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C. A. BALL.

SAFETY DEVICE FOR RAILWAY CARS.

No. 562,881. Patented June 30, 1896.

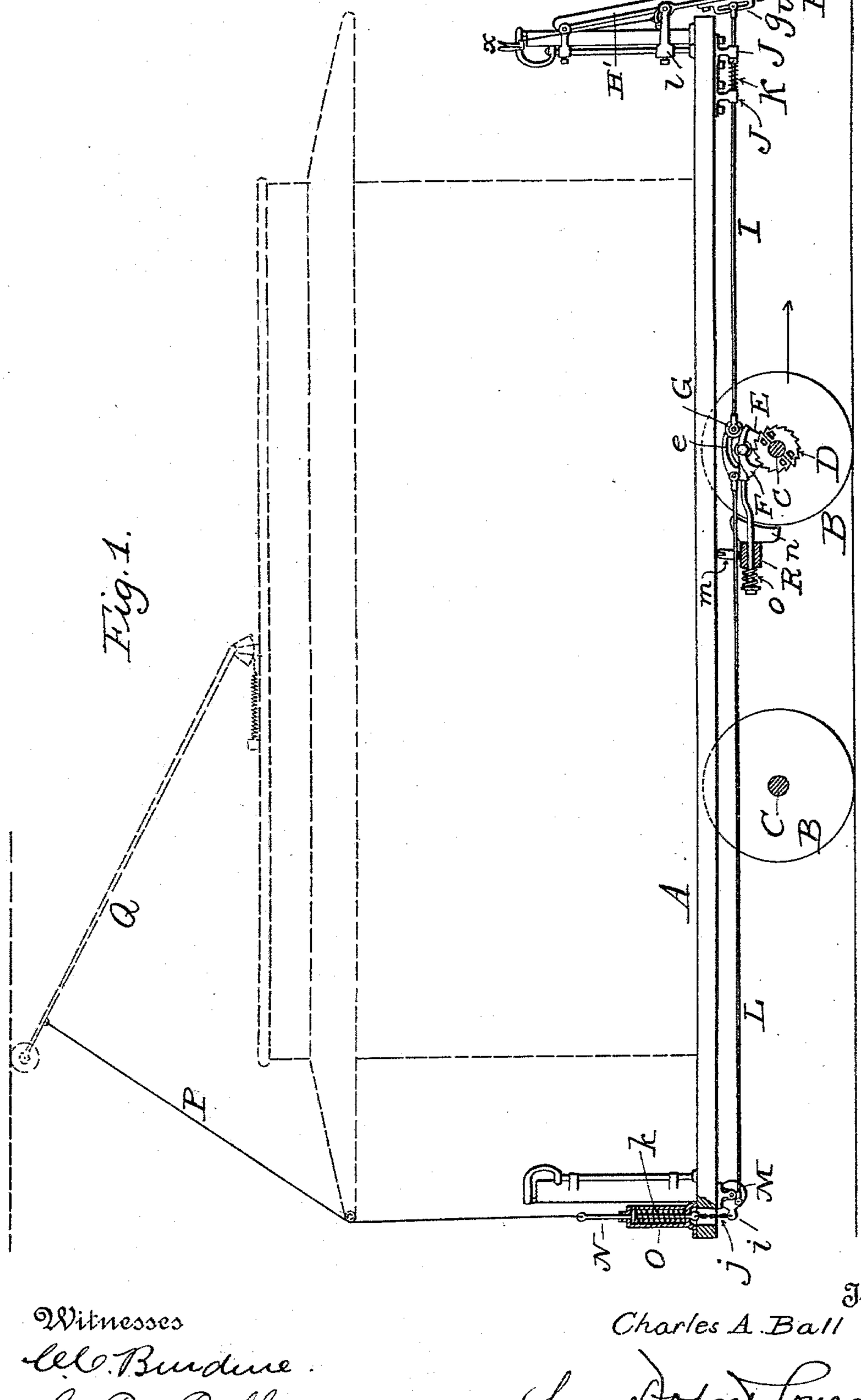

Fig. 1.

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C. B. Bull.

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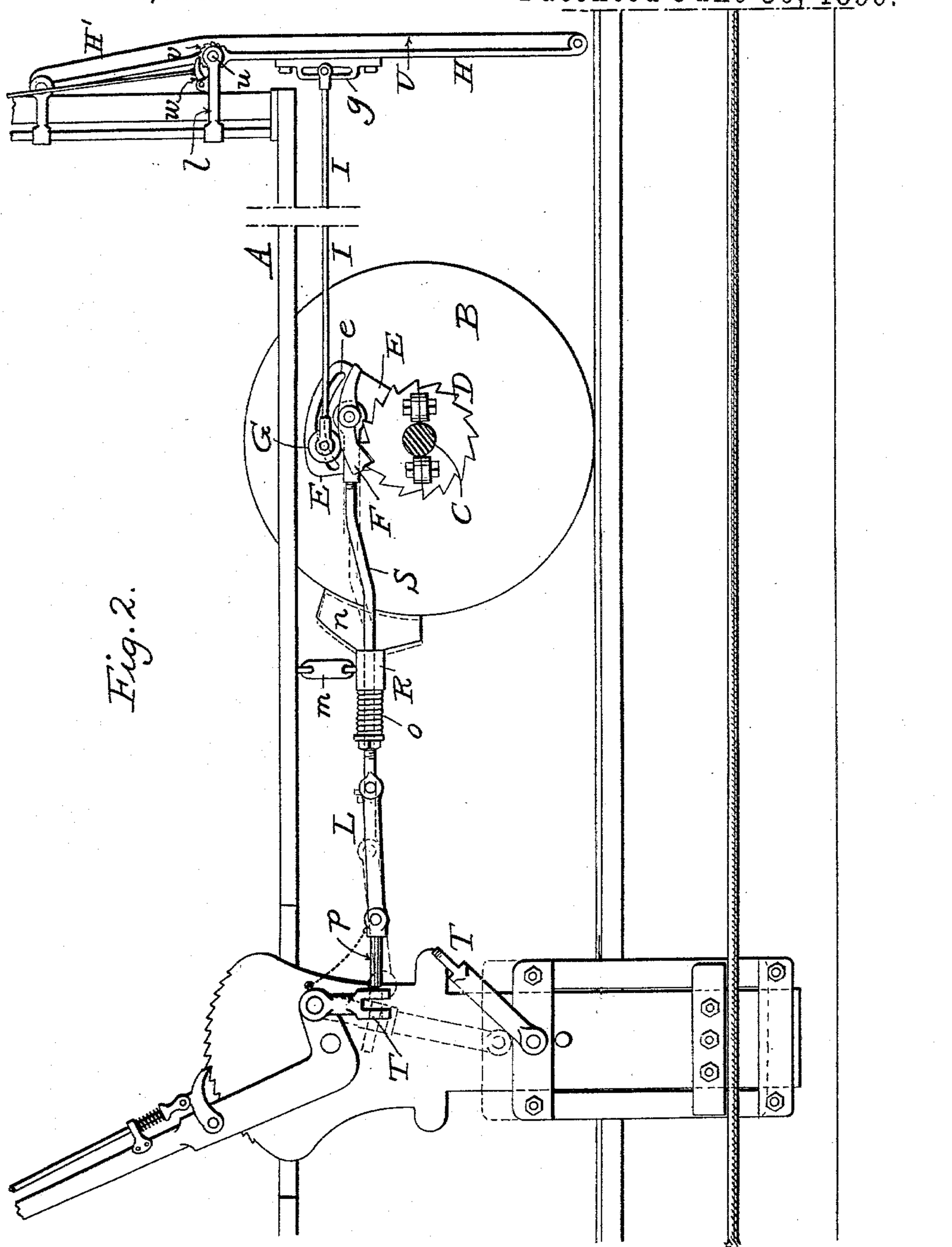

Fig. 2.

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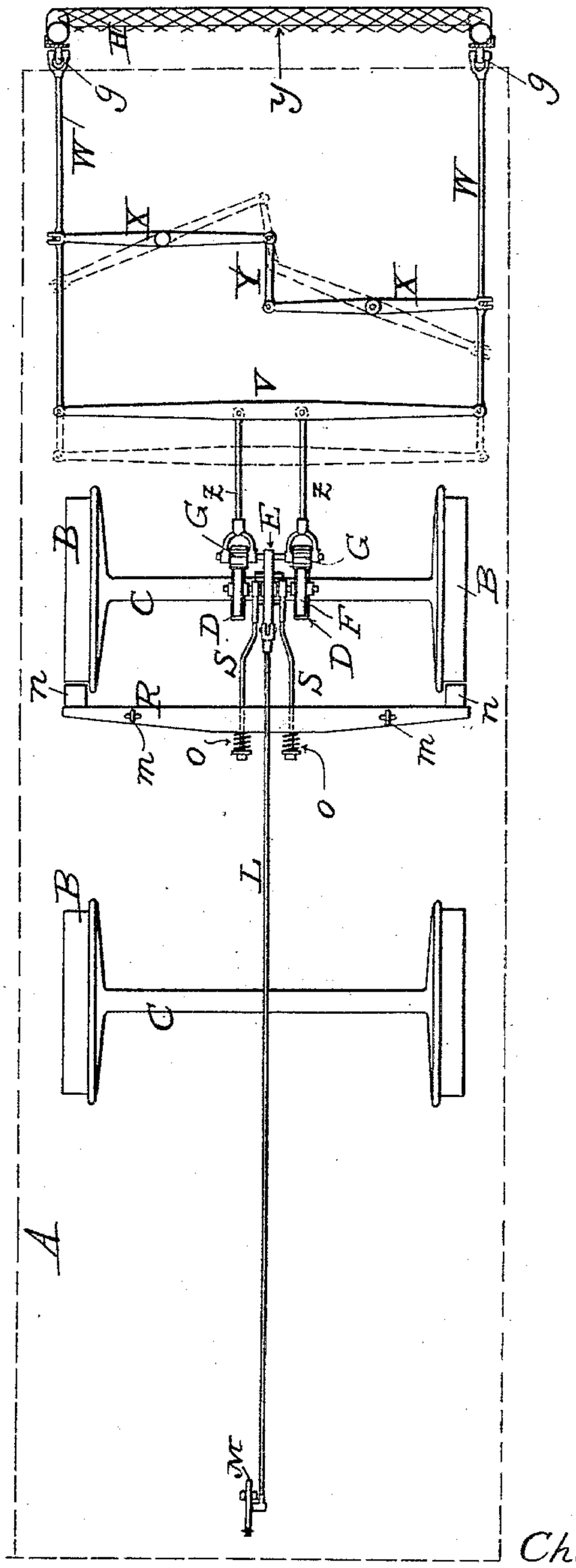

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

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SAFETY DEVICE FOR RAILWAY CARS.

No. 562,881. Patented June 30, 1896.

Fig. 7.

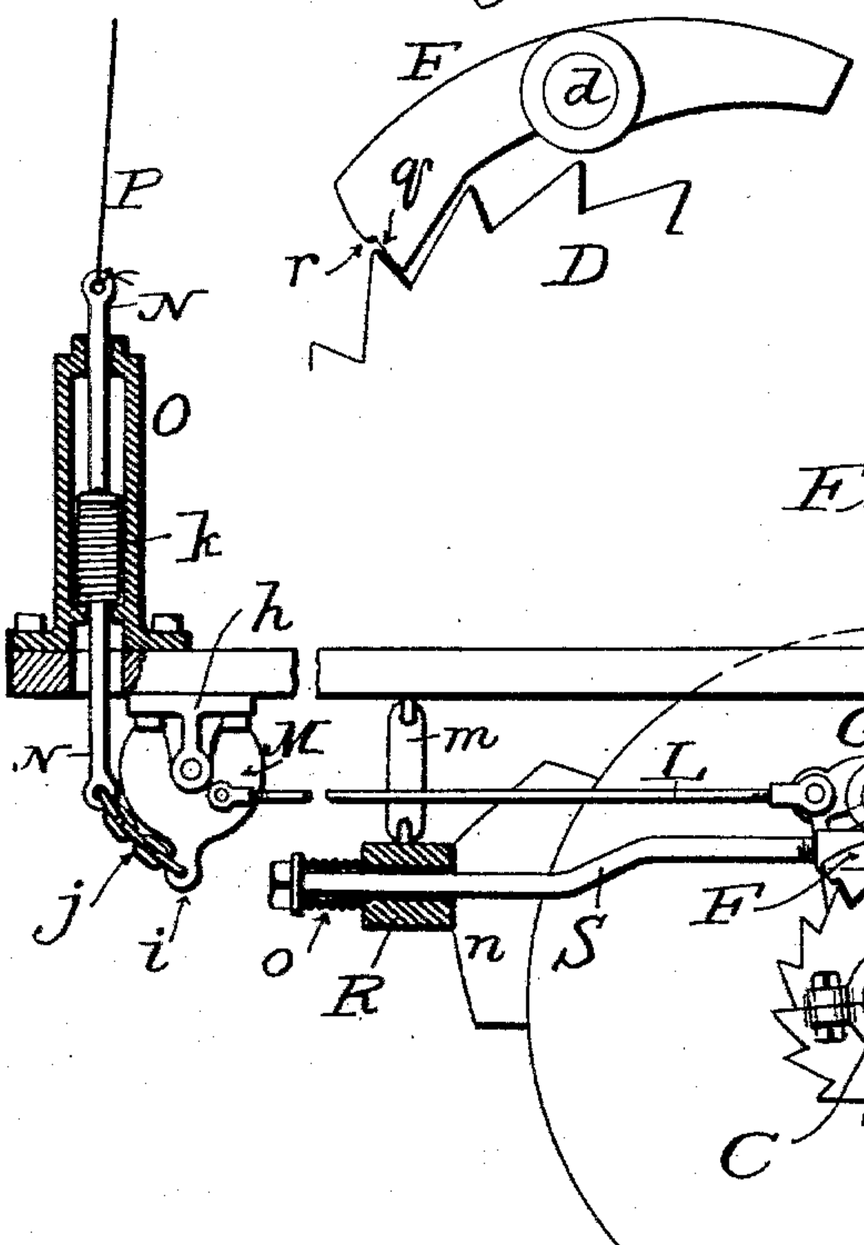
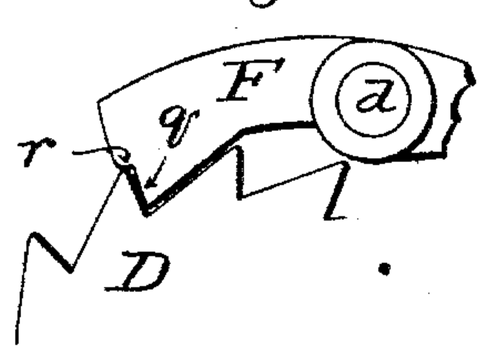


Fig. 8.



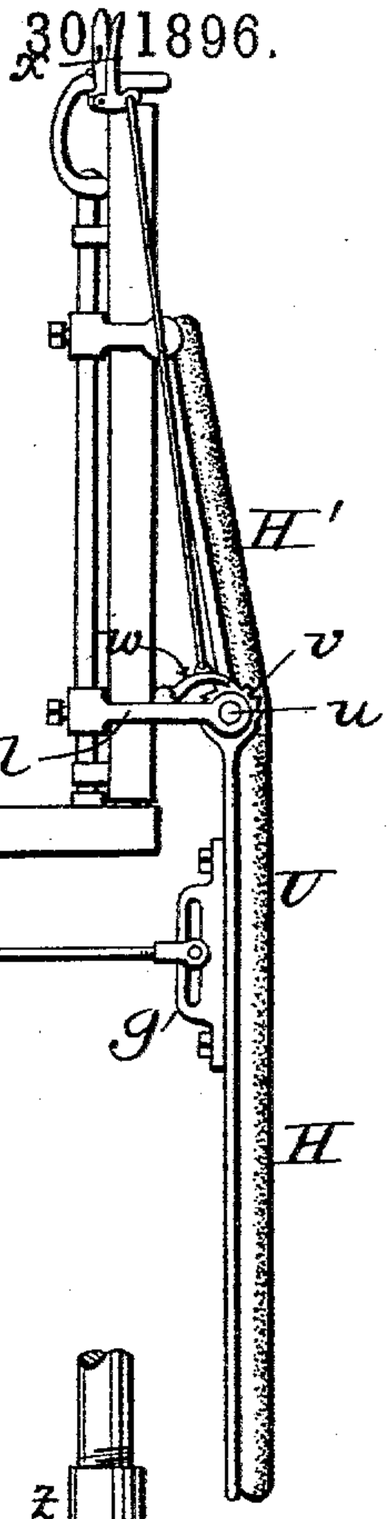


Fig. 4.

Fig. 5.

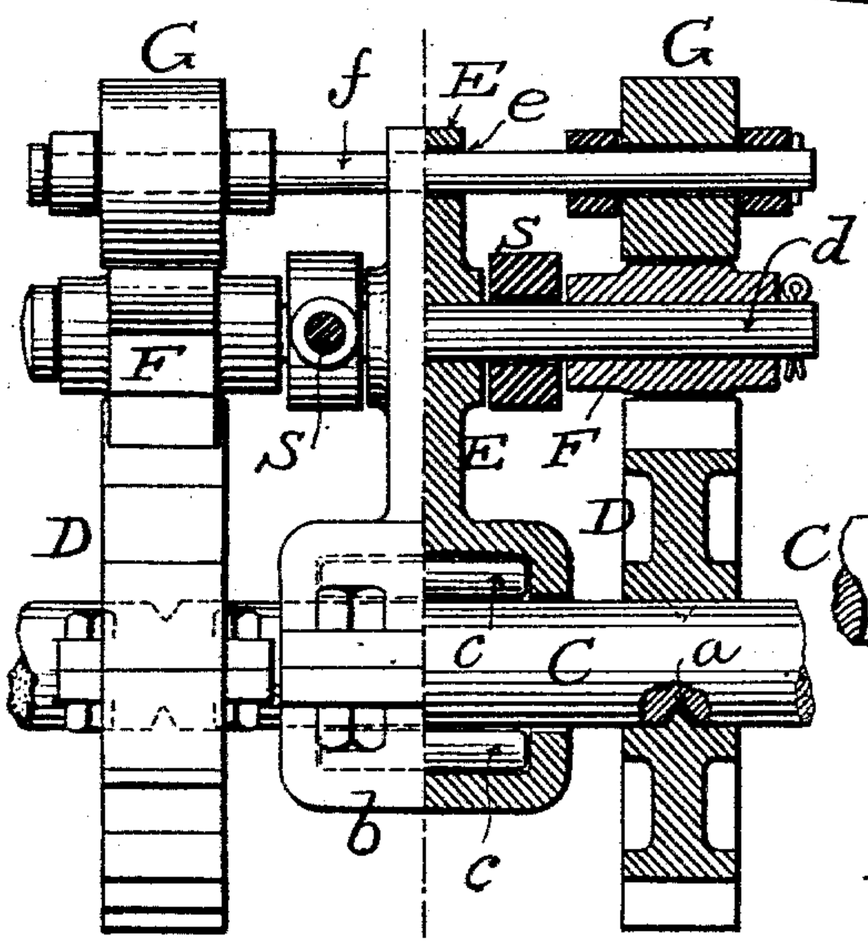
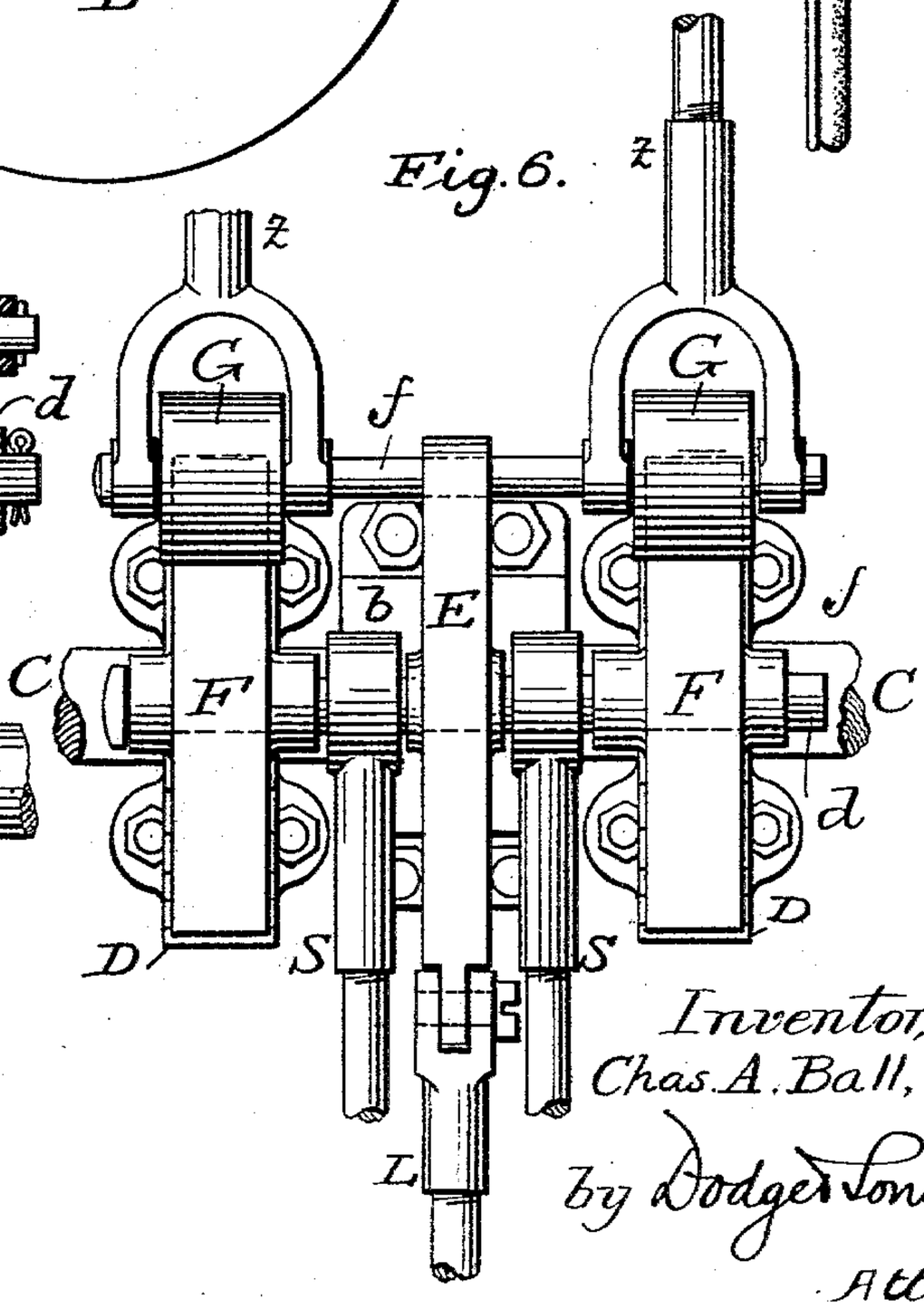


Fig. 6.



Attest;
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C. B. Bull.

Inventor,
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by Dodger Sons,
Attys

UNITED STATES PATENT OFFICE.

CHARLES A. BALL, OF WASHINGTON, DISTRICT OF COLUMBIA.

SAFETY DEVICE FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 562,881, dated June 30, 1896.

Application filed May 3, 1895. Serial No. 548,033. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. BALL, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Safety Devices for Railway-Cars, &c., of which the following is a specification.

My invention pertains to safety appliances for street-railway cars and other vehicles, whereby the momentum of the vehicle is utilized to cut off the propelling power and to apply brakes whenever a person or an obstruction is encountered upon the rails or road-bed, thus preventing injury to the person and to the vehicle.

The invention is susceptible of considerable variation as to the details of its embodiment, but in whatever form it may be clothed a prominent feature will be the application of the momentum of the vehicle itself to the work of bringing such vehicle to rest.

It is of course desirable that the propelling power be cut off the instant an obstruction is met with, and before the brakes are applied, and that the setting of the brakes follow immediately after. This is important, for the reason that otherwise there would be great liability of injury to the propelling machinery, as the burning out of the armature of an electric motor, breakage or stripping of a cable, or the like.

A simple embodiment of the invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of an overhead-trolley car, partly in outline and partly in section, showing my safety device in position for operation. Fig. 2 is a similar view on a larger scale, showing the invention applied to a cable-grip car. Fig. 3 is a top plan view of the running-gear and safety mechanism; Fig. 4, an enlarged view of the mechanism shown in Fig. 1; and Figs. 5, 6, 7, and 8, detail views of the same.

A indicates the floor or platform of a car or other vehicle, carried by wheels B, secured upon axles C, which have their journals mounted in boxes, as usual.

D D indicate ratchet-wheels, which may be made fast upon the axle C in any convenient manner, so as to rotate therewith. As both track-wheels B are ordinarily shrunk or otherwise permanently secured upon the axle, and as the attachment is designed to be quickly applied to cars already in use as well as to others, the ratchet-wheels D will advisably be made in two halves or sections, as indicated in Figs. 1, 2, 4, and 6, the parts being separately applied to the axle and then bolted together, as shown. To enable the wheels to be thus quickly applied and yet held against rotating upon or independently of the axle, I provide either or both sections of each wheel with a stud or projection *a*, Fig. 5, and I drill seats for such studs in the axle, as shown in the same figure, so that when the two sections are drawn firmly together they are also locked to and caused to turn with the axle.

Between the ratchet-wheels D D is a yoke or plate E, the lower end of which is provided with a divided shell *b*, designed to loosely encircle the axle, so that the latter may turn freely without moving the shell or the plate E. To prevent undue friction between the shell *b* and the axle, I may interpose cylinders *c*, as shown in Fig. 5, or I may adopt any other form of antifriction-bearing. A rod *d*, passing through yoke or plate E, carries two pawls or dogs F F, which normally stand directly over but out of engagement with the ratchet-wheels D D, though destined to enter into engagement therewith whenever an obstruction is encountered. Above the pawls the plate E is provided with a slot *e*. Passing through this slot is a rod *f*, which serves as an axle for two rollers G G, which serve normally to depress the tails of pawls F and to hold their forward ends above and out of engagement with ratchet-wheels D D, but which at other times ride over the pawls and depress their locking ends to effect or to insure engagement with said wheels. The curvature of the slot *e* and of the pawls F F will be such that when the rollers G G are at one side of the axis of rod *d* the pawls shall be lifted, and when at the other side thereof they shall be depressed, the rod *f* being prevented by the slot from rising, thus insuring positive pressure of the rollers upon the pawls.

The roller-carrying rod *f* is connected in any convenient manner with a yielding fender, guard, or frame H, pivotally or otherwise sup-

ported at the front of the vehicle, and extending across the track and down to a point slightly above the road-bed or paving.

In Fig. 1 I have represented a rod I as extending directly from the axle-rod *f* to a slotted block *g*, carried by the guard or fender H, said rod I passing through a suitable guide and support J, and being encircled by a spring K of strength sufficient to hold the lower portion of the fender forward, or in the position shown in Fig. 1. A through-pin or a collar will of course be applied to the rod for spring K to bear against.

The yoke or plate E is held against falling backward by the rod or connection I, and it is similarly prevented from falling forward by a rod or connection L, extending from the yoke or plate to a rotatable disk or elbow-lever M, the axle of which is carried in bearings or hangers *h* at the rear end of the car, as shown.

The disk or lever M has an arm *i*, to which is attached a chain or flexible band *j*, which in turn has one end made fast to a vertically-movable rod N, passing through a shell or casing O, and encircled by a lifting-spring *k*, as shown in Figs. 1 and 4. From the rod N a cord or flexible band P passes to and connects with the trolley-arm Q, sufficient slack being allowed to permit proper rise of said arm, as usual.

The points of attachment of rod or connection L and chain or band *j* are such that a comparatively short movement of rod L shall produce a relatively great movement of rod N, and the parts will be so set or adjusted that the rod L shall normally draw or hold the plate E with the forward end of its slot *e* against or close to axle-rod *f* of rollers G G.

R indicates a brake-beam suspended from the under side of the floor or platform A by links *m*, or by the common spring strap-hangers, and provided with the usual brake-shoes *n*. The links or hangers are so set that the shoes are normally held slightly off or away from the treads of the wheels, as in Figs. 1 and 3. The beam R is connected with the yoke or frame E by means of rods S, the forward ends of which may be conveniently formed or furnished with eyes to encircle the rod upon which the dogs or pawls F are pivoted, as shown in Figs. 1 to 6. The rods S pass through the beam R and through spiral springs *o* in rear thereof, and are provided with nuts and washers or with enlarged heads to bear against the springs, as shown. The springs *o* have a twofold function, first, to permit a forward movement of plate or yoke E sufficient to withdraw the trolley from the line-wire or to cut off the power before the brakes are set firmly enough to materially retard the progress of the vehicle; and, second, to protect the parts against undue strain and concussion.

The parts being in the positions and relation indicated in Fig. 1, and the car moving in the direction indicated by arrow in said figure, if a person, or obstruction of any kind, be encountered by guard or fender H, said fender will be stopped or forced back, while the car, continuing to advance, will carry forward the supporting-arms *l* in or to which the fender is pivoted, thus causing its lower portion to assume a vertical or practically vertical position, as in Fig. 4. The block *g* being thus moved backward and acting upon and through rod I will carry the rollers G backward over the pawls F, thereby depressing the locking ends of said pawls and causing their positive engagement with the ratchet-wheels D D. This engagement causes the frame or yoke E to swing forward with the rotation of the axle, slot *e* being made sufficiently long to permit such movement, and as a consequence the shoes *n* are set against the wheels with great force, the entire momentum of the car being applied to effecting such setting. Thus the car is brought to rest with great promptness, its momentum being in a sense opposed to itself, and utilized to actuate the mechanism and set the brakes.

In applying the invention to cable-cars, the mechanism will be the same as above described, except that the rod L will be arranged to release the grip instead of withdrawing the trolley. The mechanical connections for this purpose will or may vary according to the style of grip employed.

In Fig. 2 I have represented the invention as applied in connection with a common type of grip, the rod L being jointed, and its end *p* being arranged to serve as a coupling-pin to connect a divided or two-part link T, by which the movable jaw of the grip is raised and lowered. With this construction the action will be the same as under the first-described arrangement, except that when the dogs or pawls F engage ratchet-wheels D and carry plate or yoke E forward, the pin *p* will be withdrawn and the movable lower jaw of the grip thereby permitted to drop and release the cable.

Other connections may obviously be adopted in lieu of those shown.

It is desirable that the pawls or dogs F be so constructed that they shall not become jammed or locked in the teeth of the ratchet-wheels so firmly as to prevent their ready release when desired. To guard against such jamming, I form the pawls and the ratchet-teeth as shown in Figs. 7 and 8; that is to say, each pawl has its outer end rounded or curved, preferably in the arc of a circle concentric with the pivot-axes of the pawl. Just above the curved or rounded face *q* there is a rounded shoulder *r*. The crests of the ratchet-teeth are slightly rounded, and the teeth are of such measurement on their radial faces that the crests of the teeth shall bear against the rounded shoulders *r*, just before the dogs fall to the bases of the teeth. Thus the end bearing of the dogs is confined to a limited surface, and the pawls may be readily withdrawn from engagement with the teeth, and the lower faces of the pawls are held out of

contact with the long or back faces of the teeth by the crests of the teeth riding beneath the shoulders *r* and lifting the pawls, as shown in Fig. 8.

The fender or guard H may be of any approved or desired type, but I prefer that illustrated in Figs. 1, 2, 3, and 4. This comprises a frame of substantially rectangular form, made in two sections H and H′, and of any suitable material, metal tubing being preferred. The upper section H′ is fixed or stationary while in use, but the lower section H is arranged to swing upon journals or upon pivots *u*, supported in arms *l*, secured to the dashboard of the vehicle. The upper ends of the side bars of section H may be formed or furnished with ratchets *v*, so that when the fender is forced back to the position indicated in Fig. 4, it may be locked by a dog or pawl *w*, connected by a wire or cord with a release-lever *x*. The frame H H′ is advisably provided with a pneumatic buffer U, to break the force of a blow given to a person with whom the vehicle may chance to collide, and a netting *y* is stretched across the frame to insure its encountering any obstacle that may be in the path of the vehicle.

I do not claim the pneumatic buffer, nor do I restrict myself to its use.

It will be seen that unless provision be made to prevent such a result, it might happen that in the event of the person or obstruction being encountered only by one of the side bars of the fender, that bar or that side of the fender would move without transmitting the motion through a centrally-located rod I to the rollers G. I therefore preferably adopt the arrangement illustrated in Fig. 3, wherein I have shown equalizing-levers, to cause the two sides of the fender to move in unison and equally.

As shown, I substitute for the single rod I two short rods *z*, which are attached to a cross-beam V, in turn connected with the fender by two rods W, the forward ends of which have pins working in the slots of blocks *g*, such as shown in Figs. 2 and 4.

At a convenient point in the length of rods W, I connect the outer ends of equalizing-levers X, the inner ends of which are coupled together by a link Y. It will be seen that under this arrangement the two sides of fender H must move in unison wherever pressure be applied to it. The levers X will be pivotally supported from the under side of the car floor or platform. Other forms of equalizer may be employed.

While I have described the mechanism as arranged to withdraw the trolley from the line-wire or to disconnect the movable member of a cable-grip from the setting-lever or other controlling device, it is to be understood that these embodiments are merely illustrative. It is obvious that in the case of an electric road the current may be cut off by any other form of circuit-breaker in lieu of the movable trolley-arm; that is to say, any common form of switch may be connected with rod L instead of that particular form shown. So, too, in case of a cable-railway, the pawl which holds the grip-lever may be released, or any other simple plan of disconnection may be employed, according to the structural character of the grip used.

It being immaterial to the purposes of this invention what the nature of the power or the character of the connection between the power and vehicle may be, I use the terms "connections" and "coupling device" in the claims to cover such connections generically.

The details of the pawl-and-ratchet mechanism may be varied as circumstances require or experience suggest, a single pawl and ratchet being used, if desired. So, too, of other minor features of construction, that may be varied considerably, provided only the general plan of operation be retained.

The mechanism may be duplicated in order to permit the car to run equally well in either direction.

The yoke or plate E may have a support independent of the axle, and the ratchet wheel or wheels may be attached to or formed with the wheels B.

Having thus described my invention, what I claim is—

1. In combination with a vehicle, a brake; a ratchet-wheel carried by an axle of the vehicle; a pawl-carrier connected with the brake and provided with a pawl; a fender; and a pawl-setting device connected with the fender and acting directly upon the pawl to effect engagement of the pawl with the ratchet-wheel when the fender encounters an obstruction; whereby the momentum of the car is applied to set the brake.

2. In combination with a vehicle, and with an external source of power or motion, a ratchet-wheel carried by an axle of the vehicle; a coupling device between the vehicle and the source of power or motion; a pawl-carrier provided with a pawl and connected with the said coupling device; a fender; and a pawl-setting device connected with the fender and acting directly upon the pawl to effect engagement of the pawl with the ratchet-wheel when the fender encounters an obstruction; whereby the power is cut off promptly and with certainty.

3. In combination with a vehicle and with an external source of power therefor; a coupling between the source of power and the vehicle; a ratchet mechanism carried by the vehicle and connected with the coupling; and a fender connected with and serving to throw the parts of the ratchet mechanism directly and positively into engagement without the aid of springs, when an obstruction is encountered.

4. In combination with a vehicle, and with an external source of propelling power; a coupling connecting the vehicle and the power; a ratchet-wheel carried by an axle of the vehicle and connected with said coupling

device; a movable yoke or plate carried by the vehicle and provided with a pawl to engage the ratchet-wheel; a pawl-setting device for throwing the pawl into engagement with the ratchet-wheel; a fender or guard carried by and movable relatively to the vehicle; and connections between the fender and the pawl-setting device, whereby movement of the fender relatively to the vehicle is caused to effect engagement of the pawl with the ratchet, and through these parts to disconnect the vehicle from the power.

5. In combination with a vehicle, its wheels B, and axle C; a ratchet-wheel D carried by said axle; a plate or yoke E provided with a pawl F and with slot *e;* a brake-beam connected with said plate E and provided with shoes to bear upon the wheels B; a roller G arranged to bear upon pawl F, and having its axle extended into slot *e;* a movable fender H; and a connection between the roller and the fender, substantially as and for the purpose set forth.

6. In combination with an external source of power, a vehicle and its wheels and axle; a coupling device for connecting the vehicle with the external source of power; a brake-beam carrying shoes to act upon the wheels of the vehicle; devices for connecting the brake-beam and the coupling device with the rotary axle of the vehicle; and a spring interposed between the brake-beam and the said connecting devices, whereby the axle is permitted to rotate sufficiently to effect an uncoupling of the vehicle from the power before the brake is set sufficiently to arrest the motion of the vehicle.

7. In combination with a vehicle and its running-gear; an external source of propelling power; a coupling device connecting the vehicle and the power; a brake to arrest the motion of the vehicle; a ratchet-wheel carried by the running-gear of the vehicle; a yielding connection between the brake and the ratchet mechanism; a fender or guard; a pawl serving to connect the brake mechanism and the coupling device with the ratchet-wheel; and connections between the fender and the pawl, all substantially as described and shown.

8. In combination with a vehicle and with a brake therefor; a ratchet-wheel carried by the running-gear of the vehicle; a swinging plate E provided with a slot *e* and with a pawl F; a roller G guided by the slot *e* and arranged to bear upon pawl F; fender H; and a rod or connection extending from the fender to the roller, substantially as and for the purpose set forth.

9. In combination with a vehicle and an outside source of power therefor; a coupling for connecting the vehicle and the power; a ratchet-wheel D carried by the running-gear of the vehicle; a swinging yoke E provided with slot *e;* a pawl F carried by said yoke; a roller G movable over said pawl and guided by slot *e;* a fender or guard; and a connection between the fender and roller G, substantially as set forth.

10. In combination with a vehicle and with means for stopping its motion; a ratchet-wheel carried by the running-gear of the vehicle; a yoke or plate E loosely supported upon an axle of the vehicle, connected with the devices for stopping the vehicle, and provided with slot *e;* pawl F carried by yoke or plate E; roller G arranged to bear upon pawl F and guided by slot *e;* fender H; and connections between the fender and the roller, substantially as shown and described.

11. In combination with a vehicle, its running-gear, and means for arresting its motion; ratchet mechanism carried by the running-gear and serving to actuate the arresting devices; a fender; connections between the fender and the ratchet mechanism; and an equalizing device introduced into said connections and serving to produce an equal movement of the two sides of the fender.

12. In combination with a vehicle; a fender; and intermediate levers connected with said fender and with the vehicle and serving to insure an equal movement of its two sides directly backward and forward in the line of travel of the vehicle.

13. In combination with a vehicle A and its fender H; rods W; equalizing-levers X connected with said rods; and link Y connecting the rods, substantially as and for the purpose set forth.

In witness whereof I hereunto set my hand in the presence of two witnesses.

CHARLES A. BALL.

Witnesses:
HORACE A. DODGE,
WALTER S. DODGE.