(No Model.) 4 Sheets—Sheet 1.

E. B. PHILLIPS.

CAR STARTER AND BRAKE.

No. 457,790. Patented Aug. 18, 1891.

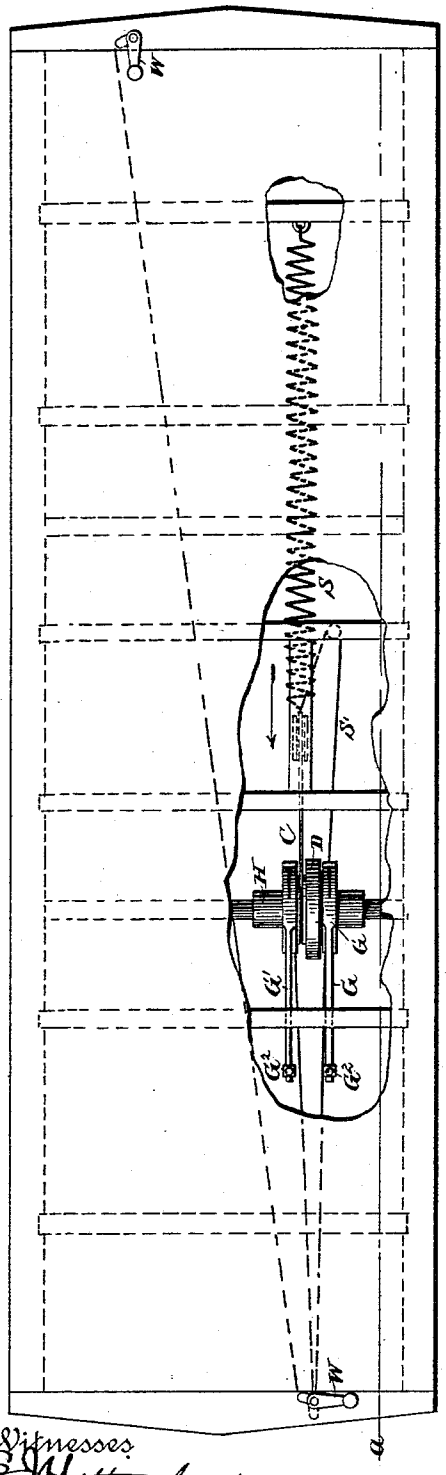


Fig. 1.

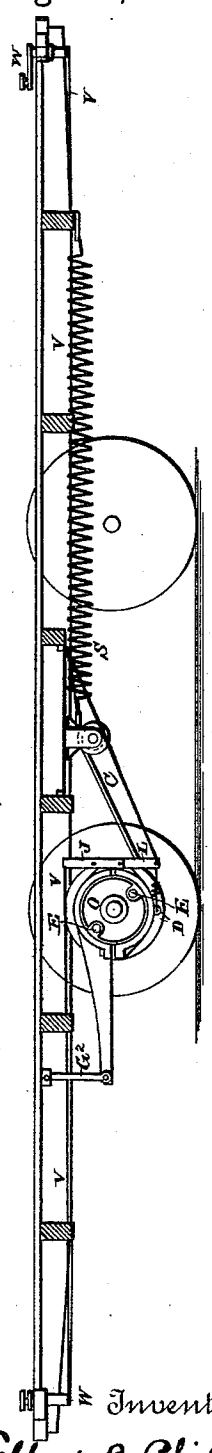


Fig. 2.

Witnesses.
E. Mottinghaus
G. F. Downing.

Inventor
Elbert B. Phillips
By H. A. Seymour
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 3.

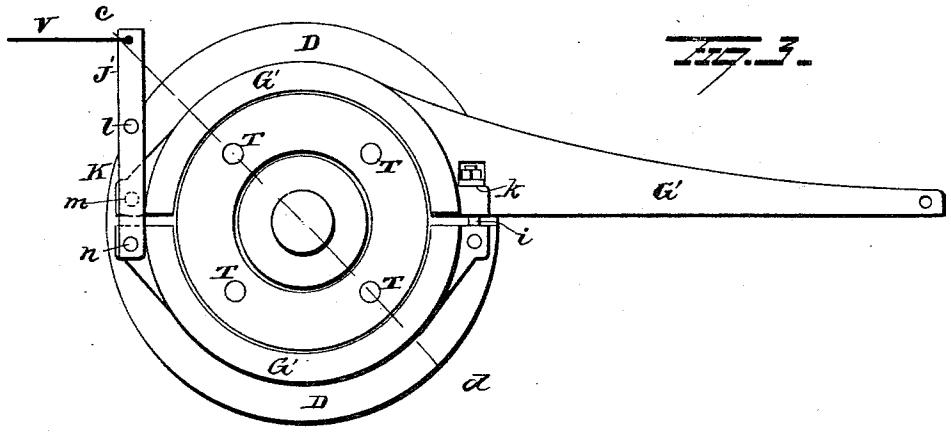
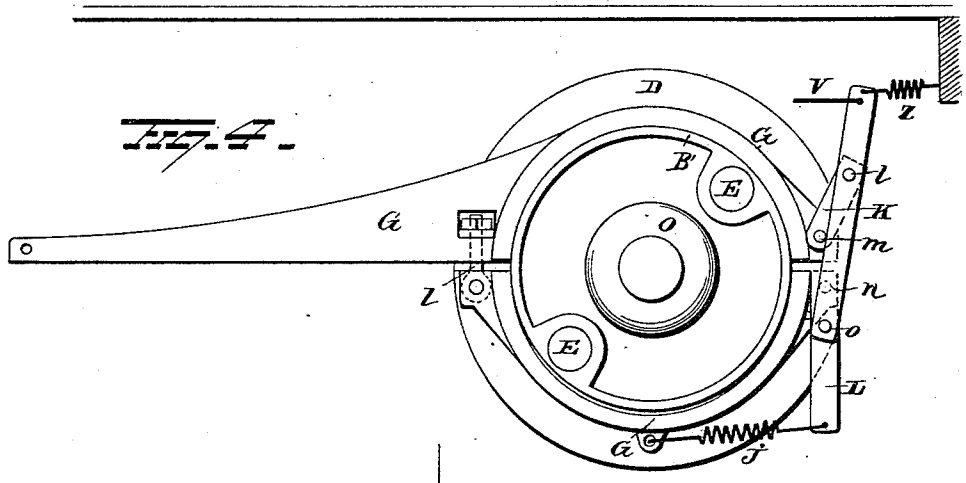


Fig. 4.



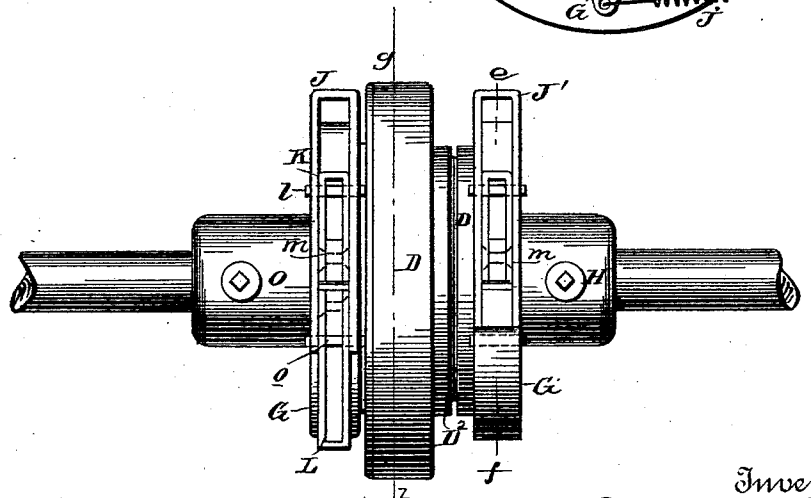


Fig. 5.

Witnesses
C. A. Mottinghame
G. F. Downing

Inventor
Elbert B. Phillips
By H. A. Seymour
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

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E. B. PHILLIPS.

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Fig. 6.

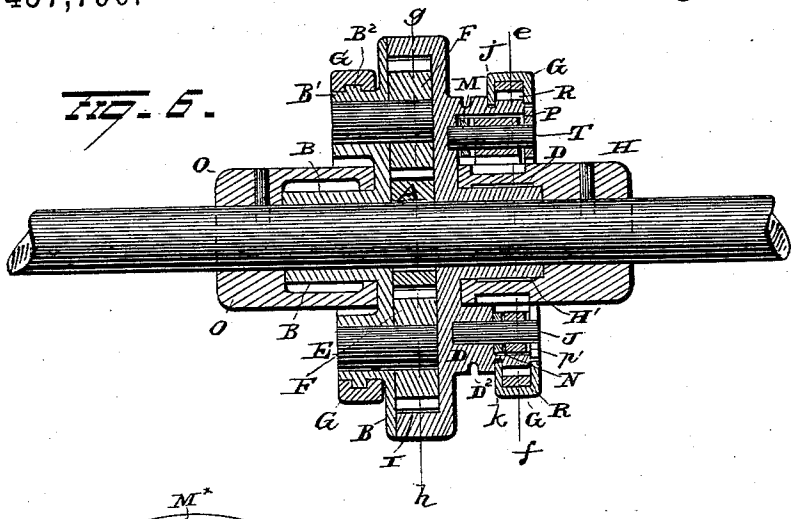


Fig. 7.

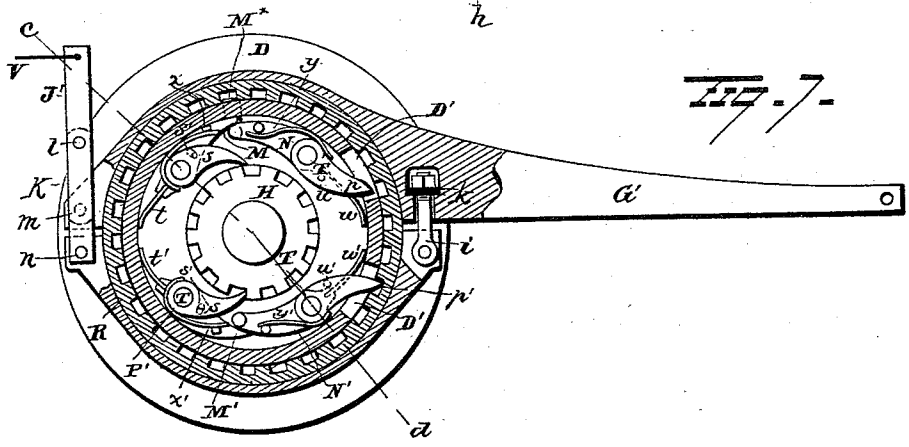
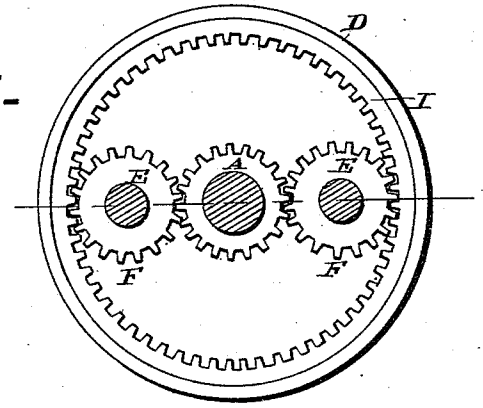


Fig. 8.



Witnesses
C. V. Mottinghame
G. F. Downing

Inventor
Elbert B. Phillips
By H. A. Seymour
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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E. B. PHILLIPS.

CAR STARTER AND BRAKE.

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Fig. 9.

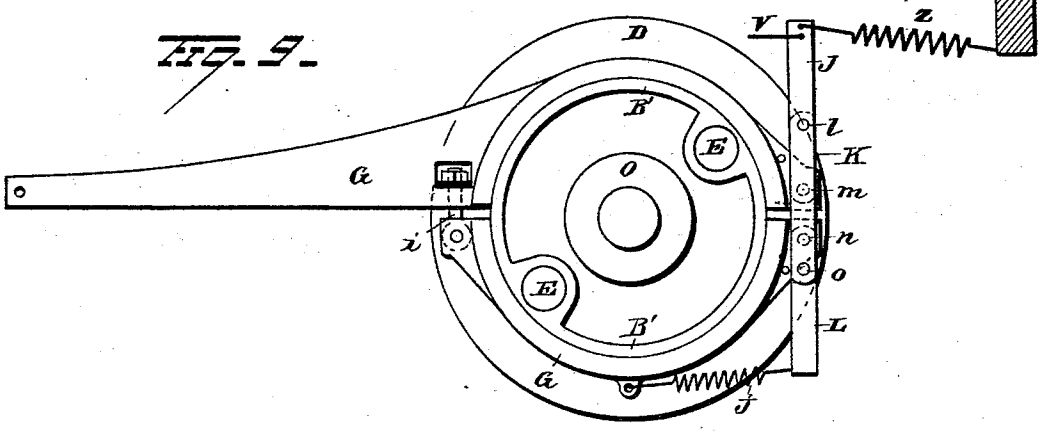
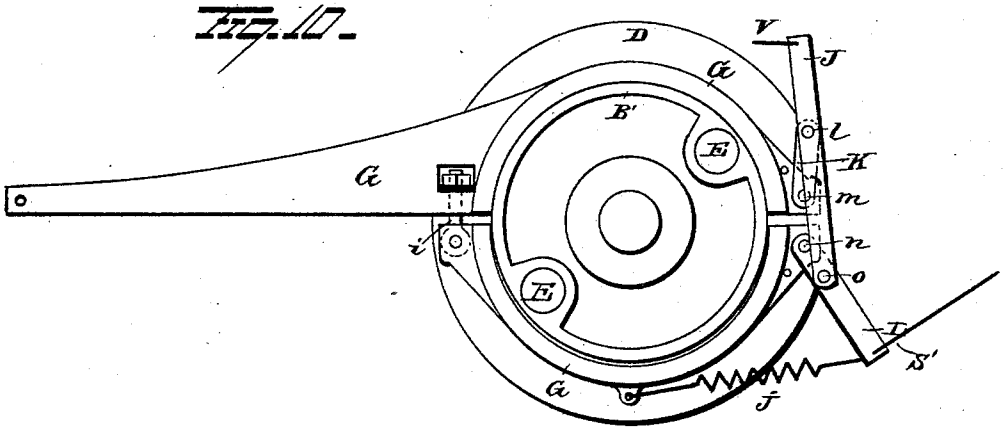


Fig. 10.



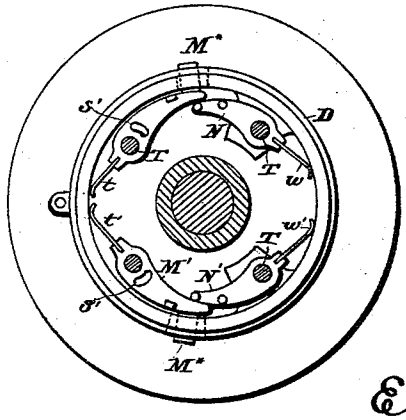


Fig. 11.

Witnesses
C. Mottingham
G. F. Downing

Inventor
Elbert B. Phillips
By H. A. Seymour
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ELBERT B. PHILLIPS, OF CLEVELAND, OHIO.

CAR STARTER AND BRAKE.

SPECIFICATION forming part of Letters Patent No. 457,790, dated August 18, 1891.

Application filed February 9, 1891. Serial No. 380,777. (No model.)

To all whom it may concern:

Be it known that I, ELBERT B. PHILLIPS, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Car Starters and Brakes; 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.

This invention relates to an improvement in car starters, propellers, and brakes, its object being to produce means for the accomplishment of the purposes stated, which shall be of simple construction, comparatively cheap to manufacture, and which shall be effectual in the performance of their functions.

With these objects in view the invention consists in the novel construction and combination and arrangement of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of a street-car frame and truck having applied to it one form of apparatus according to this invention. Fig. 2 is a sectional elevation on the line *a b* of Fig. 1. Figs. 3 and 4 are elevations as seen looking toward opposite sides of the car of that part of the apparatus which is carried by the car-axle. Fig. 5 is an elevation at right angles to Figs. 3 and 4 and looking in the direction of the arrow in Fig. 1. Fig. 6 shows a section through *c d*, Figs. 3 and 7. Fig. 7 shows a section through *e f*, Figs. 5 and 6. Fig. 8 shows a section through line *g h*, Figs. 5 and 6, but with the axes of the gear-wheels F F in a horizontal plane. Figs. 9 and 10 show the mechanism illustrated in Fig. 4, but with parts thereof in different positions. Fig. 11 is a section through the line *j k*, Fig. 6, with the pawls P P′ *p p′* removed.

The apparatus embodying this invention, when applied to a tram-car, consists of parts in relation to each other mounted on the car-axle and attached to the car-body as follows:

The shell of drum D, Figs. 1 to 8, is loosely mounted on the car-axle. Around this shell or drum D is loosely mounted the toothed ring R, with the clamp or gripper G′, which is adapted to clamp and hold the ring R, as may be desired. The arm of the gripper is jointed to the car by a link G^2, and is kept in place on the drum D by its sides extending into the drum, (see Fig. 6,) but freely, so that the drum may at any time be freely revolved within the toothed ring R and the clamp or gripper G′.

In the drum D, at one side thereof, there are internal teeth I, and at the other side of the drum on the pins T are mounted the pawls P P′ and *p p′*. The pawls *p p′* are adapted to engage with the toothed ring R by extending out through spaces D′ in the drum D. The pawls P P′ are adapted to engage with the toothed hub H, which is securely attached to the car-axle and extends within and bears against the drum D.

The toothed wheel A is securely attached to the car-axle against the drum D and in the same plane as the internal teeth I.

B is a disk, plate, frame, or part hereinafter called the "disk." It has a central part or boss and a lateral projection in the form of a short hollow cylinder B′, having around it an annular rib or projection B^2. The disk B is loosely mounted on the car-axle, and is held in position against the toothed wheel A by the hub O, which is securely attached to the car-axle. In the disk B are fitted one or more studs E, on each of which revolves a pinion F, which gears with the toothed wheel A and with the internal teeth I. Surrounding the part B′ of the disk B is the clamp or gripper G, adapted to clamp and hold the said part B′ of the disk, as may be desired. The arm of the clamp or gripper G is jointed to the car-body in a similar manner to the clamp or gripper G′, and is retained in proper position in relation to the disk B by fitting over the annular rib B^2.

The spring S is attached at one end to the car-body and at the other end to a cable or chain C, of suitable length, which is attached to the drum D in such a manner that it holds the spring somewhat in tension and keeps the drum normally in one position. Obviously, although I have shown a spring adapted to be kept normally in tension, any suitable equivalent might be employed—such, for example, as an arrangement of spring that would be normally in compression or would be compressed as the chain or cable was wound upon the drum.

I will now describe in detail the construc-

tion and operation of the clamps or grippers, the pawls, and other minor parts of the apparatus.

The clamp or gripper G, used to hold the disk B, is a split cast-iron ring with an arm. The two parts of this ring are hinged together by the adjustable eyebolt *i*, and are regulated with each other to clamp the parts B′ and hold the disk B by the levers J L and link K, Figs. 1, 2, 4, and 5. The lever J and link K turn freely on the pins *o* and *m*, respectively, the pin *m* passing through one part of the clamp or gripper and the pin *o* passing through the lever L, which turns freely upon the pin *n*, that passes through the other part of the clamp or gripper. The lever L is held in position by the spring *j*. The lever J fits over the link K, and they turn together on the pin. When these parts are drawn from the position shown in Fig. 4 to the position shown in Fig. 9, the two parts of the clamp or gripper are obviously drawn together and clamp the part B′ of the disk B. It is evident that when the lever L is drawn to the position shown by Fig. 10 the clamp or gripper will release the disk B. The lever J and link K are drawn to their position (shown in Fig. 9) by a cable or chain V, leading to a lever W, operated by the driver or person in charge of the car, and to the position in which they appear in Fig. 4 by the spring *z*. Those parts of the clamp or gripper G that come into frictional contact with the part B′ of disk B, so as to hold it, are kept free from it when the gripper is not in use by friction-shoes located in spaces in opposite sides of G and adapted by springs to bear lightly upon either the part B′ or B², or both, when the clamp or gripper is not in action to hold the disk and to conform to the movements of the clamp or gripper. These shoes are put into position so that they may be easily taken out and renewed.

The gripper G′ is generally constructed in the same manner as gripper G; but it may be without the friction-shoes and is without the lever L, for obvious reasons. To prevent shock, which might sometimes occur by the pawl suddenly engaging with the toothed hub H when the toothed ring E is released, it is advantageous to employ one or more friction-shoes carried by the gripper G′ and adapted to bear against the toothed ring R by a spring, so as to release this ring gradually. The gripper G′ is also operated by a cable or chain V, leading to the lever W.

It will be obvious that instead of a clamp or gripper G′ of the kind referred to a holding device—such as a tooth or projection carried by the car—may be arranged to enter between teeth on the exterior of the toothed ring and hold the same when necessary, suitable means operated by, say, one of the cables B, being provided to disengage the tooth or projection from the ring when desired. I prefer, however, to use a clamp or gripper of the kind herein described and shown, as it will admit of the ring being released gradually and without shock.

The pawls P P′ and *p p′*, Figs. 6 and 7, mounted on the pins T in the drum D, comprise two sets, which are exactly alike in construction and operation. The pawls P *p* constitute one set and are adapted to be used when the car is traveling in one direction, and the pawls P′ *p′* constitute another set, adapted to be used when the car is traveling in the other direction.

I will now describe the set of pawls P *p*. The parts constituting this set are, with the parts M and N for operating them, mounted on the pins T. (See Figs. 7 and 11.) The pawl P is operated with the part M by the pin *s*, which is driven into the side of the pawl P and extends into the part M through an oblong hole *s′*, which will allow of a certain amount of circumferential movement between P and M, which is restrained by the spring X, tending to operate them. The part M is held in the position shown with the pawl P free from the hub H by the spring *t* and has a projection M*, that extends through the drum D into the groove D², Fig. 6, into which the chain C winds. The pawl *p* operates with the part N by the pin *u*, which is driven into the pawl *p* and extends over N, limiting the motion between them in one direction, and they are restrained against motion in the other direction by the spring *y*. The part N is held in the position shown against the part M, with the pawl free from the toothed ring R, by the spring *w*. The parts M and N are so placed in relation to each other that the movement of M will cause the movement of N, they turning together on the pins T in opposite directions, so as to cause the pawls *p* P to engage with the toothed ring R and hub H, respectively, as shown by the position of the other set of pawls P′ *p′*, Fig. 7. When the parts M and N are pressed inward by the action of the chain C on the projection M*, the pawls can pass over the teeth of ring R and hub H (when the drum is winding up the chain) by the yielding of the springs *x* and *y*, but will be ready to engage with the ring and hub when the drum unwinds.

The second set of pawls are arranged and operated in a similar manner to the first set. Each pawl may be replaced by a set of multiple pawls — that is, pawls of different lengths—to insure quiet working.

In order that only the proper set of pawls shall be brought into operation when the drum revolves to wind up the spring, the chain is provided with a long link, so arranged as to miss the projection M* for operating the second set of pawls. Any convenient means can be used in lieu of the chain to bring the right set of pawls into position for use when the drum commences to wind up the spring.

The hubs H and O have cavities H′ and O′, respectively, to contain oil and waste for lubrication.

The functions of the apparatus when applied and arranged as hereinbefore explained with reference to and shown in the drawings are to extend the spring S and to act (while the spring is being so extended) as a brake to the car, to afterward hold the spring extended without acting as a brake to the car, and to apply the power of the spring in recoil to the car-axle for causing it to commence rotating or for assisting to turn the axle, as may be desired.

I will now describe the operation of the apparatus to accomplish these results. When the car is in motion and the apparatus is not in use, the toothed wheel A will, by its revolutions with the car-axle and intergearing with the pinions F and internal teeth I, idly rotate the disk B, the drum D, and consequently also the internal teeth I, being held by the spring S. The pawls being held free from the ring R and hub H by the springs *t t'* and *w w'*, (as shown by the position of the pawls P *p*,) the car will be free to move in either direction. When the apparatus is to be used, the driver or person in charge of the car operates the lever W and chains V, pulling in the levers J J' to the positions shown in Figs. 3 and 9, thereby clamping and holding the disk B and the toothed ring R. The toothed wheel A will now by its rotation with the car-axle and with the pinions F and internal teeth I cause the drum D to rotate in the opposite direction to that in which the car-axle is revolving, thereby winding the chain C in the groove D^2 of drum D, and consequently extending the spring S and storing energy therein. The chain C will, by acting against the projection M* of the part M', press in this part M' if the car be traveling in the direction shown by the arrows in Figs. 2 and 7, thereby putting the parts M' N', with the pawls P' *p'*, into the position shown in Fig. 7, when they will pass over the teeth of the hub H and ring R as the drum D is being rotated and be ready to engage therewith, as I will explain. When the spring S has been extended to the desired limit, a chain or cable S', of suitable length, connecting the moving end of spring S with the lever L, will pull out the lever L to the position shown in Fig. 10, thereby releasing the disk B, when it will idly rotate, as before, and the drum D will be held by the pawl *p'* engaging with the toothed ring R. The spring S will in this way be held extended ready to exert its power when desired in turning the car-axle through the medium of pawl P', which will engage with the hub H when the ring R is released, this release being effected by operating the lever W, that connects with the lever J'. The drum D and the pawls will in this way be caused to move in the reverse direction, and thereby start or assist the car to move in the direction in which it was previously moving, and will be returned to their original positions, and the apparatus will be ready for use again in whichever direction the car may be traveling. When the lever J is released by the driver or person in charge, which will generally be at the same time that the lever J' is released, the lever will be returned by the spring Z to its original position, (shown by Fig. 4,) and the levers J L will be in position to be used again to hold the disk B.

Any device may be used instead of the lever L, whereby the spring S may be caused to release the disk B independently of the driver of the car when the spring has been sufficiently extended.

I do not confine myself to any particular form of clamp or gripper to be used for holding the disk B and the toothed ring R. Any form of apparatus that will accomplish substantially the same results as I have just described may be used.

It is obvious that the apparatus may be constructed without the following parts, viz: the clamp or gripper G', the toothed ring R, and the pawls *p p'*, also without the lever L of clamp or gripper G. When the apparatus is thus modified, a chain attached to the spring S and to the car-body will limit the extension of the spring and the rotation of the drum D. The disk B will then be rotated within the clamp or gripper G against the retarding influence of friction until the car stops. This modified form of the apparatus would be much more simple, but is not so advantageous as a car-starter in all cases, because the recoil of the spring must be utilized when the brake is taken off the disk. This form would also cause much more wear of the toothed gearing and of the friction-shoes of the clamp or gripper G and would not be able to hold the spring S extended without acting as a brake to the car. As will be obvious, the apparatus hereinbefore described may be applied to a counter-shaft that is geared to the main axle to be rotated or assisted in rotating; also that the one driving-axle may be geared by an endless chain or belt to the other car axle or axles.

Although I have illustrated and described one construction of the apparatus, it will be readily understood that I necessarily reserve to myself the right of varying the forms, proportions, dimensions, and details of construction as may be found desirable in carrying the invention into practice, and that in like manner I may use any suitable materials in constructing the various parts.

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

1. In a combined car starter or propeller and brake, the combination of an axle, teeth fixed upon the axle, an energy-accumulator, a drum loose on the axle, a cord or its equivalent connecting the said drum with the energy-accumulator, pawls in the drum for driving the axle both ways, and mechanism for causing the drum to rotate in a contrary direction to the axle, the said pawls being so constructed and mounted in the drum that during the ro-

tation one or some of said pawls will be caused to assume such a position in relation to the teeth fixed on the axle that when the direction of rotation of the drum is reversed and the drum is then driven by energy previously accumulated the axle will be caused to rotate in the same direction as the drum, substantially as set forth.

2. In a combined car starter or propeller and brake, the combination of winding mechanism mounted loosely on an axle and adapted to store energy in a spring while the apparatus is in use as a brake, a clutch or holding device for retarding or locking the winding mechanism and for unlocking the same, a disk or equivalent loose on the said axle, a toothed wheel or toothed wheels carried by the same disk or equivalent and in gear with a toothed wheel fixed on the axle and also with the winding mechanism, and a clamp or gripper capable of retarding or of arresting and holding the said disk or equivalent, as set forth.

3. In a combined car starter or propeller and brake, the combination of a drum loosely mounted on an axle and having teeth, a clutch or holding device for retarding or locking the drum, a spring wherein energy can be stored, a flexible connector between the said drum and spring, means whereby rotary motion of the drum can be directly transmitted to the axle, a toothed wheel fixed upon the axle, a disk or equivalent loose upon the axle, pinions to turn upon pins carried by the disk, the said pinions being in gear with the teeth on the drum and with the above-mentioned toothed wheel, and a clamp or gripper for retarding and arresting and holding the said disk without rotating therewith, substantially as hereinbefore described, for the purposes indicated.

4. In a combined car starter or propeller and brake, a loose toothed ring and a clamp, gripper, or holding device adapted to retard or arrest and hold the said ring and to release it, as required, for the purposes indicated.

5. In a combined car starter or propeller and brake, the combination of a drum loosely mounted on an axle, a spring, a flexible connector between said drum and spring, mechanism whereby rotation of the axle in one direction can at will be caused to revolve the drum in the opposite direction and store energy in said spring, mechanism for causing rotation of the drum in the reverse direction to directly rotate the axle in the same direction as that in which it moved when storing energy in the spring, a toothed ring mounted to rotate about the axis of the axle and capable through intermediate mechanism of holding the drum when energy has been stored in said spring, a clamp, gripper, or holding device adapted to hold and to release the toothed ring, and means for operating said clamp, gripper, or holding device, substantially as set forth.

6. In a combined car starter or propeller and brake, the combination of a drum loosely mounted upon an axle and adapted when rotated to store energy in a spring, a disk loosely mounted on said axle, a toothed wheel carried by the said disk and in gear with a toothed wheel fixed on the axle and also with the winding mechanism, mechanism for directly transmitting motion from the drum to the shaft when the drum moves in the reverse direction to that in which it moves when storing energy in said spring, a clamp or gripper adapted to be thrown by the driver of the vehicle into action to grip or hold said disk, and means for automatically releasing the clamp or gripper and throwing the mechanism that rotates the drum from the axle out of action when the spring has been moved through a predetermined distance, as set forth.

7. In a combined car starter or propeller and brake, the combination, with the clamp or gripper for the disk carrying the pinion, of lever mechanism adapted to be operated by the driver of the vehicle to throw the clamp or gripper into action, a lever adapted to throw the said clamp or gripper out of action, and a chain or flexible connector attached to the latter lever and to the spring wherein energy is stored, said lever and chain or flexible connector being so arranged as to automatically throw the said clamp or gripper out of action and thereby release the frame or disk when the spring has been moved through a predetermined distance, substantially as hereinbefore described.

8. In a combined car starter or propeller and brake, the combination of a drum mounted loosely on an axle and adapted to store energy in a spring, mechanism for causing the drum to rotate, when required, in a contrary direction to the axle, a toothed hub fixed on the axle, a toothed ring, a clamp, gripper, or holding device adapted to arrest and hold said ring, two sets of pawls carried by said drum, one set being arranged for use when the axle rotates in one direction and the other set for use when the axle rotates in the opposite direction, one of the pawls of each set being capable, when operated, of engaging with the toothed hub and the other pawl of each set with the toothed ring, and means whereby the correct set of pawls is automatically brought into an operative position when the drum rotates to store energy in said spring, substantially as hereinbefore described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ELBERT B. PHILLIPS.

Witnesses:
A. B. CALHOUN,
FRED R. ROBINSON.