Aug. 4, 1942. C. E. STOLTZ 2,292,303

MINE LOCOMOTIVE

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Fig. 1

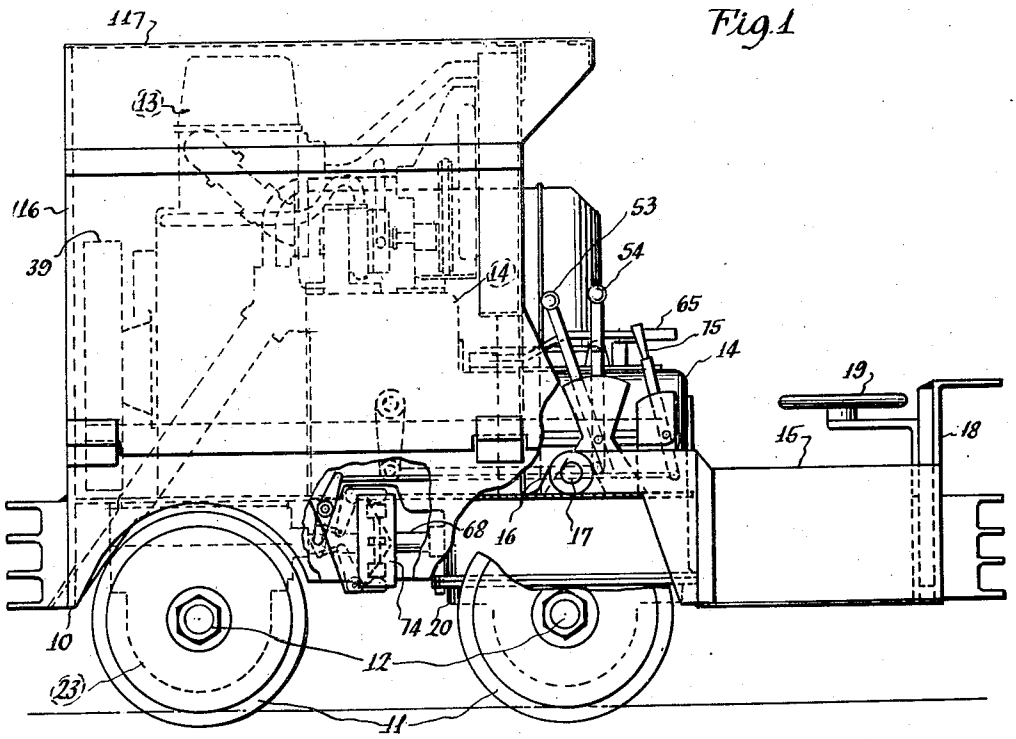
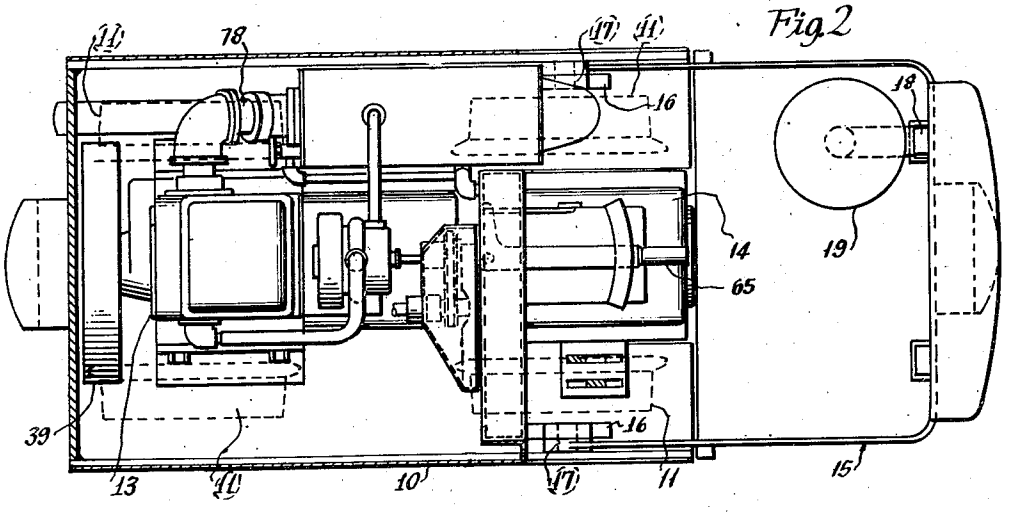


Fig. 2



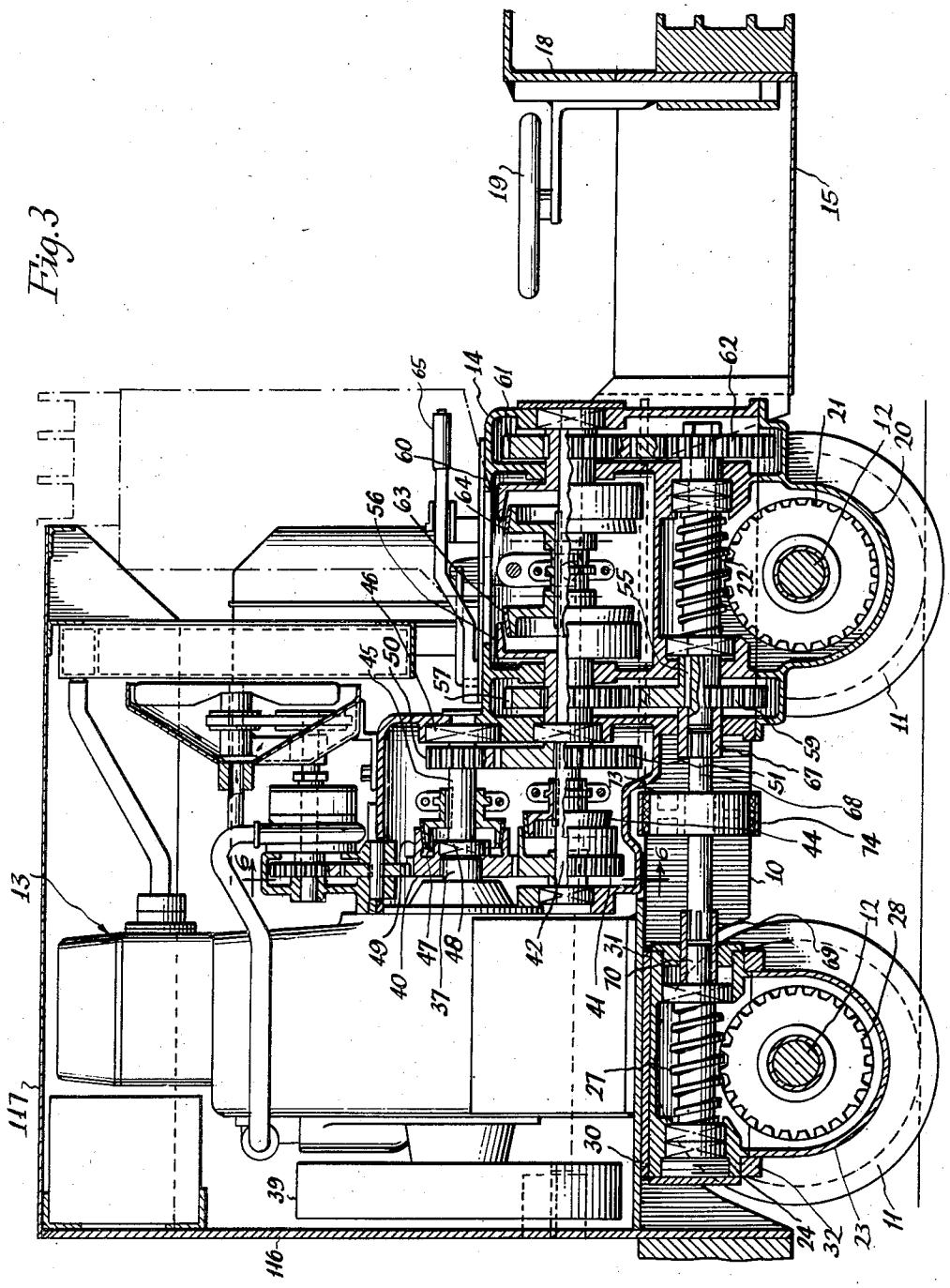
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Fig. 3



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Fig. 4

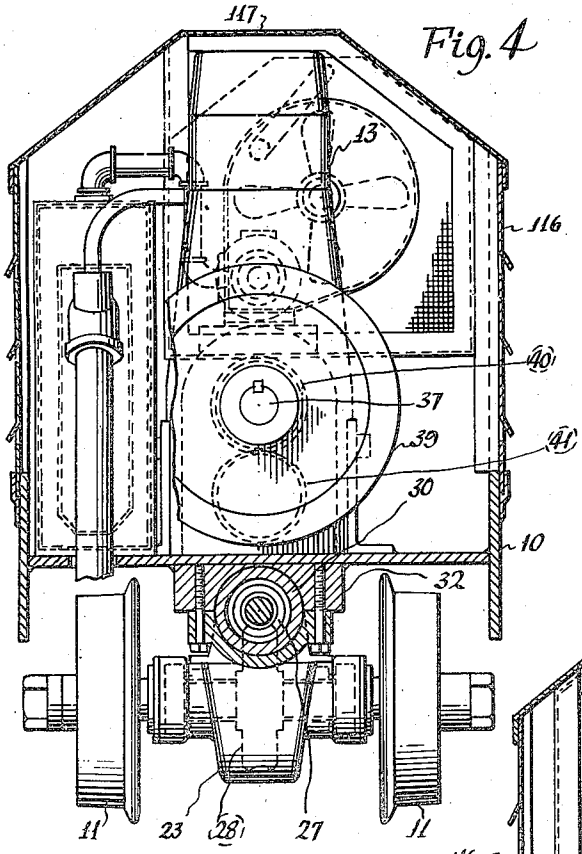


Fig. 5

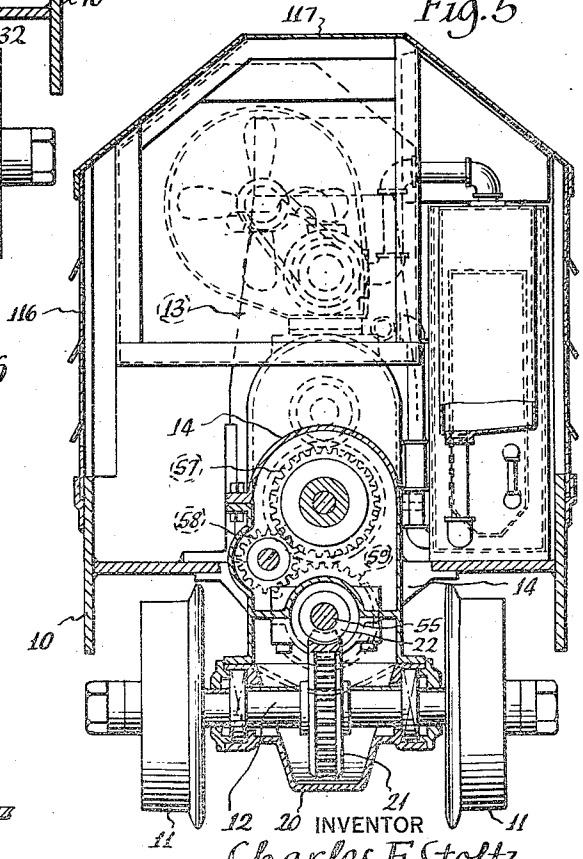
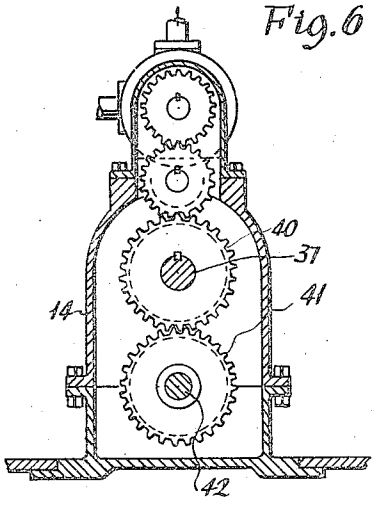


Fig. 6



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UNITED STATES PATENT OFFICE

2,292,303

MINE LOCOMOTIVE

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Application May 11, 1940, Serial No. 334,600

4 Claims. (Cl. 105—62)

This invention relates to improvements in mine locomotives and more particularly to improvements in a mine locomotive of the internal combustion type adapted for use in mines underground.

The principal objects of my invention are to provide a simple, compact, safe, and fool-proof locomotive for operation underground, adapted to be propelled by an internal combustion engine.

Another object of my invention is to provide such a locomotive having a novel and simple form of gear train so arranged that the locomotive may be reversed and speeds may be changed without the shifting of gears.

A further object of my invention is to provide a change speed reversible drive connection between an internal combustion engine and the track wheels of the locomotive, wherein the drive gearing and locomotive wheels are so arranged with respect to the engine that a worm and worm gear drive may be provided for driving all four track wheels, and the transmission between the drive engine and worm and worm gearing may include a compactly arranged pair of parallel spaced longitudinal shafts disposed parallel to the worm shafts.

A still further object of my invention is to provide a simplified and compact form of locomotive of the class described propelled by an internal combustion engine of the Diesel type and having the drive engine and drive gearing so arranged that a movable end cab of the locomotive may move over a part of the drive gearing, to shorten the length of the locomotive so it may be put in a mine cage and transferred from one level of the mine to the other.

Other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a view in side elevation of a mine locomotive constructed in accordance with my invention, with certain parts broken away and certain other parts shown in section;

Figure 2 is a top plan view of the device shown in Figure 1, with certain parts broken away and certain other parts shown in section;

Figure 3 is an enlarged partial longitudinal sectional view of the locomotive shown in Figure 1;

Figure 4 is an end view of the locomotive, drawn to a smaller scale than Figure 3 and with certain parts broken away and certain other parts shown in transverse section;

Figure 5 is an end view of the locomotive drawn to the same scale as Figure 4, but with certain other parts broken away and shown in transverse section than are shown in section in Figure 4; and

Figure 6 is a fragmentary transverse sectional view taken substantially along line 6—6 of Figure 3.

Like reference characters refer to like parts throughout the various figures.

Referring now in particular to the drawings, the mine locomotive includes generally a frame 10 mounted on track wheels 11, 11 and axles 12, 12. The locomotive is propelled by means of an internal combustion engine 13, preferably of the Diesel type, mounted at the forward end of said frame. A central portion of said frame, just rearwardly of said engine, is open to receive a transmission casing 14, for housing the reduction and drive gearing for the locomotive.

An end cab or compartment 15 for the operator is pivotally mounted on bearing bosses 16, 16, on opposite sides of said frame, on pivotal pins 17, 17, for vertical movement about an axis extending transversely of said frame, to permit said end cab to be folded upwardly over the locomotive frame so the entire locomotive may be placed in a mine cage and hoisted from one level of the mine to the other (see Figures 1 and 3). Said end cab is provided with a detachable bracket member 18 having a seat 19 mounted thereon. Said bracket member and seat may be removed when said end cab is folded upwardly over the locomotive frame.

The rear truck axle 12 is journaled in a lower half 20 of the transmission housing 14, which may be detachably secured to said upper half by means of the usual cap screws. A worm gear 21 is mounted on said axle, for driving said axle, and is meshed with a worm 22 journaled in said casing and extending longitudinally thereof.

The front truck axle 12 is journaled in the lower half 23 of a casing 24 for a worm 27 and worm gear 28, which serve to drive the front axle 12 and track wheels 11, 11. The upper half of said casing is provided with substantially cylindrical forward and rear ends 30 and 31 respectively, journaled in a split bearing member 32. Said bearing member is secured to the bottom of the frame 10 and forms a bearing support for the upper half of said casing, to permit tilting movement of the front axle about an axis extending longitudinally of the machine, so the locomotive may follow an uneven track.

Referring now in particular to the novel drive connection, for driving the worms 22 and 27 from the Diesel engine 13 at either a high or low speed and in reverse directions without the shifting of gears, said Diesel engine is provided with a longitudinally extending crank shaft 37 (see Figure 3). A flywheel 39 is mounted on the forward end of said crank shaft and a spur gear 40 is mounted on the rear end of said crank shaft. Said spur gear meshes with and drives a spur gear 41 on a parallel shaft 42, journaled in the transmission housing 14. A suitable friction

clutch 44 is provided to operatively connect the spur gear 41 with the shaft 42, for driving said shaft from said gear. Said clutch may be of any type well known to those skilled in the art, but for the purposes of simplicity is herein shown as being a friction cone clutch. A longitudinal shaft 45 extends coaxial with the crank shaft 37. Said shaft is journaled at one of its ends in the transmission casing 14 on a ball bearing 46 and at its opposite end in a hub 47 of the spur gear 40, on a ball bearing 48. A suitable clutch 49, herein shown as being a friction cone clutch, is provided to selectively connect the spur gear 40 with said coaxial shaft, for driving said shaft from said spur gear. A spur gear 50 is keyed on said coaxial shaft and meshes with and drives a spur gear 51 keyed on the longitudinal shaft 42, for driving said shaft from the shaft 45.

Hand levers 53 and 54 are provided to shift said clutches through a suitable linkage arrangement, which need not herein be described in detail, since it is no part of my present invention (see Figure 1). Said hand levers are interlocked in a suitable manner (not shown), to interlock the friction clutches 44 and 49 so that when one clutch is in an engaged position the other clutch will be in a disengaged position, to prevent the attempted driving of the shaft 42 from the gears 40 and 50 at the same time. The longitudinal shaft 45 may thus be driven at either a high or low speed under control of the friction clutches 44 or 49 without the shifting of gears.

A reverse drive connection is provided from the shaft 45 to a parallel shaft 55, upon which the worm 22 is mounted. As herein shown, said reverse drive connection includes a clutch member 56 journaled on its hub in the casing 14 and having a spur gear 57 keyed thereto. Said spur gear meshes with an idler pinion 58, which meshes with a spur gear 59, keyed on the shaft 55. A clutch member 60 is freely mounted on the longitudinal shaft 45, adjacent the rear end thereof. Said clutch member is journaled on its hub in the casing 14 and has a spur gear 61 keyed thereto. Said spur gear meshes with a spur gear 62 on the end of the shaft 55 opposite from the spur gear 59. Thus, when the clutch member 56 is driven from the shaft 45, the worm 22 will be rotated in one direction, and when the clutch member 60 is driven from said shaft, said worm will be rotatably driven in an opposite direction, in an obvious manner.

The clutch members 56 and 60 are herein shown as being of the friction cone type, for the purposes of simplicity. Oppositely facing frusto-conical clutch members 63 and 64 are feathered on the shaft 45, and are herein shown as being connected together so that only one of said clutches may be in engagement at a time. Said oppositely facing clutch members are adapted to engage the clutch members 56 and 60 respectively, for driving the locomotive in reverse directions, and are shifted by means of a hand lever 65 through a suitable linkage arrangement (not shown).

It will be observed that the friction clutches 56 and 60 are of relatively large diameter so that they can be employed for starting the locomotive, whereas the change speed clutches 44 and 49 are of much smaller size. This arrangement has proved of especial advantage in providing the desired compactness of design. The starting clutches 56 and 60 have relatively ample space above axle 12 and between their respective reversing gear trains, but the change speed clutches 44 and 49 are limited as to size and space in order that their respective shafts 42 and 45 may be disposed in close proximity to each other, and thus maintain the especially compact relationship of the entire drive mechanism. Accordingly, in the preferred form shown herein, the relatively large friction clutches 56 and 60 serve the dual purpose of reversing the direction of drive, and of starting the locomotive, while the smaller clutches 44 and 49 are primarily designed for changing speed without shifting of gears.

The drive connection from the worm 22 to the worm 27 includes a sleeve 67 journaled in the casing 14 and keyed to the forward end of the shaft 55. Said sleeve is internally splined and is adapted to engage the splined end of a shaft 68. The opposite end of the shaft 68 is likewise splined and is adapted to engage an internally splined sleeve 69, journaled in the casing 24 and keyed to a shaft 70 for the worm 27. A flexible coupling is thus provided between the worms 22 and 27, to provide a worm drive for all four wheels of the locomotive.

The means for braking the locomotive includes a brake drum 73 mounted on the shaft 68 and adapted to be engaged by a friction band 74. Said friction band is engaged with or disengaged from said brake band by means of a suitable system of levers through a hand lever 75 in a manner which need not herein be shown or described in detail, since it is no part of my present invention.

It will be seen from the foregoing that a simplified reversible plural speed drive connection has been provided for driving the locomotive, which includes a pair of parallel shafts extending longitudinally of the locomotive, one of which shafts is coaxial with the crank shaft for the drive engine, and that the locomotive speeds may be changed without the shifting of gears while either of the starting clutches 56 or 60 is in an engaged position, and that the direction of travel of the locomotive may be reversed while either of the change speed clutches 44 or 49 is in an engaged position. It may still further be seen that the gearing and speed changing and reversing arrangement is of a simplified and compact construction utilizing a minimum number of gears and shafts, and that worm and worm gear drive reductions may be provided to the track wheels with the braking means mounted on the shaft connecting the worms 22 and 27 together, so said braking means may take advantage of said worms in stopping the locomotive.

A cover 116 is provided for the entire locomotive to shield said locomotive from danger which might be caused by falling rocks. This cover is detachably connected to the sides of the frame 10 and is provided with a removable top 117. Said top has a central horizontal portion extending just above the top of the motor and radiator and has inclined sides to permit the locomotive to clear ore chutes which might be present in the mine.

While I have herein shown and described one form in which my invention may be embodied, it will be understood that the construction thereof and the arrangement of the various parts may be altered without departing from the spirit and scope thereof. Furthermore, I do not wish to be construed as limiting my invention to the specific embodiment illustrated, excepting as it may be limited in the appended claims.

I claim as my invention:

1. In a narrow gauge short wheel base mine locomotive, a frame mounted on track wheels and axles, a motor mounted on said frame over one of said axles and having a longitudinally extending drive shaft, constant mesh transmission connections between said motor drive shaft and said axles comprising a shaft coaxial with said drive shaft, a parallel shaft, change speed gear connections between said drive shaft and said parallel shaft including a spur gear on said coaxial shaft, a clutch connecting said spur gear with said drive shaft, a spur gear on said parallel shaft meshing with said first named gear, a gear on said drive shaft, and another spur gear on said parallel shaft meshing therewith, and a clutch connecting said last named spur gear with said last named shaft whereby said parallel shaft may be driven at different speeds, said parallel shaft being extended longitudinally over the second axle and having reverse gearing driven by said parallel shaft including a pair of aligned friction clutches on the latter shaft, a worm shaft disposed below said parallel shaft having worm drive connection with said second axle, a gear train connecting one of said last named friction clutches with said worm shaft disposed on one side of said worm drive connection with said second axle, and a second gear train connecting the other of said friction clutches with the said worm shaft on the other side of said worm gear connection for driving said second axle in reverse direction, a second worm shaft for driving said first named axle arranged coaxially with said first named worm shaft, and a horizontally extending drive connection between said worm shafts whereby both of said axles will be driven simultaneously.

2. In a narrow gauge short wheel base mine locomotive, a frame mounted on track wheels and axles, one of which axles is swiveled on a longitudinally extending axis for lateral tilting movement, a motor mounted on said frame over said swiveled axle and having a longitudinally extending drive shaft, constant mesh transmission connections between said motor drive shaft and said axles comprising a shaft coaxial with said drive shaft, a parallel shaft, change speed gear connections between said drive shaft and said parallel shaft including a spur gear on said coaxial shaft, a clutch connecting said spur gear with said drive shaft, a spur gear on said parallel shaft meshing with said first named gear, a gear on said drive shaft and another spur gear on said parallel shaft meshing therewith, and a clutch connecting said last named spur gear with said last named shaft whereby said parallel shaft may be driven at different speeds, said parallel shaft being extended longitudinally over the second axle and having reverse gearing driven thereby including a pair of aligned friction clutches thereon, a worm shaft disposed below said parallel shaft coaxial with the swiveling axis of said first named axle and having worm drive connection with said second axle, a gear train connecting one of said last named friction clutches with said worm shaft disposed on one side of said worm drive connection with said second axle, and a second gear train connecting the other of said friction clutches with said worm shaft on the other side of said worm gear connection, for driving said axle in reverse direction, a second worm shaft for driving said swiveled axle arranged coaxially with the swiveling axis of the latter, and a flexible horizontally extending drive connection between said worm shafts whereby both of said axles will be driven simultaneously.

3. In a narrow gauge short wheel base mine locomotive, a frame mounted on track wheels and axles, a motor mounted on said frame over one of said axles and having a longitudinally extending drive shaft, constant mesh transmission connections between said motor drive shaft and said axles comprising a shaft coaxial with said drive shaft, a parallel shaft, change speed gear connections between said drive shaft and said parallel shaft including a spur gear on said coaxial shaft, a clutch connecting said spur gear with said drive shaft, a spur gear on said parallel shaft meshing with said first named gear, a gear on said drive shaft, and another spur gear on said parallel shaft meshing therewith, and a clutch connecting said last named spur gear with said last named shaft whereby said parallel shaft may be driven at different speeds, said parallel shaft being extended longitudinally over the second axle and having reverse gearing driven by said parallel shaft including a pair of aligned friction clutches on the latter shaft, a worm shaft disposed below said parallel shaft having worm drive connection with said second axle, a gear train connecting one of said last named friction clutches with said worm shaft disposed on one side of said worm drive connection with said second axle, and a second gear train connecting the other of said friction clutches with the said worm shaft on the other side of said worm gear connection for driving said axle in reverse direction, a second worm shaft for driving said first named axle arranged coaxially with said first named worm shaft, and a horizontally extending driving connection between said worm shafts whereby both of said axles will be driven simultaneously, and said motor drive shaft, parallel shaft, and worm shafts all having their respective axes arranged at progressively lower levels within substantially the same vertical plane.

4. In a narrow gauge short wheel base mine locomotive, a frame mounted on track wheels and axles, a motor mounted on said frame over one of said axles and having a longitudinally extending drive shaft, constant mesh transmission connections between said motor drive shaft and the other of said axles comprising a shaft coaxial with said drive shaft, a second shaft, change speed gear connections between said drive shaft and said second shaft including two relatively small alternately engageable clutches, said second shaft being extended longitudinally over the second axle and having reverse gearing driven from said second shaft including a pair of relatively large friction starting clutches on the latter shaft having a common intermediate shifting member, a worm shaft disposed below said second shaft having worm drive connection with said second axle, a gear train connecting one of said last named friction clutches and the adjacent end of said worm shaft, and a second reversing gear train connecting the other of said friction clutches with the opposite end of said worm shaft, said last-named friction clutches being disposed in the space between the two reversing gear trains and above the said worm drive connection with the second axle and each being of sufficient size to start the locomotive.

CHARLES E. STOLTZ.