H. H. TUNIS.

ELASTIC OVERHEAD TRUCK FOR RAILWAYS.

APPLICATION FILED SEPT. 19, 1908.

962,179.

Patented June 21, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

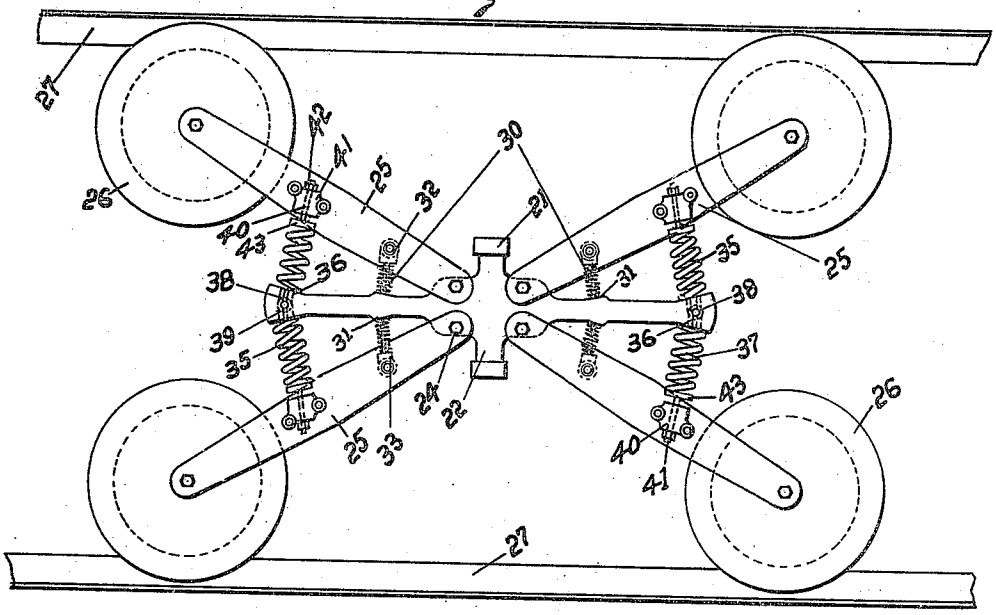
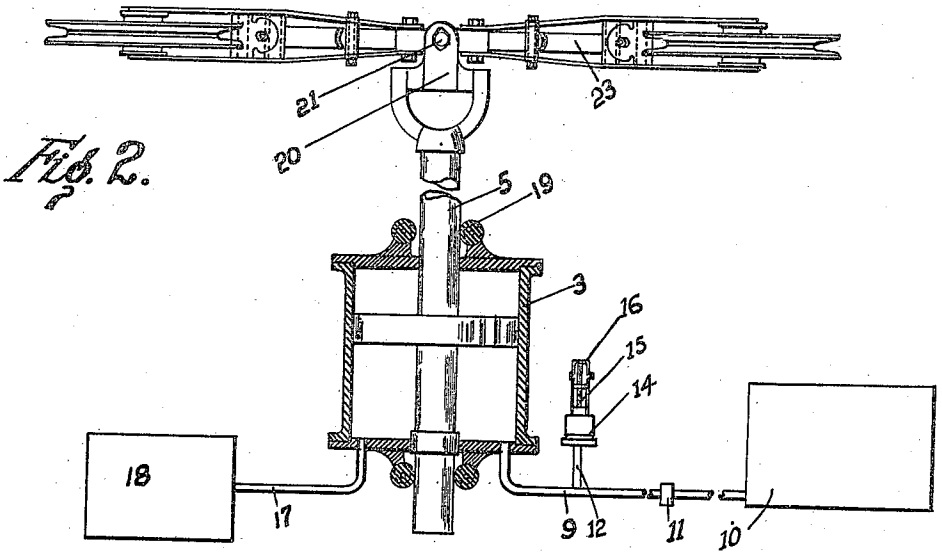


Fig. 2.



WITNESSES:

Wm Runge.

S. R. Wainken

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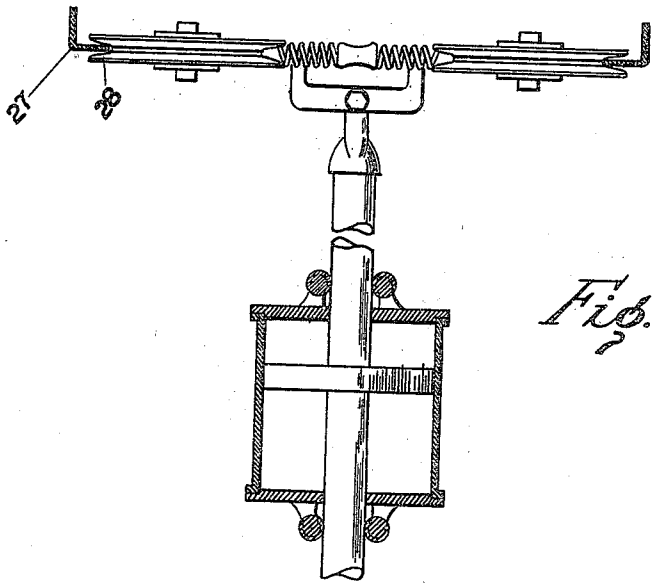

Fig. 3.

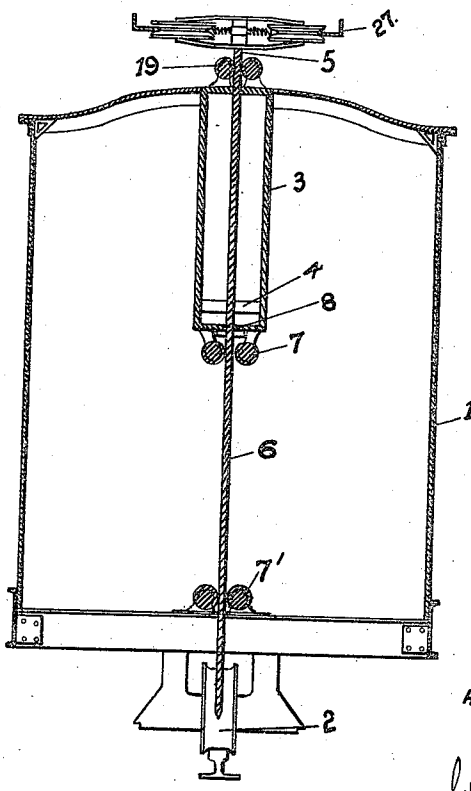

Fig. 4.

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UNITED STATES PATENT OFFICE.

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ELASTIC OVERHEAD TRUCK FOR RAILWAYS.

962,179. Specification of Letters Patent. Patented June 21, 1910.

Application filed September 19, 1908. Serial No. 453,860.

To all whom it may concern:

Be it known that I, HOWARD H. TUNIS, citizen of the United States of America, residing in the county of Baltimore, State of Maryland, have invented certain new and useful Improvements in Elastic Overhead Trucks for Railways, of which the following is a specification.

This invention relates to monorail transportation and more particularly to that type of monorail system in which the cars run on a single track and the center of gravity of each car is maintained normally over the track and returned to that position by means of an overhead rail or guide engaged by a follower on the car.

The improvements which are the subject of this invention relate to the means for supporting the follower, or followers, on the cars and maintaining the followers in engagement with the rail as the cars move and sway and the height of the balance rail above any particular car varies.

The device by means of which the variations of the vertical distance between the balance rail and any particular car are taken up consists of a cylinder and its piston, any suitable means for supplying fluid under pressure to the cylinder, and an escape for the fluid leading from the pressure side of the cylinder. The followers which engage the balance rail are shown as grooved rollers, the grooves coöperating with the edges of the rails. The rollers are mounted on a body, the body and rollers forming a truck connected to the piston. In the device illustrated, the piston rod carries the truck.

The means for controlling the follower is an important feature of my invention. Each follower is mounted on a carrier which moves relatively to the truck body independently of every other carrier. The carriers are held each with its follower in contact with the rail, by means of a yielding member shown as a spring, and a second yielding member of greater resistance than the first is placed in the path of the carrier or some member attached thereto. The second resilient member normally engages either the truck or the carrier, not both. When a follower is moved from normal beyond a predetermined extent, the second tension member comes into action; *i. e.*, is brought into engagement with both the carrier and the truck body and its resistance opposed to the tendency of the car to tip and displace the follower. As the displacement of the follower increases, the resistance offered by the spring also increases. Thus, it is apparent that when the car tips beyond a certain point, an added resistance is offered to its further deflection and this force increases until the deflection of the car is arrested, and then tends to return the car to a vertical position.

Referring to the accompanying drawings,—Figure 1 is a top plan view of a balanced truck showing the coöperating balance rails fragmentarily. Fig. 2 is a side elevation of the balancing device detached from the car. Fig. 3 is a front elevation of the same, showing the balance rails in section. Fig. 4 is a cross section of a car showing the device in operative position.

The car 1 is provided with a number of wheels 2 placed in the longitudinal vertical plane of the center of gravity of the car when in its normal position. Rigidly mounted on the car with its axis upright and at a point near the center of the car is a cylinder 3 having a piston 4 and piston rod 5 extending upward from the piston through the anti-friction bearings 19. A guide rod 6 alined with the piston rod extends downward therefrom through suitable anti-friction bearings 7 secured to the lower wall of the cylinder, and when down enters another pair of guide rollers 7′ on the floor of the car. The guide rod 6 is suitably packed at 8 where it passes through the cylinder wall. A pipe 9 leads from the cylinder to a tank 10 which is to be supplied with air, or other fluid, under pressure. Between the tank 10, or other container, and the cylinder is a pressure regulating or reducing valve 11 of any well known type. At 12, a branch pipe leads from the supply pipe 9 to a relief valve 14 having a spring 15. The tension of the spring is regulated by turning a suitable screw 16 so that the spring will yield and allow the valve to open at a predetermined pressure. An auxiliary passage 17 leads from the lower wall of the cylinder to an auxiliary air tank 18 which is in constant communication with the cylinder. This auxiliary tank serves to increase the volume of air upon which the piston 4 is cushioned, thereby giving greater resiliency to such cushion. The upper extremity of the piston rod 5 is provided with

a universal joint 20, the upper pivot of which, 21, is secured to the body 22 of the balance truck 23. Mounted on the body 22 of the truck and pivoted at 24 at their inner extremities to swing in a horizontal plane are carriers 25, each in the form of an arm having at its outer extremity a roller 26 journaled to rotate in a horizontal plane. These rollers will be hereinafter termed "followers." Parallel balance rails 27 with their acting surfaces inwardly disposed are mounted on suitable supports and coöperate with the followers and truck to balance the car. Each rail is in the form of an angle iron, as shown in Fig. 3, and the rollers are each grooved to receive the horizontal web 28 of the corresponding rail. Thus, when a truck is once mounted on the rails, the grooves of the wheels engage the webs and vertical motion of the truck is prevented. The carriers are held in position, each with its follower engaging the corresponding rail by means of primary resilient members, or springs, 30 seated at 31 on the truck body and engaging a pivotally mounted seat 32 on the arm. Lugs 33 on the seats 31 and 32 prevent displacement of the springs. These springs are of relatively low tension and are always in operation to maintain the followers in engagement with the rails. Between each carrier 25 and the truck body is a secondary resilient member or spring 35 of much greater tension than the spring 30 and adapted to interpose its resistance between the carrier and the truck body only when the carrier is displaced and swung toward the truck body a predetermined distance. The springs 35 engage seats 36 on the truck body and are retained in position by means of rods 37, each of which is pivotally mounted at its extremity 38 within a seat 36. The latter is slotted at 39 to permit the desired motion of the rods. At its opposite extremity, each rod passes through a suitable slot 40 in an abutment 41, one of which is secured to each carrier arm 25. A nut 42 serves to prevent the escape of the end of the rod when the truck is dismounted. Each of the secondary resilient members or springs 35 is placed upon one of these rods between a carrier and the truck body, and is held slightly compressed and out of contact with the carrier seat or abutment 41 by means of a nut 43 which is normally spaced a slight distance from the abutment.

In the operation of the device, the rails 27 are suitably mounted to resist the balancing stress of the cars. The truck is attached to the car as described by means of a vertically yielding support and the wheels 26 are brought into engagement with the flanges 28 of the rails. In this position, the springs 30 are slightly flexed, whereby the follower wheels 26 are maintained in contact with the balance guides. Air under pressure is supplied to the pipe 9 and this pressure is regulated and reduced by the valve 11. It will be noted that the truck is held to the balance rails by engagement of its grooved rollers with the horizontal webs 28. As the vertical distance between the balance guide and the top of the car is reduced for any reason, as the passing of a track under a bridge, the truck is depressed and with it, the piston 4. During this operation, air is compressed in the cylinder 3 and in the auxiliary tank 18; the increased pressure due to the latter increases the resiliency of the action of the piston. To prevent too great pressure upon the underside of the guide rail and the balance follower, or other injury to the device, a relief valve 14 is provided. This is set to the desired maximum pressure and when this pressure is reached, part of the air is allowed to escape through the valve. By this means, the resistance offered to the tendency to depress the truck, due to variations in level of the balance guide rails 27, is regulated and prevented from rising above a predetermined amount. As the car tips and sways slightly, the springs 30 expand and contract and maintain the followers in contact with the balance guide rails.

When the truck is depressed by any means, it must be again raised to its working position; this is accomplished by the air pressure in the tanks 10 and 18. The truck is at all times supported upon the air and its weight counterbalanced thereby. In this connection, it should be noted that each follower is mounted to move independently from every other relatively to the truck body, so that an irregularity in the track encountered by one roller has no influence whatever upon any other roller. By this arrangement, a large amount of vibration and oscillation is eliminated. When the car tips through the predetermined angle, the abutment 43 comes in contact with the seat 41, the spring 35 is placed under tension, and its resistance interposed between the truck body and the carrier arms. In this way, the total resistance offered to the further tipping of the car is increased by an amount equal to the initial tension of the springs 35 on one side of the truck, and as the angle of inclination increases, this resistance increases rapidly, whereby the deflection of the car from vertical is gradually checked and restrained, and if the car is going at sufficient speed, the reaction of the springs will return it to upright position.

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

1. In a monorail system, in combination, for balancing a car, a guide, a follower mounted on the car to move relatively thereto, and a plurality of yielding members of

different tension interposed between the car and the follower.

2. In a monorail system, in combination, for balancing a car, a guide, a follower mounted on the car to move relatively thereto, and a plurality of yielding members of different resistances interposed between the car and the follower, the member of least resistance normally operating to maintain the follower in contact with the guide, the member of greater resistance operating when the follower is moved to a predetermined position relatively to the car.

3. In a monorail system, in combination, for balancing a car, an overhead balance rail, a follower mounted on the car to move relatively thereto, and a plurality of yielding members of different resistances interposed between the car and the follower, the member of least resistance normally operating to maintain the follower in contact with the guide and to resist minor lateral tendencies of the car, the member of greater resistance operating when the follower has moved to a predetermined position relatively to the car to resist major lateral tendencies of the car.

4. In combination, a track, a car thereon, an overhead rail, a follower coöperating with the overhead rail and mounted on the car to move relatively thereto, a plurality of members of different resistances interposed between the car and the follower, the member of least resistance normally bearing on the car and follower, the member of greater resistance normally free of one of said members and brought into tension when the other is flexed to a predetermined degree.

5. In combination, a track, a car thereon, an overhead rail, a follower coöperating with the overhead rail and mounted on the car to move relatively thereto, a plurality of members of different resistances interposed between the car and the follower, the member of least resistance normally bearing on the car and the follower, the member of greater resistance normally resting against one of said members, and means for maintaining it normally free of the other of said members.

6. In combination, a track, a car thereon, an overhead rail, a follower coöperating with the overhead rail and mounted on the car to move relatively thereto, a plurality of yielding members of different resistances interposed between the car and the follower, the member of least resistance normally under tension, the member of greater resistance normally relaxed, and means whereby the greater resistance is placed in tension when the other resistance is flexed to a predetermined degree.

7. In a monorail system, a balance truck, a follower mounted thereon to move relatively thereto, and a plurality of yielding members of different resistances between the truck and the follower.

8. In a monorail system, a balance truck, a balance rail, followers for the rail, a separate arm for each follower, each arm being pivoted at the inner extremity of the truck to swing independently of every other arm.

9. In a monorail system, a balance rail and a balance truck, the latter consisting of a body and four independent arms and followers on the arms, each arm radiating from the truck body and pivoted at its inner extremity to swing relatively to the body, and means acting on the arms and tending to maintain the followers in contact with the rail.

10. In a monorail system, a balance truck, four separate carrier arms pivotally mounted thereon, each to swing in a substantially horizontal direction, the pivots engaging the inner extremities of the carrier arms, and follower members mounted on the carrier arms.

11. In a monorail system, a balance truck, a balance guide, a plurality of followers, an independent carrier for each follower, each carrier mounted on the truck to move independently of the other carriers relatively to the truck, and means for maintaining each follower in contact with the guide.

12. In a monorail system, a balance truck, a balance rail, carriers mounted on the truck each to move independently of every other relatively to the truck, a follower on each carrier, and yielding means engaging the truck and each carrier to maintain each follower in contact with the rail.

13. In a monorail system, a balance truck, a balance rail, a carrier mounted on the truck to move independently relatively thereto, a follower on each carrier, and a plurality of yielding members of different tension between each carrier and the truck.

14. In a monorail system, a balance truck, a balance rail, a carrier mounted on the truck to move independently relatively thereto, a follower on each carrier, and a plurality of yielding members of different tension between each carrier and the truck, one normally engaging both the truck and the carrier to maintain the follower in engagement with the rail, and the other normally in contact with but one and brought into action to engage both the truck and the carrier only when a predetermined displacement of a carrier takes place.

15. In a monorail system, a balance truck, a balance rail, carriers mounted on the truck to move independently relatively to the truck, a follower on each carrier, a plurality of yielding members of different tension between each carrier and the truck, means for supporting each yielding member of less tension in engagement with both the truck and the carrier and to maintain the

corresponding follower in engagement with the rail, and means for supporting each yielding member of greater tension partly compressed and normally engaging one member only of the relatively movable couple composed of the truck and carrier, so that when the carrier is displaced by a predetermined amount, it is brought into action, engaging both the truck and the carrier.

16. In a monorail system, a balance truck having a body and a follower, the follower mounted on the body to move in a lateral plane relatively thereto, and a plurality of yielding members of different resistances between the body and the follower.

Signed by me at Baltimore, Maryland, this 14th day of September 1908.

HOWARD H. TUNIS.

Witnesses:
EDWARD L. BASH,
L. H. LATHAM.