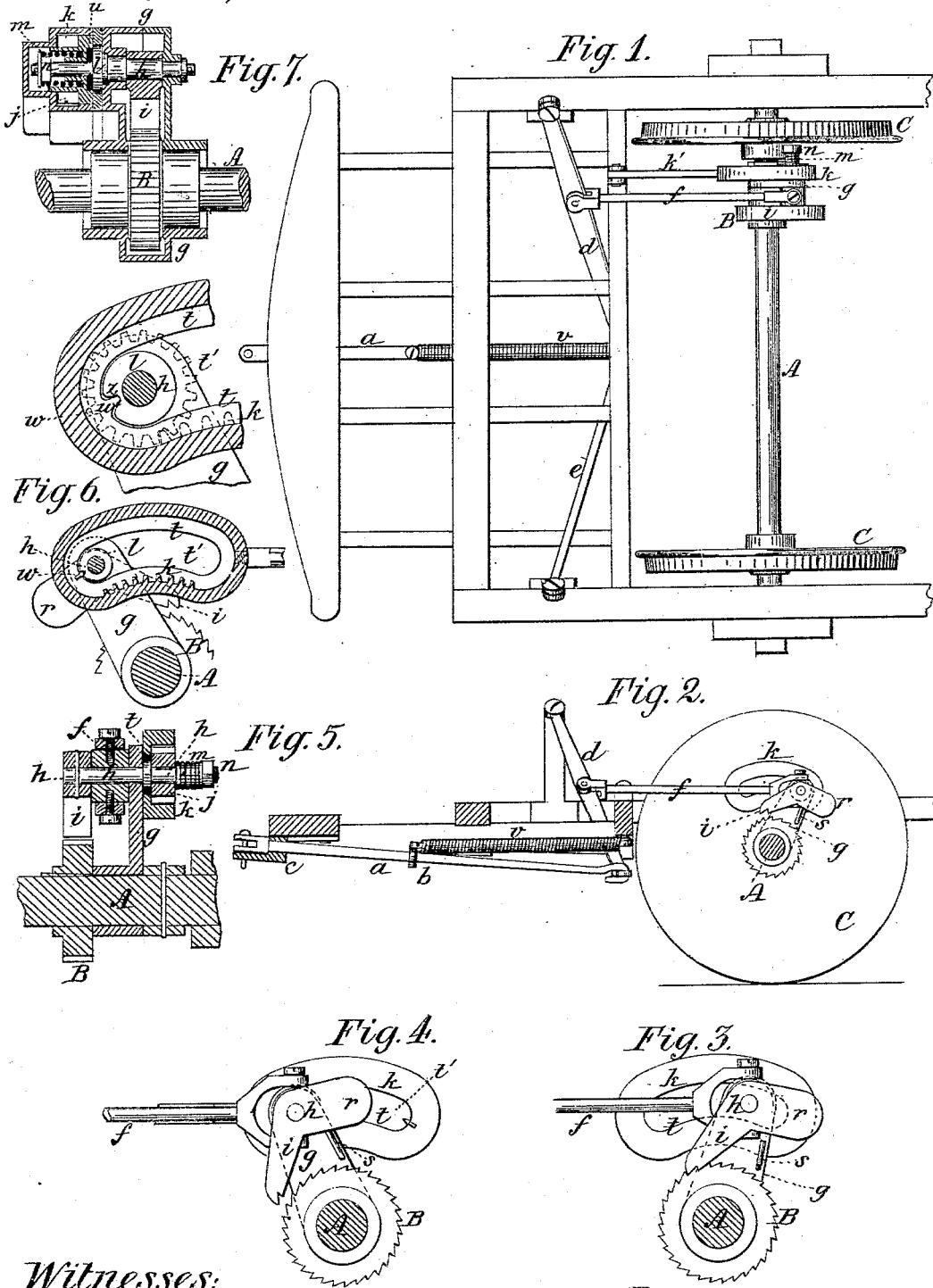


H. P. HOLT.
Car-Starter.

No. 211,015.

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN CAR-STARTERS.

Specification forming part of Letters Patent No. **211,015**, dated December 17, 1878; application filed November 1, 1878.

To all whom it may concern:

Be it known that I, HENRY PERCY HOLT, of Royal Insurance Buildings, Leeds, in the county of York, in that part of the United Kingdom called England, civil engineer, have invented certain new and useful Improvements in Railway-Car Starters, which improvements are set forth in the following specification, reference being had to the accompanying drawings.

This invention relates to devices for facilitating the starting of tramway-cars drawn either by mechanical or animal power. The motive power is applied to a draw-bar, so as to draw it out at starting any suitable limited distance at a greater velocity than the motion of the car, and thus utilize this limited forward movement of the draw-bar in excess of that of the car to pull round the car-wheels at the time of starting through the medium of devices connecting said draw-bar with a ratchet-pawl and a ratchet-wheel on the forward axle.

My invention consists of certain combinations and arrangement of devices for applying the forward movement of the draw-bar to the car-axle at the time of starting, for disconnecting and holding out of gear the moving or starting parts after the car is put in motion, to allow the axle to run free, and for locking such parts out of gear to allow the car to run in an opposite direction by a similar starting device at its other end.

The ratchet-pawl is made to engage with a ratchet-wheel fixed on the axle by a spur-pinion fitted loosely upon an axis-stem, upon which said pawl is fixed, said pinion being adapted to engage with a segmental rack attached to the car-frame, and both the pinion and pawl arranged upon an arm which turns loosely upon the axle, and which is connected with the draw-bar. The pinion and ratchet-wheel have a frictional contact, which, while serving to engage the pawl and ratchet-wheel at the commencement of the forward movement of the draw-bar, serves also to allow the pawl to be thrown and held out of contact with said ratchet-wheel after the car has been started, and independent of the pinion-and-rack connection.

The segmental rack while being fixed to the

car-frame is adapted to conform to the spring of the car-body, so as not to interfere with its pinion-connection. The pinion is adapted to traverse in a segmental guide or rack-bridle, and the flange of the latter has a spur or tooth at its inner end arranged to enter a notch in a friction-disk fixed on the pawl-stem for the purpose of locking the pawl when thrown back and out of the range of the ratchet-wheel when the starting device is not used, or when the car is to be run in an opposite direction by the other end starting device.

Referring to the drawings, Figure 1 represents a top view of a part of a car-frame and wheels having my improved starting device applied thereto, and in the position it occupies when the car is standing; Fig. 2, a vertical longitudinal section of the same; Fig. 3, a similar view, the parts being in the positions they occupy when the car has been started; Fig. 4, a similar view, showing the pawl away from the ratchet-wheel after the car has been started; Fig. 5, a section through the pawl-axis, showing its frictional connection with the rack-pinion; Fig. 6, views of the segmental rack, with its end locking spur or tooth, and the friction-disk for holding the pawl out of gear when not in use; and Fig. 7, the ratchet-pawl connecting devices inclosed by a case, and showing the friction-disk with a friction-washer.

The motive power is attached to a draw-bar, *a*, arranged to have a limited movement of its own, so as to pull out at starting the car with a more rapid movement than that of the car, and until arrested by a collar, *b*, coming against a guide-stop, *c*, on the car, when the car is then drawn by said bar.

The draw-bar is connected with a ratchet-pawl device for turning the forward axle, *A*, a distance equal to the excess of the motion of said bar over that of the car. This connection, is by means of a multiplying-lever, *d*, pivoted at one end to one side of the car-frame, and connected at its other end to the inner end of the draw-bar, these united ends being supported by a swinging rod, *e*, pivoted to the opposite side of the car, so that the front stop, *c*, and the swinging rod *e* support the draw-bar and the inner end of the multiplying-lever.

The multiplying-lever d is connected by a chain or rod, f , to a vertical arm, g , which works loosely on the car-axle, and supports and carries a horizontal loosely-fitting stem, h , upon one end of which the ratchet-pawl i is fixed, and upon the other end is loosely mounted a spur-pinion, j , so as to work into a segmental rack, k , attached, by a joint-rod, k' , to the car-frame, so as to be fixed with regard to the fore-and-aft line of the car, and to allow for the spring of the car-body, the rack being supported upon the pawl-stem and conforming to the arc described by the pinion in applying the pawl to the ratchet-wheel B, which is fixed upon the axle so as to pull the latter round as the draw-bar is drawn out.

A friction device is combined with the ratchet-pawl i and the pinion j for two purposes—to cause the pawl to be turned down to engage with the ratchet-wheel B at the moment the draw-bar commences its outward movement and to allow the pawl to free itself from the ratchet-wheel when the draw-bar is at the limit of its forward movement and is drawing the car by the stop. This friction device consists of a collar or disk, l , fixed on the ratchet-stem h so as to bear against the arm g , turning loosely on the axle, and against this collar or disk l the pinion j is pressed by a spiral spring, m , Fig. 5, arranged upon the stem h , between said pinion and an adjusting-nut, n , on the end of the stem opposite to that which carries the pawl i , so that the spring acts to bind the pinion against the collar or disk l on the axis-stem h with sufficient force to turn said stem and bring the pawl down on the ratchet-wheel at the moment of starting and by the turning of the pinion, which the draw-bar effects by the pulling forward of the arm g , which carries said pinion. As soon as the pawl strikes the ratchet-wheel the pinion then turns idly upon its stem during the remaining forward movement of the arm g , which is limited by the collar b on the draw-bar, and which limited movement determines the starting of the car. The moment the collar b strikes the stop c the car receives a sudden impetus, which, in connection with a weighted arm, r , of the pawl, causes it to overcome the friction of the stem collar or disk l and be thrown out from the ratchet-wheel, so that the latter turns free of the pawl. The movement of the pawl is only sufficient to engage and free it from the ratchet-wheel, and when so freed, when the cars are running, its weighted end is supported by a stop, s , on the arm g , as shown in Fig. 4. This disengaging movement of the pawl is made independent of the pinion, because the pawl-stem turns loosely in the pinion, which does not turn at this time; but in engaging the pawl the pinion turns the pawl-stem by the frictional bearing-disk. The segmental rack k has a flange, t , which forms the bridle or slot t' , through which the pinion-stem h passes, and within which it moves with the axle-arm g , so as to support the rack, as the flange t forms a bearing-way for the collar

or disk l of the pinion-stem, and the spring of the car-body is thus without any binding effect upon the rack-and-pinion connection.

In connection with the friction collar or disk l a friction-washer, u , (shown in Fig. 7,) may be interposed between said collar and the spur-pinion to receive the frictional pressure of said pinion, to render the friction device reliable in its stated functions.

As stated, the car is provided at each end with a starting device to adapt the car to be drawn from either end, and in order to hold the ratchet-pawl out of gear at one end of the car, while the other pawl device is in use, I provide the flange t of the rack-bridle k with a tooth or spur, w , arranged at its inner end, and in such a position as to enter a notch, z , in the circumference of the collar or disk l of the pawl, and lock the pawl out of gear, as shown in Fig. 6. As the friction-disk and the pawl are fixed to their carrying-stem h the turning movement of the disk is limited by the extent of the engaging and disengaging movement of the pawl, so that the movement of the arm g to its inner position with regard to the center of the car and the action of the weighted arm r of said pawl will always turn the disk so as to bring its notch in position to receive the locking-tooth.

The pawl-carrying arm g may be fitted on bosses of the ratchet-wheel, as in Fig. 7, instead of on the axle.

A spring, v , attached to the draw-bar and to the car-frame, or otherwise arranged, serves to retract the draw-bar when the car has stopped, or to place the device in position to start the car, or when the device is not in use, while the stop c limits the inward movement of the pawl-carrying arm.

The bearing-stop c and the draw-bar a are provided with holes to receive a pin for locking the two together when the starting device is not used, as shown in Fig. 2.

Any suitable ratio of advantage at starting may be given to the motor, which, in most cases, I prefer to arrange to travel double the distance of the car during the same length of time for the first few feet at starting, and under these conditions only about five-ninths of the usual amount of power is required to start the car.

A check-chain may be used for pulling the pawl out of gear with the ratchet-wheel at such time as the arm g has completed its forward stroke and the car is running. So, also, a spring may be used for the purpose of drawing the pawl out of gear with the ratchet-wheel when the arm g is in its extreme inner or backward position, so as to allow the car to run in an opposite direction to that in which this end apparatus is intended to work. The wheels C are, as usual, fixed upon the axles.

The ratchet-wheel, pawl, and the connecting-rack device may be covered by a suitable case, as shown in Fig. 7.

I claim—

1. The combination, with the axle ratchet-

wheel B, of a pawl and an actuating-pinion therefor, carried by an arm turning loosely on the axle, a fixed segmental rack engaging with and operating said pinion, and the draw-bar united to said loosely-turning ratchet-carrier, adapted for operation in starting the car, substantially as herein set forth.

2. The combination, with the ratchet-pawl *i* and its actuating-pinion *j*, turning loosely on the pawl-stem, the carrying device *g*, and the fixed rack *k*, of a friction device consisting of a collar fixed on the pawl-carrying stem between the carrying device *g* and the pinion *j*, and a spring bearing upon said pinion, and adapted for operation with the axle-ratchet, substantially as herein set forth.

3. The pawl *i*, having a weighted arm, *r*, and combined with the loosely-turning pinion *j*, the rack, and the friction device, for operation in disengaging the pawl after the car is started.

4. The rack-bridle pivoted to the car-frame and supported upon the axle by the arm *g*, in combination with the rack and pinion *j k*, the ratchet, pawl, and the friction device, adapted for operation as described, and allow for the spring of the car-body independent of the rack-and-pinion connection with the car-axle.

5. The starting device adapted for engagement and disengagement with the axle-ratchet

by means of the rack, the shifting-pinion, the pawl, and the friction device, in combination with the multiplying-lever *d*, the connecting-rod *e*, arranged for operation substantially as described.

6. The device for holding the ratchet-pawl out of gear when not in use, consisting of the tooth *w* in the bridle-rack and the notch *Z* in the friction collar or disk fixed on the ratchet-stem and interlocking, as stated.

7. The combination, with the weighted ratchet-pawl *i r*, the loosely-turning carrier *g*, the loosely-turning pinion *j*, and the rack-bridle, of the stop-pin *s* on said carrier, for the purpose stated.

8. A car-starting device consisting of the axle ratchet-wheel B, the weighted ratchet *i*, the loosely-turning arm *g*, the loosely-turning pinion *j*, the bridle-rack *k*, the friction device *l m*, the multiplying-lever *d*, and the draw-bar connected with the pinion and ratchet-carrying-arm, for operation substantially as described.

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

HENRY PERCY HOLT.

Witnesses:

GEO. F. CHAMOCK,
JOHN G. WILLIS.