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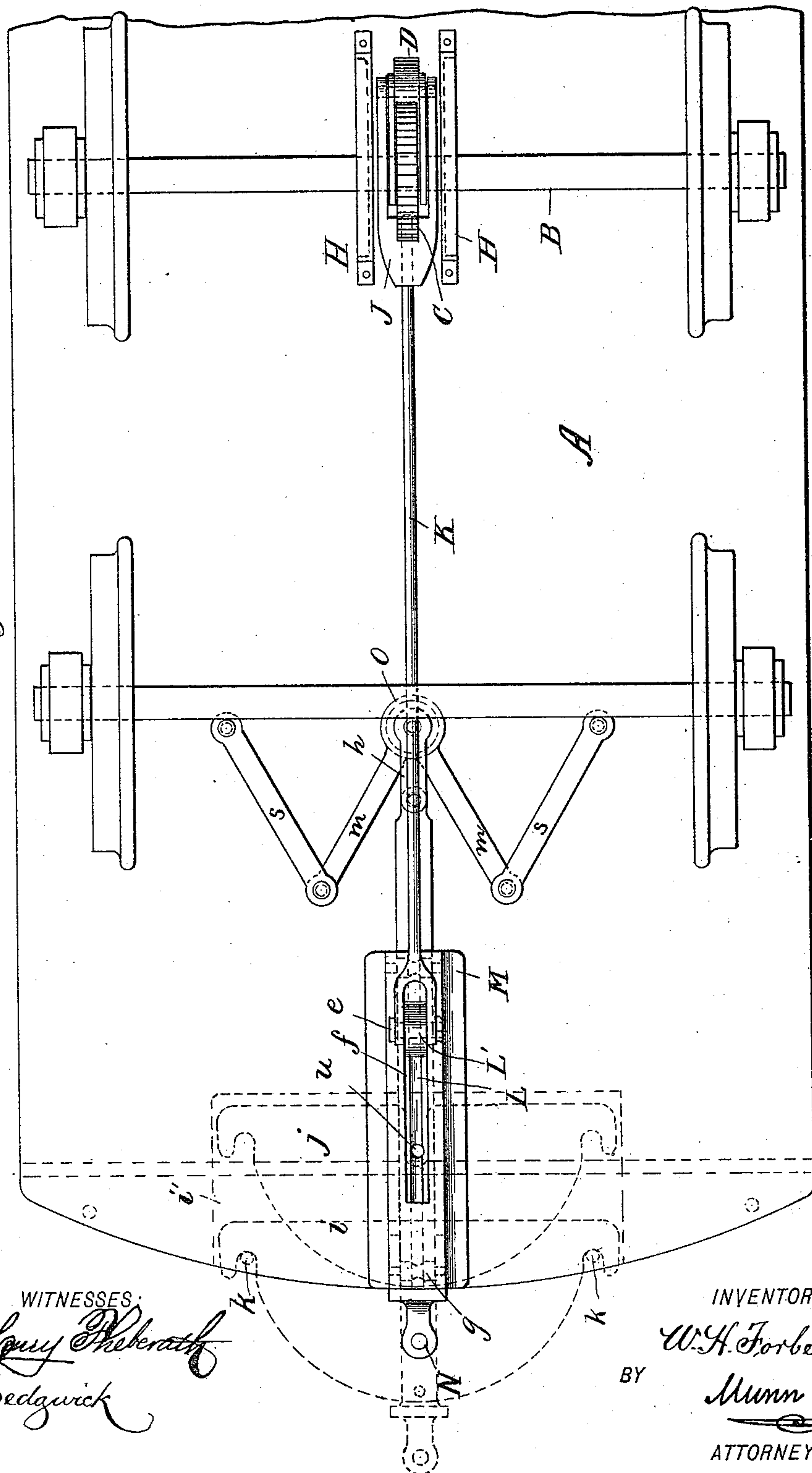
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W. H. FORBES.  
CAR STARTER.

No. 441,404.

Patented Nov. 25, 1890.

Fig. 1.



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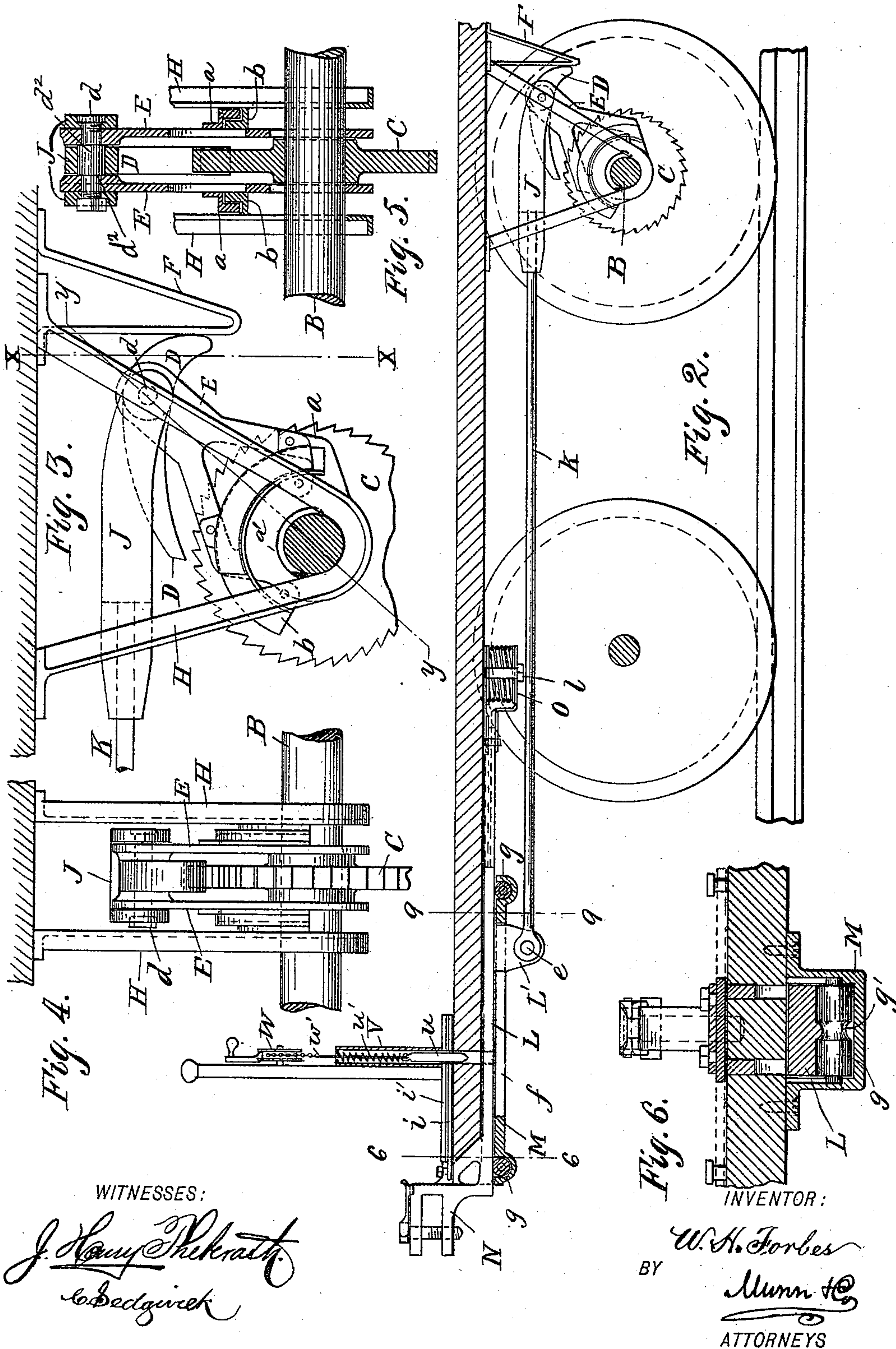
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CAR STARTER.

No. 441,404.

Patented Nov. 25, 1890.



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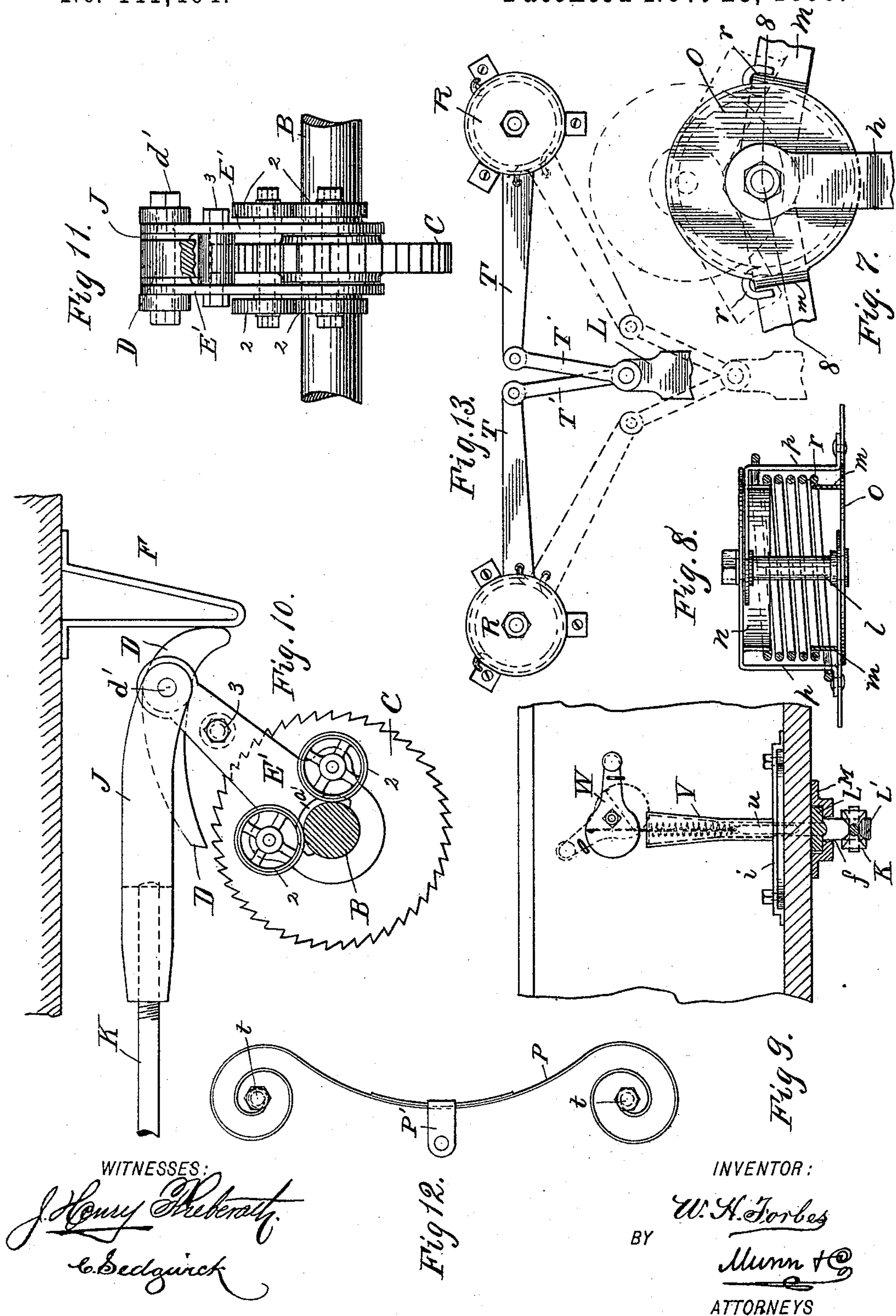
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3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

WILLIAM H. FORBES, OF PHILADELPHIA, PENNSYLVANIA.

## CAR-STARTER.

SPECIFICATION forming part of Letters Patent No. 441,404, dated November 25, 1890.

Application filed February 14, 1890. Serial No. 340,391. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM H. FORBES, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Car-Starter, of which the following is a full, clear, and exact description.

My invention relates to improvements in car-starters, and is intended to be used principally upon street-cars, although it may be used upon cars of all descriptions.

It is well known that it requires much greater power to start a car than it does to haul it when it is once started, and the strain occasioned by the frequent starts is the chief cause of street-car horses being so rapidly broken down.

The object of my invention is to provide means by which this difficulty will be obviated and a car started with as little power as is required to haul it.

To this end my invention consists in a car-starter constructed and arranged as will be hereinafter fully described, and specifically pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and figures of reference indicate corresponding parts in all the figures.

Figure 1 is an inverted plan view of the device as applied to a car-bottom; Fig. 2, a vertical longitudinal section of the same; Fig. 3, a side elevation of the ratchet-wheel and pawl as applied to the car-axle and connected with the draw-bar; Fig. 4, a rear view of the same, taken from line  $x x$  of Fig. 3; Fig. 5, a section of the same on the line  $y y$  of Fig. 3; Fig. 6, a vertical section on the line  $6 6$  of Fig. 2, looking toward the front of the car; Fig. 7, an inverted plan of the case containing the spring which actuates the draw-bar; Fig. 8, a vertical cross-section of the same on the line  $8 8$  of Fig. 7; Fig. 9, a vertical section on the line  $9 9$  of Fig. 2, looking toward the front end of the car; Fig. 10, a side elevation of a modified form of ratchet and connections as applied to a car-axle; Fig. 11, a rear view of the same, and Figs. 12 and 13 are modified forms of springs that may be used to retract the draw-bar.

I have shown my invention as applied to the rear axle B of a car A; but it may be applied to either or both axles, as desired. A ratchet-wheel C is fixed to the axle B near the central part thereof, and the teeth of the ratchet-wheel are engaged by the curved pawl D, which is pivoted between the upwardly-extending arms E upon each side of the ratchet-wheel, and which is held in disengaged position, when not in use, by a stop F, which is attached to the car-bottom, and depending therefrom presses against the rear end of the pawl, thus raising the front end. The arms E are spread at the bottom and attached to a collar  $a$ , which encircles the axle B, and the upper edge of which is bent outwardly and rests in a semicircular bracket  $b$ , which is attached to the hanger H on each side of the ratchet-wheel and in which the collar  $a$  and arms E may turn, and there will thus be no friction upon the axle B. The hangers H are of a V shape, are suitably attached to the car-bottom, and inclose the axle B, and the collars  $a$  are cut away at the parts  $a'$ , so that when the car settles upon its springs it will allow the hangers to project below the axle.

The bifurcated end of the arms J is attached to the upper ends of the arms E by a pin  $d$ , which passes through the ends of the arms E and J and through the pawl D, acting as a pivot for the same. The pin  $d$  has a shoulder  $d^2$  near each end, which engages the arms E and prevents them from pressing against the pawl D.

The forward end of the arm J is attached to a connecting-rod K, which extends forwardly, and is attached by a bolt  $e$  to a depending tongue  $I'$  of the draw-bar L, said tongue extending downwardly through a longitudinal slot  $f$  in the bottom of the draw-bar case M, so that when the draw-bar is moved in the case M the tongue will move in the slot  $f$ , thus moving the connecting-rod K and actuating the ratchet-wheel, as will appear hereinafter.

The case M is firmly attached to the car-bottom near the front end of the car, is provided with a slotted bottom, as shown, and each end is curved, as shown in Fig. 2, and provided with a roller  $g$ , which turns in the



curved portion of the case, and upon which the draw-bar L rests, the object of the rollers being to prevent friction between the draw-bar and the case. The rollers *g* are provided with a central annular groove *g'*, which receives a similar-shaped projection on the draw-bar L, and thus prevents any lateral motion of the draw-bar.

The draw-bar L moves longitudinally in the case M, its forward end extends through the case, and is provided with an ordinary coupler N, which extends above the car-bottom and to which the car-pole is coupled in the usual well-known manner, and its rear end extends along the car-bottom and is attached by means of the strap *h* to the bottom of the spring-case O, which will draw back the draw-bar after it has been pulled forward in the manner hereinafter described.

Attached to the rear of the coupler N and resting upon the floor of the car is a triangular brace *i*, having hooks *j* near its base, so that when the coupler and draw-bar are drawn forward the hooks *j* will engage the bolts *k* on the car-floor and prevent the draw-bar from being moved sidewise. This construction is indicated by dotted lines in Fig. 1, which show the brace in its two positions, said brace being provided with a suitable cover *i'*.

The spring-case O consists of an upper and lower plate, which are pivoted upon the bolt *l*. These plates composing the spring-case turn independently upon the bolt *l*, and are provided with laterally-extending arms *m*, which may be made integral with the spring-plates or may be rigidly attached thereto. The plates, also, are each provided with a semi-circular flange *n* and with guards *p*, extending from top to bottom thereof. The flanges and guards thus hold the spring *r* in place within the case. Each end of the spring *r* is hooked around one of the arms *m* upon opposite sides of the case.

The arms *m* extend diagonally forward from the case O on opposite sides of the draw-bar L, and their ends are pivoted to the ends of the arms *s*, which extend diagonally rearward and are pivoted to the car-bottom. This construction is clearly shown in Fig. 1. It will thus be seen that when the draw-bar L is pulled forward the spring-case O, which is attached thereto, will be pulled forward also, thus forcing the arms *s* apart and having the effect of turning the arms *m* backward and tightening the spring *r*, which is attached to the arms, so that when the drawing-pressure is removed from the draw-bar L the reaction of the spring *r* upon the arms *m* will force the case O back into its original position and draw in the draw-bar.

In Figs. 12 and 13 I have shown modified forms of springs that may be used to retract the draw-bar, and it is evident that many modifications may be used without changing

the nature of the invention. In Fig. 12 the spring P is formed at each end with a coil, and is attached to the car-bottom by a bolt *t*, which passes through the center of each coil. The spring is attached to the car-bottom in such a manner that it will extend across the end of the draw-bar L at right angles with the same, and is provided near the center with a strap *P'*, which is attached to the rear end of the draw-bar. When the draw-bar is pulled forward, it will tighten the coils at the ends of the spring P, and when the drawing-pressure is released the spring will draw back the draw-bar.

In Fig. 13 I have shown two spring-cases R, which are attached to the car-bottom at each side of the rear end of the draw-bar. Each of these cases contains a spiral spring, one end of which is attached to the case and the other to the end of an arm T, which is pivoted in the case and extends inwardly to a point opposite the rear end of the draw-bar L, and is there pivoted to a forwardly-extending arm T', by which it is connected with the draw-bar. When the draw-bar is pulled forward, it will draw forward the ends of the arms T, and when it is released the springs in the cases R, which will have been tightened by the forward movement of the arms, will throw the arms back into their original position, thus retracting the draw-bar connected therewith.

The draw-bar L may be retained in its rearward position by a pin *u*, which fits a hole in the draw-bar and in the case M, and which moves vertically in a case V, which is attached to the car-fender above the draw-bar. The pin *u* is operated by a crank-pulley W, which is pivoted to the car-fender above the case V, and which is provided with a chain or rod *w'*, which is attached to the upper end of the pin *u*, so that by means of the crank-pulley W the pin may be dropped into or raised from engagement with the draw-bar L. The case V is closed at the top except for an orifice through which the chain or rod *w'* passes, and between the top of the case and the top of the pin *u* is a spiral spring *u'*, which presses against the top of the pin *u* and holds it in engagement with the hole in the draw-bar L, except when it is raised by the crank W.

In Figs. 10 and 11 I have shown a modified arrangement for suspending the pawl D and bifurcated arm J above the ratchet-wheel C. An arm E' encircles the axle B upon each side of the ratchet-wheel C and extends upwardly, and is pivoted to the pawl D on the bifurcated end of the arm J by the pin *d'*, which passes through both the arms E', the end of the arm J and the pawl D, and acts as a pivot for the latter. The arms E' are supported upon the axle B by the friction-rollers 2 2, which are pivoted to the sides of the arms, and by bearing upon and turning with the



axle thereby prevent excessive friction. The arms E' are connected near their upper ends by a bolt 3, which passes through both arms, is provided with a suitable head and nut, and which acts as a brace to strengthen the arms and prevent them from spreading. The arms E' and rollers 2 are especially adapted to cars used in mining or other business where they are very heavily loaded.

10 The device operates as follows: The drawing-pole is coupled to the coupler N in the usual manner, and when the horses start the draw-bar L, connecting-rod K, and arm J are pulled forward. As the parts named are  
15 started the pawl D will be pulled away from the stop F and will drop into engagement with the ratchet-wheel C, the arms E will swing forward, and the draft on the draw-bar, acting through the connecting-rod K, arm J,  
20 pawl D, ratchet-wheel C, and axle B, will easily start the car. The forward motion of the draw-bar L will be determined by the tongue L' striking the end of the slot f in the draw-bar case M. When the car is started, and as  
25 soon as the drawing-pressure is lessened or removed, the spring r will throw the parts back into position in the manner already described, and the pin u will drop through the draw-bar to hold it in position till the car is  
30 to be again started, when it may be raised, as described. The curved parts a b together form an anti-friction bearing or support for the swinging arms E, and likewise the rollers 2 2 also may be similarly denominated.  
35 Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination, with the ratchet-wheel on the car-axle, oscillating arms on said axle,  
40 and a pawl pivoted between said arms to engage said ratchet, of the sliding draw-bar mounted in a casing on the under side of the car and extending at its rear end through and beyond said casing, a retractile spring con-  
45 nected with said rearward-extending end of the draw-bar, a rod connected at its forward end to the under side of said draw-bar, between the ends thereof, and a bifurcated arm on the rear end of the rod pivotally connected  
50 with said oscillating arms, substantially as set forth.

2. A car-starter consisting of a ratchet-wheel fixed to a car-axle, upwardly-projecting arms E upon each side of said ratchet-  
55 wheel and adapted to move in conjunction therewith, a pawl D, pivotally secured between said arms and having a rearwardly-projecting end, a stop depending from the car-bottom and with which said projecting end of  
60 the pawl is designed to engage, a case M, attached to the under side of the car, a draw-bar L, adapted to move longitudinally in said case, a spring attached to the car-bottom and connected with the rear end of said draw-bar,  
65 and bifurcated arm J and rod K, for connect-

ing the draw-bar and pawl, substantially as set forth.

3. The combination, with the axle having a ratchet-wheel, oscillating arms mounted on the axle and provided with a pawl engaging  
70 the rack with its forward end and projecting at its opposite end rearwardly beyond the said arms, and the draw-bar connected to said arms and provided with a retractile spring at its rear end in front of said oscillating arms,  
75 of a stop F, depending from the bottom of the car in the path of the rearward-projecting end of the pawl, substantially as set forth.

4. The combination, with the draw-bar L, adapted to move longitudinally in the case M  
80 and provided with a suitable coupler N, by which it may be drawn forward, and suitable connections with the ratchet-wheel C and pawl D, as described, of means, as spring-actu-  
85 ated arms m, spring-case O, pivotally connected with the inner ends of the arms m, carried back and forward thereby and containing a coil-spring, the ends of which bear on the arms to throw them together, arms s s,  
90 pivotally connected at their outer ends to the diverging ends of arms m and at their opposite ends pivoted to the under side of the car, and a connection between the draw-bar and the pivotally-connected ends of bars m, sub-  
95 stantially as set forth.

5. The combination, with the axle B and ratchet-wheel C affixed thereto, of the hanger H, having brackets b, the arms E, having col-  
lars a adapted to rest upon said brackets, the pawl D, pivoted between the arms E, and the  
100 arm J, pivotally attached to the arms E and pawl D and suitably connected with the draw-bar to transmit motion to the pawl, ratchet-wheel, and axle, substantially as described.

6. The combination, with the axle and  
105 ratchet-wheel fixed thereto, of the oscillating arms mounted loosely on the axle, and an anti-friction support or bearing supporting the said arms and relieving friction between them and the shaft where the latter passes through  
110 them, substantially as set forth.

7. The combination, with the case M, having curved transverse recess g' in its bottom at its ends, as shown, and with the draw-bar L adapted to move longitudinally therein, of  
115 the rollers g, resting in the said recesses, supporting the draw-bar and provided with grooves g' to receive a corresponding projection of the draw-bar to prevent the same from moving laterally, substantially as described.  
120

8. The combination, with the case V and pin u, connected with the crank-pulley W, as shown, and adapted to engage the draw-bar L, of the spring u', adapted to fit within the case V and press the pin u into the hole in  
125 the draw-bar, substantially as described.

9. The combination, with the car A and draw-bar L, adapted to move longitudinally in the case M and provided with a suitable coupler N, as shown, of the brace i, attached  
130



to the rear of said coupler, and having hooks *j* to engage bolts *k* on the car and support the draw-bar, substantially as described.

10. The combination, with the car A and  
5 draw-bar L, adapted to move longitudinally in the case M, of the pin *u*, adapted to secure said draw-bar in a fixed position, as shown,

and having means, as crank-pulley W and chain *w'*, for raising it from contact with said draw-bar, substantially as described.

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Witnesses:

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