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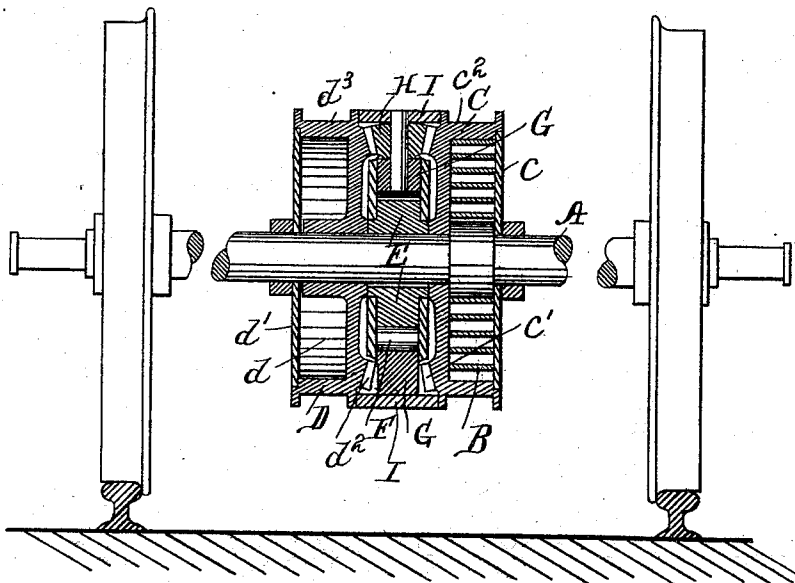
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T. J. GRAY.
CAR STARTER.

No. 535,200.

Patented Mar. 5, 1895.

Fig. 1.



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Robt. M. Wagner

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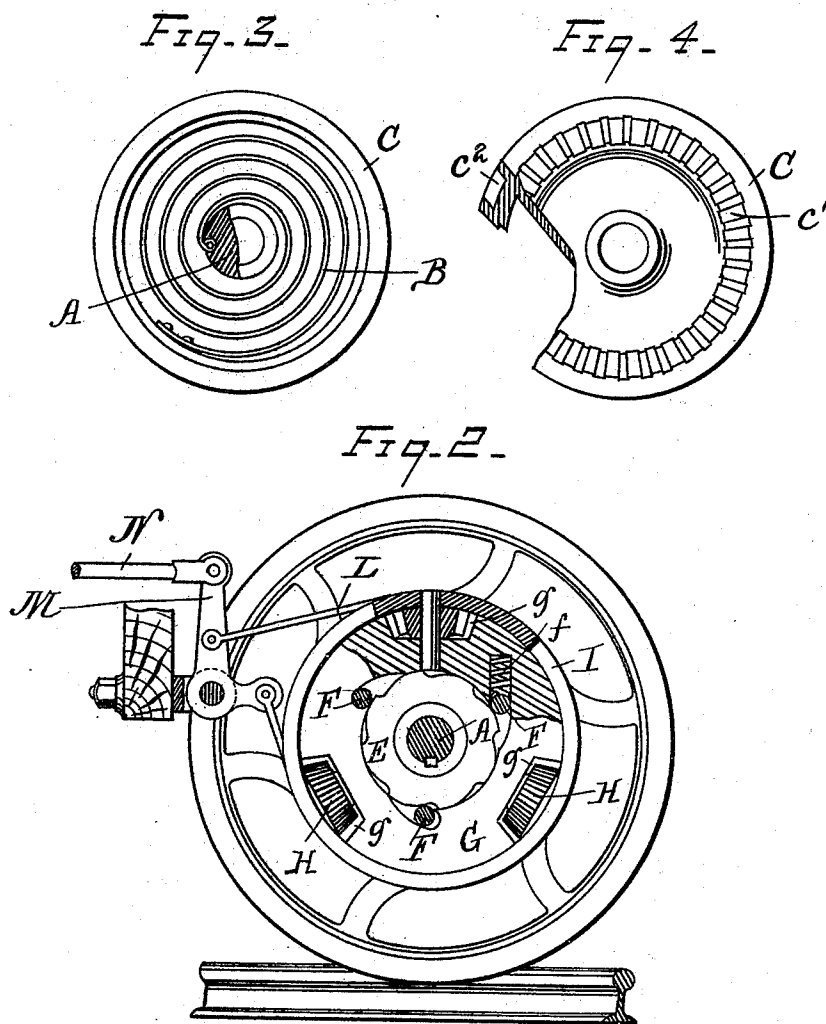
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T. J. GRAY,
CAR STARTER.

No. 535,200.

Patented Mar. 5, 1895.



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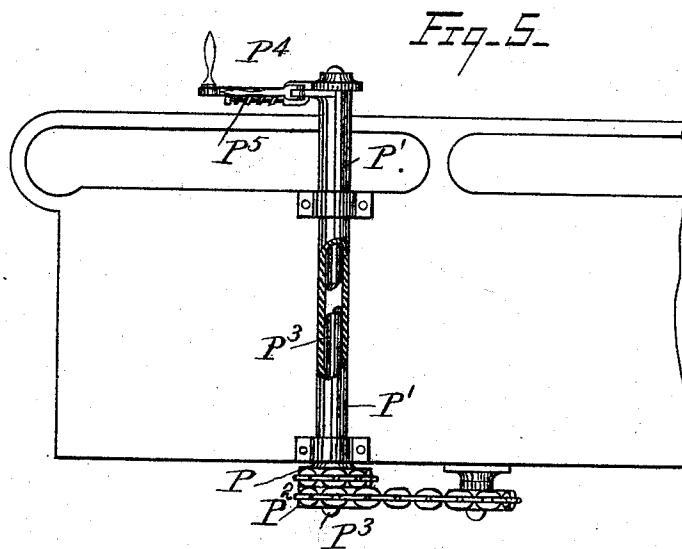
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Fig. 7.

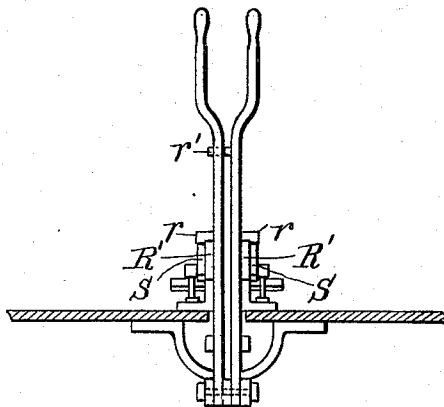


Fig. 8.

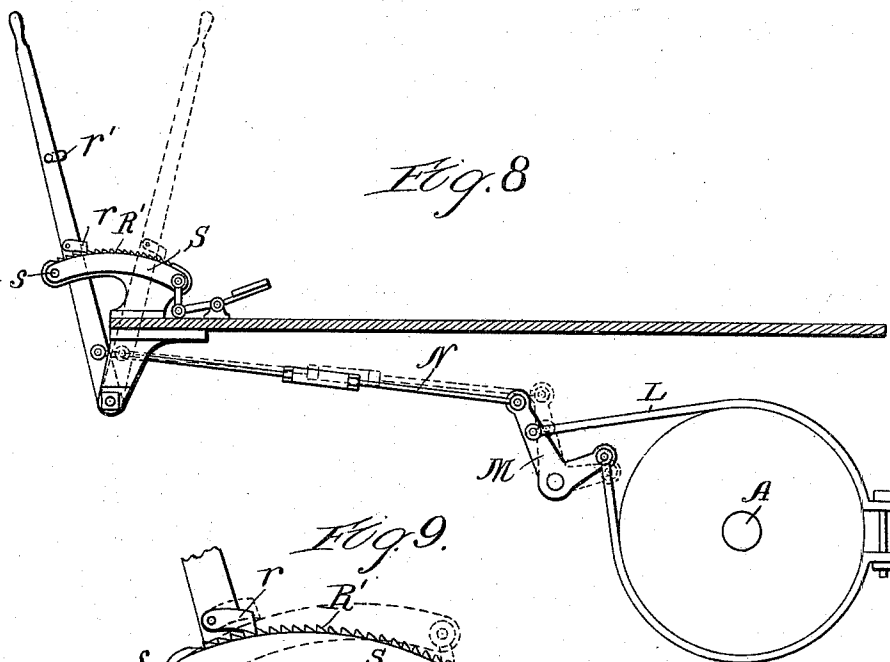
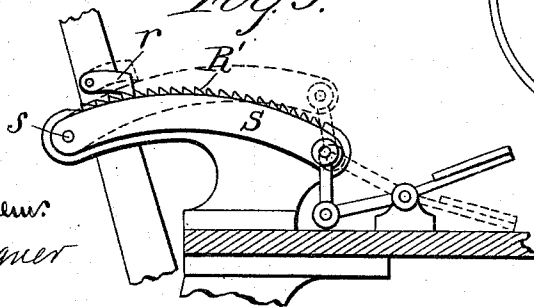


Fig. 9.



Witnesses:

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UNITED STATES PATENT OFFICE.

THOMAS J. GRAY, OF CHICAGO, ILLINOIS, ASSIGNOR TO WILLIAM J. EDWARDS, OF SAME PLACE.

CAR-STARTER.

SPECIFICATION forming part of Letters Patent No. 535,200, dated March 5, 1895.

Application filed January 27, 1894. Serial No. 498,165. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. GRAY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Car-Starters, of which the following is a specification.

In a car-starter characterized by my invention, the power for starting the car is stored up by the momentum of the car while stopping the latter, the increasing resistance due to the storing up of such power being at such time in opposition to the advancement of the car, and hence being a means for stopping the same. Upon the releasement of the stored up power, it will instantly act as a means for effectively starting the car, no matter how heavily the same may be loaded. The increasing resistance of the starting power being thus opposed to the momentum of the car will increase proportionally to the momentum of the car due to its speed and load, and hence the power will be stored up to an extent proportional to the load it is required to start. As a means for attaining these ends, one of the car axles is connected with a loose gear by an intervening convolute spring. The axle also carries a clutch device whereof one member is fixed upon the axle and the other provided with a set of pinions which connect it with said gear. These pinions also engage with an abutment gear, which is independent of the axle. When both of said gears are held against rotation by any suitable brake or locking devices, the spring will be wound up to an extent proportional to the momentum of the car and will oppose the movement of the car with an increasing resistance until the car stops. By then releasing the gear which is subject to the spring it will turn forwardly and in so doing compel the pinions to traverse the abutment gear. This action causes the clutch members to lock together and also revolve the entire clutch, forwardly, whereby the axle will be rotated and the car started. After starting, the abutment gear can be released, whereupon the gears and clutch will turn as a whole with the axle.

In the accompanying drawings,—Figure 1 is a vertical section through the starting device on a plane coincident with the car-axle,

which latter together with the wheels is shown in elevation. Fig. 2 is a section taken transversely through the axle and mainly shows in end elevation, the clutch, pinions and a brake-device, a portion of said clutch being broken away so as to show one of the pinions in section and its spindle in elevation. Fig. 3 shows the axle partly in end elevation, and broken away so as to show the inner end of the convolute spring attached thereto, the spring and the chambered side of gear B (with plate c, Fig. 1, removed) being shown in elevation. Fig. 4 shows the opposite side of the gear with a portion broken obliquely away so as to show its peripheral groove for a brake-strap. Fig. 5 shows a portion of a car in front end elevation, and illustrates a brake actuating mechanism, portions of the hollow rotary shaft P' and rod P³ being broken away for convenience of illustration. Fig. 6 is a top plan of the brake mechanism and starting device, portions of rods N and N' being broken away, with portions of a cross beam of the car being also broken away. Fig. 7 shows in front elevation, a couple of brake-levers which may be used in place of the rotary shaft and rod of Figs. 5 and 6. Fig. 8 is an elevation showing the straps connected with said brake-levers. Fig. 9 shows one of the said brake devices in elevation and illustrates means for releasing the dog or pawl.

In said drawings, A indicates the axle, and B denotes a convolute spring arranged about the axle and having its inner end secured thereto. The gear C is loose upon the axle and is chambered to inclose the spring, which latter has its outer end attached to said gear. The chamber within this gear can be closed in any suitable way so to exclude dust, for example, by an end cap or plate c.

The clutch device is arranged between the loose gear C and an oppositely arranged abutment gear D which is likewise loose upon the axle, it being observed that while for the sake of lightness the abutment gear is chambered as at d and its chamber closed by an end cap or plate d', it can be made solid if so desired.

The inner member E of the clutch device is fixed upon the axle and is shown in the nature of a ratchet or hub which is peripherally notched so as to be engaged by any one or

more of a set of roller dogs F arranged between the said inner fast clutch member E and the outer annular clutch member G which is in the nature of a pawl or dog ring or carrier.

5 This outer clutch member has in its perimeter, a series of recesses g , for beveled pinions H which are journaled in said outer clutch member and arranged to engage the opposing bevel gear faces c' and d^3 , respectively of the
10 gears C and D.

In order to exclude dust, an annular band I is arranged about the outer clutch member with its edges in juxtaposition to the gears C and D, and in this way, the outer end of the
15 spindles for bevel pinions H, can be fixed in said ring or band I, the said pinions in such case being free to turn about their respectively allotted spindles.

While any desired or suitable construction
20 of brake devices can be employed, I have shown a couple of brakes—consisting of bands K and L, respectively applied to the grooved perimeters c^2 and d^3 of the gears C and D, and have provided brake operating mechanism
25 whereby the brake can be released from gear C without releasing the brake from gear D.

In order to store up power for starting the car, the attendant will apply the brakes to the two gears C and D so as to lock the same
30 against rotation, and assuming the car to be running at such time, the forward movement of its axle A will wind up the spring C to an extent proportional to the momentum due to the load. This winding up of the spring necessarily opposes the forward movement of the
35 axle and hence the car will be stopped when the opposition of the spring is sufficient to overcome its momentum.

In order to start the car, the attendant will
40 release the brake from gear C, but leave the abutment gear D still locked by its allotted brake. At such juncture, the tendency of the convolute spring to unwind, will act to turn the gear C in a forward direction, as indicated
45 by the arrow in Fig. 3, it being understood that the term "forward direction" means the direction of rotation of the wheels and axle when the car is moving forward. This forward rotation of gear C revolves the pinions
50 H and since the latter are in mesh with the stationary abutment gear D, they will necessarily be compelled to travel along the same and in so doing cause the clutch section G to turn in a forward direction. This action on
55 the part of the outer clutch section throws the rolls or dogs F in positive engagement with the ratchet or clutch section E which is fast upon the axle, and hence places the two clutch members in clutch, and establishes
60 power transmitting connection between the gear C and the axle. The spring action will therefore cause the axle to turn in a forward direction, and thereby start the car. It will also be seen that owing to the aforesaid gears
65 interposed between the spring and the axle, the clutch will rotate at a less rate of speed

than the gear C, and hence ample leverage and power for starting the car will be secured.

After the car has been started the abutment gear D can be released from its allotted
70 brake, and hence the gears and clutch will simply turn with the axle. The gear D might be permanently held against rotation, but this would necessitate a continuous running on the part of the pinions H which would be
75 objectionable. I prefer therefore to employ a brake in conjunction with gear D.

Springs f could be used in conjunction with the dogs F, but such are not necessary.

I do not confine myself to any particular
80 form or construction of clutch or pawl or ratchet device so far as the establishment of connection between a carrier for the pinions H and the axle is concerned, it being obvious that various forms of clutches or pawl and
85 ratchet devices could be employed. The clutch shown however is exceedingly effective, and is on many accounts preferable.

With reference to the brake operating mechanism or devices shown in Figs. 2, 5 and 6,
90 each brake-band is attached to its allotted bell-crank M, M' understood to be pivoted upon the car frame. These bell-cranks are connected with operating rods N, N' and the latter are in turn connected with and operated
95 by chains O, O', respectively. One of these chains is attached to a pulley P fixed upon a rotary hollow shaft or sleeve P' while the other is attached to a pulley P² fixed upon a rotary rod P³ arranged within the hollow
100 shaft. The brake K is operated from the rotary hollow shaft while the brake L is operated from the rotary rod. A crank handle P⁴ is secured upon the hollow shaft P' and provided with a latch P⁵ for engaging rod P³
105 so as to lock the two shafts together. When therefore it is desired to apply with brakes respectively to one and the other of the two gears C and D, the attendant will turn the crank P⁴ in a direction to wind up both chains,
110 the two shafts P' and P³ at such time being locked together by the latch P⁵, and after the chains have been wound up sufficiently to tighten the brakes and lock the gears, the shaft P' can be locked by any suitable device, such
115 for example as the pawl and ratchet ordinarily employed on street cars. The gears being locked, the spring will wind up until the car stops. To start the car, the attendant will operate latch P⁵ so as to release the
120 rod P³ and hence release the brake on gear C. After the car has been properly started, the attendant can release the shaft P', and thus release the brake on gear D.

In Figs. 7, 8 and 9, levers R and R' are separately allotted to the brake-strokes and directly connected with the bell cranks by rods N and N' respectively. Each lever can in such case have its own locking device. For example each lever can carry a pawl or dog r
130 for engaging a rack-segment R', and in order to release the pawls at proper times each rack-

segment can be accompanied by a vibratory releasing bar S pivoted at s at one end and at its opposite end connected with an operating foot-lever or treadle. By operating either
 5 foot-treadle, its allotted releasing bar will rise alongside its allotted rack-segment and disengage the pawl therefrom, the pawl in such case riding back along its allotted releasing bar when the lever carrying the pawl swings
 10 back. With such arrangement, the lever controlling the brake for gear C can have a lug r' which will engage the lever allotted to the brake for gear D, whereby when one lever is thrown forward to lock the brake upon gear
 15 C it will carry forward the other lever and hence lock the brake upon gear D, it being observed that at the proper moment, the lever allotted to the brake for gear C can be allowed to swing back and loosen up said brake
 20 without disturbing the other lever.

What I claim as my invention is—

1. A car-starter comprising a gear connected with the axle by a power storing spring, a clutch interposed between the axle
 25 and gear, pinions carried by the clutch and engaging said gear, and an abutment gear engaged by the pinions, substantially as and for the purpose described.

2. A car-starter comprising a clutch device
 30 having one of its members fixed upon the axle, pinions carried by the clutch, an abutment gear independent of the axle and engaged by the pinions, a loose gear connected with the axle by a winding spring and engaging
 35 the pinions, and suitable brake devices

for holding and releasing the gears, substantially as described.

3. In a car-starter, the gear C having a closed chamber, a convolute spring arranged within
 40 said chamber and connecting the gear with the axle, and a friction device for connecting and disconnecting said gear with and from the axle, substantially as described.

4. In a car-starter, the clutch arranged upon the axle and comprising inner and outer mem-
 45 bers with intervening dogs, pinions carried by the outer clutch members, a pair of gears loose upon the axle and engaging the pinions, a winding spring connecting one of said gears with the axle, and means suitable for hold-
 50 ing and releasing the two gears, substantially as described.

5. In a car-starter, the inner clutch member fixed upon the axle, the outer clutch member provided with recesses g, pinions arranged in
 55 said recesses, an annular outer band in which the outer ends of the spindles for the pinions have their bearings, and gears engaging the pinions, substantially as described.

6. A car-starter comprising a clutch ar-
 60 ranged upon the axle, and carrying pinions, gears engaging the pinions, a spring connecting one of the gears with the axle, brake-bands for locking and releasing the spring, and mechanism for operating the brakes, sub-
 65 stantially as described.

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Witnesses:

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