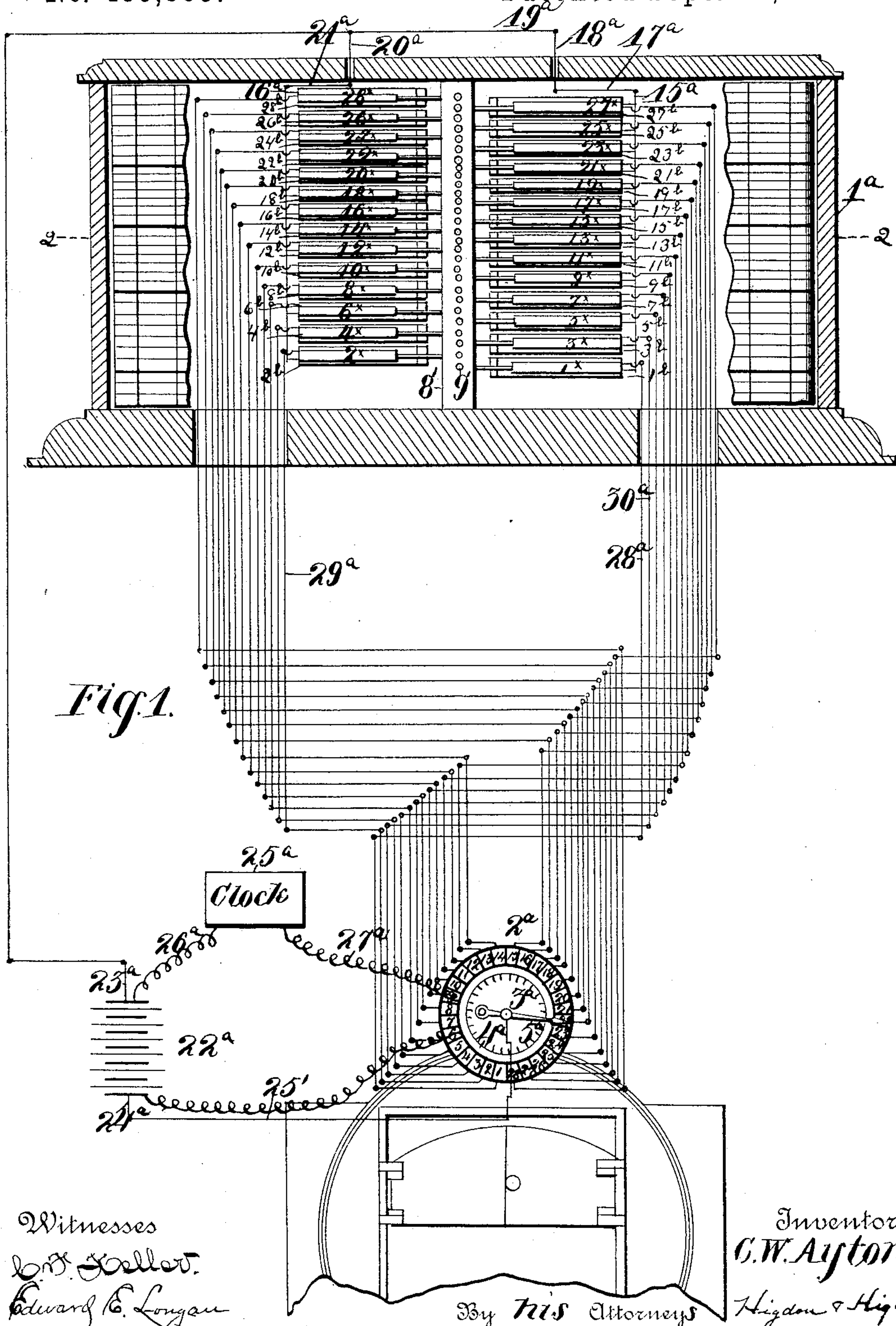


C. W. AYTON.

ELECTRICAL RECORDER FOR VOLTMETERS, THERMOMETERS, &c.

No. 459,863.

Patented Sept. 22, 1891.



Witnesses  
L. B. Keller.  
Edward C. Longan

By *his* Attorneys

Inventor  
C. W. Ayton.  
Higdon & Higdon

C. W. AYTON.

ELECTRICAL RECORDER FOR VOLTMETERS, THERMOMETERS, &c.

No. 459,863.

Patented Sept. 22, 1891.

Fig. 2.

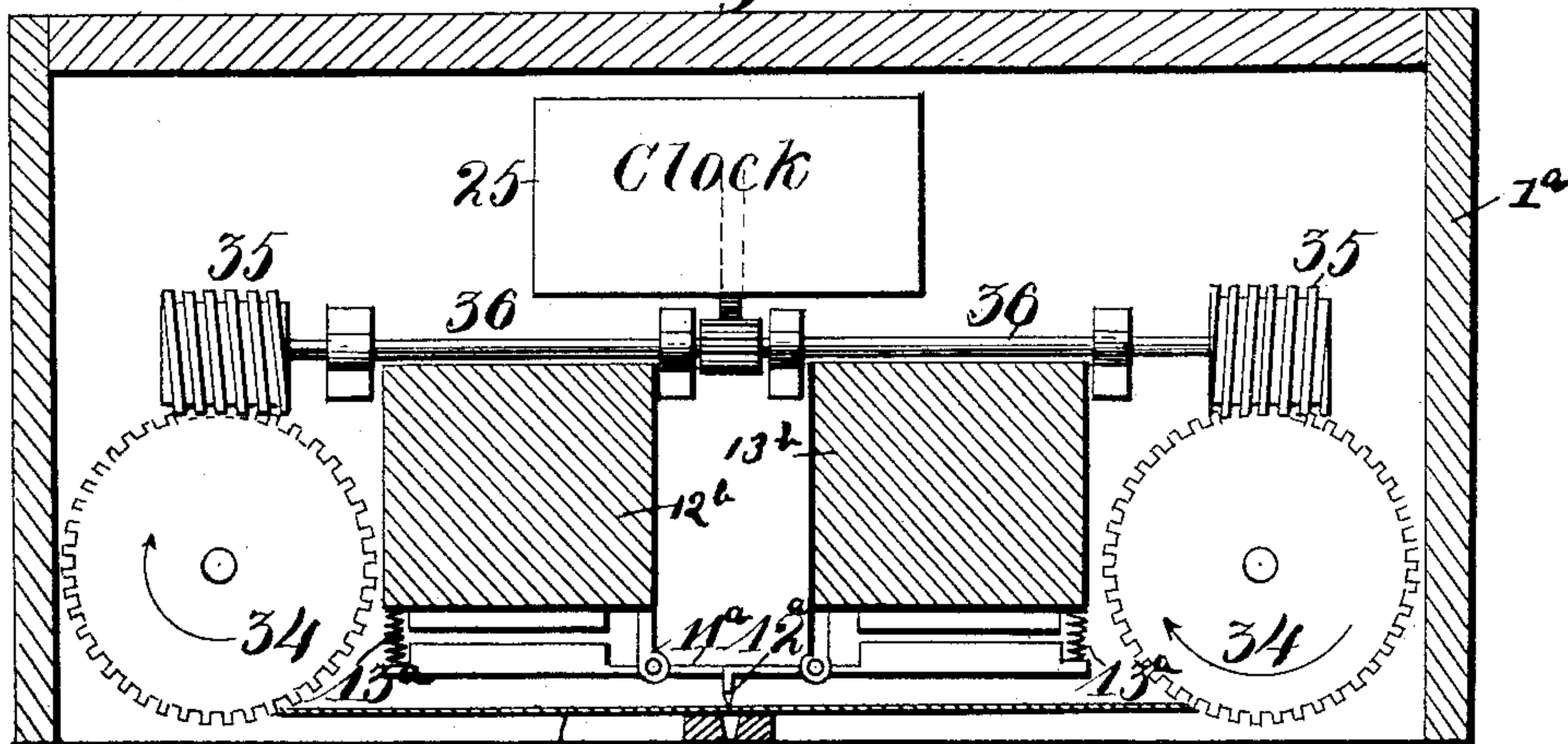


Fig. 3.

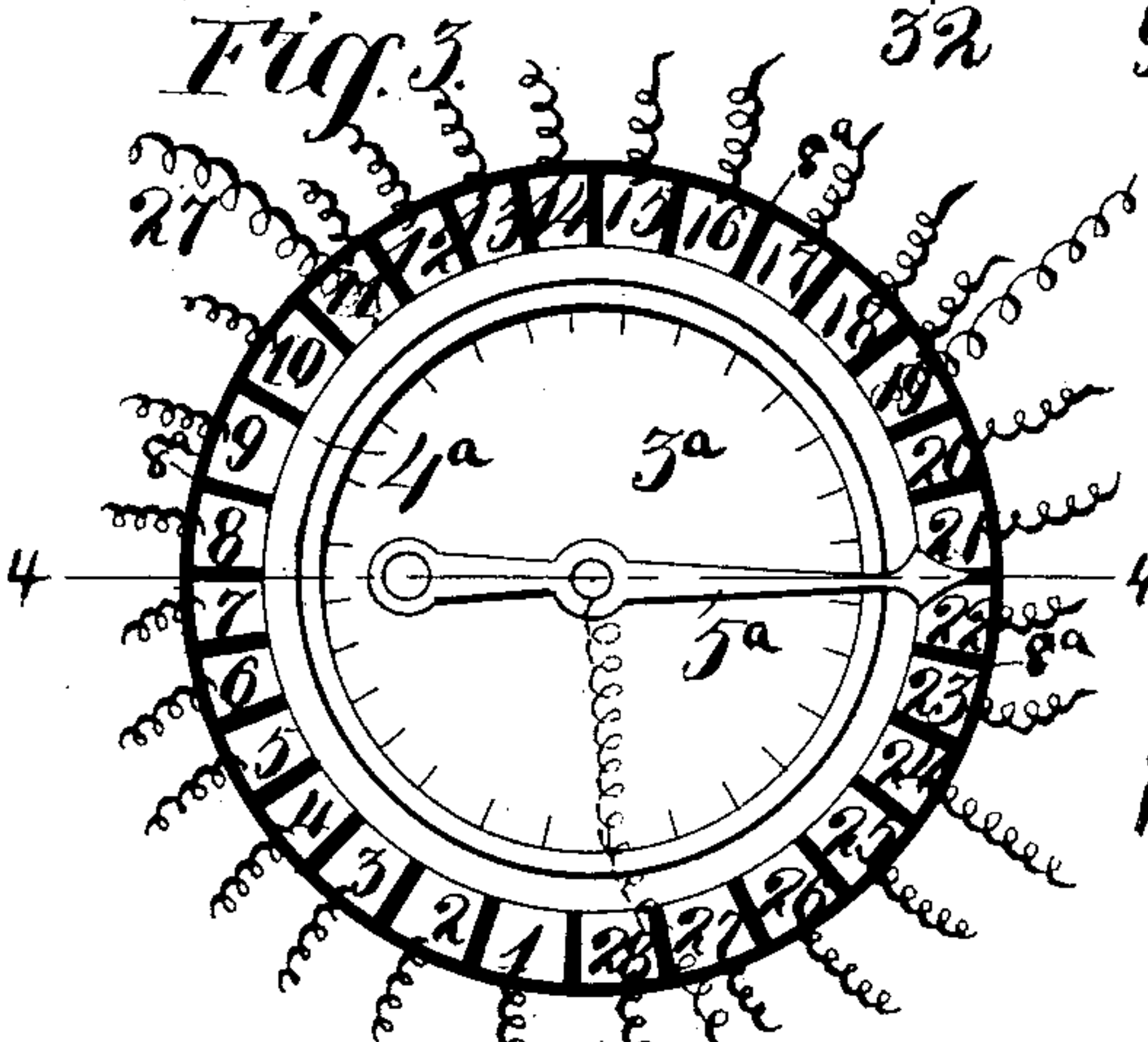


Fig. 5.

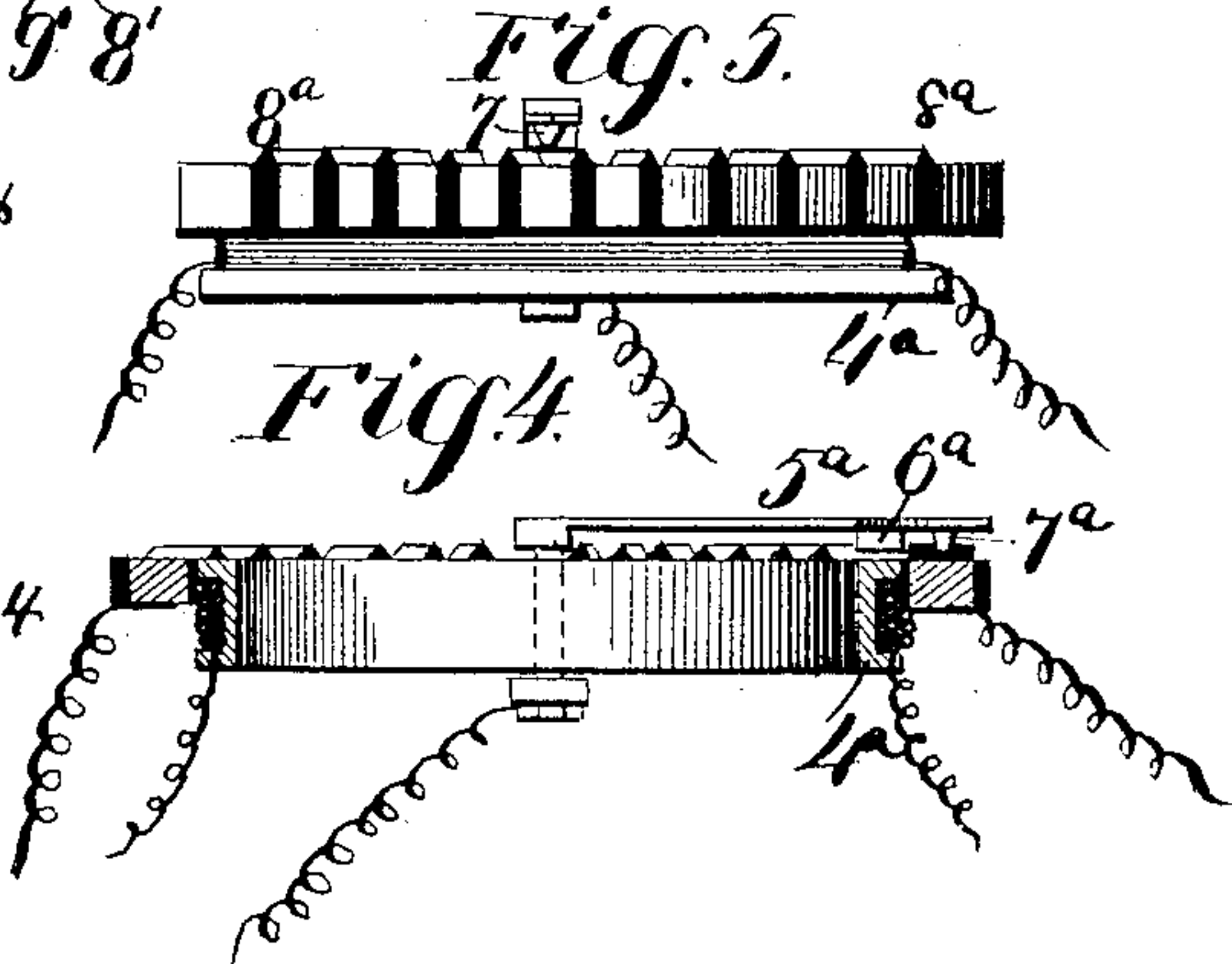


Fig. 4.

Fig. 6.

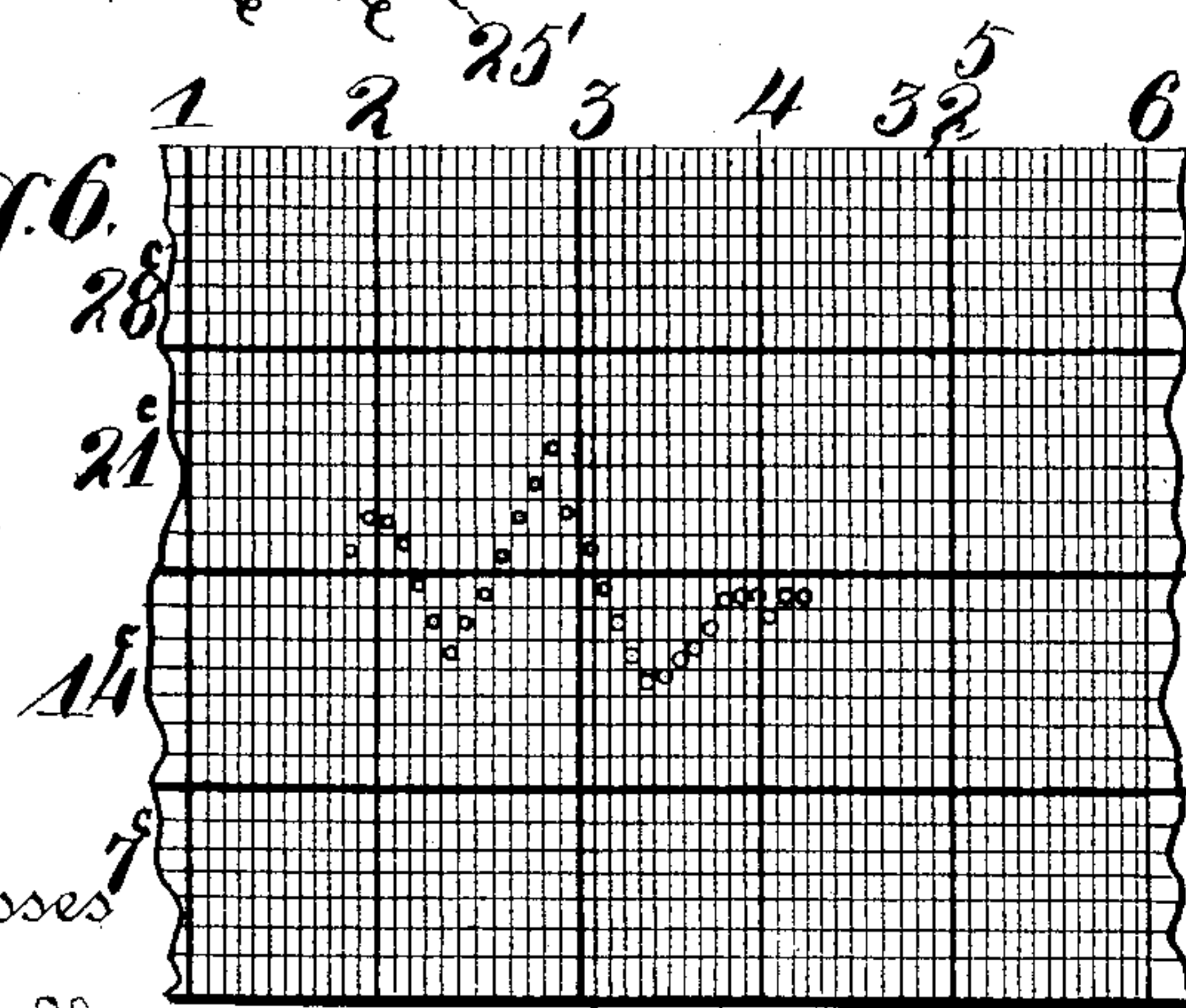
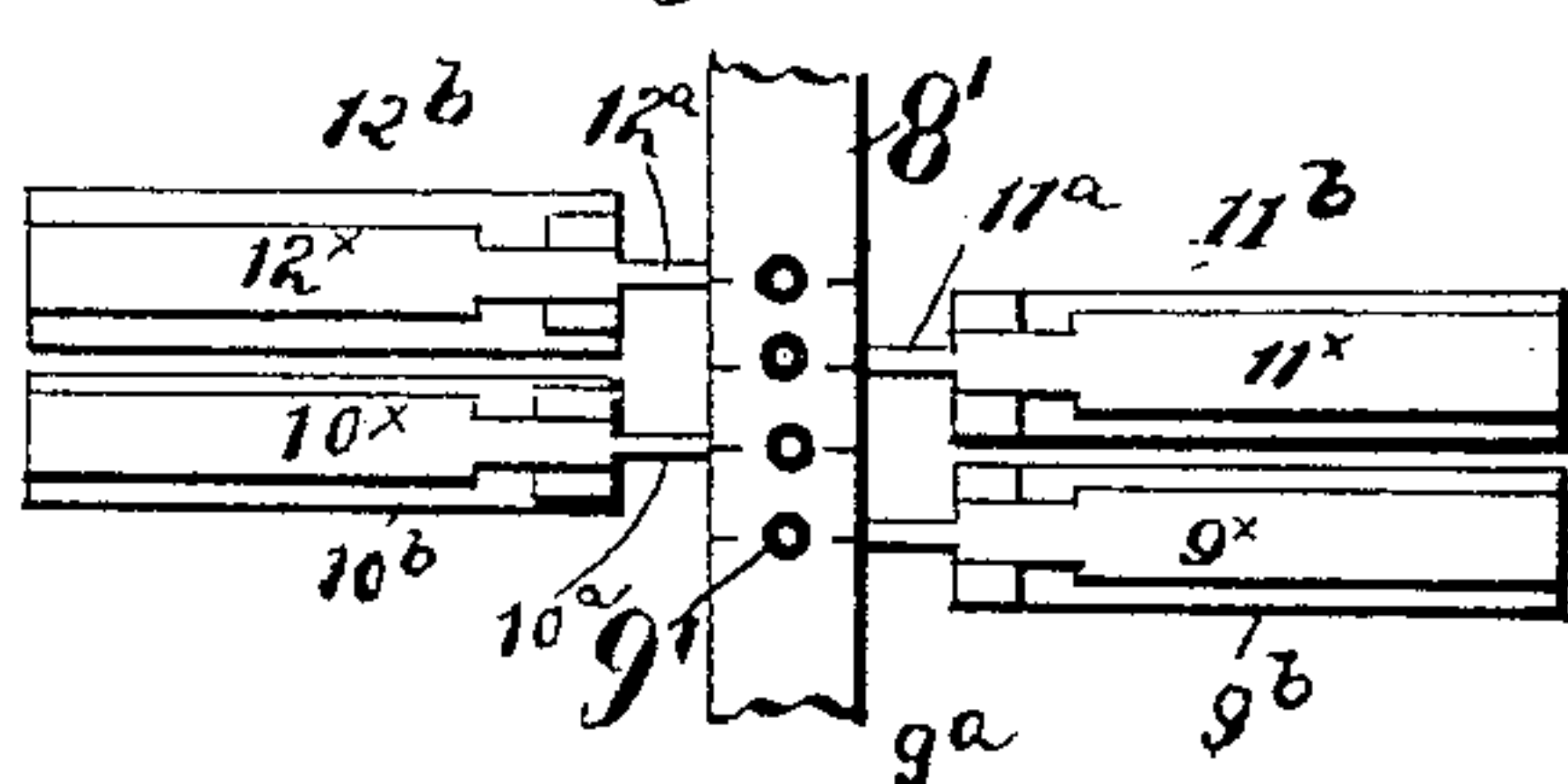


Fig. 7.



Witnesses

D. S. Keller.

Edward E. Longan,

Inventor

C. W. Ayton.

By his Attorneys Higdon & Higdon



# UNITED STATES PATENT OFFICE.

CHARLES WM. AYTON, OF ST. LOUIS, MISSOURI.

ELECTRICAL RECORDER FOR VOLTMETERS, THERMOMETERS, &c.

**SPECIFICATION** forming part of Letters Patent No. 459,863, dated September 22, 1891.

Application filed March 23, 1891. Serial No. 386,073. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES WM. AYTON, of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Electric Recorders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to improvements in electric recorders; and it consists in the novel arrangement and combination of parts, as will be more fully hereinafter described, and designated in the claims.

In the drawings, Figure 1 is a front elevation of a recorder, a steam-gage, and also a diagrammatic view showing the electrical connections between said recorder and gage, a battery, and any circuit breaking and closing clock. Fig. 2 is a horizontal cross-section taken on the line 2 2, Fig. 1, showing the construction of the magnets and armatures for the same and the manner in which the graduated record-paper is moved by clock mechanism. Fig. 3 is an enlarged top plan view of a graduated dial which I employ in carrying out my invention, with the mechanism located around the same. Fig. 4 is a cross-section taken on the line 4 4 of Fig. 3, especially showing the construction of the electro-magnet which I employ in carrying out my invention. Fig. 5 is a side elevation of the graduated dial, especially showing the form of the insulating material which is interposed between the metallic segments which I employ in carrying out my invention. Fig. 6 shows a graduated record-paper which I preferably employ in carrying out my invention; and Fig. 7 is a front elevation of the recorder, showing the position of the magnets relative to each other.

The object of my invention is to construct a device for recording purposes, the same designed to be operated by the action of electricity, and I desire to premise my specification by asserting that the principle which I employ for recording purposes may be extended and applied to a voltmeter, Ampère meter, thermometer, or anything of similar mechanism that has a metallic indicating-needle or a needle provided with a metallic

armature, so as to be susceptible of being attracted by the electro-magnet which I employ in carrying out my invention.

While it is evident that my invention may be applied to various meters, and especially to those referred to above, I will only describe its construction and application to an ordinary steam-gage and the manner in which it records at certain intervals of time, as desired, the number of pounds of steam-pressure.

Referring to the drawings, 1<sup>a</sup> indicates the casing in which the graduated record-paper, the rollers for operating the same, and the magnets and other contiguous mechanism are located and secured in any suitable and mechanical manner. The recorder may be located at any distance from the steam-gage, as desired, without affecting in the least the functional operation of the same.

2<sup>a</sup> indicates the steam-gage, the same being graduated up to twenty-eight pounds, and is adapted to indicate twenty-eight pounds of pressure. Of course the steam-gage may be constructed and graduated up to one hundred or more pounds of pressure, and my invention is as equally applicable to the same.

3<sup>a</sup> indicates the dial of said steam-gage, around which is located and secured in any mechanical manner an electro-magnet 4<sup>a</sup>. Said magnet is circular in form and is provided with a U-shaped peripheral recess, in which the coils of said magnet are located. The ends of said wire-coil are connected, as will be more fully hereinafter described. Located around said electro-magnet and secured in any suitable and mechanical manner, but insulated from each other, are a series of twenty-eight metallic segments, the same being numbered from 1 to 28, as shown in Figs. 1 and 3. The number of said segments should correspond to the number of graduations on the steam-gage, or, in other words, one segment to each graduation, the segment numbered 1 corresponding to the one-pound graduation, segment 2 corresponding to the two-pound, segment 3 corresponding to the three-pound, segment 4 to the four-pound, and so on up to 28, or as many graduation as may be desired on the steam-gage. The series of segments 1 to 28 are insulated from each other and



also from the electro-magnet 4<sup>a</sup>, so that there is no electrical connection between said segments and said electro-magnet.

5 5<sup>a</sup> indicates the indicating-needle or pointer, the same being provided with a projection 6<sup>a</sup>, adapted to come in contact with the electro-magnet 4<sup>a</sup> and with the projection 7<sup>a</sup>, the same adapted to come in contact with the segments 1 to 28. The segments are insulated from  
10 each other by means of plugs 8<sup>a</sup> of insulating material. Said plugs are provided with oval projection, the same extending beyond the contact-surface of said segments, so that projection 7<sup>a</sup> of needle 5 will slip off of said plugs  
15 onto one of the segments, or, in other words, the pointer 5<sup>a</sup> will never rest upon the insulating material. The pointer 5<sup>a</sup> is attracted at suitable intervals of time. Whenever a current is passed through the coil around  
20 the electro-magnet 4<sup>a</sup>, said attraction will bring projection 7<sup>a</sup> of said pointer in contact with the segments. The number of magnets that are located in the recording mechanism corresponds to the number of segments, and  
25 in the construction herein described I employ 28 magnets of the construction shown in Fig. 2.

Referring to Fig. 1, 1<sup>b</sup>, 3<sup>b</sup>, 5<sup>b</sup>, 7<sup>b</sup>, 9<sup>b</sup>, 11<sup>b</sup>, 13<sup>b</sup>, 15<sup>b</sup>, 17<sup>b</sup>, 19<sup>b</sup>, 21<sup>b</sup>, 23<sup>b</sup>, 25<sup>b</sup>, and 27<sup>b</sup> indicate a series of magnets provided with armatures 1<sup>x</sup>,  
30 3<sup>x</sup>, 5<sup>x</sup>, 7<sup>x</sup>, 9<sup>x</sup>, 11<sup>x</sup>, 13<sup>x</sup>, 15<sup>x</sup>, 17<sup>x</sup>, 19<sup>x</sup>, 21<sup>x</sup>, 23<sup>x</sup>, 25<sup>x</sup>, and 27<sup>x</sup>, which are located to the right in said figure of the casing 1, and 2<sup>b</sup>, 4<sup>b</sup>, 6<sup>b</sup>, 8<sup>b</sup>, 10<sup>b</sup>, 12<sup>b</sup>, 14<sup>b</sup>, 16<sup>b</sup>, 18<sup>b</sup>, 20<sup>b</sup>, 22<sup>b</sup>, 24<sup>b</sup>, 26<sup>b</sup>, and 28<sup>b</sup> indicate a series of magnets provided with  
35 armatures 2<sup>x</sup>, 4<sup>x</sup>, 6<sup>x</sup>, 8<sup>x</sup>, 10<sup>x</sup>, 12<sup>x</sup>, 14<sup>x</sup>, 16<sup>x</sup>, 18<sup>x</sup>, 20<sup>x</sup>, 22<sup>x</sup>, 24<sup>x</sup>, 26<sup>x</sup>, and 28<sup>x</sup>, which are located to the left in said figure opposite the first-mentioned series. The magnets of the second-named series are located in planes alter-  
40 nately above those of the first-named series, as illustrated in Fig. 7, for the purpose hereinafter described.

8' indicates a vertical bar provided with apertures 9'. Said bar is interposed in a vertical position between the first series of magnets and the second series. Each of said magnets is provided with pivotal armatures 1<sup>x</sup> 2<sup>x</sup> 3<sup>x</sup>, &c., the same being provided with projections 11<sup>a</sup>, and said projections are provided with perforation-points 12<sup>a</sup>, adapted to  
50 approximately fit in apertures 9' of the vertical bar 8'. Said apertures are pivoted to said magnets, preferably as shown in Fig. 2.

13<sup>a</sup> indicates helical springs which are interposed between said magnets and their corresponding armatures, the function of which is to restore said armatures to their normal position after being attracted by the magnets. The series of magnets 1<sup>b</sup> 3<sup>b</sup> 5<sup>b</sup> 7<sup>b</sup>, &c., are arranged one above the other in a vertical position, as shown in Fig. 1, and are all in electrical contact, which is effected by means of a wire 15<sup>a</sup>. The series of magnets 2<sup>b</sup> 4<sup>b</sup> 6<sup>b</sup> 8<sup>b</sup>, &c., are arranged likewise and are in electrical  
65 contact through the agency of a wire 16<sup>a</sup>, and said wires 15<sup>a</sup> and 16<sup>a</sup> are electrically connected by wires 17<sup>a</sup>, 18<sup>a</sup>, 19<sup>a</sup>, 20<sup>a</sup>, and 21<sup>a</sup>.

Having described the mechanical parts of my invention, I will now proceed to describe the electrical connections of the same and  
70 will preface such description by stating that 22<sup>a</sup> indicates the battery of any number of cells, as desired, having a positive pole 23<sup>a</sup> and negative pole 24<sup>a</sup>, and also by stating that 25<sup>a</sup> indicates a clock of ordinary construction so designed as to break and close  
75 the circuit, as more fully hereinafter described. The negative pole 24<sup>a</sup> of said battery is electrically connected to pointer 5<sup>a</sup> or its bearing by means of a wire 25', and said  
80 negative pole is also electrically connected to one end of the coil of the electro-magnet 4<sup>a</sup>. The positive pole 23<sup>a</sup> of said battery is connected to wire 16<sup>a</sup>, which connects the series of magnets 2<sup>b</sup> 4<sup>b</sup> 6<sup>b</sup>, &c., up to 28<sup>b</sup>, and said  
85 positive pole 23<sup>a</sup> is connected to clock 25<sup>a</sup> by means of a wire 26<sup>a</sup>, and another part of said clock is connected to the other end of the coil of the electro-magnet by means of a wire 27<sup>a</sup>.

Having given a description of the connections between the electro-magnet, clock, and battery and part of the connecting of the magnets, I will now proceed to describe the remaining connections between said magnets and the segments. The segments are numbered 1 2, &c., to 28, as hereinbefore stated.  
90 The first series of magnets are designated by 1<sup>b</sup> 2<sup>b</sup> 3<sup>b</sup>, &c., as hereinbefore stated, and the second series are designated 2<sup>b</sup> 4<sup>b</sup> 6<sup>b</sup>, &c. Said segments and said magnets are connected  
100 as follows, to wit: Segment 1 is connected to magnet 1<sup>b</sup> by means of a wire 28<sup>a</sup>, segment 2 is connected to magnet 2<sup>b</sup> by means of a wire 29<sup>a</sup>, segment 3 is connected to magnet 3<sup>b</sup> by means of a wire 30<sup>a</sup>, and so on, each segment being connected in an electrical manner  
105 to its corresponding magnet throughout the entire series.

The clock mechanism may be so devised as to close the circuit between wires 26<sup>a</sup> and 27<sup>a</sup>  
110 at stated intervals—for instance, every one, two, three, or four minutes or more, as desired. Of course as often as this circuit is completed the electro-magnet 4<sup>a</sup> will attract the pointer or needle 5<sup>a</sup> and draw the same  
115 down on one of the segments 1 2 3, &c., or wherever the same is located. For instance, if we conceive the circuit to be closed in Fig. 1, the pointer 5<sup>a</sup> will be attracted and rest on segment 22, and another circuit will be formed  
120 between said pointer and through magnet 22<sup>b</sup>, said pointer being in connection with the negative pole of the battery and said magnet 22<sup>b</sup> in electrical connection with the positive pole of said battery, and whenever the current is passed through magnet 22<sup>b</sup> of course  
125 its corresponding armature will be attracted, and the attraction of said armature to its appropriate magnet will throw projection 11<sup>a</sup>, and consequently perforation-point 12<sup>a</sup>, in an  
130 opposite direction, which will strike a graduated record-paper 32, which passes in front of said perforation-points, and will make a perforation in same. For other illustration, if



we conceive the circuit to be closed by the clock mechanism, when the pointer 5<sup>a</sup> is over segment 16, said pointer will be attracted and come in contact with said segment by the action of the electro-magnet, and a current will be passed through magnet 16<sup>b</sup>, and so on, throughout the entire series. By the location of the magnets as shown in Fig. 7 it can be readily perceived that the different perforation-points will not coincide and strike in the perforations formed by the others.

32 indicates the graduated record-paper, the vertical lines indicating the hour-spaces, the same being subdivided in twelve five-minute spaces or ten six-minute spaces or fifteen four-minute spaces, as desired, or the vertical lines may represent half-hour spaces and the horizontal lines indicate the steam-pressure, which are numbered, respectively, 7° 14° 21° 28°, and these subdivided into seven divisions, or other divisions may be employed. This paper is located in its normal position on rollers 34, the same being secured in a vertical position in recorder-frame 1 in any suitable and mechanical manner. Said rollers are adapted to rotate in the same direction. Said rollers are provided with teeth, in which worms 35 are adapted to mesh. Said worms are so constructed that when they are actuated they rotate the rollers 34 in the same direction, as indicated by arrows. Said worms 35 are mounted upon shafts 36, said shafts being so constructed as to be rotated by the mechanism of clock 25<sup>a</sup>.

The record-paper is first rolled on one of the rollers 34, then passed across, so as to be acted upon by the perforation-points 12<sup>a</sup> of projections 11<sup>a</sup> of the armatures, and is then taken up and carried by the other roller. I desire to premise, however, that I do not wish to limit myself to this construction for carrying the graduated record-paper, but only wish to state that the paper may be carried by the clock mechanism which breaks and closes the circuit through the electro-magnet. The graduated record-paper may be carried past the perforation-points 12<sup>a</sup> at any desired speed. Of course the speed may be regulated by the gearing which actuates or rotates rollers 34. Of course by inspecting the graduated record-paper after the same has been acted upon by the perforation-points the operator can readily perceive and ascertain the amount of steam-pressure at any time as graduated on the record. For instance, if the record-paper is graduated in one, two, and three hour spaces and said spaces subdivided into twelve five-minute spaces the operator could only tell the amount of steam-pressure that is being carried at intervals of five minutes. Of course the graduation of the paper may be varied as to intervals of time and also as to the number of pounds of steam-pressure.

If it is desired to apply my invention to a voltmeter, the record-paper should be graduated so as to indicate volts; if to an Ampère meter, so as to indicate ampères, and if to a

thermometer so as to indicate degrees, and so on. The reading of the record after it has been acted upon by the perforation-points requires only ordinary judgment on the part of the operator and needs no further minute description or elucidation.

Having fully described my invention, what I claim is—

1. An electric recorder having a dial or gage carrying metallic contacts, a rotating metallic needle or a needle provided with a metallic armature, a source of electricity, and a magnet located in the dial under the needle, the magnet being adapted to attract the said needle to a certain metallic contact, thereby completing a circuit from said needle through its contact to and through a corresponding magnet and back to the original source of electricity, substantially as set forth.

2. An electric recorder having a graduated dial or gage carrying a rotating metallic needle or a needle provided with a metallic armature, an electro-magnet over which said needle moves in its path, a series of insulated segments corresponding to the number of graduations of the dial or gage, so situated relative to the needle that the same is adapted to come in contact with them, a source of electricity from which a current emanates and adapted to pass through the coils of said electro-magnet at intervals, thereby attracting said needle and bringing the same in contact with one of the metallic segments, said segments being in electrical connection with corresponding magnets and the original source of electricity, and means for breaking and closing the circuit through said electro-magnet at intervals, substantially as set forth.

3. An electric recorder having a graduated dial or gage carrying a metallic needle or a needle provided with a metallic armature, an electro-magnet over which said needle moves in its path, a battery the poles of which are connected to the ends of a coil of the electro-magnet, a series of insulated segments corresponding to the number of graduations of the dial or gage, so situated relative to the needle that the same is adapted to come in contact with them, a series of magnets corresponding to the number of insulated segments, said magnets being in electrical connection with each other and each of said magnets in electrical connection with its corresponding segment, and a clock mechanism for breaking and closing the circuit through said electro-magnet, substantially as set forth.

4. The combination, with an electro-magnet, of a rotating needle thereof, contacts traversed by the said needle and adapted to make contact therewith when the needle is attracted by the said magnet, means for periodically sending a current of electricity through the coils of the said magnet, and an independent recording instrument electrically connected with each of the said contacts and with the needle, substantially as described.

5. In an electric recorder, a graduated dial,



a circular magnet therein, a series of insulated metallic segments surrounding said magnet, a series of magnets having armatures provided with recording-points, each of said  
 5 magnets having connection with one of said segments, a rotating needle above the dial, an armature thereon, a battery, and suitable connections whereby the attraction of said needles by the circular magnet will complete  
 10 a circuit through the needle, the segment over which it is resting, and the corresponding recording-magnet, substantially as described.

6. In an electric recorder, a graduated dial, a rotating and dipping needle mounted above  
 15 the same, a magnet in said dial, a clock having electrical connection with said magnet, whereby the needle is dipped at a predetermined moment at the point on the dial over which it is resting, and recording mechanism  
 20 actuated by the dipping of the needle, substantially as described.

7. In an electric recorder, a series of metallic segments insulated from each other by means of insulating-plugs 8, the same being  
 25 provided with oval projections, thereby preventing the indicating-needle from resting on the insulating material, and consequently causing the needle to rest on one of the metallic segments, substantially as set forth.

30 8. An electric recorder consisting of a graduated dial or gage carrying a metallic needle or needle provided with a metallic armature, an electro-magnet 4, provided with a U-

shaped peripheral recess, in which the coils of the wire are located, said magnet so located  
 35 relative to the indicating-needle that it moves over the same in its path, a battery the poles of which are connected to the ends of the coil of the electro-magnet and the negative pole  
 40 of said battery connected to the indicating-needle, a clock mechanism for breaking and closing the circuit through said electro-magnet, a series of insulated segments corresponding in number to the number of graduations of  
 45 the dial or gage, and said segment in electrical connection with a series of magnets located in the recorder-frame 1, said series of magnets being connected together electrically, and  
 50 also to the positive pole of the battery, said magnets corresponding in number to the number of insulated segments and each being provided with a pivotal armature, the same being provided with perforation-points adapted to perforate the graduated record-paper,  
 55 which is caused to move in front of said perforation-points in an interposed position between the vertical bar 8, provided with depressions 9, and said point, substantially as set forth.

In testimony whereof I affix my signature in  
 60 presence of two witnesses.

CHAS. WM. AYTON.

Witnesses:

E. E. LONGAN,  
 C. F. KELLER.