(No Model.)

G. R. BALDWIN.

REVERSING GEAR.

No. 436,072. Patented Sept. 9, 1890.

Fig. 1.

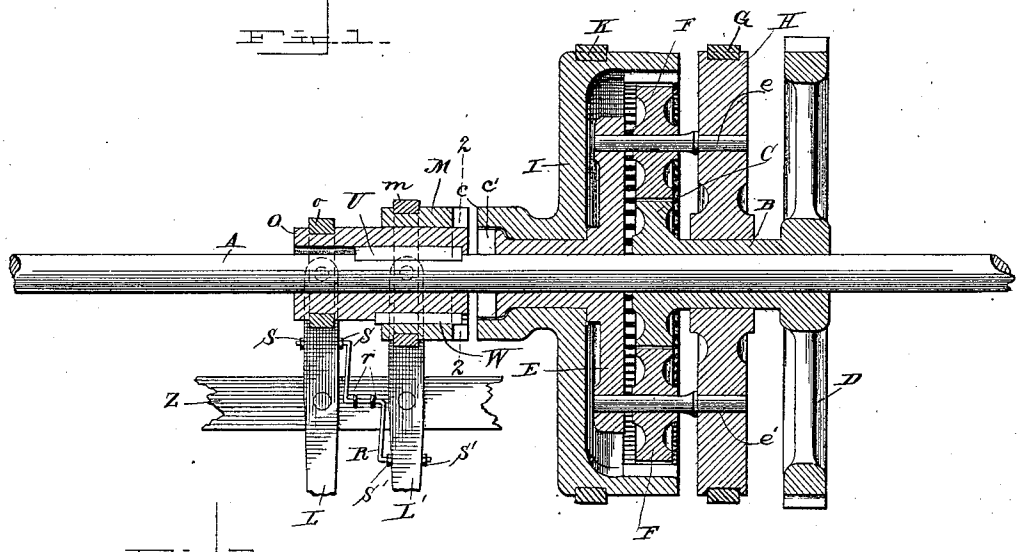


Fig. 2.

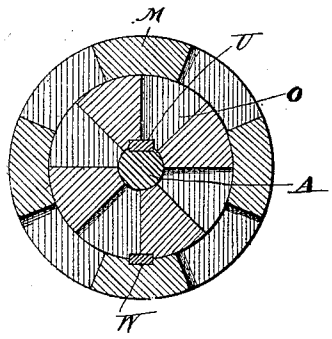


Fig. 3.

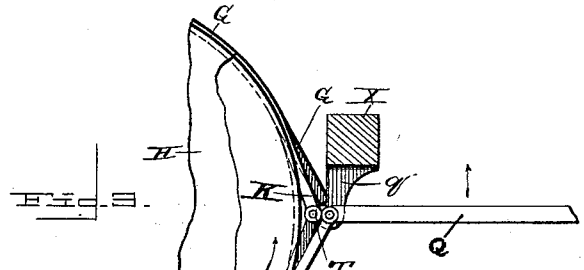
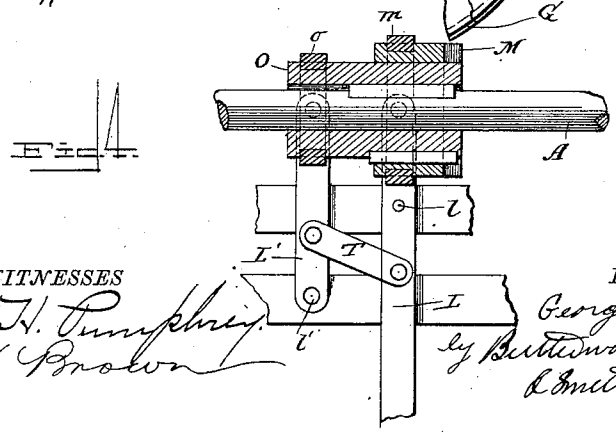


Fig. 4.



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GEORGE READE BALDWIN, OF MONTREAL, CANADA.

REVERSING-GEAR.

SPECIFICATION forming part of Letters Patent No. 436,072, dated September 9, 1890.

Application filed May 9, 1890. Serial No. 351,116. (No model.)

To all whom it may concern:

Be it known that I, GEORGE READE BALDWIN, a citizen of the United States, residing at Montreal, in the Dominion of Canada, and Province of Quebec, have invented certain new and useful Improvements in Reversing-Gear; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists of the improved transmitting and reversing gear for use, principally, with electric motors, hereinafter to be more particularly described and claimed.

In the drawings, Figure 1 is a plan view and a section of my invention. Fig. 2 is a section through the clutches on the line 2 2 of Fig. 1, and Fig. 3 is a detail side view and partial section showing the brake-gear. Fig. 4 is a modification.

In the use of electric motors for traction purposes it is desirable to have a simple form of transmitting-gear conveying to the driving-wheels the revolutions of the motor and reducing the speed thereof. It is also desirable to have a convenient form of reversing-gear independent of the motor, so that the motor may run continuously in one direction and thereby avoid the many severe strains, both electrical and mechanical, to which the parts are subjected when the current is frequently reversed in order to reverse the motor itself. At the same time it is also desirable to have a detachable connection between the motor and the driving-wheels, so that when the car is to be stopped or slowed down the connection between these parts may be broken and the car stopped without stopping the motor, inasmuch as the greatest difficulties in electrical railroading—such as burning out a motor—result when attempting to start the motor from a state of rest under a heavy load. To avoid these difficulties and combine in one mechanism a reversing and transmitting gear which shall have the desirable qualities above alluded to, I have designed the apparatus herein described and illustrated, in which—

A represents a portion of the shaft to which the driving-wheels of a car or locomotive are connected directly or by gearing. As far as the gear herein described is concerned, said shaft is the driven shaft and will be so referred to. On this driven shaft A is loosely mounted the driving-gear D by means of the sleeve B. The driving-gear is supposed to be actuated directly from the pinion on the armature-shaft of the electric motor. (Not shown.) On the sleeve B, or otherwise rigidly attached the driving-gear D, is the pinion C.

On the same shaft A is mounted and freely revoluble thereon the pinion-carrying disk E, which supports by means of the studs *e e'*, or in any other convenient manner, the idler-pinions F F', which gear into the driven pinion C. Upon the other end of the studs *e e'*, or on some other rigid projection from the disk E, is mounted a brake-wheel H, which in the construction shown in the drawings revolves freely on the sleeve B. The large internal gear I is also freely revoluble about the shaft A, being mounted directly thereon, or upon some sleeve concentric therewith, such a sleeve being formed in the construction illustrated in the drawings by the projecting hub of the pinion-carrying disk E. The teeth on this internal gear mesh with the teeth on the idler-pinions F F', as shown. Suitable brakes are arranged so as to be applied to the internal gear I, or to some rigid portion thereof, and to the pinion-carrying disk E, or to some rigid attachment thereto, such as the brake-wheel H. These brakes are preferably band-brakes, such as G and K, illustrated in Figs. 1 and 3.

The outer faces of the hubs on which the internal gear I and the pinion-carrying disk E are mounted are provided with teeth *c c'*, as shown in Fig. 1, which teeth mesh with corresponding teeth on sliding clutches O and M. The clutch O slides directly on the shaft A and revolves therewith by virtue of the feather and key-way U. The clutch M slides on the clutch O and is forced to revolve therewith by virtue of the feather W. The endwise movement of said clutches is controlled by any convenient mechanism, such as the rings *o m*, pivoted to the end of the levers L L' and fitting into corresponding circular grooves on the clutches.

For purposes of safety, preventing breakage of the parts of the gear, it is desirable to em-

ploy some simple mechanism which shall permit but one clutch to be thrown into position at a time and but one brake to be applied at a time. I have illustrated one form of such mechanism in Fig. 1, in which Z may represent a beam or other support to which the levers L L′ are pivoted. A bent rod R slides endwise along said beam by virtue of its middle portion running in the guides *r*. At either end suitable lugs S S and S′ S′ encompass the levers on opposite sides of their pivots, thereby causing the motion of one lever in such direction as to throw its clutch into engagement to automatically move the other lever in the opposite direction, so as to remove the second clutch from engagement. A similar object is accomplished in the brake-gear by simply reversing the connections as shown in Fig. 3, where the brake-lever Q is shown pivoted to a bracket *q* on a beam X. The upper end of the band G is also fastened to this rigid pivot and the lower end of the band K. At the end T of the lever the corresponding opposite ends of the bands G and K are attached, so that the upward motion of the lever in the direction of the arrow will evidently tighten the band K and loosen G, whereas the downward motion of the lever will loosen K and tighten G in the center position, no brake being on.

The method of operation of my invention is the following: The driving-wheel D revolves continuously, being geared direct to the motor. When the cars are at a standstill both brakes are off, supposably, and the various parts of the gear revolve idly, according to the laws of friction and inertia. If it be desired to throw the shaft into gear so that it shall revolve in the same direction as the wheel D, the brake G is applied so as to bring the disk E to a stop and the clutch O is thrown into gear. The brake G is then released and the brake K applied, the result of this being that the internal gear I is brought to a standstill, and the driven pinion C continuing to revolve the idler pinions F F′ are dragged around between the two gears in a manner somewhat similar to the balls in a ball-bearing, and the pinion-carrying disk E and the shaft A are given a rotation in the same direction as the gear D, but at a considerably less speed. To bring the shaft A to a standstill the brake K is released. The internal gear I will then begin to revolve and the brake-wheel H become stationary. For a sudden stop the brake G is appled after the release of the brake K. If it now be desired to give the shaft an opposite rotation to that of the wheel D, the clutch O is withdrawn, brake K then applied (brake G being released by the same movement.) Clutch M is now thrown into mesh with the internal gear I and the brake K released and the brake G applied. This brings the brake-wheel H and the disk E to a standstill, and the idler-pinions F F′ are held on stationary bearings. The continued revolution of the driven pinion C causes the idler-pinions, and of course the integral gear meshing with them, to revolve in the opposite direction, which motion is transmitted to the shaft A through the clutch.

In Fig. 4 I have illustrated another of the various safety mechanisms for operating the clutches. The lever L′ is pivoted at *l′*, a point farther distant from the clutches than the point *l* at which the lever L is pivoted. The link T then transmits motion direct from one lever to the other, causing them to swing in opposite directions.

The advantages of my gear are evident, in that it accomplishes all the desired objects of permitting the motor to run free and to throw the driving-wheels into gear therewith by a sliding clutch with friction members, which permit the full momentum of the motor to be employed in starting the car, in that it reduces the speed of the motor before transmitting it to the shaft, and can be used equally well for forward or backward motion without changing the direction of rotation of the motor or the speed thereof. The use of automatic attachments to the brakes and clutches described prevents the possibility of the parts of the gear being so locked that they will oppose one another and produce any breakage, and the friction of the apparatus is nearly all brought upon the external part of the internal gear I and the brake-wheel H, which can be readily replaced when worn, and upon the brake-bands surrounding the same. By making the brake-bands of slightly-softer material than the brake-wheel and gear-wheel nearly all the wear can be thrown upon the brake-bands, which can be still more cheaply and readily replaced. Except in starting and stopping, no sliding friction is made use of in the mechanism.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the driving-gear, the driven pinion rigid therewith, the revoluble pinion-carrying disk, the idler-pinions, which are mounted on said disk and mesh with the driven pinion, the annular gear which also meshes with the idler-pinions, the shaft on which the driving-gear, driven pinion, disk, and annular gear may revolve freely, the brakes by which the rotation of the annular gear or of the pinion-carrying disk may be retarded or stopped, and the clutches by which either the annular gear or the disk may be locked to the shaft, substantially as described.

2. The combination of the driving-gear, the driven pinion rigid therewith, the revoluble pinion-carrying disk, the idler-pinions, which are mounted on said disk and mesh with the driven pinion, the annular gear, which also meshes with the idler-pinions, the shaft on which the driving-gear, driven pinion, disk, and annular gear may revolve freely, the brakes by which the rotation of the annular gear or of the pinion-carrying disk may be

retarded or stopped, and the clutches by which either the annular gear or the disk may be locked to the shaft, together with connecting mechanism between said clutches by which only one may be thrown into operation at one time, substantially as described.

3. The combination of the driving-gear, the driven pinion rigid therewith, the revoluble pinion-carrying disk, the idler-pinions, which are mounted on said disk and mesh with the driven pinion, the annular gear, which also meshes with the idler-pinions, the shaft on which the driving-gear, driven pinion, disk, and annular gear may revolve freely, the brakes by which the rotation of the annular gear or of the pinion-carrying disk may be retarded or stopped, and the clutches by which either the annular gear or the disk may be locked to the shaft, together with connecting mechanism between said clutches by which only one may be thrown into operation at one time, and connecting mechanism between the brakes whereby only one of said brakes may be applied at the same time, substantially as described.

4. The combination of the driving-gear, the driven pinion rigid therewith, the revoluble pinion-carrying disk, the idler-pinions, which are mounted on said disk and mesh with the driven pinion, the brake-wheel, which is rigidly connected to said disk, the annular gear, which also meshes with the idler-pinions, the shaft on which the driving-gear, driven pinion, disk, and annular gear may revolve freely, the band-brakes which surround the brake-wheel and the annular gear, and the clutches by which either the annular gear or the disk may be locked to the shaft, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE READE BALDWIN.

Witnesses:
M. HANAN,
WM. F. LIGHTHALL.