intervention of the second coil F is not necessary, as the coil *g* with the key M and the source of current can be placed in series to the line and the ground connection then be made with the free terminal of the source of current.

To obviate misunderstanding and to distinguish the described method from the usual system of telegraphy, I call the described method the "multipulse" system. Wherever,

therefore, I use in this specification or the claims following this specification the word "multipulse" in connection with telegraphic system I wish to be understood as meaning a system in which rapidly recurring or alternating impulses of electrical currents are used.

I am aware that it is not broadly new with me to so balance the inductive influence of induced currents, when used in a system of multiple telegraphy, that no effect is produced therefrom upon the home instrument, while said home receiving instruments will respond to the inductive effect of similar induced currents transmitted from a distant station, and I make no claim hereinafter broad enough to include such a method of transmitting telegraphic signals or a means for practicing such method, my broadest claims being directed to a method of duplex transmission which involves the use of tertiary currents for affecting the home or receiving instruments.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A method of inductively transmitting telegraphic signals between two telegraphic stations joined by a single line-wire or cable which consists in setting up or establishing at one station two sets of rapidly-recurring primary current impulses, the secondary inductive effect of which is nullified upon the home receiving instruments, while the secondary current impulses transmitted to the distant station are caused to set up or establish tertiary current impulses which act upon receiving instruments located at that station.

2. A method of simultaneously transmitting in opposite directions two sets of telegraphic signals over a single line-wire joining two stations, which consists in nullifying the secondary effects of two sets of rapidly-recurring primary current impulses established or set up at each transmitting-station upon the home receiving instruments, and in setting up or establishing over the line rapidly-recurring secondary current effects, which in turn are caused to set up or establish at the distant stations rapidly-recurring tertiary effects upon receiving instruments located at said stations.

3. In a system of telegraphy means for generating at independent stations rapidly-recurring electrical impulses; means at each of said stations for transmitting the impulses at will; additional means in the nature of independent induction-coils adapted to divide the transmitted currents into two paths; secondary induction-coils one at each station and both included in the main line; a tertiary coil at each station located in inductive relation to the aforesaid coils, in combination with a receiving instrument or instruments at each station included in circuit with the tertiary coil, substantially as described.

4. In a system of telegraphy means at independent stations for generating rapidly-recurring electrical impulses; signal-transmitting mechanism in circuit with said generating means; an induction system at each station comprising two primary coils connected in multiple with the current-generating mechanism, and a secondary coil at each station connected in circuit with a line-wire joining the stations, in combination with a tertiary coil at each station which surrounds all of the before-mentioned coils and includes in its circuit a signal-receiving instrument or instruments.

5. A system of telegraphy embracing a source of current supply at each station; a line-wire joining said stations; signal-transmitting devices in circuit with each source of current supply; two induction-coils at each station connected in multiple with a source of current supply; a secondary induction-coil at each station located in the inductive field of one of the aforesaid coils, in combination with a tertiary coil at each station which surrounds or incloses all of the before-mentioned coils and includes in its circuit a receiving instrument or instruments; the several coils at each station being provided with means for adjusting them in such manner that the home instruments will not be affected when the home key is actuated and will respond only for currents transmitted from the distant station, all substantially as described.

In testimony whereof I sign my name, this 17th day of February, 1896, in the presence of two subscribing witnesses.

ISIDOR KITSEE.

Witnesses:

WALLACE B. ELDRIDGE,

GEO. M. COSTELLO.