(No Model.) 4 Sheets—Sheet 1.

F. J. DIBBLE.

TELETHERMOMETER.

No. 474,771. Patented May 10, 1892.

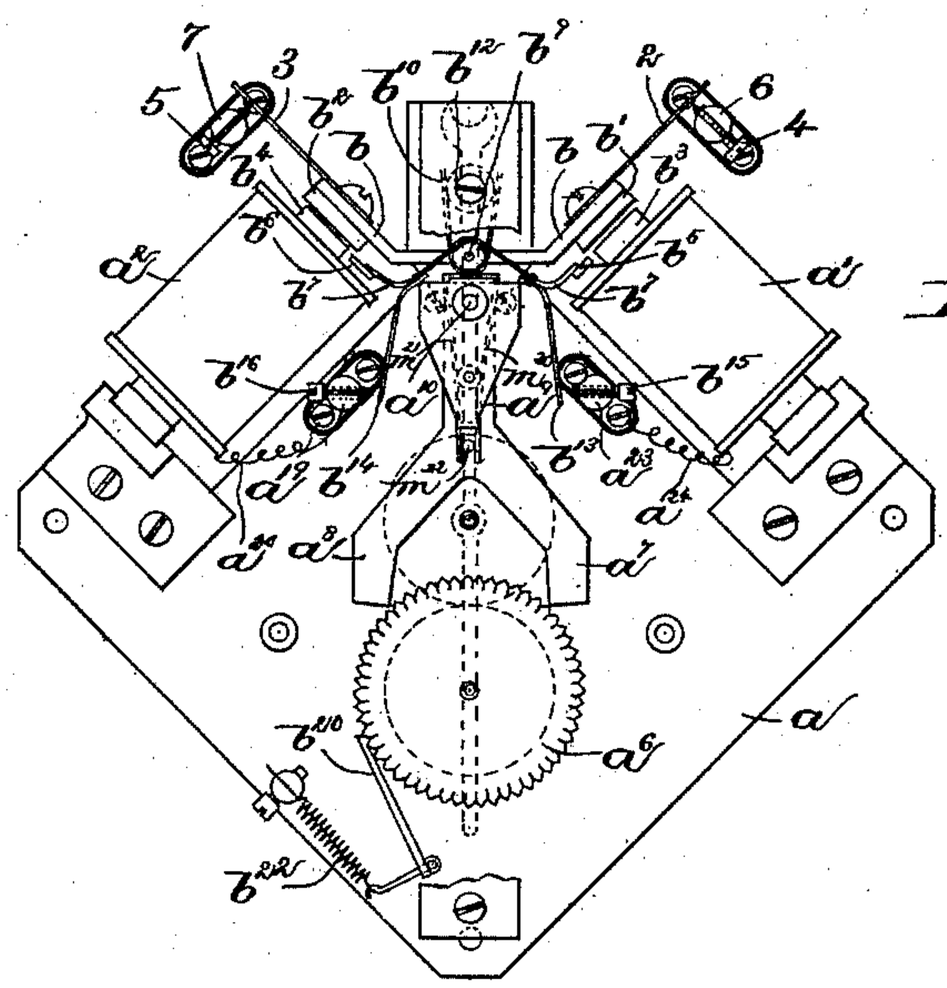


Fig: R.

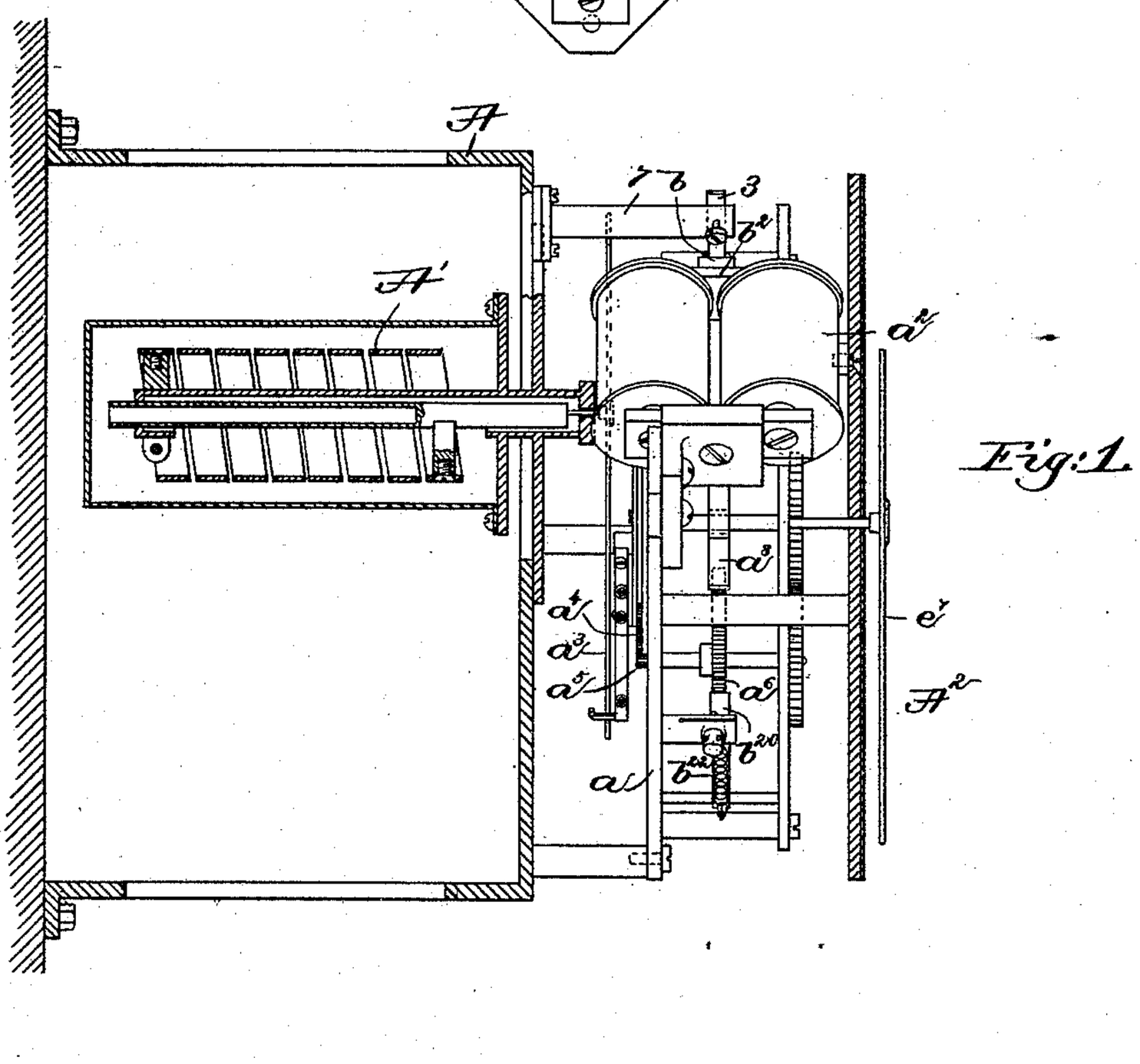


Fig: 1.

Witnesses.
Howard F. Eaton.
Frederick L. Emery.

Inventor:
Fernando J. Dibble,
by Crosby & Gregory
Attys.

(No Model.)

4 Sheets—Sheet 2.

F. J. DIBBLE.

TELETHERMOMETER.

No. 474,771. Patented May 10, 1892.

Fig: 4.

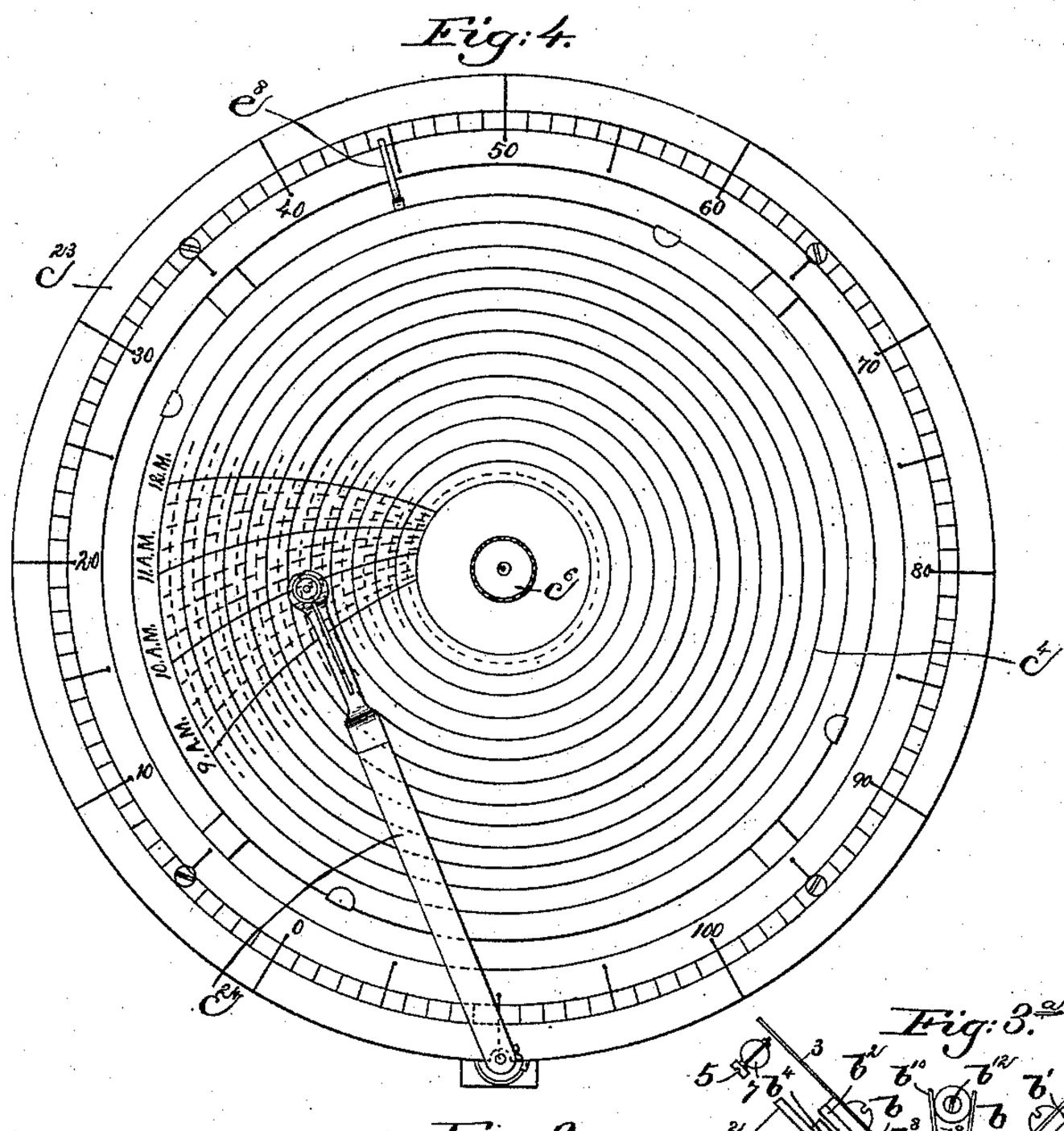


Fig: 3.

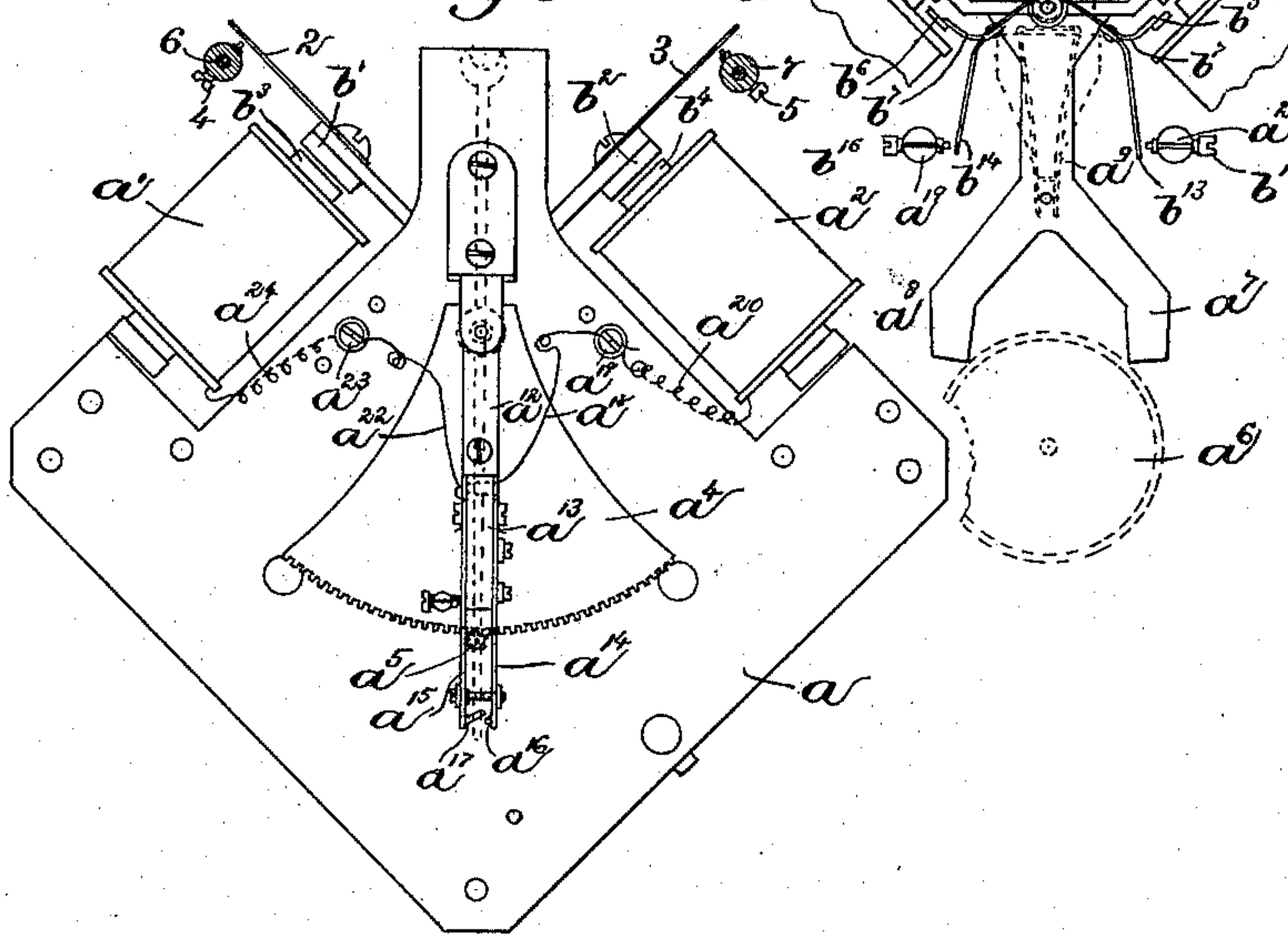
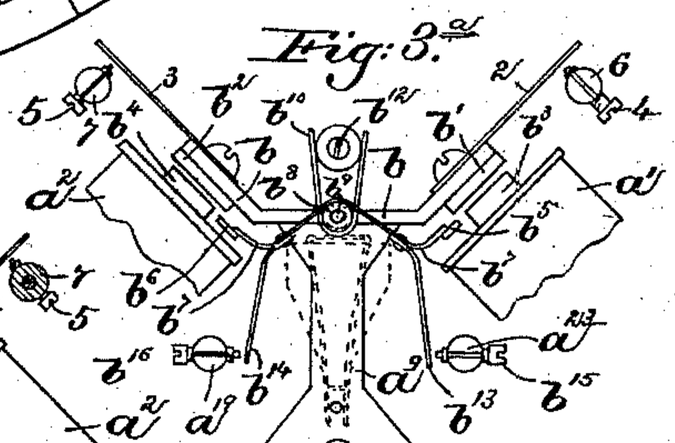


Fig: 3a.



Witnesses.
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(No Model.) 4 Sheets—Sheet 3.

F. J. DIBBLE.

TELETHERMOMETER.

No. 474,771. Patented May 10, 1892.

Fig: 5.

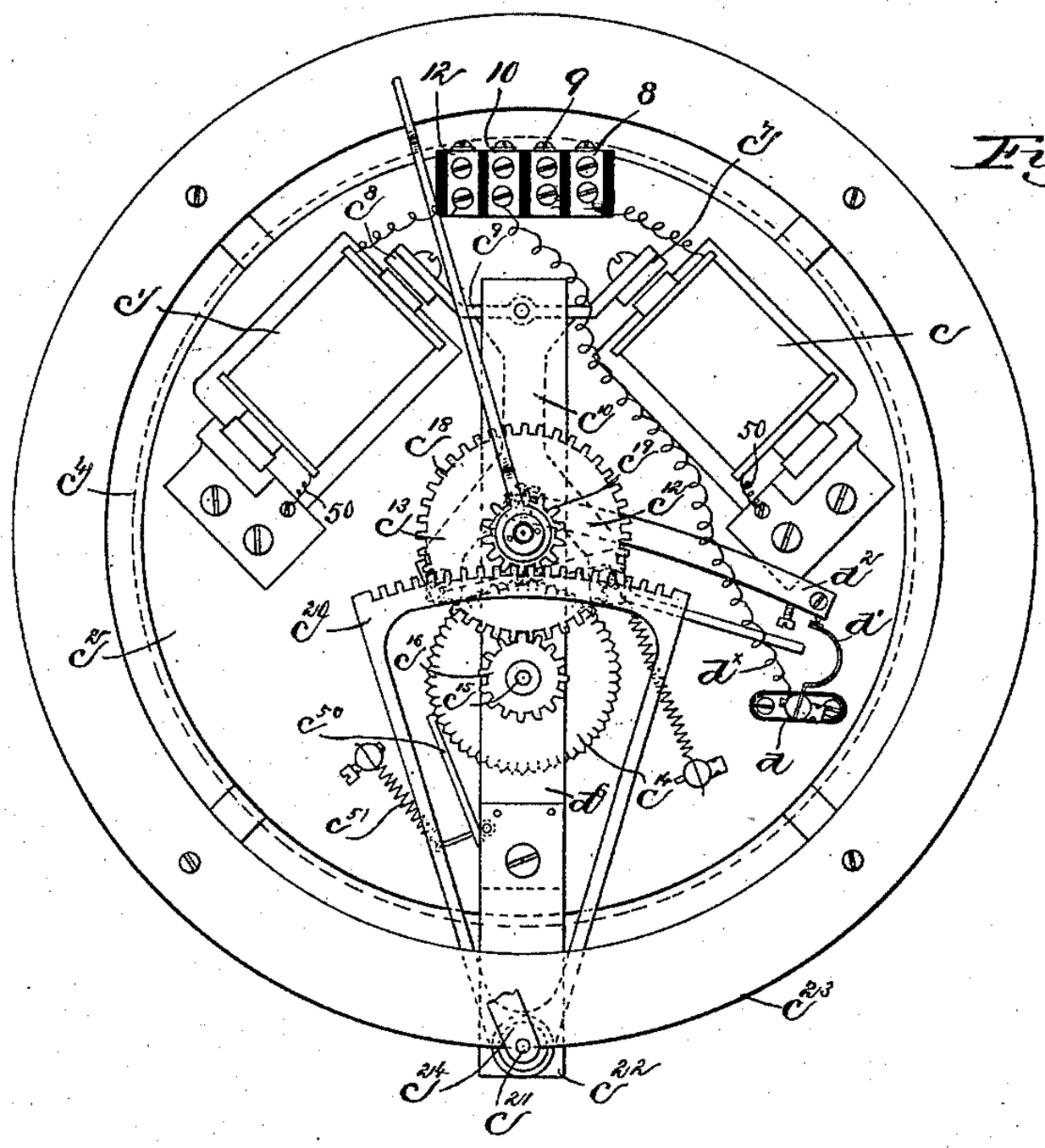


Fig: 6.

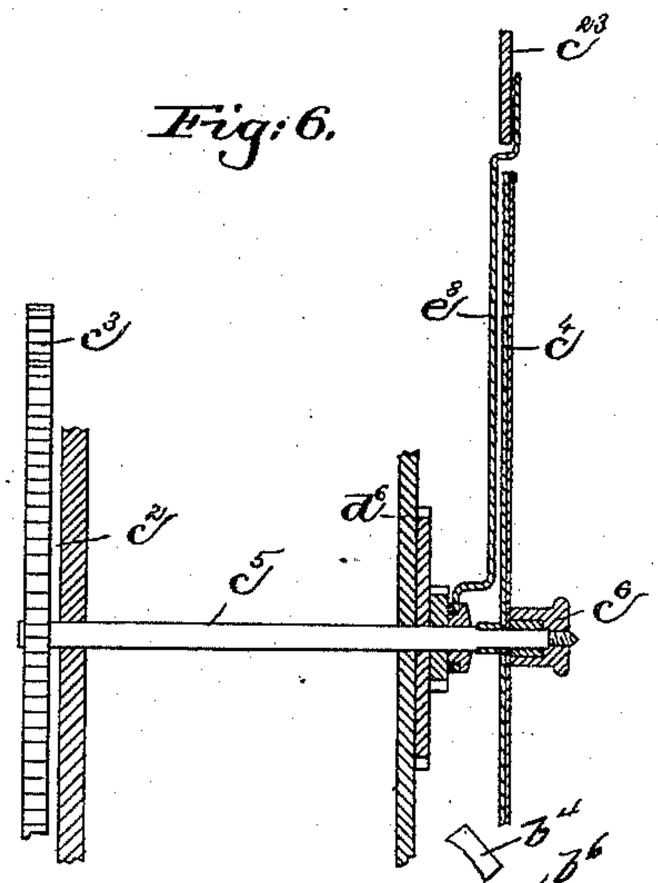


Fig: 7.

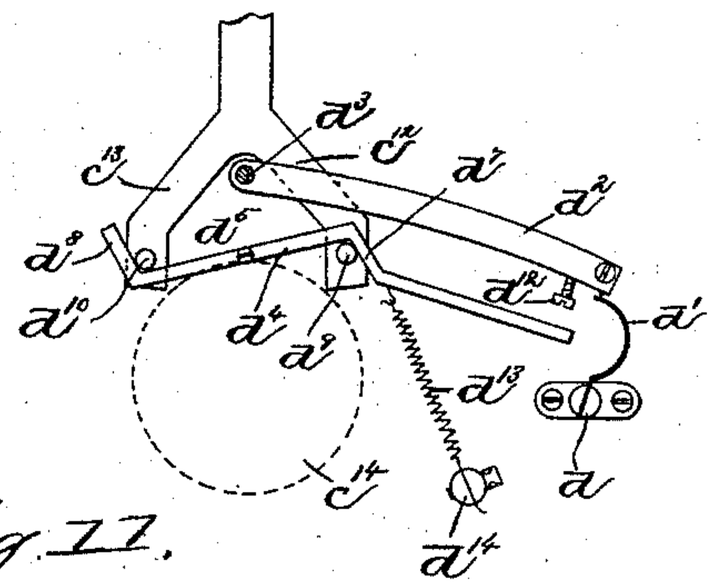
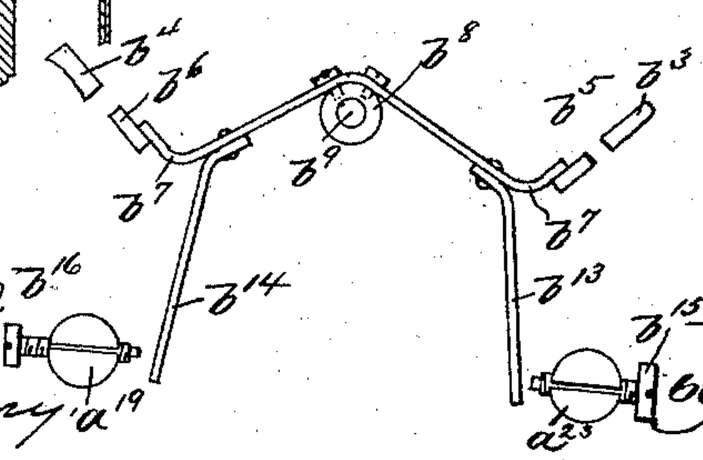


Fig: 11.



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(No Model.) 4 Sheets—Sheet 4.

F. J. DIBBLE.

TELETHERMOMETER.

No. 474,771. Patented May 10, 1892.

Fig: 10.

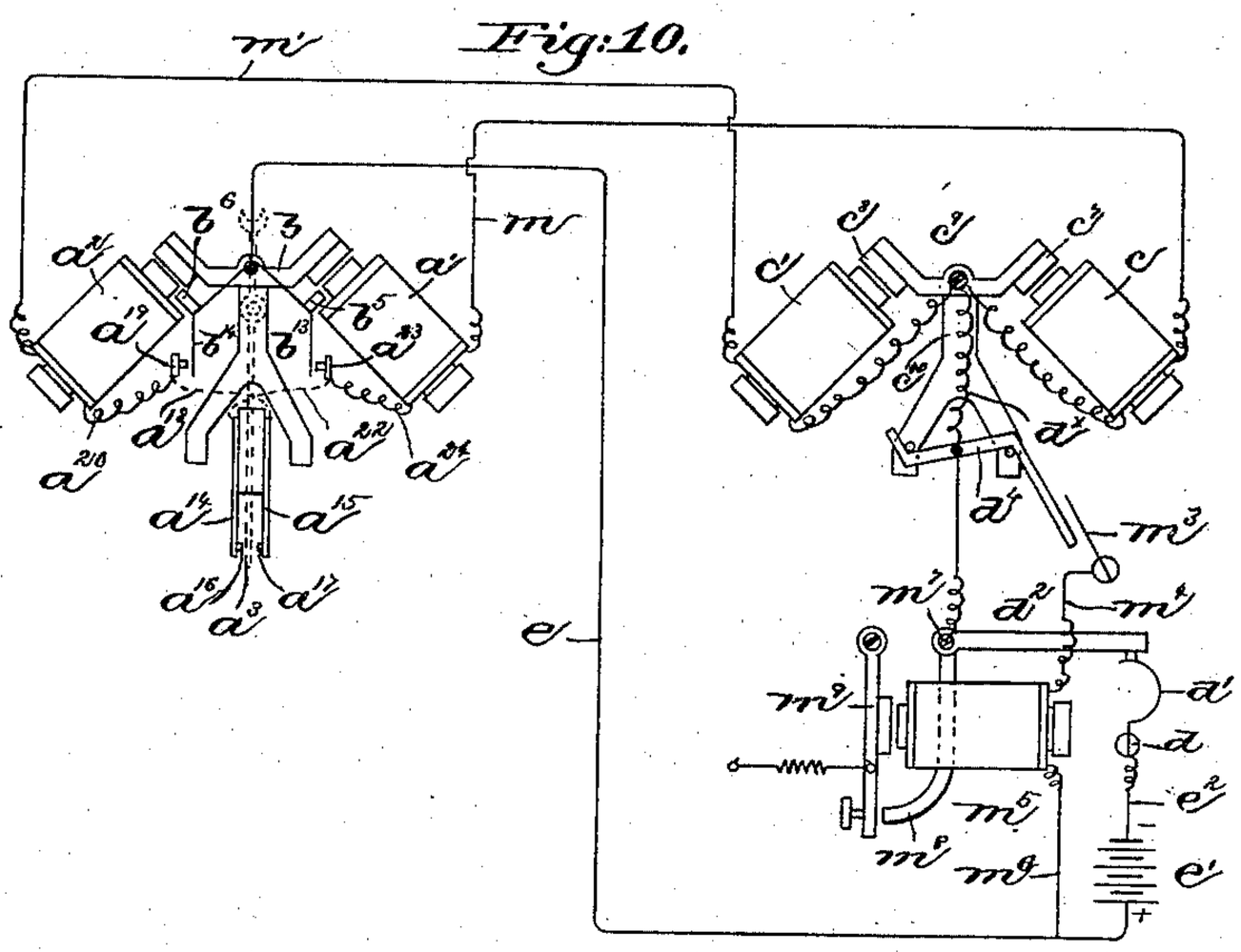


Fig: 9.

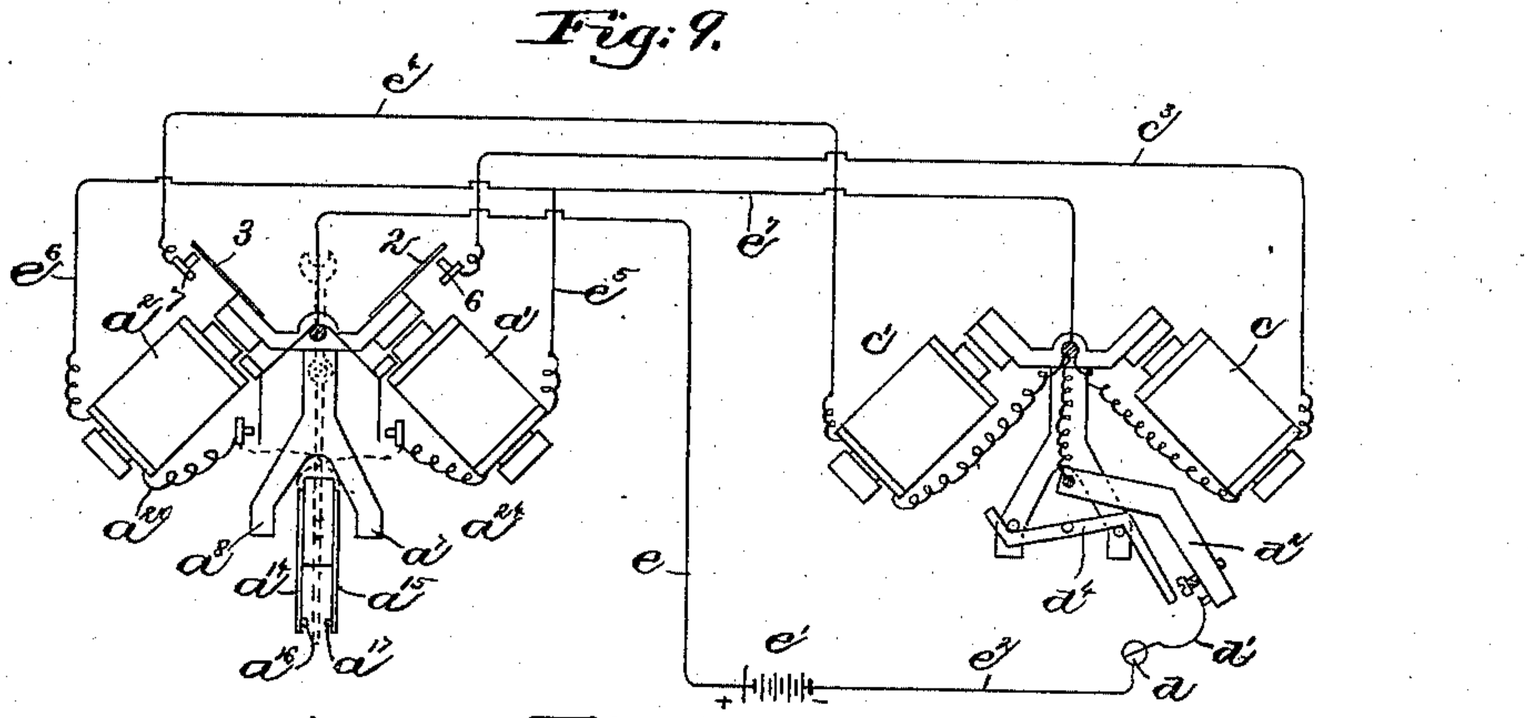
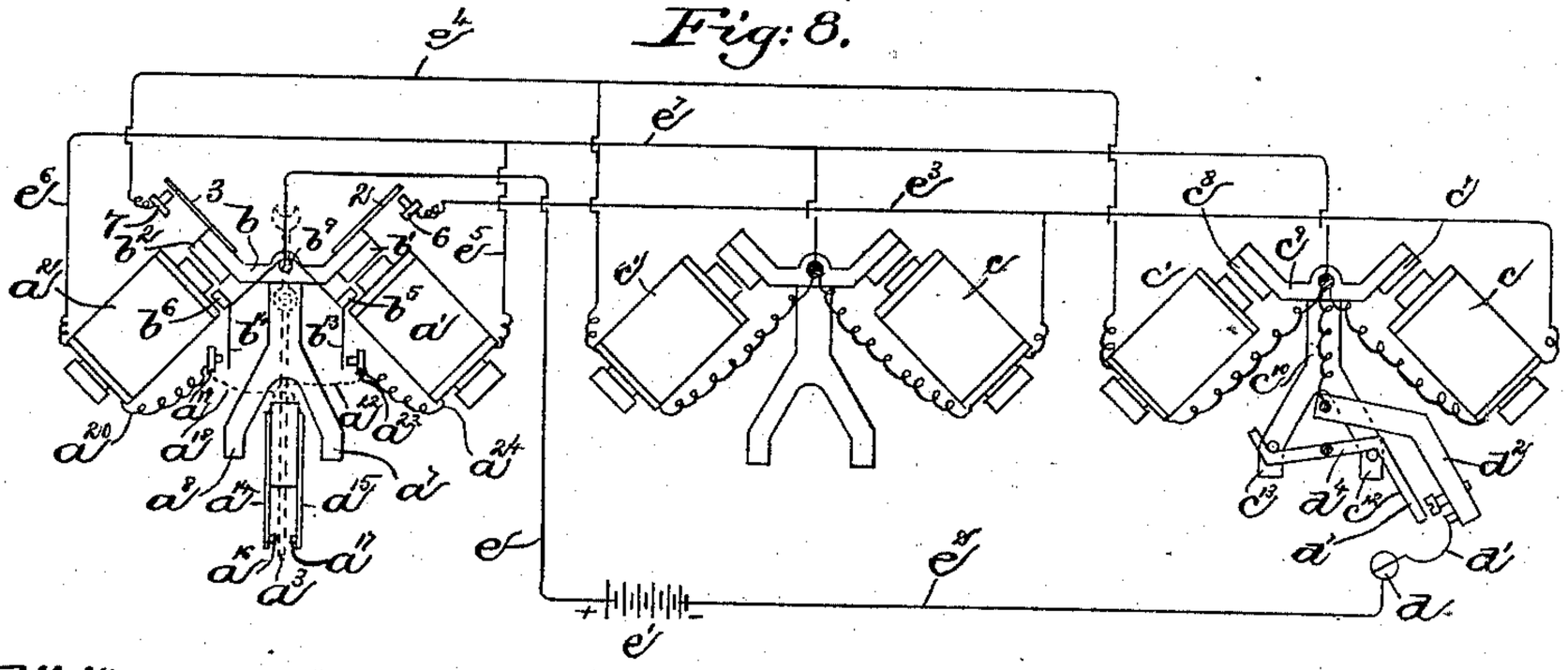


Fig: 8.



Witnesses.
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Laurence L. Emery.

Inventor.
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by Crosby & Gregory
Attys.

UNITED STATES PATENT OFFICE.

FERNANDO J. DIBBLE, OF PEABODY, MASSACHUSETTS, ASSIGNOR TO THE TELEMETER COMPANY, OF NEW YORK.

TELETHERMOMETER.

SPECIFICATION forming part of Letters Patent No. 474,771, dated May 10, 1892.

Application filed January 24, 1889. Serial No. 297,398. (No model.)

To all whom it may concern:

Be it known that I, FERNANDO J. DIBBLE, of Peabody, county of Essex, State of Massachusetts, have invented an Improvement in Telemeter Systems, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention relates to telemeter systems in which variations of temperature, pressure, or other similar changing force or phenomena occurring at one locality or station may be transmitted to another or distant locality or station and there be recorded, my present invention being an improvement upon the telemeter system shown and described in United States Patent No. 327,526, granted to Charles L. Clarke, dated October 6, 1885.

One feature of my present invention consists in providing the transmitting apparatus with a solid pallet operating the ratchet-wheel which imparts motion to the pointer or index of the said instrument, the said pallet having secured to or forming part of it the armature of the electro-magnets forming part of the said instrument.

Another feature of my invention consists in a novel arrangement of circuits, as will be described.

Still another feature of my invention consists in joining together the armatures controlling the shunt-circuits, so that but one shunt-circuit at a time can be closed.

My invention further consists in providing the receiving apparatus with a solid pallet, and also with a novel circuit-breaker operated by the said pallet when moved in either direction by either of the receiving-magnets.

My invention also consists in providing the receiving-instrument with a recording-dial inclosed within the case of the said receiving-instrument and located within the indicating-dial of the said receiving-instrument, substantially as will be described.

The particular features in which my invention consists will be pointed out in the claims at the end of this specification.

Figure 1 shows in section and elevation the transmitting apparatus employed by me as connected to the case containing a metallic thermometer, the latter and its case and the dial of the transmitter being shown in section; Fig. 2, a front elevation of the transmitter shown in Fig. 1, looking toward the left, with the dial, its co-operating pointer, and the gears employed to rotate the latter being omitted, the said gears being indicated by dotted lines; Fig. 3, a bottom or back view of the transmitter shown in Fig. 1 to more clearly show the contact-points at which the electrical circuits are first closed; Fig. 3ª, a detail to be referred to. Fig. 4 is a top or plan view of the receiving and recording instrument. Fig. 5 is a top or plan view of the receiving-instrument with the recording-dial removed and the arm carrying the recording-pen broken off. Fig. 6 is a sectional detail to be referred to; Fig. 7, a detail of the circuit-closer and circuit-breaker carried by the receiving-instrument; Fig. 8, a diagram of circuits, showing one transmitting apparatus and two receiving apparatuses; Fig. 9, a diagram of circuits, showing but one transmitting and one receiving instrument; Fig. 10, a diagram of a modified arrangement of circuits to be referred to; and Fig. 11 a detail, on an enlarged scale, to more clearly show the winker-armature.

Referring to Fig. 1, the case A, containing the thermometer A′, has secured to it a transmitting apparatus A^2, consisting of a bed-plate a, to which are secured two sets of magnets a' a^2, the circuits of which are controlled, as herein shown, by the pointer a^3, actuated by the expansion and contraction of the metallic thermometer A′, caused by changes of temperature in the locality in which the transmitting-instrument is placed. The plate a has pivoted to its rear side a segmental gear a^4, (see Fig. 3,) in mesh with a pinion a^5 on the arbor of the ratchet-wheel a^6, provided with ratchet-teeth, each of which has its sides oppositely inclined at substantially the same angle, so that the said ratchet-wheel may be rotated in opposite directions, as will be described, by the pallets a^7 a^8, (see Figs. 2 and 3ª,) secured to or forming part of a bar a^9, pivoted on a shaft or arbor a^{10}. The segmental arm a^4 has secured to it a bar a^{12}, having at its front end, as shown, a block a^{13} of insulating material, the said block having secured to its opposite sides contact-arms a^{14}

a^{15}, provided with contact-points a^{16} a^{17}, with which co-operate the metallic pointer a^3. The contact-arm a^{15} is connected by the fine wire a^{18} (see Fig. 3) to a post a^{19}, connected, as by wire a^{20}, (see Fig. 2,) to the magnet a^2, and the contact-arm a^{14} is connected by the wire a^{22} to the post a^{23}, electrically connected by a wire a^{24} with a magnet a'.

The pallet-bar a^9 has secured to or forming part of it a yoke b, (see Figs. 2 and 3^a,) to which are secured the armatures b' b^2 of the magnets a' a^2, respectively, so that when one magnet, as a', attracts its armature b' the armature b^2 of the other magnet a^2 will be thrown or moved out of the influence of the said magnet by the said yoke. The yoke b has secured to its opposite ends contact-springs 2 3, (see Fig. 2,) which co-operate with contact-points (shown as screws 4 5) inserted through posts 6 7, herein shown as secured to the case a. The magnets a' a^2 are provided with extended pole-pieces b^3 b^4, with the sides of which co-operate auxiliary armatures b^5 b^6, respectively, (see Fig. 2,) the said auxiliary armatures being hereinafter designated by me as "winker-armatures." The winker-armatures b^5 b^6 are preferably connected to the arms of the yoke b^7, secured to a hub b^8, fast on a shaft b^9, and held in a central position, as herein shown, by a spring b^{10}, acting on a post b^{12}, secured to the plate a. The arms of the yoke b^7 have secured to them contact arms or springs b^{13} b^{14}, which co-operate with contact-points (shown as screws b^{15} b^{16}) adjustable in the upright posts a^{23} a^{19}. The ratchet-wheel a^6 is rotated in opposite directions by the magnets a' a^2 attracting their armatures, as will be described, and is held fixed or stationary, when the said armatures are unattracted, by a pawl b^{20}, acted upon by a spring b^{22}, (see Fig. 2,) the said pawl assisting to complete the movement of the ratchet-wheel the distance of one tooth, as will be described.

The transmitting-instrument has connected to it, as will be described, one or more receiving-instruments, each provided with magnets c c', supported by a base-plate c^2, having secured to it a suitable clock mechanism, only one gear-wheel c^3 of which is shown in Fig. 6, the said clock-work being of any usual or well-known construction and having its gears regulated to revolve a recording-dial c^4, secured to the arbor c^5, as by thumb-nut c^6, once in twenty-four hours, or it may be any other desired duration of time in which a record is to be made. The magnets c c' are provided with armatures c^7 c^8, fastened to or forming part of a yoke c^9, which is itself secured to or forms part of a pallet-bar c^{10}, provided with pallets c^{12} c^{13}, substantially as shown in connection with the transmitting-instrument. The pallets c^{12} c^{13} actuate a ratchet-wheel c^{14} on a shaft c^{15}, provided with a pinion c^{16}, which meshes with a gear-wheel c^{19}, meshing with the segmental arm c^{20}, mounted on a shaft c^{21}, having bearings in an arm c^{22}, supported by the plate c^2 and extended therefrom beyond the graduated ring c^{23}, the latter being shown plain or unmarked in Fig. 5. The ratchet-wheel c^{14} is similar in construction to the wheel a^6, it being provided with teeth, each having its sides oppositely inclined at substantially the same angle, so that the said wheel may be rotated in opposite directions. The ratchet-wheel c^{14} is held stationary when not engaged by the pallets c^{12} c^{13} by a pawl c^{50}, held in engagement with the said ratchet-wheel by a spring c^{51}, the said spring-actuated pawl assisting to rotate the said ratchet-wheel one step or tooth. The shaft c^{21} has mounted upon it above the graduated ring c^{23} an arm c^{24}, carrying a pen or other indicating or recording device, (not shown,) by which a permanent record may be made upon the graduated dial c^4 in usual manner.

The recording-instrument in practice will be contained in a suitable casing or box. (Not shown.)

The receiving-instrument, as shown in Fig. 5, is provided with four connecting-plates 8, 9, 10, and 12, the plate 9 being in electrical connection with the base-plate c^2 of the instrument and the remaining plates insulated from said base-plate. The plate 8 is connected to the magnet c and the plate 12 to the magnet c', and both magnets are electrically connected, as by wire 50, through the base-plate c^2 with the connecting-plate 9, while the plate 10 is connected, as by wire $d^\times$, to the post d, insulated from the base-plate c, supporting one member d' of a circuit-closer, the co-operating member d^2 of which is shown as a bar or arm which is mounted on a pivoted shaft d^3, (see Fig. 7,) supported by the base-plate c^2, and the bar d^6, supported above the said base-plate, the said arm being normally brought by gravity in contact with the member d'. The contact member d^2 is raised out of contact with the member d' by a circuit-breaker, shown as a bar d^4, secured to a shaft d^5, having bearings in the base-plate c^2, and a thin bar d^6. The bar d^4 is extended across the pallets c^{12} c^{13}, and is bent in opposite directions to form arms d^7 d^8, with which co-operate studs d^9 d^{10}, carried by the pallets c^{12} c^{13}, respectively, the arm d^7 being prolonged, as shown in Fig. 7, to engage a screw or stud d^{12}, carried by the arm d^2, the said arm being normally held in engagement with the stud d^{12}, when the pallets are out of engagement with the teeth of the wheel c^{14}, by a spring d^{13}, having one end secured to the said arm and its opposite end fastened to a post d^{14}, secured to the plate c^2. The arms d^7 d^8 of the bar d^4 extend in opposite directions, and the studs d^9 d^{10} are located on opposite sides of the said bar, so that when the yoke c^9 is moved in one direction, as by the magnet c, the stud d^{10} will ride up the inclined arm d^8 and bring the arm d^7 in engagement with the stud d^{12} and lift the bar d^2 from the contact member d', and also when the yoke is moved by the magnet

c' the stud d^9 will act upon the arm d^7 and move it in the same direction to lift the bar d^2 out of engagement with the contact member d'. It will thus be seen that when either magnet is energized the circuit-breaker is rendered operative. Referring to Fig. 8, the bed-plate of the transmitter is connected by a wire e to one pole of the battery e', and the post d of one of the receiving-instruments is connected to the other pole of the battery by the wire e^2.

The post 6 of the transmitting-instrument is connected by wire e^3 to the magnet c of the receiving-instrument, and the post 7 by the wire e^4 to the magnet c' of the receiving-instrument, and the magnets a' a^2 of the transmitting-instrument are connected by wires e^5 e^6 to a common wire e^7, connected to the base-plate of the receiving-instrument.

In the operation of my improved telemeter system the pointer e^8 of the receiving-instrument and the pointer e^9 of the transmitting-instrument are first adjusted to indicate the same temperature—namely, the normal temperature of the locality in which the transmitting-instrument is situated and the variations from which it is desired to register on the receiving-instrument. In case the temperature falls below or rises above the normal in the locality in which the transmitting-instrument is located, the pointer a^3 will be moved by the thermometer A′ into contact with one or the other of the contact-points a^{16} a^{17} on the arms a^{14} a^{15}, thus energizing one or the other of the magnets a' a^2, and through the armatures of the said magnets energizing the magnets c c' of the receiving-instrument, thereby causing the arm c^{24} to be moved over the graduated dial c^4 and leave thereon a permanent record of the variations from the normal at the transmitting-instrument.

Referring to Fig. 8, let it be supposed that the pointer a^3 is brought in contact with the contact member a^{16}. In this instance the circuit through the magnet a' is closed, which circuit may be traced as follows: from the positive pole of the battery by wire e to the pointer a^3, thence the arm a^{14}, wire a^{22} to post a^{23}, and wire a^{24} to the magnet a', and from the magnet a' by wires e^5 e^7 and base-plate c^2 of the receiving-instrument to the contact-arm d^2, and thence through the contact member d' and wire e^2 to the battery. As soon as the magnet a' is energized it first attracts the winker-armature b^5, which completes a shunt-circuit around the contact-point a^{16}, the shunt-circuit being completed through the magnet a'. As soon as the pointer completes the circuit of the magnet through the contact-point a^{16} a light current passes through the said magnet, energizing it sufficiently to attract the winker-armature, while the armature b' remains at rest. As soon as the shunt-circuit is completed by the winker-armature a stronger current passes through the magnet by means of stronger contact at the arm b^{13} and the armature b' is attracted, bringing the spring 2 in contact with the post 6, thus dividing the current from the battery, so that a part passes to the line e^7 through the magnet a', while the remaining portion passes to the line from the base-plate through the yoke b and spring 2. The divided circuit around the magnet a' may be traced as follows: from the battery e' by wire e to the bed-plate, thence by the yoke b, arm 2, and post 6, and wire e^3 to the magnet c of the receiver, through the bed-plate, the arm d^2, contact member d', and wire e^2 to the battery. As the magnet c of the receiver is energized, its armature c^7 is attracted and the pallet c^{12} rotates the ratchet-wheel c^{14} one step, thereby moving the recording-arm c^{24} by means of the segmental gear c^{20}, thus leaving a permanent record on the graduated dial c^4. As the pallet c^{12} rotates the ratchet-wheel c^{14}, the bar d^4 is moved, as described, to lift the contact member d^2 from the contact member d', and thus break the circuit through the transmitter, permitting the armature b' and winker-armature b^5 to be restored to their normal positions, as shown by a spring, such as b^{10}. If the pointer a^3 is brought into engagement with the contact-point a^{17}, the magnet a^2 is energized in a similar manner and the circuit of the magnet c' completed by the arm 3 and post 7, and the shunt around the contact-point a^{17} completed through the arm b^{14} and post a^{19}, the armature c^8 being thus attracted and the ratchet-wheel c^{14} moved in the opposite direction by the pallet c^{13}, thus moving the arm c^{24} in the opposite direction from that in which it was moved by the pallet c^{12}, leaving a permanent record on the dial with the variation in the posite direction.

In Fig. 8 I have shown two receiving-instruments connected to the transmitting-instrument and the circuit-breaker located at the most remote receiving-instrument; but instead thereof any desired number of receiving-instruments may be connected to the transmitting-instrument, there being a single receiving-instrument shown in Fig. 9. So, also, the circuit-breaker may be connected to any one of the receiving-instruments. I prefer to employ the arrangement of circuits shown in Figs. 8 and 9; but instead thereof I may employ the arrangement of circuits shown in Fig. 10, wherein the magnets a' a^2 of the transmitting-instrument are respectively connected by wires m m' to the magnets c c' of the receiving-instrument. One pole of the battery e', as the positive pole, is connected to the base-plate of the transmitting-instrument by wire e. The arm d^4, operated by the pallet-bar a^9, forms one member of a circuit-closer in the arrangement of circuits shown in Fig. 10, the co-operating member m^3 of which is connected by wire m^4 to an electro-magnet m^5, also connected by wire m^6 with the positive wire e. The negative pole of the battery is connected by the wire e^2 to the post d, to which is secured the member d' of the circuit-closer, the co-oper-

ating member d^2 of which is shown as an elbow-lever pivoted as at m^7 and having its arm m^8 in position to be acted upon by the armature m^9 of the electro-magnet m^5.

With the arrangement shown in Fig. 10 the circuit of the battery is first closed at one of the contact-points—as, for instance, the contact-point a^{16}—and the circuit completed through the magnet a', the said circuit being traced as follows, viz: from the positive pole of the battery by wire e, pointer a^3, contact-point a^{16}, bar a^{14}, wires a^{22} a^{24}, through the magnet a', thence by wire m to magnet c, through the magnet c to the bed-plate c^2 of the receiving-instrument, thence by wire $d^\times$, circuit-closer d^2 d', and wire e^2 to the negative pole of the battery. As soon as the circuit is completed through the magnet a' the shunt-circuit around the contact-point a^{16} is completed through the magnet a' by the arm b^{13} and post a^{23}, and on the passage of the current through the magnet c the pallet-bar c^{10} brings the bar d^4 in contact with the member m^3, thus closing the circuit of the electro-magnet m^5, which is located in a shunt-circuit around the battery. The magnetizing of the magnet m^5 attracts its armature m^9, and the latter strikes the arm m^8 of the circuit-closing lever d^2 and turns said lever on its pivot and lifts it out of contact with the member d', thus breaking the battery-circuit after the record has been made on the receiving-instrument. It will be noticed that the circuit-breaker acts as a centering device by which the pallets c^{12} c^{13} are brought to their central or normal position as soon as the circuit is broken, thus bringing the armatures of the magnets equal distances from the poles of the said magnets and insuring the operation of the receiving-instrument. The centering device for the transmitter is shown in Fig. 2 as two springs m^{20} m^{21}, acting on a stud m^{22}.

I have herein described my improved apparatus as employed for recording variations in temperature; but I do not desire to limit my invention to this particular use, as it may be employed equally as well to indicate other phenomena.

I claim—

1. The combination, with a battery, of a transmitting apparatus provided with a pointer to automatically complete the battery-circuit and also provided with an electro-magnet in circuit with said battery, a shunt-circuit through said magnet and around said circuit-closing pointer, a second or divided circuit around said magnet, a receiving apparatus having an electro-magnet placed in said divided circuit and which constitutes both a receiving-magnet and a circuit-breaking magnet as well, recording mechanism controlled by movement of the armature of said receiving and circuit-breaking magnet, and a circuit-breaker also operated by movement of said armature to break the battery-circuit, substantially as described.

2. The combination, with a battery, of a transmitting apparatus having a pointer connected to said battery, two contact-points, electro-magnets connected to said contact-points, armatures of said magnets connected together to move simultaneously in opposite directions with relation to their respective magnets, a shunt-circuit around said contact-points, completed by the attraction of the armature of the magnets, and a receiving-instrument having electro-magnets in the said shunt-circuits, and armatures for said magnets connected together to move simultaneously in opposite directions, a toothed surface, and a pallet-bar connected to said armatures and provided with pallets to engage said toothed surface, substantially as described.

3. In an electrical instrument, the combination, with two magnets, of armatures for said magnets, connected together to move simultaneously in opposite directions with relation to their respective magnets, a ratchet-wheel having the sides of its teeth oppositely inclined at substantially the same angle, a pallet-bar connected to said armatures and provided with pallets normally disengaged from said ratchet-wheel and a spring-actuated pawl to assist in moving the ratchet-wheel, and a centering-device to restore the pallet-bar to its normal position with its pallets disengaged from the ratchet-wheel when the circuit of the operating-magnet is broken, substantially as described.

4. In an electrical instrument, the combination, with two magnets, of armatures for said magnets, connected together to move simultaneously in opposite directions with relation to their respective magnets, and auxiliary or winker armatures for said magnets, connected together to move simultaneously in opposite directions, substantially as and for the purpose specified.

5. In an electrical instrument, the combination, with two magnets, of armatures for said magnets, connected together to move simultaneously in opposite directions with relation to their respective magnets, a pallet-bar provided with pawls, and a bar, as d^4, connected to the said pawls, whereby one arm or end of the said bar is moved positively in the same direction on the movement of the pallet-bar in either direction, substantially as described.

6. The combination, with an electrical receiving-instrument provided with electro-magnets and a pointer and an indicating ring or dial and a clock mechanism to move said pointer, of a recording-dial located in front of the receiving-instrument within the indicating-ring, a recording-instrument, the arm c^{24}, to which the recording-instrument is connected, and a segmental gear connected to said arm and actuated by the said electro-magnets to move said recording-instrument over the said dial, substantially as described.

7. The combination, with a pallet-bar hav-

ing pawls, of a centering device therefor, consisting of the bar d^4, having arms to engage said pawls, substantially as described.

8. The combination, with a battery, of a transmitting apparatus having a pointer connected to said battery, two contact-points, electro-magnets connected to said contact-points, main armatures for said magnets, connected together to move simultaneously in opposite directions, and winker-armatures for said magnets, connected together to move simultaneously in opposite directions, a shunt-circuit around said contact-points, completed by the winker-armatures, and a divided circuit completed by the attraction of the main armatures of the said magnets, and a receiving-instrument having electro-magnets in the shunt or divided circuits, armatures for said magnets, connected together to move simultaneously in opposite directions, a toothed surface, and a pallet-bar connected to said armatures and provided with pallets to engage said toothed surface, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FERNANDO J. DIBBLE.

Witnesses:

JAS. H. CHURCHILL,

FREDERICK EMERY.