No. 888,417. PATENTED MAY 19, 1908.

T. BODDE.

AUTOMATIC CONTROLLING DEVICE FOR CARS.

APPLICATION FILED JULY 10, 1907. 4 SHEETS—SHEET 1.

Fig. 1.

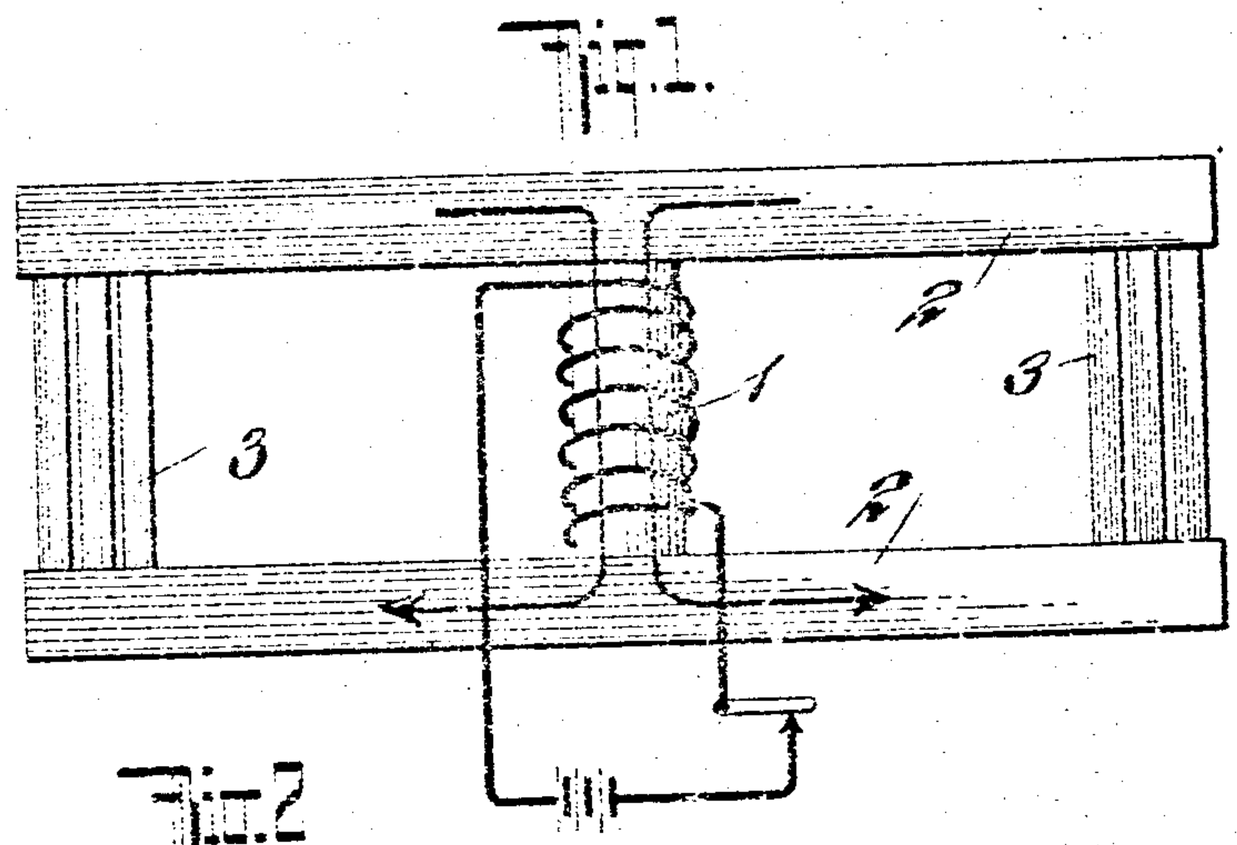


Fig. 2

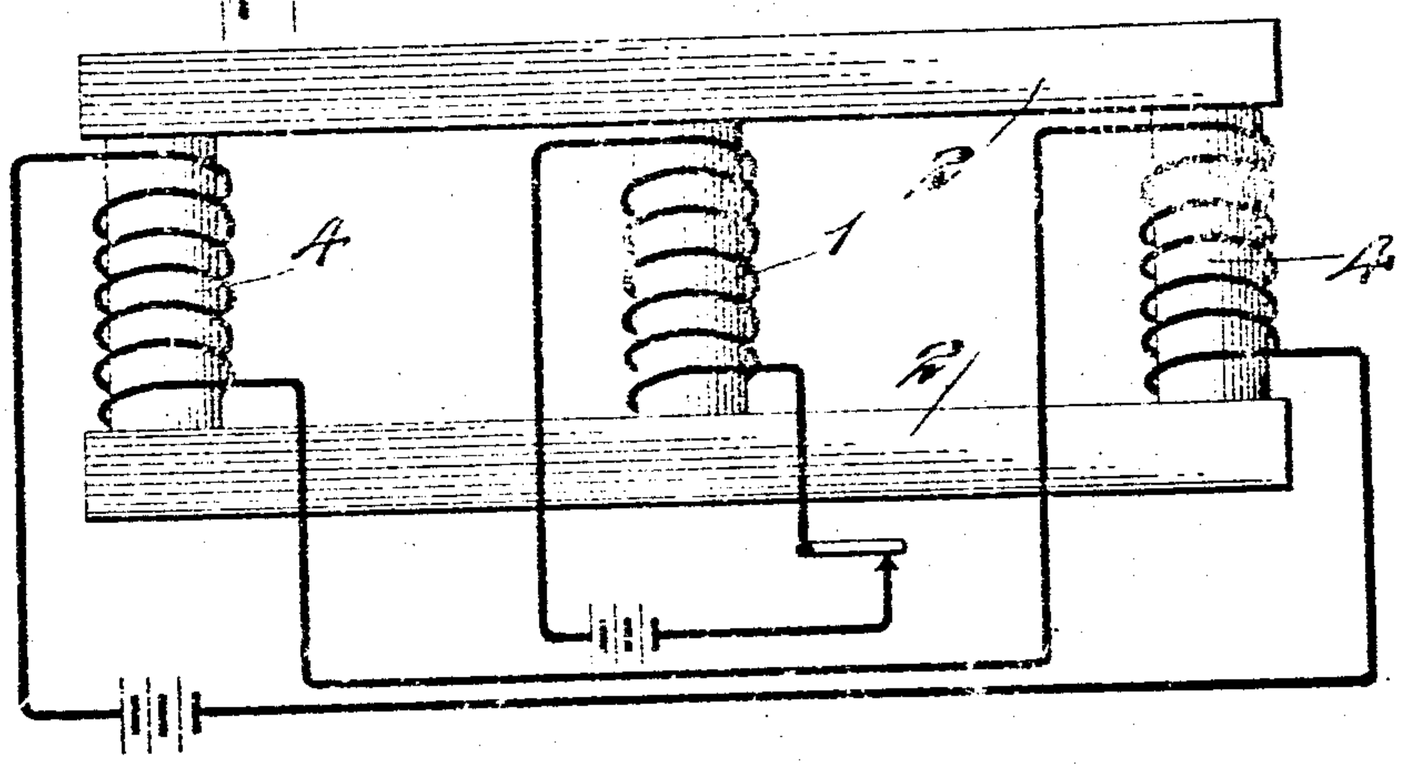
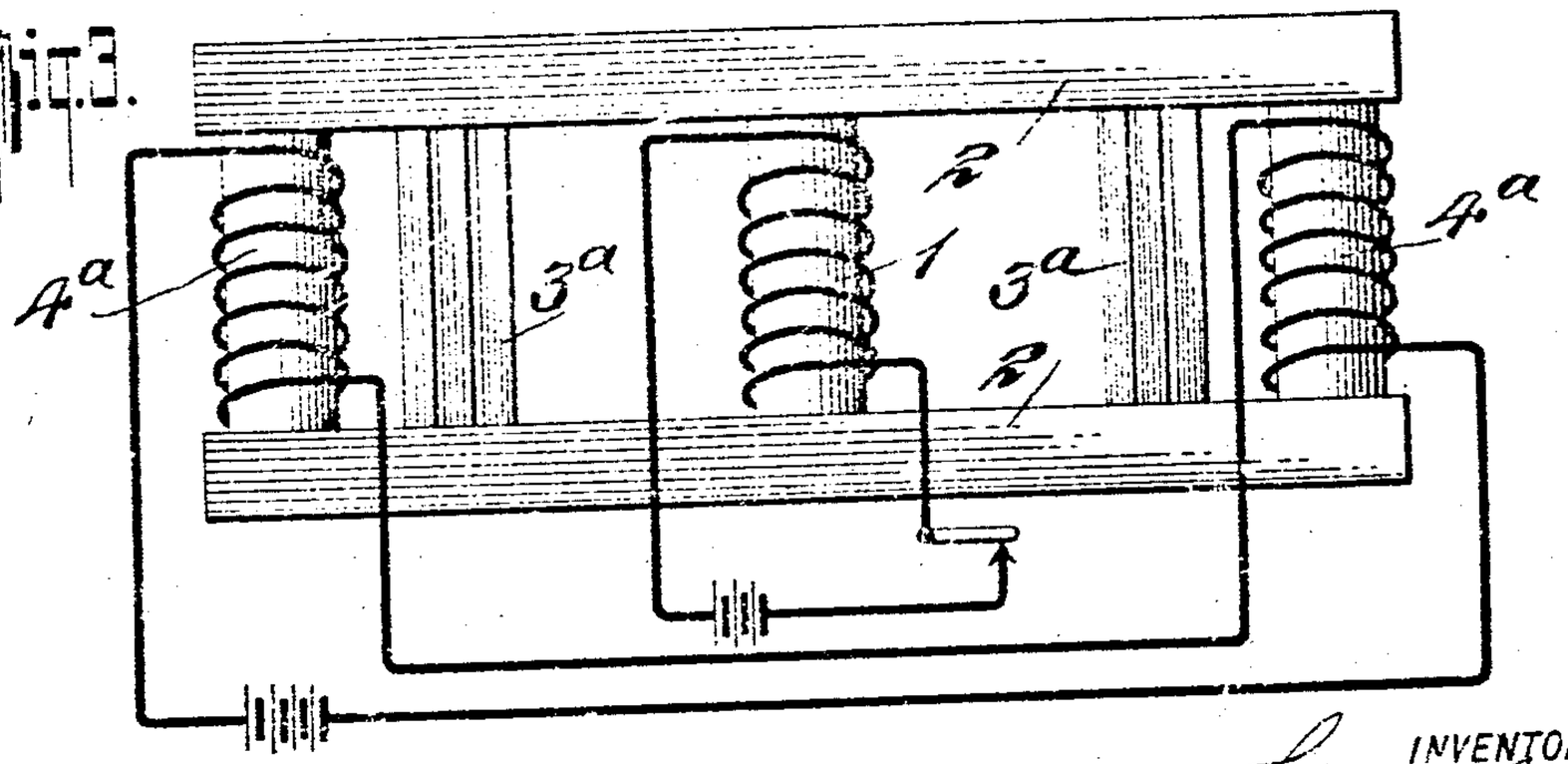


Fig. 3.



WITNESSES

Juliette B. Lutz

R. B. Cavanagh.

INVENTOR

Theodore Bodde

BY Siggord & Bull

HIS ATTORNEYS

No. 888,417. PATENTED MAY 19, 1908.

T. BODDE.

AUTOMATIC CONTROLLING DEVICE FOR CARS.

APPLICATION FILED JULY 10, 1907.

4 SHEETS—SHEET 2.

Fig. 1.

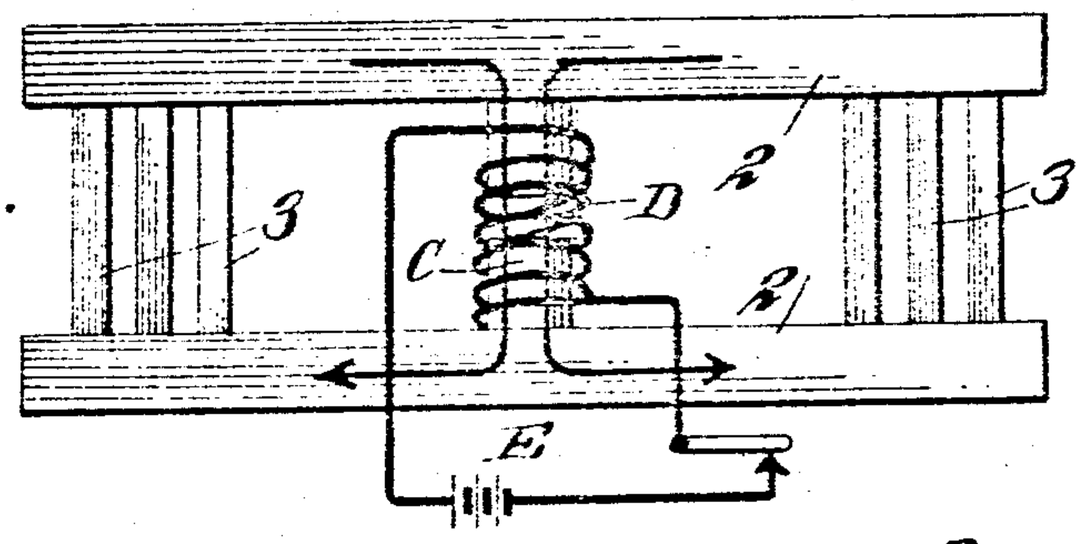


Fig. 4.

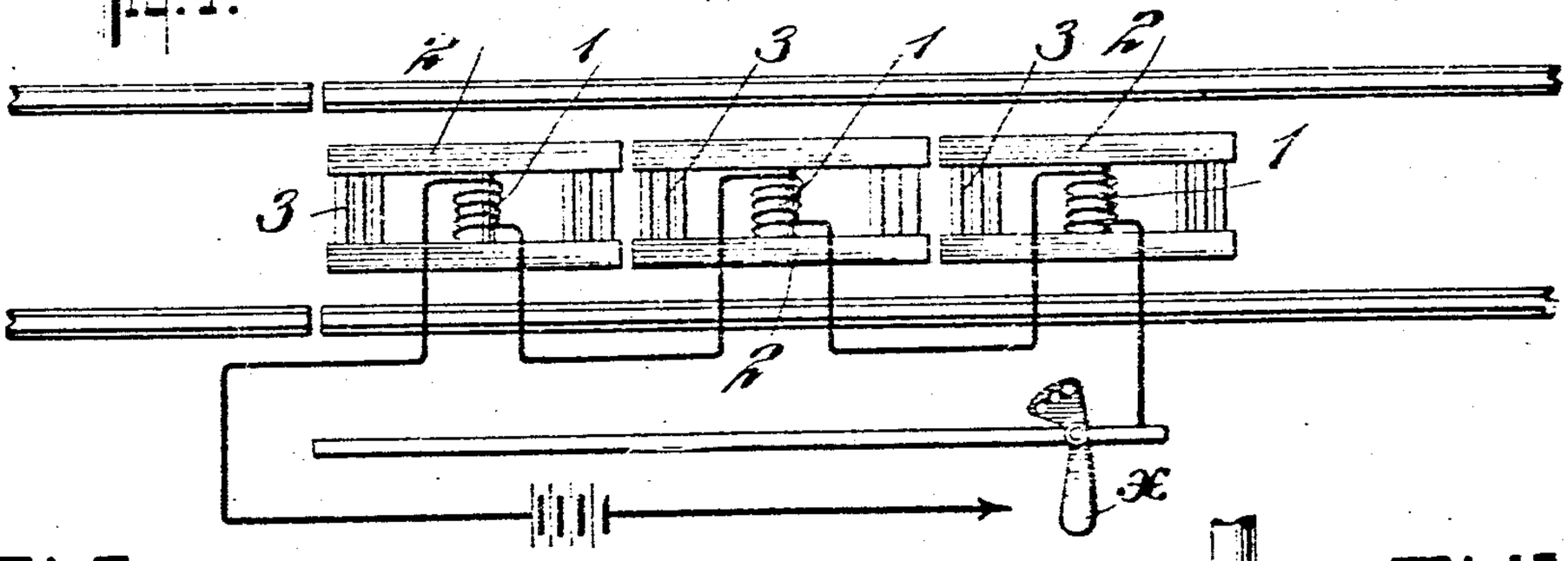


Fig. 8.

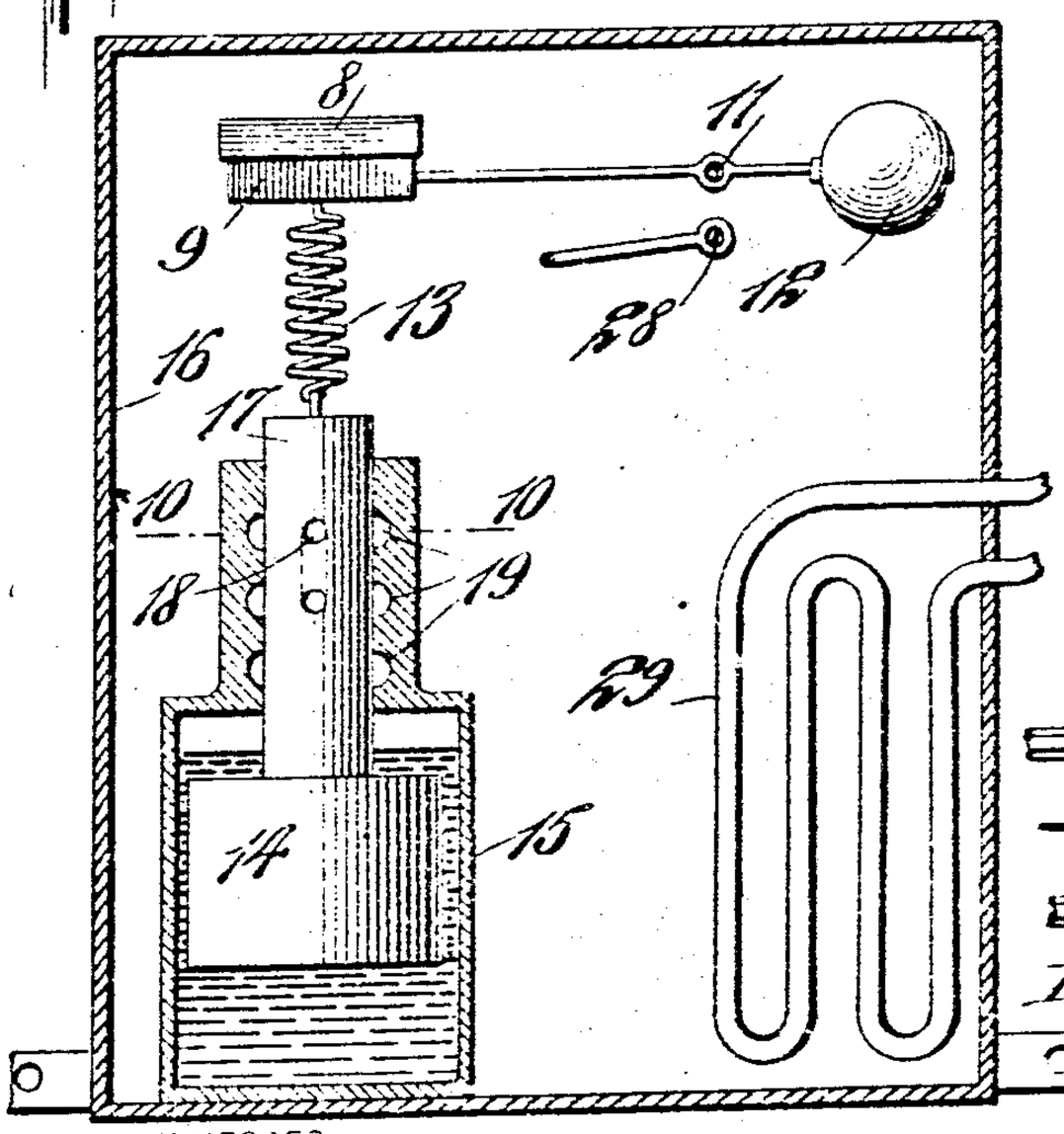


Fig. 10.

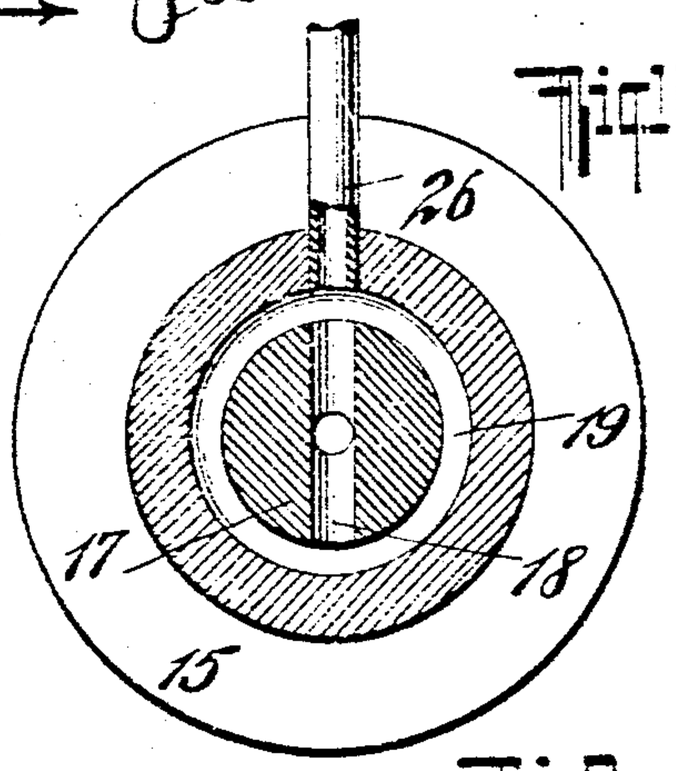
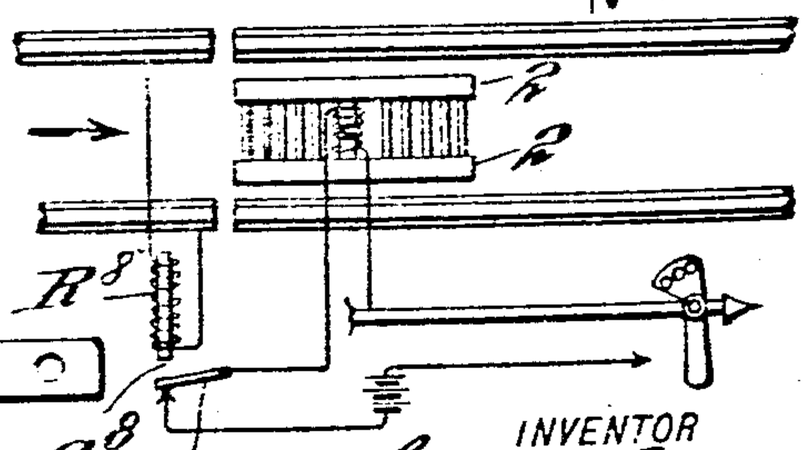


Fig. 9.



WITNESSES

Julius A. Luth.

P. B. Conaway.

INVENTOR

Theodore Bodde

BY Eggleston & Bull

his ATTORNEYS

No. 888,417

PATENTED MAY 19, 1908.

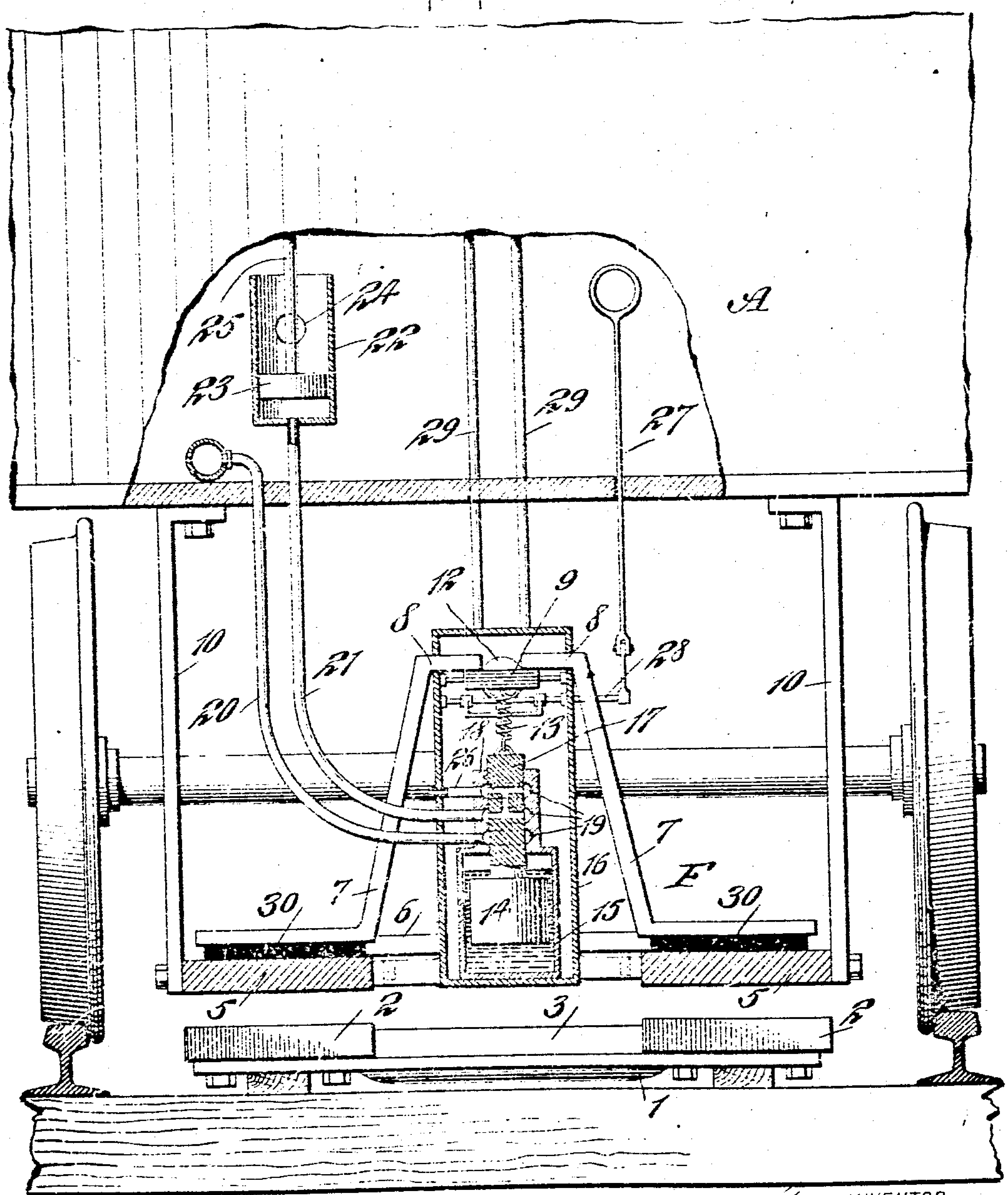
T. BODDE.

AUTOMATIC CONTROLLING DEVICE FOR CARS.

APPLICATION FILED JULY 10, 1907.

4 SHEETS—SHEET 3.

Fig. 5.



WITNESSES

Julius H. Lutz

R. D. Cavanagh

INVENTOR

Theodore Bodde

BY Gifford & Bull

his ATTORNEYS

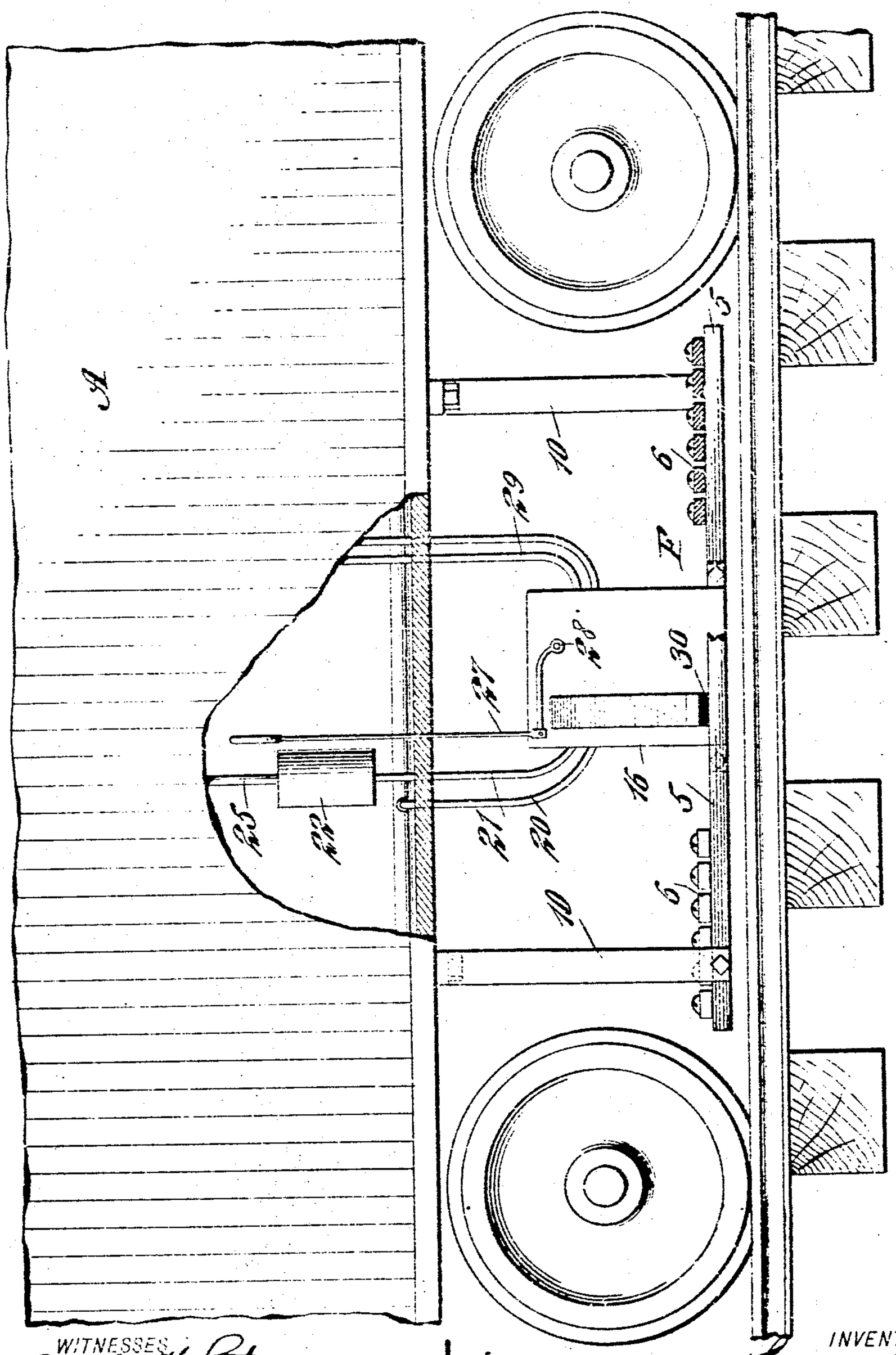
No. 888,417. PATENTED MAY 19, 1908.

T. BODDE.

AUTOMATIC CONTROLLING DEVICE FOR CARS.

APPLICATION FILED JULY 10, 1907.

4 SHEETS—SHEET 4



WITNESSES:
Julius A. Lutz
R. B. Earnest

INVENTOR
Theodore Bodde
BY Byford & Buck
his ATTORNEYS

UNITED STATES PATENT OFFICE.

THEODORE BODDE, OF WESTFIELD, NEW JERSEY.

AUTOMATIC CONTROLLING DEVICE FOR CARS.

No. 888,417. Specification of Letters Patent. Patented May 19, 1908.

Application filed July 10, 1907. Serial No. 382,996.

To all whom it may concern:

Be it known that I, THEODORE BODDE, a subject of the Queen of the Netherlands, and a resident of Westfield, in the county of Union and State of New Jersey, have invented a certain new and useful Improvement in Automatic Controlling Devices for Cars, of which the following is a specification.

This invention relates to automatic controlling devices for cars, such controlling devices being of the type shown in my co-pending application filed March 18, 1907, Serial No. 362,820

In carrying out the invention, I have in view means for automatically controlling cars trains, and the like, when conditions or circumstances require, such as the presence of another train upon the track-block, or the presence of other dangers.

The invention consists of the construction, combination and arrangement of parts set forth in and falling within the scope of the appended claims.

In the accompanying drawings like characters of reference indicate like parts in all the views, and Figure 1 is a view showing one form of a track-magnet employed in connection with my invention; Fig. 2 is a view of another form of track-magnet; Fig. 3 likewise indicates a third arrangement of track-magnet; Fig. 4 is a view illustrating a manner in which these track magnets are disposed on the track beginning with each block, in any number of sets as desired, sometimes three or more magnets being employed; Fig. 5 is a view looking at the car from one end, showing a portion of the latter broken away, said view illustrating in detail the connections between the pole pieces and the armature of the train magnet, the construction and disposition of the valve and dash-pot therefor and of the piston by which the worst of the power is cut off in time of danger; Fig. 6 is a side longitudinal view of the car, a portion of the car body being broken away, said view showing the train magnet box and the construction and arrangement of the train-magnet relative thereto. Fig. 7 is a view of still another form of track-magnet; and Fig. 8 shows diagrammatically the disposition of the track-magnet and the circuit working at "Normal danger", that is to say, with the circuit normally open at an extra contact point, and only closed at that contact point when there is a train arriving on the preceding track section in the direction of the arrow. Figs. 9 and 10 are detail views of the dash pot and valve employed in connection with my invention.

As heretofore stated, this invention is of the same type, broadly considered, as that illustrated in my copending application aforesaid, that is to say, at a track section, or certain track sections, I locate adjacent to the tracks what we may term a track magnet, and upon the train or other moving vehicle is mounted a train-magnet, which latter operates a safety device of any suitable type or nature which is operated at a predetermined time by the passage of the train-magnet over or past the track-magnet. In my invention an air gap or space always exists between the track-magnet and the train-magnet.

I will now proceed to describe my invention more in detail and in so doing will deal first with the construction and arrangement of various forms of track-magnets shown.

Referring now to the construction shown in Fig. 1, the numeral 1 indicates the core located between the pole pieces 2, 2. At the end of each of these pole pieces and extending between the same I arrange the permanent magnet bars 3, 3 which are spaced apart and connected to each pole piece with equal polarity as that of the core 1 when it is energized by the ampere turns around it. In this way one of the pole pieces will be the north pole and the other the south pole, so that to all intents and purposes we have a polarized track-magnet. The presence of the permanent magnets 3, 3 possesses the advantage that it requires less ampere turns around the core in order to render the track-magnet effective, as the permanent magnets may furnish the great bulk of the required total flux in each pole piece of the track-magnets in order to oppose the magnetic poles of the train magnet, the construction of which latter will be described in detail hereafter. A further advantage of the construction shown in Fig. 1 is that when the electric circuit around the core 1 is open, which corresponds to "danger", the magnetic flux from the permanent magnets 3, 3 will pass in the direction of the arrows, through the pole pieces and the core of the track-magnet, and in this way cause a considerable magnetic induction in the iron of the track-magnet, in consequence of which the iron will possess a much higher permeability than if it was not crossed by such magnetic flux. Thus, when

the train-magnet arrives over the track-magnet the magnetic flux from the former will pass much more readily through the track magnet than if the iron of such track magnet were simply neutral, that is, did not conduct a considerable flux coming from the permanent magnets 3, 3.

In Fig. 2 in the place of the permanent magnets 3, 3 I have substituted electromagnets 4, 4 which are, as in the case of the permanent magnets, connected to each pole piece with equal polarity as that of the core 1, when it is energized by the ampere turns of wire around it. In order to be effective, the electric circuit of the electromagnets 4, 4 is closed during the time of the passage of a train over the track-magnet. In Fig. 3 I have shown a construction of track-magnet embodying in combination the features of both Figs. 1 and 2, that is to say, I provide the permanent bar magnets 3^a and the electromagnets 4^a extending between the pole pieces 2, 2. In Fig. 4 I have shown a set or series of track-magnets, three in number, located between the rails of the track and arranged in working connection with the semaphore X.

In the construction of the track magnet shown in Fig. 7, two soft iron pole pieces 2, 2 are connected by the permanent steel magnets 3, 3 as in Fig. 1, all of the same polarity on the same pole piece. Moreover, there is again disposed between the two pole pieces the soft iron core C which in this construction, however, is broken or discontinued or made narrow for a certain distance and such core is surrounded by the wire spool D which is wound and connected in such way as to cause, when closed on the source of electricity, such as the battery E, a polarity in the core C, which is contrary to the polarity of the permanent magnets 3. Hence, when the circuit of the spool D is closed, which corresponds to "safety" the magnetic flux from the permanent magnets 3 is allowed to pass through the core, including the air gap of the same in the direction of the arrow and the pole pieces then present practically no outside magnetism. But when the circuit of the spool D is open, which corresponds to "danger", the air gap of the core presents such a high magnetic resistance to the flux from the permanent magnets 3, 3 that this flux will pass almost entirely through the air, thus giving a high outside magnetism to the pole pieces. If now such a track-magnet is disposed on the track in such a way as to face in the time of "danger", the train-magnets which pass over it with pole pieces of contrary polarity, the flux from those train-magnets will be drawn in, as it were, by the track-magnet. This occurs, however, only in the time of "danger", and not so when the device is at "safety". In this construction it will be noted that not only does the track-magnet not present the opposition pole to the train-magnet which passes over it in time of "danger", but presents coöperating poles, as it were.

Having described in detail the construction of the various forms of track magnets utilized by me, I will now proceed to describe the arrangement of train-magnet, or that carried by the vehicle, and also describe the connected parts operating in conjunction therewith.

Having especial reference to Figs. 5, 6, 9, and 10, A indicates the car or other vehicle traveling along the trackway and carrying suspended by the straps 10, 10, the train magnet which is indicated as an entirety by F. This train magnet comprises the pole pieces 5, 5 and the permanent bar magnets 6, spaced apart relative to each other and extending across and connecting the two pole pieces. All of these permanent magnets have equal polarity on the same pole piece, so that one of the pole pieces is made the north pole and the other the south pole. 7, 7 indicate projections extending up from the grid formed by the pole pieces and the magnets, and adapted to contact with the under side of the inturned ends 8, 8 of the projection is the armature 9. This armature is pivoted on an axis 11 and is perfectly balanced on such axis by the counterweight 12. This construction possesses certain advantages in that the jars and vibrations of the train while in motion can have practically no disturbing influence upon such balanced armature, so that it will not be jarred from the seat, against which it is attracted, by the shocks of the train. The only force which tends to force or pull the armature away from its seat is the tension spring 13 which is attached at its upper end to the armature. In order to give the necessary tension to the spring, I provide at the lower end a weight 14 moving freely in a cylinder 15 which is filled with oil or other liquid, or gas. In this way the cylinder 15 forms a perfect dashpot for any movement of the weight 14 with relation to such cylinder. This cylinder or chamber is arranged within a box 16 which also contains the armature and its axis. Consequently the movements of the train will have practically no influence on the tension of the spring 13, which is the main purpose of this dashpot disposition. When the train-magnet passes over a track-magnet which presents no opposing poles to the train-magnet, (this corresponding to "danger",) the armature will fly off its seat and the weight descend into the vessel 15. The upper part of such weight is formed as a sliding valve, the plug portion 17 of the weight having ports 18 therein adapted to register with ports 19 in the sleeve portion of the neck or extension of the cylinder containing the weight. In the construction shown in the drawings the tube 20 is connected with the train pipe of an air brake

system, while the tube 21 leads to the dash-pot cylinder 22 within which moves the piston 23. An opening 24 is formed in the wall of the cylinder and the piston rod 25 when pushed out from the cylinder 22 tends to shut off the motive power of the train. The pipe 26 leading from the upper portion of the neck of the cylinder communicates with the outside air. As is clearly shown in Fig. 5, when the sliding valve in the neck of the chamber or cylinder is in its upper position, which corresponds to "safety," the inside of the cylinder 22 is connected with the atmosphere and hence the rod 25 may be freely moved by hand to shut off or apply the motive power of the train. But when the sliding valve is in its lower position, which corresponds to "danger," the inside of the cylinder 22 is connected with the air brake pressure and hence the piston 23 will be pushed out of the cylinder and by means of the rod 25 shut off the motive power of the train. Moreover, when the piston reaches the opening 24 the air from the brake system can freely escape through that hole and hence the brakes will be applied and stop the train. To start the train again, the engineer must first force the armature 9 against the shoulders 8 of the projections 7. This may be done by means of the lever 27 which when pulled upward, turns the shaft 28 and thus forces the armature against the shoulders 8. As soon as the armature rests against the shoulders the engineer lets go the lever 27, which drops of its own weight and then he can operate the piston 25 to apply the motive power of the train. The heating wires or pipes 29 may be employed to heat the inside of the box 16 and thereby avoid the possibility of freezing in cold weather. Furthermore, in the construction shown in Figs. 5 and 6 the projections 7 are separated from the pole pieces 5 by means of some non-magnetic material 30, so that the magnetic flux passing through the armature path encounters a considerable magnetic resistance, and hence, not only is the "sticking" of the armature prevented, but the demagnetization of the armature path at the moment that the train magnet passes over the track-magnet takes place more quickly than if the air gap did not exist.

Fig. 8 illustrates diagrammatically the disposition of the track magnet and its circuit when it is desired, for economical reasons, that the track magnet work at "normal danger"; that is to say, with its circuit normally open at an extra point of contact a^8 and only be closed at that point of contact when there is a train arriving on the preceding section in the direction of the arrow. This is accomplished by means of the relay R^8 which in the well known way, is deënergized, when a train passes over its block and thus the relay drops the armature A^8 which in turn closes the contact a^8 so that the track magnet can then perform its functions for the arriving train. This relay R^8 may be operated in series with its track battery, or it may be operated in parallel with the track battery. It is evident that by a construction of this character considerable economy in the use of the current is attained. Instead of the relay R^8 we might evidently use as well a "track instrument" closing the contact a^8 at the arrival of the train in the preceding block.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:—

1. The combination with a vehicle, a train magnet carried thereby, of a track magnet having pole-pieces connected by a permanent magnetic member, and a core member.

2. The combination with a vehicle adapted to move along a track, of a train magnet carried by said vehicle, and a track magnet located at the track, said track magnet having pole pieces connected by a core member.

3. The combination with a vehicle adapted to travel along a track, of a train magnet carried thereby, and a track magnet located at the track, said track magnet having pole pieces connected by a plurality of permanent magnets and a plurality of core members.

4. The combination with a vehicle adapted to travel along a track, of a train magnet carried by the vehicle, and a track magnet having pole pieces supplied with core members spaced apart whereby a path of magnetic resistance is formed between the core members.

5. The combination with a vehicle adapted to travel along a track, of a train magnet therefor having a member projecting therefrom, and an armature adapted to bear against said projection at predetermined times, and a track magnet located at the track.

6. The combination with a vehicle or the like adapted to travel along the track, of a train magnet carried thereby and having a plurality of projecting members, and an armature adapted to bear against said projection at predetermined times, and a track magnet located at the track.

7. The combination with a car or the like, of a train magnet having a plurality of projecting members, an armature adapted to bear against such projections at predetermined times, a track magnet and a safety device operated by the passage of the train magnet past the track magnet.

8. The combination with a car or the like, of a train magnet, an armature, and means for mounting the armature in balance against accidental displacement.

9. The combination with a car or the like, of a train magnet having a plurality of mem-

bers projecting therefrom, an armature adapted to bear against such projections at a predetermined time, and means for mounting the armature in balance against accidental displacement.

10. The combination with a car or the like, of a train magnet having a plurality of members projecting therefrom, an armature adapted to bear against such projections at a predetermined time, and means for preserving the armature in balance on its axis.

11. The combination with a car or the like, of a train magnet having a plurality of members projecting therefrom, an armature adapted to bear against such projections at a predetermined time, a spring connected to said armature and a weight connected to said spring.

12. The combination with a car or the like, of a train magnet having a plurality of members projecting therefrom, an armature adapted to bear against such projections at a predetermined time, a tension device for said armature, a weight connected to said tension device, and a damping device for said weight.

13. The combination with a car, a permanent train magnet therefor, an operating armature, a valve connected to said armature and safety means controlled by said valve.

14. The combination with a car, of a permanent train magnet, an operating armature, a valve connected to said armature, safety means (comprising a cylinder, piston and rod) controlled by said valve, and an outlet in the wall of said cylinder.

15. The combination with a car of a permanent train magnet, an operating armature, a valve connected to said armature, safety means, comprising a cylinder, piston and rod, connected to said valve, means whereby an actuating medium is admitted to said cylinder to operate said piston and rod and an outlet permitting the escape of said medium at the end of said operation.

16. The combination with a car, of a train magnet, an operating armature, a valve connected to said armature, safety means, comprising a cylinder, piston and rod, connected to said valve, and means supplying air at atmospheric pressure to said cylinder through said valve when the latter is not operated by said armature.

17. The combination with a car, of a train magnet, an operating armature, a valve connected to said armature, safety means, comprising a cylinder, piston and rod, connected to said valve, a pipe connecting said valve with the outside air, and ports in said valve permitting the passage of air to said cylinder when said valve is in its normal, unoperated position.

18. The combination with a car of a permanent train magnet, an operating armature, a valve connected to said armature, safety means, comprising a cylinder, piston and rod, connected to said valve, and means whereby an actuating medium is supplied to said cylinder through said valve when the latter is operated by said armature.

19. The combination with a vehicle carrying a train-magnet, of a track-magnet arranged in circuit with a source of electrical energy and provided with a contact point, and means normally holding said contact open, such means closing the point of contact to complete the circuit when the vehicle passes over a preceding track section.

20. The combination with a vehicle adapted to travel along a track, of a train magnet therefor, and a track magnet located adjacent to the track and comprising a plurality of pole pieces, means for magnetically energizing said pole pieces on open circuit, and means for deënergizing the pole pieces when the circuit is closed.

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

THEODORE BODDE.

Witnesses:
RICHARD B. CAVANAGH,
W. A. PAULING.