

March 15, 1960

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2,928,359

AERIAL TRAMWAY HOPPER CAR

Filed March 5, 1956

3 Sheets-Sheet 1

Fig. 1.

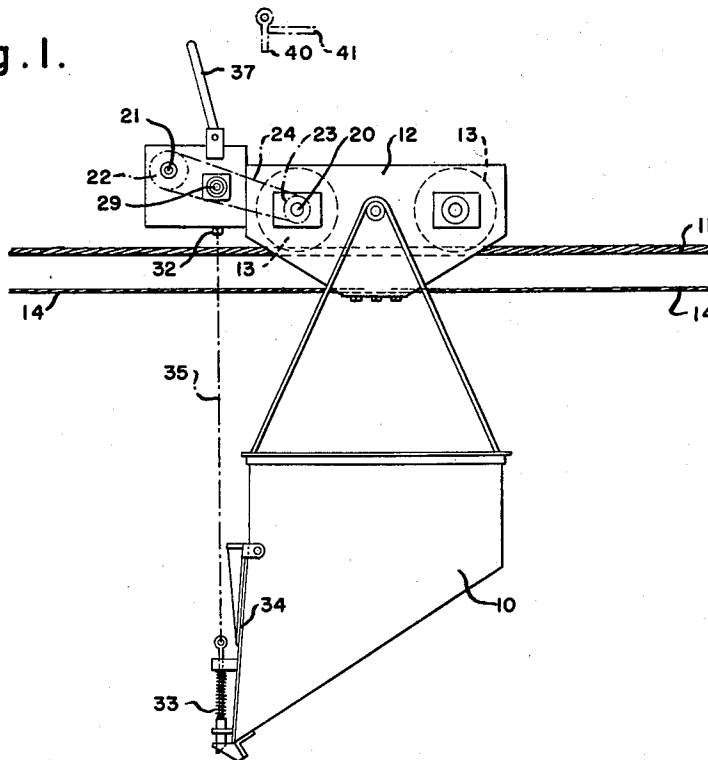
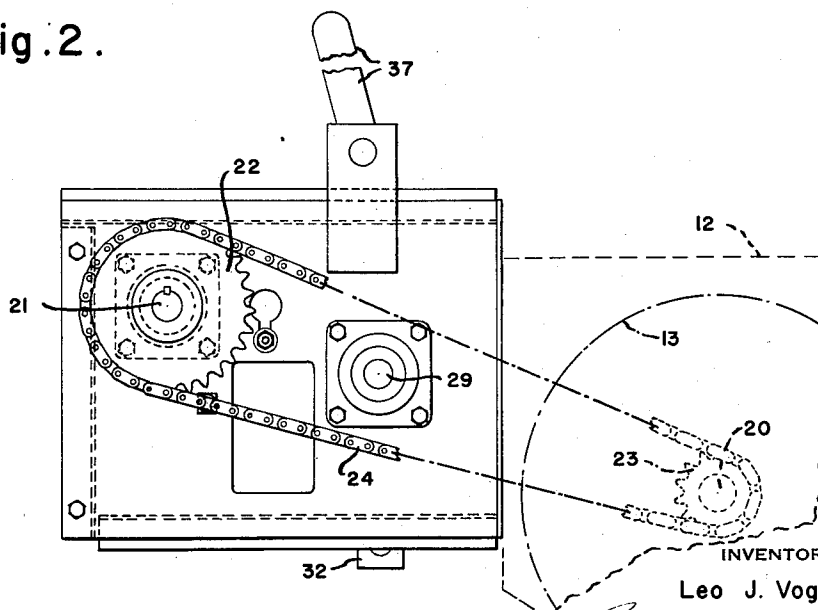


Fig. 2.



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3 Sheets-Sheet 2

Fig. 4.

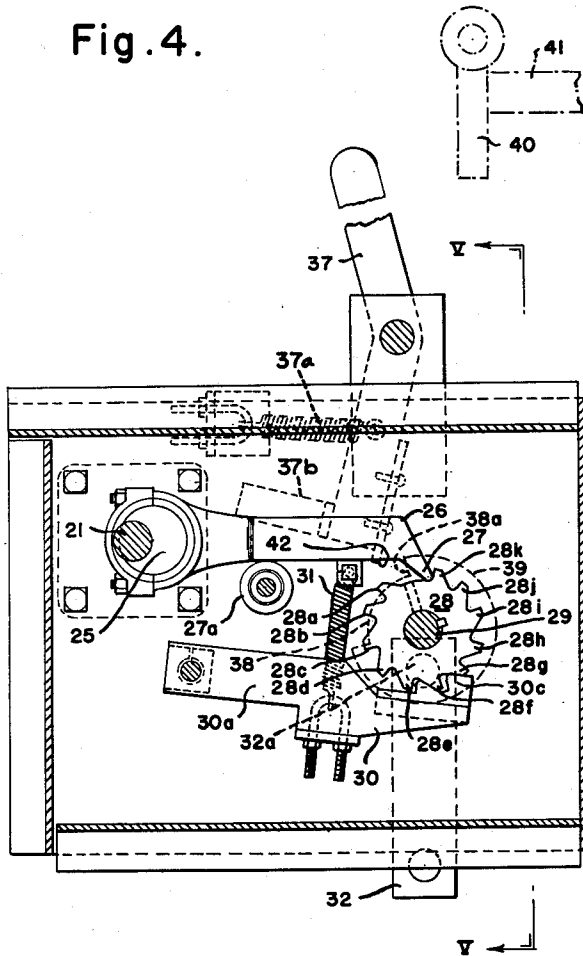


Fig. 5.

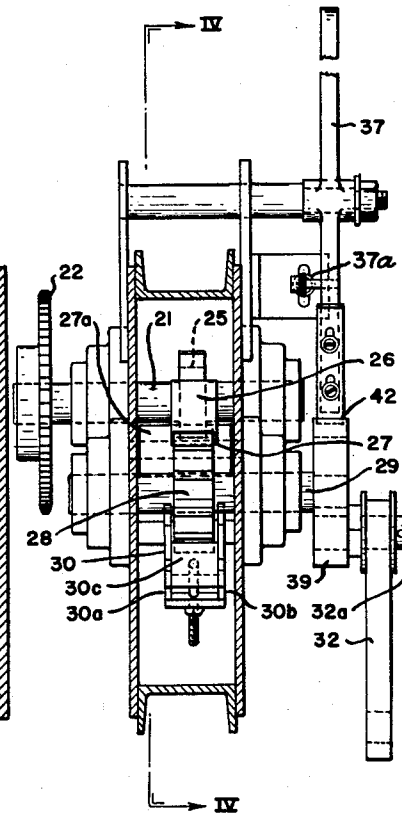
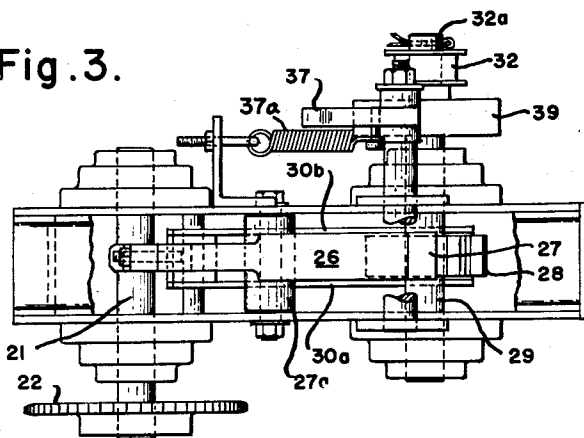


Fig. 3.



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3 Sheets-Sheet 3

Fig. 6.

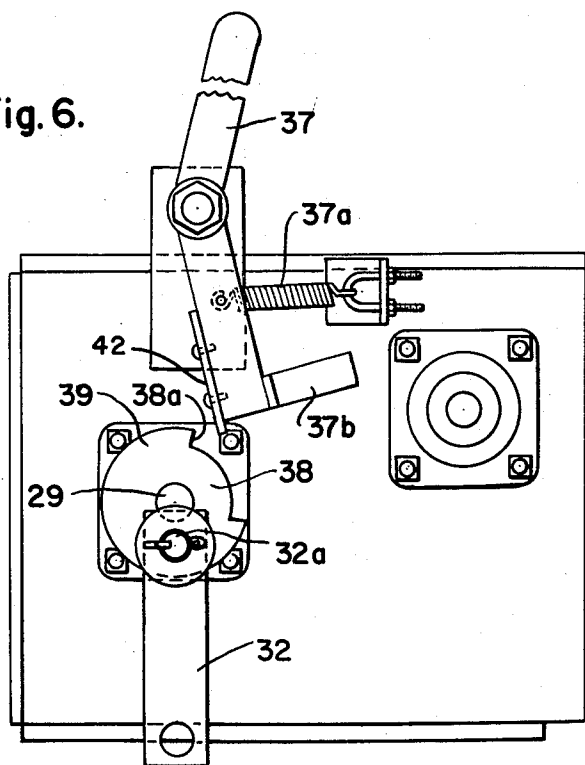


Fig. 7.

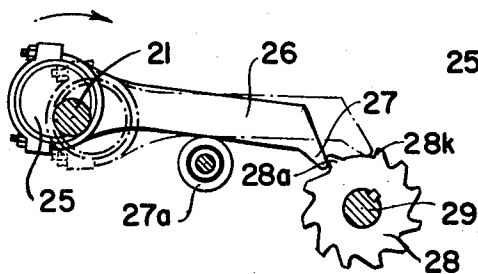
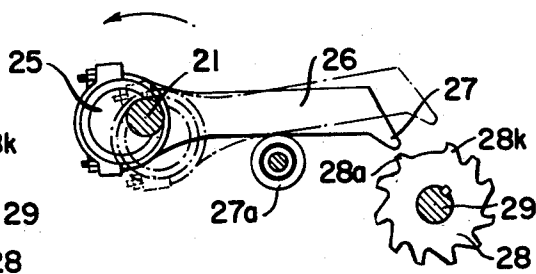


Fig. 8.



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1

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AERIAL TRAMWAY HOPPER CAR

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Application March 5, 1956, Serial No. 569,622

5 Claims. (Cl. 105—242)

This invention relates to aerial tramways and particularly to a tramway car dumping mechanism for an aerial tramway controlled by the movement of the tramcar. Aerial tramways are used to a large extent in the mining and related industries and in situations where it is uneconomical to install trackway on the surface. In general, aerial tramways have a supporting cable or cables upon which a carriage runs. A car is suspended from the carriage and the carriage and car are moved on the supporting cable or cables by means of pulling cables on each side of the carriage so that it may move forward or in reverse on the supporting cables. The car is conventionally provided with a door hinged to open under the pressure of the load and to close by gravity when the load had been discharged. A spring mounted latch acts to lock the door in the closed position. One of the problems of real importance in aerial tramway operation has been controlling the point at which the door opened and the load in the car was discharged. There has long been a need for a positive means for unlatching the door at any varied selected point on the tramway cable. Various devices have been proposed to accomplish this but, in the main, they have not been completely satisfactory for one or more reasons.

I provide in an aerial tramway car having a door, latch means on the car for controlling the opening and closing of the door and a carriage for suspending the car, a latch operating mechanism comprising a shaft rotatable by the movement of the carriage in either direction, eccentric means on the shaft, pawl means mounted at one end on the eccentric means for movement therewith, a second shaft spaced from and parallel to the driven shaft, toothed ratchet means on said second shaft in the path of the pawl means and engageable thereby, means intermediate the driver shaft and second shaft engaging the pawl whereby the pawl drivingly engages the ratchet means on rotation of the shaft in one direction and bypasses the ratchet in the opposite direction, crank means on the second shaft rotatable therewith and connections between the crank means and the latch means on the car whereby the crank means releases the latch at its highest point of travel. Preferably a segmental disk is provided on the second shaft with a cooperating reset lever means mounted on the frame adjacent the second shaft and engageable with the segmental cam, said lever acting to position the ratchet at each end of the tram. Preferably the means intermediate the two shafts supporting the pawl means is a roller upon which the pawl means rides during at least a portion of its movement.

In the foregoing statement I have pointed out certain of the objects, advantages and purposes of my invention. Other objects, purposes and advantages will be apparent from a consideration of the following description and the accompanying drawings in which,

Figure 1 is a side elevation of a tramcar with latch operated mechanism according to my invention;

Figure 2 is a side elevation of the latch-operated mechanism of Figure 1.

2

Figure 3 is a plan view of the latch-operated mechanism of Figure 1;

Figure 4 is a section on the line IV—IV of Figure 5;

Figure 5 is a section on the line V—V of Figure 4;

Figure 6 is an end elevation viewing Figure 5 from the right;

Figure 7 is a segmental view of the pawl rotating in clockwise direction; and

Figure 8 is a segmental view of the pawl rotating in counterclockwise direction.

A tramcar 10 is supported on a cable 11 by a carriage 12 having grooved sheave wheels 13 which run on the supporting cable 11. Driving cables 14 are connected to the carriage at opposite sides thereof so as to move the carriage and car in either direction on the supporting cable 11. A sprocket shaft 20 is driven by the rotation of the sheave wheels so as to rotate in one direction when the tramcar is traveling outward on the supporting cables and in the reverse direction on the tramcar's return travel. A shaft 21 is driven from the shaft 20 through the chain and sprocket drive made up of a sprocket 22 on shaft 21, a sprocket 23 on shaft 20 and a drive chain 24. As shown in Figure 2, the shaft 21 rotates counterclockwise on the outward travel of the tramcar and clockwise on the return travel of the tramcar. The shaft 21 has an eccentric 25 intermediate its ends carrying an elongated pawl 26 having offset tip 27. This pawl 26 rides on a roller 27a.

The tip 27 of the pawl may engage a ratchet 28 on a shaft 29 spaced from and generally parallel to shaft 21. A holding pawl 30 made up of side frames 30a and 30b and holding teeth 30c engages the ratchet 28 to hold it against rotation. A spring 31 is interposed between the pawl 26 and the holding pawl 30 so as to bias them both into engagement with the teeth of the ratchet 28. Roller 27a changes the angle of approach of the pawl 26 to the ratchet 28 from a first angle when the driven shaft rotates in one direction (see Figure 8) to a second angle when the driven shaft rotates in the opposite direction (see Figure 7). A crank arm 32 is mounted on a crank pin 32a on a reset wheel 39 fixed to the ratchet shaft 29 so that a half turn of the shaft raises the latch 33 on the door 34 of the tramcar by means of a pull chain 35.

The ratchet wheel 28 has eleven teeth 28a—k inclusive spaced 30° apart on the center line of the ratchet teeth and a blank space leaving 60° between two teeth.

A reset lever 37 is mounted on the carriage to engage a cut out segment 38 of a reset wheel 39 keyed on the ratchet shaft 29. The reset lever is held against stop 37b out of engagement with reset wheel 39 by a spring 37a. A hinged stop 40 is positioned at the loading position to engage the reset lever 37 as the tramcar moves into position for loading.

The operation of the tramway structure described above is as follows: Assuming that the tramcar has been loaded, the car is moved away from the loading position by the driving or haul cables 14. As the car is moved away from the loading position the shaft 21 is rotated in the counterclockwise direction (viewing Figures 1, 2 and 4). The pawl 27 rides on the roller 27a so that as the shaft 21 rotates the pawl tip cannot engage the teeth of the ratchet wheel and the shaft 29 remains stationary.

When the tramcar has moved outwardly to the desired distance and is ready for dumping the operator reverses the pull on the haul ropes so as to move the tramcar in the reverse direction causing shaft 21 to rotate clockwise. Upon this clockwise rotation, the tip of the pawl 27 is no longer cammed out of tooth engagement by the roller 27a but actively engages the teeth 28a—k successively, thus rotating the ratchet shaft 29 through 330°, resulting in the raising of the crank arm 32 and the tripping of the door latch 33 on the door 34 with the consequent

dumping of the contents of the car followed by closing and relatching of the door. The rotation of the ratchet shaft 29 through 330° will be effected by eleven turns of the shaft 21. When the eleven turns have been completed, the parts will be in the position shown in Figure 4, with the tip of the pawl 27 lying in the gap between teeth 28a and 28k. The stroke of the actuating pawl is only slightly more than the spacing between the successive teeth and materially less than the gap between teeth 28a and 28k. In consequence, while the tip of the pawl 27 remains within the radius of engagement with the ratchet teeth throughout the return travel of the tramcar, there is no rotation of the ratchet shaft 29 after the first eleven turns of the shaft 21. The tip of the pawl merely slides back and forth over the surface of the ratchet between the teeth 28a and 28k.

When the tramcar nears the loading point the reset lever 37 passes beneath a hinged stop 40 which stop is free and permits the reset lever 37 to pass without substantial movement. When the tramcar is loaded and is moved outwardly on the cable from a loading position the reset lever 37 strikes the stop 40. The stop 40 is backed up by a permanent stop 41 fixed to the loading platform. The engagement of the reset lever 37 with the stop 40 causes the tip 42 of the reset lever to engage the shoulder 38a of the cut-out segment 38 in the reset wheel 39 which is keyed to the ratchet shaft 29. As the reset lever 37 moves under the stop 40 the ratchet shaft 29 is caused to rotate clockwise a sufficient distance to bring the tooth 28a into position to receive the pawl tip 27, thus completing the resetting of the device. As the tramcar is moved outwardly with its load, the operational steps of dumping are the same as those that have been already described.

While I have described a presently preferred embodiment of my invention, it will be understood that the invention may be otherwise embodied within the scope of the following claims.

I claim:

1. In an aerial tramway car having a door, a latch means on the door for latching the door and a carriage for suspending said car, a latch operating mechanism comprising a driven shaft journaled on the carriage and drive means to rotate said driven shaft, eccentric means on the driven shaft for movement therewith, elongated pawl means pivotally journaled at one end on the eccentric means for movement therewith, a second shaft journaled on the carriage spaced from and parallel to the driven shaft, toothed ratchet means fixed on said second shaft in the path of the pawl means and engageable thereby, fulcruming means intermediate the driven shaft and second shaft engaging the pawl to change the angle of approach of the pawl to the ratchet means from a first angle in which the tip of the pawl is directed toward the ratchet means when the driven shaft rotates in one direction and to a second angle in which the tip of the pawl is directed away from the ratchet means when the driven shaft rotates in the opposite direction, whereby the pawl drivingly engages the ratchet means on rotation of the driven shaft in said one direction and bypasses the ratchet means on rotation of the driven shaft in said opposite direction, crank means on the second shaft rotatable therewith and connections between the crank means and latch means on the door whereby the crank means releases the latch means once during a rotation of the second shaft.

2. In an aerial tramway car having a door, latch means on the door for latching the door and a carriage for suspending said car, a latch operating mechanism comprising a driven shaft journaled on the carriage and drive means to rotate said driven shaft, eccentric means on the shaft for movement therewith, pawl means pivotally journaled at one end on the eccentric means for movement therewith, a second shaft journaled on the carriage spaced from and parallel to the driven shaft, toothed

ratchet means fixed on the second shaft in the path of the pawl means and engageable thereby, said ratchet means having a portion free of teeth, fulcruming means intermediate the driven shaft and second shaft supporting the pawl and directing the pawl tangentially to the root of the teeth of the ratchet means to change the angle of approach of the pawl to the ratchet means from a first angle in which the tip of the pawl is directed toward the ratchet means when the driven shaft rotates in one direction and to a second angle in which the tip of the pawl is directed away from the ratchet means when the driven shaft rotates in the opposite direction, whereby the pawl drivingly engages the ratchet means on rotation of the driven shaft in said one direction and rides in the portion free of teeth when the driven shaft rotates in said opposite direction, crank means on the second shaft rotatable therewith and connections between the crank means and latch means whereby the crank means releases the latch means intermediate its rotation.

3. In an aerial tramway car having a door, latch means on the door for latching the door and a carriage for suspending said car, a latch operating mechanism comprising a driven shaft journaled on the carriage and drive means to rotate said drive shaft, eccentric means on the shaft for movement therewith, pawl means pivotally journaled at one end on the eccentric means for movement therewith, a second shaft journaled on the carriage spaced from and parallel to the driven shaft, toothed ratchet means fixed on the second shaft in the path of the pawl means and engageable thereby, said ratchet means having teeth spaced at 30° intervals about the ratchet with one tooth removed to leave an arcuate portion, roller fulcruming means intermediate the driven shaft and second shaft supporting the pawl and directing the pawl tangentially toward the root of the teeth of the ratchet means to change the angle of approach of the pawl to the ratchet means from a first angle in which the tip of the pawl is directed toward the ratchet means when the driven shaft rotates in one direction and to a second angle in which the tip of the pawl is directed away from the ratchet means when the driven shaft rotates in the opposite direction, whereby the pawl drivingly engages the ratchet means on rotation of the driven shaft in said one direction and rides on the arcuate portion of the ratchet wheel on rotation of the driven shaft in said opposite direction, crank means on the second shaft rotatable therewith and connections between the crank means and latch means on the car whereby the crank means releases the latch means once during a rotation of the second shaft.

4. In an aerial tramway car having a door, latch means on the door for latching the door and a carriage for suspending said car, a latch operating mechanism comprising a driven shaft journaled on the carriage and drive means to rotate said drive shaft, eccentric means on the shaft for movement therewith, pawl means pivotally journaled at one end on the eccentric means for movement therewith, a second shaft journaled on the carriage spaced from and parallel to the driven shaft, toothed ratchet means fixed on the second shaft in the path of the pawl means and engageable thereby, said ratchet means having a portion free of teeth, a holding pawl spaced from the pawl means and engaging the teeth of the ratchet to restrict rotation of the second shaft to a single direction, resilient biasing means biasing the holding pawl and pawl means toward each other and the ratchet means, fulcruming means intermediate the driven shaft and second shaft supporting the pawl means and directing the pawl means tangentially to the root of the teeth of the ratchet means to change the angle of approach of the pawl to the ratchet means from a first angle in which the tip of the pawl is directed toward the ratchet means when the driven shaft rotates in one direction and to a second angle in which the tip of the pawl is directed away from the ratchet means when the driven shaft

5

rotates in the opposite direction, whereby the pawl means drivingly engages the ratchet means on rotation of the driven shaft in said one direction and rides in the portion free of teeth when the driven shaft rotates in said opposite direction, crank means on the second shaft rotatable therewith and connections between the crank means and latch means whereby the crank means releases the latch means intermediate its rotation.

5. In an aerial tramway car having a door, latch means on the door for latching the door and a carriage for suspending said car, a latch operating mechanism comprising a driven shaft journaled on the carriage and drive means to rotate said drive shaft, eccentric means on the shaft for movement therewith, pawl means pivotally journaled at one end on the eccentric means for movement therewith, a second shaft journaled on the carriage spaced from and parallel to the driven shaft, toothed ratchet means fixed on the second shaft in the path of the pawl means and engageable thereby, said ratchet means having a portion free of teeth, fulcruming means intermediate the driven shaft and second shaft supporting the pawl and directing the pawl tangentially to the root of the teeth of the ratchet means to change the angle of approach of the pawl to the ratchet means from a first angle in which the tip of the pawl is directed toward the ratchet means when the driven shaft rotates in one direction and to a second angle in which the tip of the pawl is directed away from the ratchet means when the driven shaft rotates in the opposite direction, whereby the pawl drivingly engages the ratchet means

6

on rotation of the driven shaft in said one direction and rides in the portion free of teeth when the driven shaft rotates in said opposite direction, crank means on the second shaft rotatable therewith and connections between the crank means and latch means whereby the crank means releases the latch means intermediate its rotation, a reset mechanism on the second shaft and biasing means engageable therewith to rotate the second shaft a distance equal to the portion free of teeth after the completion of each rotation of the second shaft.

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