J. L. ZANDER.

ELECTRICAL RECORDING APPARATUS OR INDICATOR.

APPLICATION FILED MAY 27, 1911.

1,031,408. Patented July 2, 1912.

2 SHEETS—SHEET 1.

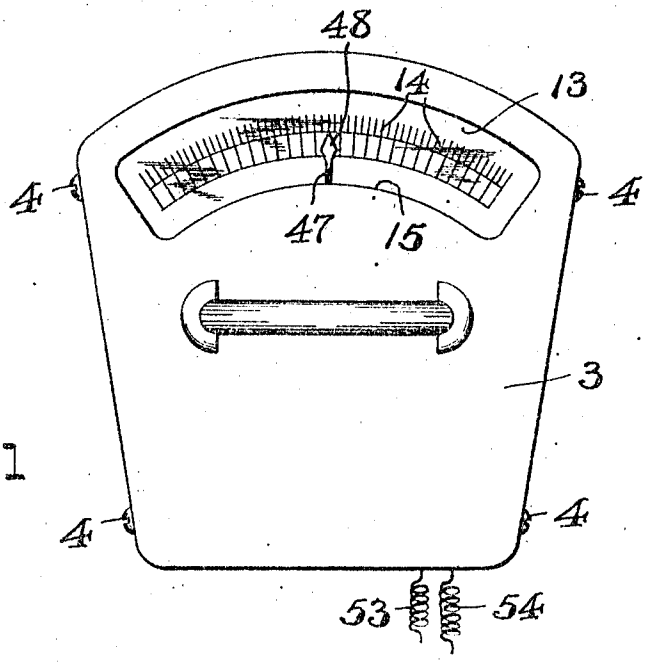

Fig. 1

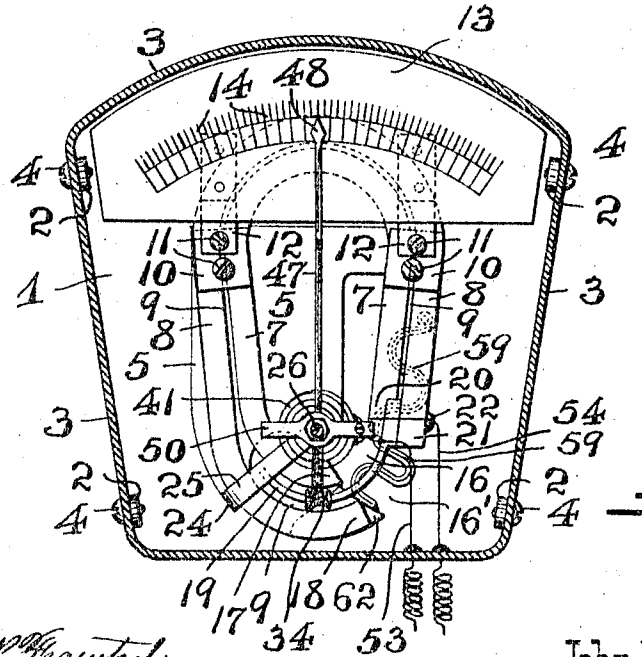

Fig. 2

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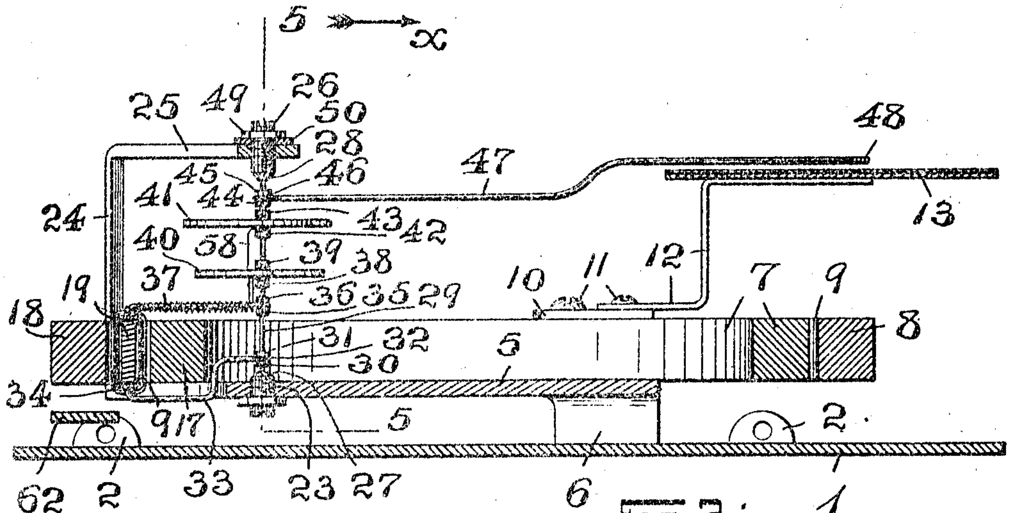

Fig. 3

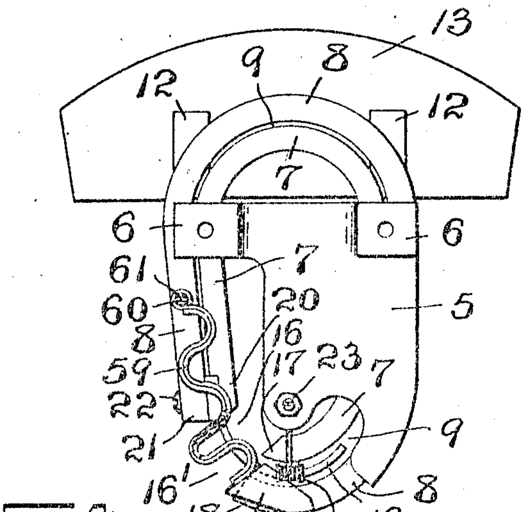

Fig. 4

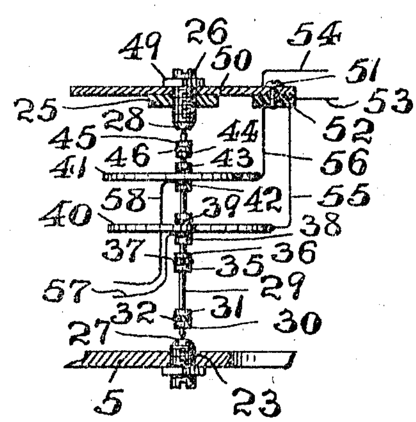

Fig. 5

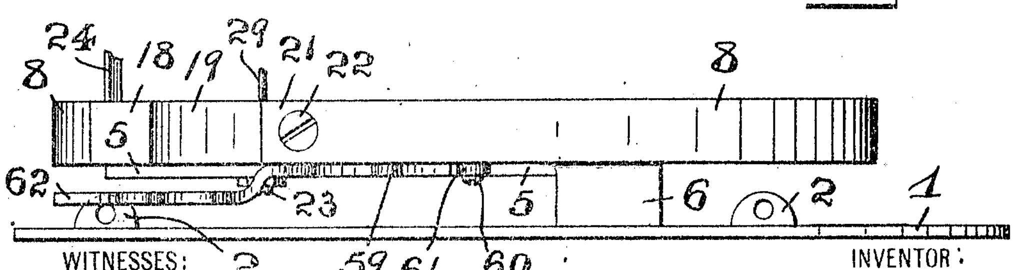

Fig. 6.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL RECORDING APPARATUS OR INDICATOR.

1,031,408. Specification of Letters Patent. Patented July 2, 1912.

Application filed May 27, 1911. Serial No. 629,931.

To all whom it may concern:

Be it known that I, JOHN L. ZANDER, a citizen of the United States, residing at Irvington, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electrical Recording Apparatus or Indicators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The present invention has reference, generally, to improvements in electrical recording apparatus or indicators; and, this invention relates, more particularly, to a novel and simply constructed device or apparatus which is especially adapted for indicating the degrees of temperature.

This invention has for its principal object to provide a novel and simply constructed apparatus of the general character hereinafter more particularly set forth; and, furthermore, to provide a sensitive and efficient electrical recording device.

The invention has for its further object to provide an electrical recording or indicating apparatus, the magnet of which consists of two main members of most peculiar shape, the two members being bent in the forms of ovoids, and one member being arranged within the other member, both of said ovoid-shaped members being formed with corresponding open spaces or gaps, across which extends a piece of soft magnetic iron, secured at one end to the two ovoid-shaped members, and the other end of said piece of soft magnetic iron extending between the other ends of the said ovoid-shaped members, but without contacting therewith, and upon which is movably disposed, the electro-magnetic coil, said coil moving also between the free end-portions of the said ovoid-shaped members, so that the coil is surrounded on all of its sides and is therefore subjected on all of its sides to the influence of the magnet.

This invention has for its further object to provide in connection with a magnet of the character herein-above stated, and more particularly described in the following specification, a compensating device which short-circuits the magnet, and which is easily affected in a rise in temperature, the rise in temperature also increasing the resistance of the coil, as the said compensating device creeps closer toward the field or the pole-ends of the magnet-members, so that a constant or uniform condition of the coil will be maintained.

Other objects of this invention not at this time more particularly enumerated will be clearly understood from the following detailed description of the present invention.

With the various objects in view, the said invention consists, primarily, in the novel electrical recording or indicating apparatus hereinafter set forth; and, the invention consists, furthermore, in the novel arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, all of which will be more fully described in the following specification, and then finally embodied in the clauses of the claim which are appended to and which form an essential part of this specification.

The invention is clearly illustrated in the accompanying drawings, in which:—

Figure 1 is a top or plan view of a portable electrical heat-measuring or indicating device made according to and embodying the principles of the present invention; and Fig. 2 is a horizontal sectional representation of the casing of the device, showing also in plan or top view the mechanism arranged within said casing. Fig. 3 is a longitudinal vertical view of the device, taken centrally through Fig. 2, but made on an enlarged scale, with the upper part of the inclosing casing omitted from said view. Fig. 4 is a bottom view of the mechanism, removed from the base-plate of the casing; Fig. 5 is a detail vertical section, said section being taken on line 5—5 in Fig. 3, looking in the direction of the arrow *x*; and Fig. 6 is a side elevation of Fig. 2, showing the magnet of the device, and the base-plate upon which the said magnet is mounted.

Similar characters of reference are employed in all of the above described views, to indicate corresponding parts.

Referring now to the several figures of the drawings, the reference-character 1 indicates a suitable base which may be of any marginal configuration and may be provided at suitable points near its marginal edge with upwardly extending ears or lugs 2 which are formed with screw-threaded

holes. Suitably arranged upon the said base is an inclosing casing 3, the sides of which register with said ears or lugs, in the manner illustrated in Fig. 2 of the drawings, and the said casing being suitably secured in place by means of screws 4. Suitably mounted upon said base 1, by means of its feet 6, is a supporting plate 5, said plate extending in a forward direction toward the front edge of the base, and being preferably of the marginal configuration shown more particularly in Fig. 4 of the drawings. Resting upon the upper surface of said plate 5, and suitably secured in position thereon, are a pair of ovoid-shaped members or elements 7 and 8, the member 7 being smaller than the member 8, so that the member 7 is surrounded by the member 8, and said members 7 and 8 being separated by a suitable space 9 between them. The said members 7 and 8 are also preferably connected by means of brass plates 10 which are secured in place by means of screws 11. Suitably secured upon said brass-plates, by means of said screws 11, are brackets 12 upon which is mounted a suitable plate 13 which is provided upon its face with a scale, as 14, or other suitable divisions or graduations, as clearly indicated in Fig. 1 of the drawings, said scale being disposed beneath a suitable reading-opening, as 15, with which the casing 3 is provided. The said inner and smaller magnet-member 7 has an open space or gap 16 between its end-portions; and, in a like manner, the outer and larger magnet-member 8 is also provided with an open space or gap 16′.

The end-portions 17 and 18 of the respective ovoid-magnet-members or elements 7 and 8 practically form the one pole-piece of the magnet. A curved plate or element, as 19, of soft iron, forms the other pole-piece of the magnet, the said plate or element 19 being suitably arranged and secured between the ends 20 and 21 of the respective ovoid magnet-members or elements 7 and 8 by means of a screw 22, or other suitable fastening means. The said curved plate or element 19, as will be seen from an inspection of Figs. 2 and 4, extends across the open space or gap between the respective end-portions of the said magnet-members or elements 7 and 8, and for some distance into the space 9 formed between the said ovoid-magnet-members or elements, substantially as shown. As will be understood, this curved portion of the plate or element 19 which is arranged in the space 9 between said members 7 and 8 provides the other pole-piece of the magnet, which is encircled by and upon which is movably arranged the energizing coil to be presently more fully described.

Suitably arranged in that portion of the plate 5, at a point back of the end-portion 17 of the inner and smaller ovoid-shaped magnet-member 7 is an upwardly projecting adjusting screw 23. Connected with the said plate 5, in any suitable manner, is a post 24 which is provided with an arm 25 extending horizontally from said post 24, said arm 25 being provided with a downwardly extending adjusting screw 26, which is in alinement with the said adjusting screw 23. The said screws 23 and 26 are provided in their free end-portions with suitably formed seats 27 and 28, respectively, in which are oscillatorily arranged the correspondingly pointed end-portions of a spindle 29. Suitably mounted and secured upon said spindle are a pair of collars or sleeves 30 and 31 by means of which is secured to said spindle a rod 32, said rod extending downwardly and forwardly, as at 33, and carrying at its free end-portion the spool of the previously mentioned energizing coil, indicated by the reference-character 34. The said spindle 29 carries another pair of collars or sleeves 35 and 36 by means of which is secured to said spindle a forwardly extending rod 37 which is secured at its free end-portion to the spool of said energizing coil 34, the portion 33 of the rod 32 being arranged beneath the said magnet-member 7, and the rod 37 being arranged above said magnet-member 7, substantially in the manner shown. Secured upon said spindle 29, between a pair of collars or sleeves 38 and 39, and suitably insulated from said spindle and said collars or sleeves, is a spiral spring 40. A second spiral spring 41 is secured upon said spindle 29 between a pair of collars or sleeves 42 and 43, said spring 41 being also suitably insulated from said collars or sleeves and the said spindle. The reference-characters 44 and 45 indicate another pair of collars or sleeves, by means of which is also secured upon said spindle 29 the eye-portion 46 of an index-hand 47, the indicating end-portion 48 of which terminates above and moves over the previously mentioned scale or graduations 14. Screwed upon the upper end-portion of the adjusting screw 26 is a binding nut, as 49, which movably secures a contact-arm 50 upon the said arm 25 of the post 24, the said contact-arm 50 having fastened upon one of its end-portion, by means of a screw 51, a block 52 of insulating material, to which are secured the leading-in wires 53 and 54, which are thereby suitably insulated from each other by means of said block. The end-portion 55 of the wire 53 is flexibly connected with the outer end of the spiral spring 40, and similarly connected with the outer end of the other spring 41 is the end-portion 56 of the other wire 54. Leading from the inner end-portions of said springs 40 and 41 are the terminal wires 57 and 58, which are double-

wound around the previously mentioned rod 37, and are then connected with the terminals of the coil 34, so as to complete an electrical circuit, as will be clearly understood from an inspection of the several figures of the drawings.

The hereinbefore mentioned compensating device, as will be seen from an inspection of Figs. 2, 4 and 5 of the drawings, consists essentially of a bar 59 of non-magnetic, but readily expansible metal, said bar being preferably serpentine-shape as shown, and being formed at one end with an eye 60 and a screw 61 by means of which it is fastened to the under side of the outer magnet-member or element 8. A portion of said serpentine bar extends across the gap formed between the end-portions of the respective magnet-members or elements 7 and 8, and upon its free end-portion the said serpentine-bar is connected to a block or plate 62 of good magnetic material, the said block or plate being located directly beneath the end-portion of the outer magnet-member or element 8, and in close proximity to the energizing coil, when the latter stands in its normal initial position, indicated in said Fig. 4 of the drawings. The operation of this compensating device is self-evident; as the outside or air temperature rises the bar 59, as it expands, causes the block or plate 62 to creep closer to the pole-pieces or the magnetic field, this increasing the active magnetic lines of force with reference to the coil, whereby the increase in resistance is counteracted by the higher magnetic density, with the same uniform result, as if the outside or air-temperature were constant. In like manner, as the temperature decreases, the block or plate 62 moves farther away from the magnetic field and the coil, so that the opposite effect takes place. For better results, it is desirable to make the serpentine bar 59 of two metals, arranged side by side and having different degrees of expansion, as steel and brass, or other metals suitable for the purposes.

The workings and operations of the several parts of the apparatus will be clearly understood from the foregoing description and from an inspection of the several figures of the drawings, and need, therefore, not be further described at this time.

I am aware that changes may be made in the general arrangements and combinations of the various devices and parts, as well as in the details of the construction of the same, without departing from the scope of the present invention as set forth in the foregoing specification, and as defined in the clauses of the claim which are appended thereto. Hence, I do not limit my present invention to the exact arrangements and combinations of the devices and parts as described in the said specification, nor do I confine myself to the exact details of the construction of the said parts as illustrated in the accompanying drawings.

I claim:—

1. An electrical measuring instrument comprising a movable coil and a pair of magnet-members, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, and a pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members.

2. An electrical measuring instrument comprising a movable coil and a pair of ovoid-shaped magnet-members, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, and a curved pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members.

3. An electrical measuring instrument comprising a pair of magnet-members, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, and a pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members, a wire-wound coil encircling said pole-piece and movably arranged thereon, a spindle, springs connected with said spindle, electric circuit-wires connected with said spring, and an index-hand mounted upon said spindle.

4. An electrical measuring instrument comprising a pair of ovoid-shaped magnet-members, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, and a curved pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members, a wire-wound coil encircling said curved pole piece and movably arranged thereon, a spindle, springs connected with said spindle, electric

circuit-wires connected with said springs, and an index-hand mounted upon said spindle.

5. An electrical measuring instrument comprising a pair of ovoid-shaped magnet-members, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, and a pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members, a wire-wound coil encircling said pole-piece and movably arranged thereon, a spindle, springs connected with said spindle, electric circuit-wires connected with said spring, and an index-hand mounted upon said spindle, an expansible compensating device extending from said magnet-members and across the gap of said members, and a block of magnetic metal connected with said device, said block being located in close proximity to the said coil, substantially as and for the purposes set forth.

6. An electrical measuring instrument comprising a pair of ovoid-shaped magnet-members, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, and a curved pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members, a wire-wound coil encircling said curved pole-piece and movably arranged thereon, a spindle, springs connected with said spindle, electric circuit-wires connected with said springs, and an index-hand mounted upon said spindle, an expansible compensating device extending from said magnet-members and across the gap of said members, and a block of magnetic metal connected with said device, said block being located in close proximity to the said coil, substantially as and for the purposes set forth.

7. An electrical measuring instrument comprising a base-plate, a supporting plate mounted upon said base-plate, an adjustable bearing-screw at the forward end-portion of said supporting plate, a post extending upwardly from said plate, an arm extending from said post, an adjustable bearing screw connected with said arm, a spindle mounted between said bearing-screws, a pair of ovoid-shaped magnet-members upon said supporting plate, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, a curved pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members, spiral springs upon said spindle, electric circuit-wires connected with said springs, an index-hand mounted upon said spindle, and a wire-wound coil in circuit with said springs, substantially as and for the purposes set forth.

8. An electrical measuring instrument comprising a base-plate, a supporting plate mounted upon said base-plate, an adjustable bearing-screw at the forward end-portion of said supporting plate, a post extending upwardly from said plate, an arm extending from said post, an adjustable bearing screw connected with said arm, a spindle mounted between said bearing-screws, a pair of ovoid-shaped magnet-members upon said supporting plate, one of said members being surrounded by the other member, said members being provided with a gap between their respective end-portions, and said members being separated at one of their end-portions so as to provide a space between them, a curved pole-piece connected with one set of end-portions of the said magnet-members and extending across said gap and into the space between the other set of end-portions of the said magnet-members, spiral springs upon said spindle, electric circuit-wires connected with said springs, an index-hand mounted upon said spindle, and a wire-wound coil in circuit with said springs, an expansible compensating device extending from said magnet-members and across the gap of said members, and a block of magnetic metal connected with said device, said block being located in close proximity to said coil, substantially as and for the purposes set forth.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 23rd day of May 1911.

JOHN L. ZANDER.

Witnesses:
FREDK. C. FRAENTZEL,
FREDK. H. W. FRAENTZEL.