

(No Model.)

4 Sheets—Sheet 1.

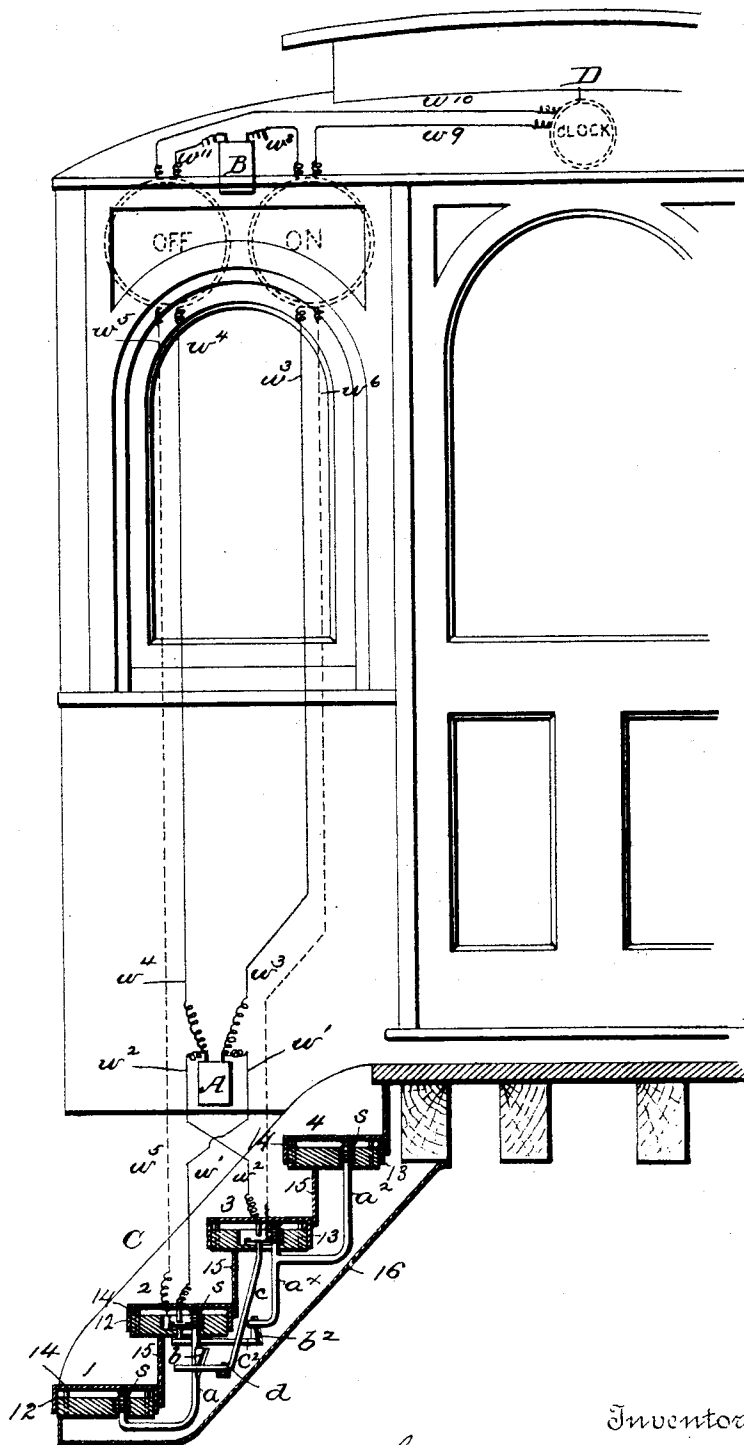
J. W. ELLIS.

ELECTRIC PASSENGER REGISTER AND RECORDER.

No. 540,090.

Patented May 28, 1895.

Fig. 1.



Witnesses
Geo M Whitney

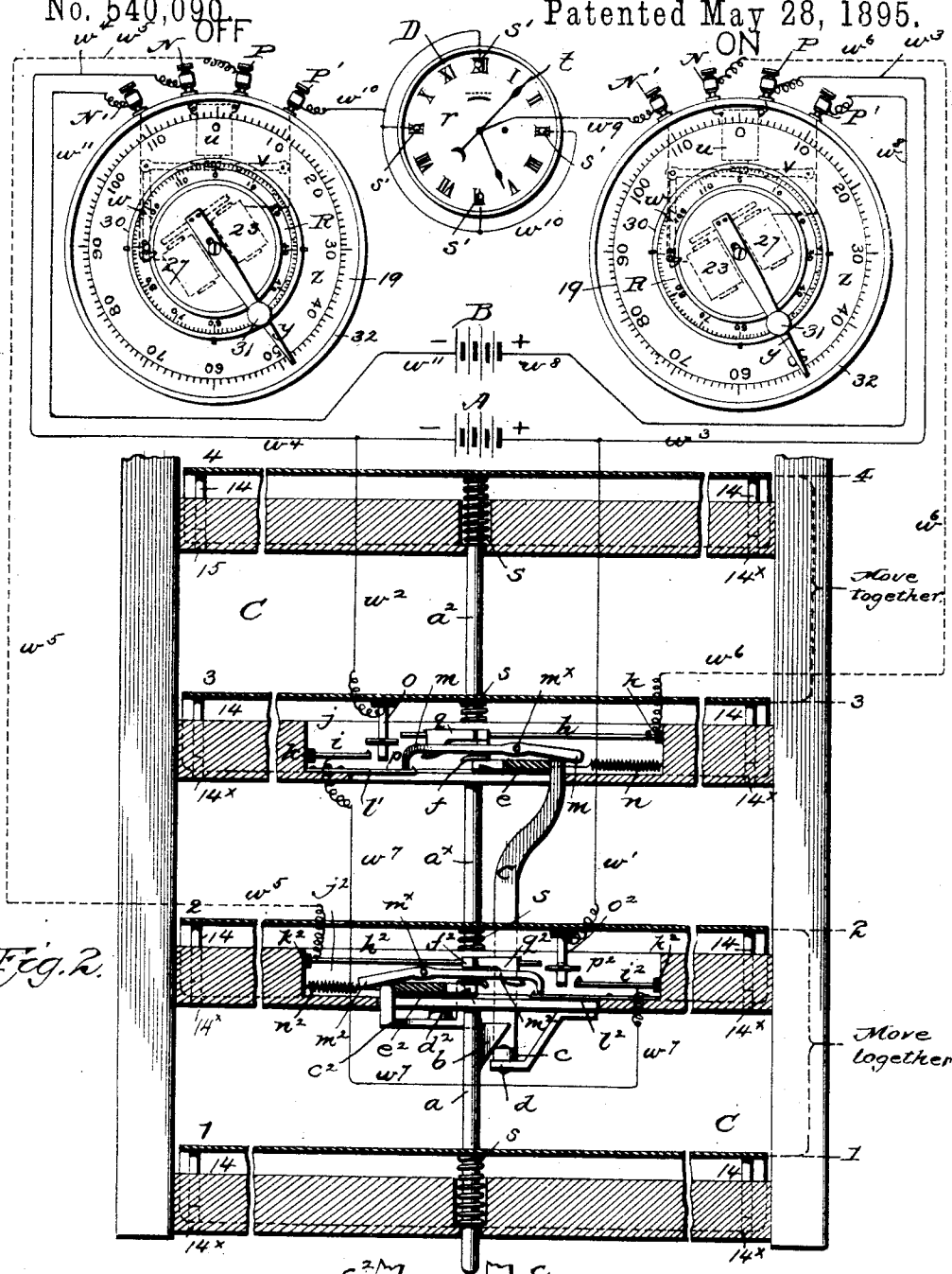
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Witnesses

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Имущество

Joseph William Ellis

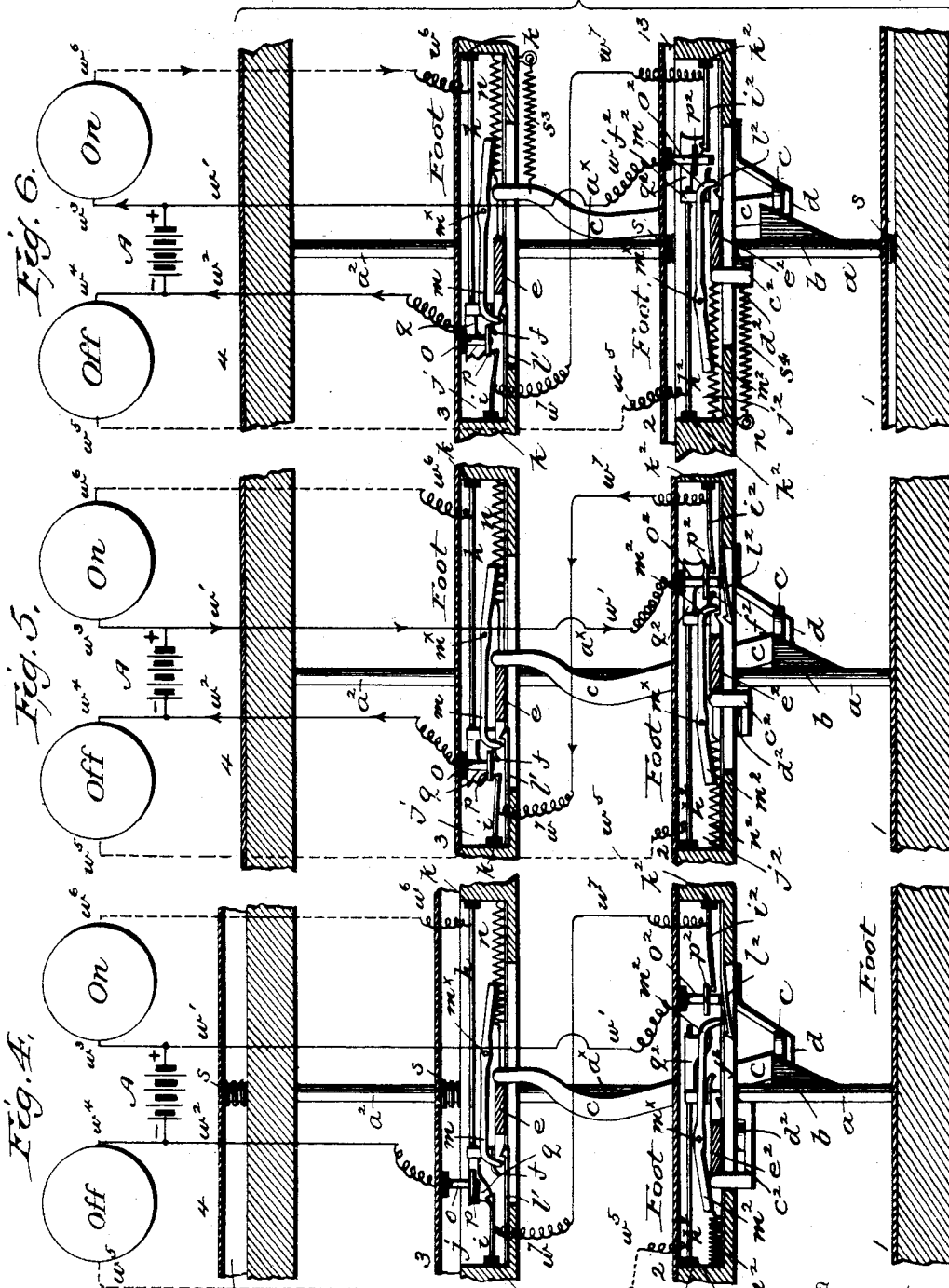
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Witnesses

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Fig. 7.

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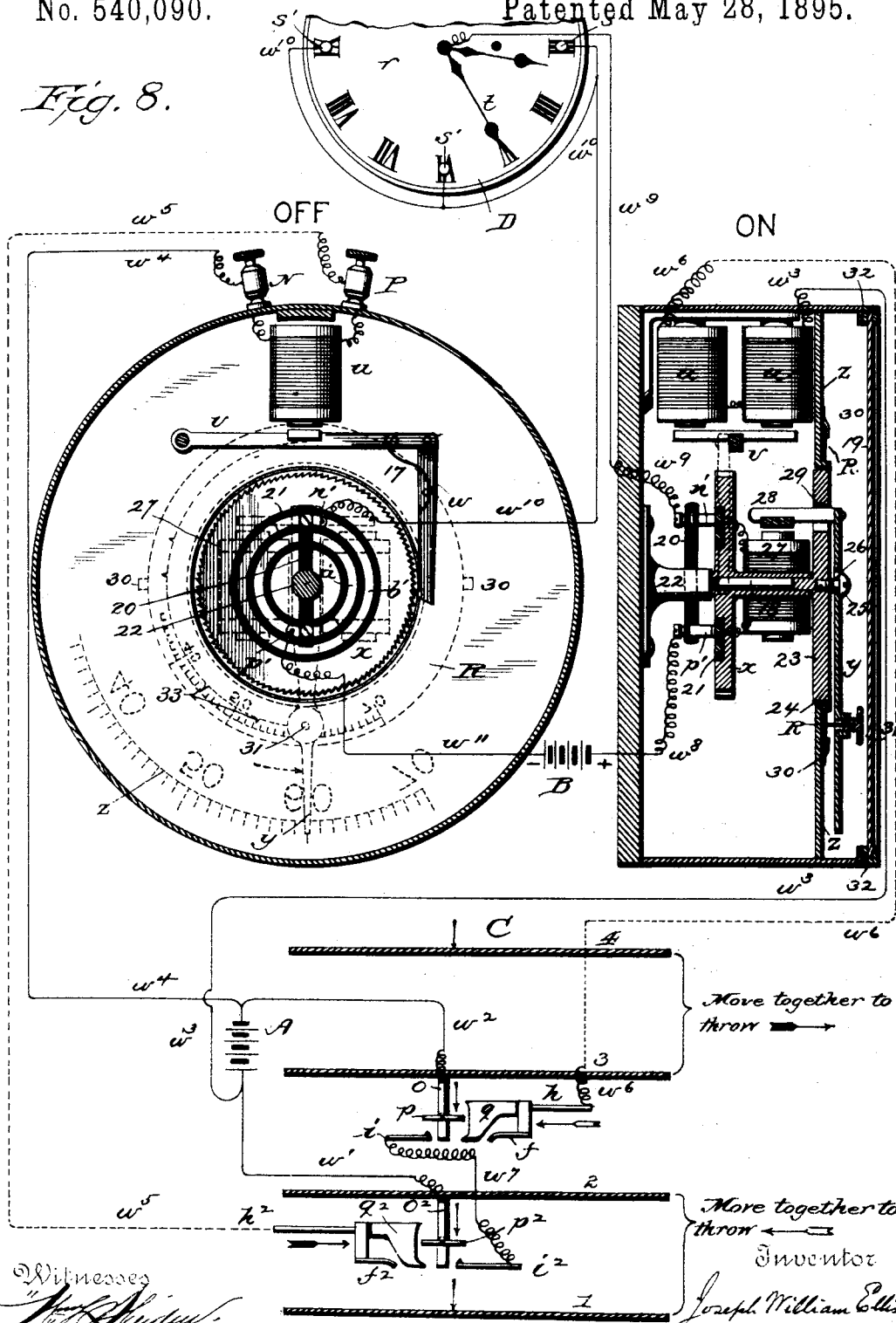
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Fig. 8.



Witnesses
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UNITED STATES PATENT OFFICE.

JOSEPH WM. ELLIS, OF ALBANY, NEW YORK.

ELECTRIC PASSENGER REGISTER AND RECORDER.

SPECIFICATION forming part of Letters Patent No. 540,990, dated May 28, 1895.

Application filed January 12, 1895. Serial No. 534,644. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH WILLIAM ELLIS, a citizen of the United States of America, and a resident of Albany, in the State of New York, have invented a new and useful Improvement in Electric Passenger Registers and Recorders, of which the following is a specification.

This invention relates to means for "automatically" tallying passengers as they enter and leave a railway car or other public vehicle for the purpose of preserving a reliable indication of the number of such passengers and the duration of their travel, as a check on conductors; and it consists in a novel electric registering and recording system showing the number of passengers carried between given stations as determined by the times of arrival at and departure from such stations, and in certain novel combinations of electrical and mechanical devices, hereinafter described and claimed.

Four sheets of drawings accompany this specification as part thereof.

Figure 1 of the drawings is a diagrammatic end view, partly in section, showing a railway-car provided with said registering and recording system. Fig. 2 is a diagrammatic sectional elevation confined to said system, showing the parts enlarged, with the planes of section at right angles to that of Fig. 1. Fig. 3 is a fragmentary plan view of the second step projected from Fig. 2. Figs. 4, 5, and 6 are diagrams confined to the registering devices, showing successive positions of the parts of what is hereinafter termed the "step mechanism." Fig. 7 is a perspective view showing certain details, and Fig. 8 is a diagram showing a face view of the clock and sectional, rear and edge views, respectively, of the two combined registers and recorders enlarged from Fig. 2.

The same letters and numbers refer to the same or like parts in all the figures.

My electric registering and recording system is composed of one or more electric batteries, two being shown in the drawings at A and B; a step-mechanism, C, at each entrance to be guarded, which makes and breaks the electric registering circuit; "Off" and "On" combined registers and recorders (so marked on the drawings) and hereinafter termed

"registers," preferably of one and the same construction; and a clock, D, which makes and breaks a recording circuit common to both registers; together with metallic-circuit-forming wires and electrical connections hereinafter more specifically referred to.

The battery or batteries A and B may be of any approved make, and located in any convenient place or places within or beneath the car.

Each step-mechanism C comprises two or more stiff plates movable vertically and covering successive steps. Four are shown in the drawings numbered respectively 1, 2, 3, and 4, beginning at the bottom. These "step-plates," as they are hereinafter termed, are depressed by the feet of the passengers getting on and off, and are re-elevated by springs, as soon as they are relieved from pressure.

In the specific arrangement represented by the drawings, to which the remainder of this description will be confined for clearness, the step-plates 1 and 2 are made to move simultaneously with each other by a rigid connection *a* Fig. 1, and the succeeding pair, 3 and 4, are connected with each other in like manner by a rigid connection *a*² Fig. 1; the electrical devices connected directly with the "Off" register being arranged beneath said step-plate 2, while those connected with the "On" register are arranged beneath said step-plate 3. Said rigid connection *a* carries a cam *b* coacting with one end of a lever *c* fulcrumed at *d*, and said rigid connection *a*² carries a rigid arm *a*^x, which engages with a cam *b*² Fig. 1, on a lever *c*² fulcrumed at *d*² Fig. 2. Said levers *c* and *c*² act respectively on slides *e* and *e*², Figs. 2 to 6, which carry respectively copper contact-pieces *f* and *f*². These contact-pieces are insulated from the slides *e* and *e*² as at *g*, Fig. 3, while an electrical connection is preserved between themselves and the respective legs of a circuit, hereinafter described, by means of stiff wires or "contact-bars" *h* and *h*², upon which said contact-pieces *f* and *f*² slide. Said contact-bars *h* and *h*², and an opposing pair of yielding contact-bars *i* and *i*² are rigidly fastened in the end-walls of recesses *j* and *j*² in the wooden steps, beneath the step-plates 3 and 2 respectively, and there insulated as shown at *k* and *k*² Fig. 2. Spring detents *l* and *l*² at the bottoms of the step-

recesses j and j^2 engage with notches in the bottoms of the slides e and e^2 to retain them temporarily in the positions to which they are moved by the levers c and c^2 , as shown at l' in Figs. 4 to 6; and tripping levers m and m^2 , pivoted at m^x and acted on by the levers c and c^2 , depress said detents to release the slides, which are retracted by spiral springs n and n^2 when so released. Combined contact-makers and pushers o and o^2 , hereinafter termed "keys," are rigidly attached to and insulated from the step-plates 2 and 3 respectively at their upper ends, and coact as pushers with said detents l' and l^2 , as shown at o^2 in Figs. 4 and 5. These keys o and o^2 carry small contact-plates p and p^2 of copper, and are furthermore peculiarly constructed, as shown in Fig. 7. As here shown, the lower end of each key is attached to the upper part of the key by a horizontal pivot 5. The swinging movement of said lower end is limited by a step 6. A spring 7 operates to retain said lower end normally in line with said upper part so as to act as a pusher; and a horizontal stud-pin 8 is carried by the key and electrically separated from said upper part of the key by insulation 9. Said pins 8 project backward, as shown in Fig. 3, and are acted on by horizontally projecting tappets q and q^2 carried by said slides e and e^2 insulated therefrom and constructed in common with toe and heel projections, marked 10 and 11 in Fig. 7. The function of these tappets is in certain cases to coact with said pins 8 so as to lift and hold said lower ends of the keys o and o^2 clear of the detents l' and l^2 , as at q in Figs. 4, 5, and 6. In other cases they pass above the pins 8, as at q^2 in Fig. 5, and permit the keys to act as pushers, as above described. Depending flanges 12 and 13, Fig. 1, at front and rear, operate to exclude dust, snow and obstructions from beneath each of the step-plates 1, 2, 3, and 4, and assist to stiffen them; and depending stud-pins 14, carried by the step-plates, and guided by vertical holes 14^x, Fig. 2, bored in the wooden steps, confine the step-plates to vertical movement. Aprons 15, Fig. 1, protect the mechanical connections and motion-transmitting devices in front between the steps; and a back-plate 16, Fig. 1, prevents access to them from behind the steps.

The clock D is an ordinary time-piece of appropriate make, having its dial-plate r , Figs. 2 and 8, provided with metallic contact-points s' at III, VI, IX, and XII, suitably insulated from the works of the clock, and its minute-hand t adapted to coact with said contact points successively to make and break an electric circuit every fifteen minutes; the works of the clock being suitably insulated. As clocks so fitted or constructed for various purposes are old and well known, it is not considered necessary to show such insulation or to more fully show or describe said circuit making and breaking devices, which may be of an approved description.

The construction common to the "On" and

"Off" registers as aforesaid is shown in Figs. 2 and 8, which see. Each register is provided with a pair of electric terminals P N electrically connected with the helixes of an electro-magnet u within the register casing. The armature of the latter is mechanically attached to a lever v which carries a registering pawl w and its spring 17. A ratchet-wheel x is turned step by step by said pawl w , and carries by its arbor 18 an index-hand y in front of a suitably graduated dial-plate z ; and said dial-plate and index-hand are exposed to view, as in full lines in Fig. 2, by means of a glass face-plate 19 forming part of the register casing; said pawl-carrying lever v and ratchet wheel x being so proportioned that at each electric impulse said index-hand is turned forward one point, or so as to register an additional unit. Each register is further provided with a second pair of electric terminals P' N' , Fig. 2; a pair of brushes p' n' , Fig. 8, supported by a brush-holder 20 of insulating material and electrically connected with said terminals P' and N' respectively; a pair of continuous electric contacts a' b' , Fig. 8, in the shape of concentric rings, carried by the back of said ratchet-wheel x , together with an interposed insulating ring 21; a stud-shaft 22, Fig. 8, for said ratchet-wheel arbor 18, the latter being made hollow for the purposes of the mechanism now being described; a circular disk 23, within a central opening 24, Fig. 8, in the dial-plate z , interposed between the front end of said arbor 18 and the index-hand y , and connected therewith by a shouldered screw 25 embraced in front of its shoulder by a slot 26 in said index-hand; an electro-magnet 27, having its helixes electrically connected with said contacts a' b' , and carried by the back of said disk 23 so as to revolve therewith in unison with said index-hand; a rigid arm 28, projecting rearwardly from said index-hand through a slot 29 in said disk 23, and having the armature of said magnet 27 mechanically attached thereto; clips 30 for holding an annular record-card R surrounding said central opening 24 in the dial-plate z , and attached to the front of said dial-plate; a marker 31, shown in the form of a thumb-screw bored to hold an ever-point lead, which is carried by the index-hand y ; and a movable frame 32 for the glass face-plate 19, to give access to the index-hand y for turning it to zero, and to the record-card R for removing it and substituting a fresh blank, at the end of each trip. Such blanks should be of moderately stiff paper printed with a reduced fac-simile of the graduations on the dial-plate z , as shown in Fig. 2 and in dotted lines in Fig. 8, and can be readily slipped under the free end of the index-hand y and behind the marker 31, and sprung into place behind the clips 30.

The electric circuits are shown in Figs. 1, 2, 4, 5, 6, and 8, and are completed by suitable conductors, hereinafter termed wires, as follows: Wires w' and w^2 extend from the keys

o^3 and o to the respective poles of the battery A. Wires w^3 and w^4 extend thence to the terminal P of the "On" register and the terminal N of the "Off" register, respectively. From the terminal P of the "Off" register and the terminal N of the "On" register wires w^5 and w^6 extend to the contact-bars h^2 and h respectively; and a wire w^7 connects the contact-bars i and i^2 with each other, completing what may be termed the "step circuits." From the positive pole of the battery B, (Fig. 2) a wire w^8 extends to the terminal P' of the "On" register. The terminal N' of this register is electrically connected by a wire w^9 (through the insulated works of the clock D) with the clock-hand t ; said contact-points s' on the clock-dial are connected by wires w^{10} with the terminal P' of the "Off" register; and the terminal N' of the latter is connected by a wire w^{11} with the negative pole of said battery B, completing the "clock-circuit." The wires w^5 and w^6 are of greater resistance than the other wires of the step-circuits, being for example of annealed, soft iron while the other wires are of copper.

The parts of the step-mechanism C are shown in their normal positions in Figs. 1 and 2. In this condition of this mechanism, and with the minute-hand t between two of the contact points s' of the clock D, all the electric circuits are open, and all parts of the system except the clock-movement are at rest.

The entrance of a passenger, illustrated by Figs. 4, 5, and 6, produces the following effects: By stepping on either of the lower step-plates 1 and 2, the passenger's weight depresses both, owing to their rigid mechanical connection a , and their motion is transmitted by the cam b to the lever c , and by the latter to the slide e , interlocking its notched end with the catch-end of the detent l' and at the same time bringing the contact-piece f into a position vertically beneath the contact-plate p preceded by the tappet q which turns up the lower end of the key o , leaving the parts beneath the step-plate 3 as shown in Fig. 4. The effects of this movement upon the parts beneath the step-plate 2 are the bringing together of the contact-bar i^2 and the contact-plate p^2 , and the depression of the detent l^2 by the key o^2 , as in Fig. 4, for purposes which will presently be explained. As an entering passenger gradually transfers his weight from step-plate 1 or step-plate 2 to step-plate 3 or step-plate 4, said step-plates 3 and 4 are depressed, as shown in Fig. 5. The effect of the depression of these step-plates on the electrical devices beneath said step-plate 3 is to simultaneously close two electrical contacts between the contact-plate p and contact-piece f on the one hand, and between said contact-plate p and the contact-bar i on the other hand. The effects on the devices beneath the step-plate 2 are as follows: The depression of the step-plates 3 and 4, through their rigid mechanical connection a^2 , its arm a^x , and the cam b^2 , actuates the lever c^2 , and

causes the latter to throw the slide e^2 into the position in which it is shown in Fig. 5; but the latter is not fastened in this position, owing to the previous depression of the detent a^2 by the key o^2 . An electrical contact is unavoidably closed however at $f^2 p^2$, but is counteracted by the contact previously formed between the contact-plate p^2 and the contact-bar i^2 , and, owing to the greater conductivity of the wires w' , w^2 , and w^7 , the electric current flows from the battery A, through said wire w' , the key o^2 , contact-plate p^2 , contact-bar i^2 , wire w^7 , contact-bar i , contact-plate p , key o and wire w^2 back to the battery, without any effect on either of the registers. While the passenger's weight is partially supported by the step-plates 1 and 2 and partially by step-plates 3 and 4 as above, all the step-plates are depressed as in Fig. 5. As the passenger's weight is gradually elevated from the step-plates 1 and 2 these step-plates rise, as in Fig. 6, breaking the electric contacts at $p^2 f^2$ and at $p^2 i^2$ beneath the step-plate 2. Said electric contacts beneath the step-plate 3 remaining closed, the current now flows from the battery A through the wire w^3 to the terminal P of the "On" register, Figs. 2 and 8, thence through the helixes of the connected registering magnet u , and proceeds from said magnet to the terminal N connected therewith, and, through the wire w^6 , contact-bar h , contact-plates f and p , key o and wire w^2 , back to the battery. When said registering magnet u is so energized, its armature is attracted, and motion is transmitted, through the lever v to which said armature is attached, the pawl w carried by said lever, the ratchet-wheel x rotated by said pawl, its arbor 18, and the disk 23 rotating therewith, to the index-hand y of said "On" register, causing the latter to indicate or register the entering passenger as an additional unit on the dial-plate z . The current last described will continue to flow until the step-plates 1 and 2, their rigid connections a , the cam b and the lever c have regained their position of rest as in Fig. 2 when by the contact of said lever c with the heel end of the tripping lever m said tripping-lever is caused to depress the detent l' , releasing the slide e , and permitting it to be retracted by the spring n , which breaks said contact at $p f$ by the retraction of the contact-piece f with the slide e . Finally, as said entering passenger frees said step-plates 3 and 4, and the latter are re-elevated by their springs s , the key o straightens out by the action of its spring 7, Fig. 7, the slide e^2 and the lever c^2 return to their positions of rest, and the step-mechanism is ready for another actuation by another passenger getting on or one getting off.

A departing passenger must of necessity first depress the step-plates 3 and 4, bringing the step-mechanism substantially to the condition represented by Fig. 6, except that, the step-plates 1 and 2 being originally elevated, and the parts beneath said step-plate 3 being in the positions represented in Fig. 2, the tap-

pet q^2 turns up the lower end of the key o^2 as at o , Fig. 4, so as to permit the slide e^2 to interlock at once with the detent l^2 , preparatory to the succeeding registering contacts, and the respective step-circuits are open at $f p$, $f^2 p^2$, and $i^2 p^2$. As the weight of the passenger becomes divided between the two pairs of step-plates, as in Fig. 5, all the electric contacts of the step-mechanism being closed, the electric current, taking the path of least resistance, again flows from the battery A through the wire w' , key o^2 , contact-plate p^2 , contact-bar i^2 , wire w^7 , contact-bar i , contact-plate p , key o , and wire w^2 , so as to prevent a false actuation of either register, and as soon as the passenger frees the upper step-plates 3 and 4, as in Fig. 4, the current flows from the battery A through the wire w^4 to the terminal N of the "Off" register, and thence through the helixes of its registering magnet u , its terminal P, the wire w^5 , contact-bar h^2 , contact-piece f^2 , contact-plate p^2 , key o^2 , and wire w' back to the battery; the energized registering magnet u of the "Off" register attracting its armature, and motion being transmitted therefrom to the index-hand y of this register in the manner before described with reference to the registering of an entering passenger by the "On" register, so as to register the departing passenger as an additional unit on the dial z of said "Off" register. Finally, as to this operation, the departing passenger frees the step-plates 1 and 2, and the parts again return to their positions of rest as in Fig. 2.

Should an entering passenger step on either of the step-plates 1 and 2 while one is still supported by a step-plate 3 or step-plate 4, the first effect will be as illustrated by Fig. 5 and before described; and when said step-plates 3 and 4 are freed, their re-elevation by their springs s , accompanied by the retraction of the lever c^2 , is followed immediately by the retraction of the circuit-closing slide e^2 , owing to the pusher action of the key o^3 on the detent l^2 as in said Fig. 5. Otherwise there would be a false registration of the second passenger on the "Off" register. In like manner any false registration upon the "On" register of a departing passenger closely following another is prevented by the pusher action of the key o on the detent l' . Provision will be made in customary manner to prevent two passengers passing over the steps side by side or in opposite directions at one and the same time.

Whenever the minute-hand t , Figs. 2 and 8, of the clock D reaches one of the contact points s on the clock-dial r , an electric circuit is closed through both registers; the current flowing from the battery B through the wire w^8 , the terminal P' Fig. 2, of the "On" register, the helixes of the recording magnet 27 of this register, its terminal N', Fig. 2, the wire w^9 , the minute-hand t , the contact-point s' , the wires w^{10} , the terminal P', Fig. 2, of the "Off" register, the helixes of its recording magnet

27, its terminal N', Fig. 2, and the wire w^{11} , back to said battery B. The effect of this current is to simultaneously reciprocate the index-hands y longitudinally, through the electro-magnets 27 and their armatures and the rigid arms 28, Fig. 8, so as to cause the markers 31 to indicate the end of a time-period by a distinctive mark 33 on each record-card R, as shown in dotted lines in the figure last named. Between such marks each marker 31 produces a continuous line, the length of which, or the locations of said marks 33 relatively to the graduations on the record-card, indicates the number of passengers entering or leaving; as the case may be, during a given time-period. Consequently, if the train arrives at a certain station at 3.25 for example, as in Fig. 8, the dial-marks between the two marks 33 corresponding respectively with 3.15 and 3.30 on the record-cards of the respective registers, will indicate the number of passengers entering and leaving at such station.

The levers c and c^2 may be retracted by springs $s^3 s^4$, Fig. 6, or the cams b and b^2 may be grooved or slotted so as to be double-acting; as may be preferred. The mechanical devices for transmitting motion to the slides e and e^2 , as a whole, together with other mechanical and electrical details, admit of considerable modification. A system otherwise similar to the one herein described may be arranged for registering passengers only as they get on or as they get off; and other like modifications will suggest themselves to those skilled in the art.

The within-described system without material modification may also be used at the entrances and exits, either or both, of ferries, places of public amusement, and the like, with any required increase in the capacity of the registering and recording devices.

Having thus described my said improvement, I claim as my invention and desire to patent under this specification—

1. An electric registering and recording system comprising a series of vertically movable step-plates; mechanical connections and motion transmitting devices acted on by said step-plates; circuit closers controlled by said transmitting devices, electric circuits closed by the depression of said step-plates subject to such control, two registers having electro-magnetic actuators in circuit with the respective circuit-closers, and provided with record-cards markers and marker-actuating electro-magnets, a clock provided with circuit-closing devices including a series of electric contacts; and an electric circuit connecting all these contacts with the electro-magnets last named of both registers, substantially as hereinbefore specified.

2. The combination, substantially as hereinbefore specified, of a vertically movable step-plate carrying a downwardly projecting key, a contact-plate carried by said key, a slide carrying a contact-piece movable be-

neath said contact-plate, a contact-bar in permanent electric connection with said contact-piece, an electric circuit including said contact-plate and said contact-bar, and an electric register in said circuit.

3. The combination, substantially as hereinbefore specified, of a vertically movable step-plate carrying a downwardly projecting key, a contact-plate carried by said key, a slide carrying a contact-piece movable beneath said contact-plate, a detent fastening said slide temporarily in effective position, a contact-bar in permanent electric connection with said contact-piece, an electric circuit including said contact-plate and said contact-bar, an electric register in said circuit, and mechanical devices for shifting said slide to close said circuit and for tripping said detent to open it.

4. The combination, substantially as hereinbefore specified, of successive vertically movable step-plates, circuit-closing devices beneath each, an electric circuit closed under certain circumstances when both step-plates are depressed, two electric circuits of greater resistance controlled by said circuit-closing devices respectively, and "On" and "Off" registers included in the respective circuits last named.

5. The combination, substantially as hereinbefore specified, of successive vertically movable step-plates, circuit-closing devices beneath each, comprising downwardly projecting keys carried by the step-plates and provided with contact-plates, slides carrying contact-pieces movable beneath said contact-plates, and contact-bars in permanent electric connection with said contact-pieces, electric circuits including said contact-plates and said contact-bars, "On" and "Off" registers in said circuits respectively, and mechanical devices transmitting motion from each of said step-plates to the circuit-closing slide beneath the other step-plate.

6. The combination, substantially as hereinbefore specified, of successive vertically movable step-plates, circuit closing devices beneath each, comprising downwardly projecting keys carried by the step-plates and provided with contact-plates, slides carrying contact-pieces movable beneath said contact-plates, contact-bars in permanent electric connection with said contact-pieces, and contact-bars projecting fixedly beneath said contact-pieces, an electric circuit including the contact-bars last named and said contact-plates, two electric circuits of greater resistance including said contact-plates and the contact-bars first named, and "On" and "Off" registers in said circuits of greater resistance, respectively.

7. The combination, substantially as hereinbefore specified, of successive pairs of vertically movable step-plates, rigid mechanical

connections between the step-plates of each pair, circuit-closing devices beneath one step of each pair, electric circuits controlled by said circuit-closing devices respectively, and "On" and "Off" registers included in the respective circuits.

8. The combination, substantially as hereinbefore specified, of successive keys having pivoted pusher ends, detents acted on by said pusher ends, and circuit-closing slides so freed for retraction, with electric circuits closed by the respective slides, and "On" and "Off" registers in said circuits respectively.

9. The combination, substantially as hereinbefore specified, of a graduated record-card, a revoluble and endwise-movable index-hand carrying a marker, mechanism for revolving said index-hand step by step to register successive units and to record the same, and a clock-controlled mechanism for instantaneously reciprocating said hand endwise periodically to indicate by said marker the limits of given time-periods.

10. The combination, substantially as hereinbefore specified, of a graduated record-card, an index-hand carrying a marker, actuating mechanism for moving said index-hand step by step to register successive units, electromagnetic mechanism for reciprocating said hand periodically, an open electric circuit including the helixes of said electro-magnetic mechanism, and a clock distinct from said actuating mechanism and provided with a series of circuit-closing contacts in said electric circuit.

11. The combination, substantially as hereinbefore specified, of an annular record-card, an index-hand revolving concentrically therewith and carrying a marker, mechanism for revolving said index-hand step by step, electro-magnetic mechanism revolving with the index-hand for reciprocating it endwise, an open electric circuit including the helixes of said electro-magnetic mechanism, and a circuit-closing clock in said electric circuit.

12. The combination of an annular record-card, an index-hand revolving concentrically therewith and carrying a marker, mechanism for revolving said index-hand including a wheel on the same arbor provided with a pair of concentric electric contacts, electro-magnetic mechanism for reciprocating said index-hand endwise, revolving therewith and having its helixes electrically connected with said contacts, a pair of electric brushes coacting with said contacts, an open electric circuit including said brushes, and a circuit-closing device in said electric circuit, substantially as hereinbefore specified.

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Witnesses:

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