July 28, 1925.

1,547,517

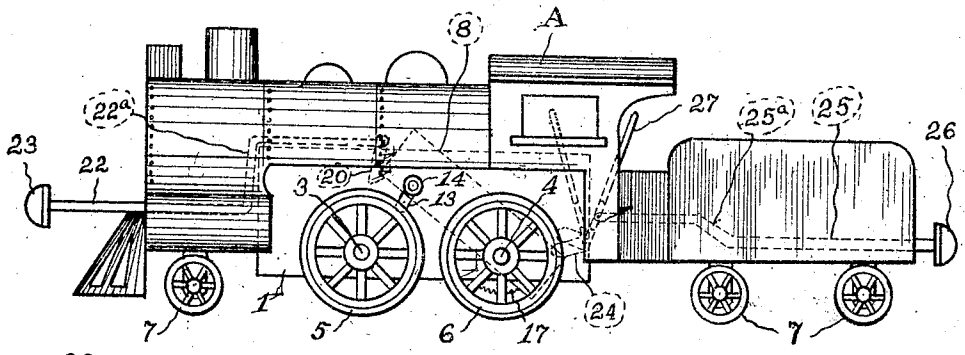
C. J. NEFF

REVERSIBLE TOY MECHANISM

Filed Feb. 6, 1923

4 Sheets-Sheet 1

Fig. 1.



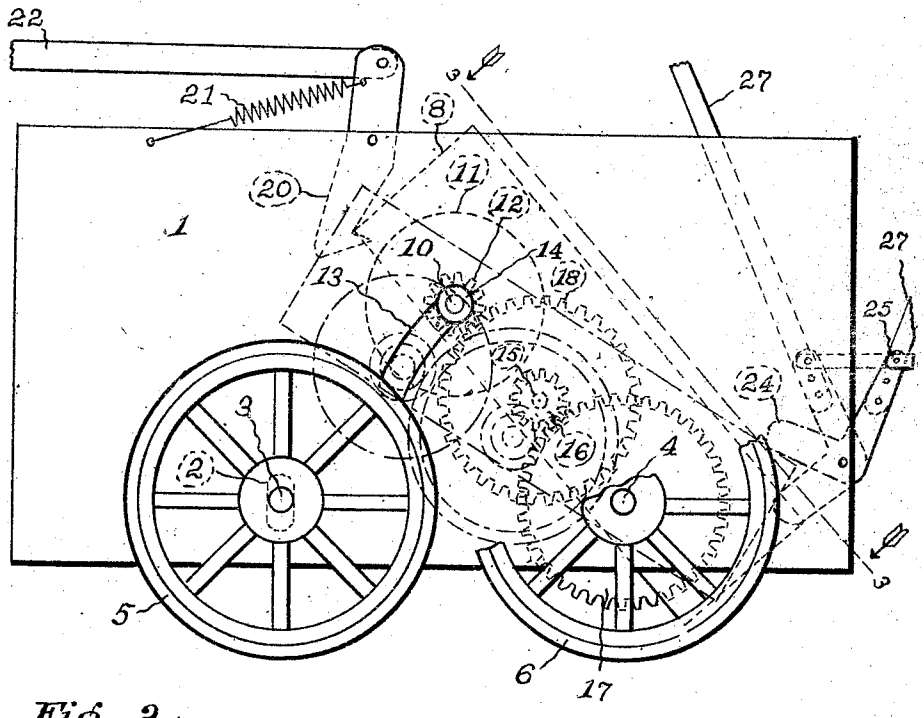


Fig. 2.

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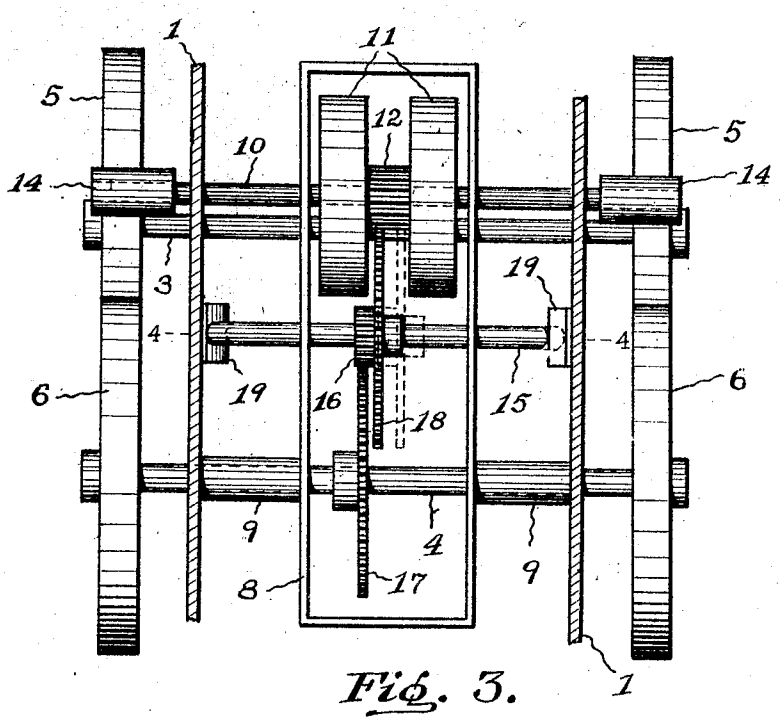


Fig. 3.

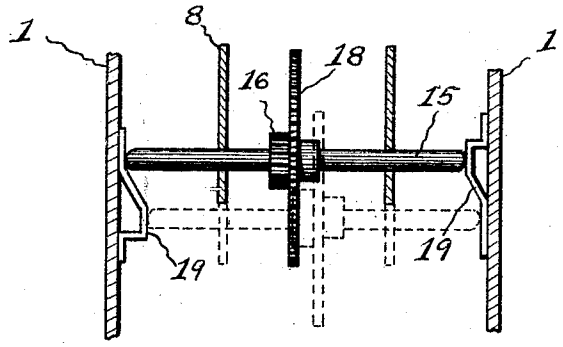


Fig. 4.

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REVERSIBLE TOY MECHANISM

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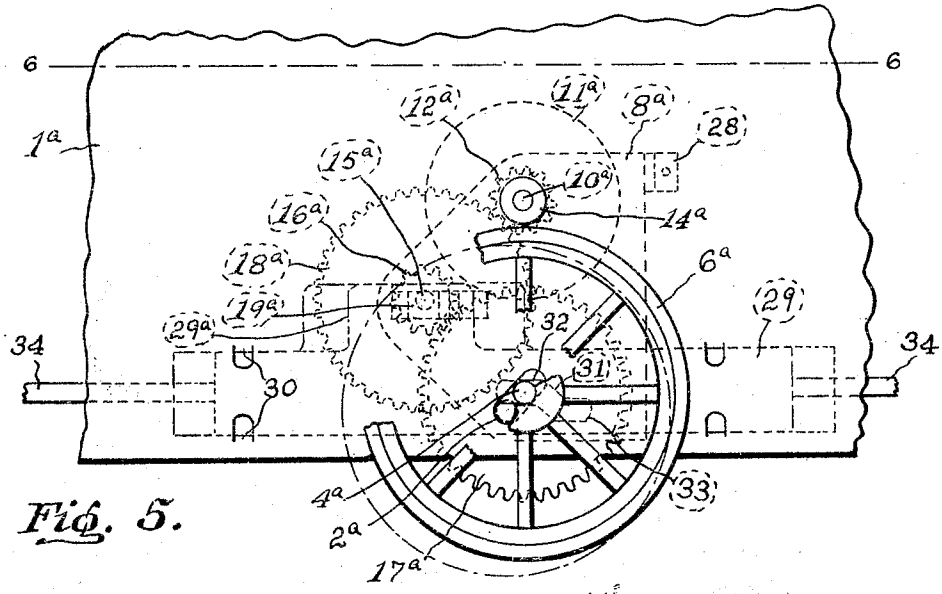


Fig. 5.

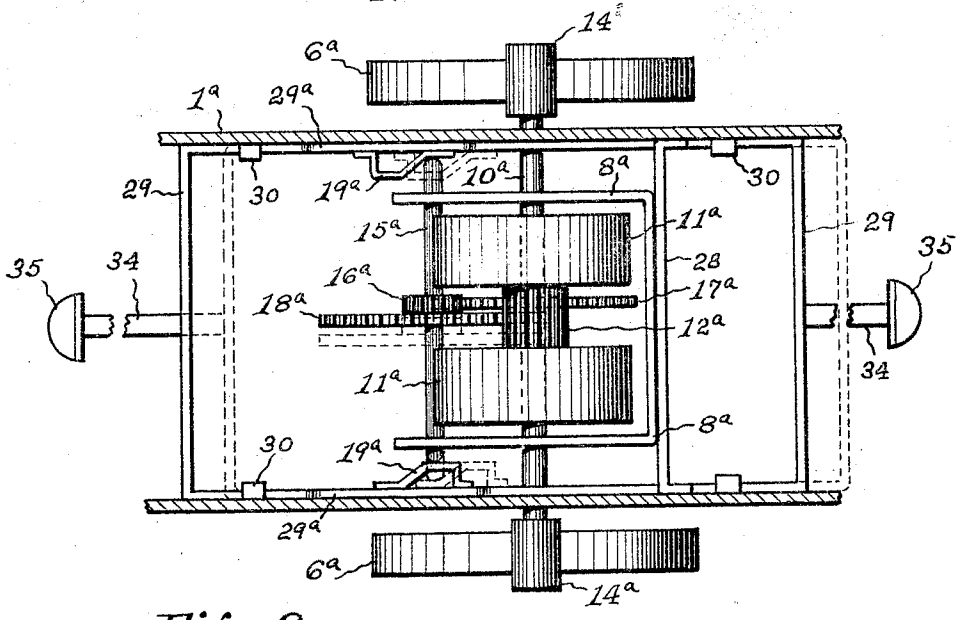


Fig. 6.

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REVERSIBLE TOY MECHANISM

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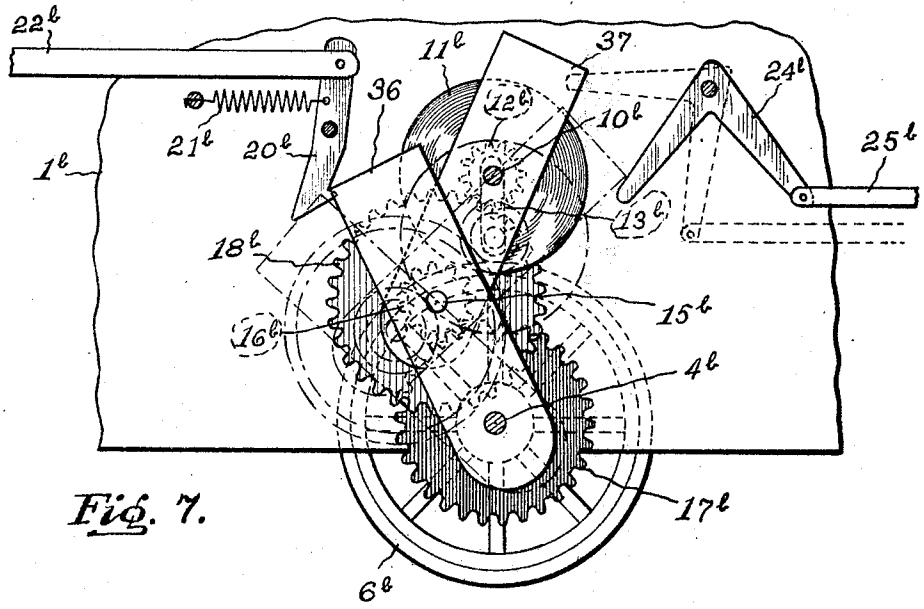


Fig. 7.

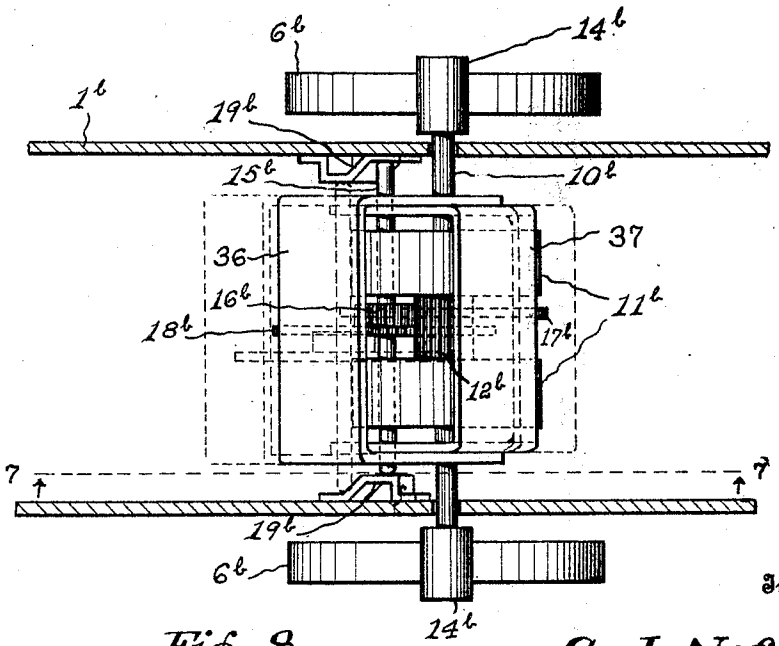


Fig. 8.

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Attorneys

Patented July 28, 1925. 1,547,517

UNITED STATES PATENT OFFICE.

CHARLES J. NEFF, OF SANDUSKY, OHIO.

REVERSIBLE MECHANISM.

Application filed February 6, 1923. Serial No. 617,202.

To all whom it may concern:

Be it known that I, CHARLES J. NEFF, a citizen of the United States, residing at Sandusky, in the county of Erie and State of Ohio, have invented certain new and useful Improvements in Reversible Toy Mechanisms, of which the following is a specification.

The present invention relates to certain new and useful improvements in motor propelled toys, and has for its object to provide a toy of this character which embodies novel features of construction, whereby it is reversible in the sense that it can be driven in either a forward or backward direction by the motor.

Further objects of the invention are to provide a reversible toy mechanism which comprises few and simple parts and can be inexpensively manufactured and assembled, which is dependable in its action and not liable to get out of repair, which enables the mechanism to be readily shifted for driving the toy in either direction, and which is adapted to be constructed in such a manner that the mechanism will be automatically shifted to reverse the direction of movement of the toy when the toy meets with an obstruction and is prevented from moving further in the direction in which it was originally moving.

For the purpose of illustrating the invention and making the construction and manner of operation thereof perfectly clear, a number of different embodiments of the invention are shown by the drawings and described in the specification, although it will be understood that the invention is susceptible of many other forms and embodiments, and that changes can obviously be made in the details of construction without departing from the spirit of the invention and within the scope of the claims.

For a full understanding of the invention reference is to be had to the following description and accompaning drawings, in which

Figure 1 is a side elevation of a toy locomotive which is constructed in accordance with the invention.

Figure 2 is an enlarged side elevation of the motor mechanism for the locomotive shown by Figure 1, a portion of the rear driving wheel being broken away, and the driving mechanism being shown by dotted lines in the position assumed when the toy is propelled in a forward direction, and by dot and dash lines in the position assumed when the toy is propelled in a backward direction.

Figure 3 is a sectional view on the line 3—3 of Figure 2, looking in the direction of the arrows, the gearing being shown in the position assumed when the toy is being driven in a forward direction, and the shifting gear being shown by dotted lines in the position assumed when the toy is driven in a backward direction.

Figure 4 is a detail sectional view taken substantially on the line 4—4 of Figure 3, showing the position of the cam members which engage the opposite ends of the intermediate slidable shaft and cooperate therewith to slide the shaft and shift the gears as the auxiliary frame is moved up and down.

Figure 5 is a side elevation of a portion of a toy which embodies a modified form of the invention, in which both the forward and backward drives are obtained through the same set of ground wheels, portions being broken away to illustrate more clearly the details of construction.

Figure 6 is a horizontal sectional view taken on the line 6—6 of Figure 5, and looking downward on the interior mechanism of the toy, the parts being shown in the position assumed when the toy is being driven in a forward direction, and the dotted line positions of certain of the parts showing the positions assumed thereby after they have been shifted to reverse the direction of movement of the toy.

Figure 7 is a longitudinal vertical sectional view through a toy, which embodies a further modification of the invention, said view being taken substantially on the line 7—7 of Figure 8, and the swinging auxiliary frames being shown by full lines in the position assumed when the toy is being driven in a forward direction, and by dot and dash lines in the position assumed when the toy is being driven in a backward direction.

Figure 8 is a top plan view of the con-

struction shown by Figure 7, the sides of the main toy frame being shown in section, and the swinging auxiliary frames being shown by full lines in the position assumed when the toy is driven in a forward direction, and by dotted lines in the position assumed when the toy is driven in a backward direction.

Corresponding and like parts are referred to in the following description and indicated on all of the views of the drawings by like reference characters.

In Figure 1 of the drawings the invention is shown as embodied in a toy locomotive, although it will be understood that the body portion of the toy may have any desired shape or configuration, and may be made in imitation of any form of vehicle, rolling stock or the like. A suitable energy storing mechanism is provided for driving the toy, and in the present instance an inertia wheel is utilized for this purpose, although it will be understood that other known and conventional forms of energy storing means can be substituted for the inertia wheel if desired, since the inertia wheel is in itself old, and no claim to novelty is based broadly thereon.

Referring to Figure 1 of the drawings, the reference character A designates the body portion of the toy locomotive, and this body portion can be made in any suitable manner, neither the exact construction nor design thereof being at all material to the present invention. The main frame 1 of the motor mechanism is shown as suitably fitted in the locomotive body and secured thereto, although it will be understood that the main frame of the toy may be an integral part of the toy body if so desired. The frame 1 includes a pair of spaced and parallel upright side plates which are provided with short slots 2 to receive a front axle 3, and suitable bearings for a rear axle 4. The front driving wheels 5 are mounted upon the ends of the axle 3, while the rear driving wheels 6 are rigidly applied to the extremities of the rear axle 4. Other wheels, such as the small wheels 7 may also be utilized for supporting the toy, if desired, although the wheels 7 are merely supporting wheels and the driving power of the motor is transmitted either to the front driving wheels 5 or the rear driving wheels 6.

Arranged between the side plates of the main frame 1 is an auxiliary frame 8 which is pivotally mounted upon the rear axle 4, being held in proper position in the central portion of the axle by means of spacing sleeves 9, which are fitted upon the axle and interposed between the said auxiliary frame and the opposite side plates 1 of the main frame. The auxiliary frame inclines upwardly and forwardly, and is provided at a point toward its swinging upper end with a shaft 10 upon which one or more inertia wheels 11 are mounted. In the present instance there are two inertia wheels 11 which are connected by an elongated pinion 12. The extremities of the inertia wheel shaft 10 project upon opposite sides of the auxiliary frame and extend through curved slots 13 in the side plates 1 of the main frame. The extremities of the inertia wheel shaft are provided with sleeves 14 which may be formed of some suitable material such as rubber, and which form friction pinions adapted to be moved into and out of engagement with the peripheries of the front driving wheels 5. The curved slots 13 are concentric with the rear axle 4, and when the auxiliary frame is swung downwardly, as indicated by dot and dash lines on Figure 2, the friction pinions 14 engage the peripheries of the front driving wheels 5, while when the auxiliary frame is swung upwardly the friction pinions are disengaged from the front drive wheels.

A sliding shaft 15 is journaled in the auxiliary frame 8 at a point intermediate the inertia wheel shaft 10 and the rear axle 4. Both the said sliding shaft 15 and the inertia wheel shaft 10 are parallel to the rear axle and the sliding shaft is provided with a pinion 16 which is adapted to mesh with a gear wheel 17 on the rear axle 4, and also with a gear wheel 18 which is at all times in mesh with the elongated pinion 12 between the two inertia wheels 11. This shaft 15 is longitudinally slidable, as indicated more clearly by Figures 3 and 4, and by sliding this shaft the pinion 16 thereon is adapted to be shifted into and out of engagement with the gear wheel 17 of the rear axle 4. This shaft is caused to move longitudinally within its bearings by means of opposed cam members 19 on the inner faces of the sides of the main frame 1 as the auxiliary frame 8 is swung up and down. These two cams 19 have an opposed and complemental relation and engage the opposite extremities of the sliding shaft 15. As indicated quite clearly by Figure 4, when the auxiliary frame 8 is swung upwardly and caused to assume a position corresponding to that shown by dotted lines on Figure 2, the two cams 19 cooperate with each other to slide the shaft 15 endwise in a left hand direction. In a corresponding manner, when the auxiliary frame 8 is swung downwardly and caused to assume a position corresponding to that indicated by dot and dash lines on Figure 2, the sliding shaft 15 is moved endwise in a right hand direction at the same time that it is lowered, this last mentioned position of the sliding shaft being indicated by dotted lines on Figure 4. It will be entirely obvious by reference to Figure 4 that this longitudinal or endwise movement of the sliding shaft is produced by the engagement of the rounded ends of

the said shaft with the oppositely inclined portions of the cams 19 as the auxiliary frame is swung up and down. When the auxiliary frame is raised the cams 19 act upon the sliding shaft 15 to move it in one direction and bring the pinion 16 thereof into engagement with the gear wheel 17 of the rear axle. When the auxiliary frame is swung downwardly to bring the friction pinions 14 into engagement with the front driving wheels 5, the sliding shaft 15 is moved in an endwise direction by the action of the cams 19 to disengage the pinion 16 from the gear wheel 17.

A suitable catch or detent 20 is pivotally mounted upon the main frame 1 and arranged to engage the swinging end of the auxiliary frame 8 for the purpose of holding the said auxiliary frame in a raised position. A spring 21, which may be of any suitable or approved construction is associated with the catch 20, and normally holds the catch yieldably in position for automatically engaging the auxiliary frame when it is raised and moved into the position indicated by dotted lines on Figure 1. A plunger 22 is connected to the catch 20 and extends through the forward end of the toy, terminating at its forward extremity in a bumper 23. The plunger 22 may be suitably offset at an intermediate portion, as indicated at 22^a, if this is found desirable, in order to make a suitable connection with the catch 20, and at the same time project from the front of the toy at the desired elevation.

A bell crank lever 24 is pivotally mounted upon the main frame 1 and suitably arranged so that one arm thereof will engage the lower end of the auxiliary frame 8. The other arm of the bell crank lever 24 is connected with a plunger 25 which extends rearwardly through the body of the toy and projects from the rear end thereof. This plunger terminates in a bumper 26 and, as in the previous instance, an intermediate portion of the plunger may be offset, as indicated at 25^a, if desired. With this construction it will be obvious that when the rear bumper 26 strikes an obstruction and the plunger 25 is forced inwardly the bell crank lever 24 will be swung in such a direction as to swing the auxiliary frame from the lower position indicated by dot and dash lines on Fig. 2 to the raised position indicated by dotted lines on Figure 2. As soon as the auxiliary frame reaches the raised or dotted line position, the catch 20 will automatically engage the frame to hold it in a raised position. The bell crank lever 24 is shown as having a lever member 27 applied thereto and projecting up into the cabin of the locomotive, thereby enabling the child to reverse the mechanism of the toy by manipulating this lever 27 if such is desired.

In order to store energy in the inertia wheels and initially start the toy in motion, the toy is held in a firm engagement with the floor and manually moved forwardly, the auxiliary frame 8 being first raised so that the inertia wheels 11 will be connected to the rear axle 4 by a train of gearing. This forward movement of the toy while held manually in a firm engagement with the floor can be repeated a number of times if desired, and the rotation of the rear driving wheels 6 caused thereby will be transmitted to the inertia wheels 11 and the latter caused to rotate at a high rate of speed. This is the customary manner of starting an inertia wheel propelled toy, and after the inertia wheels have thus been caused to rotate at the desired rate of speed the toy is released, whereupon the energy stored in the inertia wheels is transmitted through the train of gearing to the rear axle and rear drive wheels 6, with the result that the toy is propelled in a forward direction.

In the event the toy encounters an obstruction while thus moving in a forward direction, the front bumper 23 and plunger 22 will be forced rearwardly and the catch 20 disengaged from the auxiliary frame 8. The said auxiliary frame will then drop by gravity from the raised position, which is indicated by dotted lines on Figure 2, to the lowered position which is indicated by dot and dash lines on the same figure. This same movement of the auxiliary frame 8 brings the friction pinions 14 into engagement with the peripheries of the corresponding front driving wheels 5, and at the same time the sliding intermediate shaft 15 of the auxiliary frame is moved in an endwise direction to disengage the pinion 16 thereof from the driving gear 17 of the rear axle. The gear connection between the inertia wheels and the rear driving wheels is thus broken and a friction gear connection established between the inertia wheels and the front driving wheels 5, with the result that the toy is now propelled in a reverse or backward direction through the friction pinions and the front driving wheels 5. In the event the toy meets with an obstruction while moving in a backward direction the rear bumper 26 and plunger 25 will be forced inwardly and the bell crank lever 24 operated to swing the auxiliary frame 8 back into the raised position which it originally occupied. This lifts the friction pinions 14 out of engagement with the front driving wheels 5 and slides the shaft 15 endwise to again bring the pinion 16 into engagement with the driving gear wheel 17. The energy stored in the inertia wheels is thus again utilized to propel the toy in a forward direction, the auxiliary frame 8 being held in an elevated position by the catch 20. This same shifting of the auxiliary frame could, of course, be

produced manually by manipulating the lever 27. The toy can thus be propelled back and forth until the energy which was stored in the inertia wheels has been exhausted, and with the arrangement of the bumpers at the front and rear ends of the toy the reversal of movement will be automatic when an object is encountered by these bumpers in the movement of the toy.

A modification of the invention is illustrated by Figures 5 and 6, in which both the forward and backward drives are obtained through the same set of driving wheels, such an arrangement being particularly desirable for use in connection with toy wagons and other vehicles which do not ordinarily have two sets of wheels arranged with one set immediately in advance of the other set, as is necessary in the form of the invention previously described. In Figures 5 and 6 the spaced upright sides of the main frame are designated at 1^a, and this main frame may or may not constitute an integral portion of the body of the toy, as may be desired. The driving wheels 6^a are rigid with an axle 4^a which extends transversely through the main frame, being received within inclined slots 2^a therein.

An intermediate portion of the axle 4^a is provided with a driving gear 17^a which meshes with a pinion 16^a on an intermediate shaft 15^a which is slidably mounted within an auxiliary frame 8^a. A gear wheel 18^a on the sliding shaft 15^a meshes with an elongated pinion 12^a which is arranged between a pair of inertia wheels 11^a on an upper shaft 10^a which is arranged above the axle 4^a and journaled in the auxiliary frame. The ends of the shaft 10^a extend through the side plates of the main frame 1^a and terminate in friction pinions 14^a which are adapted to engage the driving wheels 6^a when the axle 4^a thereof is moved toward the upper ends of the slots 2^a. When the axle is moved toward the lower ends of the slots 2^a the driving wheels 6^a and friction pinion 14^a are separated so that a friction drive of the toy is impossible. The auxiliary frame 8^a is supported on the inertia wheel shaft 10^a and if desirable an additional brace member 28 may be utilized.

The intermediate shaft 15^a is, as in the previous instance, mounted to slide in an endwise direction within the auxiliary frame 8^a so that it can be moved to throw the pinion 16^a into and out of mesh with the driving gear 17^a of the axle. The ends of the sliding shaft 15^a are rounded and engage complemental and opposed cam members 19^a which are carried by opposite sides of a sliding frame 29. The two sides of this sliding frame 29 fit against the side plates of the main frame 1^a and engage suitable guide members such as the ears 30 for directing the frame in its back and forth movements. The sides of the sliding frame 29 are formed with inclined slots 31 which communicate at their upper ends with the upper horizontal slots 32 and at the lower ends with the lower horizontal slots 33. The inclined slot portions 31 serve to direct the axle 4^a from the upper horizontal slot 32 into the lower horizontal slot 33 and vice versa as the sliding frame 29 is moved back and forth. In this way the main driving wheels 6^a are moved up and down relative to the toy body and brought into and out of engagement with the friction pinions 14^a. When the axle 4^a is in the upper horizontal slots 32 of the sliding frame 29, the driving wheels 6^a have the position indicated by full lines on Figure 5, and the peripheries thereof are in a frictional engagement with the friction pinions 14^a, the axle having a sufficient amount of play in the slots so that substantially the entire weight of the toy will be transmitted to the driving wheels through the friction pinions. When the axle 4^a is in the lower horizontal slots 33 the driving wheels 6^a are lowered relative to the toy body and separated from the friction pinions 14^a.

The cams 19^a are carried by upwardly projecting arms 29^a on opposite sides of the sliding frame 29, and the inclined portions thereof have an opposed relation so that they will cooperate with each other to move the intermediate shaft 15^a back and forth within its bearings as the sliding frame 29 is moved back and forth. Plungers 34 project forwardly and rearwardly from the sliding frame 29 and may terminate at opposite ends of the toy in bumpers 35.

When starting the toy the sliding frame 29 is moved to bring the axle 4^a into the lower horizontal slots 33, whereupon the sliding movement of the shaft 15^a brings the pinions 16^a into mesh with the driving gear 17^a. The drive wheels 6^a and the sliding frame 29 then assume the positions indicated by dot and dash lines on Figure 5 and indicated by full lines on Figure 6. The toy can then be started as previously described in the manner that is common in connection with inertia wheel propelled toys. The toy will first be propelled in a forward direction the energy stored in the inertia wheels being transmitted thru the train of gearing to the axle. In the event an obstruction is encountered by the front bumper 35, the sliding frame 29 will be moved rearwardly, with the result that the axle 4^a will be shifted from the upper horizontal slots 32 of the sliding frame to the lower horizontal slots 33 thereof. At the same time the cams 19^a slide the shaft 15^a to disengage the pinion 16^a from the gear wheel 17^a, with the result that the driving connection through the gearing is broken and energy is transmitted to the driving wheels through the friction pinions 14^a which engage the peripheries there-

of. The friction drive, however, is in a reverse direction so that the toy is now propelled backwardly.

In the event the rear bumper 35 strikes an obstruction upon the backward movement of the toy the sliding frame 29 will be moved back to its original position, with the result that the friction drive will be broken and a gear connection again established between the inertia wheels and the axle. The toy can thus be propelled back and forth until all of the energy which was stored in the inertia wheels has been exhausted.

A still further modification of the invention is illustrated by Figures 7 and 8. In this construction the forward and backward drive are both obtained through the same set of driving wheels, although instead of the driving wheels themselves being movable up and down relative to the body of the toy, the inertia wheels and friction pinions are carried by an auxiliary frame which is movable up and down to shift the friction pinions out of and into engagement with the drive wheels. The upright side plates of the main frame are indicated at 1^b and this main frame may or may not be an integral part of the toy body, as desired. The driving wheels 6^b are applied to an axle 4^b which extends transversely through the main frame and is journaled in the side plates 1^b thereof. An intermediate portion of the axle 4^b is provided with a driving gear 17^b which meshes with a pinion 16^b on a sliding shaft 15^b. This sliding shaft is mounted in an inverted U-shaped auxiliary frame member 36 which is pivotally mounted on the axle 4^b so that it can swing upon the axle as a center, although the pinion 16^b will remain in mesh with the driving gear 17^b at all positions of the frame member.

An upper auxiliary frame member 37 is pivotally mounted upon the sliding shaft 15^b and journaled therein is a shaft 10^b upon which the inertia wheels 11^b are mounted. This inertia wheel shaft 10^b is arranged above the axle 4^b in a parallel relation thereto, and the ends of the inertia wheel shaft 10^b project through the sides 1^b of the main frame, being loosely received within vertical slots 13^b therein. Friction pinions 14^b are applied to the extremities of the inertia wheel shaft 10^b and are adapted to be raised and lowered so as to be moved out of and into engagement with the driving wheels 6^b, as may be desired. Arranged between the two inertia wheels 11^b is an elongated pinion 12^b which meshes with a gear wheel 18^b on the sliding shaft 15^b. This sliding shaft 15^b can be moved in an endwise direction to shift the pinion 16^b into and out of mesh with the driving gear 17^b, although the gear wheel 18^b of the sliding shaft remains at all times in mesh with the elongated pinion 12^b.

In Figure 7 the parts are shown by full lines in the position assumed when the auxiliary frames 36 and 37 are swung upwardly to move the friction pinions 14^b away from the driving wheels, and by dot and dash lines in the position assumed when the auxiliary frames are swung downwardly and the friction pinions caused to engage the driving wheels.

The ends of the sliding shaft 15^b are rounded and arranged to engage complemental and opposed cam members 19^b which are applied to the inner faces of the side plates of the main frame 1^b. The auxiliary frame member 36 has a swinging movement about the axle 4^b as a center, the two positions being indicated on Figure 7 by full lines, and dot and dash lines respectively, and on Figure 8 by full lines and dotted lines respectively. When the two auxiliary frame sections 36 and 37 are swung upwardly into the full line position indicated by Figure 7, the cam members 19^b slide the shaft 15^b to bring the pinion 16^b of the sliding shaft into mesh with the driving gear 17^b of the axle 4^b. Gear connection is thus established between the inertia wheels and the driving wheels, and the friction gear is moved out of engagement with the driving wheels. A catch 20^b is provided for engagement with the swinging end of the auxiliary frame 36 to hold the latter in a raised position. A spring 21^b normally tends to hold the said catch resiliently in operative position, and a forwardly extending plunger 22^b is connected to the catch. With the parts in this position the toy can be started in the manner previously described, and when released the toy will be propelled in a forward direction owing to the transmission of stored energy from the inertia wheels through the train of gearing to the axle 4^b. If the bumper at the forward end of the plunger 22^b encounters an obstruction the catch 20^b will be disengaged from the auxiliary frame member 36, whereupon the frame members 36 and 37 will drop by gravity from the full line positions indicated on Figure 7 to the dot and dash line position indicated on the said figure. The friction pinions 14^b are thereby brought into engagement with the driving wheels 6^b and the sliding shaft 15^b moved to disengage the pinion 16^b from the driving gear 17^b. The drive will thus be shifted from a gear drive to a friction drive and the direction of movement of the friction drive is the reverse of that of the gear drive, so that the toy will now be propelled in a backward direction.

A suitable bell crank lever 24 is provided for engagement with the swinging end of the upper auxiliary frame member 37 to swing the two auxiliary frame members upwardly and move them from the position

indicated by dot and dash lines on Figure 7 to the position indicated by full lines on said figure. This bell crank lever 24^b is connected to a rearwardly extending plunger 25^b, and if the bumper at the rear extremity of this plunger encounters an obstruction the bell crank lever 24^b will be operated to raise the auxiliary frame members 36 and 37, thereby again establishing a gear connection between the inertia wheels and the drive wheels and breaking the friction drive connection. The catch 20^b will automatically engage the frame member 26 to hold the frames in a raised position until such time as it may be again desired to reverse the direction of movement of the toy and cause it again to move in a backward direction.

It will be noted that in all of the forms of the invention there is a gear drive for propelling the toy in one direction and a friction drive for propelling the toy in the other direction. The same source of stored energy is used for both the gear drive and the friction drive. It is old in the art of toys to use either a gear drive or a friction drive separately to propel a toy, although I am not aware that prior to my invention there was ever any suggestion of constructing a toy in which a friction drive and gear drive could be used alternately for transmitting power from the same source of energy to the driving wheels of the toy. The mechanism for accomplishing this result is both inexpensive and sturdy, so that it can be manufactured at small cost and is not liable to get out of repair. The construction also has the advantage of enabling the direction of movement of the toy to be easily reversed, and this is a result which has been long sought after, but which has only been accomplished heretofore by complicated and expensive mechanisms which cost so much to manufacture that they were hardly practical for commercial purposes.

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

1. A toy of the character described, including energy storing means, propelling means, a train of gearing for transmitting energy from the energy storing means to the propelling means, means entirely independent of the said train of gearing and including a friction gear for transmitting energy from the energy storing means to the propelling means, and means for rendering the transmission means including the friction gear and train of gearing alternately operative.

2. A toy of the character described, including energy storing means, propelling means, a train of gearing for transmitting energy from the energy storing means to the propelling means to propel the toy in one direction, means independent of the said train of gearing including a friction gear for transmitting energy from the energy storing means to the propelling means to propel the toy in the opposite direction, and means for rendering the train of gearing and said independent transmission means including the friction gear alternately operative to move the toy back and forth in opposite directions.

3. A toy of the character described, including energy storing means, propelling means, a train of gearing for transmitting energy from the energy storing means to the propelling means to propel the toy in one direction, means independent of the said train of gearing including a friction gear for transmitting energy from the energy storing means to the propelling means to drive the toy in the opposite direction, bumpers, and means actuated by the bumpers for automatically rendering the train of gearing and the independent transmission means including the friction gear alternately operative so that the toy will move back and forth.

4. A toy of the character described, including energy storing means, supporting wheels, a toothed train of gearing between the energy storing means and a supporting wheel, a friction pinion connected to the energy storing means independently of the said train of gearing and adapted to be brought into and out of engagement with the periphery of a supporting wheel, and means for automatically rendering the train of gearing inoperative when the friction gear is caused to operatively engage a drive wheel.

5. A toy of the character described, including energy storing means, drive wheels, train of gearing for transmitting energy from the energy storing means to a drive wheel for propelling the toy in one direction, a friction pinion driven independently of the said train of gearing by the energy storing means and adapted to engage a drive wheel to propel the toy in the opposite direction, means for rendering the train of gearing inoperative when the friction gear engages a driving wheel, and means for bringing the train of gearing and friction gear alternately into operation to propel the toy in opposite directions.

6. A toy of the character described, including energy storing means, driving wheels, a train of gearing between the energy storing means and a driving wheel for propelling the toy in one direction, a friction pinion driven independently of the said train of gearing by the energy storing means and movable into and out of engagement with a driving wheel, said friction gear being adapted to engage the periphery of a driving wheel to propel the toy in the

opposite direction, means for automatically rendering the before mentioned train of gearing inoperative when the friction gear is moved into operative position, and an obstacle actuated means for alternately shifting the driving connection to reverse the direction of movement of the toy.

7. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable relative to the main frame, energy storing means on the auxiliary frame, a train of gearing between the energy storing means and a driving wheel for propelling the toy in one direction, a friction pinion driven independently of the said train of gearing by the energy storing means and carried by the auxiliary frame so that it can be moved into and out of engagement with the periphery of a driving wheel, said friction pinion being adapted to cooperate with the respective driving wheel to propel the toy in a reverse direction, and means for automatically rendering the before mentioned train of gearing inoperative when the friction pinion is moved into operative position.

8. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable relative to the main frame, energy storing means on the auxiliary frame, gearing between the energy storing means and one of the drive wheels for propelling the toy in one direction, a friction pinion carried by the auxiliary frame and movable therewith so as to be brought into and out of engagement with one of the driving wheels, said friction pinion being driven by the energy storing means in such a direction that it will cooperate with the driving wheel to propel the toy in a reverse direction, cam actuating means controlled by the movements of the auxiliary frame for automatically rendering the first mentioned gear connection inoperative when the friction pinion is in operative position and rendering the said gearing operative when the friction pinion is in inoperative position.

9. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable relative to the main frame, energy storing means on the auxiliary frame, gearing connecting the energy storing means and a drive wheel and including a gear member shiftable into and out of operative position, a friction pinion carried by the auxiliary frame and driven by the energy storing means, the friction pinion being movable into and out of engagement with a drive wheel by the movements of the auxiliary frame and serving when in operative position to propel the toy in a direction which is the reverse of that in which the toy is propelled by the before mentioned gearing, and cam actuating means controlled by the movements of the auxiliary frame for automatically moving the before mentioned shiftable gear member to render the gearing operative when the friction pinion is inoperative and to render the gearing inoperative when the friction pinion is operative.

10. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable relative to the main frame, a shaft on the auxiliary frame, an inertia wheel on the shaft, a friction pinion driven from the inertia wheel shaft, the movements of the auxiliary frame enabling the friction pinion to be moved into and out of engagement with a driving wheel, gearing connecting the inertia wheel shaft with a drive wheel independently of the friction pinion and including a gear member shiftable relative to the auxiliary frame, into and out of operative position, and means controlled by the movements of the frame for automatically shifting the said gear member relative thereto to render the gearing operative when the friction pinion is inoperative and to render the gearing inoperative when the friction pinion is operative.

11. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable relative to the main frame, a shaft journaled on the auxiliary frame, an inertia wheel on the shaft, a friction pinion applied to the shaft, the movements of the auxiliary frame enabling the friction pinion to be brought into and out of operative engagement with a drive wheel, gearing connecting the inertia wheel shaft with a drive wheel and including a shiftable gear member on a sliding shaft, and cam means for automatically sliding the said shaft when the auxiliary frame is moved, whereby the gearing is automatically rendered inoperative when the friction pinion is operative and vice versa.

12. A toy of the character described, including a main frame, driving wheels, axles for the driving wheels, an auxiliary frame pivotally mounted upon an axle, a shaft journaled on the auxiliary frame, and an inertia wheel on the shaft, gearing connecting the inertia wheel shaft to an axle and including a gear member slidable laterally into and out of operative position, a friction pinion driven from the inertia wheel shaft and adapted to engage a driving wheel, the swinging movements of the frame enabling the friction pinion to be moved into and out of operative position, and means actuated automatically by the swinging movement of the frame for moving the before mentioned slidable gear member to render the gearing inoperative when the friction pinion is operative and vice versa.

13. A toy of the character described, including a main frame, driving wheels, axles for the driving wheels, an auxiliary frame pivotally mounted upon an axle, a shaft

journaled upon the auxiliary frame, an inertia wheel on the shaft, gearing connecting the inertia wheel shaft to the axle on which the auxiliary frame is pivoted, said gearing including a shiftable gear member and a sliding shaft carrying the same, a friction pinion applied to the inertia wheel shaft and adapted to engage a driving wheel, the swinging movements of the auxiliary frame enabling the friction pinion to be moved into and out of operative position, and fixed cams engaging the ends of the sliding shaft for automatically moving the before mentioned shiftable gear as the auxiliary frame is swung upon the axle, whereby the gearing is rendered operative when the friction pinion is inoperative and vice versa.

14. A toy of the character described, including a main frame, two sets of driving wheels arranged one in advance of the other, an axle for one set of driving wheels, an auxiliary frame pivotally mounted upon the said axle, a shaft journaled upon the auxiliary frame, an inertia wheel on the shaft, gearing between the inertia wheel shaft and the axle, said gearing including a shiftable gear member, friction pinions applied to the inertia wheel shaft, the gearing serving to transmit energy from the inertia wheel to the driving wheels of the axle on which the auxiliary frame is mounted, while the friction pinions are adapted to be moved into engagement with the other set of driving wheels by a swinging movement of the auxiliary frame, and means actuated by the movement of the auxiliary frame for automatically moving the before mentioned shiftable gear member to render the gearing inoperative when the friction pinions are in operative position and vice versa.

15. A toy of the character described, including a main frame, driving wheels, an axle for the driving wheels, an auxiliary frame pivotally mounted upon the axle, a second auxiliary frame pivotally mounted upon the first auxiliary frame, a shaft journaled on the second auxiliary frame and projecting through the main frame, said main frame being slotted to receive the shaft, an inertia wheel on the shaft, friction pinions applied to the ends of the shaft and adapted to be moved into and out of engagement with the driving wheels, gearing connecting the inertia wheel shaft to the axle and including a gear member shiftable into and out of operative position, and means controlled by the movements of the auxiliary frames for automatically moving the shiftable gear element to render the gearing inoperative when the friction pinions engage the driving wheels and vice versa.

16. A toy of the character described, including a main frame, energy storing means, a drive wheel, a train of gearing connecting the energy storing means and the drive wheel and including a gear member shiftable into and out of operative position, a second and normally inoperative driving connection between the energy storing means and the drive wheel, cam means for moving the shiftable gear member and obstacle actuated means for automatically rendering the second driving connection operative and securely actuating the cam means to render the first mentioned gearing inoperative whereby the toy may be caused to move in opposite directions.

17. A toy of the character described, including a main frame, energy storing means, a drive wheel, one driving connection between the energy storing means and the drive wheel, a second driving connection between the energy storing means and the drive wheel, cam controlled means for breaking the first mentioned driving connection, and means controlling the second mentioned driving connection and operating in synchronism with the cam means to bring the two driving connections alternately into action.

18. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable up and down relative to the main frame and adapted to drop into its lowermost position by action of gravity, a shaft journaled upon the auxiliary frame, an inertia wheel upon the shaft, a friction gear applied to the shaft and movable into and out of engagement with the periphery of a drive wheel for propelling the toy in one direction, gearing connecting the inertia wheel shaft to a drive wheel to propel the toy in the opposite direction, means actuated by the movement of the auxiliary frame to automatically render the gearing operative or inoperative, the gearing being inoperative when the auxiliary frame is lowered to bring the friction pinion into engagement with a driving wheel and vice versa, obstacle actuated means for automatically raising the auxiliary frame, detent means for holding the auxiliary frame in a raised position, and obstacle means for releasing the detent.

19. A toy of the character described, including a main frame, driving wheels, an auxiliary frame movable relative to the main frame, energy storing means on the auxiliary frame, one driving connection between the energy storing means and the drive wheel, a second driving connection between the energy storing means and the drive wheel, and cam means actuated by the movements of the auxiliary frame for controlling one of the driving connections, the other driving connection being controlled directly by the movements of the auxiliary frame.

20. A toy of the character described, in-

cluding energy storing means, an axle, a drive wheel operatively connected to the axle, one driving connection between the energy storing means and the axle, a second driving connection between the energy storing means and the drive wheel itself, and means for rendering the two driving connections alternately operative.

21. A toy of the character described, including energy storing means, an axle, a drive wheel operatively connected to the axle, one driving connection between the energy storing means and the axle, a second driving connection between the energy storing means and the periphery of the drive wheel, and means for rendering the two driving connections alternately operative.

22. A toy of the character described, including energy storing means, an axle, a drive wheel operatively connected to the axle, a train of gearing connecting the energy storing means and the axle, and a second driving connection receiving power from the energy storing means and including a wheel adapted to frictionally engage the periphery of the drive wheel, and means for rendering the driving connections alternately operative.

23. A toy of the character described, including energy storing means, an axle, a drive wheel on the axle, a train of gearing between the energy storing means and the axle, said train of gearing including a gear member which is shiftable into and out of operative position, a friction pinion driven from the energy storing means and adapted to engage the periphery of the drive wheel, means for moving the friction pinion into and out of engagement with the periphery of the drive wheel, and means for automatically shifting the gear member of the before mentioned train of gearing to render the train of gearing inoperative when the friction gear is in engagement with the drive wheel.

24. A toy of the character described, including an axle, a drive wheel on the axle, an auxiliary frame movably mounted upon the axle, energy storing means mounted on the auxiliary frame, a driving connection between the energy storing means and the axle, an independent pinion driven from the energy storing means and adapted to engage the periphery of the drive wheel, means for moving the auxiliary frame to bring the pinion into and out of engagement with the periphery of the drive wheel, and means also actuated by the movements of the auxiliary frame for rendering the driving connection between the energy storing means and the axle inoperative when the pinion is in engagement with the periphery of the drive wheel.

In testimony whereof I affix my signature.

CHARLES J. NEFF.