Dec. 2, 1941. W. J. BESLER 2,265,096

GEARED LOCOMOTIVE

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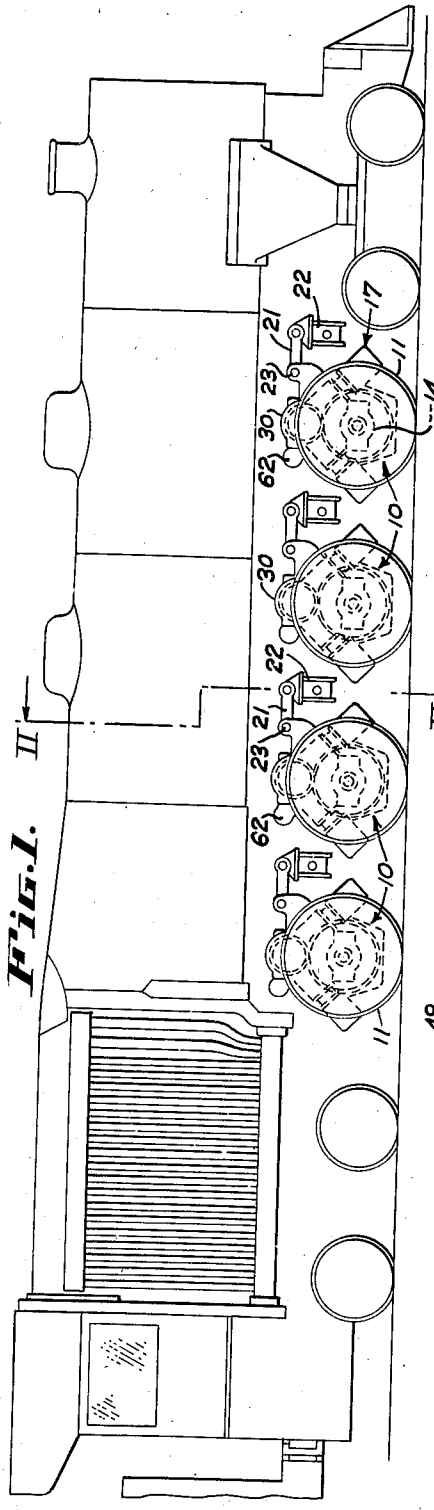

Fig. 1.

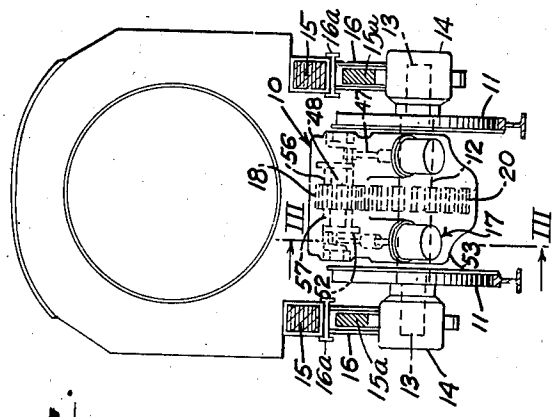

Fig. 2.

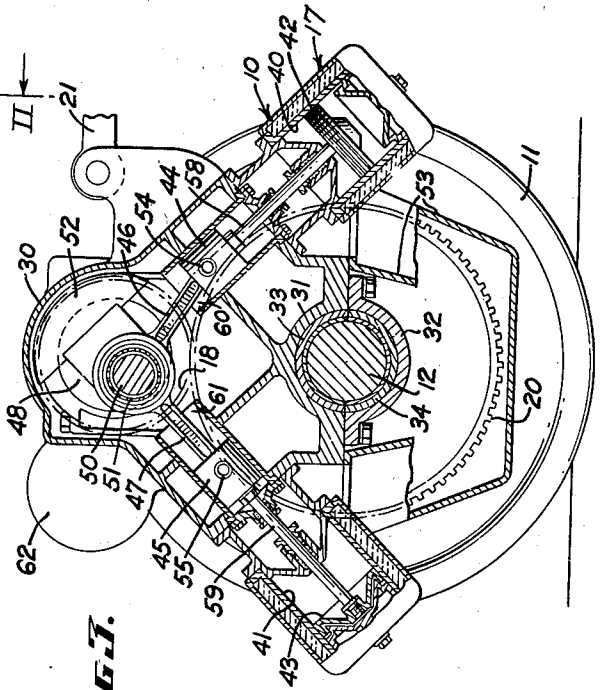

Fig. 3.

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GEARED LOCOMOTIVE

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8 Claims. (Cl. 105—37)

This invention relates to steam locomotives and more particularly to locomotives employing a plurality of steam driven engines disposed upon and driving individual traction axles.

Among the objects of the present invention is the provision of a locomotive of high horse power which will be free from exposed working parts.

Another object of the invention is to provide a steam locomotive which will have its totally enclosed working parts operating in a bath of oil.

Another object of this invention is to provide a steam locomotive which will eliminate outside connecting rods and unbalanced reciprocating parts preventing, among other things, the customary vibration.

A further object of this invention is to provide a steam locomotive in which the driving axles are independently powered.

Another object of the present invention is to provide a steam locomotive with separately powered axles that will allow each individual driving axle to have a restricted lateral motion with respect to the main frame and permit a floating of the axles so that the effective rigid wheel base will be minimized if not entirely eliminated.

A further object of this invention is to provide a steam locomotive having the main locomotive frame outside of the wheels to provide a better balance for the locomotive in taking curves at a high speed.

An object of the present invention is to provide a steam locomotive with main side frames and springs outside the driving wheels so that better riding and greater stability will result.

Another object of the present invention is to provide a steam locomotive of the type and design herein disclosed, wherein the journal boxes for each individual axle are mounted on the frame outside of the wheels and wherein the engines are mounted on, ride with and take alignment from each of the driving axles.

Another object of this invention is to provide a locomotive with geared type steam engines of the novel characteristics herein described and at the same time eliminating all unbalanced dynamic forces thereby preventing the present difficulties resulting from "track hammer" which is generally known to be produced by such unbalanced dynamic forces.

An object of the present invention is to provide a locomotive with a plurality of steam driving engines having the effect and characteristics of a smooth continuous torque and high tractive effort which will give the steam locomotive the approximate balance and torque characteristics of an electric locomotive.

An object of this invention is to provide a steam locomotive which will have the smooth high tractive effort of an electric locomotive and to provide railroads with a steam locomotive power at a fraction of the cost of electrification.

Another object of this invention is to provide a locomotive which, by its characteristics of outside main side frames, elimination of reciprocating parts and the like will lend itself to the application of protective sheathing and so clean up the appearance of the conventional locomotive. Furthermore a locomotive of the type herein described is particularly adapted to the application of streamline design.

Another object of this invention is to provide a steam locomotive with a plurality of driving engines which will be identical and interchangeable so that for engine repairs any or all of the engines may be removed, replaced, and repaired with interchangeable units.

Another object of the invention is the provision of an engine which is balanced on each side —in the horizontal plane—thus bringing the center of weight directly above the axis of the axle and so imposing no load on the engine frames except such as is imposed through the torque bar.

Still another object of the present invention is the provision of a steam locomotive having a plurality of driving units each of which is connected to the main frame only by means of the drive axle bearing and a torque bar.

Further objects are to provide a construction of maximum simplicity, economy, ease of assembly and such further objects, advantages and capabilities as will later more fully appear and as are inherently possessed thereby.

The invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying single sheet of drawings and while there is shown therein a preferred embodiment it is to be understood that the same is capable of modification and change, and comprehends other details and constructions without departing from the spirit or the scope of the present invention.

Referring now to the drawing:

Fig. 1 represents a diagrammatic view of the conventional steam locomotive in side elevation with the water tube type fire box. The four driving wheels are shown in position with the main side frames and journal saddles and boxes removed.

Fig. 2 is a sectional view taken on the line II—II of Fig. 1 illustrating the position of the driving engines between the wheels and the mounting thereof on the axle and showing the main side frames and journal boxes.

Fig. 3 is a vertical section taken on the line III—III of Fig. 2 and looking in the direction of the arrows.

Referring now more particularly to the drawing:

In Fig. 1 there is illustrated in diagrammatic form a more or less conventional locomotive but with the individual driving units positioned below the engine frame in their relative respective positions to fully illustrate the invention herein. The drive units are designated generally by the numeral 10. The unit comprises a pair of driving wheels 11 and an axle 12 whose outer extensions 13 permit journaling in journal boxes 14 and an engine generally indicated as 17.

The journal boxes are sprung to the locomotive frame through saddle 16, rocker pins 16a and leaf springs 15. The main side frame is shown as 15a and may include a binder member (not shown) running between depending portions of the main side frame 15a and under the journal 14 in the conventional manner. The axle 12 is so journaled in the journal boxes 14 as to permit free transverse or lateral movement—but with restricted scope—which is particularly advantageous and desirable in negotiating curves. This axle mounting in the journal boxes 14 may be uniform for each of the individual driving units so that the amount of free lateral or transverse movement is substantially equal in each. However, it has been found desirable in certain instances to further restrict the lateral movement on the center or intermediate units where the greater lateral movement is not required for the accommodation of curves and the like. When mounted in this manner the axle may be said to float its journaling. With each individual driving axle mounted for individual operation it is readily seen that the effective rigid wheel base of the conventional locomotive is itself substantially done away with and may be said to exist in the present structure only insofar as the center units may be restricted in their lateral movement as compared with the lateral movement of the end units. With this individual mounting of each drive axle it is possible to use high speed locomotives over all of the divisions of a railroad even through mountainous sections where the curves are frequent and sharp. The outside journal boxes 14 are preferably oil lubricated not only to insure proper lubrication at high speeds but constant lubrication in all positions of the lateral movement of the axle.

Mounted on the axle 12 between the drive wheels 11 there is shown a V-type four cylinder reciprocating steam engine 17 with depending cylinders. The engine 17 is geared directly to the drive axle 12 by means of gear 18 and gear 20 mounted in the median portion of the axle 12. The engine shown for each drive unit has four cylinders arranged in V-pairs disposed on either side of the driving gears 18 and 20. Because of their depending position the entire engine assembly is balanced in position on each side of the axle imposing no load on the engine frame except the fore and aft torque of the torque bar or link 21 which is fastened in any suitable manner to the cross member 22 which latter is attached to the main frame structure of the locomotive. The torque bar is fastened to the engine housing 30 at 23 in any suitable manner and not only holds the engine in position but forms the only direct attachment of the engine to the main frame of the locomotive. This assembly and positioning of the engine completely balances the engine on the axle 12 and does away with any unbalanced dynamic forces in the drive assembly such as the drive rods of the conventional steam locomotive. Thus there is provided a locomotive with separate power units which is arranged for a constant torque propulsion.

The engine 17 and the manner of its mounting is best understood by reference to Fig. 3 where for convenience two cylinders only are sectioned to show the operation. The entire engine assembly is enclosed within an outer housing member 30 and an inner housing member 31 which fits over the axle 12 and is directly carried by the said axle. The housing members 30 and 31 are further positioned on the axle 12 and the entire engine assembly held in place by housing member 32 which is secured in any suitable way to the inner housing member 31. Suitable axle bearing members 33 and 34 are provided on the inner faces of housing members 31 and 32. Thus it is readily seen that the engine is mounted on, rides on and takes its alignment from the axle 12. This also accomplishes and makes possible an engine mounting having a housing 30 entirely surrounding all of the moving parts including the axle 12.

As further shown in Fig. 3 the engine cylinders 40 and 41 are disposed on opposite sides of the longitudinal center of the axle 12 and in a plane at right angles to the axis of rotation. The engine itself may generally be described as having the cylinders 40 and 41 which are positioned and shaped to become a part of the housing 30 with piston heads 42 and 43 secured in the customary manner to cross-heads 44 and 45 transmitting motion to the connecting rods 46 and 47, which are mounted on a shaft 48 by a flying crank 50 with suitable bearings 51 for each. Shaft 48 is suitably journaled in the sides of the housing member 30. The crank 50 has a counterweight 52 to insure smooth, even operation and to maintain the thoroughly balanced operation. Each cylinder has two power impulses for each revolution, therefore the four cylinders for each power unit shown in the drawing will have eight power impulses per revolution.

Inside the housing 30 and positioned below the driving gear 20 and the axle 12 is an oil pan 53. The gear 20 operates constantly in a bath of oil maintained in this pan and as it rotates it carries lubricating oil from the pan to the gear 18 mounted on the shaft 48. At the point where the gears 20 and 18 mesh, lubricating oil is distributed throughout the working parts of the engine. For example some of the oil carried by gear 20 is transferred to gear 18 and by gravity the oil is carried to bearings 56 and 57 and along shaft 48. From there oil is carried to the crank 50 and into the journaling of the shaft. Since the interior of the engine housing is, to a large extent, open and communicating, the splash of the oil constantly squeezed out at the point of meshing will also serve to furnish oil for lubrication as above. In addition some of the oil will move down the connecting rods by gravitation to keep the cross-heads 44 and 45 lubricated as well as the bearings 54 and 55 and piston rods 58 and 59. Oil will also flow down the sides of gear 20 to lubricate the axle bearings 33 and 34

formed by the housing memebrs 31 and 32, with a constant flow toward the journals. Any excess oil in the housing is drained back and returned to the pan 53 at points 60 and 61 or at any suitable points by well-known means. Thus the bath of oil keeps all of the moving parts properly lubricated at all times with a continually fresh supply of oil. While this flow is sufficient to lubricate, as a factor of safety, it is advisable to have an independent pressure oiling system for supplemental lubrication.

Suitable reversing mechanism such as in common use in steam engines is provided for at 62 to balance the positioning of the lug 23 on the housing 30 by which the engine is fastened to the torque bar 21 and to the locomotive crossmember 22.

Since each unit 10 is complete in and of itself and operates independently of the other units except that all have the single source of steam supplied to the engines by the boiler of the locomotive, many structural and practical advantages follow. In the event one of the driving units should become fouled for any reason it is not necessary to take the entire locomotive out of service. All that is necessary is to release the journalings and the torque bar 21 and quickly remove the entire unit on the drop pit. As the units may be made interchangeable it is equally as simple and fast to insert a new drive unit, fasten it in place and put the locomotive back in service. Likewise the engine itself is rendered easily accessible for repair, adjustment or dismantling.

Obviously the locomotive described herein has eliminated the tremendous main and side rods with the attendant counterbalancing and in so doing has eliminated the vibration and the hammer blows on the tracks which result from counterbalance weights and other unbalanced dynamic forces. The absence of main and side rods and other motion work makes it possible through practical elimination of the rigid wheel base, to accommodate sharper curves than with locomotives of the conventional design. This is further accentuated by a closer spacing of the axles in the present assembly keeping down the length of the locomotive.

The main side frame members of the locomotive being positioned outside the drive wheels lends structural advantage to protective sheathing and particularly for streamlining without interference with moving parts or making accessibility difficult.

I claim:

1. In a steam vehicle the combination of a main frame, a boiler mounted thereon, axle saddles depending from said frame, journal boxes associated with said axle saddles, and a plurality of closely spaced identical and interchangeable steam engine-axle units supporting said frame by means of said axle saddles, each of said steam engine-axle units comprising an axle, a V-type engine connected to drive said axle and mounted with the cylinders downward and the center of the weight mass substantially directly over the axis of the axle.

2. In a steam vehicle the combination of a main frame, a boiler mounted thereon, axle saddles depending from said frame, and a plurality of closely spaced identical and interchangeable steam engine-axle units supporting said frame by means of said axle saddles each of said steam engine-axle units comprising an axle journaled in boxes associated with said axle saddles, a V-type engine connected to drive said axle and mounted with the cylinders downward and the center of the weight mass substantially directly over the axis of the axle, and a torque bar extending in a general fore and after direction to connect each of said engines to said frame, whereby the whole weight of each engine is carried by its axle alone.

3. In a steam vehicle the combination of a main frame, a boiler mounted thereon, closely spaced axle saddles depending from said frame and spaced thereon at a distance apart only sufficient to allow working clearance for the brakes on the driving wheels, a plurality of identical and interchangeable steam engine-axle units supporting said frame by means of said axle saddles, each of said steam engine-axle units comprising an axle, and an engine mounted thereon, said engine being positioned so that it will not extend longitudinally substantially beyond the confines of the driving wheels.

4. Separate power units for steam locomotives comprising a single depending V-type engine secured to and wholly supported on, geared to and taking alignment from an axle of the drive wheels.

5. Separate and interchangeable power units for steam locomotives comprising a single depending V-type engine secured to and wholly supported on, and taking alignment from the axle of the drive wheels.

6. A steam locomotive having main side frames, drive wheels for said locomotive with axles therebetween, an engine mounted on each of said drive wheel axles in static balance and geared to said axles, all in such a manner that the engine is secured to, wholly supported by and takes alignment from the axle on which it is mounted, said axles being journalled in said main side frames outside the drive wheels.

7. In a steam locomotive having main side frames and springing outside the driving wheels, a plurality of individually powered driving axles wherein the power driving each of said axles is a single engine mounted thereon in static balance in such a manner that the said engine is secured to, wholly supported by and takes alignment from its said axle, also said axle in each instance being journalled in said main side frames with restricted lateral movement.

8. A steam locomotive with main side frames having a plurality of separate driving units each of which comprises a single engine mounted substantially in static balance and geared to the axle of a pair of drive wheels, whereby said engine is wholly supported on said axle and wherein all of the moving parts of the said engine for said driving units are enclosed within a suitable housing, and wherein each unit is connected to the said locomotive only by means of the drive axle bearings in said main side frames and a torque bar which maintains the position of said engine unit.

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