2 Sheets Sheet. 1

J. B. Waring.

Starting & Stopping Cars.

No. 75818 Patented Mar. 24, 1868

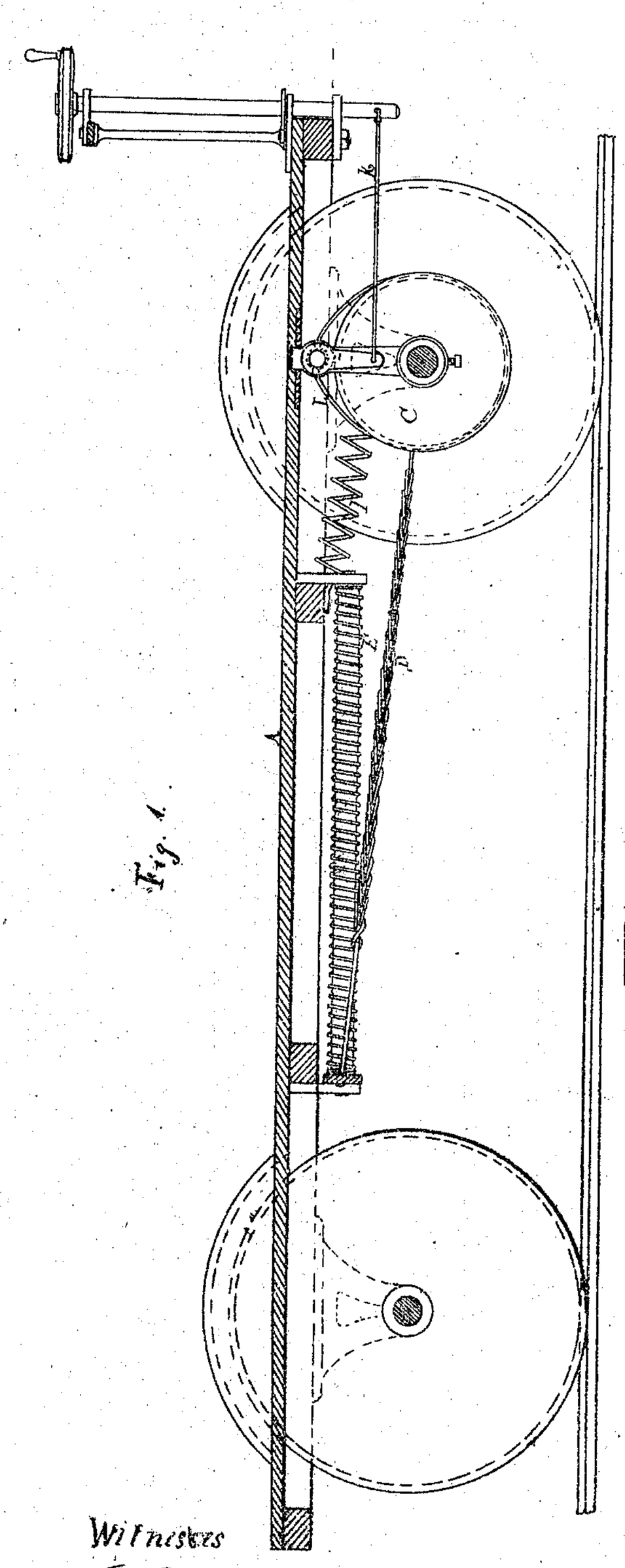

Fig. 1.

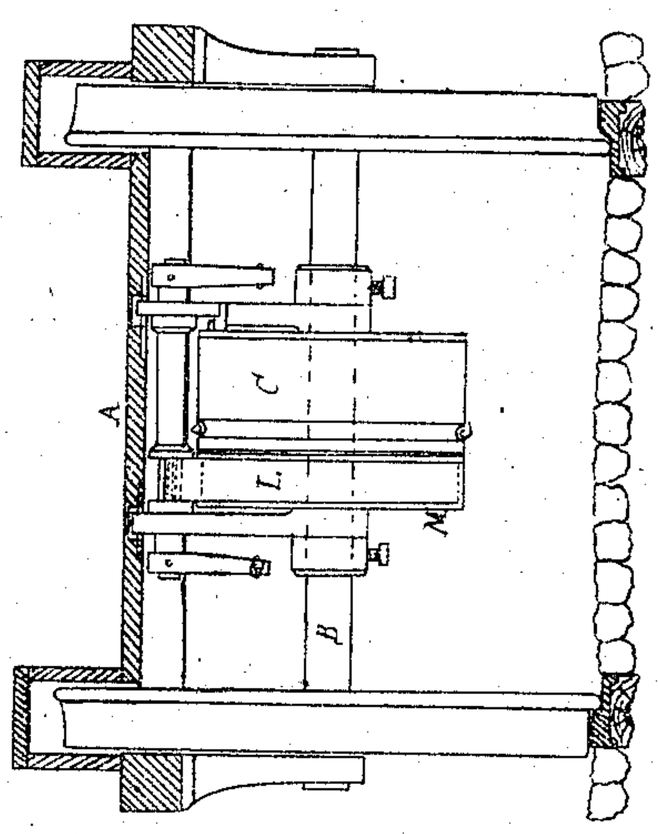

Fig. 2.

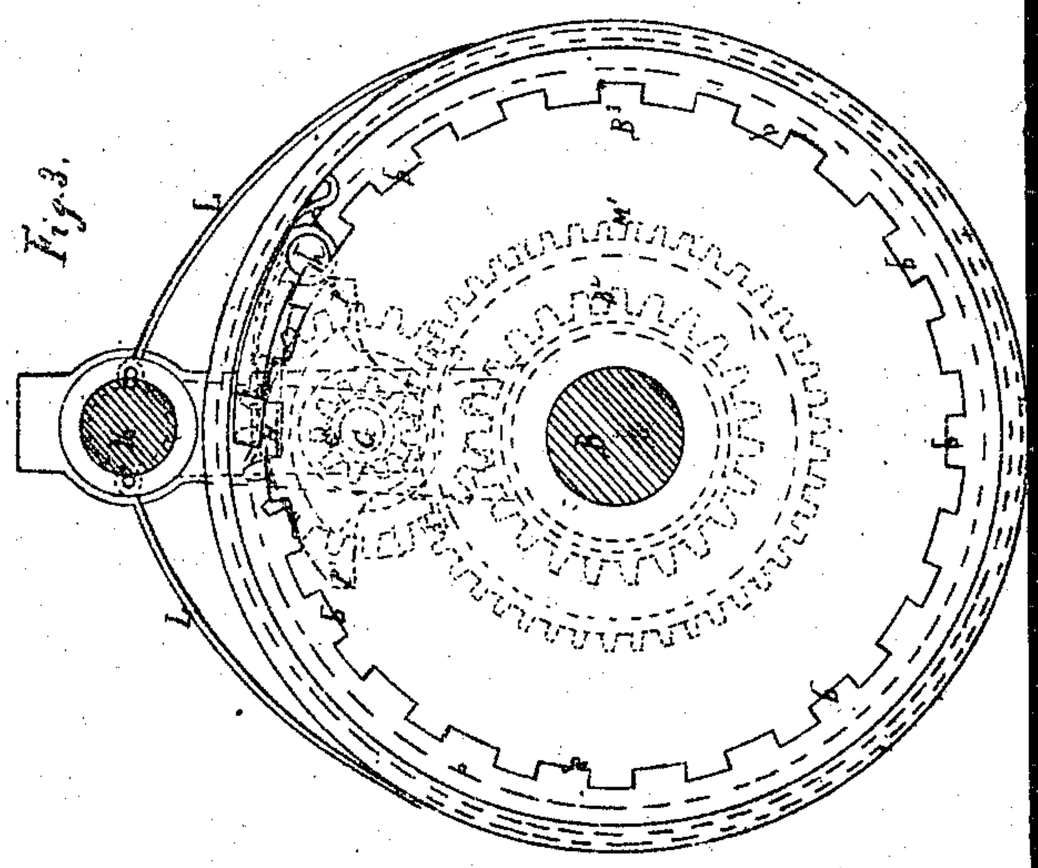

Fig. 3.

Witnesses

A. Moore

Chas. C. Wilson

Inventor

John B. Waring

by his attorneys

T. D. Stetson

Sheet 2.

J. B. Waring.

Starting & Stopping Cars.

No. 75818 Patented Mar. 24, 1868

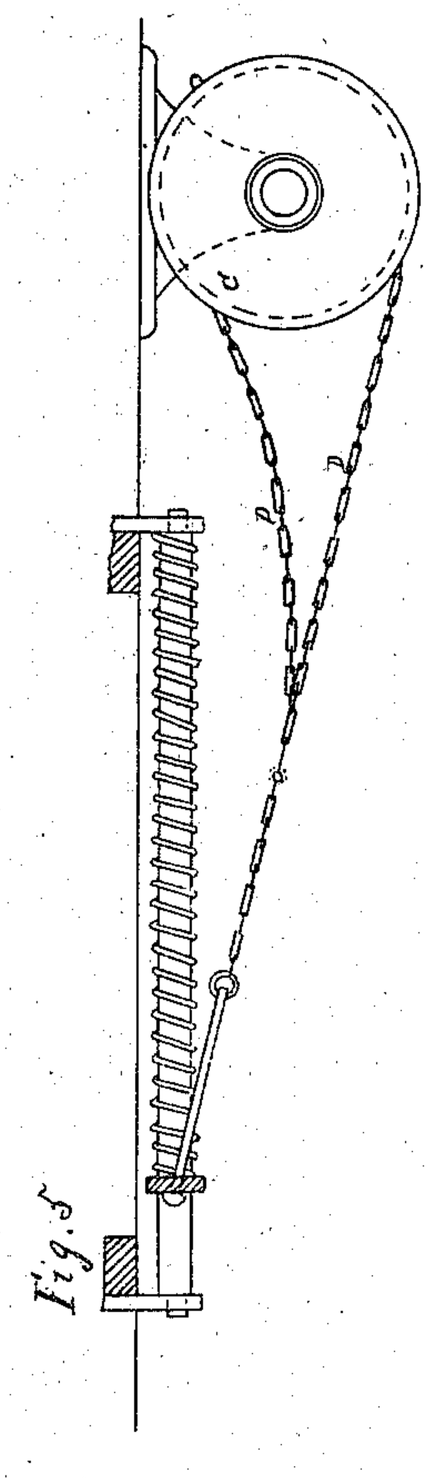

Fig. 5.

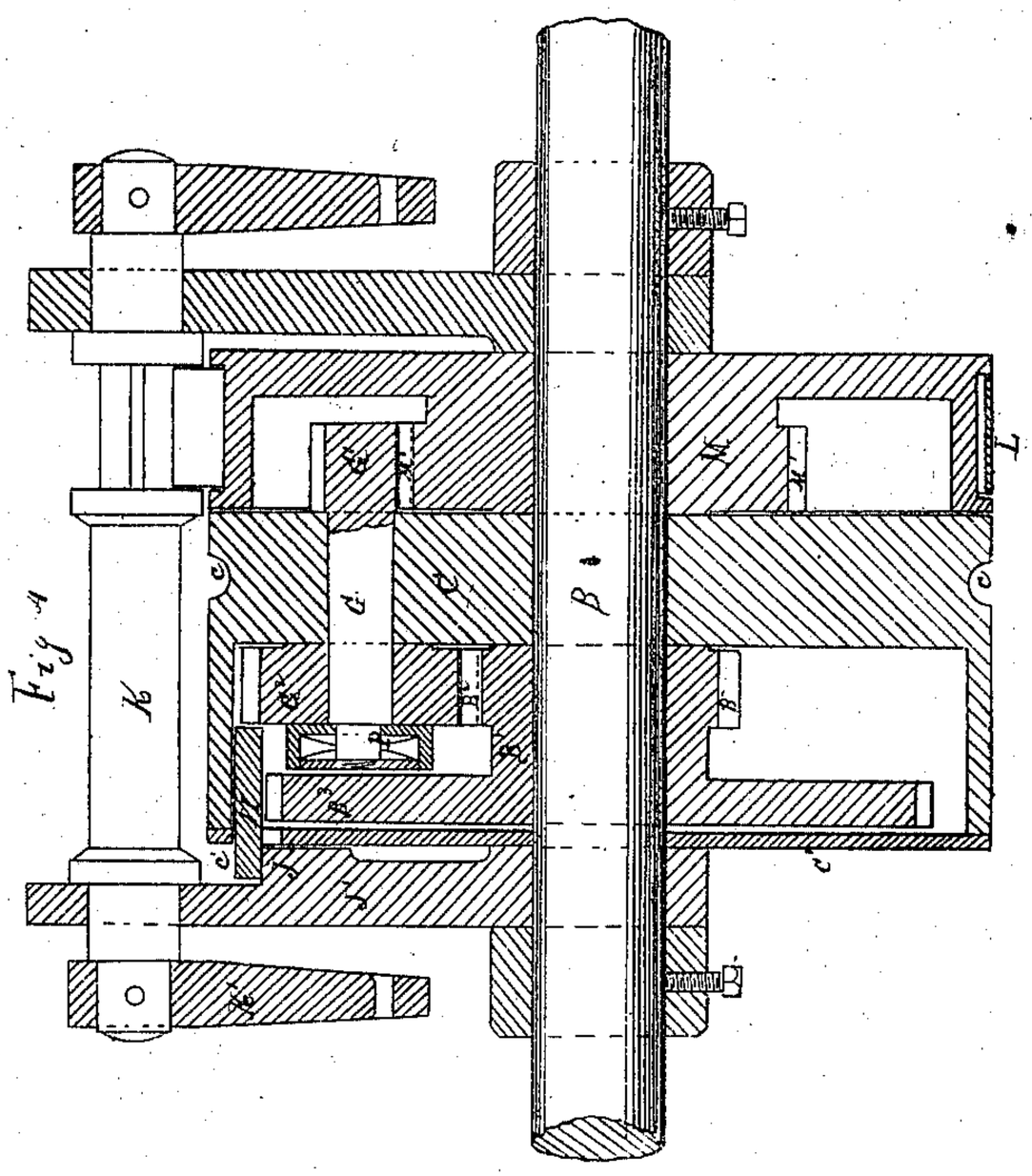

Fig. 4.

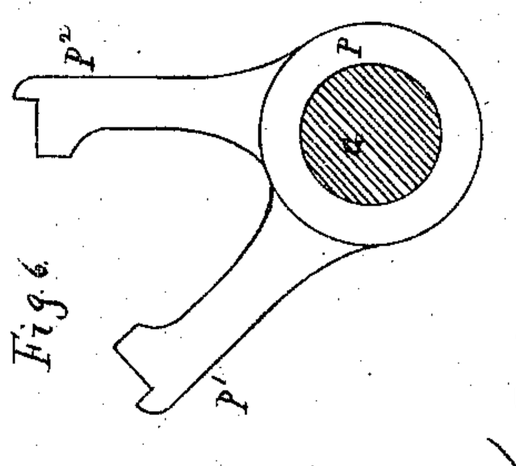

Fig. 6.

Witnesses

A. Moore

Chas. C. Wilson

Inventor

John B. Waring

by his attorneys

W. B. Stetson

United States Patent Office.

JOHN B. WARING, OF NEW YORK, N. Y.

Letters Patent No. 75,818, *dated March* 24, 1868.

IMPROVED CAR-STARTING AND STOPPING APPARATUS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN B. WARING, of the city, county, and State of New York, have invented certain new and useful Improvements in Horse-Cars; and I do hereby declare that the following is a full and exact description thereof.

My invention relates to apparatus for retaining power. It is adapted to absorb the momentum in the frequent stoppages to take in and set down passengers, and to give out the power thus accumulated to aid in overcoming the inertia of the car in starting again. Apparatus having this object in view has been a favorite subject for inventors for several years, but all the apparatus for the purpose known to me have been open to objections, which my invention avoids.

I will first describe what I consider the best means of carrying out my invention, and will afterwards designate the points which I believe to be new. The accompanying drawings form a part of this specification.

Figure 1 is a central longitudinal section through the running-gear of the car.

Figure 2 is a transverse section.

Figures 3 and 4 represent some of the parts on a larger scale. Fig. 3 is a section at right angles to the axis, and fig. 4 is a vertical section in the plane of the axis.

Figure 5 represents, on a smaller scale, a modification of some parts.

Figure 6 represents, on a larger scale, a modification of one of the details.

Similar letters of reference indicate like parts in all the figures.

The figures represent the novel parts, with so much of the other parts as is necessary to indicate their relation thereto. Tints are employed merely to aid in distinguishing parts. They do not indicate material. The material may be of iron and steel.

A is the body of the car, and B is one of the axles. The wheels, the pedestals in which the axles are carried, the ordinary carrying-springs, the hand-crank for operating the brake-cord or chain, and the several other ordinary parts of the car, may be of the ordinary construction. Some of these parts are indicated in the figures. I securely key, or otherwise rigidly fix upon the axle B, a boss, B^1, having gearing B^2 on one portion of its periphery, and a broad flange, B^3, on another portion, arranged as represented. This piece turns invariably with the axle B, and may be considered a part thereof. This is enclosed within a drum, C, which may turn upon the axle. To this drum C is attached a chain, D, which extends to a spring, E, which is mounted as represented, so as to have a considerable length of traverse or effective range of motion. The spring E exerts a tension on the chain D, which is nearly constant. The chain D is wound and unwound upon the exterior periphery of the chain-drum C, resting in the groove *c*, as will be presently described.

G is a short shaft mounted in the drum C. It carries on one end a pinion, G^1, outside of the drum C, and on the other end a pinion, G^2. The latter is inside of the drum C. The end of the shaft G projects beyond the pinion G^2, and is fitted with a spring-cam, P^1 P^2, a device which exerts a constant pressure against one face of the pinion G^2. C^1 is a plate, which forms one end or head of the drum C, and is provided with a sufficient opening, c^1, through which may operate the stout pawl H, which is hinged at *h* to the interior of the chain-drum C, and is pressed inward by the spring I. This pawl H performs an important function in the operation of my invention, and is subjected to peculiar conditions, as will be presently described.

The periphery of the flange or wheel B^3 is notched or recessed, as indicated by *b*, in figs. 3 and 4, so that it may receive this pawl H in a great variety of positions, and retain its hold thereon very strongly until the pawl H is lifted.

J^1 J^2 are uprights mounted upon the shaft B, so that the latter is free to turn therein, and supported at their upper ends by being inserted in sockets in the floor of the car A, as indicated in figs. 1 and 2. This arrangement allows the uprights J^1 J^2 to slide vertically into the floor, or through the same, to any extent which is required in practice, but prevents them from moving in any other direction. They are kept in place, where they bear upon the axle B, by the adjustable collars and set-screws, as represented. They support near their upper ends a horizontal shaft, K, on which are stoutly keyed two arms, K^1 and K^2. From one of these arms, K^1, a cord, k^1, extends to the brake-shaft, at one end of the car. From the opposite arm, K^2, a similar cord,

not represented, may extend to the brake-shaft at the other end of the car. A stout strip or band of iron, sufficiently thin to be flexible, is strongly secured on the shaft K, as represented by L. The ordinary position of the shaft K is such that the arms K^1 K^2 extend directly downward. In this position the band L is allowed the greatest amount of slack or liberty. When the shaft K is partially turned in either direction, the band L is contracted.

My apparatus operates by inducing a contraction of the spring E when the car is brought to rest, and allowing an extension of the spring when the car is being set in motion again. The chain D partially winds and unwinds on the drum C. The shaft K and stout strap L perform important functions in controlling the force, and inducing it to act in the right directions.

M is a hollow drum free to turn on the shaft B, and mounted in contact with the drum C, as represented. It receives the pinion G′, and is provided with gearing M′, which locks therewith, as indicated in figs. 3 and 4. The pinion G′ may traverse around in the interior of M, in either direction. The exterior of the drum M is slightly recessed, and adapted to receive the band L, before described.

Now, so soon as the functions of the pawl H, and of the few adjacent parts, not yet explained, are understood, the action of the apparatus may be very easily explained. On the inner face of the upright, J^1, is a cam-shaped projection, *j*. In the ordinary normal position of the parts, the pawl H is supported on this cam at such an elevation as keeps it out of the notches *b;* but, when the apparatus is in action, and the chain-drum C is turned in either direction to wind up the chain D, in the act of stopping the car, the pawl H ceases to be supported by the cam *j*, and would immediately drop into one of the notches, *b*, if it were not supported by other means. The spring-cam P^1 P^2 above referred to performs this function of supporting the pawl H until the proper moment. It then makes a partial rotation, and allows the pawl H to drop and catch in one of the notches, *b*, in which condition it allows the spring E to expend its force in assisting the car to start, by acting in the same direction in which the car is moved. The relation of these parts is peculiar, and will require a minute description, with possibly some repetitions.

The spring-cam P^1 P^2 acts as one mass, excepting that it is made in two pieces, with a spring, *p*, between, so as to exert a constant pressure against the pinion G^2, and thus to obtain a certain amount of friction therefrom, which tends to turn the spring-cam in the same direction that the said pinion turns. P^1 P^2 are short arms or projections on the said cam, one or the other of which comes in play to suspend the pawl H, according as the pinion G^2 turns in one direction or the other. So long as the pinion G^2 continues to move in either direction, the spring-cam supports the pawl H out of contact with the notches *b*, but whenever the pinion G^2 stops, and commences to move in the opposite direction, the spring-cam P^1 P^2 changes its position, and partially revolves with it in the opposite direction. A change of motion, therefore, gives an interval, during which neither of the arms or projections P^1 P^2 supports the pawl H. This change of motion may occur with such rapidity (as will be observed further on) that the pawl H has not time to fall into one of the notches, *b;* but, in case it is performed, as it must be in practice, with moderation, the pawl H is sure to fall, and be secured in one of the notches, *b*, during the change of motion of the pinion G^2, from the revolution in one direction to the revolution in another.

Now, it will be observed that the winding up of the chain D is effected by the revolution of the chain-drum C, in a direction opposite to that in which the wheels of the car are revolving. When the car has stopped, or partially stopped, and is again allowed to proceed, by the releasing of the brake, the tension of the chain D pulls the chain-drum C forcibly back to its original position, in other words, impels it in the same direction that the car is moving. The pawl H, by locking into one of the notches, *b*, in the exterior of the flange B^3, makes this motion available to impel the car, by compelling the chain-drum C to turn the wheels of the car with the same angular velocity as itself.

Having now got a general idea of the functions of the apparatus, to wit, that the chain-drum C winds up the chain by a motion in the opposite direction to that in which the car is moving, during which period its connection with the axle of the car is through gearing, and very indirect, and that it unwinds the chain by turning in the opposite direction, that is to say, in the same direction in which the car-wheels are moving, and that during this latter period its connection with the axle is direct, let us follow the several steps in detail.

First. During the period while the car is moving quietly along, impelled by the horses or steam, and with the brakes free. In this condition the chain-drum C stands still by virtue of the tension of the chain D. The boss B^1 revolves necessarily with the axle B, and, by its gearing B^2, causes the rotary motion of the pinion G^2, and consequently of the shaft G and pinion G^1. The brake-drum M is free from all constraint of any kind, and consequently turns quietly around as it is impelled by the revolution of the pinion G^1. In this condition of the parts, the gentle friction of the spring-cam P is the only resistance offered by the apparatus to the motion of the car. This friction is sufficient to hold the cam P tilted up, so that one of its arms P^1 or P^2 is in contact with the pawl H, and would support it, but it is in addition to this support, or rather independently thereof, supported on the cam-like projection *j*, before described.

Second. During the period while the brake is on, and the motion of the car is being arrested. The driver or engineer, when the car is to be retarded, winds the hand-wheel represented, and thereby shortens the cord k^1. This draws on the arm K^1, and rocks the shaft K, thereby shortening the brake-strap L, and causing it to bind forcibly upon the periphery of the brake-drum M. This brake-drum, which had been previously running, is now stopped, and from this moment the rolling motion of the axle B and the boss B^1, by communicating the rotary motion above described to the shaft G^1, commences to slowly turn the chain-drum C. This motion is in the opposite direction to that in which the car-wheels are moving, as will be obvious from an inspection of the pinions G^1 and G^2.

The gearing B^2 turns in the same direction as the axle B, because it is fast thereon. The gearing G^2 turns in an opposite direction because it gears into B^2, and this, by giving a corresponding motion to the pinion G^1,

which meshes in the now stationary gearing M^1, compels the shaft G to move bodily in the opposite direction. Thus the chain-drum C, in which the shaft G has its bearing, is slowly turned in a direction opposite to that in which the car-wheel is moving. This motion continues so long as the forward motion of the car-wheels continues while the brake is on. The cam H, so soon as the chain-drum C revolves away from its support on the projection *j*, ceases to be supported by said projection, but it continues to be supported by the spring-cam P, which has been before described as in the proper position to perform this duty. The pawl H, therefore, is still of no effect. It traverses over the several notches *b*, or rather it traverses slowly in the opposite direction, while the notches *b* are revolved rapidly under it. During all this period the spring E is resisting the forward motion of the car, and will soon bring the car to a state of rest. A common friction-brake, not represented, may be used in addition to my apparatus, to arrest the motion of the car more suddenly, if desired. But in case no device of that nature is employed, the motion of the car will be soon arrested by the resistance of my spring E, and the momentum of the car will be treasured up, so to speak, in the spring E, ready to be given out in impelling the car when required.

Third. During the brief period while the brake is being gradually slackened. The motion of the car having been entirely extinguished, or sufficiently so, it is now desired to go ahead again. The driver or engineer now gradually turns his hand-crank, and slackens the cord *k*, and allows the arm K^1 to fall into its original perpendicular position; thus slackening the brake-band L, and releasing the brake-drum M. It will be observed that the chain-drum C, supporting the whole strain of the chain D, is held by the shaft G and its pinions G^1 and G^2, which mesh, on the one hand into the gearing M^1 in the brake-drum M, and on the other hand into the gearing B^2 in the boss B^1. Now, the moment the brake-drum M is released it can be no longer held by these means, but is free to turn in obedience to the tension of the chain D, by simply whirling around the shaft G, and its connections. But to acccomplish this, it will turn the shaft G, and consequently the pinion G^2, in the opposite direction to that which occurred when the chain was being wound up, and this will affect the spring-cam P, and let down the pawl H. The first result, therefore, of liberating the brake-drum M, is to cause the shaft G to commence to revolve in a direction opposite to that in which it revolved when the chain was being wound up. The commencement of this movement turns the spring-cam P, and lowers the pawl H, which immediately finds a resting-place in one of the notches *b*. Now, the further slackening of the brake-strap L, and the entire liberation of the brake-cam M, do not allow the gearing to whirl back again through the series of revolutions which it performed in winding up the chain, because the chain-drum C and the boss B^1, and consequently the shaft B, are, by the interposition of the strong pawl H, firmly locked together, and revolve as one. In this condition of the parts, therefore, the chain D commences to unwind, being pulled by the spring E, and in doing so, imparts the proper forward motion to the axle B, and consequently to the wheels of the car. The force of the horses, or of the steam or other motive-power, is thus efficiently aided by the action of my apparatus in imparting a proper forward motion to the entire structure, and in a very brief space of time the forward motion of the car is the same as before. The motion of the car increases and the spring E becomes extended until the chain-drum C has returned to its original position. The last thing which occurs in resuming its original position is to press the overhanging portion of the pawl H upon the smoothly-rounded surface of the cam-like projection *j*, on the upright, J′, and thus to elevate the pawl H out of the notch *b*, leaving the several parts free to revolve idly, as at first.

It will be observed that my apparatus is equally efficient, and that the action is precisely the same, whether the car is moving in one direction or the other. A brake-wheel may be provided at each end, and the tilting of the shaft K may be effected by a cord or chain connected to either of the arms K^1 or K^2, or the two cords may be attached, if desired, to the same arm. The construction is susceptible of a great many modifications in the details without departing from the principle of my invention. Many such modifications will suggest themselves to any good mechanic, and I do not confine myself to the precise forms of the parts herein described. Thus, for example, instead of the spring E being a spiral spring wound around a fixed rod, and exerting its force to extend itself, I can employ various other forms of spring, and various other modes of mounting. One which I esteem on some accounts preferable to the form here represented is one or more spiral springs without any central rod, and exerting its force or their force to contract. One modification of the connection from the spring E, or its equivalent, to the chain-drum C may be worthy of special description, and is indicated on a small scale in fig. 5, where, instead of one chain, D, two chains are represented, each extending around or partially around the chain-drum C in opposite directions. This arrangement allows the spring to pull with its full leverage down to the last moment in starting the car, and to resist with its full leverage in commencing to arrest the motion. It will be readily understood that in case two chains are employed in this manner, one will hang slack while the other is in use, and that only one chain will ever be effective at one time; in other words, the upper chain is effective while the car is travelling in one direction, and the lower while the car is travelling in the other direction.

In consequence of the difference of diameter of the gearing, and the periphery of the chain-drum, the winding up of the chain D on the chain-drum C, in stopping, requires a longer movement of the wheels of the car than that given in starting by the unwinding of the chain D; that is, in stopping, the chain is wound up slowly, by reason of the slow gearing, and in starting, owing to its virtually direct action on the axle B, the whole force of the spring E is rapidly expended in giving the forward movement, thus concentrating the momentum expended in slowly coming to a stop, and exerting it at once in starting.

Having now fully described my invention, what I claim as new in apparatus for use on railroad-cars, or other vehicles, to aid in stopping and starting, or either, is as follows:

1. I claim the pawl H, spring I, and series of detents *b*, arranged to operate in combination with a wheel, previously turned the reverse to the axle, substantially as and for the purpose herein set forth.

2. I claim the turning part P, arranged relatively to the wheel G^2, pawl H, and series of detents *b*, substantially as herein set forth.

3. I claim disconnecting the pawl H from the series of detents *b*, by means of the cam-like projection *j*, arranged to operate substantially as and for the purpose herein set forth.

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

J. B. WARING.

Witnesses:

HENRY D. GREEN,

W. C. DEY.