March 9, 1954 J. P. RUTH 2,671,415

LOCOMOTIVE

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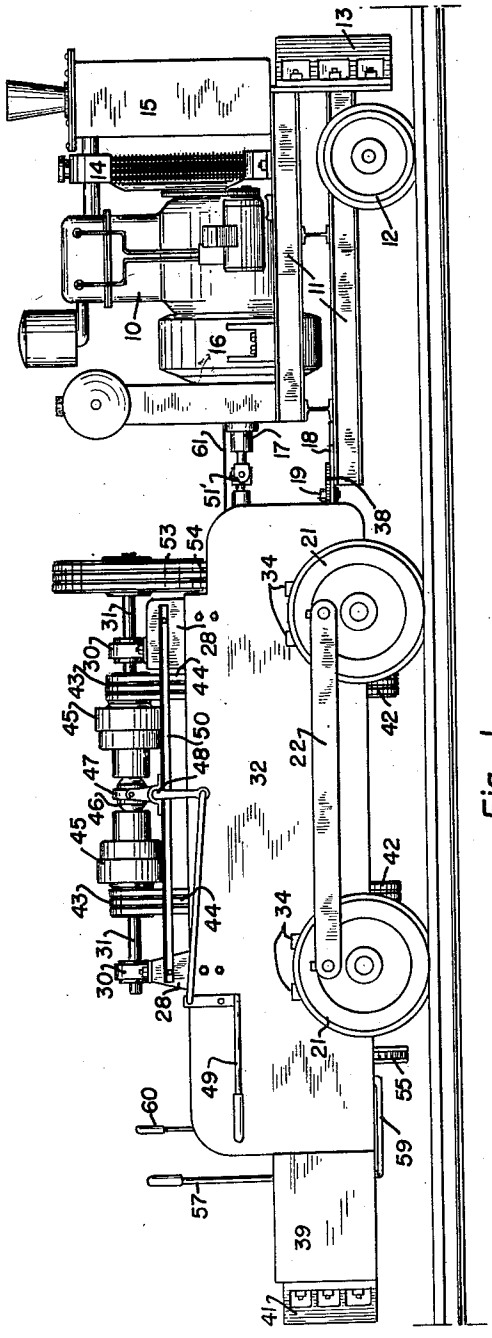


Fig. 1

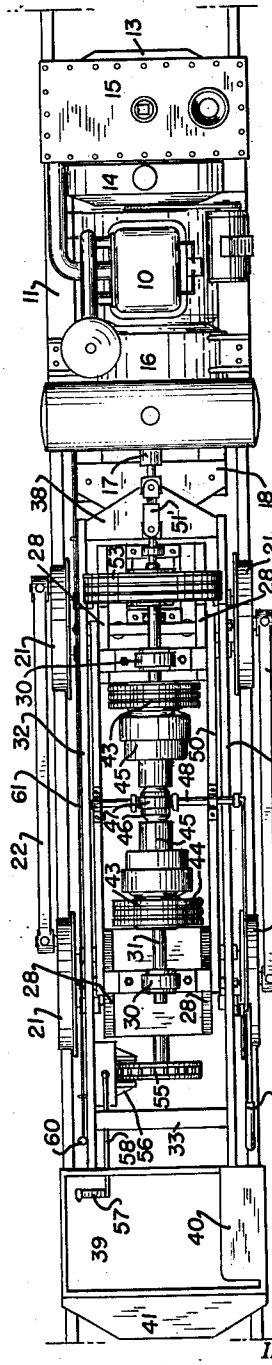


Fig. 2

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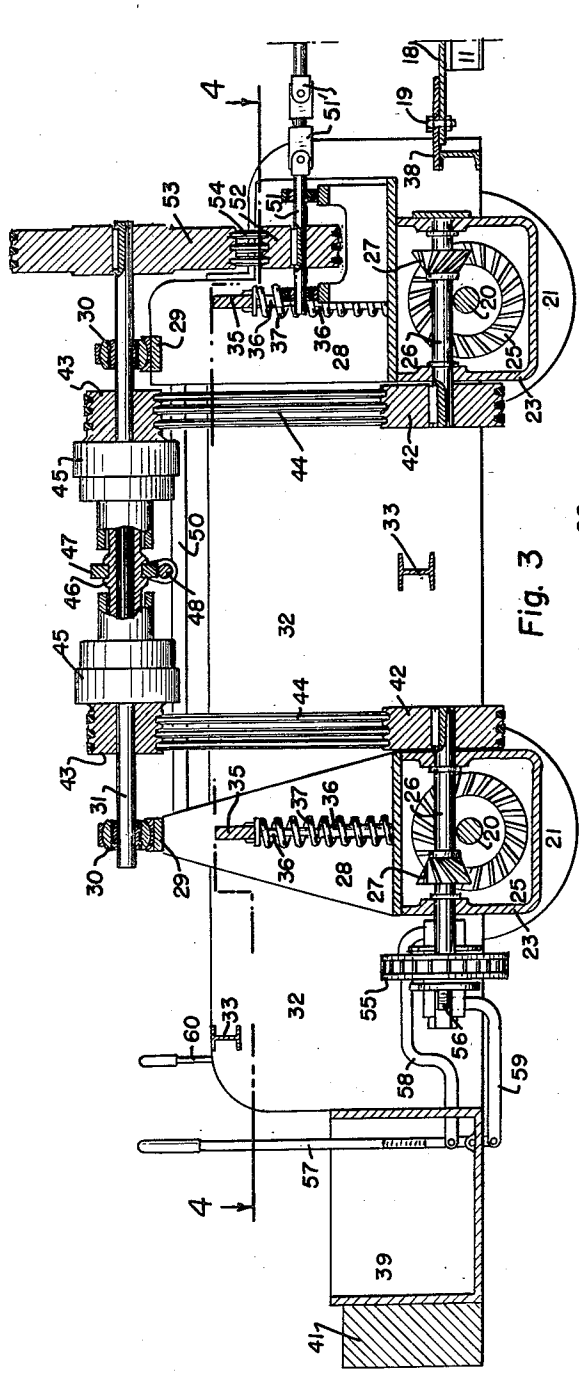


Fig. 3

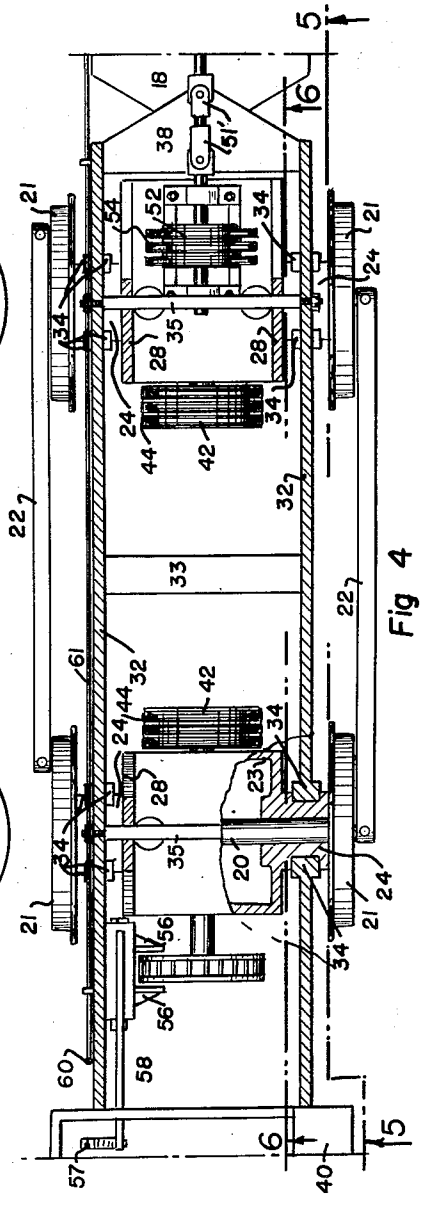


Fig 4

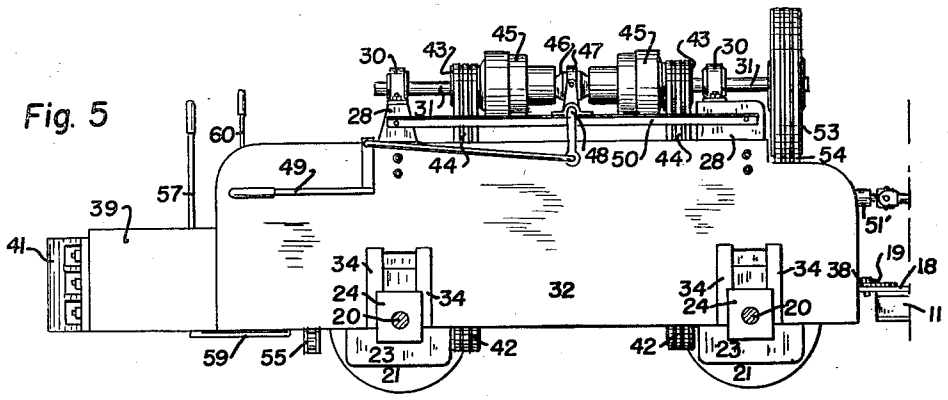
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Fig. 5



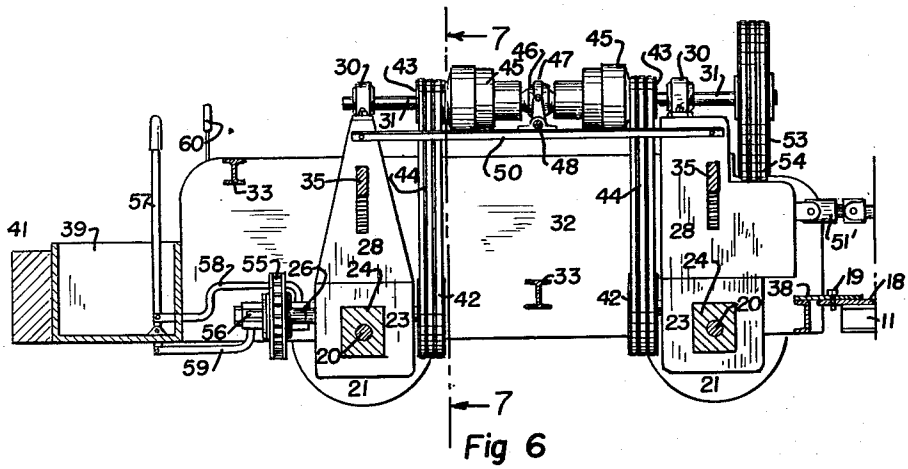


Fig 6

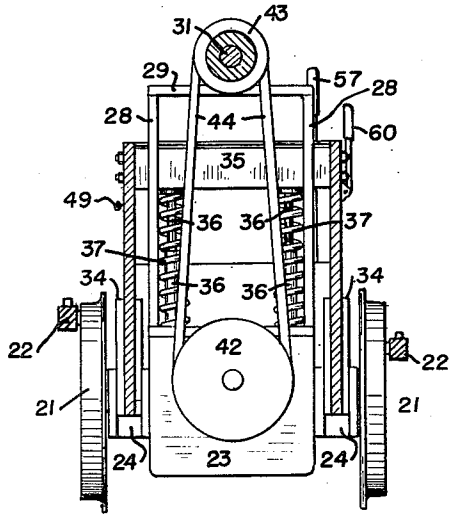


Fig. 7

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LOCOMOTIVE

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Application November 30, 1949, Serial No. 130,227

5 Claims. (Cl. 105—62)

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This invention relates to locomotives, and more particularly to rail locomotives of a type adapted for underground use, as in mining, and has as an object to provide an improved such locomotive adapted to be powered by an internal combustion engine.

A further object of the invention is to provide an improved construction and operative relation of elements constituting a diesel-powered locomotive adapted for use in underground workings.

A further object of the invention is to provide an improved diesel-type locomotive effectively employable in narrow, low-roofed drifts and tunnels of abruptly changing direction.

A further object of the invention is to provide an improved reversible drive in and for the propulsion of a diesel-powered locomotive.

A further object of the invention is to provide improved means for operatively mounting a reversible drive on and for the propulsion of a diesel-powered locomotive.

A further object of the invention is to provide improved means for braking a locomotive adapted for underground use.

A further object of the invention is to provide an improved construction for a mining-type locomotive that is simple, inexpensive, efficient, rugged and durable, conducive to economical maintenance and rapid repair, and that is particularly applicable to adaptation of diesel power to underground tramming operations.

With the foregoing and other objects in view, my invention consists in the construction, arrangement, and combination of elements as hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

Figure 1 is a side elevation of a typical embodiment of the invention as assembled and arranged ready for practical use. Figure 2 is a top plan view of the showing of Figure 1. Figure 3 is a vertical section, on an enlarged scale, taken approximately longitudinally and centrally of the tractive unit shown in the preceding views, certain elements of the complete disclosure being broken away to conserve space and other elements of the view being broken away to better illustrate otherwise concealed construction. Figure 4 is a horizontal section taken substantially on the indicated line 4—4 of Figure 3, certain elements of the view being broken away to better illustrate otherwise concealed construction. Figure 5 is a side elevation, partly in section, taken substantially on the indicated line 5—5 of Figure 4. Figure 6 is a vertical section taken substantially on the indicated line 6—6 of

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Figure 4. Figure 7 is a transverse section taken substantially on the indicated line 7—7 of Figure 6.

The manifest advantages attendant upon use of diesel-powered locomotives in underground tramming operations have been slow of realization because of the peculiar factors encountered in the translation of loads through restricted drifts and tunnels, about abrupt curves, in opposite directions along a single track, and with speed and efficiency; exhaust of the hot engine gases within the underground workings being a further complicating factor of obvious significance. Surmounting the difficulties above noted, the instant invention is directed to the provision of a diesel-powered locomotive susceptible of practical underground use with satisfaction and high efficiency.

The improvement, as illustrated, is an articulated, two-truck unit whereof one of the trucks supports the power unit and its appurtenances in driving relation with the associated truck which is thereby powered for tractive effect.

In the drawing, an internal combustion engine, preferably of diesel type, is designated by the numeral 10 and is shown as mounted on a rigid frame assembly 11 with its power output shaft on the longitudinal median line of the ultimate assembly. The frame 11 is operatively mounted for translation on a single transverse axle equipped with rail-engageable wheels 12 and disposed adjacent one end of said frame which carries coupler and bumper means 13. The engine 10 is equipped with the customary adjuncts and appurtenances essential to its operation, all mounted on and carried by said engine and the frame 11, and a cooling radiator 14 is mounted on the frame 11 between the engine 10 and the frame end furnished with the means 13 adjacent and in spaced relation with an exhaust gas conditioning unit 15, preferably of the type shown in my copending application for patent, Serial No. 695,659, filed September 9, 1946, and now matured as Patent No. 2,508,297, wherethrough the engine exhaust gases may be washed and cooled for acceptable discharge to atmosphere. A fluid drive coupling 16, of conventional type and construction, is carried by the frame 11 on the side of the engine 10 remote from the unit 15 and in an operative association with said engine effective to deliver the engine power output to and through a shaft 17 on the longitudinal median line of the ultimate assembly. A coupling plate 18 is fixed transversely of and projects longitudinally from the end of the frame 11 remote from the means 13 and is formed with an eye

directly beneath the projected axis of the shaft 17 for reception of a pin 19 constituting a vertically-axised connection for operative association of the power truck with the tractive unit hereinafter described.

The tractive unit is supported by and reversibly driven for translation through a spacedly-parallel pair of identical axles 20 each equipped with fixedly-related, rail-engageable wheels 21 which are in turn connected for simultaneous rotation in the same direction by means of side rods 22 end-engaging with eccentrically-disposed crank pins projecting from the wheels 21 in an usual manner. Each axle 20 is journaled in and traverses a gear box 23 formed or furnished on its opposite sides with rigidly-associated extensions 24 surrounding the associated axle 20 portion and closing between the gear box and adjacent wheel 21, each of said extensions 24 being similarly grooved or recessed on its opposite vertical faces to provide paired, vertically-disposed slide bearings. Each of the axles 20 operatively engages with and through a spiral-cut bevel gear 25, preferably of hypoid type, within its associated gear box 23, said gears 25 being identical save for an opposite direction of tooth pitch, and a jack-shaft 26 is journaled for rotation in and through each gear box 23 above the associated axle 20 and perpendicular to the latter on the longitudinal median line of the assembly and carries a bevel pinion 27 in meshing relation with the gear 25 of its associated axle, the pinions 27 being disposed on opposite sides of their respective axles, or in operative opposition, so that rotation of one of the jack-shafts 26 is productive of associated axle 20 rotation in a given direction while like rotation of the other jack-shaft is productive of associated axle 20 rotation in an opposite direction.

Risers 28 upstand in spaced, parallel relation from the opposite ends of each gear box 23 to fixed connection of their paired upper ends with a beam 29 bridging therebetween in spaced parallelism with the axle 20 traversing the associated gear box, and each of the beams 29 supports a bearing 30 rotatably mounting a shaft 31 to dispose the latter in spanning relation between and above the beams 29 on the longitudinal median line of the ultimate assembly and in alignment above the jack-shafts 26.

The wheel and axle assemblies of the tractive unit are positioned and maintained in operative relationship by means of a frame consisting of a pair of like, generally plane, rigid side members or skirts 32 disposed in spaced parallelism and permanently interengaged, as by means of struts 33 bridging therebetween. The spacing between the skirts 32 is such as to register the skirts, when vertically disposed, with the slide bearings formed in the opposed vertical faces of the gear box extensions 24, and lower margins of said skirts are similarly notched to engage over and with said extensions, the parallel vertical margins of said notches being worked and thickened, as at 34, to function as guides slidably cooperable in and with the extension 24 slide bearings. Manifestly, the skirt 32 lower margin notches are located to engage with the gear box extension 24 in a spaced, parallel disposition of the axles traversing said extensions such as relates said axles in perpendicularly-traversing association with and between the skirts with the axle-mounted wheels 21 exteriorly of the skirts, and in such disposition the axle and gear box assemblies, together with the risers 28 and shaft 31, are mounted for limited altitudinal reciprocation relative to the skirt-constituted frame. Completing the operative association of the tractive unit frame and axle assembly, vertically-elongated slots are formed in the risers 28 in registration transversely of the assembly and in position to reciprocably accommodate beams 35 rigidly and perpendicularly between the skirts 32 above the respective axles 20, and telescopically-related guides 36 reciprocably interengage in fixed relation with the gear box 23 and associated beam 35 within and to position expansive coil springs 37 in operative relation between the beams 35 and gear boxes 23 for resiliently-yieldable altitudinal support of the unit frame from and relative to the axle assembly; such engagement of the beams 35 through the risers 28 cooperating with the skirt notch engagement with the gear box extensions 24 to effectively and operatively interrelate the unit frame and axle assembly. Extensions of the skirts 32 at one end of the unit frame fixedly mount a centrally-apertured, longitudinally-projecting plate 38 disposed for cooperation with the coupling plate 18 of the power truck in a registration of the plate apertures accommodating the pin 19 and completing a hitch between the power and tractive trucks which permits of relative articulation thereof in the horizontal plane, and an opposite extension of the skirts 32 mounts and supports an operator's compartment 39 and seat 40 equipped with coupler and bumper means 41 terminating the tractive unit.

Adjacent, registered ends of the jack-shafts 26 extend through and project in spaced opposition beyond their respective gear boxes 23 to each fixedly mount a belt pulley 42 exteriorly of the associated gear box, said pulleys 42 being alike and preferably grooved for cooperation with a multiple, V-belt drive, and suitably proportioned, similarly-grooved pulleys 43 are mounted for free rotation on the shaft 31 in operative registration above the pulleys 42 and in driving relation with the latter through the agency of a belt assembly 44. Each of the pulleys 43 is fixed to and for rotation with a clutch element 45 freely rotatable on the shaft 31 and connectible with the latter through appropriate axial shift of a complementary clutch element 46 splined to the shaft 31 between the elements 45 and shiftable on and along said shaft in either direction to coupling coaction with either of the said clutch elements 45, and a yoke-actuated shift ring 47 on the clutch element 46 is linked through a rock-shaft 48 with a lever 49 adjacent the operator's compartment to provide means for manually and selectively shifting the element 46 into coupling relation with either of the clutch elements 45; the rock-shaft 48 being conveniently journaled transversely of the unit and beneath the shaft 31 on bars 50 spanning between upper ends of the risers 28 longitudinally of the assembly. The double-acting clutch shown and described is conventionally represented and may be of any particular type and construction suited to accomplish its function of selectively engaging either of the pulleys 43 in driven relation with the shaft 31 while providing an intermediate position wherein both pulleys 43 are free for rotation on and relative to said shaft, the said shaft 31 being adapted for continuous rotation by the engine 10 in the manner and through the connections hereinafter described.

Supported for rotation on and above the gear

box 23 adjacent the plate 38, a shaft 51 is disposed to axially align with the output shaft 17 of the fluid drive unit 16 when the power and tractive trucks are coupled in longitudinal alignment by means of the plates 18 and 38 and pin 19, and a flexible, telescopic joint 51', preferably including a pair of universal joints and a splined section, engages between and operatively connects the shafts 17 and 51 for simultaneous rotation in all angular relationships of the power and tractive trucks. A belt pulley 52 is fixed to the shaft 51 to underlie a suitably-proportioned belt pulley 53 on the end of the shaft 31 overhanging the shaft 51, so that a belt drive 54 operatively interconnecting the pulleys 52 and 53 serves to interengage the shafts 31 and 51 for simultaneous rotation deriving from the engine 10 through the fluid drive 16.

The jack-shaft 26 of the axle assembly adjacent the operator's compartment 39 is extended through and projects beyond its associated gear box 23 in a direction opposite to that of the projection supporting its pulley 42, and an interiorly-bladed disc 55 designed to be cooled by air circulation therethrough as an incident of its rotation is fixed to the end of said jack-shaft adjacent the operator's compartment for rotation with said shaft. The disc 55 cooperates with manually and selectively actuatable means to complete a braking mechanism for the deceleration and arresting of locomotive travel, to which end the opposite, exterior, circular faces of said disc are plane, parallel, and suitably worked or lagged to coact with opposed faces of shoes 56 slidably carried by one of the frame skirts 32 for adjustment longitudinally of the assembly toward and away from the disc 55 faces. The shoes 56 are conveniently alike and are slide-supported on opposite sides of the disc 55 for simultaneous actuation in opposite directions by means of a lever 57 mounted in and upstanding from the operator's compartment 39, it being feasible to mount the lever 57 for oscillation about a pivot in a vertical arc longitudinally of the tractive unit and to connect a point above the lever pivot through a link 58 with the shoe 56 most remote from the lever and to connect a point below the lever pivot through a link 59 with the shoe 56 more nearly adjacent the lever, so that oscillation of the lever 57 in one direction simultaneously urges both shoes 56 into frictional engagement with the disc 55 faces, for consequent braking effect on the tractive unit travel, while oscillation of the said lever in the opposite direction simultaneously separates the shoes 56 from the disc 55 faces for unrestrained tractive unit travel.

A suitable operating lever 60 is mounted adjacent the operator's compartment 39 and is linked, as by means 61, with the throttle control of the engine 10, thereby grouping all of the controls essential to locomotive operation within convenient reach of an operator carried and accommodated at one end of the assembly.

Practical use and operation of the improved locomotive constructed and assembled as shown and described should be readily readable from the drawings and foregoing description. Independent mounting and assembly of the power unit and tractive means for hinge-coupling as set forth permits separation of the truck units for accommodation on mine skips or cages of limited size and facilitates travel of the operative assembly about the track curves of low radius; the couplings and power shaft connections provided facilitating interconnection of the truck units in condition for use. With the locomotive assembled and the power output shaft 17 operatively connected with the shaft 51, the shaft 31 is at all times driven synchronously with and at a speed suitably proportioned to that of the power shaft of the engine 10 through the fluid drive 16, and the double-acting clutch on the shaft 31 permits selective completion of an operative drive to either of the axles 20, with consequent control of the direction of axle 20 rotation and tractive unit travel, while the side rods 22 couple the wheels of both axles for simultaneous tractive effect regardless of the particular axle drive engaged. Travel of the tractive unit is reflected by a rotation of both jack-shafts 26, so that arresting frictions applied to the disc 55 are always effective through the associated gear axle assembly and the side rods 22, thus providing full control when the double-acting clutch is completely disengaged and the clutch elements 45 are free to rotate on the shaft 31. Provision of the fluid drive coupling 16 minimizes the effect of shocks and momentary overloads developed through clutch-connection of the shaft 31 with either of the pulleys 43, and the construction and operative interrelation of elements comprising the locomotive conduce to long operative life of the assembly, facilitate maintenance and repair, and condition the unit for efficient attainment of the ends for which designed.

Since many changes, variations, and modifications in the form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

1. In a locomotive, a power unit, wheeled, spacedly-parallel drive axles, a gear fixed to each of said axles, separate gear drives independently and oppositely serving said axle gears in axially-perpendicular relation with said axles, whereby power actuation of said drives in the same direction is reflected as oppositely-directed rotation of said axles, a shaft powered by said unit in a fixed spacing above said axles and spacedly paralleling said drives, connections coupling each of said gear drives in idling relation with said shaft, and means shiftable axially of the shaft between said connections for selectively and alternatively clutching said connections to and into driven relation with said shaft.

2. In a locomotive, a power unit, wheeled, spacedly-parallel drive axles intercoupled for synchronous rotation in the same direction, a gear fixed to each of said axles, separate gear drives independently and oppositely serving said axle gears in axially-perpendicular relation with said axles for oppositely-directed rotation of the latter in reaction to like power actuation of the drives, a shaft powered by said unit in spaced relation above said axles and gear drives, connections coupling each of said gear drives in idling relation with said shaft, and means shiftable axially of the shaft between said connections for selectively and alternatively clutching said connections to and into driven relation with said shaft.

3. The organization according to claim 2, wherein said shaft is supported from, perpendicular to, and in a fixed spacing above said

axles, said gear drives include spacedly-aligned shaft elements paralleling said shaft, and said connections are constituted as pulleys fixed to exterior ends of said shaft elements in belt-driven relation with idler pulleys on and independently clutch-engageable with said shaft.

4. In a locomotive having a power unit, wheeled, spacedly-parallel drive axles intercoupled for synchronous rotation in the same direction, a frame operatively correlating said axles in altitudinally-reciprocable relation therewith, and springs resiliently supporting said frame relative to said axles, a gear fixed to each of said axles, separate gear drives independently and oppositely serving said axle gears in axially-perpendicular relation with said axles for oppositely-directed rotation of the latter in reaction to like power actuation of the drives, a shaft supported from, perpendicular to, and in a fixed spacing above said axles independently of said frame in driven relation with the power unit, connections coupling each of said gear drives in idling relation with said shaft, and means shiftable axially of the shaft between said connections for selectively and alternatively clutching said connections to and into driven relation with said shaft.

5. The organization according to claim 4, wherein each of said axles is journaled in and through a gear box formed with opposite end extensions slidably engaged by and between spacedly-parallel elements fixedly depending from said frame, risers fixedly upstand in spaced parallelism from said gear boxes interiorly of said frame in supporting relation with said shaft, each of said risers being formed with a vertically-elongated slot, a frame-fixed beam slidably intersects each of said risers through its slot for reciprocation altitudinally thereof parallel to and above each gear box, and said springs operatively engage between the gear boxes and associated beams.

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