T. BODDE.

ELECTRIC SELECTIVE INSTRUMENT.

APPLICATION FILED DEC. 30, 1907.

1,169,713. Patented Jan. 25, 1916.

Fig. 1.

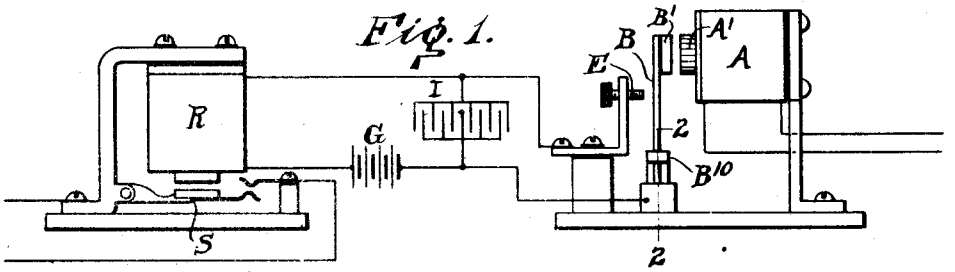


Fig. 3.

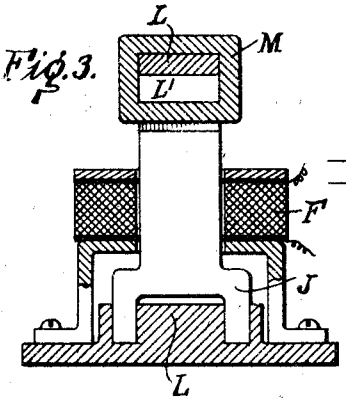


Fig. 4.

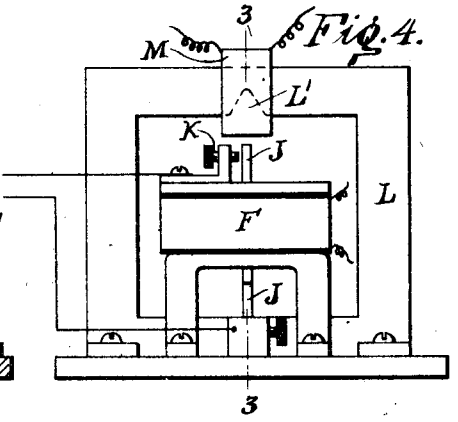
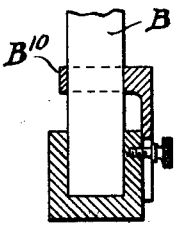


Fig. 2.



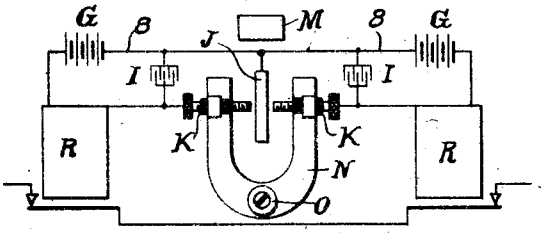


Fig. 5.

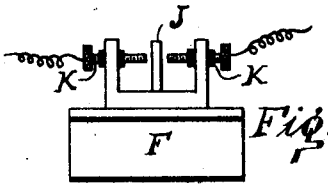


Fig. 6.

Fig. 7.

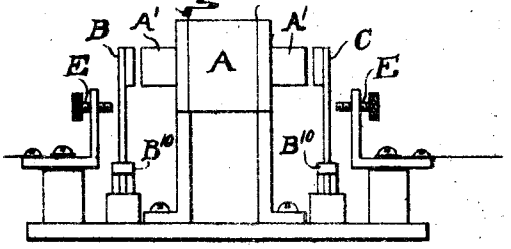
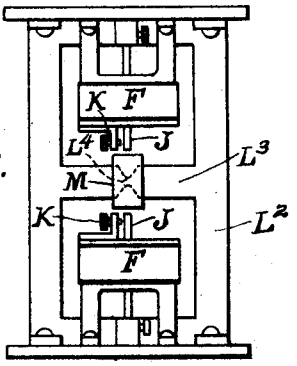


Fig. 8.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SELECTIVE INSTRUMENT.

1,169,713. Specification of Letters Patent. Patented Jan. 25, 1916.

Application filed December 30, 1907. Serial No. 408,514.

To all whom it may concern:

Be it known that I, THEODORE BODDE, a subject of the Queen of the Netherlands, residing in Westfield, in the county of Union, in the State of New Jersey, have invented a certain new and useful Improvement in Electric Selective Instruments, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

The primary object of my invention is the production of a novel relay or selective instrument which will readily and reliably respond in a certain way to a flow of an electric current of one character, and will respond in a different way, or not at all, to a flow of current of a different character. My novel instrument is especially adapted for use in signal systems.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention, however, and the advantages possessed by it, reference may be had to the accompanying drawings and descriptive matter in which I have illustrated and described some of the forms in which the invention may be embodied.

Of the drawings, Figure 1 is a view partly in elevation and partly diagrammatic of one form of selective instrument. Fig. 2 is a sectional elevation taken on the line 2—2 of Fig. 1 and on a larger scale than Fig. 1, illustrating the means for adjusting the vibrating period of the spring contact maker. Fig. 3 is a section taken on the line 3—3 of Fig. 4. Fig. 4 is an elevation of a portion of a selective instrument differing in some respects from that shown in Fig. 1. Fig. 5 is a diagrammatic representation of a modification of the instrument shown by Fig. 4 in which there are two sets of make and break devices and coöperating parts. Fig. 6 is a partial elevation, taken similarly to Fig. 4, showing the modified contact mechanism of Fig. 5. Fig. 7 is an elevation showing a modification of the instrument of Fig. 1 in which the spring contact members are duplicated. Fig. 8 is in elevation and partly diagrammatic of instrument of Fig. 4 in which the spring contact devices are duplicated.

The selective instrument shown in Fig. 1 comprises a magnetizing coil A having a polarized core A', a resilient member B supporting an armature B' at its upper end, an adjustable contact screw E adapted to be intermittently engaged by the spring B when the latter is set in vibration, a relay winding R adapted when energized to attract its armature and thereby close a pair of contacts or perform other useful functions. One terminal of the relay R is electrically connected to the screw E and the other terminal of the relay R is electrically connected to the spring B, a battery G is inserted in the connection between the relay R and the spring B. A condenser I is connected in shunt to contact screw E and spring B. Assuming that alternating or pulsating current is passed through the winding of the coil A, the armature supported by the spring B will be intermittently attracted, and I so make the spring B that its natural period of vibration shall be equal to the periodicity of the magnetic impulses produced by the particular current flow through the coil A to which I desire to have the instrument respond. In consequence of this when current of the desired frequency of alternations or pulsations begins to flow through the coil A, the spring B will be set into vibration which will rapidly increase in amplitude until the spring will engage the screw E at one end of each stroke. The duration of any one contact between the screw E and spring B would be too small to permit any appreciable current to flow through the coil R on account of the inductance of the latter, if the condenser I were not provided. The condenser I, however, connected as shown, will discharge at each contact between the spring B and the screw E, and the battery will charge the condenser in the intervals between the engagement of B and E. In consequence of this, if the parts are suitably chosen and proportioned a practically constant unidirectional flow of current of the proper magnitude can be had through the relay R so long as the spring intermittently engages the screw E.

The arrangements shown and described give a simple and effective and accurate instrument. If the current flowing through the coil A is direct current, or if it is not of the proper frequency, the armature supported by the spring B will not be given

the impulses which are necessary to cause the desired amplitude of vibration. By suitably constructing the spring B its period of vibration can of course be made whatever is necessary. With a given spring B the period of vibration can be adjusted to some extent as by varying its effective length by means of the vertically adjustable yoke B^{10} shown best in Fig. 2.

The arrangement shown in Figs. 3 and 4 differs from that of Figs. 1 and 2 principally in the fact that a magnetizing coil F surrounds a resilient body J of magnetic material which forms a magnetic shunt across the center of a rectangular magnet core L having a rectangular opening or window in it. One end of the body J is free and the other is held in a suitable holder, but on account of its own resilience the body J is, in effect, spring supported. One side of the core L immediately adjacent the free end of the spring J is preferably cut away as indicated at L′ to increase the reluctance of this portion of the core and is surrounded by the coil M. By passing currents of the desired characteristics through the coils F and M the spring J may be set into suitable vibrations to intermittently engage the adjustable contact K. The contact K and spring J may be connected it will be understood with a relay coil, battery, and condenser in like manner as are the contacts E and spring B of Fig. 1. The vibration of the spring J may be set up in different ways. For instance, the coil F may be constantly energized by direct current, and the coil M receive the variable current. In this case the spring J will be set into strong vibration when the frequency of the current flowing through coil M is of the proper value. If the coil M is energized with direct current, and the coil F with alternating current the spring will be set into strong vibration when the current through coil F is of the proper frequency.

In the arrangements shown in Figs. 5 and 6 the instrument of Figs. 3 and 4 is modified by providing a pair of contacts K one at each side of the spring J. The contacts K are mounted in a yoke N which is frictionally held with some force in any position into which it may be moved, by its fulcrum screw O and a friction washer between the head of the screw and the yoke N. By this arrangement the distance between the normal position of the spring and each contact will be automatically equalized through the engagement of the contacts by the vibrating spring. A relay R, battery G, and condenser I are employed in conjunction with each contact K and the spring J. When these relays are employed for controlling a single electric circuit which is broken at two points when the two relays R are deënergized an advantage is had over such an arrangement as is shown in Fig. 1 from the fact that a strong direct current flowing through whichever of the coils M and F is employed as the variable current coil and holding the spring J out of its normal position and in engagement with one of the contacts K will not result in operatively closing the controlled circuit.

In the modification shown in Fig. 7, the spring supported armature and contact E of Fig. 1 are duplicated at each end of the magnetizing coil A. This arrangement may be employed in conjunction with two sets of relays R, battery G and condensers I. If the two springs B and C at opposite ends of the coil A have different vibration frequencies, one spring will respond to a flow of current through the coil A of one frequency and the other to a flow of current of a different frequency. Instead of two batteries G there may be but one, as in the instrument W^2 of Fig. 9. The instrument of Fig. 7 has the advantage over the instruments like Fig. 1 connected in series or shunts with each other in the same circuit that the number of parts, space occupied and material required are reduced.

The arrangement shown in Fig. 8 is a modification upon the lines of Fig. 7 of the construction shown in Figs. 3 and 4. In this form of the invention the rectangular core has two windows formed in it, the side legs L^2 being connected by a central leg L^3 which is surrounded by the coil M. A coil F, spring J, and contact K are mounted in each window of the core in operative relation with the single coil M.

The apparatus hereinbefore described, while capable of operation in many different relations, is particularly adapted for use in electric railway block signal systems. For instance, these selective devices may be used in a block signal system of the general character described and claimed in my copending application Ser. No. 393,640, filed the 19th day of September, 1907, in which the track rails are divided into sections by cross bonds, and alternating current for signal purposes is supplied to each section at a point approximately midway between the ends of the section, alternating currents of frequencies differing from each other and also from the frequency of the power current flowing along the track rails if the latter is alternating and not direct, being supplied to adjacent sections. In such a system my new selective devices may be employed to respond to the current flow through the track crossbond and energize the track relays at the proper time.

I do not wish the claims hereinafter made to be limited to the particular embodiment disclosed more than is made necessary by the state of the art.

Having now described my invention, what

I claim as new and desire to secure by Letters Patent is:

1. A selective instrument for responding to electro-magnetic impulses of predetermined frequency, comprising in combination a member free to vibrate and having a natural frequency of vibration corresponding to said predetermined frequency and tending to be set in vibration by said electro-magnetic impulses, means for subjecting said member to electromagnetic impulses of said predetermined frequency, an electric circuit including a source of current and having a gap closed by said vibrating member once in each vibration of predetermined amplitude, a condenser in shunt to said gap, and means responding to a flow of current through said circuit.

2. A selective instrument for responding to a particular non-continuous electric current, including in combination a winding along which the current passes, an armature within the electro-magnetic influence of said winding and free to vibrate and having a vibration frequency corresponding to the frequency of magnetic impulses produced by said particular current, an electric circuit including an electro-magnet winding, a source of direct current, a stationary contact surface, and a movable contact surface caused to engage the stationary contact surface and close the circuit at each armature vibration of the amplitude produced by said particular current, and a condenser in shunt to said contact surfaces.

3. In a selective instrument, the combination of a winding through which the current to be responded to may pass, an armature in electro-magnetic relation to said winding and free to vibrate and having a natural period of vibration corresponding to the frequency of the magnetic impulses produced in said winding by the current to be responded to, a contact adapted to be engaged by said armature at one limit of its vibration when the vibrations are of the predetermined amplitude, a winding of an electro-magnet, and a source of direct current connected in series between the armature and said contact, and a condenser in shunt to said contact and armature.

4. In combination, an armature having one end free and the other resiliently supported whereby said body is free to vibrate and has a natural vibration frequency, means for magnetizing it in the direction of its length, and means for creating a magnetic field adjacent its free end extending transverse to the direction of the armature, one of said magnetizations being produced by a variable current, whereby when said variable current is of the proper frequency relatively large vibrations of the armature are produced, and a contact engaged by said armature at one limit of each of said large vibrations, a source of direct current and an electro-magnet winding in series with said contact and armature, and a condenser in shunt to said contact and armature.

5. In combination, an armature having one end free and the other resiliently supported whereby said body is free to vibrate and has a natural vibration frequency, means for magnetizing it in the direction of its length, and means for creating a magnetic field adjacent its free end extending transverse to the direction of the armature, one of said magnetizations being produced by a variable current, whereby when said variable current is of the proper frequency relatively large vibrations of the armature are produced, and a pair of contacts, one engaged at each limit of said large vibrations, and electric flow controlling means actuated by and dependent on the alternate engagements of said armature with the two contacts.

6. In combination, an armature, having one end free and the other resiliently supported whereby said body is free to vibrate and has a natural vibration frequency, means for magnetizing it in the direction of its length, and means for creating a magnetic field adjacent its free end extending transverse to the direction of the armature, one of said magnetizations being produced by variable current, whereby when said variable current is of the proper frequency relatively large vibrations of the armature are produced, and a pair of contacts, one engaged at each limit of said large vibrations, and a yielding support for said pair of contacts whereby they may adjust themselves at equal distances from the rest position of said armature.

7. In combination, a core forming a closed magnetic circuit, a magnetic shunt extending across said circuit and having one end free and the other resiliently supported, whereby said shunt is free to vibrate and has a natural vibration frequency, a magnetizing coil surrounding said shunt, a second magnetizing coil surrounding the portion of the core in front of the free end of said shunt, means for passing a continuous current through one of said coils, and means for passing a variable current through the other coil whereby when said variable current is of a frequency corresponding to said vibration frequency relatively large vibrations of said shunt are produced.

THEODORE BODDE.

Witnesses:
A. K. GALE,
F. K. WINTER.