J. A. McGREW AND J. T. LOREE.

PROPULSION UNIT FOR VEHICLES.

APPLICATION FILED MAR. 17, 1921.

1,412,250.

Patented Apr. 11, 1922.

3 SHEETS—SHEET 1.

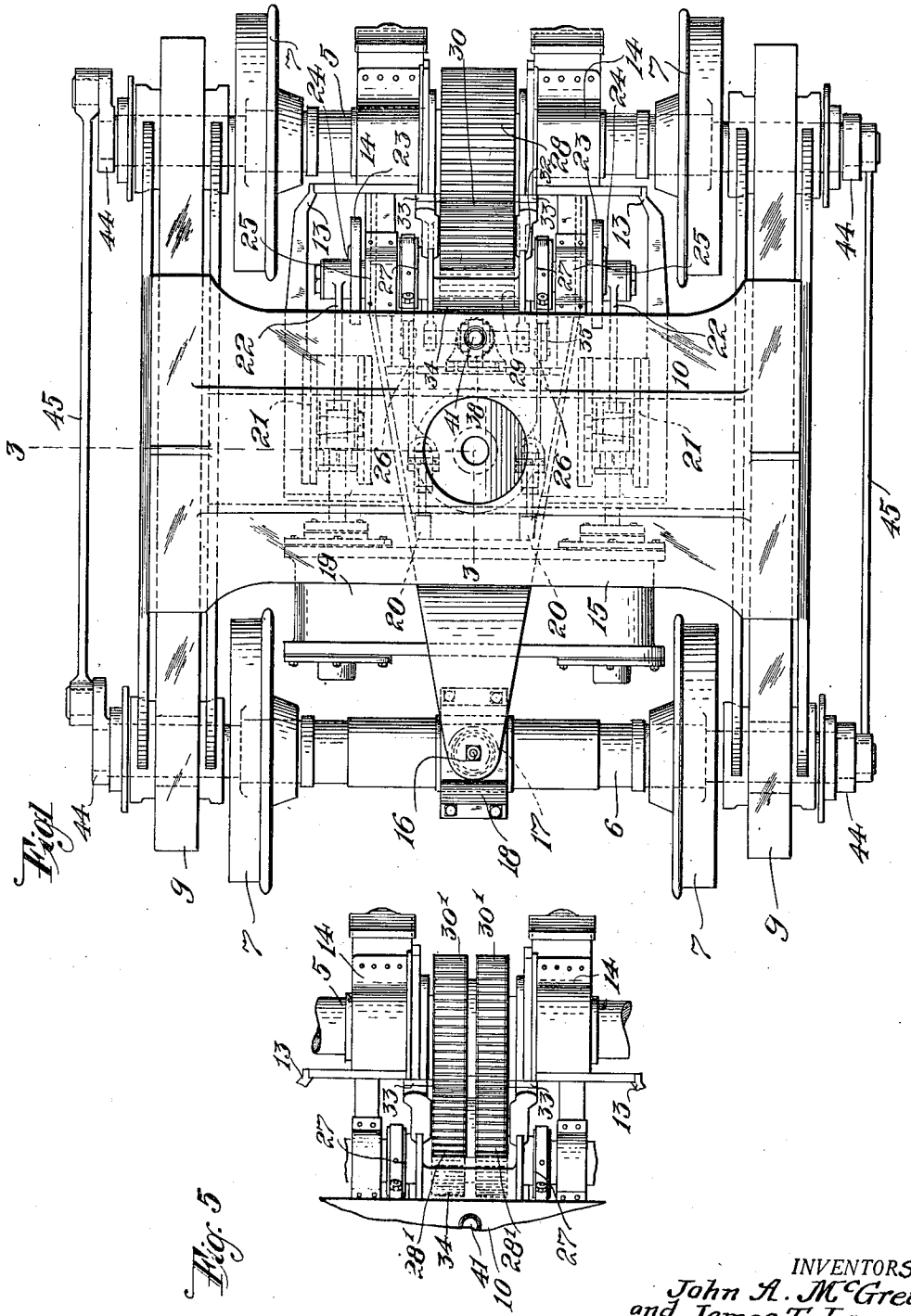

Fig. 1

Fig. 5

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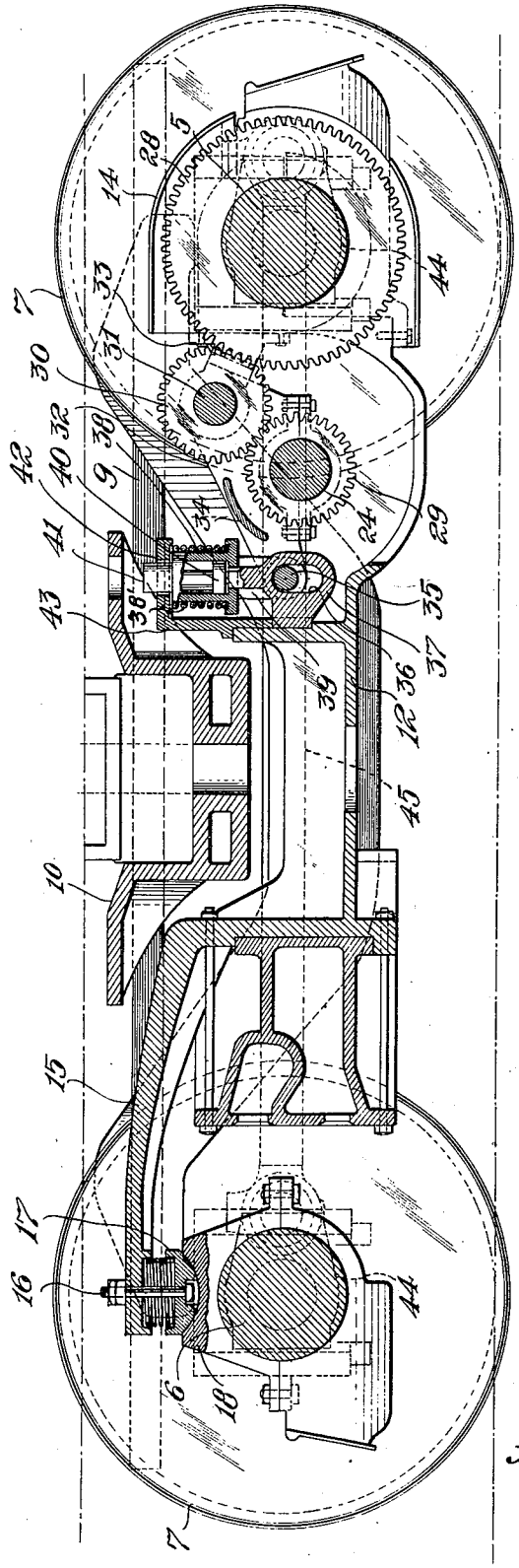

Fig. 2

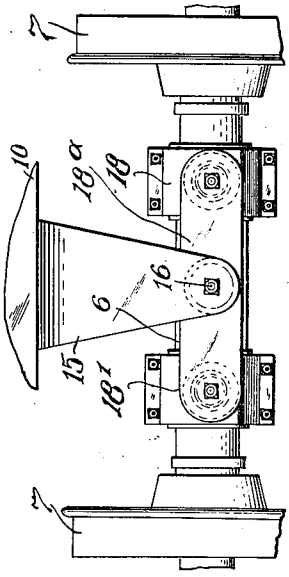

Fig. 6

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3 SHEETS—SHEET 3.

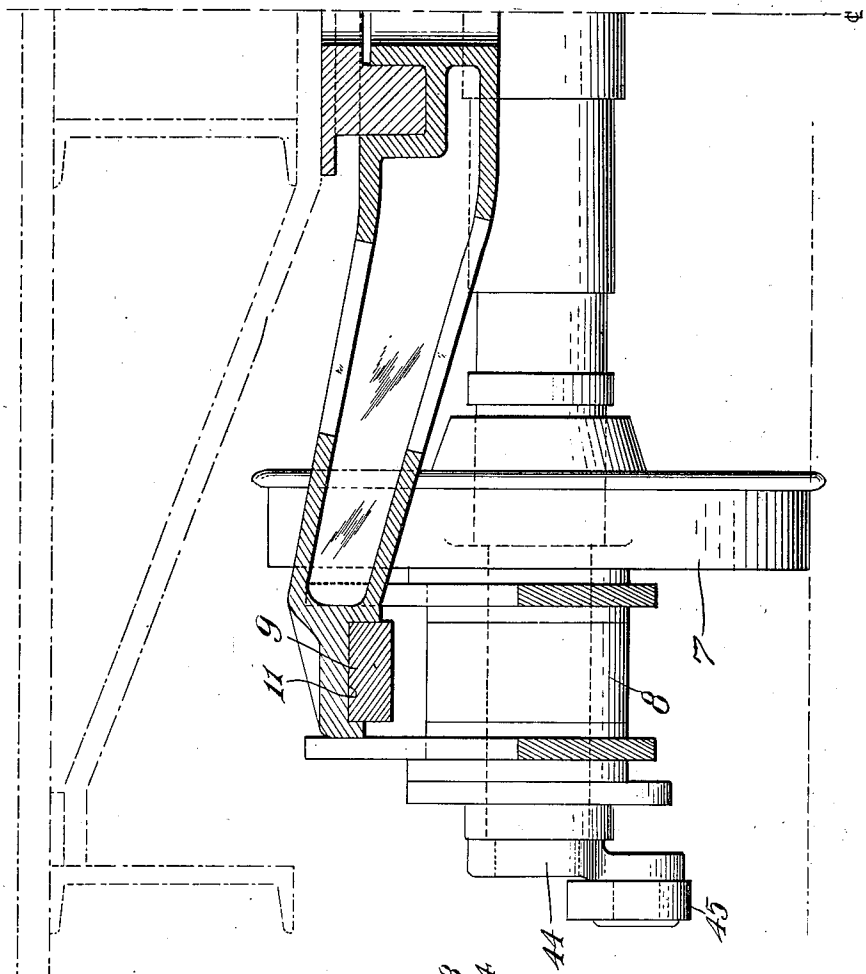

Fig. 3

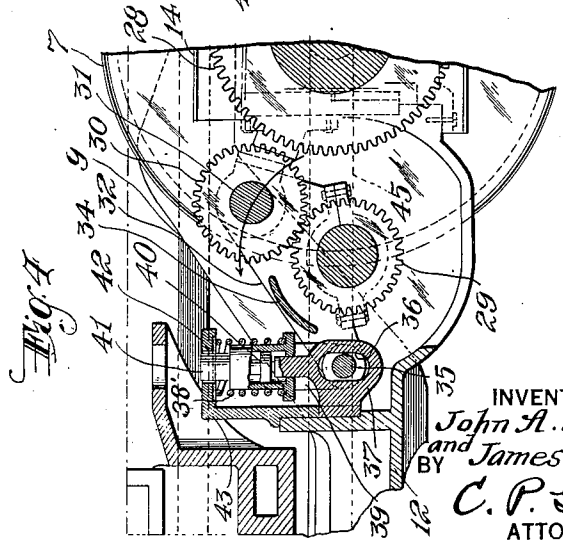

Fig. 4

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UNITED STATES PATENT OFFICE.

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PROPULSION UNIT FOR VEHICLES.

1,412,250. Specification of Letters Patent. Patented Apr. 11, 1922.

Application filed March 17, 1921. Serial No. 452,969.

To all whom it may concern:

Be it known that we, JOHN A. McGREW and JAMES T. LOREE, both citizens of the United States, and residents of the city of Albany, county of Albany, and State of New York, have invented a certain new and useful Propulsion Unit for Vehicles, of which the following is a specification.

This invention relates to an improved propulsion unit for vehicles and generically considered has for its primary object and purpose to provide a propulsion mechanism directly carried by and flexibly suspended from the spaced axles so that the propulsion mechanism will maintain a substantially constant normal position during the vertical oscillation of the axles and will not be subjected to severe strains or stresses. An additional practical advantage which is obtained by means of the present invention is that the propulsion unit is rendered interchangeable with different bodies as it is not connected to any part of the underframe of the vehicle body but is supported solely by the spaced axles.

In one adaptation of our invention we propose to utilize the same as an auxiliary propulsion means for locomotives and to provide a simple and compact propulsion unit for use in connection with a locomotive engine to thereby produce a propulsion system which will be capable of exerting relatively higher tractive power at low speeds than heretofore attained.

One of the essential considerations of a satisfactory system of propulsion for railroad operation is that the necessary power not only for the movement of trains between terminals at the proper operating speeds but also sufficient power to start and accelerate the movement of trains out of terminals, at sidings, or over grades, shall be available.

Due to more or less recent developments in this art, the locomotive engine has been greatly increased in size with a resultant increase in operating efficiency, though as a whole, the design has not been materially changed from the usual common practice of providing a supply tender for each locomotive in the form of an independent car for carrying fuel and water. As these tenders or supply cars frequently weigh as much as 160,000 pounds, it is manifest that the revenue producing tonnage which the locomotive engine is capable of hauling, is greatly reduced.

In locomotives of modern design the engine boiler is so proportioned that it will supply a quantity output of steam which is sufficient to meet the demands of the maximum cylinder horespower requirements. Such requirements, however, are not reached until a piston speed of 700 to 1000 feet per minute is attained. With the ordinary freight locomotive for instance, this would be equal to a speed of from 25 to 35 miles per hour. Therefore, it is quite evident that while the entire boiler horsepower is available at speeds below 25 miles per hour, it cannot be fully utilized at such speeds in the present standard locomotive engine. However, numerous attempts have been made to utilize this surplus available boiler power at low speeds, such for instance as by the use of the Mallet type of compound locomotive engine at low speeds as a simple locomotive engine; and by booster engines driving the lead locomotive truck or mounted on the trailer truck of the locomotive. All of these auxiliary propulsion methods have one or more of the practical objections of complicated design, excessive maintenance cost, inability of easy repair, or large initial financial outlay. Moreover, in these impractical attempts, no consideration was given to the utilization of the tender loads, whereby the tractive effort upon the rails might be increased.

With the object of utilizing the unrenumerative tender truck wheel loads and likewise the surplus boiler capacity by making use of them to supplement the tractive power of the locomotive engine at times when such additional tractive power is most needed, namely, at low speeds and in starting, we propose to provide one or all of the tender trucks with a propulsion unit, the operation of which may be controlled from the cab of the locomotive engine, and without materially altering the customary design of the tender truck. The amount of additional tractive power which we obtain by means of our invention is determined by the weight of the tender and the amount of steam available for the operation of the steam propulsion motors carried for the tender axles.

It is one of the important objects of our invention in carrying out the purposes to which we have above referred, to provide

an improved flexible three-point bearing motor frame suspended directly from spaced axles of the truck. The propulsion mechanism is positioned on this frame and operatively connected to a truck axle to supply a positive driving force thereto.

Other objects of our invention consist in the improved construction, combination and relative arrangement of the several parts as will be hereinafter more fully described, illustrated in the accompanying drawings and subsequently incorporated in the subjoined claims.

In the drawings wherein we have illustrated one practical embodiment of our invention and in which similar reference characters designate corresponding parts throughout the several views:

Figure 1 is a top plan view of a locomotive tender truck, equipped with our improved propulsion unit and illustrating one practical embodiment thereof;

Figure 2 is a longitudinal sectional view;

Figure 3 is a fragmentary transverse section taken on the line 3—3 of Fig. 1 but omitting the propulsion mechanism and its supporting frame;

Figure 4 is a detail sectional view showing the power transmitting gear in an inoperative position;

Figure 5 is a detail plan view illustrating an alternative multiple arrangement of the transmission gear and,

Figure 6 is a detail plan view showing a slightly modified embodiment of the mounting of the single point frame bearing on one of the axles.

Referring in detail to the drawings 5 and 6 respectively indicate spaced truck axles upon the opposite ends of which the wheels 7 are suitably fixed. At their ends the axles 5 and 6 are mounted in the boxes 8 which are connected by the longitudinal side bars 9. These side bars are connected by the centrally located transversely disposed bolster 10, the ends of which are provided with the channels 11 to receive the bars 9. This bolster and frame may be of any approved construction and is centrally provided with a socket to receive a male part on the body bolster of the tender frame. The tender supporting truck can thus be readily removed by lifting the body of the tender and replaced by a new truck when necessary.

It will be understood that the foregoing description relates to a conventional mounting of the tender or car body upon the supporting truck and does not constitute an essential part of the present invention, as various other ways of detachably mounting the body of the tender upon the supporting truck, may be adopted.

The propulsion unit includes a frame 12 having a central portion of maximum width located beneath the bolster 10. From the ends of this central portion of the frame, arms 13 extend longitudinally in one direction and are connected to the spaced bearings 14 engaged upon the truck axle 5. From the center of the frame 12 a longitudinally extending upwardly offset arm 15 projects above the other axle 6 and is connected at its end by the king bolt 16 to an oscillatable bearing member 17 mounted upon the boxing 18 in which the central portion of the axle is journaled. Thus, it will be seen, that we provide a three-point bearing suspension for the frame 12, one end of this frame being suspended by a single point centrally from the axle 6 while at its opposite end the frame is suspended by spaced bearings 14 from the axle 5. Thus in the embodiment just described, the three-point bearing suspension is directly from the spaced axles of the truck.

If desired, in lieu of the single bearing 18 on the axle 6, spaced bearings 18′ may be arranged upon this axle and connected by a yoke 18^a. This yoke may be arranged either above or below the axle as preferred, and the oscillatable bearing 17 at the end of the frame arm 15 is engaged in a central seat formed in the yoke bar 18^a. Of course, it is also possible to devise other alternative constructions, but in every case the single point bearing at the end of the frame arm 15 is preferably located directly in line with the central longitudinal axis of the frame and in vertical alignment with the axial centre of the axle 6.

Upon the frame 12, beneath the arm 15, the steam receiving cylinders 19 are mounted, each of the cylinders being supplied with steam from the locomotive boiler by means under the control of the engineer. As this steam supply means constitutes no essential feature of the present invention it need not be further referred to in detail. For the purpose of this explanation it will suffice to state that each cylinder 19 is equipped with a valve 20 by means of which the inlet and outlet of the steam at the opposite ends of the cylinder is properly controlled. The piston reciprocating in each of the cylinders is connected to a crosshead 21 mounted on the frame 12 and rods 22 connect these crossheads eccentrically to the discs 23 fixed upon opposite ends of a shaft 24 which is journaled in the bearings 25 on the frame 12. The operating means 26 for the valves 20 is actuated through the medium of the eccentrics 27 fixed upon the shaft 24.

Upon the axle 5 between the spaced bearings 14, a gear 28 is fixed. A driving gear 29 of relatively smaller diameter is fixed upon the central portion of the shaft 24. A power transmitting gear 30 interposed between the gears 28 and 29 and adapted to mesh therewith has its shaft 31 journaled at its ends in the frame members 32 which

are loosely mounted for rocking movement on the shaft 24 at opposite sides of the gear 29. These frame members are adapted to engage stop brackets 33 fixed to the bearings 14 which limit the movement of the power transmitting gear to its operative position in engagement with the gears 28 and 29. The frame members 32 are connected intermediate of their ends by the transversely extending web 34. A rod 35 connects the frame members 32 at their other ends to each other, said rod extending through the slot 36 in an arm 37 fixed to the frame 12. This arm is straddled by the bifurcated lower end 39 of a vertically disposed cylinder 38, the spaced arms which project downwardly from the cylinder body being loosely engaged upon the rod 35. The fixed arm 37 has an upwardly extending portion provided with a piston 40 which is disposed within the cylinder 38. The upper end of said cylinder is reduced in diameter as at 41 and extends through a guide opening 42 in the bracket 43 which is fixed to the frame 12. A spring 38′ surrounds the cylinder 38 and normally acts to urge the cylinder downwardly. When pressure fluid, such as air or steam, is admitted to the cylinder, it is forced upwardly against the action of this spring whereby the gear 30 is maintained in operative engagement with the gears 28 and 29, it being understood that said gear is at all times in mesh with the gear 29.

When the power transmitting gear 30 is in meshing engagement with the gears 28 and 29 so as to transmit power to the truck axle 5, the rod 35 is located in the upper end of the slot 36. In order to render the propulsion means inoperative, the pressure fluid is released from the cylinder 38 so that the spring 38′ forces the cylinder downwardly, thereby rocking the gear carrying frame upon the shaft 24 and moving the transmission gear upon the gear 28 to an inoperative position with respect to the gear 29, as shown in Figure 4 of the drawings.

In order to insure sufficient linear contact of the teeth of the transmission gear with the teeth of the driven gear 28, the teeth of the latter gear may be divided into two or more sections as shown at 28′ in Figure 5 and the transmission gear may be made up of a plurality of independently rotatable gear elements 30′ each of which is adapted to mesh with one section of the teeth on the driven gear. Thus a better linear contact of the teeth of the transmission gear elements with the driven gear is obtained so as to transmit rotation to the axle. It will be understood that this transmission gear may consist of any desired multiple of the independently rotatable gear elements, and the width of the driven gear 28 increased correspondingly.

To the opposite ends of each of the axles 5 and 6 crank arms 44 are fixed at one of their ends and to the other ends of these crank arms the driving rods 45 are connected by means of suitable wrist pins. Thus it is apparent that from the power driven axle 5 rotation is positively transmitted to the other axle 6. We have herein illustrated a conventional means for coupling the truck axles to each other so that they will both be positively driven, but it is to be understood that any other equivalent driving connections may be substituted for the rods 45.

From the foregoing description considered in connection with the accompanying drawings, the construction and manner of operation of our improved propulsion unit for vehicles will be readily understood. In the illustrated adaptation of the invention we have disclosed the same as applied to a locomotive tender for the purpose of supplementing the tractive power of the locomotive drive wheels. In such case by means of the engineer's valve, steam may be supplied from the steam dome of the locomotive boiler to the cylinders 19 through the medium of which and the gearing above described, the axles of the tender truck are positively driven. The adhesive pressure of the truck wheels upon the rails due to the weight of the tender body and its load, will thereby be effectively utilized to accelerate the movement of the train in starting and at low speeds or on grades where the maximum horsepower capacity of the boiler is not being fully utilized for the transmission of power to the locomotive drivers. By means of the mounting and arrangement of the complete power unit on the suspension frame having a three-point suspension directly from the spaced axles of the truck, maximum stability is obtained whereby the greatest increase in tractive power is secured while at the same time the desired flexibility in the support of the propulsion unit is procured. Thus, by locating the single suspension bearing 17 for the propulsion unit in the central longitudinal line of the frame and in vertical alignment with the axis of the axle 6, the said frame will maintain a substantially normal position in the vertical oscillation of the axle, as in passing over rail joints and consequently, the frame is relieved of strains or stresses which would otherwise devolve thereon and the possibility of injury or displacement of parts of the propulsion mechanism carried by said frame, is obviated.

Owing to the improved construction and manner of suspension of the carrying frame for the propulsion mechanism, all parts of this mechanism are readily accessible for the purpose of renewal or repair. Thus, by running the tender or car over a pit, the spaced

axles carrying with them the propulsion motor as a unit, will be dropped from the under frame of the tender body, and a similar unit suspended from spaced axles may be substituted therefor, or the ordinary standard truck axles and wheels provided. Such unitary assemblage of the propulsion unit and the spaced axles results in quick and easy interchangeability and enables a temporarily disabled propulsion unit to be removed and placed in the repair shop and another similar completely operative propulsion unit substituted therefor and arranged in precisely the same position to receive and support the tender body and frame.

It will also be manifest that in view of the very simple construction of the propulsion mechanism, the maintenance cost thereof will be relatively small and the initial installation will not involve a great financial outlay.

We have herein referred to the application of the auxiliary power unit to one of the tender trucks, but it will be obvious that if desired, all trucks of the tender may be equipped with the auxiliary propelling mechanism. It is likewise possible to adapt our improved propulsion unit to various other types of wheel vehicles without necessitating any radical alterations in the construction thereof. Further, it is to be understood that while we have herein shown and described several preferred embodiments of the invention, the same is nevertheless susceptible of many minor modifications in the form, proportion and relative arrangement of the several parts and we accordingly reserve the privilege of adapting all such legitimate changes as may be fairly embodied within the spirit and scope of the invention as claimed.

We claim:

1. An interchangeable propulsion unit for locomotives comprising spaced coupled wheel axles adapted to be detachably positioned in supporting relation to a load capable of maintaining an adhesive tractive pressure of the wheels upon the supporting rails, and propulsion mechanism geared to one of said axles and flexibly suspended directly from the axles by means permitting said axles to assume various horizontal and vertical angular positions relative to each other without destroying the operative connection with the propulsion mechanism.

2. An interchangeable propulsion unit for locomotives comprising spaced wheel axles adapted to be detachably positioned in supporting relation to a load capable of maintaining an adhesive tractive pressure of the wheels upon the supporting rails, and steam actuated propulsion mechanism supplied from the locomotive boiler operatively connected to one of said axles to positively drive the same and a supporting frame for said mechanism in one end of which said driving axle is journaled, said frame at its other end having a universally movable pivoted support upon the other of the axles to permit of the relative angular movement of said axles without destroying the operative connection between said mechanism and the driving axle, said axles, the propulsion mechanism and its supporting frame being removable and replaceable as a unit with respect to the load.

3. In combination, a locomotive tender truck having spaced axles and supporting wheels detachable from the tender truck frame, a propulsion unit arranged between and supported entirely from the spaced axles and operatively geared to one of said axles to thereby utilize the adhesive pressure of the wheels upon the track rails to increase the tractive power.

4. Auxiliary propulsion means for steam locomotives including, in combination with a truck of the locomotive tender having spaced axles, a propulsion unit supported entirely from and between the spaced truck axles and operatively geared to an axle of the truck.

5. Auxiliary propulsion means for steam locomotives including, in combination with a truck of the locomotive tender having spaced axles, a propulsion unit having a three point bearing suspension upon the spaced truck axles and operatively geared to one of said axles.

6. Auxiliary propulsion means for steam locomotives including, in combination with a truck of the locomotive tender having spaced axles, a propulsion unit supported entirely from and between the spaced truck axles and operatively geared to one of said axles, and means for transmitting rotation from the driven truck axle to another axle of the truck.

7. Auxiliary propulsion means for steam locomotives including, in combination with a truck of the locomotive tender having spaced axles, a propulsion unit supported entirely from and between the spaced truck axles and operatively geared to one of said axles, and means connecting the corresponding ends of the spaced truck axles to each other to transmit a positive driving force from the driven axle to another axle of the truck.

8. Auxiliary propulsion means for steam locomotives including, in combination with the locomotive, tender truck having spaced axles, a frame having spaced bearings on one of said axles and a single centrally located bearing on the other truck axle, and a steam actuated propulsion unit supplied from the locomotive boiler and operatively connected to one of the truck axles to positively drive the same.

9. Auxiliary propulsion means for steam locomotives including, in combination with a truck of the locomotive tender having

spaced axles, a frame supported entirely upon and between the spaced truck axles, steam receiving cylinders mounted upon said frame at opposite sides of its longitudinal axis and fed from the locomotive boiler, a shaft journaled upon said frame, operating connections between the cylinder pistons and the opposite ends of said shaft, and gearing operatively connecting said shaft to one of the truck axles to positively drive the latter.

10. Auxiliary propulsion means for steam locomotives including, in combination with a truck of the locomotive tender having spaced axles, a frame supported entirely upon and between the spaced truck axles, steam receiving cylinders mounted upon said frame at opposite sides of its longitudinal axis and fed from the locomotive boiler, a shaft journaled upon said frame, operating connections between the cylinder pistons and the opposite ends of said shaft, and gearing operatively connecting said shaft to one of the truck axles to positively drive the latter, said gearing including a power transmission gear and means for mounting said gear for movement into and out of operative position.

11. A propulsion unit for locomotive tender trucks comprising spaced wheel axles directly supporting propulsion mechanism rotating one of the axles of the tender and pivotally connected with another of said axles for permitting compensatory movement of the mechanism with respect to the axles upon oscillation of the latter said unit adapted to be weighted by the tender to increase the tractive power of the unit and adapted to be operated by the surplus boiler steam capacity of the locomotive and detachably droppable from the tender truck on the dropping of the wheel axles therefrom.

In testimony that we claim the foregoing as our invention, we have signed our names hereunder.

JOHN A. McGREW.
JAMES T. LOREE.