March 26, 1940. W. F. ECKERT 2,194,929

LOCOMOTIVE

Filed April 29, 1938 4 Sheets-Sheet 1

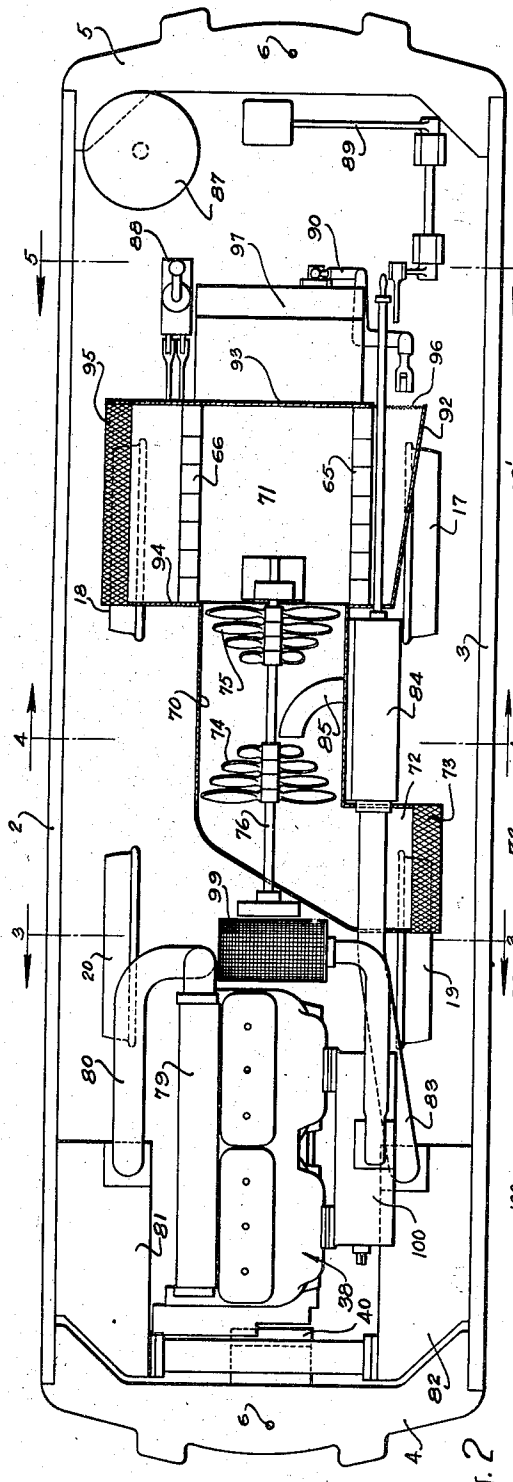

Fig. 2

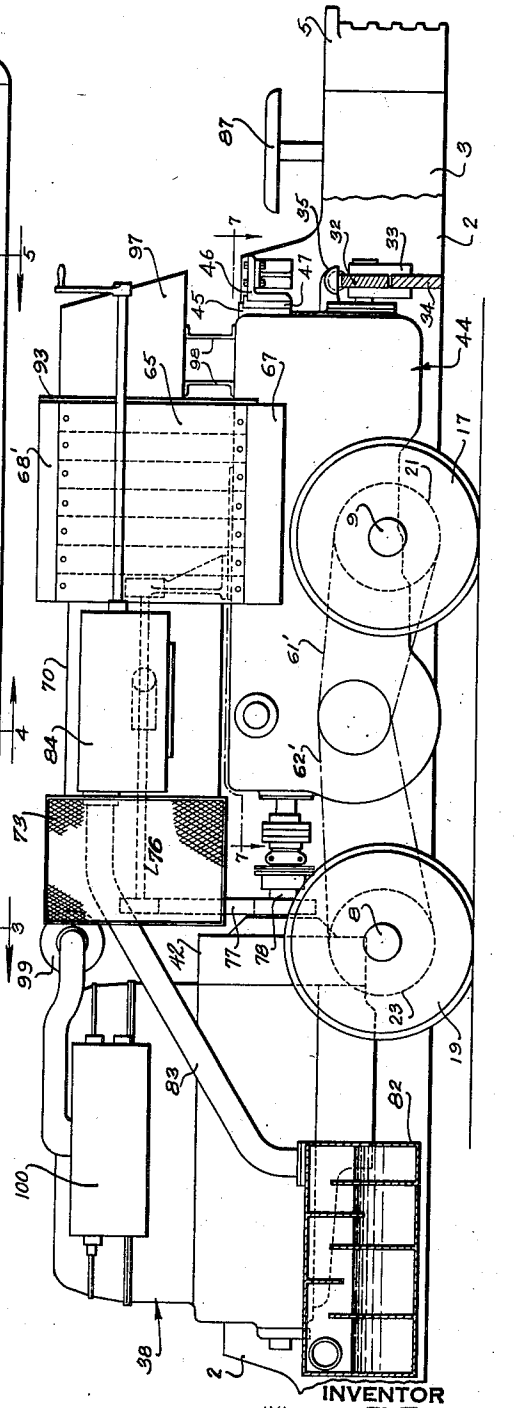

Fig. 1

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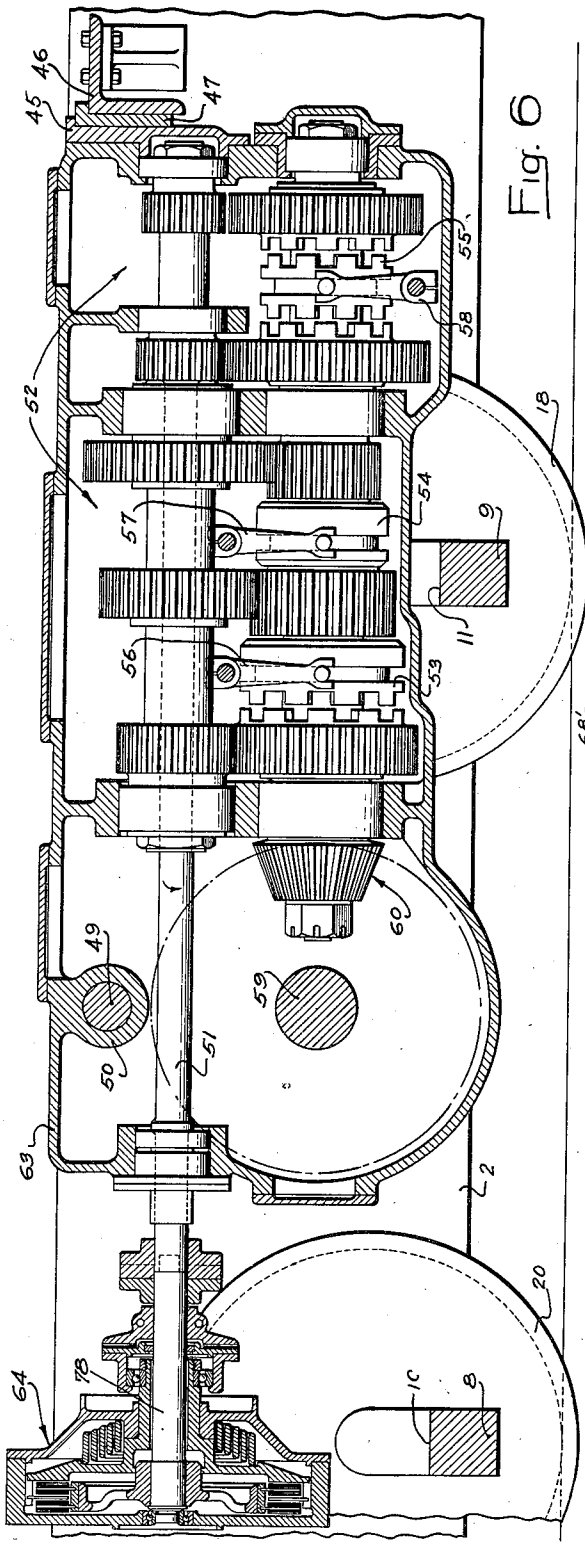

Fig. 6

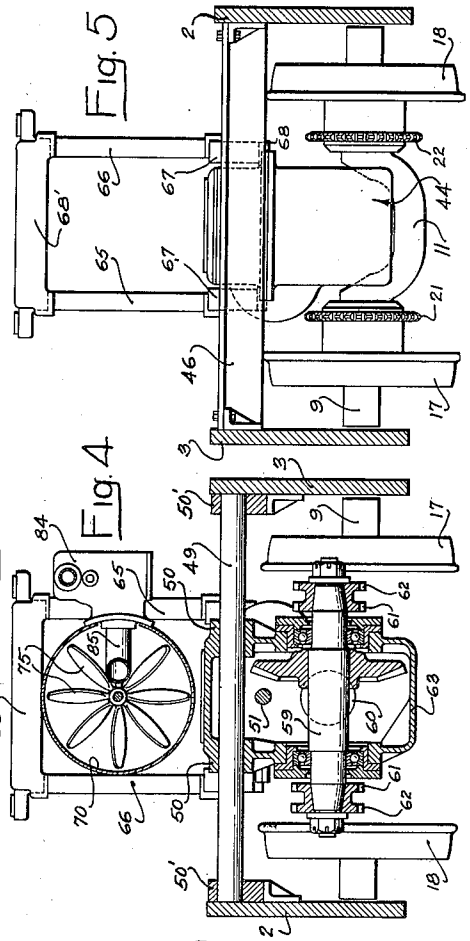

Fig. 5

Fig. 4

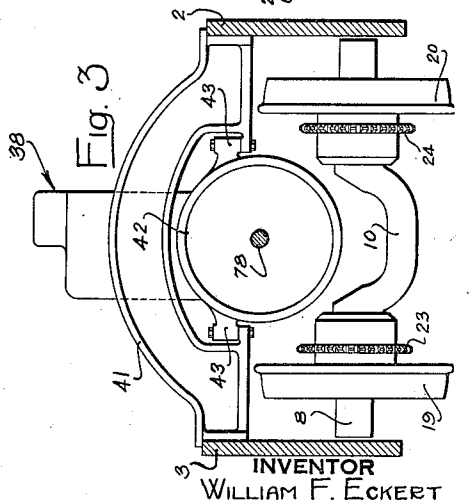

Fig. 3

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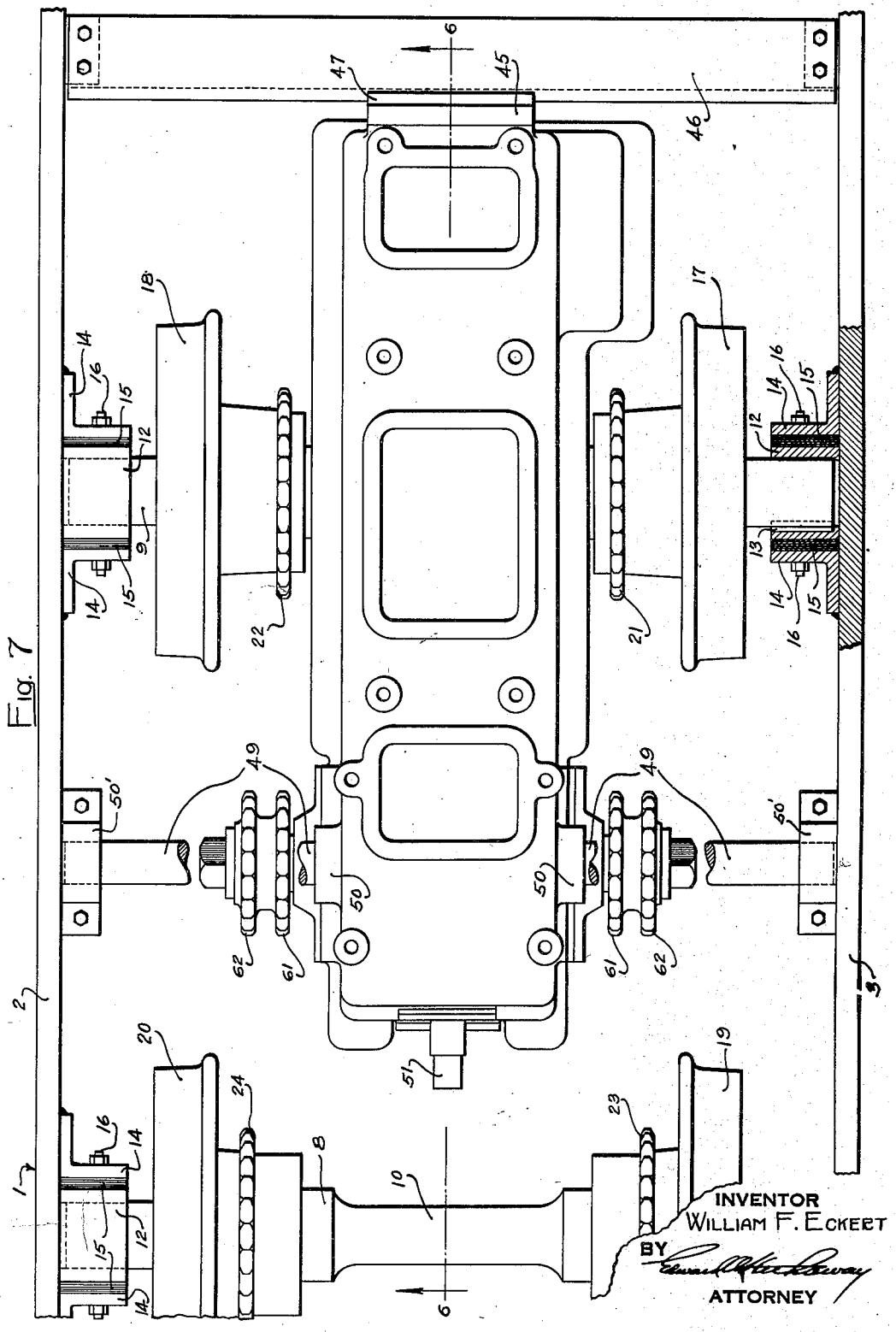

Fig. 7

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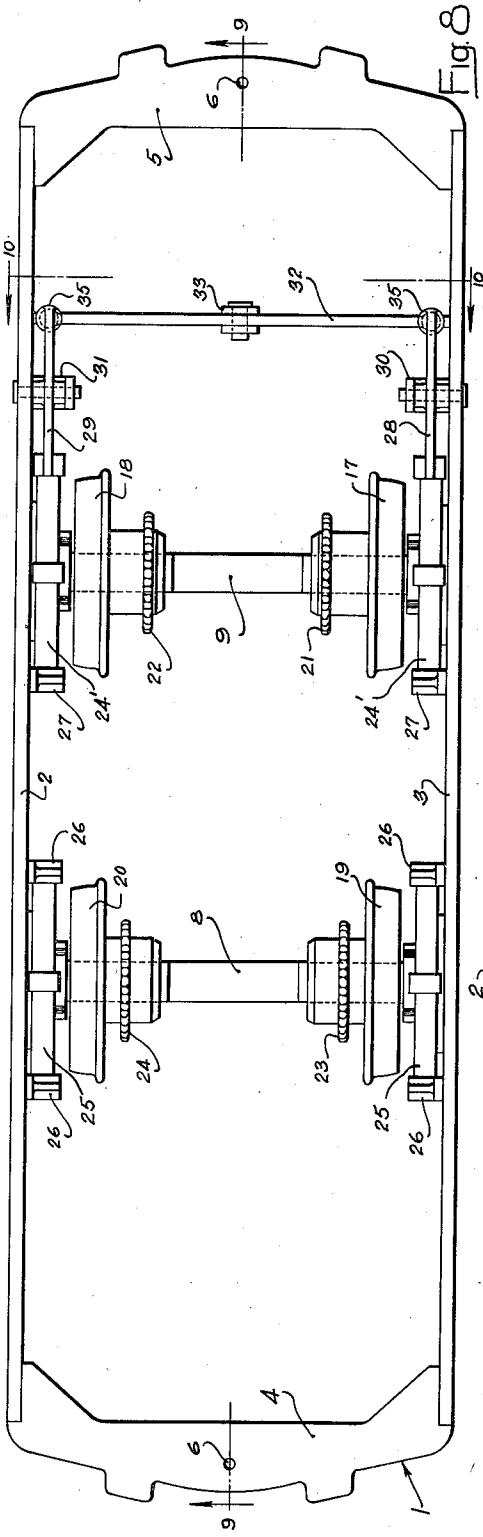

Fig. 8

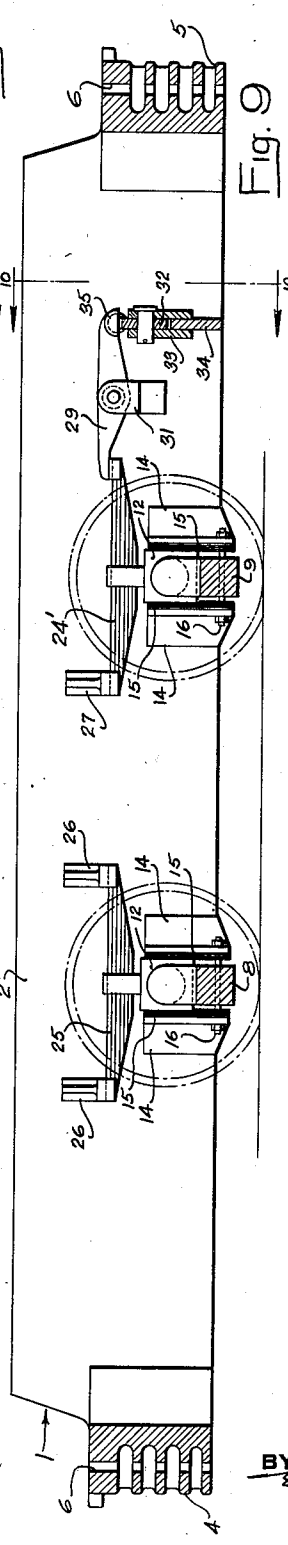

Fig. 9

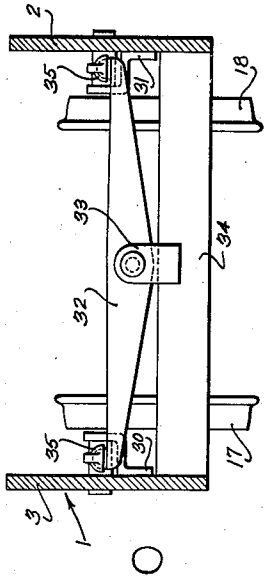

Fig. 10

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UNITED STATES PATENT OFFICE

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LOCOMOTIVE

William F. Eckert, Ridley Park, Pa.

Application April 29, 1938, Serial No. 205,058

12 Claims. (Cl. 105—62)

This invention relates to internal combustion engine mine locomotives particularly of the Diesel engine type.

Various types of internal combustion engine mine locomotives have been heretofore proposed and used, but the same have been deficient in a great many respects such as being excessively costly and lacking in compactness, flexibility and ease of operation, or the parts have been inaccessible for convenient inspection or repair.

It is one object of my invention to provide an improved internal combustion engine mine locomotive in which the various parts are so constructed and arranged as to insure maximum functional and structural cooperation for obtaining maximum compactness and ruggedness of the locomotive while at the same time permitting such parts to be readily accessible for inspection or repair and for allowing the control equipment to be arranged in a convenient manner. A further object is to provide an improved combination and arrangement that is conducive to economical manufacture, maintenance and operation together with a high degree of flexibility of operation but without sacrifice of maximum tractive effort.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a side elevation of my improved locomotive with certain parts in section to show details of construction;

Fig. 2 is a plan view of Fig. 1 with certain other parts shown in section;

Figs. 3, 4 and 5 are sections taken respectively on lines 3—3, 4—4 and 5—5 of Fig. 2, the pedestals and springs being omitted for clarity;

Fig. 6 is a longitudinal section through the transmission taken substantially on a vertical plane indicated by line 6—6 of Fig. 7;

Fig. 7 is a plan view of the transmission, wheels and that portion of the locomotive frame associated with the transmission and wheels, certain parts being omitted for clarity and the whole taken substantially on a line 7—7 of Fig. 1;

Fig. 8 is a plan view of the locomotive frame, wheels and spring equalizing system;

Fig. 9 is a longitudinal section taken on the line 9—9 of Fig. 8;

Fig. 10 is a transverse section taken on the line 10—10 of Figs. 8 and 9.

In the particular embodiment of the invention, such as is disclosed herein merely for the purpose of illustrating one specific form among possible others that the invention might take in practice, I have provided a frame 1, Figs. 8, 9 and 10, having relatively deep side sills 2 and 3, formed preferably of plate steel, and relatively heavy cast end sills 4 and 5 of less depth than the side sills. The end sills are of any suitable form having a coupling pin opening 6 and are suitably riveted, welded or otherwise secured to the side sills. A front and rear pair of non-rotatable axles 8 and 9 have their central portions 10 and 11 dropped to accommodate respectively a transmission and a portion of the engine equipment as hereinafter described. The ends of the axles, Fig. 7, have pedestal blocks 12 non-rotatably secured thereto by keys 13 and slidably guided in a simple angle iron type of pedestal guides 14. These angle irons are welded to the inner surfaces of side sills 2 and 3. To adjust the longitudinal positions of the axles as well as to compensate for the wear or tightening of the drive chains to be described later, a series of shims 15 are interposed between the angle irons and each side of the pedestal block 12. Keeper bolts 16, Figs. 7 and 9, pass beneath the pedestal blocks and connect the lower portions of the pedestal guides and shims. Freely journalled upon each axle are two pairs of wheels 17, 18, 19 and 20 having relatively large hubs to which sprockets 21, 22, 23 and 24 are secured.

As shown in Figs. 8 to 10, the frame is carried on the axles through sets of main springs 24' and 25 which are supported on each of the pedestal blocks 12, the ends of springs 25 being engaged by lugs 26 secured to the inner surfaces of side sills 2 and 3. The rear springs 24' have their forward ends engaged by lugs 27 similarly secured to side sills 2 and 3 while the rear ends of springs 24' are engaged by a pair of longitudinal equalizing beams or lever arms 28 and 29 pivotally supported in brackets 30 and 31 secured to the inner surfaces of the side sills. A transverse equalizing beam 32 is pivotally supported in a bracket 33 secured to a cross frame member 34, the outer ends of the equalizing beam 32 having ball seat connections 35 with the rear ends of equalizing levers 28 and 29. This arrangement, as described later, permits maximum utilization of the frame length with a minimum length spring by allowing the transmission to overhang the rear axle by a substantial amount.

A water cooled internal combustion engine generally indicated at 38, preferably of the Diesel type although it can be of the gasoline type, is supported, Fig. 2, at its front end on a horizontal

ledge or bracket 40 projecting inwardly from the forward end sill 4 while the rear end of the engine is supported, Fig. 3, by an arched cross member 41 secured to side sills 2 and 3. This arched member overlies the rear portion of the engine structure such as the clutch housing 42 and has inwardly projecting lugs upon which engine arms are supported as generally indicated at 43. This arrangement insures maximum vertical compactness of the engine relative to the frame and axles.

A transmission generally indicated at 44 overlies axle 9 and substantially equally overhangs the same on opposite sides thereof. The transmission as shown in Figs. 5 and 6 extends down into the depressed central portion 11 of the rear axle. To support the transmission in its lowered position, the rear end of the transmission housing has as shown in Figs. 6 and 7 a flange 45 supported on a transversely extending angle iron 46. A spacing member 47 of any suitable thickness is interposed between flange 45 and angle iron 46, thereby providing a convenient and effective means to compensate for small variations in the dimensions of the various frame parts. The forward end of the transmission is supported by a cross rod 49, Figs. 4, 6 and 7, extending through suitable bosses 50 formed as part of the transmission casing, the outer ends of the rod being supported in brackets 50' which are secured to the inner surfaces of the side sills 2 and 3.

The transmission per se does not constitute a part of my present invention, but in so far as the operation of the transmission enters the present combination it will suffice to state that it has a longitudinally extending driven shaft 51 connectible through a series of selective speed and reversing gears generally indicated at 52 and adapted to be rendered selectively operative by positive tooth clutches 53, 54 and 55 controlled respectively by shipper arms and shafts 56, 57 and 58. The shaft which carries clutches 53 and 54 drives a transverse jackshaft 59 through a bevel pinion and gear generally indicated at 60. This jackshaft, specifically shown as immediately below rod 49 which supports the transmission, carries on each of its outer ends a pair of rear wheel driving sprockets 61 and front wheel driving sprockets 62, Fig. 4. Suitable chains, Fig. 1, diagrammatically indicated at 61' and 62' connect the driving sprockets with the wheel sprockets 21–24, Fig. 7. The transmission shaft 51 is connected to the engine through a clutch of any suitable type specifically shown as a disc clutch 64.

The foregoing arrangement of transmission and supporting elements allows jackshaft 59 to lie substantially in the same horizontal plane with the wheel axes and also allows the transmission housing 63 to lie substantially between horizontal planes containing the upper and lower edges of side sills 2 and 3. Hence this improved arrangement is not only conducive to maximum functional cooperation between the jackshaft and wheels in transmitting power thereto but also insures maximum compactness which is so vital in mine equipment. These features are accomplished together with having the operating parts and gears of sturdy size and construction.

To accomplish further compactness and ruggedness, I utilize the transmission housing for supporting a pair of radiators 65 and 66 for cooling the engine jacket water. Lower radiator headers 67 are supported upon casing flanges 68, which provide the longitudinal parting line of the transmission casing, while an upper header 68' connects the upper ends of the radiator cores 65 and 66. The headers are connected with the usual cylinder water jackets of engine 38. It will be seen from Fig. 1 that the header 68' defines the uppermost limit of the locomotive and lies substantially in a horizontal plane containing the top of engine 38.

To utilize the space between the radiator structure above described and the engine, and at the same time effectively circulate cooling air over the radiator cores 65 and 66 and also dilute the engine exhaust gases, I have provided as shown in Figs. 1, 2 and 4 a longitudinal blower passage 70 communicating at its rear end with a central space 71 between the radiator cores or sections 65 and 66 while the other end of passage 70 has a laterally extending outlet 72 covered with a screen 73 for excluding foreign matter. A pair of blowers 74 and 75 are secured to a shaft 76 which is driven by a belt 77, Fig. 1, from the engine shaft 78. Exhaust gases from the engine are discharged into an exhaust manifold 79 and thence through a pipe 80, flame extinguishing tanks 81 and 82, and a pipe 83 to a labyrinth passage structure 84 which discharges through a pipe 85 into blower passage 70 in the direction of air flow therethrough. The blowers 74 and 75 draw air laterally inwardly over radiator sections 65 and 66 and thence through passage 70, Fig. 2, to discharge the cooling air and exhaust gases through outlet 72. The specific construction and operation of the labyrinth 84 as well as the flame extinguishing tanks 81 and 82 are described in my other application, Serial No. 199,312, filed March 31, 1938. To reduce the possibility of exhaust gases being recirculated from outlet 72 back over the radiator section 65, a shield 92 is located alongside of radiator section 65 thereby causing the main body of air to be drawn from the rear of section 65 and from the side of radiator section 66. This arrangement also insures that the operator located on seat 87 will always be in the path of fresh air such as flows to the radiator. A vertical wall 93 closes the rear of chamber 71 and extends laterally at one side, as does a forward wall 94, to support a suitable screen 95 through which all air to radiator 66 must flow. Another screen 96 connects wall 93 and shield 92 for air flowing to radiator 65. An engine fuel tank 97 is located behind wall 93 and is supported upon the transmission 44 by channels 98. An air cleaner 99, provided for the engine intake manifold 100, is transversely located between the engine and blower passage 70.

The foregoing combination of elements forming my improved locomotive allows the various control levers for the engine and transmission clutches to be conveniently located entirely to the rear of the locomotive whereby an operator seated upon a seat 87 at one corner of the locomotive frame may operate the locomotive as well as have a full view to the front and sides of the locomotive. The various control handles and levers for the clutches or brake system are generally indicated at 88, 89 and 90, Fig. 2. Inasmuch as the details of construction of these elements and their connecting links with the specific clutches do not constitute a part of my invention per se, the foregoing description will suffice.

From the disclosure herein it is seen that I have provided an extremely compact and rugged internal combustion engine locomotive that is especially useful for mine operation wherein sharp

curves, low head space and rough road bed conditions are encountered as part of the normal operation. My improved arrangement insures maximum cooling of the radiators and yet reduces to a minimum any possibility of subjecting an operator of the locomotive to the heat of the exhaust gases.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A locomotive comprising, in combination, a frame, wheels and axles therefor one of which has a stationary dropped central portion, a gear transmission supported by said frame centrally thereof and having a longitudinal casing whose lower wall extends into said dropped axle portion but is above the axle thereof, driving connections extending longitudinally from one end of the transmission to said wheels, and an internal combustion engine supported by said frame and connected to said transmission.

2. A locomotive comprising, in combination, a frame, a plurality of wheels and axles therefor, a transmission supported by said frame, driving connections from said transmission to said wheels, a water cooled internal combustion engine supported by said frame and connected to said transmission, and a radiator supported directly by said transmission for cooling the engine water, said radiator having upwardly extending core sections supported on opposite sides of said transmission.

3. A locomotive comprising, in combination, a frame, a plurality of wheeled axles therefor, a transmission supported by said frame, driving connections from said transmission to said wheels, a water cooled internal combustion engine supported by said frame and connected to said transmission, a radiator supported by said transmission for cooling the engine water, said radiator having upwardly extending core sections supported on opposite sides of said transmission, and means for circulating air over said radiator sections and discharging said air at a point forwardly of the radiator.

4. A locomotive comprising, in combination, a frame, wheels and axles therefor for supporting said frame, a transmission supported by said frame and having driving connections with said wheels, a water cooled internal combustion engine supported by said frame and connected to said transmission, a radiator supported adjacent said transmission for cooling the engine water, means including a longitudinal air flow passage and a blower therein overlying said transmission and disposed between said radiator and engine for circulating cooling air over said radiator, and an engine exhaust pipe discharging into said longitudinal flow passage.

5. A locomotive comprising, in combination, a frame, wheels and axles therefor, a water cooled internal combustion engine supported by said frame, power transmission means between said engine and wheels, a radiator disposed rearwardly of said engine for cooling the engine water, a longitudinally extending air flow passage overlying said transmission and disposed between said radiator and engine, and rotatable blower mechanism disposed within said passage for circulating air over said radiator and through said passage to be discharged forwardly and laterally of the radiator.

6. A locomotive comprising, in combination, a frame, wheels and axles therefor, pedestal blocks and guides for non-rotatably supporting but vertically guiding at least one of said axles with respect to said frame, longitudinal springs on each side of said frame for supporting the same on said pedestal blocks, a transverse equalizing beam operatively connecting the rear end of said springs, a transmission supported over said non-rotatable axle and overhanging the same to a point adjacent said transverse equalizing beam, driving connections between said transmission and said wheels, and an internal combustion engine connected to said transmission.

7. The combination set forth in claim 6 further characterized by the provision of longitudinally extending equalizing lever arms located adjacent the frame sides and interposed between said transverse equalizing beam and said springs, thereby to allow said transmission to appreciably overhang said non-rotatable axle.

8. A locomotive comprising, in combination, a frame, wheels and axles therefor, a gear transmission having a casing, a transverse rod secured to said frame and extending through said transmission casing, said transmission having a jackshaft located in a plane below said rod, driving connections from said jackshaft to said wheels, and an internal combustion engine connected to said transmission.

9. A locomotive comprising, in combination, a frame having a forward end and a rearward end at which the operator is normally positioned, wheels and axles therefor, a water cooled internal combustion engine supported by said frame at its forward end, power transmitting means between said engine and wheels, an engine water cooling radiator disposed at the rear end of said frame adjacent the operator's position, a longitudinal air flow passage extending from said radiator forwardly to said engine and being disposed between the same, and a rotatable blower associated with said passage for circulating fresh air from a point adjacent the operator's position and thence over said radiator and discharging the air forwardly through said longitudinal passage whereby heat dissipated from the radiator is carried away from the operator's position while fresh air is circulated adjacent the same.

10. The combination set forth in claim 9 further characterized in that said engine and radiator substantially define the height of said locomotive and said longitudinal passage is contained within such height.

11. The combination set forth in claim 9 further characterized by the provision of an exhaust labyrinth device located adjacent to the side of said longitudinal passage and discharging into the same whereby the heat of the radiator and the exhaust gases are dissipated within the cooling air and carried away from the operator's position.

12. A locomotive comprising, in combination, a frame, wheels and axles therefor, a water cooled internal combustion engine supported by one end of said frame, power transmitting means between said engine and wheels, a lateral air flow radiator disposed at the other end of said frame for cooling the engine water, a longitudinally extending air flow passage disposed between said radiator and engine, and a rotatable blower disposed in said longitudinal passage for circulating air laterally over said radiator and then longitudinally through said passage.

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