June 5, 1951 A. L. LEE 2,555,854

TRAMMING LOCOMOTIVE

5 Sheets-Sheet 1

Original Filed July 21, 1945

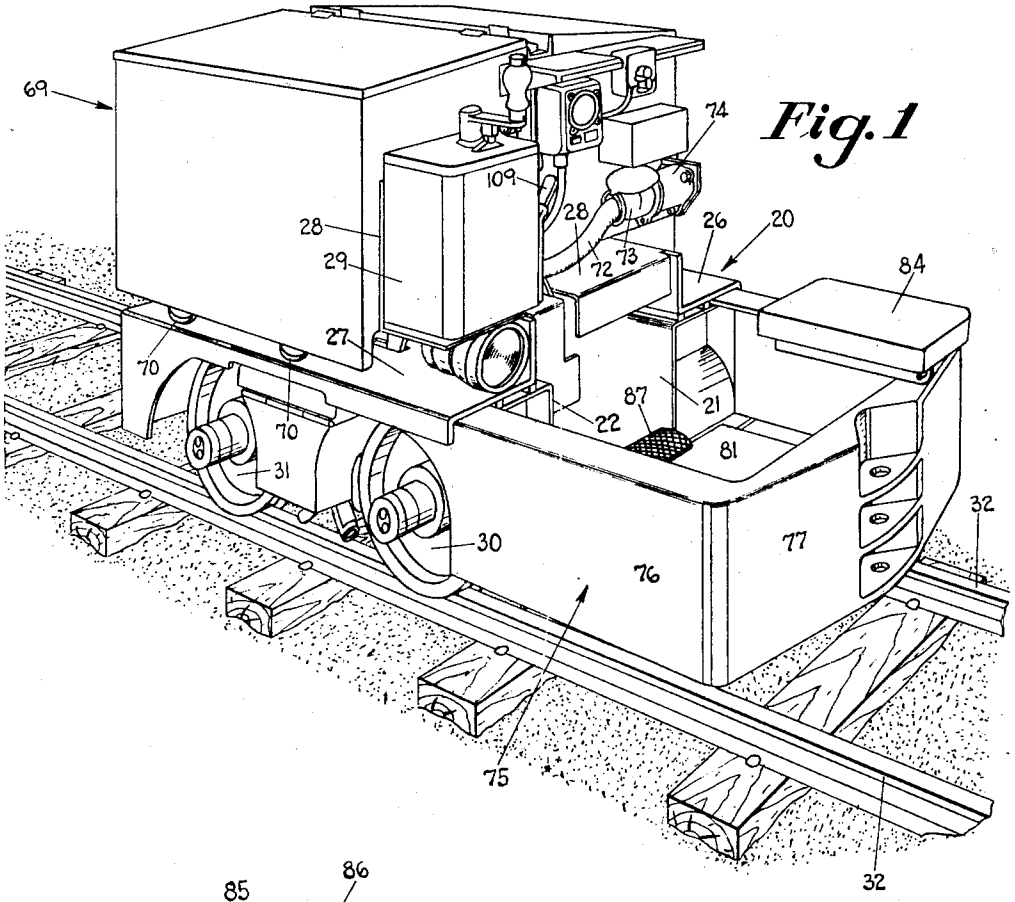

Fig. 1

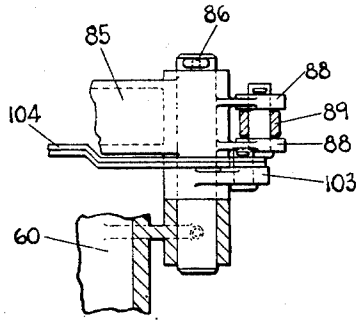

Fig. 4

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TRAMMING LOCOMOTIVE

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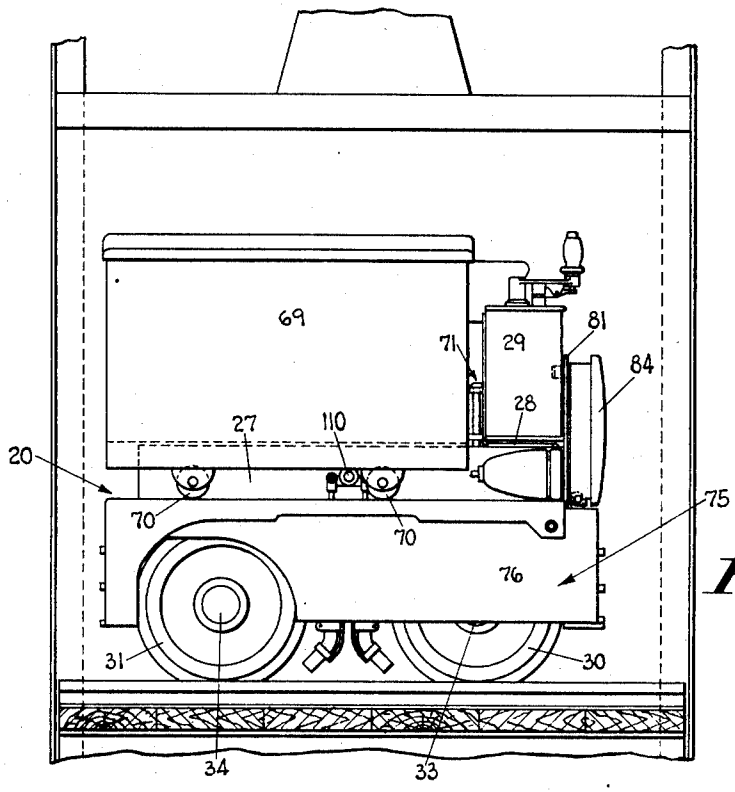

Fig. 2

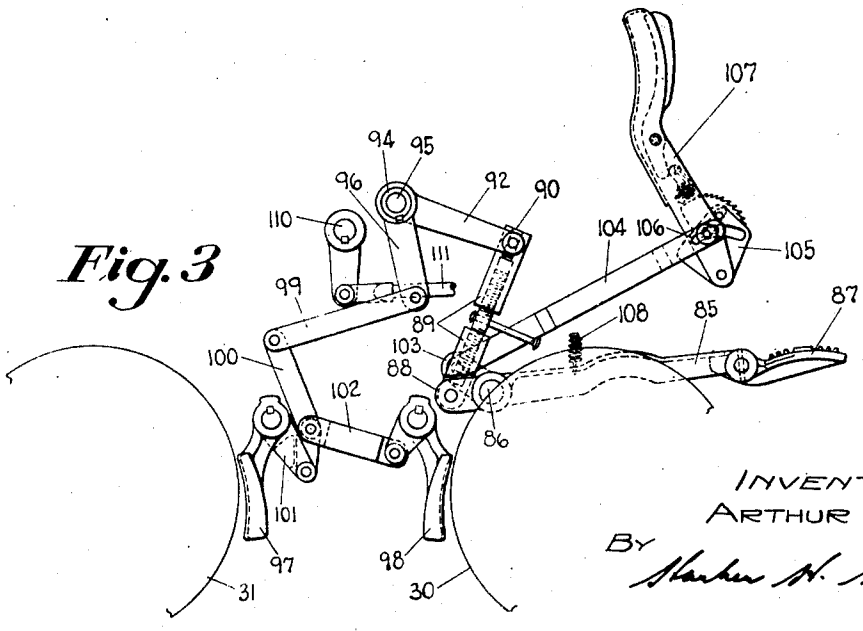

Fig. 3

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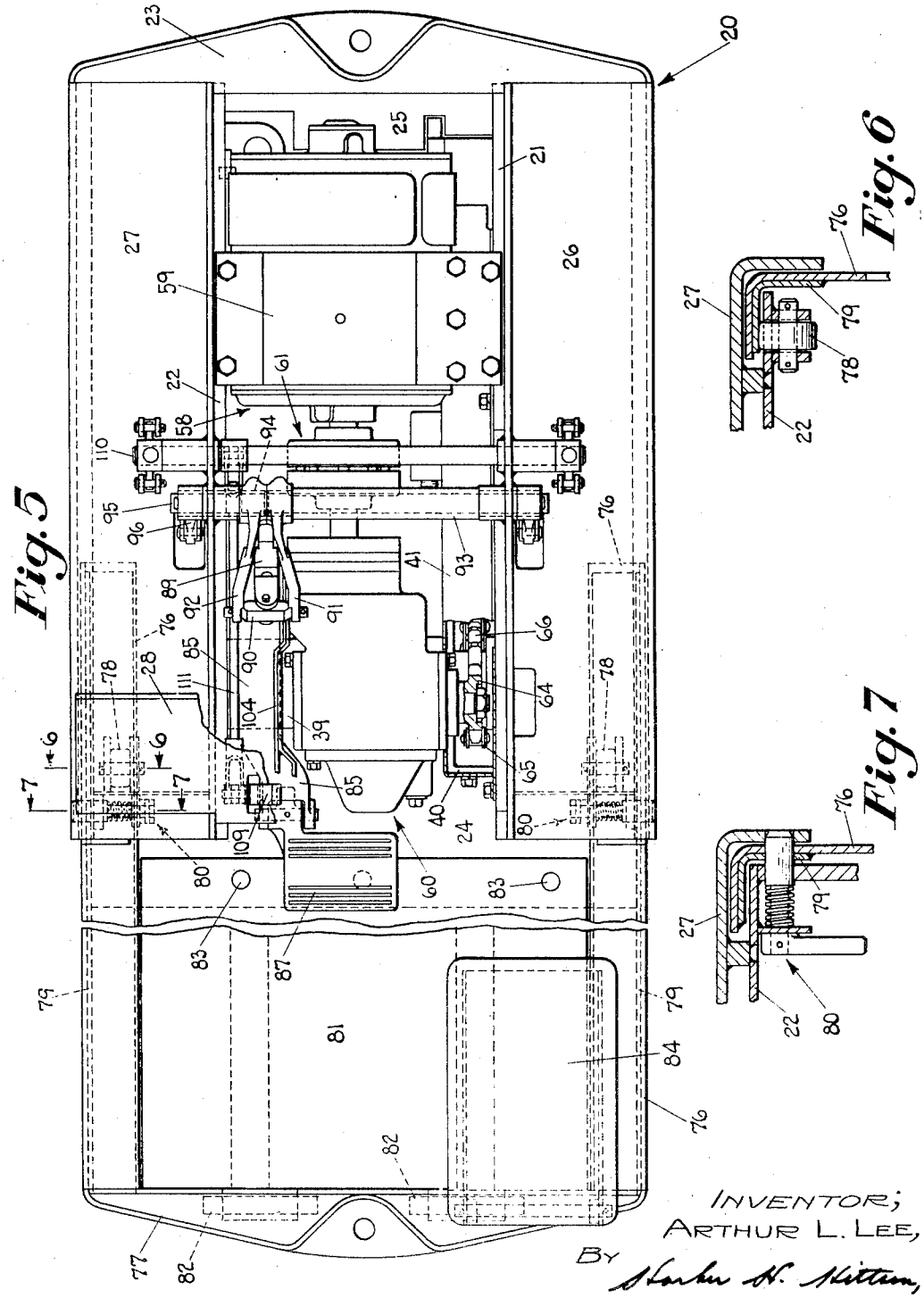

Fig. 5

Fig. 6

Fig. 7

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TRAMMING LOCOMOTIVE

Original Filed July 21, 1945 5 Sheets-Sheet 4

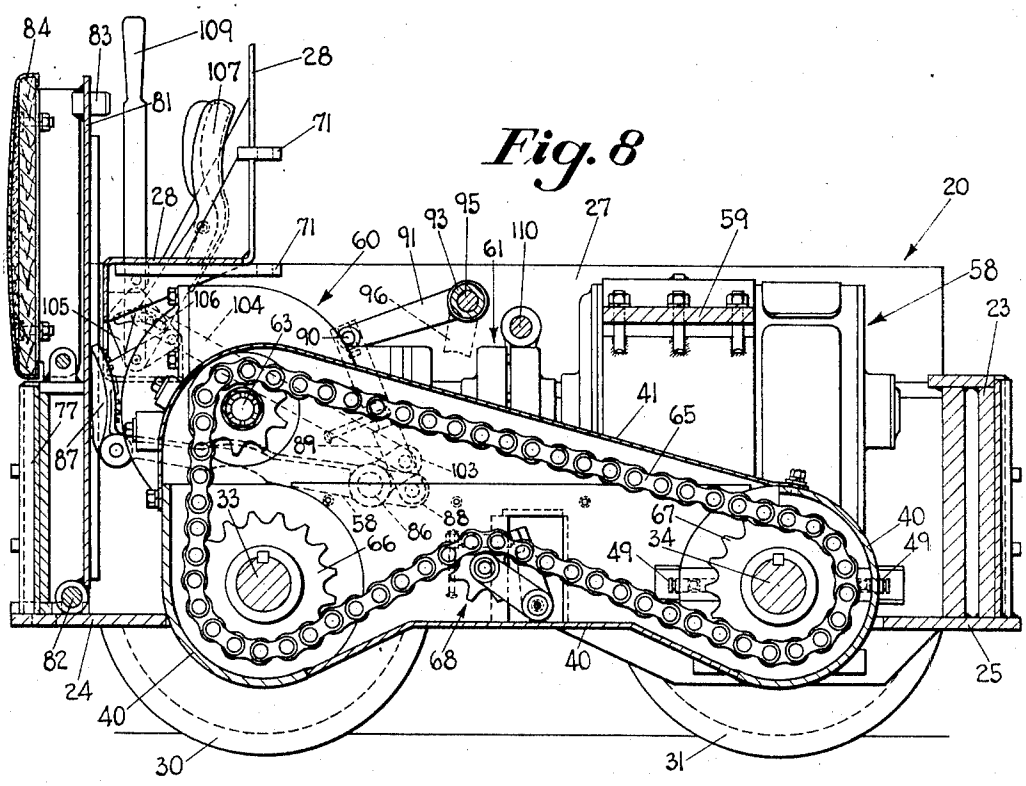

Fig. 8

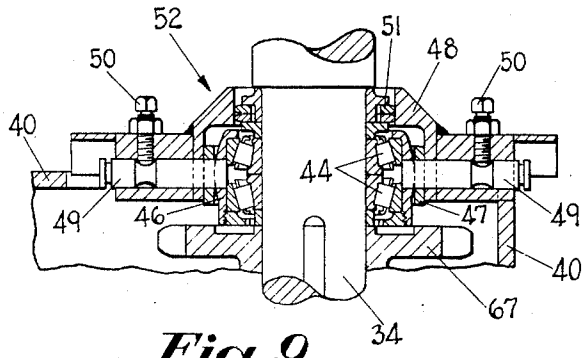

Fig. 9

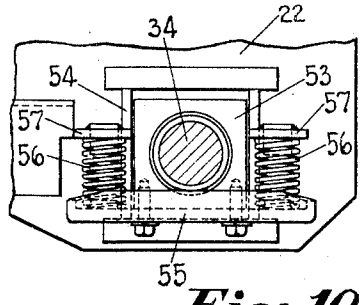

Fig. 10

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TRAMMING LOCOMOTIVE

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Original Filed July 21, 1945

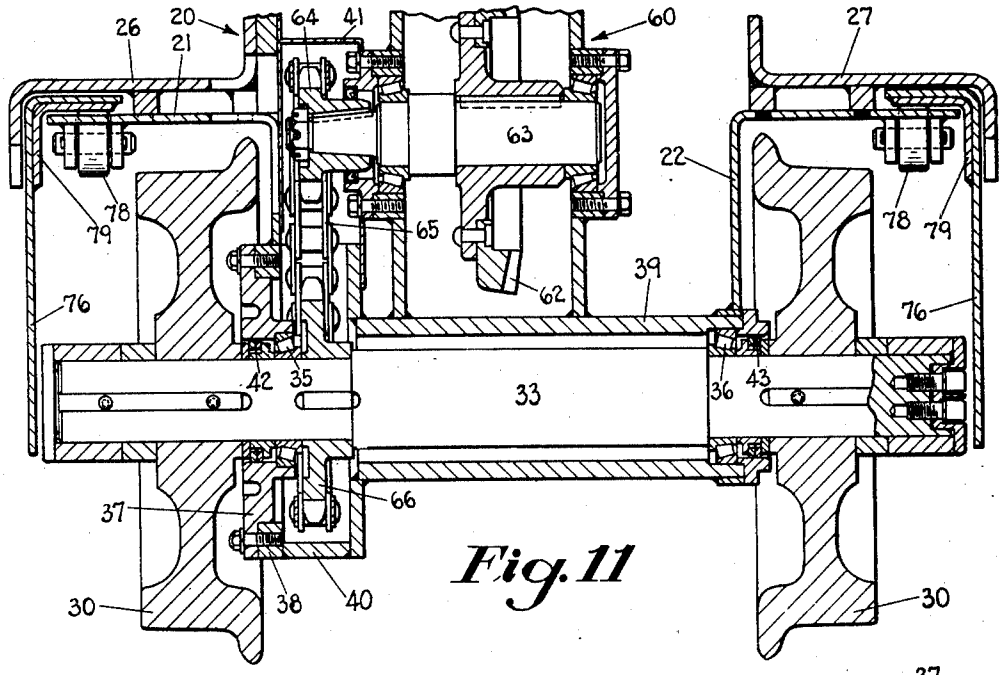

Fig. 11

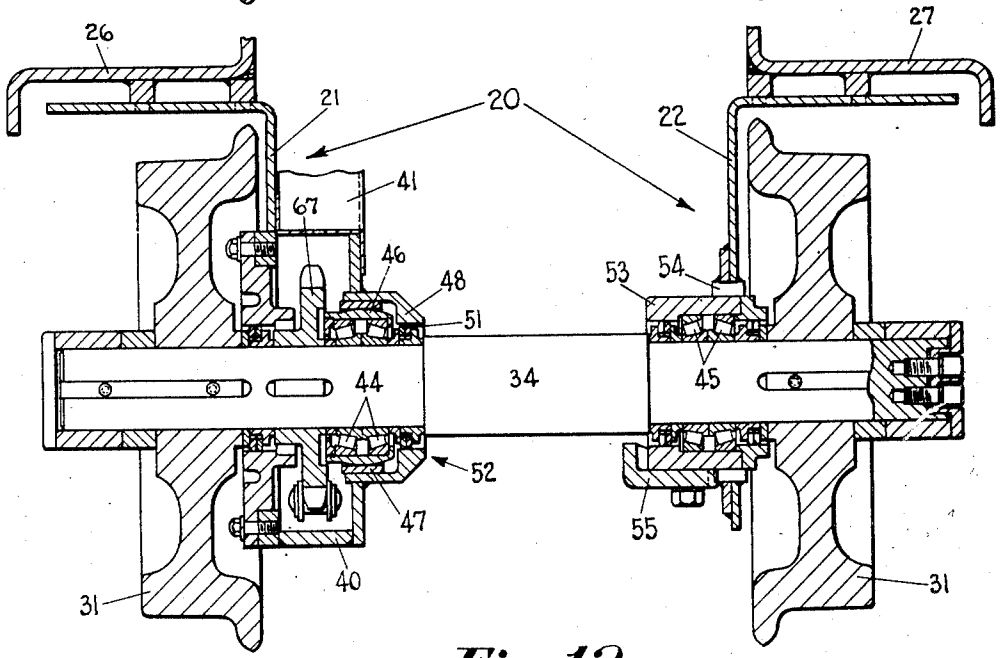

Fig. 12

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Patented June 5, 1951 2,555,854

UNITED STATES PATENT OFFICE

2,555,854

TRAMMING LOCOMOTIVE

Arthur L. Lee, Upper Arlington, Ohio, assignor to The Jeffrey Manufacturing Company, a corporation of Ohio

Original application July 21, 1945, Serial No. 606,327. Divided and this application November 4, 1946, Serial No. 707,587

2 Claims. (Cl. 105—102)

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This invention relates to a tramming locomotive and an object thereof is to provide such a locomotive in which the overall length may be readily adjusted by improved means so that the locomotive may be received on an elevating hoist.

Another object of the invention is to provide an improved locomotive with a front or operator's platform which may be reciprocated or moved rectilinearly to reduce the length of the locomotive to a minimum for transportation on a hoist.

A further object of the invention is to provide a tramming locomotive or other vehicle with improved mounting or supporting means for a pair of axles so that the wheels of the locomotive may travel on an uneven track and in which two drive axles are driven from a single driving motor, preferably through a common flexible drive involving in the preferred form a single continuous drive chain.

A further object of the invention is to provide a locomotive with flexible control means which may be moved out of the way when the operator's platform is adjusted to a collapsed position to reduce the overall length of the vehicle to a minimum.

Still another object of the invention is to provide a locomotive with improved brake operating mechanism.

A further object of the invention is to provide an improved bearing and axle mounting for a locomotive or similar vehicle.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a perspective view of a tramming locomotive incorporating the features of my invention;

Fig. 2 is a side view of the locomotive with the operator's platform in its collapsed position, showing the locomotive carried on a hoist;

Fig. 3 is a detailed view of a portion of the brake operating mechanism of the locomotive, with many parts omitted in the interest of clearness;

Fig. 4 is a combined sectional and plan view of a detail of the brake mechanism;

Fig. 5 is a plan view of the locomotive, with parts omitted;

Fig. 6 is a sectional view taken through the line 6—6 of Fig. 5, looking in the direction of the arrows;

Fig. 7 is a sectional view taken through the line 7—7 of Fig. 5, looking in the direction of the arrows;

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Fig. 8 is a sectional elevational view through the locomotive, with the battery box removed and certain parts omitted, showing particularly the drive mechanism therefor;

Fig. 9 is a sectional plan view showing a bearing and shaft mounting;

Fig. 10 is an elevational view showing a mounting of one of the bearing boxes;

Fig. 11 is a sectional elevational view through the front axle of the locomotive; and

Fig. 12 is a similar view through the rear axle thereof.

This application is a division of my application Serial No. 606,327, filed July 21, 1945, now Patent No. 2,530,472, granted November 21, 1950, for an Improvement in a Tramming Locomotive.

The locomotive includes a main frame 20 which is formed of a pair of laterally spaced longitudinally extending right angle main frame side members 21 and 22 (see Figs. 11 and 12). At their rear ends the side members 21 and 22 are rigidly connected together by a heavy cross-piece 23 (see Figs. 5 and 8) which forms the rear bumper and coupling member of the locomotive. At their bottoms and adjacent their forward and rearward ends the side members 21 and 22 are also connected by cross-plates 24 and 25, respectively.

Positioned above and rigidly attached to the horizontal plate portions of the main frame side members 21 and 22 are Z-shaped main frame aprons 26 and 27, the former being attached to main frame member 21 and the latter to main frame member 22 (see Figs. 11 and 12). All of the main frame members above described are rigidly attached together, as by welding, and constitute the principal elements of the locomotive main frame.

Also adjacent the front or operator's end of the machine and at the top thereof there is a transversely extending Z-shaped plate or apron 28 (see Figs. 1 and 8) which forms a support or dashboard upon which a controller 29 and other instruments and adjuncts are supported. This apron or plate 28 is rigidly attached to the main frame members 26 and 27 and forms a portion of the main frame 20.

The main frame 20 of the vehicle also constitutes a truck frame and it is supported upon four flanged traction wheels, pairs of which are designated 30 and 31, respectively. Flanged wheels 30 and 31 are adapted to run along the rails 32 of a mine track, as clearly illustrated in Fig. 1 of the drawings.

As best seen in Figs. 11 and 12 of the drawings, the front wheels 30 are mounted on and

keyed to a common shaft or front axle 33, and the rear wheels 31 are similarly mounted on and keyed to a shaft or rear axle 34. The wheels 30 and 31 are mounted for axial adjustment so as to be receivable on rails of different gauge.

The mounting of the axles 33 and 34 and the manner in which they are driven constitute important features of my invention. Shaft 33, for example, is mounted in a pair of spaced anti-friction bearings 35 and 36, which bearings are mounted on the main frame 20 and held thereto against any movement relative to said main frame. To this end, bearing 35 is carried in a heavy removable bearing receiving plate 37 which is bolted to a heavy ring 38 which is welded to the main frame member 21. Bearing 36 is likewise rigidly attached to the main frame member 22 by virtue of an enclosing tube 39 for the shaft 33 which is welded to the main frame member 22 and thus constitutes a portion of the main frame, the left-hand end (as viewed in Fig. 11) of said tube 39 being rigidly attached to a chain and sprocket drive gearing casing 40 which is rigidly attached to the ring 38, as by welding.

As best illustrated in Fig. 8 of the drawings, the casing 40 extends longitudinally along one side of the main frame, and adjacent the main frame side member 21 and apron 26 and is provided with a removable cover plate 41 so that the drive gearing may be housed in a bath of lubricating oil which will also lubricate the bearings 35 and 36 as well as a bearing for the shaft 34.

The bearings 35 and 36 are provided with oil or grease seals 42 and 43, respectively, which retain the lubricating oil within the casing 40 and shaft tube 39.

It is to be particularly noted that the shaft 33 and the wheels 30 are mounted for rotation with respect to the main frame 20, but they are held against up and down or any other radial or rectilinear movement with respect to said main frame. As a consequence, as the wheels 30 roll over an uneven track, the main frame 20 will be caused to follow this unevenness. Furthermore, there is no spring mounting whatever between the shaft 33 and the main frame 20 of the locomotive or vehicle.

The shaft 34 which is near the rear end of the vehicle is mounted on a pair of spaced bearings 44 and 45. Bearing 44, which is preferably a double anti-friction roller bearing, has its outer race mounted in a cage or casing 46 (see Figs. 9 and 12) which is held against radial or other movement with respect to the main frame 20 by virtue of the fact that it is received in a cylindrical ring 47 carried by a cup or housing 48 rigidly attached to an upright plate of the drive casing 40.

The outer surface of the cage or casing 46 forms a segment of a sphere and thus presents a segmental spherical bearing surface having a rolling bearing contact with the inner cylindrical surface of the receiving ring 47.

As clearly illustrated in Fig. 9 of the drawings, a pair of diametrically positioned pivot pins 49 provide a trunnion mounting for the cage 46, the axis of which is substantially horizontal and at right angles to the axis of the shaft 34. The trunnion or pivot pins 49 are removably held in place in integral portions of the cup 48 by set screws 50. An oil seal 51 is also provided between the shaft 34 and the cup or housing 48.

The bearing parts thus described provide a complete bearing assembly 52 which provides for pivotal movement of the shaft 34 in a vertical plane passing through its axis. This, of course, provides a limited amount of up and down movement of the left-hand rear wheel 31, as viewed in Fig. 12 of the drawings, and a greater amount of movement of the right-hand wheel 31, as viewed in Fig. 12, to the end that all four of the traction wheels 30 and 31 may remain on the track rails 32 at all times, irrespective of the unevenness of said rails.

To provide for the up and down movement particularly of the right-hand wheel 31, as viewed in Fig. 12, the bearing 45 is mounted in a box 53 (see Figs. 10 and 12), said box 53 being substantially square and being guided in a rectangular frame 54 formed in the side member 22 which provides for a reasonable amount of up and down movement of the box 53 without any appreciable forward and rearward movement thereof. At its bottom the box 53 is rigidly attached, as by machine screws, to an angle spring support 55 which extends forwardly and rearwardly thereof and which is provided with forward and rearward bosses which receive coil springs 56, the upper ends of which are received in bosses carried by brackets 57 rigidly attached to the plate 22.

It is thus evident that I have provided a three-point type of suspension for the main frame 20 which involves only a single spring mounted bearing, namely, the bearing 45; the other bearing 52 which supports shaft 34 providing for pivotal up and down movement of said shaft 34 while holding it against radial or rectilinear movement. The bearings for the shaft 33, of course, as above mentioned, hold the axis of said shaft in fixed relation to the main frame 20 and provide only rotation of said shaft on a fixed axis with respect to said main frame.

The two shafts 33 and 34 are driven from an electric motor 58 (see Fig. 5) which may, for example, be a direct current motor and which is under the control of controller 29. Motor 58 is connected to and supported by a cross-piece 59 forming part of the main frame and rigidly attached at opposite ends to the frame members 21 and 22.

The armature shaft of the motor 58 drives a transmission 60 including a bevel gear which drives a master ring gear 62 (see Fig. 11). Gear 62 is mounted on a shaft 63 mounted in spaced anti-friction bearings carried by the housing or casing of transmission 60. Shaft 63 projects from said transmission casing on one side and is provided with a drive sprocket 64 which drives a single endless roller chain 65 which meshes with and drives a pair of drive sprockets 66 and 67 keyed to the shafts 33 and 34, respectively. The three sprockets 64, 66 and 67 and the chain 65 are all contained within the previously described casing 40, 41.

A slack take-up mechanism 68 is provided in association with the lower run of the endless chain 65 which may be readily adjusted from a position outside the casing 40, 41.

From the above description of the drive gearing for the vehicle or locomotive a number of characteristics are obvious. First of all, it is to be noted that all four of the wheels 30 and 31 and consequently both the shafts 33 and 34 are power driven from a single motor 58. Furthermore, they are all driven from a single or common endless drive chain 65. By using such a flexible driving member as the chain 65, relative

movement of the axis of the two axles 33 and 34 is possible without adversely affecting the drive gearing thereof. In other words, by virtue of this flexible type of drive gearing both axles can be driven from a single motor and one of them, namely, axle 34, can be mounted so that its axis can move up and down relative to the main frame 20 and relative to the axis of shaft 33 which is fixed with respect to said main frame 20. Furthermore, the axis of the sprocket 64 and shaft 63 is preferably substantially directly above the axis of the shaft 33 and it, of course, is fixed with respect to the main frame 20 and with respect to the axis of said shaft 33.

It is obvious that up and down movement of the axis of shaft 34 will not materially affect the overall length of the chain 65, while up and down movement of shaft 33 would adversely affect it or, in other words, would adversely affect the tension on said chain. Therefore, the axes of the shafts 33 and 63 are fixed and they lie one above the other, while the remote shaft 34 has its axis free to move in a vertical plane or up and down. The fact that sprocket 67 (Fig. 12) is axially spaced slightly from the longitudinal pivotal axis of the bearing 52, as provided by pivot pins 49, will cause some up and down movement of sprocket 67 with shaft 34, but this is unobjectionable because of the flexibility of the chain 65 coupled with the fact that this movement is in a plane substantially parallel with the axes of shafts 33 and 63 and is spaced from each an appreciable distance.

The locomotive illustrated is of the battery type and thus energy for operating the motor 58 is supplied by storage batteries. These storage batteries are mounted in a battery box 69 (see Figs. 1 and 2) which is preferably provided with four rollers 70, there being two such rollers on each side and at the bottom thereof which provides for rolling the battery box 69 on and off the horizontal portions of the aprons 26 and 27. As is well known in battery type tramming locomotives it is common practice to roll the battery box off the main frame onto a charging stand for periodic recharging of the batteries.

The battery box 69 is removably held on the main frame 20 by locking mechanism 71 (see Figs. 2 and 8) which involves a vertically removable bolt slidable through three perforated ears, two of which are carried by the plate or apron 28 and one by the box 69.

Electric current is derived from the batteries in the box 69 by way of a cable 72 (see Fig. 1) provided with a receiving socket 73 which fits in a receptacle 74 carried at the rear end of the battery box 69 and extending through an appropriate opening in the plate 28.

Adjacent its forward end the main frame 20 includes an extensible operator's platform 75 which may be adjusted longitudinally drawer-like so as to reduce the overall length of the locomotive when it is to be elevated or lowered by a hoist or elevator as illustrated in Fig. 2 of the drawings. In normal operation this platform is extended as illustrated in Figs. 1 and 5 of the drawings. The platform 75 includes a generally U-shaped frame 76, the front cross-member 77 of which forms a front bumper and coupling device, the U-shaped frame 76 being formed of integral upright and top bent over steel members. The bent over or horizontal flanges or wings of the U-shaped frame 76 extend rearwardly between the horizontal portions of the aprons 26 and 27 and the horizontal portions of the frame members 21 and 22, as clearly illustrated in Figs. 5 and 11 of the drawings.

When the platform 75 is in its extended position, as illustrated in Figs. 1 and 5, the upper horizontal portion of the U-shaped frame 76 overlaps the plates 21 and 22 approximately one-third of their length, as illustrated in Fig. 5 of the drawings. Anti-friction rollers 78 (see Fig. 6) are provided adjacent the front portions of the frame members 21 and 22 and extend through apertures therein to support the rearwardly extending horizontal portions of the frame 76 which are preferably provided with angle wear and reinforcing strips 79.

As illustrated in Fig. 1 of the drawings, when the platform 75 is completely expanded the wheels 30 and 31 are directly exposed at the side of the truck frame, while said platform 75, when moved rearward or contracted as illustrated in Fig. 2, overlaps the front wheels 30 along the upright portions of the frame 76.

Forwardly of each of the rollers 78 there is also preferably provided a spring pressed locking mechanism 80 which releasably locks the platform 75 in its expanded position. The platform 75 also includes a pivoted bottom plate 81 which is pivotally attached to the frame 76 at its front by a pivotal connection 82 so that the bottom plate 81 can swing upwardly about a horizontal axis at the front of the frame 76, thus providing for the inward movement of the platform 75, as illustrated in Figs. 2 and 8 of the drawings.

The bottom plate 81 is preferably provided at its rear end with a plurality of projecting lugs 83 adapted to be received in co-operating holes in the cross-plate 24 when the platform 75 is extended. Thus the bottom plate 81 also acts to lock the platform 75 in its extended position when said bottom plate 81 is down forming the floor or bottom of the operator's platform 75.

Pivotally mounted on one front corner of the platform 75 is an operator's seat 84 which is pivotally mounted on the cross-member 77 so as to swing upwardly about a horizontal axis when the platform 75 is pushed inwardly, as illustrated in Figs. 2 and 8 of the drawings. The above described platform structure is claimed in my Patent No. 2,530,472, above identified.

Manually operable brakes are provided for the locomotive which involve both a foot pedal operating mechanism and an emergency hand operating mechanism. The brake mechanism is such that a single adjustment provides for adjustment of all four brake shoes and this adjustment is effective both for the foot and hand operating devices.

Referring particularly to Figs. 3, 4 and 5 of the drawings it will be seen that the brake mechanism includes a pivoted jointed brake lever 85 which is pivotally mounted on a pin 86 carried by the housing of transmission 60 and disposed adjacent the inside of side wall 22 of the main frame 20. At its forward end the lever 85 includes a foot lever or pad 87 which is pivoted to the main brake lever 85 on a horizontal axis which provides for its being swung upwardly, as clearly illustrated in Fig. 8 of the drawings, to permit the maximum amount of inward movement of the platform 75. When the platform 75 is extended the foot lever or pad 87 extends above the floor or bottom plate 81 thereof so as to be accessible to the operator of the locomotive.

As best seen in Fig. 4 of the drawings, the brake lever 85 is provided with a pair of short arms 88 which pivotally receive a turnbuckle link

or rod 89, the upper end of which is pivotally connected to an equalizing cross-head 90 (see Fig. 5), the opposite ends of which are pivotally connected to arms 91 and 92 keyed to torsion tubes 93 and 94, respectively, which are loosely mounted on a shaft 95 which extends transversely across the main frame 20.

The torsion tubes 93 and 94 are of reduced diameter where they extend through collars welded to the upstanding portions of aprons 26 and 27, as clearly illustrated in Fig. 5 of the drawings. Each of said tubes 93 and 94 has a downwardly extending arm keyed to its outer end, the arm carried by tube 94 being designated 96.

In Fig. 3 there is illustrated in detail the mechanism which extends from the arm 96 to a pair of brake shoes 97 and 98 associated with the wheels 30 and 31 on one side of the vehicle. A duplicate arrangement is provided for operating similar brake shoes associated with wheels 30 and 31 on the opposite side of the truck which are actuated by an arm similar to arm 96 provided on the free or outer end of torsion tube 93.

The arm 96 is pivotally connected to a link 99 which in turn is pivotally connected to a lever 100, the bottom of which is pivotally attached to the crank arm 101 of brake shoe 97 which is pivotally attached for swinging movement on a fixed axis relative to the main frame 20. A toggle link 102 is pivotally connected to an integral arm of the brake shoe 98 and to a point intermediate the ends of the lever 100.

In addition to the foot pedal operated lever 85, hand operated emergency brake mechanism is provided for actuating the brakes which includes a short integral arm 103 (see Fig. 4) formed on the brake lever 85 and having the same effective length as the arms 88. An actuating rod 104 is pivotally connected to the arm 103 and extends forwardly, providing a pivotal connection with a pivoted plate 105 through an elongated lost motion slot 106.

Plate 105 is carried on a pivoted brake lever 107 which is provided with the conventional actuating and locking detent mechanism. The lost motion slot 106 provides for free operation of the foot brake lever 86 without requiring operation of the emergency brake lever 107. It is, of course, evident that manual actuation of either the brake or hand levers 85 or 107 will actuate the brakes. A spring 108 is provided to keep the brakes normally in free condition to permit free movement of the vehicle.

Upon the actuation of either the foot or hand brake it is evident that the turnbuckle link or rod 89 will be moved upwardly and through the equalizing cross-head 90 will impart rotary motion to the two torsion tubes 93 and 94 through their arms 91 and 92, respectively. This motion will then be transmitted to all of the four brake shoes with equalizing action on all of them. The action of each pair of brake shoes on one side of the vehicle will be obvious from a consideration of the action which takes place when arm 96 swings counter-clockwise in response to brake actuation, as viewed in Fig. 3 of the drawings. This counter-clockwise movement will move the link 99 to the right which will swing the lever 100 about its bottom pivot and thus increase the distance between the pivot points on the arms of brake shoes 97 and 98. This will swing the brake shoes 97 and 98 about their fixed pivotal axes, thus applying the brakes, with the braking on the two equalized since each is working against the other. The above described braking apparatus is claimed in my Patent No. 2,484,715, granted October 11, 1949, for Brake Mechanism for Rail Cars.

It is to be particularly noted that by virtue of the single adjustment provided by the turnbuckle 89 it is possible to take up the slack in the complete braking system for all four brake shoes and for both the foot and hand brake levers.

It may also be mentioned that the locomotive is preferably provided with sanding apparatus including an operating lever 109 (see Fig. 3) which may be actuated to rock a shaft 110 through a link 111 which controls sanding mechanism between the two wheels 30 and 31 which is generally of conventional construction.

From the above description it is obvious that I have produced a compact tramming locomotive or vehicle in which a simplified drive has been provided from a driving motor to four driving wheels and which includes a pair of drive shafts the axes of which are mounted for relative movement in that one of them is mounted for vertical or up and down movement in a vertical plane relative to the main frame, while the axis of the other is held against movement relative to said main frame.

Furthermore, I provide a telescoping type of operator's platform which may be expanded when the machine is in operation and which may be pressed or slid inwardly by rectilinear movement in a drawer-like fashion when the effective or overall length of the locomotive is to be reduced as, for example, when it is to be placed on a hoist or elevator.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I therefore wish not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. A locomotive including a frame, a pair of laterally extending axles for said frame, a pair of wheels for each axle, flexible endless power means for driving both of said axles including sprockets on said axles and a continuous chain extending around them, bearing means mounting one of said axles on said frame for rotation relative thereto while holding it against up and down movement relative thereto, and bearing means mounting the other of said axles on said frame for pivotal movement relative thereto about a horizontal longitudinal axis substantially in vertical alignment with said bearing means, said last named means including a bearing assembly connecting one side of said shaft directly to said frame including pivot means providing only pivotal movement of said shaft, and a spring mounting for the other side thereof providing up and down movement, both relative to said frame, said other axle sprocket being located laterally of the pivotal axis of said pivot means, said pivot means means being positioned to provide for said up and down movement in a plane substantially parallel with the axis of said one axle.

2. A locomotive including a frame, four traction wheels, two axles for said wheels, bearing means supporting said axles on said frame for rotation, one of said axles being bearinged for axial rotation only and the other of said axles

being bearinged for axial rotation and pivotal movement in one of its bearings relative to said frame, and driving means for both axles including a single continuous flexible drive chain driven by a motor and sprockets on said axles, the sprocket on the pivotally mounted axle being laterally of its pivotal mounting, said pivotal movement of said other axle occurring about an axis in substantial vertical alignment with said bearing.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
137,421	Comly	Apr. 1, 1873
467,293	Miller	Jan. 19, 1892
1,017,306	McGiffert	Feb. 13, 1912
1,358,029	Sloane	Nov. 9, 1920
1,582,312	Sensenich	Apr. 27, 1926
1,598,105	Rimmer	Aug. 31, 1926
1,858,865	Roozee	May 17, 1932