No. 803,237. PATENTED OCT. 31, 1905.

I. KITSEE.

ELECTRIC RELAY.

APPLICATION FILED MAY 3, 1905.

2 SHEETS—SHEET 1.

Fig. 1

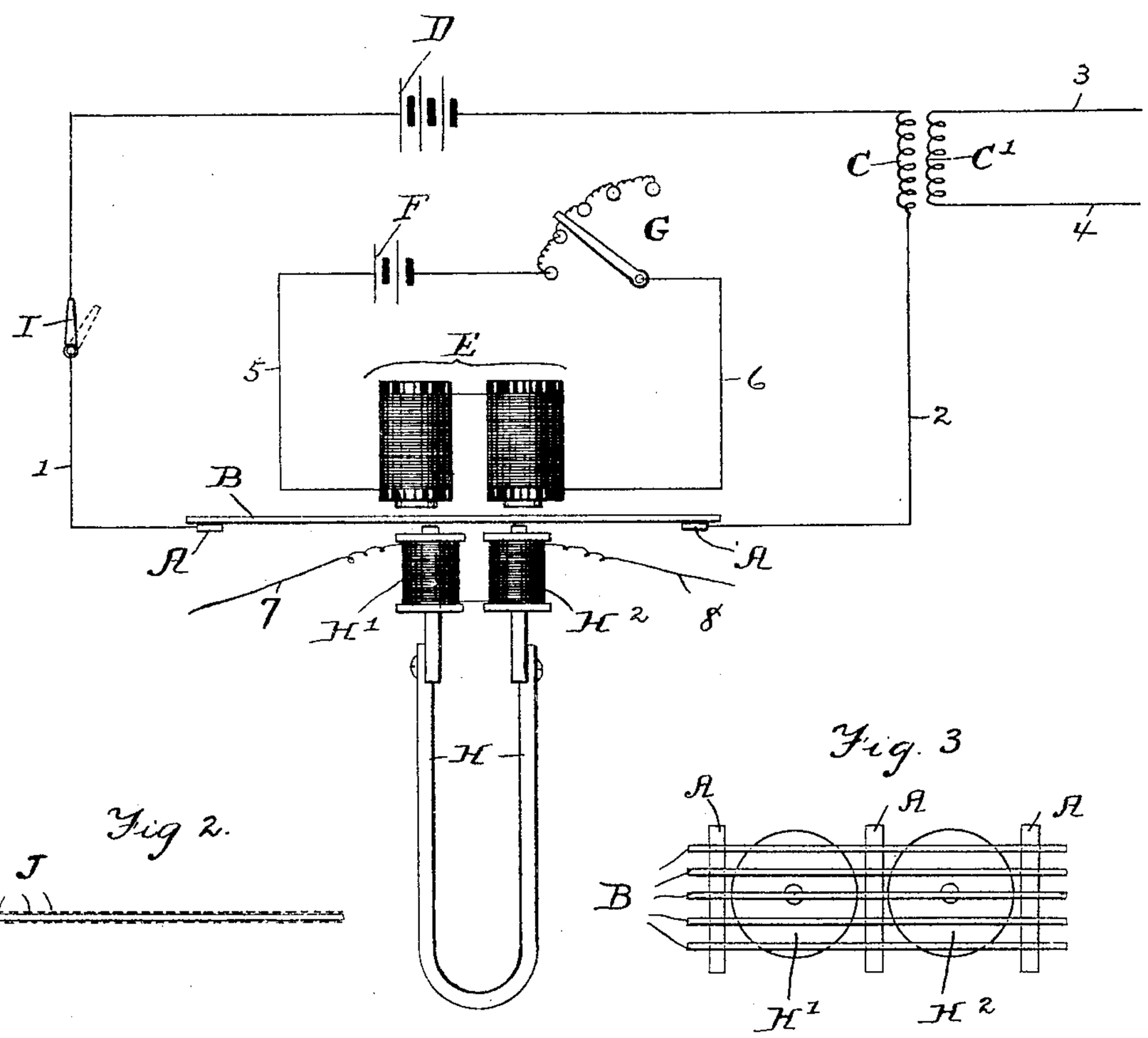
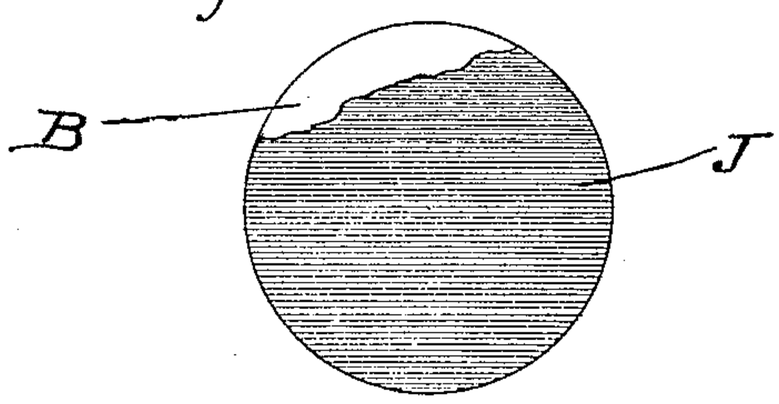


Fig 2.

Fig. 3

Fig. 4.



Witnesses
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2 SHEETS—SHEET 2.

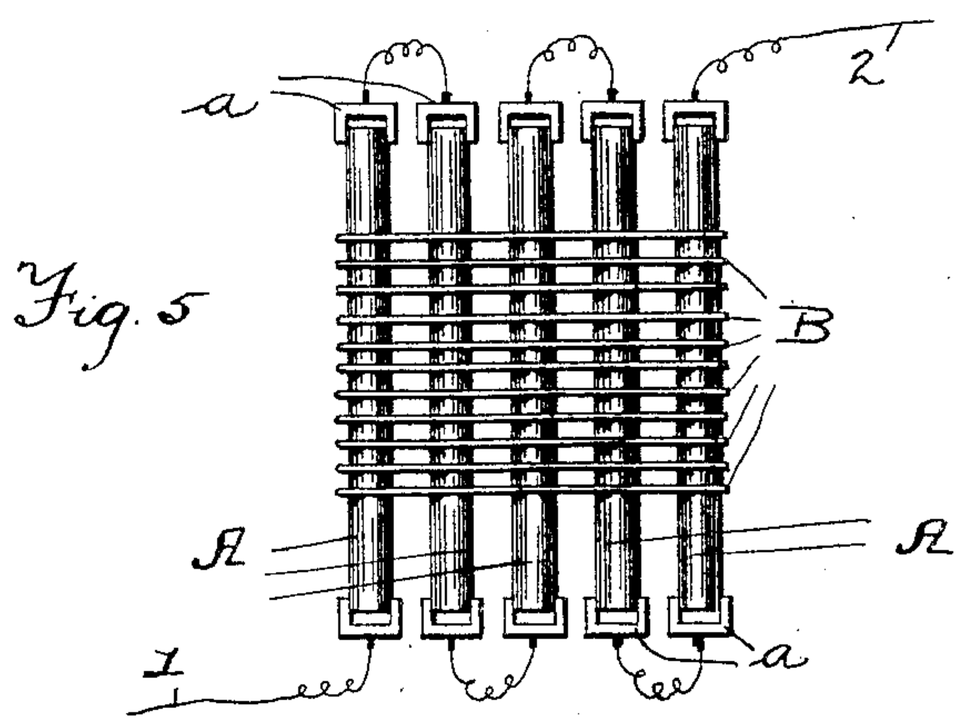
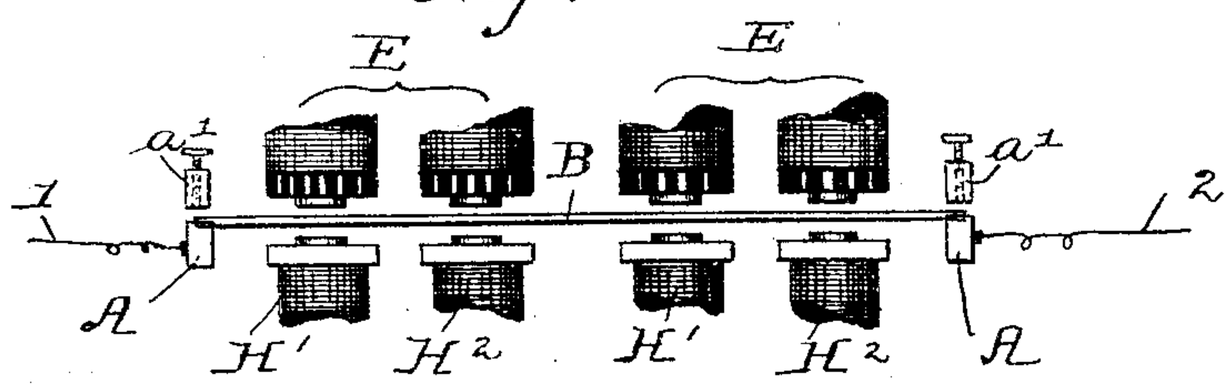


Fig. 5

Fig. 6

Fig. 7



WITNESSES:

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ELECTRIC RELAY.

No. 803,237. Specification of Letters Patent. Patented Oct. 31, 1905.

Application filed May 3, 1905. Serial No. 258,699.

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 Relays, of which the following is a specification.

My invention relates to an improvement in relays for electric transmission, and has more special reference to relays used for telephonic purposes.

Telephonic impulses are of such variable character, of such short duration, and so weak that special means have to be provided for repeating or relaying such impulses; and it is the aim of my invention to provide such means whereby the incoming weak impulses are made to actuate a device in a manner so as to repeat or relay the same with a greatly-increased force or energy.

Referring to the drawings, Figure 1 is a front elevation showing the electrical connections in diagram. Fig. 2 is a plan view of an iron wire provided with an outside covering. Fig. 3 is a top view of a modification of Fig. 1. Fig. 4 is a plan view of a disk provided on its upper surface with a covering. Fig. 5 is a top plan of a modified form of my device. Fig. 6 is a top view of a modified form, showing a series of magnets; and Fig. 7 is a side elevation showing my invention with a series of magnets.

In the figures, A represents carbon contacts on which loosely rests the paramagnetic conductor B. This paramagnetic conductor is preferably provided with an outer covering of carbon, (designated as J,) preferably applied by simply coating the wire with a finely-divided carbon intermixed with an adherent paste or gum—such, for instance, as a solution of gum-arabic. The carbon contacts A are connected through wires 1 and 2, preferably with the interposition of the switch I, to a source of current D and the primary C of an inductorium, the secondary C′ of which is connected to the lines 3 and 4. In proximity to the conductor B is the electromagnetic device E, connected through wires 5 and 6, preferably with the interposition of the variable resistance G, to the source of current F. In proximity to the conductor B is also the device H, provided with the electromagnetic coils H′ and H². In reality the device H is a counterpart of the electromagnetic arrangement contained in telephonic receivers. The coils of this device are connected through wires 7 and 8 with the line to be relayed.

In Fig. 1 I have shown the simplest form of a relay as consisting of the two small pieces of carbon A A and the single iron wire B. A device such as is illustrated in this figure should be balanced before it is placed in actual use in the following manner: The electromagnets E, which I call the "balancing-magnets," are connected locally to a source of current and a variable resistance and shall be placed, preferably, above the iron wire, and the second electromagnets, which are assembled substantially as the electromagnets of the telephonic ear-phone and are called by me for better understanding the "phone-magnets," are placed, preferably, below the iron wire. The circuit, embracing the carbon contacts, the iron wire, a battery, and the primary of an inductorium, is then closed and the secondary of the inductorium is connected to a telephonic receiver. The variable resistance is then actuated in a manner so that the electromagnets connected thereto should nearly neutralize the effect of the phone-magnet on the iron wire. The phone-magnet shall be connected in the usual manner to a telephonic transmitter, either directly or with the interposition of an inductorium. The strength of the two magnetic devices, the balancing-magnets, and the phone-magnets on the iron wire shall be varied by moving one or the other nearer or farther from the iron wires till a critical point is reached—that is, till the magnetic pull of the balancing-magnets nearly lifts the wires from their support and the contact between them and the carbon is made unstable. When this point is reached, the slightest impulse due to the vibration of the diaphragm of the transmitter will be reproduced on the phone-magnets connected to the relay-circuit.

In practice I have found that wire of No. 25 to 30 gage answers the purpose well. The wires do not need to be longer than about three inches. In my experiments I also made use of steel wires instead of iron wires and the result was satisfactory. With the aid of a device substantially as illustrated in Fig. 1 I have relayed a telephonic circuit and have received speech in a second circuit.

In some of my experiments I have found that it is best to place between the two electromagnetic coils H′ and H² a carbon support,

and I have shown this feature in Fig. 3, wherein A A A are three carbon supports, one between the two coils H′ and H² and one at each side of said coils. On these supports rest a multitude of iron wires B.

In my experiments I have also substituted for the iron wires an iron disk provided on that surface adapted to come in contact with the carbon supports with a layer of carbon. This layer may be applied in the same manner as was described above in connection with the wire as shown in Fig. 2. The disk is also designated as B and is clearly shown in Fig. 4.

In Fig. 5 a series of carbons A are connected together through the conductors *a* and are provided with a series of iron wires B.

In Figs. 6 and 7 I have shown the employment of more than one pair of electromagnets and more than one device, such as is illustrated in Fig. 1 and designated by the letter H. I have also shown in Fig. 7 the adjustable stops *a′*, so as to limit the movement of the conductors B.

In practicing my invention it is best to proceed in the following manner: The carbon supports are adjusted so as to provide a space for the wires B to rest in. The carbons are then connected with the circuit including the source of current and the primary of the inductorium. On one side of the conductors, preferably below them, is placed the device H, adapted to be connected to the telephonic circuit to be relayed. On top of the conductors is placed the magnetic device E, connected to its circuit and source of current.

It is best before closing the circuit of the device E to place an ammeter in the circuit including the source D, so as to see what amount of current is flowing when the conductors B are drawn in closer contact with the carbons A through the device H. The circuit of the device E is then established and varied so that the force of the device E should sufficiently vary the pressure of the conductor B on the carbon A. The wires 7 and 8 of the device H are connected to a telephonic circuit. If the variations of this telephonic circuit can be distinguished in the telephonic receiver connected to the wires 3 and 4, then the adjustment between the conductor B and the devices H and E is perfect; but if the sound is either too metallic or has too hollow a tone then either the device E or H should be moved farther or nearer to the conductor B or the resistance of the circuit including the source F should be increased or decreased, as the case may require. When the critical period is reached—that is, when the balance is perfect and the slightest vibration of the transmitter in the circuit to be relayed is clearly reproduced by the receiver in the circuit 3 and 4—then the device may as adjusted be connected to a telephonic circuit requiring to be relayed.

The sensitiveness of this device is great enough to reproduce the slightest sound-wave, and, as said above, in my experiments I have attained this reproduction with the aid of two pieces of carbon and two iron wires of about No. 24 gage.

The action of the electromagnets on the iron conductors is as follows: Through the device H the contact of these conductors with the carbons is increased. Through the action of the device E this increased action is partially neutralized and the iron conductor is held in bias, so to speak. If now through an incoming telephonic impulse the magnetic force of the coils H′ and H² is either increased or decreased, this variation of the magnetic pull results in a difference of the contact pressure of the wires on the carbons, and therefore in a difference in the flow of the current in the circuit including the primary C. This difference is felt in the receiver connected to 3 and 4 by impulses set up in the secondary C′.

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

1. A relay for electrically-transmitted impulses embracing a series of conductors of paramagnetic material loosely supported by a series of second conductors, an electric circuit of which said second conductors form part, repeating means included in said circuit; locally-operated electromagnetic means to keep at a strained position the paramagnetic conductors and electromagnetic means operatively connected to the transmitting-circuit to vary the strained position of the paramagnetic conductors in accordance with the impulses received.

2. An electric relay comprising a locally-organized electric circuit including paramagnetic conductors loosely contacting with carbon conductors, means independent of the incoming current to keep the two conductors at a predetermined degree of contact and means dependent on the received impulses to vary said degree of contact; the localized circuit also including the primary of a two-coil device.

3. A telephone-relay comprising a locally-organized circuit, a series of iron conductors loosely contacting with carbon conductors included in said circuit, repeating means included in said circuit, electromagnetic means locally organized to hold the iron conductors at a predetermined and strained position, and electromagnetic means included in the transmitting-circuit to vary the degree of contact in accordance with the incoming impulses.

4. In combination with a transmitting-circuit, a relay embracing a circuit locally organized and including a series of iron conductors in loose electric contact with a series of carbon conductors, two sets of electromagnetic means, one set locally organized and adapted to weaken the contact between the iron and

carbon conductors, the second set included in the transmitting-circuit and adapted to vary the weakening effect of the first set in accordance with the incoming impulses.

5. A device of the class described comprising a series of carbon conductors supporting a series of iron conductors, electromagnetic means to decrease the contact-pressure of the iron on the carbon, and electromagnetic means to oppose the effect of the first electromagnetic means; one of said electromagnetic means adapted to be connected to the current-carrying circuit and one of said electromagnetic means adapted to be connected to a local circuit containing a source of current; the carbon conductors adapted to be connected to a second electric circuit.

6. In an electric relay wherein the difference of contact between conductors is made use of to vary the flow of the current in an electric circuit, stationary carbon conductors, paramagnetic conductors provided on their surfaces with carbon in loose contact with said stationary conductors, and electromagnetic means operatively connected to the transmitting-circuit to vary the contact between the paramagnetic conductors and the carbon conductors in accordance with the incoming impulses.

7. In an electric relay stationary contacts, one or more conductors of paramagnetic material provided with carbon surface in loose contact with said stationary contacts, and electromagnetic means operatively related to the transmitting-circuit to vary said degree of contact in accordance with the incoming impulse.

In testimony whereof I hereby sign my name, in the presence of two subscribing witnesses, this 25th day of April, A. D. 1905.

ISIDOR KITSEE.

Witnesses:

EDITH R. STILLEY,

ALVAH RITTENHOUSE.