

July 8, 1924.

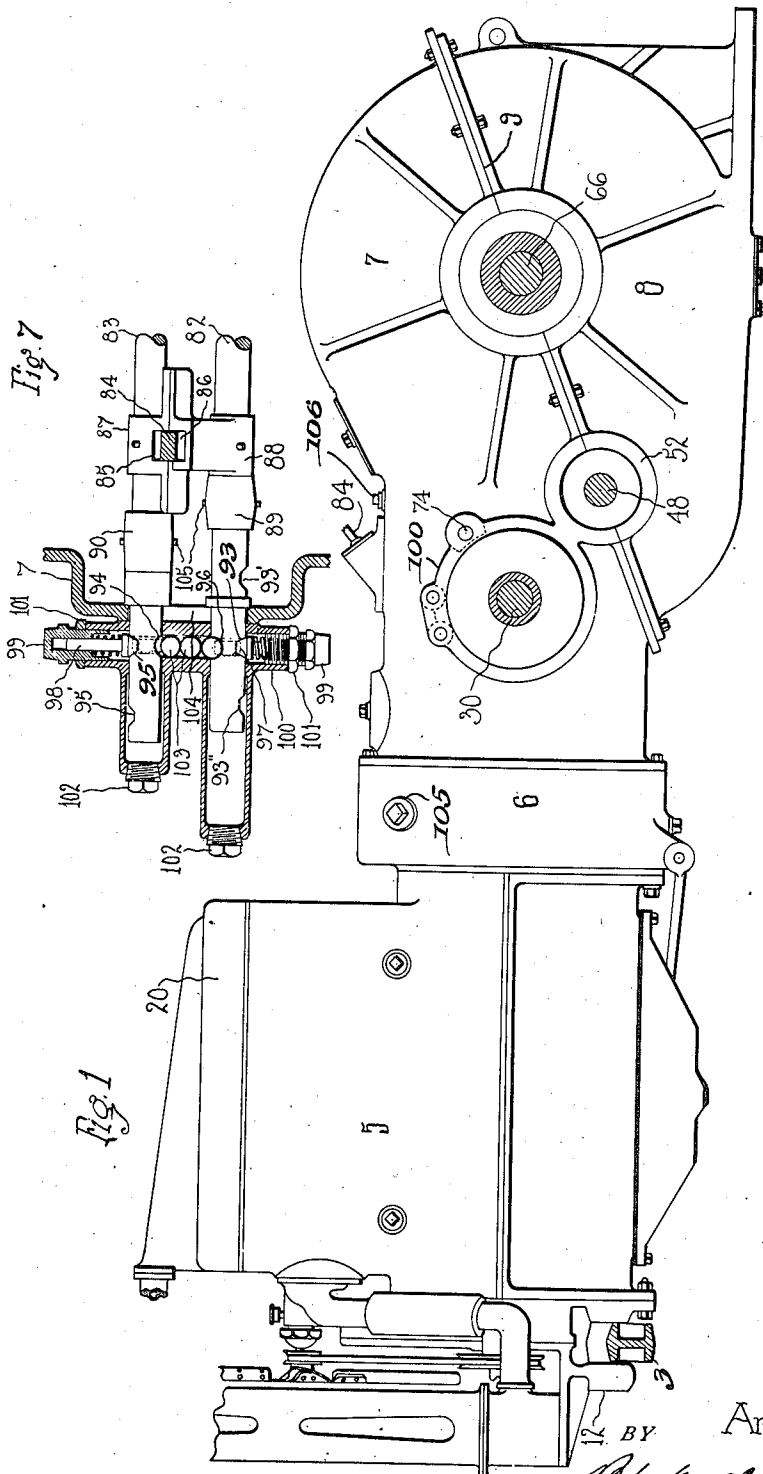
A. C. MASON

1,501,025

TRACTOR

Filed March 22, 1920

4 Sheets-Sheet 1



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July 8, 1924.

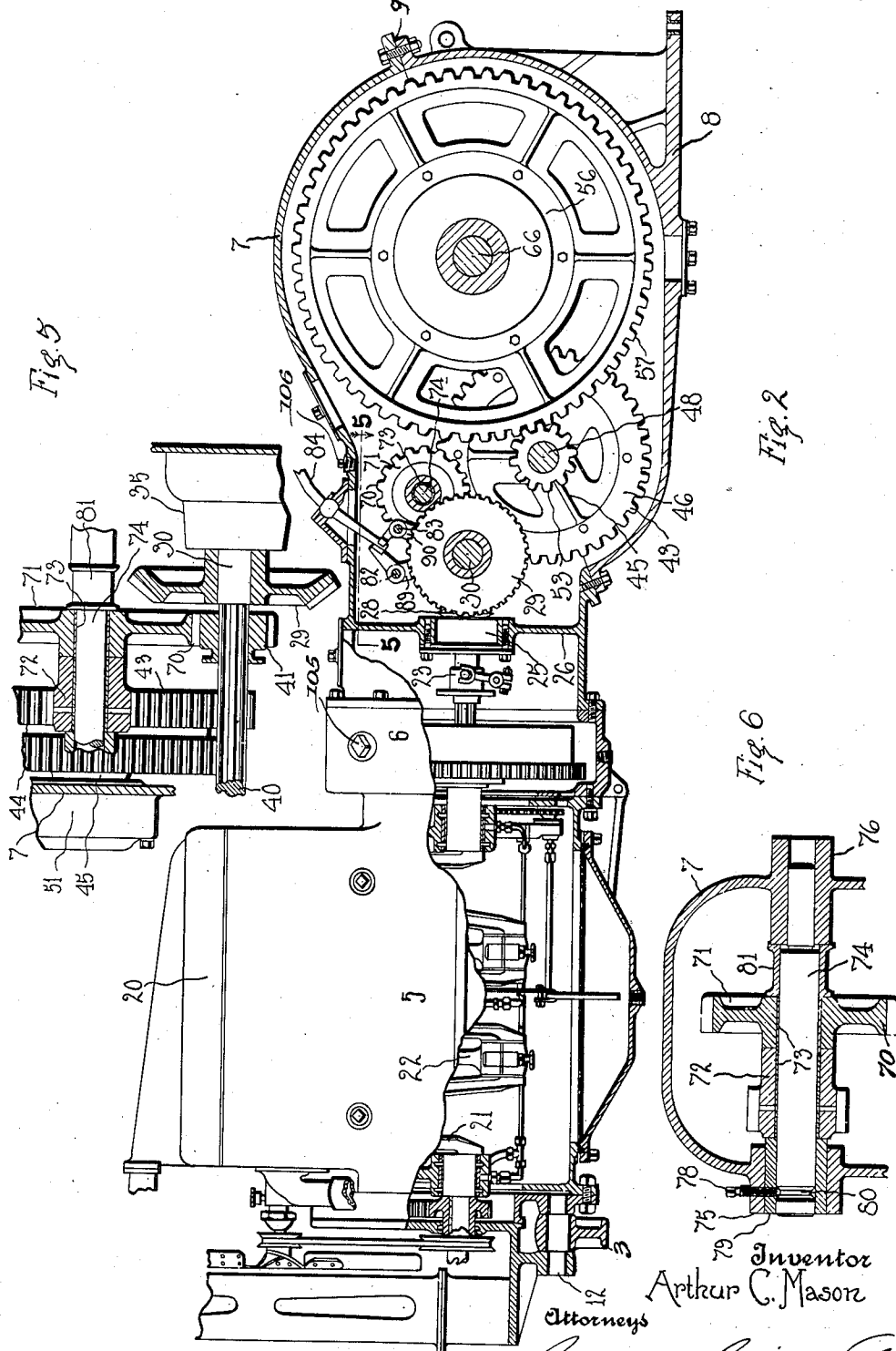
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4 Sheets-Sheet 2



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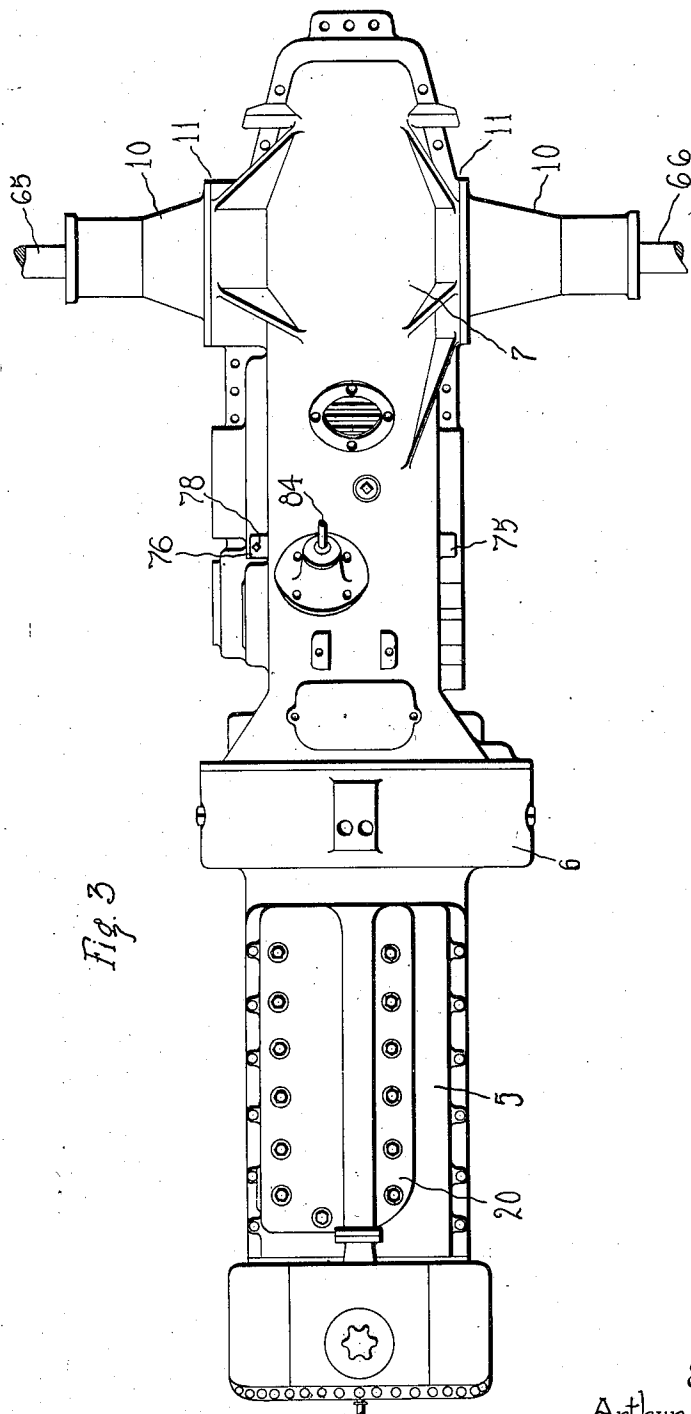


Fig. 3

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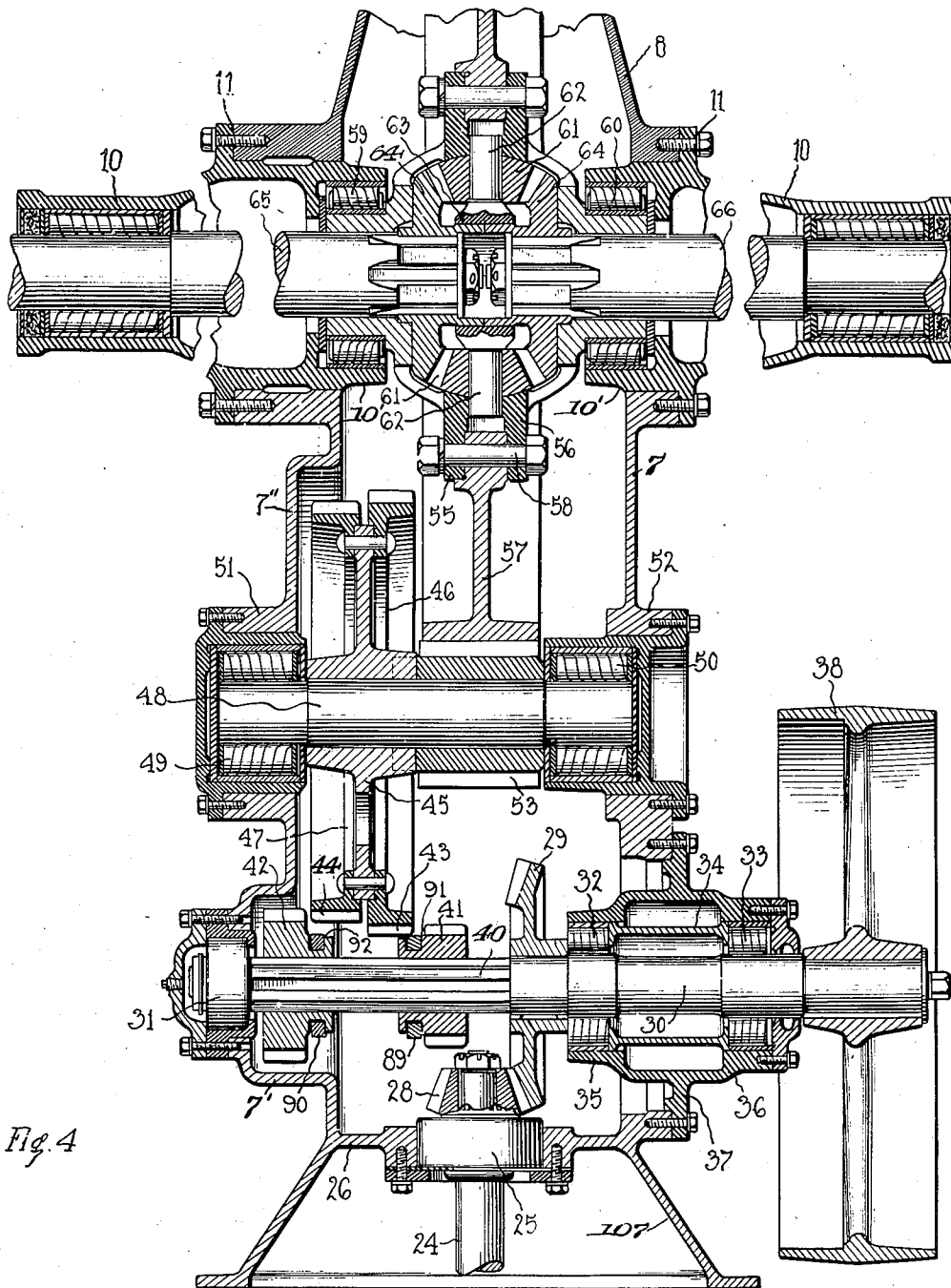


Fig. 4

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1,501,025

UNITED STATES PATENT OFFICE.

ARTHUR C. MASON, OF FLINT, MICHIGAN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

TRACTOR.

Application filed March 22, 1920. Serial No. 367,935.

To all whom it may concern:

Be it known that I, ARTHUR C. MASON, citizen of the United States, and a resident of Flint, Genesee County, State of Michigan, have invented certain new and useful Improvements in Tractors, of which the following is a specification.

The present invention relates to tractors, particularly to that class of such devices wherein the frame is made up primarily of the engine casing and the transmission casing, and it results in advantages that may be considered mainly under two heads, first, added strength of the completed apparatus, and, second, ease of machining and assembling of parts.

Under the first heading, the invention provides a transmission casing comprising an upper section cantilevered over the rear axle to effectively carry the load, and having its front end stiffened or trussed by a transverse web which serves also to separate the frame into two chambers corresponding to the position of those parts with which oils of different grades are used. In the preferred construction, the lower section meets the upper section in an inclined joint which passes through the rear axle and which terminates rearwardly of the front end of the upper section, thus permitting the latter to be made in the form of a barrel that, especially when stiffened by the web above referred to, forms an exceedingly strong waist line construction.

Under the second heading, the change speed gearing (which is of the transversely extending countershaft type) and the rear axle are assembled in the upper section of the transmission casing while the latter is inverted for the purpose, so that all such parts may be adjusted and brought into proper relation to each other to form an operatively complete unit, after which the lower section is bolted thereon to close the gear chamber. The method of assembly thus outlined is believed to be broadly new.

Another feature of the invention resides in mounting the housing for the interlocking devices for the gear shifting rods on the side of the transmission casing in such manner that the opening therefor is located near the neutral axis of the transmission casing, which results in a stiffer frame than would be secured were the interlocking unit applied to the top of the casing.

The invention also provides a rugged support for the flywheel end of the main countershaft. Again, it provides a transmission gearing wherein end thrusts on bearings are substantially eliminated.

In the drawings, Fig. 1 is a side view showing the frame. Fig. 4 is a vertical longitudinal section showing the gearing. Fig. 3 is a plan view corresponding to Fig. 1. Fig. 2 is a horizontal section through the transmission on the plane of the rear axle. Fig. 5 is a section on line 5—5 of Fig. 2 showing the reverse gearing. Fig. 6 is a section through the reverse gear shaft. Fig. 7 is a horizontal section showing the gear shifting and interlocking devices, the parts being in neutral position.

The rear or driving wheels and the front or steering wheels may be of any suitable construction, and the latter are pivoted to swing about the divided ends of the front axle 3 in the ordinary way.

The engine casing 5, with its clutch housing extension 6, the transmission casing formed of the two main elements 7 and 8, which are bolted together along an upwardly and rearwardly inclined plane at 9, and the axle housing 10, bolted to the transmission casing at 11, form the main frame of the vehicle; and this frame is centrally pivotally connected at 12 to the front axle, as will be readily understood. Thus the essential frame elements for the power plant are utilized also to form a frame having a support at three points.

The engine may be of any suitable construction, it being preferred, however, to arrange the cylinders vertically in order that the tractor may be compact, and also to permit free access to the cylinders and valves when the head casting 20 is removed. As indicated at 21 and 22, the crankshaft and connecting rods may be of the usual type; and the former terminates in a suitable clutch construction 23 whereby power is transmitted at will to the main shaft 24, the rear end of which is carried in a bearing 25 mounted on a cross wall 26 of the transmission casing.

Mounted on the rear end of the shaft 24 is a bevel gear 28 which meshes with a second bevel gear 29 on a main cross shaft 30, one end of which may be journaled in a ball bearing 31, whereas the opposite end is preferably carried in two roller bearings 32,

33 spaced apart as by means of a sleeve 34 and themselves supported by bosses 35—36 offset oppositely from the body of the detachable bearing housing 37. Thus a strong support well adapted to carry the weight of the external belt pulley, brake drum, or other auxiliary power transmitting device or rotating element 38 is formed. It will be noted that the pulley is driven as a fly-wheel whenever the shaft 24 turns.

The shaft 30 is splined or otherwise formed at 40 to support and drive the low speed gear 41 and the high speed gear 42 that may be interchangeably shifted along the shaft to engage the corresponding teeth 43 and 44 of a gear which is preferably built up from the hub 45 and low and high speed gear rings 46 and 47 riveted in place thereon. 48 designates the corresponding transversely extending countershaft, the end portions of which are carried in the roller bearings 49—50 and bearing housings or bosses 51—52, the housing 51 preferably being offset outwardly and the housing 52 being offset inwardly from the corresponding side walls of the casing element 7. Adjacent to gear 45—46—47, the countershaft 48 carries a wide faced gear 53 of small pitch which drives the ring gear of a differential, said ring gear preferably being built up from the oppositely disposed hub sections or halves 55—56 to which the gear ring 57 is bolted at 58. The hub elements 55—56 are carried in roller bearings 59—60 mounted in extension flanges 10' of the axle housings 10. Any suitable differential gearing, preferably the bevel pinions 61, carried by the spindles 62 of the spider 63, and bevel gears 64 splined on the ends of the axle sections 65—66 is employed.

When the gear 41 is in mesh with the teeth 43 (the gear 42 then being out of mesh with the teeth 44) the vehicle is driven forwardly at low speed; likewise high speed forward is obtained by sliding the gear 41 away from the teeth 43 and putting the gear 42 in mesh with the teeth 44; and the vehicle remains stationary when the gears 41 and 42 are in the neutral position shown. Again, on shifting the gear 41 further toward the bevel gear 29, the former is brought into mesh with the teeth 70, Fig. 6, of a reversing gear 71, which is rigid with a smaller gear 72 arranged to constantly mesh with the low speed teeth 43, so that reverse movement is secured. In the particular construction shown, both gears 71—72 turn on bushings 73 carried by a non-rotatable shaft 74 which is supported in bosses 75—76 on the casing element 7; and the shaft 74 is held in proper position by means of a set screw 78 which passes through a bushing 79 and into a groove 80. Should it be desired to remove the shaft, the set screw is withdrawn and the shaft slipped out endwise. A tubular spacer

81 is preferably provided for properly positioning the gears with reference to the casing.

Various means may be employed for shifting and interlocking the gears 41 and 42, one such device appearing in Figs. 1 and 7. As indicated therein, the transversely slidable shifter rods 82—83 may be actuated by an ordinary universally mounted lever 84 whose end may be swung into either one of two notches 85—86, formed in corresponding fittings 87—88 fixed on the shifter rods. Yokes 89—90 attached to the rods, project into grooves 91—92 in the gears 41—42 in the ordinary way so that either gear, but not both, may be selected and shifted at will from a neutral position in which the notches 85—86 register with one another. Formed in the sides of the shifter rod 82 are notches 93, 93', 93'' and 96, Fig. 7, and like notches 95, 95' and 94 are formed in the rod 83, the notches 93, 93', 93'' being adapted to receive the spring pressed retainer detent or plunger 97, and the notches 95, 95' being similarly arranged to receive the spring pressed detent 98. In the preferred construction, the detents 97—98 are guided in plugs 99 threaded into the detachable housing 100 and provided with lock nuts 101. It will be noted that the housing encloses the ends of the shifter rods, and that the latter may be lubricated upon removing the oiler plugs 102.

The housing and associated parts form a compact detachable unitary construction which facilitates manufacture and assembly and which permits ready inspection and repairs, it being observed also that the shifter rods may be removed lengthwise after the yoke pins 105 are removed, through the relatively large opening 104 over which the housing is positioned; again, by positioning the detachable housing on the lateral side wall (as distinguished from the upper wall) of the barrel-like transmission casing, the metal of the integral upper wall acts more effectively in strengthening the frame to thus form a beam capable of taking the very heavy stresses incident to the service.

When the parts are in the position shown, the gears 41 and 42 are in neutral; the rod 83 being shifted to register the notch 95' with the detent 98, gear 42 meshes with the teeth 41 and high speed forward is obtained. In like manner, either low speed forward or reverse is secured by shifting the rod 82 to register the notch 93' or 93'', as the case may be, with the detent 97, and it will be seen that the balls 103 and notches 94—96 prevent movement of either bar except when the other bar is in neutral position.

It will be observed that the wall 26, besides greatly stiffening the transmission casing in its barrel-like section forwardly of the

joint between the two sections, separates the interior of the frame into two compartments in one of which the crank shaft, connecting rods, clutch and associated high speed elements are contained, whereas the transmission gears are located entirely in the second, thereby enabling the use of light oil in the first compartment and heavy oil in the second, in accordance with the demands of the corresponding moving parts. The oil may be introduced by removing the plugs 105—106.

The frame, as a whole, is exceedingly strong for the weight of material involved, and in this connection it is pointed out that the bosses or extensions 7' and 7'' opposite the gears 42—44 as well as the thickened sections and bosses adjacent the opposite ends of the shafts 30—48 greatly stiffen the frame against both vertical and horizontal stresses in the vicinity of said shafts and that the flaring front end 107 of the transmission casing performs a like function with reference to the joint with the engine casing.

I claim:—

1. In a self propelled vehicle a transmission casing including an integral single-piece upper section and a lower section, a rear axle housed in said casing, said sections meeting each other in a joint which substantially intersects the axis of said axle and which terminates some distance forwardly of said axle but rearwardly of the front end of said transmission casing, and change-speed gearing assembled within said upper section for driving said axle, said gearing being assembled in said upper section, the front end of said transmission casing being open and annular in form, and having means whereby it may be secured to the rear end of another casing to thereby provide a vehicle frame.

2. In a self propelled vehicle having a driving axle, an integral single-piece transmission casing barrel-like in cross-section, said casing including an upper section which forms the full cross-section of the casing at its forward end, said casing also including a lower section meeting the upper section in an inclined joint which substantially passes through the driving axle, the front end of said transmission casing having a flange extending about the same, whereby said casing may be fastened to a second casing.

3. In a self propelled vehicle including an engine casing and a transmission casing detachably connected together intermediate between the ends of said frame, and which casings are substantially annular in cross section at the joint where they meet and are connected with one another, a rear axle and a differential housed in the transmission casing, said transmission casing including an upper section and a lower section meeting each other in an inclined joint which passes

substantially through the axis of the axle and terminates rearwardly from the front end of said transmission casing, said differential including a ring gear, and change speed gearing, including a transversely extending countershaft mounted in said upper section, for driving said ring gear from the engine.

4. In a self propelled vehicle, a transmission casing having an open forward end, and a flange whereby it may be secured to a second casing, said transmission casing including an integral single-piece upper section and a lower section, a driving axle housed in said casing, a main transversely extending countershaft housed in said upper section, a second transversely extending countershaft spaced therefrom, change speed gearing carried by said countershafts, said casing sections meeting each other in an inclined joint that substantially intersects both the axis of the axle and the axis of the second countershaft.

5. In a self propelling vehicle, a transmission casing including an upper section and a lower section, a driving axle housed in said casing, a main transversely extending countershaft housed in said upper section, a second transversely extending countershaft spaced therefrom, change speed gearing carried by said countershafts, said casing sections meeting each other in an inclined joint that substantially intersects both the axis of the axle and the axis of the second countershaft, and which terminates some distance from that end of said casing which is most remote from the axle, said transmission casing being open at its front end and substantially annular in cross section, and having a flange whereby it may be fastened to the rear end of a second casing of similar form.

6. In a self-propelled vehicle, a transmission casing including an upper section and a lower section between which said axle is housed, speed changing mechanism for driving said axle said mechanism including a main transversely extending countershaft housed and supported by said upper section, a second countershaft housed in and positioned between the two sections, gearing associated with said countershafts and axle for driving the axle selectively at different speeds, and reverse gearing housed in said upper section and supported thereby, whereby the assembling of the various parts is facilitated.

7. In a self propelling vehicle, a main frame including a transmission casing comprising an upper section and a lower section, a divided rear axle housed in said casing, a main shaft extending longitudinally of the transmission casing at the front end thereof, a main countershaft driven by the main shaft and extending transversely of the vehicle in substantially the same horizontal

plane as the rear axle, a second countershaft rearwardly and below the main countershaft, change speed gearing on said countershafts through which the rear axle is driven
5 at a selected speed relatively to the main countershaft, and reverse gearing associated with the change speed gearing rotatable

about an axis above that of the main countershaft, said casing being divided on a joint which substantially intersects the axis of the axle and the axis of the second countershaft. 10

In testimony whereof I affix my signature.
ARTHUR C. MASON.