Sept. 19, 1950 F. BRISTOL 2,522,925

TOY LOADING TRUCK

Filed Jan. 31, 1947 4 Sheets-Sheet 1

Fig. 9

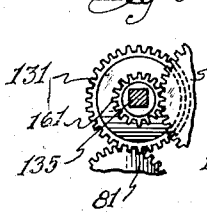


Fig. 11

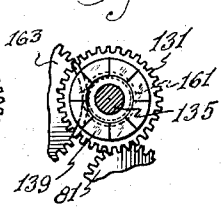


Fig. 10

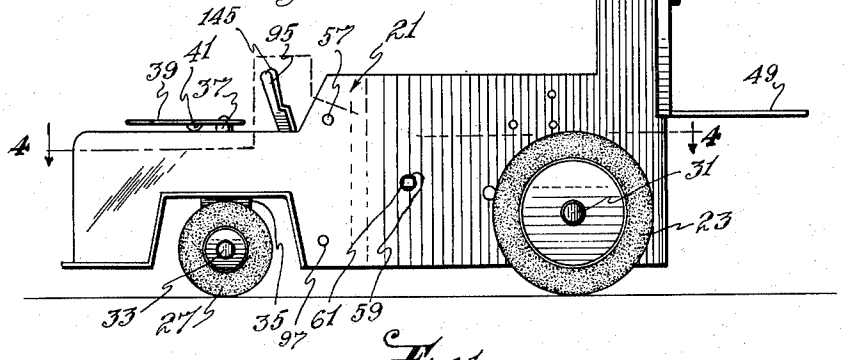


Fig. 1

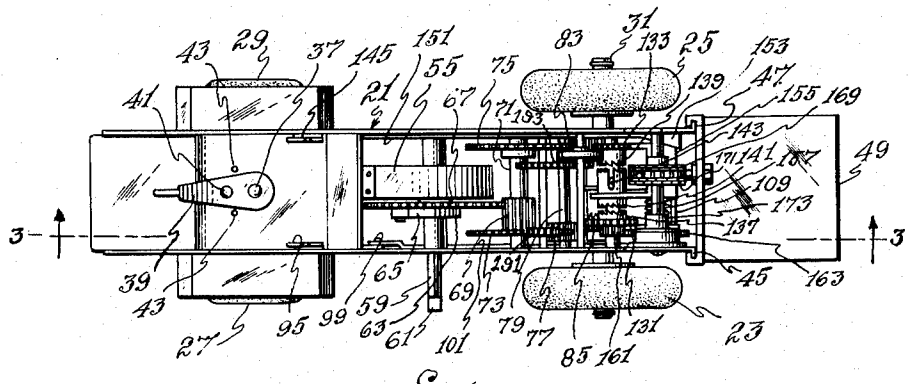


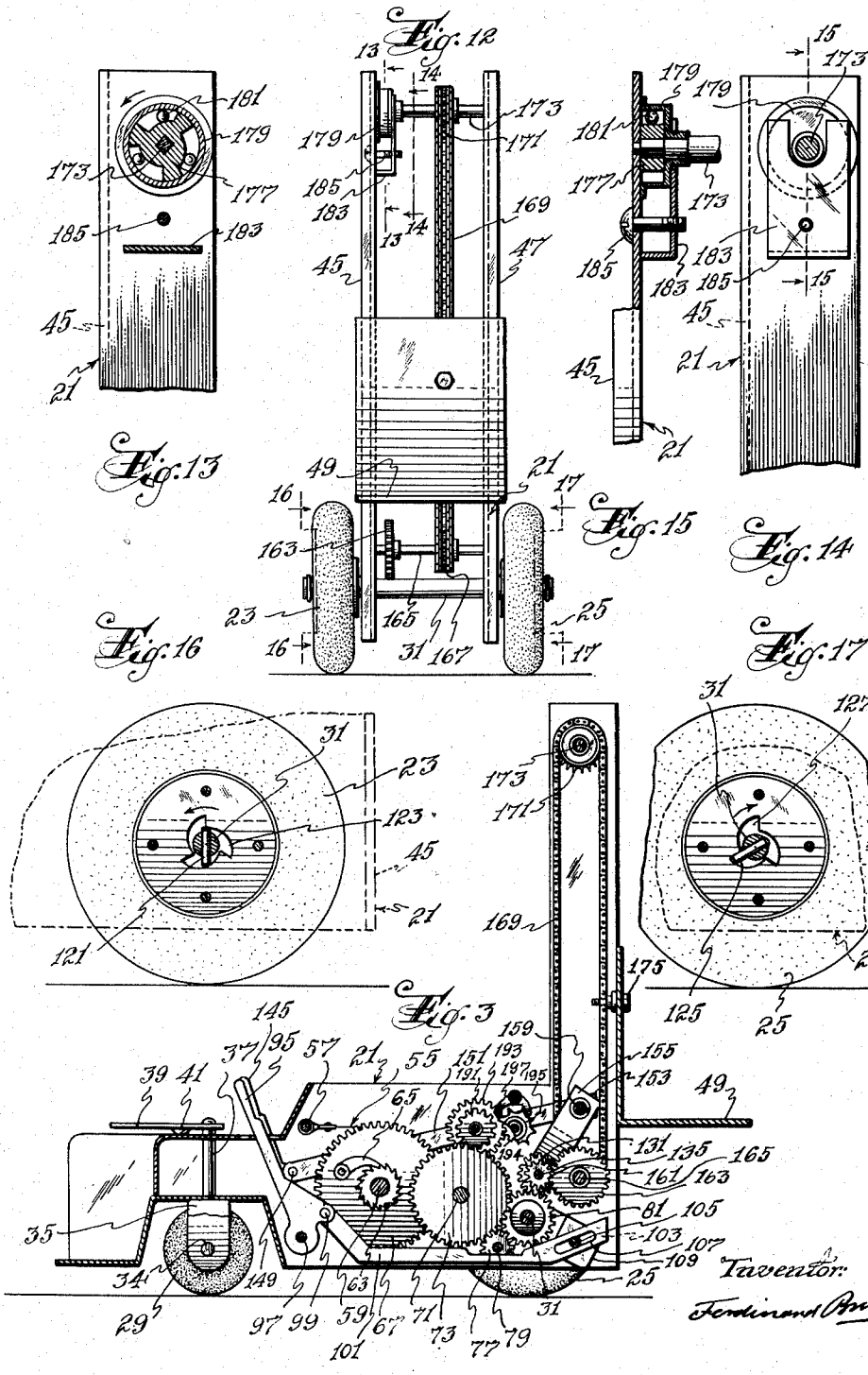
Fig. 2

Inventor:
Ferdinand Bristol

Sept. 19, 1950 F. BRISTOL 2,522,925

TOY LOADING TRUCK

Filed Jan. 31, 1947 4 Sheets-Sheet 2



Sept. 19, 1950 F. BRISTOL 2,522,925

TOY LOADING TRUCK

Filed Jan. 31, 1947 4 Sheets-Sheet 3

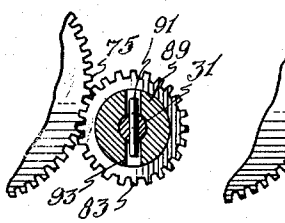


Fig. 5

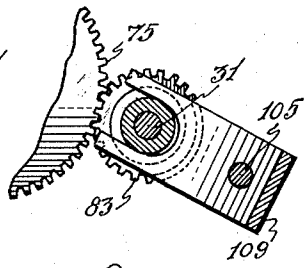


Fig. 6

Fig. 3a

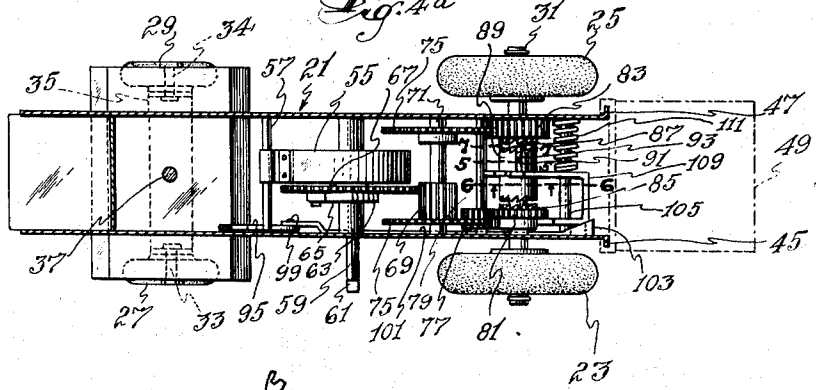


Fig. 4a

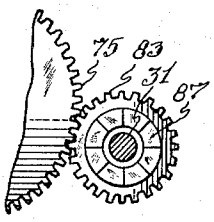


Fig. 7

Inventor:
Ferdinand Bristol

Sept. 19, 1950 F. BRISTOL 2,522,925

TOY LOADING TRUCK

Filed Jan. 31, 1947 4 Sheets-Sheet 4

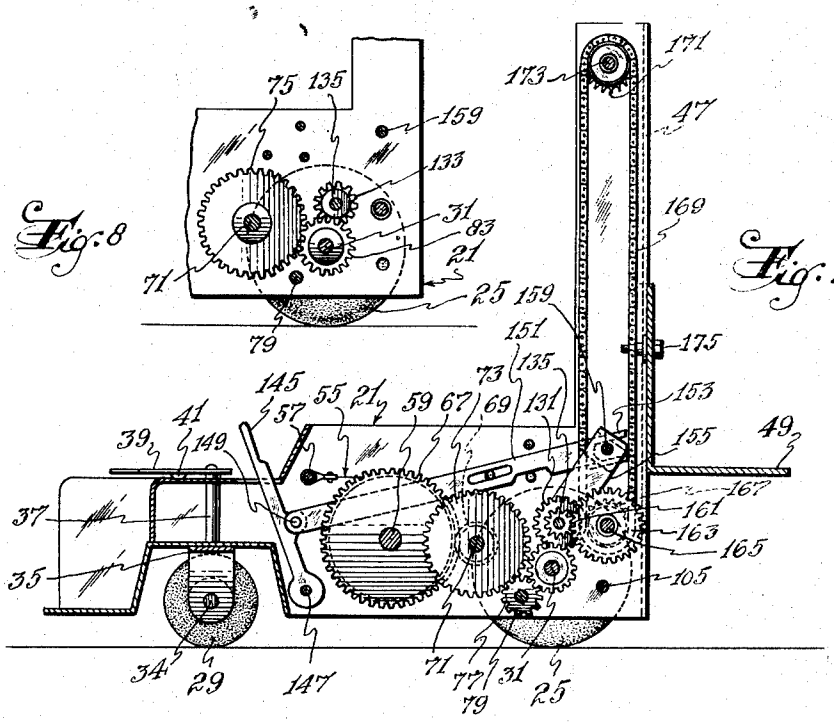


Fig. 3b

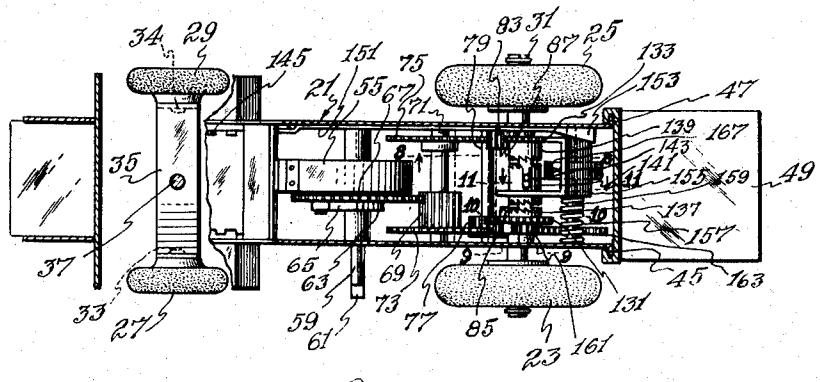


Fig. 4b

Inventor:
Ferdinand Bristol

Patented Sept. 19, 1950

2,522,925

UNITED STATES PATENT OFFICE

2,522,925

TOY LOADING TRUCK

Ferdinand Bristol, Montclair, N. J.

Application January 31, 1947, Serial No. 725,568

5 Claims. (Cl. 187—9)

1

This invention relates to self-propelled toy vehicles and it refers more particularly to a vehicle having mechanism for selectively actuating a member thereof not involved directly in the propulsion of the vehicle.

An important object of the invention is the provision of a self-propelled toy loading truck having a reversibly operable load-elevating platform and which simulates in appearance and manner of operation an industrial loading or lift truck.

Another object of the invention is the provision of a toy loading or lift truck having an elevating platform selectively and reversibly operable from the vehicle-propelling motive means.

Another object is the provision of a vehicle of the above character having adjustable means for retarding the descent of the elevating platform to compensate for the accelerating effect of a load thereon.

Another object is the provision of a toy vehicle of the above character having steering mechanism which can be set to cause the vehicle to travel a selected path, together with means for reversing the direction of travel at the will of the operator.

Further objects and advantages of the invention will be apparent upon consideration of the following detailed description, with reference to the accompanying drawings, in which:

Fig. 1 is a side elevation of a preferred embodiment of the toy vehicle of the invention;

Fig. 2 is a top plan view thereof;

Fig. 3 is a sectional elevation along the line 3—3 of Fig. 2;

Fig. 3 (*a*) is an incomplete sectional view along the line 3—3 of Fig. 2, showing particularly the elements of the wheel drive of the vehicle;

Fig. 3 (*b*) is an incomplete sectional view along the line 3—3 of Fig. 2, showing particularly the elements of the elevator drive;

Fig. 4 (*a*) is an incomplete sectional view along the line 4—4 of Fig. 1, showing particularly the elements of the wheel drive;

Fig. 4 (*b*) is an incomplete sectional view along the line 4—4 of Fig. 1, showing particularly the elements of the elevator drive;

Fig. 5 is a partial section along the line 5—5 of Fig. 4 (*a*);

Fig. 6 is a partial section along the line 6—6 of Fig. 4 (*a*);

Fig. 7 is a partial section along the line 7—7 of Fig. 4 (*a*), Figs. 5, 6 and 7 all looking in the direction indicated by the arrows at line 6—6;

2

Fig. 8 is a partial section along the line 8—8 of Fig. 4 (*b*);

Fig. 9 is a partial section along the line 9—9 of Fig. 4 (*b*);

Fig. 10 is a partial section along the line 10—10 of Fig. 4 (*b*);

Fig. 11 is a partial section along the line 11—11 of Fig. 4 (*b*), Figs. 9, 10 and 11 all looking in the direction indicated by the arrows at line 11—11;

Fig. 12 is a front end elevation of the vehicle;

Fig. 13 is a partial section along the line 13—13 of Fig. 12;

Fig. 14 is a partial section along the line 14—14 of Fig. 12;

Fig. 15 is a partial section along the line 15—15 of Fig. 14;

Fig. 16 is a partial section along the line 16—16 of Fig. 12; and

Fig. 17 is a partial section along the line 17—17 of Fig. 12.

The industrial "lift truck," as is well known, comprises vehicular means principally for receiving a load at one level at a first location, transporting the load to a second location and discharging it at a different level, the several functions being under the control of an operator. In the toy which forms the subject matter of the present invention similar means are provided in miniature, adapted to transport and to elevate and lower miniature loads for educational and amusement purposes. The vehicle has a simulated operator's position in which the toy figure of a man may be placed and a plurality of levers convenient thereto which control the travel of the vehicle and the operation of the elevating platform upon which the load is placed. In addition to simulating in miniature and in a novel manner certain features of an industrial lift truck, the toy truck of the invention comprises other novel elements and combinations of elements, to be described hereinafter.

In the drawings there is shown a toy vehicle having a frame 21, which may for economy of manufacture be composed of sheet metal stampings, supported by four wheels 23, 25, 27, and 29, of which the front and driven wheels 23, 25 are carried on an axle 31 rotatably mounted on frame 21, and the rear wheels 27, 29 are rotatable about stub axles 33 and 34, respectively, mounted on a bracket 35 which swivels about a vertical axis for steering purposes. This last feature is provided for by a king-pin 37, journalled on frame 21, at the upper end of which is attached a tiller or steering lever 39. A suitably formed projection 41 from tiller 39 cooperates with holes or indenta-

tions in frame 21, such as holes 43, to serve as a detent allowing lever 39 to remain in a set position, whereby the vehicle may be conditioned to travel in a straight or curved path, as desired.

Suitably formed portions 45, 47 of frame 21 constitute a pair of spaced vertical guides along which a horizontally extending platform 49 is reversibly operable by means to be described, the platform having suitably formed vertical portions 51, 53 cooperative with guides 45 and 47, respectively. Platform 49 overhangs frame 21 at the front end of the vehicle and is adapted to receive a load, such as a miniature representation of a heavy industrial object. As will be described, control means are provided selectively to raise or lower the platform and load or cause immobility thereof, as is done in the case of industrial lift trucks, to receive and discharge a load at different levels.

For driving the vehicle and for raising and lowering platform 49 spring power means are conveniently provided although it will be apparent that other means, such as electric motor means, may be used. Said spring means comprises a coiled flat spring 55 anchored at one end to the frame by a pin 57 fast in the frame and attached at the other end to a shaft 59 journalled on frame 21. Shaft 59 which may be squared or otherwise formed at one end 61 thereof to receive a winding key (not shown) fixedly mounts a ratchet 63 cooperative with a pawl 65 carried by a gear 67 freely rotatable about a shaft 59. Gear 67 meshes with a pinion 69 carried by a shaft 71 journalled on the frame. Shaft 71, adjacent opposite ends thereof, carries a pair of gears 73, 75 rotatable therewith. Gear 73 meshes with a pinion 77 on an idler shaft 79, pinion 77 also meshing with a gear 81 freely rotatable about front wheel axle 31. Gear 75 meshes directly with a second gear 83 freely rotatable about axle 31, without the intermediary of an idler gear.

Integral with gear 81 and formed on the hub thereof is a toothed clutch member 85 and similarly integral with gear 83 is a toothed clutch member 87, both of said clutch members being thereby rotatable with their respective gears about axle 31. Mounted on axle 31 between members 85 and 87 is a double-ended toothed clutch member 89. Clutch member 89 and axle 31 are constrained to rotate together, for example as by a pin 91 fast in the axle and extending into a slot 93 in member 89, this connection allowing a limited displacement of member 89 along the axle, for its selective engagement with one or the other of members 85, 87. Other known arrangements for accomplishing this purpose may be employed, such as splining. It is to be noted that the engaging teeth of clutch members 85, 89 are formed to transmit motion in one direction while the engaging teeth of members 87, 89 are formed to transmit motion in the opposite direction.

Displacement of clutch member 89 along axle 31 for engagement with its mating clutch member is accomplished by movement of a lever 95 at the rear portion of the vehicle, corresponding to or simulating an operator's position, which thereby controls the direction in which the vehicle travels, as will be explained. Lever 95 is pivoted to the frame at 97 and has pivotally connected to it at 99 a shift bar 101 formed at the end opposite said pivot into a cam 103. A rod 105 passing through a slot 107 in bar 101 serves as a guide for the bar.

Cam 103 has as its follower a shifter fork 109 arranged for guided displacement along rod 105 and pressed against the cam by a spring 111. An extension of fork 109 is attached to or operatively connected with clutch member 89 so that displacement of fork 109 along rod 105 produces a corresponding displacement of member 89 along axle 31.

The operation of the wheel drive described above will now be explained. Assuming that spring 55 has been wound up, in unwinding it tends to rotate shaft 59 in a counter-clockwise direction, as viewed, for example in Fig. 3 (*a*). To cause the vehicle to travel in a forward direction lever 95 is pushed forward to a suitable position, which may be determined by a detent or stop, to push shifter bar 101 forward together with cam 103 carried thereby and thus cause spring 111 to move shifter fork 109 toward the right (as viewed from the rear) and carry clutch member 89 into engagement with clutch member 85. The connections by which power can then be transmitted from spring 55 to axle 31 may be traced as follows, chiefly by reference to Figs. 3 (*a*) and 4 (*a*) which are simplified views principally showing the wheel drive:

From spring 55 to shaft 59, ratchet 61, pawl 65, gear 67, pinion 69, shaft 71, gear 73, idler pinion 77, gear 81, clutch 85, 89 to axle 31. It will be found by tracing the relationships of the several parts just mentioned that under the stated conditions and when a driving connection exists between axle 31 and one of wheels 23, 25, through means to be described, the energy stored in spring 55 can be utilized to turn said wheel in a direction causing the vehicle to be propelled forward.

To cause the vehicle to travel backward lever 95 is moved to the rear to a suitable position, which may be determined by a detent or stop, thereby pulling bar 101 backward together with cam 103 and moving shifter fork 109 to the left. This brings about the engagement of clutch members 89 and 87 against the opposition of spring 111. The connections by which power can then be transmitted from spring 55 to axle 31 may be traced as follows: From spring 55 to shaft 59, ratchet 61, pawl 65, gear 67, pinion 69, shaft 71, gear 75, gear 83, clutch members 87, 89 to axle 31. With the unwinding of spring 55 tending to rotate shaft 59 in a clockwise direction, viewed from the left, it will be found that when either or both of wheels 23, 25 is driven by axle 31, the vehicle will be propelled backward.

It is desirable that the energy of spring 55 be released at a controlled rate, which is provided for by escapement governor means to be described hereinafter.

Since the vehicle is steerable and may traverse a curved path it is also desirable, and a feature of the invention, to provide for free-wheeling or overtravel of wheels 23, 25 to permit the wheels to rotate at different rates. A simple and economically manufactured arrangement for this type of operation is illustrated more particularly in Figs. 16 and 17, which show the relation between axle 31 and the hubs of wheels 23 and 25, respectively. In Fig. 16 a pin 121 is shown adapted to fit loosely in a transverse hole in axle 31. In the hub of wheel 23 there is an opening of tri-foliate form within which pin 121 operates, the relationship of pin and opening being such that axle 31 rotates freely, relative to the wheel, in the direction indicated by the arrow but positively drives the wheel when rotating in the opposite direction.

Fig. 17 shows the corresponding arrangement of wheel 25, wherein pin 125, loosely fitting in a transverse hole in axle 31, operates in tri-foliate hub opening 127 in a manner such that wheel 25 is positively driven from axle 31 only when the axle turns in the direction indicated by the arrow. It is to be noted that the oppositely directed arrows of Figs. 19 and 20 indicate one and the same direction of rotation of axle 31, the two views looking at opposite ends of the axle. Under the illustrated condition wheel 25 is positively driven from axle 31 while wheel 23 is free to rotate relative to the axle at a speed appropriate to the path of the vehicle. The indicated direction of rotation of axle 31 corresponds to forward propulsion of the vehicle while the reverse direction of rotation causes wheel 23 to be driven positively and the vehicle propelled backward, wheel 25 then being free to rotate relative to the axle.

The means for applying power for raising and lowering platform 49 will now be described. These means are best seen in Figs. 3 (*b*) and 4 (*b*) which also show certain means common with the wheel drive but for simplicity of illustration omit other means individual thereto. Since the means and manner by and in which power from spring 55 is caused to rotate gears 81 and 83 in opposite directions about axle 31 have already been described and since these means form a part of and operate in the same manner in the elevator drive, the description of this drive will start with the gears therein meshing with gears 81 and 83, respectively. These are gears 131 and 133, respectively, freely rotatable about shaft 135 and driven in opposite directions thereabout by gears 81 and 83. Shaft 135 is itself journalled on frame 21. The hubs of gears 131 and 133 have teeth cut to form clutch members 137 and 139, respectively, adapted to be selectively engaged by double-ended clutch member 141. Member 141 is carried by and has a limited displacement along shaft 135, while constrained to rotate therewith, for the engagement of the member with clutch members 137, 139. To this end there is provided a pin 143 fast in shaft 135 extending into a slot in clutch member 141. It is to be noted that the engaging clutch teeth of members 141, 137 are cut to transmit rotation positively in one direction while the engaging teeth of the pair of members 141, 139 are cut to transmit rotation in the opposite direction.

For operating the elevator clutch there is provided a control lever 145, at the rear of the vehicle in the simulated operator's position, pivoted to the frame at 147 and to which in turn is pivoted at 149 a shifter bar 151 formed at the end thereof remote from its pivot into a cam 153 against which shifter fork 155 is pressed as a follower by spring 157, fork 155 being guided for displacement along cross rod 159. An extension of fork 155 engages clutch member 141 to operate said member along shaft 135. Shaft 135 fixedly mounts at one end a gear 161 meshing with gear 163 on shaft 165 journalled on frame 21. Fixedly mounted on the central portion of shaft 165 is a sprocket 167 connected by chain 169 with sprocket 171 fixed on shaft 173 journalled on the frame adjacent the upper portions of guides 45, 47. A driving connection between chain 169 and platform 49 is furnished by a bolt 175 extending into a link of the chain.

To retard the descent of platform 49 and compensate for the accelerating tendency of a load carried thereby, friction brake means are provided which operate only upon rotation of shaft 173 in the direction corresponding to descent of the platform. These means comprise a one-way friction clutch or uni-directional coupling of well-known construction formed by an inner clutch member 177 fast on shaft 173, a housing 179 surrounding member 177 and rotatable about shaft 173, and a plurality of balls, such as ball 181, operating in cam or wedge shaped chambers bounded by members 177, 179, said chambers being so designed that through the wedging of the balls between member 177 and housing 179 the housing is carried around with member 177 when shaft 173 rotates in the direction of the arrow, corresponding to descent of platform 49, but member 177 rotates freely without driving the housing when platform 49 is ascending. A bent friction plate 183 having one end thereof secured to the frame bears at the other end against the outer surface of housing 179 and the friction between members 183 and 179 is adjustable by a screw 185.

For controlling the operation of platform 49 lever 145 has three operating positions, a forward, a neutral and a reverse position, corresponding, respectively, to upward motion of the platform, immobility thereof, and downward motion thereof. The positions of the lever may be defined by stops, detents, or combinations thereof (not specifically illustrated) or the forward and reverse positions may be determined by the engagement of the clutch members on shaft 135, with the neutral position intermediate therebetween but not otherwise defined. To cause platform 49 to travel upwardly lever 145 is moved to its forward position thereby pushing bar 151 forward and, through the action of cam 153, permitting spring 157 to displace shifter fork 155 to the left (viewed from the rear) and carry clutch member 141 into engagement with clutch member 139. Power from spring 55 may then be transmitted from spring 55 to shaft 165 as follows: From spring 55 to shaft 59, ratchet 63, pawl 65, gear 67, pinion 69, shaft 71, gear 75, gear 83, gear 133, clutch members 139, 141, shaft 135, gear 161, gear 163, to shaft 165. By tracing the relative directions of rotation of the above-named members it will be found that as shaft 59 rotates in a counter-clockwise direction with the unwinding of spring 55, shaft 165 is also rotated in a counter-clockwise direction, both as seen in Fig. 4 (*b*). Such rotation of shaft 165 moves the forward portion of chain 169, and with it platform 49, upwardly.

It will readily be apparent that an intermediate or neutral position of lever 145 which disengages clutch member 141 from both clutch members 137 and 139 prevents motion from being transmitted from shaft 135 to shaft 165 and there is then no displacement of the platform in either direction. Any tendency of the platform to move downwardly under the influence of the weight of a load thereon may be counteracted by suitable adjustment of the one-way friction device acting on shaft 173, that is by adjustment of the friction between housing 179 and plate 183 by means of screw 185.

To cause platform 49 to be driven downwardly, in opposition to the friction just referred to, lever 145 is moved to the rear to its reverse position, thereby pulling bar 151 backward and, through the action of cam 153, displacing shifter fork 155 to the right and carrying clutch member 141 into engagement with clutch member 137. Power may then be transmitted from spring 55 to shaft 165 as follows: From spring 55 to shaft 59, ratchet 63, pawl 65, gear 67, pinion 69, shaft 71, gear 73, idler pinion 77, gear 81, gear 131,

clutch members 137, 141, shaft 135, gear 161, gear 163, to shaft 165. Due to the interposition of an additional idler pinion in the gear train, shaft 165 will now be rotated in a clockwise direction, and the forward portion of chain 169, and with it platform 49, will move downwardly.

For the regulation of the power supplied from spring 55 both to wheels 23, 25 to propel the vehicle and to shaft 165 to operate platform 49 there is provided an escapement type of governor, as has been mentioned. The escapement mechanism, best seen in Figs. 2 and 3, comprises a gear 191, meshing with gear 73, on the shaft of which is carried a second gear 193 meshing with a pinion 194 carried on a shaft mounting escapement wheel 195 with which cooperate the pallet-shaped ends of pawl 197, having an oscillatory motion about the axis of shaft 199. The period of oscillation of pawl 197 and hence the speed of operation of the spring motor is governed by the weight and moment of inertia of the pawl.

Levers 95, 39 and 145 with their associated detents or stops provide means, respectively, for setting the travel and direction of travel of the vehicle, the curvature of its course and the movement or lack of movement of the load-carrying platform along its guide, including the direction thereof. Thus, there are numerous movements which can be pre-set and which will automatically be carried out by the mechanism hereinbefore described when restraints are removed. For example, the vehicle may travel in a circle of pre-determined radius while the load-carrying platform is either raised or lowered. In other cases the vehicle and platform movements may occur at different times.

I claim:

1. In a toy lift truck the combination of a wheel mounted frame including a vertical guide, one of said wheels being swivelled for steering the vehicle, a load-carrying platform mounted on said frame for displacement along said guide, a motor mounted on said frame, a pair of sprockets rotatably mounted on said frame respectively adjacent the top and bottom of said guide, an endless chain engaging said sprockets, a driving connection between said chain and platform, a pair of friction members in sliding engagement one with the other, a uni-directional coupling for transmitting rotary motion from one of said sprockets to one of said members, said other member being stationary on said frame, means for adjusting the friction between said members, reversible gear means connecting said motor and one of said sprockets for driving said chain including a three position clutch controlling the operation and direction of operation thereof, a first lever and detent for setting the position of said clutch, reversible gear means connecting said motor and one of the vehicle wheels for driving the vehicle including a three position clutch controlling the operation and direction of operation thereof, a second lever and detent for setting the position of said last named clutch, a third lever and detent, and connecting means between said third lever and said swivelled wheel for controlling the steering of the vehicle.

2. In a toy lift truck having a wheel mounted frame including a vertical guide the combination of a load supporting platform mounted for displacement along said guide, spring motor means mounted on said frame and means connecting said motor and platform for selectively operating said platform along said guide in opposite directions including a three position clutch and control means therefor having an upwardly operating, a downwardly operating and a neutral position, an escapement for regulating the application of the power of said motor during displacement of said platform in both directions, and friction means operable to oppose descent, only, of the platform.

3. In a self-propelled toy lift truck having a wheel mounted frame including a vertical guide the combination of spring motor means mounted on said frame, connecting means for reversibly operating at least one of said wheels from said motor, a load supporting platform mounted for displacement along said guide, connecting means for reversibly operating said platform from said motor and escapement means common to said two connecting means for regulating the power supplied from said motor to said wheel and platform, said second connecting means including an adjustable friction device and a one-way clutch operable to cause said friction device to oppose descent, only, of said platform.

4. In a self-propelled toy lift truck adapted selectively to raise or lower a load while progressing in a forward or reverse direction the combination of a wheel mounted frame including a vertical guide, spring motor means mounted on said frame, connecting means for reversibly operating at least one of said wheels from said motor including clutch means positionable to control the operation and direction of progression of the vehicle, a load supporting platform mounted for displacement along said guide, connecting means for reversibly operating said platform from said motor including clutch means positionable to control the operation and direction of displacement thereof and an escapement common to said two connecting means for regulating the power supplied by said motor.

5. In a self-propelled toy lift truck adapted selectively to raise or lower a load while progressing in a forward or reverse direction the combination of a wheel mounted frame including a vertical guide, spring motor means mounted on said frame, connecting means for reversibly operating at least one of said wheels from said motor including clutch means positionable to control the operation and direction of progression of the vehicle, a load supporting platform mounted for displacement along said guide, connecting means for reversibly operating said platform from said motor including clutch means positionable to control the operation and direction of displacement thereof, and means for controlling the speed of operation of the vehicle and platform including an escapement common to said two connecting means and a friction device individual to said second connecting means operable to oppose descent, only, of said platform.

FERDINAND BRISTOL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,504,415	Barrett et al.	Aug. 12, 1924
1,707,428	Burrows	Apr. 2, 1929
1,763,542	Schoenberg et al.	June 10, 1930
1,991,576	Remde	Feb. 19, 1935
2,427,132	Godbey	Sept. 9, 1947