

No. 665,998.

Patented Jan. 15, 1901

A. G. DAVIS.

ACCELERATION LIMITING AND RECORDING DEVICE.

(Application filed Sept. 29, 1900.)

(No Model.)

Fig. 1.

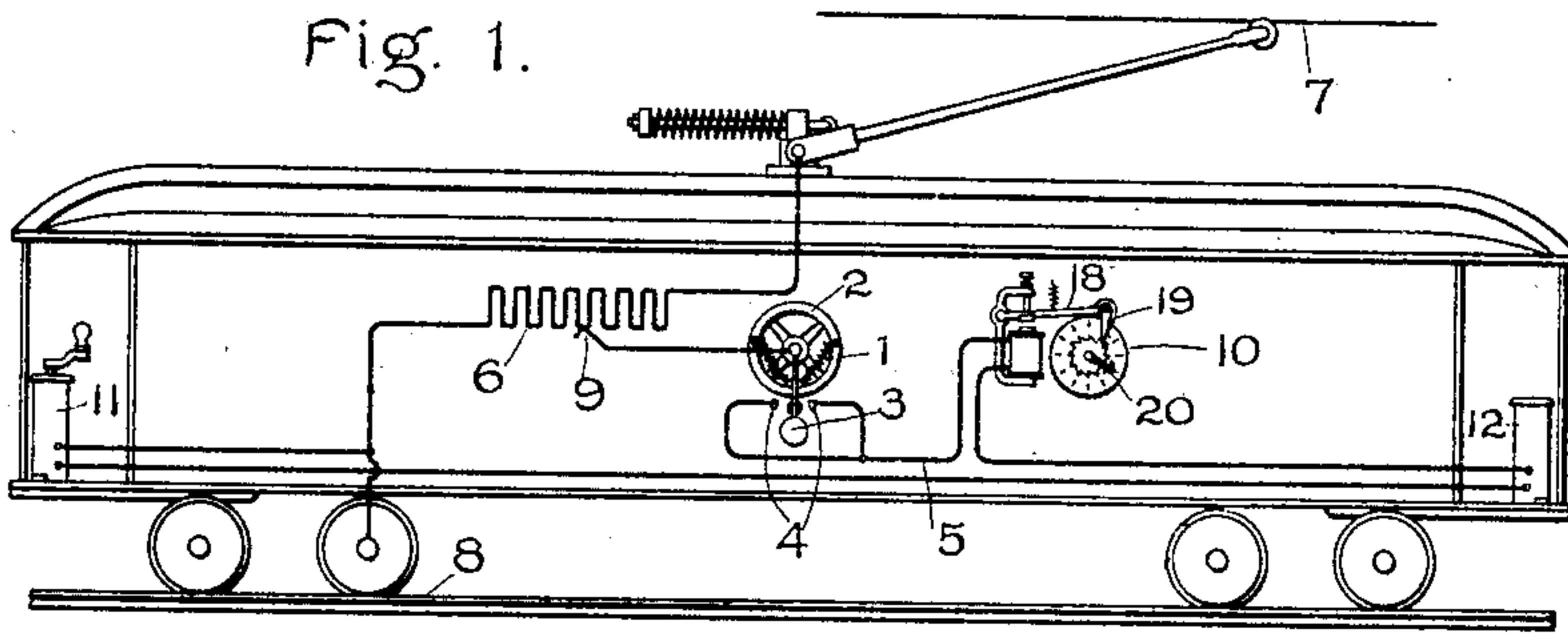


Fig. 2.

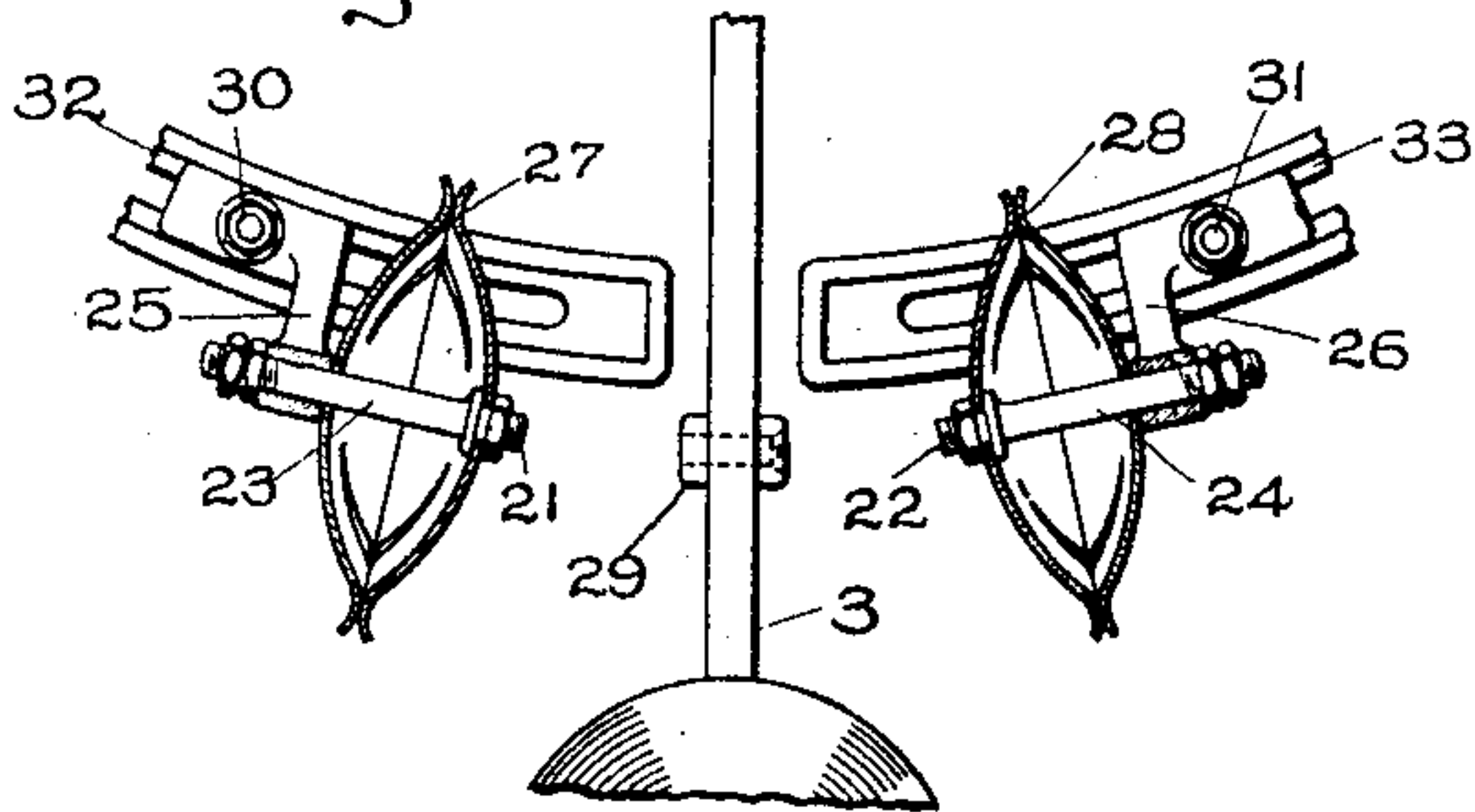


Fig. 3.

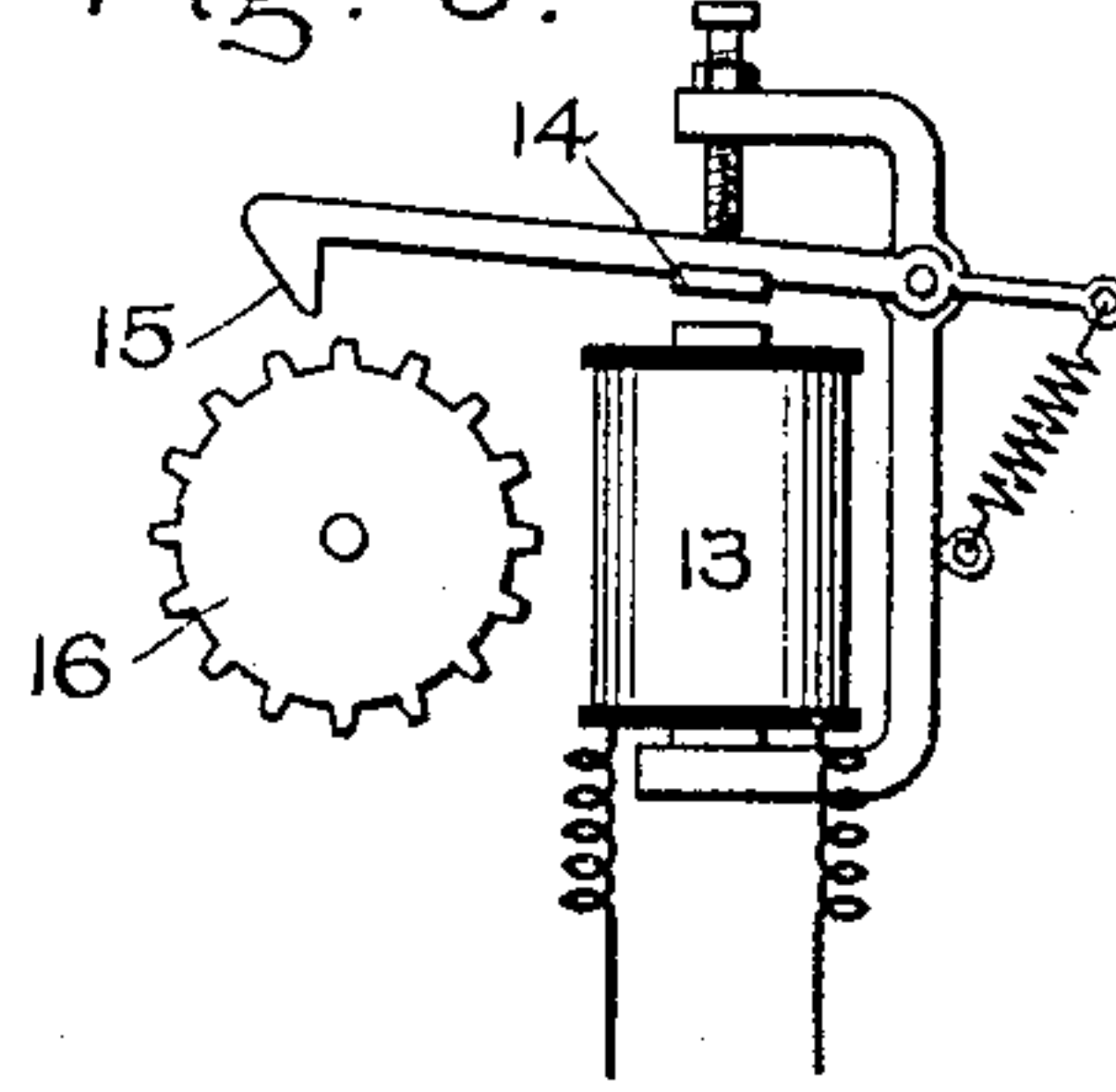


Fig. 4.

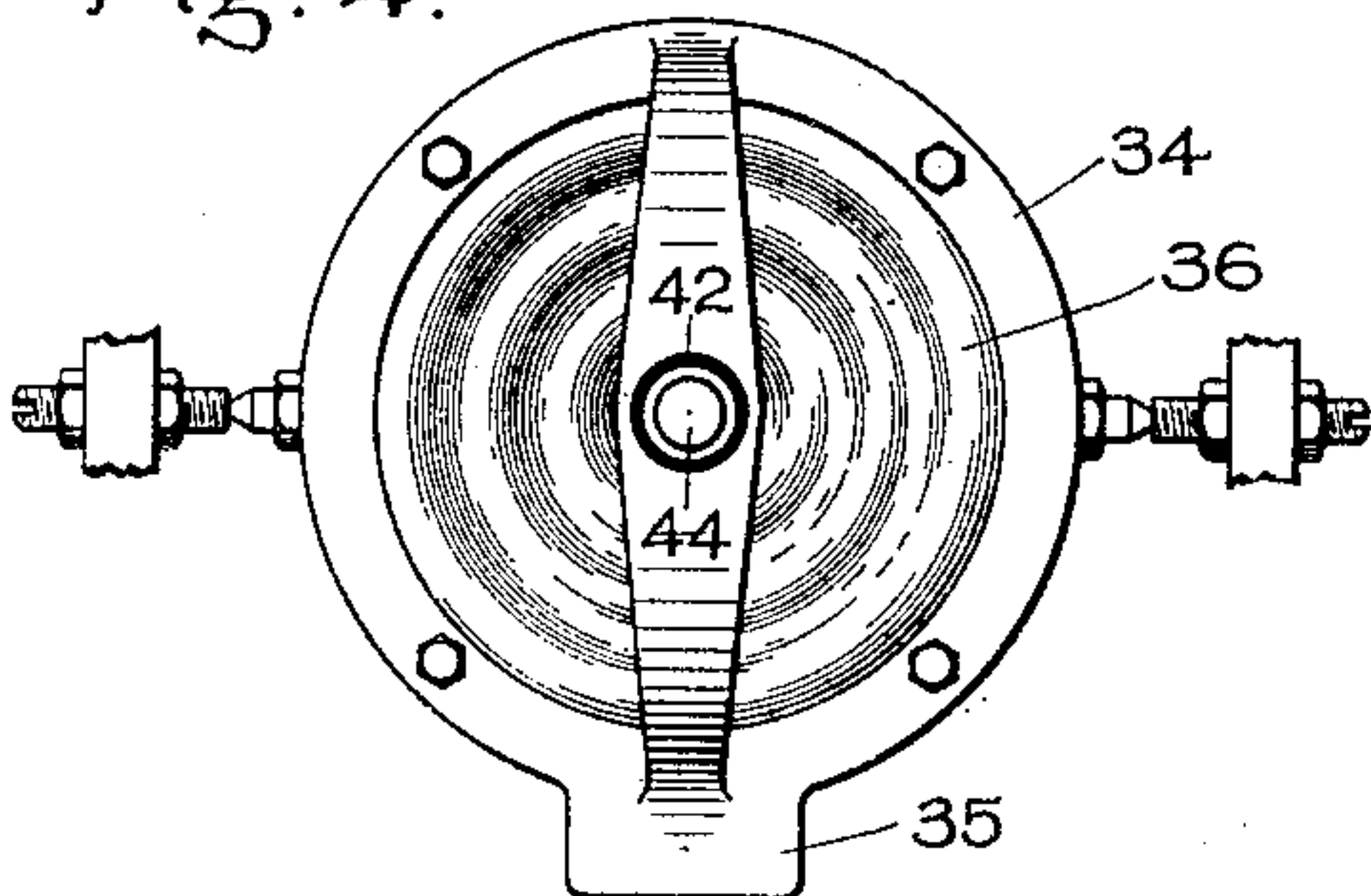


Fig. 5.

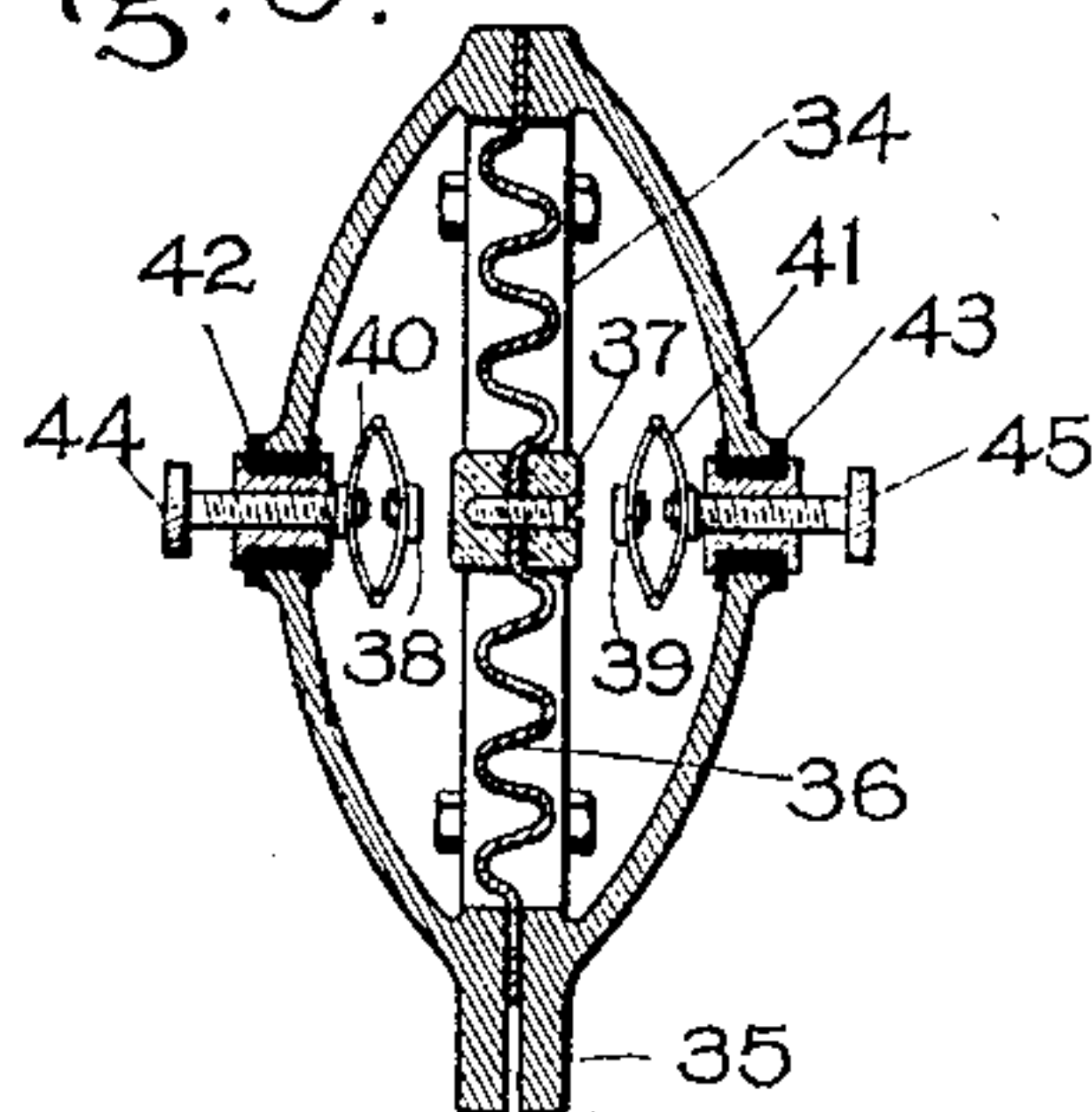
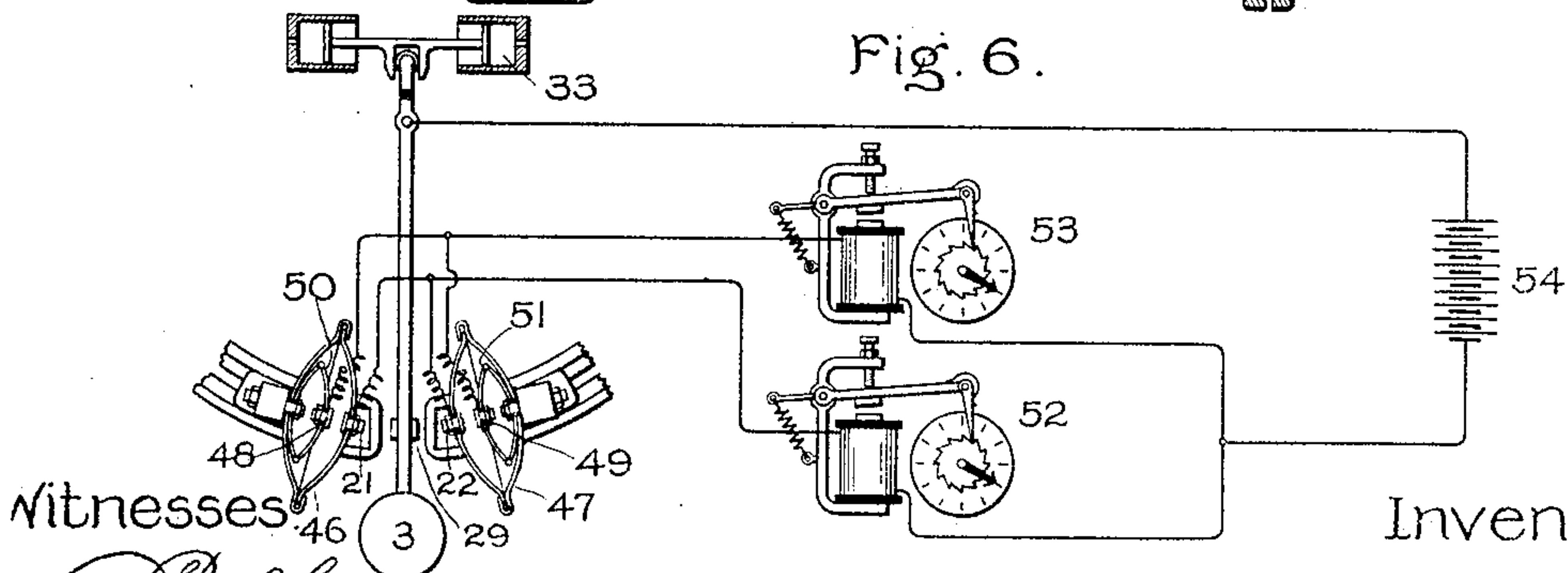


Fig. 6.



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ACCELERATION LIMITING AND RECORDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 665,998, dated January 15, 1901.

Application filed September 29, 1900. Serial No. 31,549. (No model.)

To all whom it may concern:

Be it known that I, ALBERT G. DAVIS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Acceleration Limiting and Recording Devices, (Case No. 1,169,) of which the following is a specification.

In starting and stopping vehicles—such, for example, as electric-railway cars or trains—it is undesirable that the acceleration or retardation should be too sudden or abrupt, since the motive power of the car or its braking apparatus would be subjected to too great stress. Another objection to the sudden starting or stopping of passenger-vehicles is the interference with the comfort of the passengers. These objections render it desirable that some check or preventive be put upon the motorman or other operative to prevent the vehicle under his control from being too suddenly accelerated or too abruptly stopped.

One feature of my present invention is a recording device for making a record of the number of times a certain predetermined acceleration or retardation is reached or exceeded. This record, being intended to come under the observation of the superintendent or other person in authority, exerts a moral effect upon the motorman or other operative to prevent him from improperly operating his car or train. In addition to this recording device I provide means responsive to acceleration of the vehicle for locking the power-controlling device when a certain acceleration is exceeded. This prevents the turning on of additional propelling power.

My invention includes various details of construction and arrangements of parts, all of which will be better understood by reference to the following description and accompanying drawings.

The scope of the invention will be particularly pointed out in the appended claims.

Figure 1 is a diagram of an electrically-propelled vehicle upon which is mounted a set of apparatus arranged in accordance with my invention. Figs. 2 and 3 illustrate details of construction of apparatus illustrated diagrammatically in Fig. 1. Figs. 4 and 5 are modifications of the circuit-closing device

shown in Fig. 1. Fig. 6 is an amplified form of circuit closing or indicating device somewhat resembling that shown in Fig. 1.

In order to obtain a device responsive to acceleration or retardation of the vehicle on which it may be used, I make use of a body possessing a considerable degree of inertia. As the vehicle is accelerated or retarded in speed the inertia of this body acts to produce relative motion between the members of a switch-closing device, this switch-closing device acting to control an electric circuit which, as shown in Fig. 1, operates a recording device and under suitable conditions checks further forward movement of the controller.

It is obvious that a device controlled by inertia and acting to close an electric circuit may assume many diverse embodiments. I have therefore not attempted to show all the various forms that my invention may assume, but have, on the contrary, shown one or two forms by way of illustration.

In Figs. 1, 2, and 6 the inertia-controlled device consists, fundamentally, of a pendulum. This pendulum is mounted upon an axis of its own and is free to swing in a vertical plane parallel to the path of movement of the vehicle, this motion, however, being controlled by means of centering-springs having their free ends fixed, preferably, in some manner so as to allow the pendulum when uninfluenced by the motion of the car or vehicle to hang vertically without exerting stress upon the springs. This may be accomplished in various ways—as, for example, by connecting the free ends of the centering-springs to a fly-wheel mounted concentrically with the axis of oscillation of the pendulum.

In Fig. 1 the pendulum is indicated at 3, the fly-wheel at 2, and the centering-springs between the pendulum and fly-wheel at 1. When the car or vehicle is on a grade, the tendency of the pendulum to assume a vertical position reacts through the centering-springs upon the comparatively heavy fly-wheel, so as slowly to rotate the fly-wheel until the pendulum again assumes a vertical position. The pendulum thus automatically maintains itself in a proper working position. When the speed of the car is accelerated or

retarded, the pendulum by reason of its inertia is displaced from its middle position and, if the force be sufficient, is swung far enough to make contact with either one of a pair of circuit-closing contacts 4, the circuit being completed through the pendulum and the conductors 5, connected to these contacts. In Fig. 1 the electromotive force impressed upon this circuit is obtained by connecting the circuit across some suitable portion of the length of a resistance 6, connected between the trolley-wire 7 and the ground return 8. This circuit is shown as extending from the point 9 in the resistance 6 through the circuit-closing device consisting of the pendulum 3 and associated parts, through the recording device 10, and through a locking device arranged on each controller 11 12. The locking device referred to is shown in detail in Fig. 3, and consists of a solenoid 13, having an armature 14 with a claw end 15, adapted to engage a toothed wheel 16, mounted either on the controller-shaft or suitably geared thereto.

The recording device (indicated at 10) is merely illustrative of a suitable means for recording the number of electrical impulses sent over a circuit and is of course capable of wide modification. As shown, it consists of a magnet 17, acting upon an armature 18, which by means of a spring-actuated pawl 19 is adapted to give a step-by-step motion to a pointer 20.

In the normal operation of the apparatus shown in Fig. 1 the inertia-controlled circuit-closing device is brought into action only when the acceleration or retardation reaches or exceeds a predetermined amount, in which case current being transmitted through the circuit actuates the recording device 10, at the same time operating the controller-locking devices. (Indicated in detail at Fig. 3.) The motorman is thus prevented from further throwing on the controller, while at the same time a record is made that a necessity for such action arose.

Figs. 2 and 6 show certain details which are useful in connection with the circuit-closing device in Fig. 1. Thus in Fig. 2 the pendulum is shown on an enlarged scale at 3, while its coöperating contacts, which are supposed to be carried by the wheel 2, are indicated at 21 and 22. These contacts consist of bolts 23 24, loosely mounted in adjustable arms 25 26, respectively. These bolts are maintained in fixed position with respect to their supporting-arms by means of spring-buffers 27 and 28, which serve the purpose of easing the shock when the contact 29, carried by the pendulum 3, brings up against either of its coöperating contacts. The arms 25 and 26 are made adjustable by means of securing-bolts 30 and 31, which serve to clamp them in suitable positions in slots or grooves 32 33, which form seats for the main body portions of the arms. The circuit-closing device may thus be adjusted to respond to any desired

degree of acceleration or retardation, and this adjustment may be such that the amount of acceleration or retardation necessary to operate the circuit-closing device may either be equal or different, as desired.

In order to damp out slight oscillations of the pendulum of the circuit-closing device, and thus prevent an accumulative effect, I may make use of a dash-pot or other suitable damping device. Fig. 6 shows such a damping device at 33.

In Figs. 4 and 5 I have indicated another form of circuit-closing device which may be used in place of that shown in Fig. 1. This device consists of a frame 34, pivoted upon an axis at right angles to the direction of movement of the car and weighted, as at 35, so as to preserve it in a vertical position. This frame supports a diaphragm 36, in the center of which is mounted a weight 37. This diaphragm is corrugated, as shown in Fig. 5, in order to render it more flexible. Contacts 38 and 39, mounted upon spring-buffers 40 41, coöperate with the weight 37 to produce a circuit-closing device, the circuit of which passes from the frame 34 through the diaphragm 36 and then through the weight 37 to either one of the contacts 38 or 39. These contacts are of course insulated from the frame, as indicated by the insulating material shown at 42 and 43, and are at the same time adjustable by means of the screws 44 45. This circuit-closing device operates by inertia in substantially the same manner as that shown in Fig. 1, so that no further description of the connections and mode of action seems necessary.

In some cases it may be considered unnecessary to provide the controllers with locking devices such as shown in Fig. 3, in which case I may make use of indicating or recording mechanism only. Where indicating mechanism only is employed, I have found it desirable to register different degrees of acceleration or retardation, and for this purpose I make use of a number of indicators—as, for example, two. (Shown in Fig. 6.) One of these may be used to register moderate yet undesirable degrees of acceleration or retardation, while the other may record serious or dangerous shocks. The recording devices are substantially duplicates of each other, and each may be identical with that shown and described in connection with Fig. 1.

To operate the recording devices, the circuit-closing apparatus is provided with an additional set of contacts located so as to require a greater range of movement of the pendulum or other circuit-closing device than is required to close the first set of contacts. In Fig. 6 the contacts 21 and 22 are arranged substantially as shown in connection with Fig. 2, except that they are mounted upon the surface of shell-shaped springs 46 47. The second set of contacts 48 and 49 are located, respectively, within the shells 46 and 47 and are similarly mounted upon suitable springs, (indicated at 50 and 51.) The swing-

ing of the pendulum 3 will first cause contact to be made with either one of the contacts 21 22, thereby operating the indicator 52. A greater degree of movement of the pendulum, corresponding to a greater degree of acceleration or retardation, will cause one of the contacts 21 22 to be compressed until it in turn makes contact with one of the remaining set of contacts 48 and 49, thereby operating the recording device 53. Since the recording device 52 operates whenever the contacts 21 22 are closed and also when the other set of contacts corresponding to the recording device 23 are closed, it is necessary to subtract the indications of the device 53 from the device 52 in order to obtain a proper indication of the number of times a lower degree of acceleration or retardation was reached. It is hardly necessary to mention that these electromagnetic recording devices should be supplied with current from some suitable source, which in the drawings is indicated conventionally at 54.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination with a vehicle, of a device mounted thereon and acting to record the number of times a predetermined acceleration or retardation is exceeded.

2. The combination with a vehicle, of a device thereon acting to record the number of times a predetermined rate of acceleration is exceeded, and at the same time controlling the motive power of the vehicle to prevent further acceleration.

3. The combination with a vehicle, of a device thereon responsive to acceleration of the vehicle, said device acting to control the motive power of the vehicle in such a way as to limit the acceleration to a predetermined amount.

4. The combination with a vehicle, of a device thereon responsive to acceleration of said vehicle, said device acting to limit the acceleration of said vehicle to a predetermined amount.

5. The combination of a vehicle, and a device thereon acting by inertia to close an electric circuit when the acceleration or retardation of the vehicle reaches or exceeds a predetermined limit.

6. The combination of a vehicle, and a de-

vice mounted thereon and acting to record the number of times a predetermined acceleration or retardation is reached or exceeded.

7. The combination of a vehicle, a plurality of switches, a device acting by inertia to close said switches, and a recording device in circuit with each switch.

8. The combination of a vehicle, a plurality of switches, and a device responsive to acceleration or retardation of said vehicle for successively closing said switches.

9. The combination of a vehicle, a plurality of switches, a recording device for each switch, and a device responsive to acceleration or retardation of said vehicle for closing said switches.

10. The combination of an electrically-propelled vehicle, a controller therefor, and a device responsive to acceleration of said vehicle for locking said controller when a predetermined acceleration is reached.

11. The combination of an electrically-propelled vehicle, a controller therefor, a device responsive to acceleration of said vehicle for locking said controller when a predetermined acceleration is reached, and a recording device actuated each time the controller is locked.

12. The combination with a vehicle, of a device responsive to acceleration or retardation of the vehicle but independent of grade, said device acting to control the motive power of the vehicle.

13. The combination with an electrically-propelled vehicle, of a device responsive to acceleration or retardation of the vehicle but independent of current, said device acting to lock the controlling mechanism of said vehicle.

14. The combination of a vehicle, a pendulum adapted to be carried thereby and to swing in a plane parallel to the direction of motion of the vehicle, and a damping device operatively related to the pendulum and acting to prevent slight irregularities of speed from having a cumulative effect upon the pendulum.

In witness whereof I have hereunto set my hand this 28th day of September, 1900.

ALBERT G. DAVIS.

Witnesses:

BENJAMIN B. HULL,
MABEL E. JACOBSON.