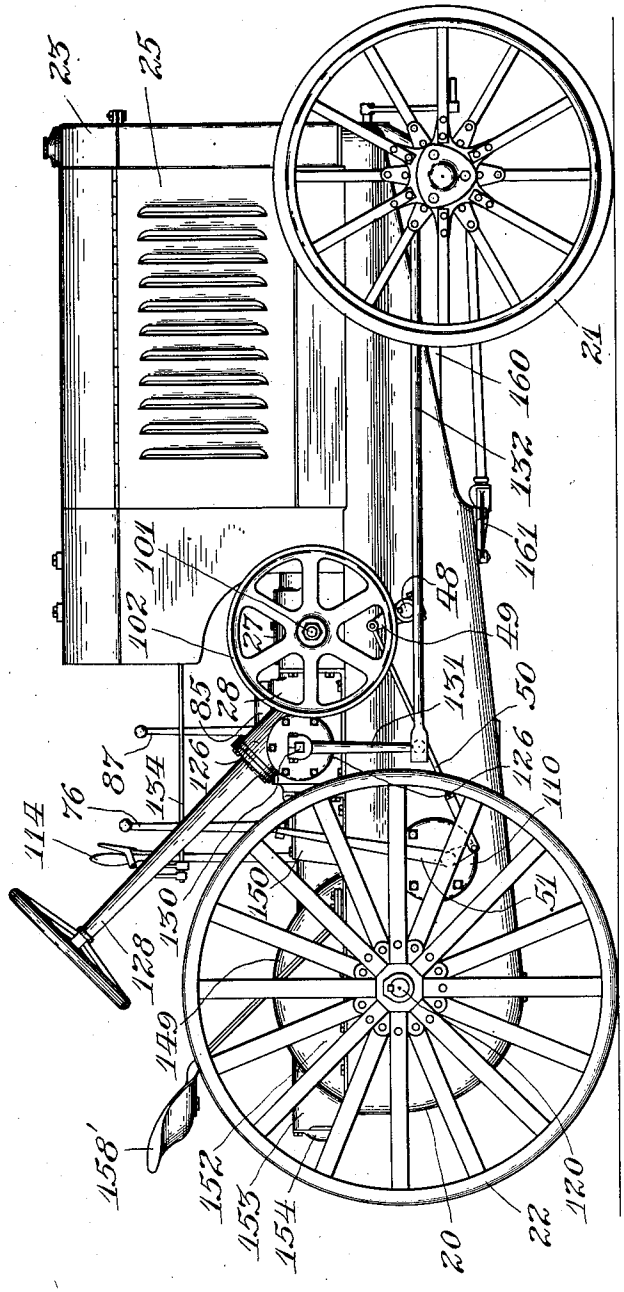
Nov. 3, 1925. 1,559,617

E. A. JOHNSTON

TRACTOR

Filed Dec. 24, 1921 8 Sheets-Sheet 1

Fig. 1.



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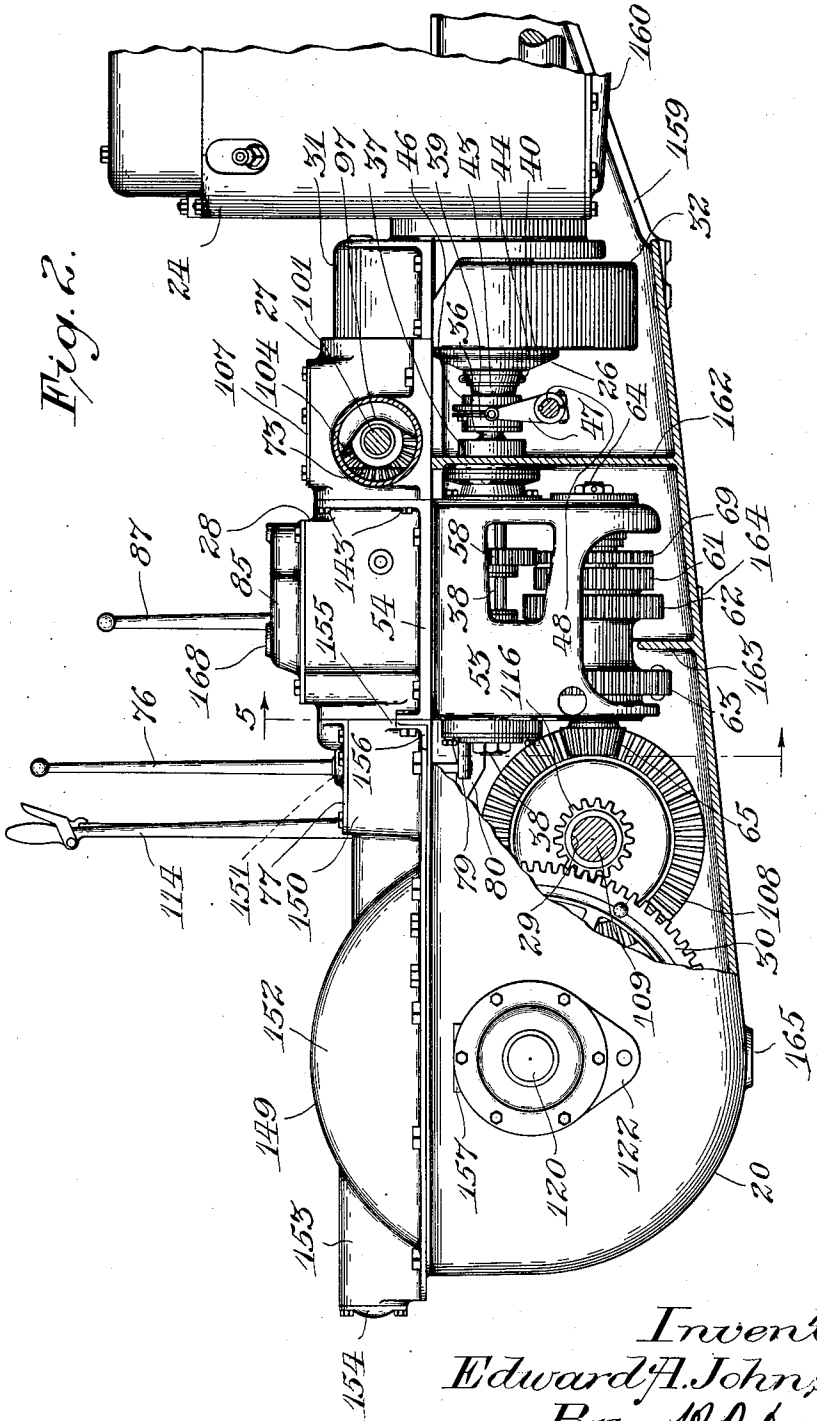
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TRACTOR

Filed Dec. 24, 1921 8 Sheets-Sheet 2

Fig. 2.



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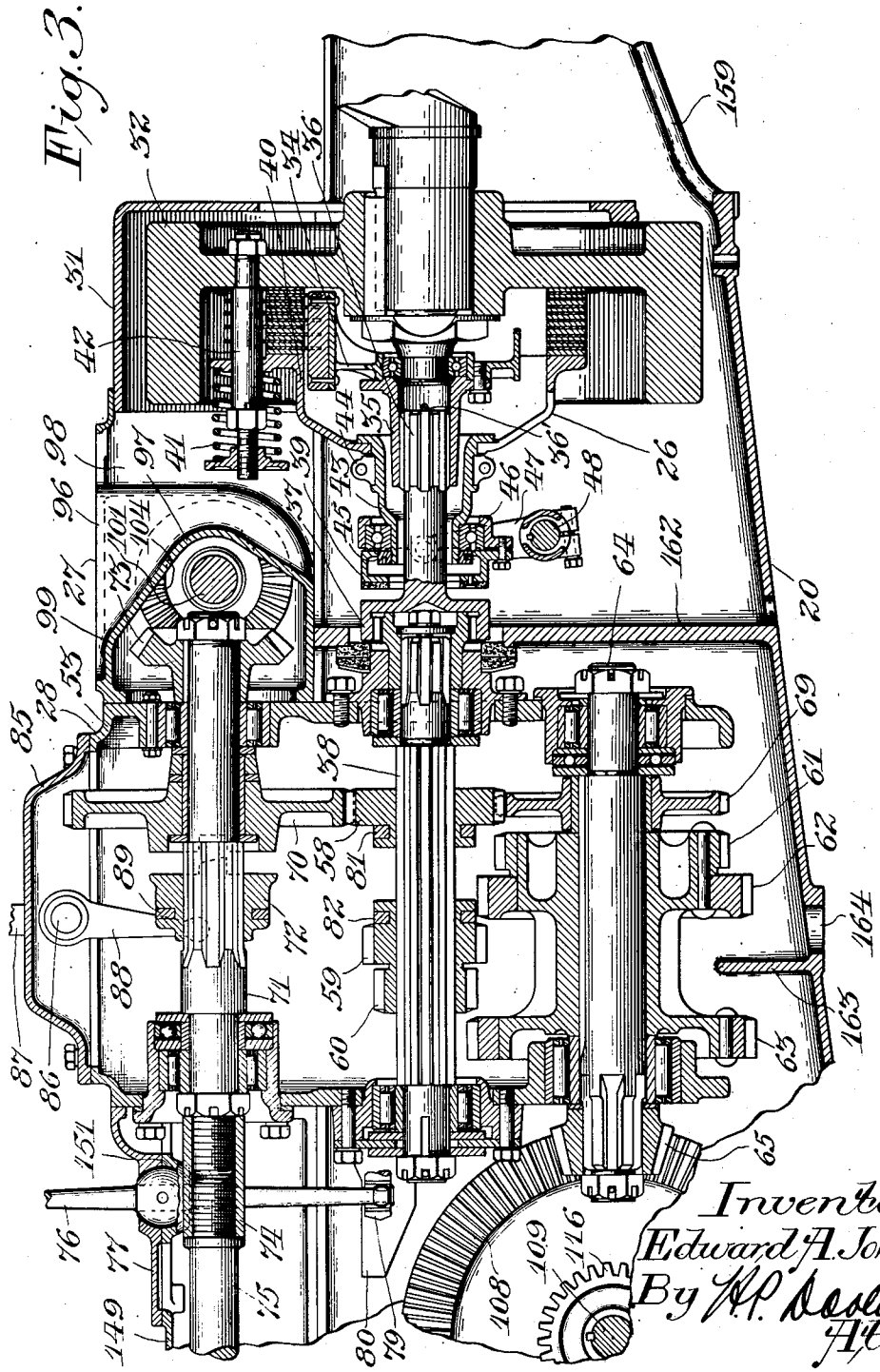
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TRACTOR

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Fig. 3.



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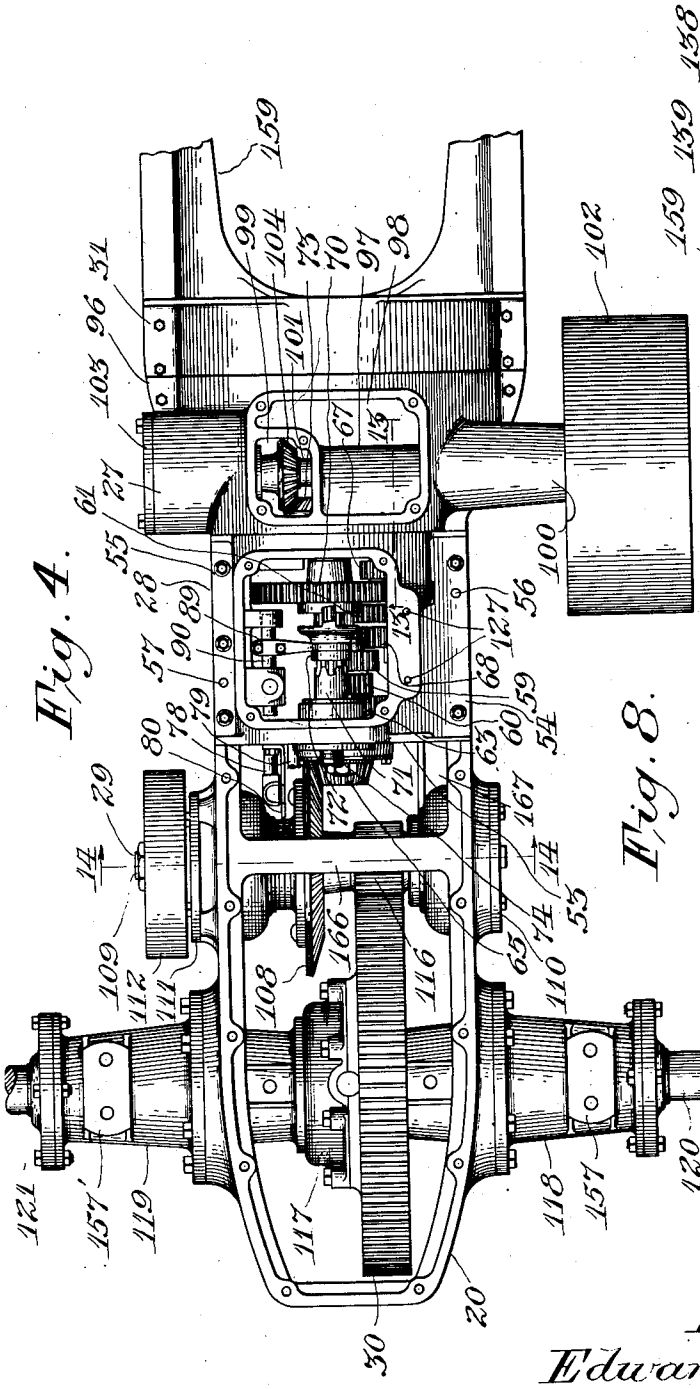


Fig. 4.

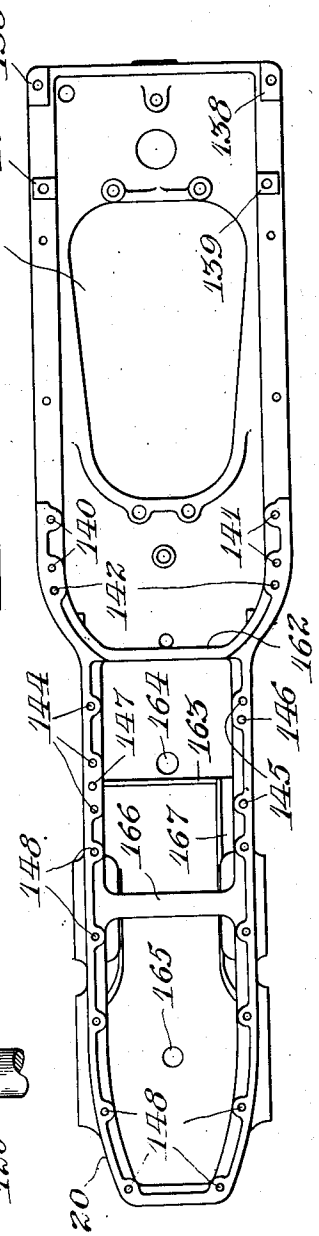


Fig. 8.

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TRACTOR

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Fig. 5.

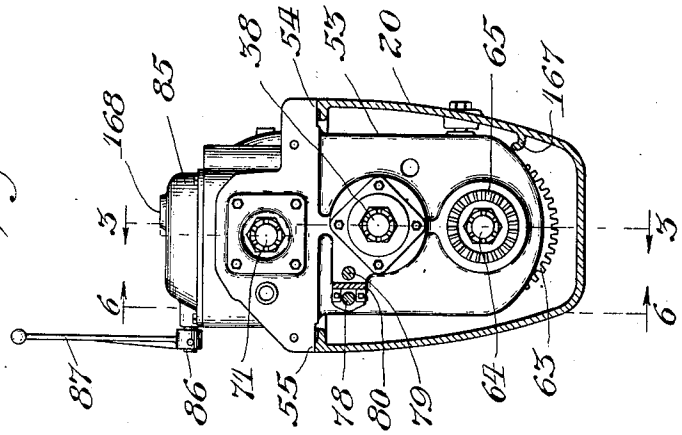


Fig. 9.

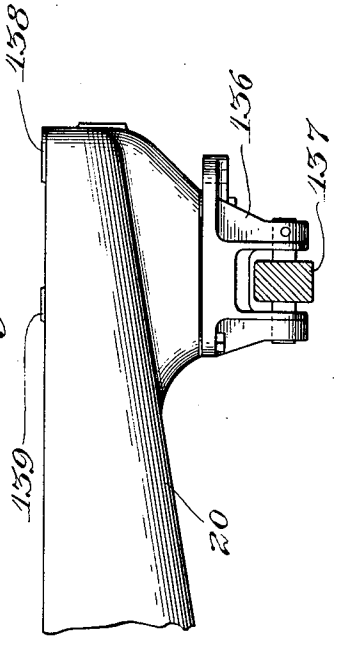
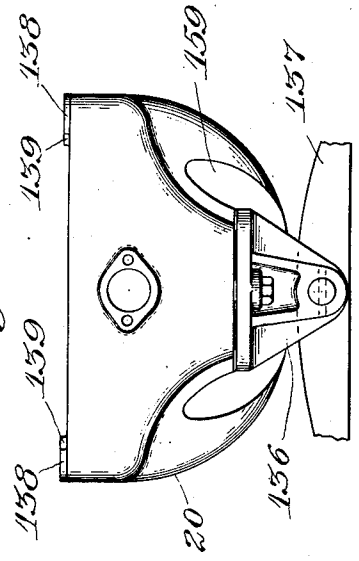


Fig. 10.



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TRACTOR

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Fig. 6.

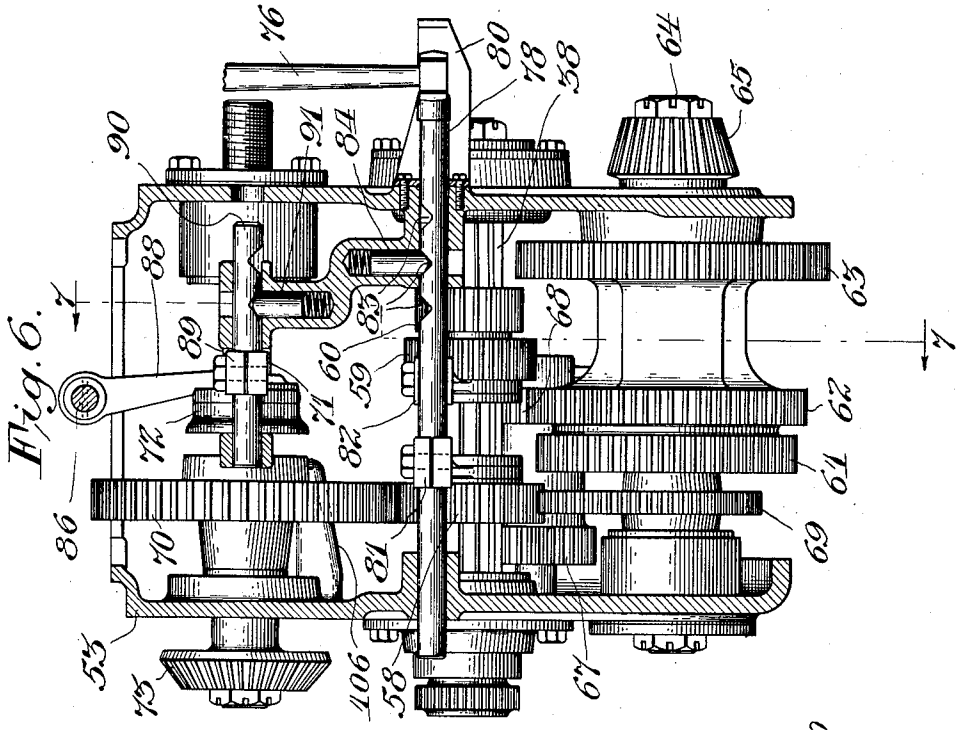
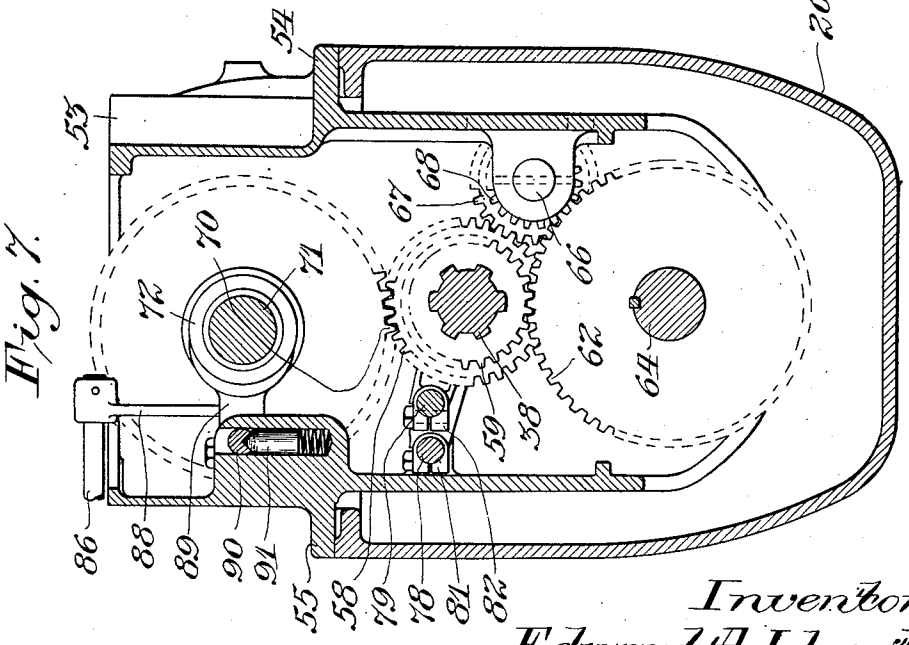


Fig. 7.



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TRACTOR

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Fig. 11.

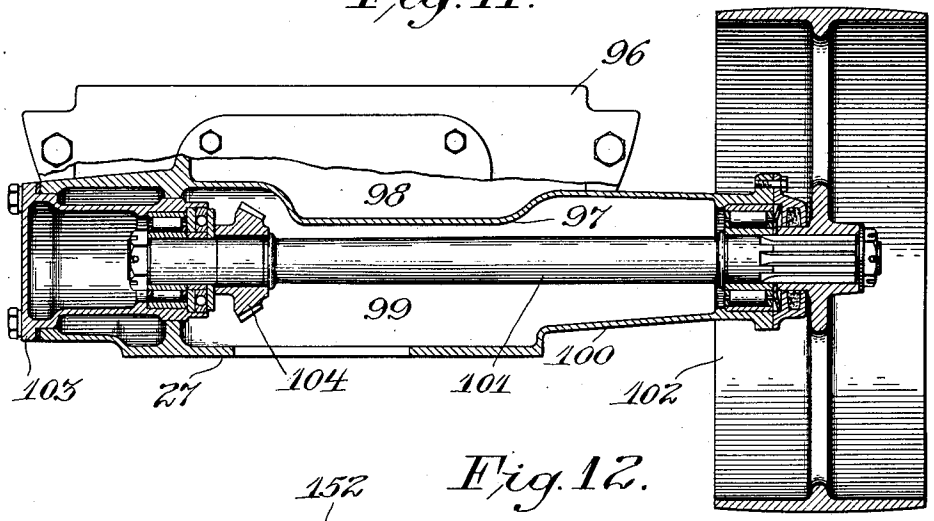


Fig. 12.

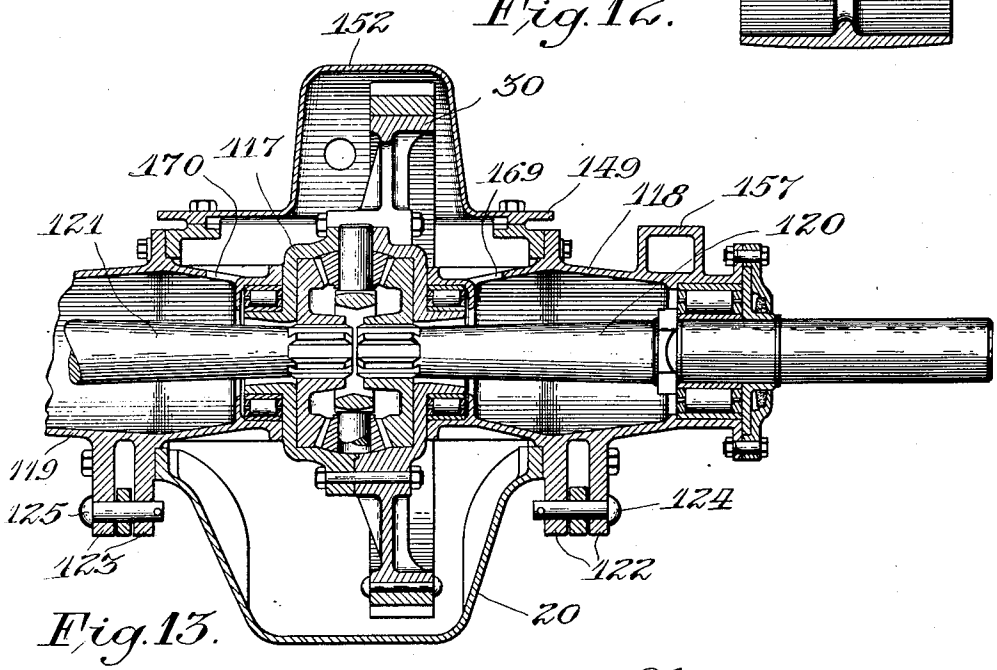
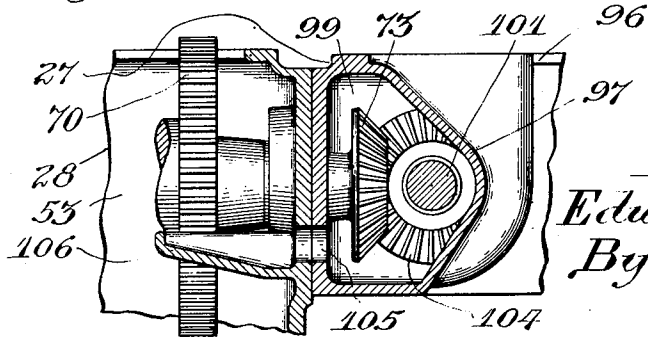


Fig. 13.



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Nov. 3, 1925. 1,559,617

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TRACTOR

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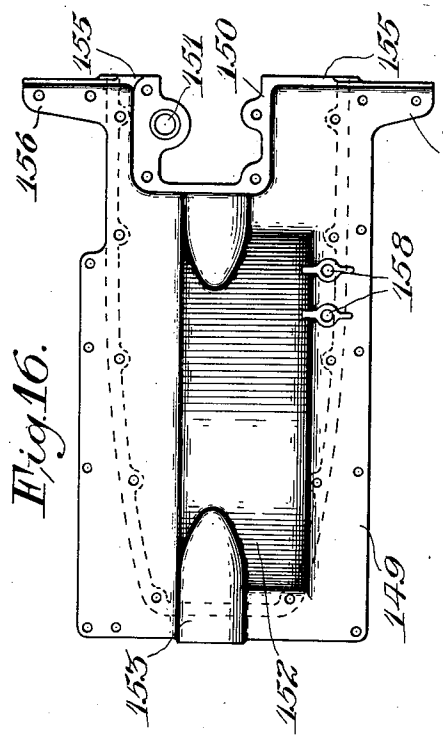


Fig. 16.

Fig. 14.

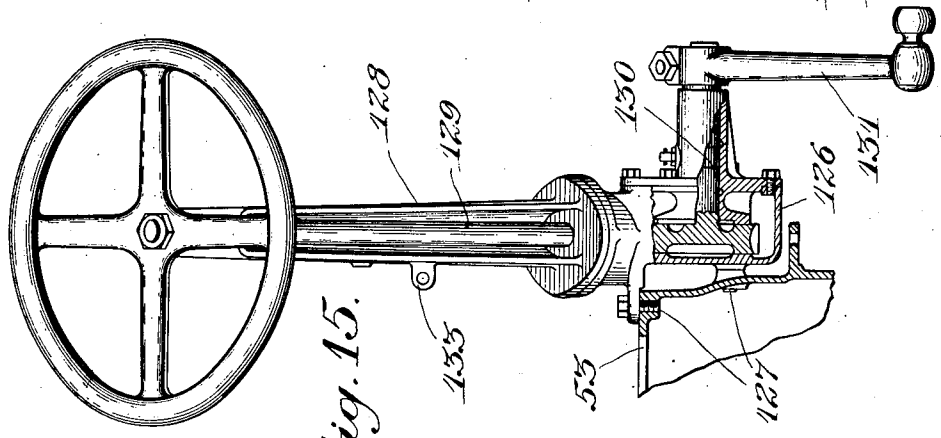


Fig. 15.

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Patented Nov. 3, 1925. 1,559,617

UNITED STATES PATENT OFFICE.

EDWARD A. JOHNSTON, OF CHICAGO, ILLINOIS, ASSIGNOR TO INTERNATIONAL HARVESTER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

TRACTOR.

Application filed December 24, 1921. Serial No. 524,570.

To all whom it may concern:

Be it known that I, EDWARD A. JOHNSTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Tractors, of which the following is a full, clear, and exact specification.

My invention relates to an improved tractor of the type generally used for agricultural purposes. Tractors as usually designed have a frame made up from several parts, usually structural shapes, bolted or riveted together. This frame is supported on the driving and supporting wheels and carries the operating and driving parts of the tractor bolted or otherwise secured thereto in operative relation. The frame of the tractor is subjected to stresses and strains of great magnitude in traveling over rough and uneven ground, which soon loosens the joints and throws the operating parts such as gears, shafts, bearings, etc. out of alignment. This results in noisy operation of the tractor and causes excessive wear and breakage of parts, with its attendant high operating cost and upkeep. It very frequently becomes necessary to replace worn out or broken parts and to adjust others, which is usually a considerable task, since the machine as a whole is so assembled that it must be dismantled in order to make an adjustment or replace a part.

It is therefore an object of my invention to provide a tractor having a rigid frame preferably formed in a single piece that will not be distorted in operation, but will maintain all the operating parts in proper operative relation, the frame being so supported that the stresses and strains therein will be reduced to a minimum.

Another object is to provide a tractor in which all the operating parts are readily accessible for necessary adjustments or replacements.

Another object is to provide a tractor or other motor vehicle in which the operating parts are assembled in distinct units which are capable of removal from and assembly in the tractor as units and without disturbing the adjustment of other parts or units.

Still another object is to provide a tractor of pleasing appearance yet sturdy and strong, and having relatively few operating parts.

Yet another object is to provide a tractor in which all the operating parts are completely housed, thereby enabling the parts to be most efficiently lubricated and protected from dust and dirt.

Another object of my invention is to provide a tractor having a power drive for an implement, the power drive shaft being associated with the transmission so that the implement may be driven only when the tractor is being driven at first and second speeds, thereby preventing injury to the implement from its being driven at excessive speed or in a reverse direction.

Another object is to provide a lubricating means for a tractor in which all the operating parts may be lubricated from a single lubricant reservoir, thereby greatly decreasing the attention required from the operator and assuring a proper supply of lubricant to all the working parts at all times.

The above and other objects are attained by the embodiment of my invention illustrated in the accompanying drawing, in which,—

Fig. 1 is a side elevation of my improved tractor.

Fig. 2 is a side elevation with the main frame partly broken away to show the transmission and clutch assemblies.

Fig. 3 is a longitudinal section substantially on the line 3—3 of Fig. 5 showing the transmission and clutch assemblies, certain parts being omitted to avoid needless complication of the drawings.

Fig. 4 is a plan view of Fig. 2 with the cover plates removed and certain other parts omitted.

Fig. 5 is a transverse sectional view on the line 5—5 of Fig. 2 looking in the direction of the arrows.

Fig. 6 is a section of the transmission taken substantially on the line 6—6 of Fig. 5.

Fig. 7 is a section of the transmission taken substantially on the line 7—7 of Fig. 6.

Fig. 8 is a plan of the main frame.

Figures 9 and 10 are a side elevation of the front end and a front elevation respectively of the main frame.

Fig. 11 is a detail of the belt pulley assembly partly in section and partly broken away to show the mounting of the shaft and means for lubricating the bearings.

Fig. 12 is a vertical section through the rear axle and differential.

Fig. 13 is a detail taken substantially on the line 13—13 of Fig. 4 showing the means for supplying lubricant to the belt pulley driving gears.

Fig. 14 is a vertical section on the line 14—14 of Fig. 4 showing the brake assembly.

Fig. 15 shows the manner of mounting the steering assembly on the transmission cage.

Fig. 16 is a plan view of the cover for the rear end of the main frame.

My improved structure comprises a main frame 20, preferably formed as an integral casting supported at its front end by the steering wheels 21 and at its rear end by the traction wheels 22.

Referring to Figures 1, 2 and 4, there are mounted on the frame from front to rear, a radiator 23, an engine 24 covered by the hood 25, a clutch mechanism 26, a belt pulley driving assembly 27, a transmission 28, an intermediate driving shaft or brake shaft 29, and a bull gear 30 carrying the differential and driving the rear axle of the tractor. The radiator, hood and engine may be of any suitable construction and per se form no part of the present invention, they being shown merely to complete the illustration. It will be noted from an inspection of the drawing that the clutch, belt pulley drive, and the differential are all assembled in distinct units and are assembled in the tractor or removed therefrom as a whole.

It will also be noted that the shaft 29 and the gears carried thereby; the rear axle, together with the gear 30, and the differential mechanism mounted therein; and the steering assembly to be described later, also constitute separate units that may be assembled or removed from the tractor without disturbing other parts. These unit assemblies, together with the main frame and lubricating system form the principal parts of my invention.

In the detail description of my tractor which now follows, I will describe the unit assemblies separately and state the relation that each bears to the others.

Clutch mechanism.

Referring to Figures 2, 3 and 4, the engine is supported at its rear end by a flywheel housing 31 secured to opposite sides of the frame. Within this housing is the fly-wheel 32 which carries one set of disks of a multiple disk clutch forming part of the clutch mechanism above referred to. The other set of disks is carried by a main clutch spider 34 secured to or formed integral with a sleeve 35 splined to one end of the shaft 36 and held in position by the pin or bolt 36′. The opposite end of the shaft 36 has a head 37 which forms one element of a clutch for driving the transmission spline shaft 38 and is adapted for engagement by the clutch brake 39 to stop rotation of the shaft when the main clutch is disengaged. A clutch shifter spider 40 is engaged by the coil springs 41, of which there are preferably 3, secured by studs which are adjustable in the ends of bolts or pins 42 fastened to the flywheel, the springs 41 normally holding the clutch disks in engagement. The shifter spider is bored centrally to receive a flanged shifter tube 43 surrounding the shaft and secured to the spider by a split collar 44. The other end of the shifter tube is screw-threaded to receive a nut 45 for securing the clutch shifter collar 46 thereon, the collar being mounted on a ball bearing as shown and engaged by the shifter fork 47. The clutch brake 39 is secured to the collar 46 and when the clutch is disengaged the brake contacts with the head 37 to check the speed of the shaft. The fork 47 is secured to a shaft 48 mounted in the main frame and extends at one end beyond the frame where a lever 49 is keyed thereon (see Fig. 1). A link 50 is pivotally connected at one end to the lever 49 and at its other end to the clutch pedal 51 which is pivoted intermediate its ends to a bearing cage mounted in the main frame near its rear end, as will be described later.

When it is desired to repair the clutch mechanism or replace a worn part, the entire mechanism may be removed as a unit, the repair effected and the clutch replaced without dismantling the entire structure, as will now be described.

The belt pulley drive asembly is first removed from the frame, which gives access to the clutch mechanism from above. The shifter fork 47 is then disconnected from the collar 46. The split collar 44 is removed from the tube, the pin 36′ driven out, and the springs, studs and lock nuts removed from the pins 42. This releases the entire clutch mechanism. The shaft 36 is now telescoped into the sleeve 35 until the clutch 37 is disengaged. The spider 40 is telescoped over the tube 43 until it clears the ends of the pins 42 and the spider 34, together with the sleeve 35 slid to the left, Fig. 3, as far as possible. The clutch mechanism will then have been shortened by this telescoping of the parts so that it may be lifted out through the opening provided by removing the assembly 27. After the neces-

sary repairs or adjustments have been made the clutch is reassembled in the tractor by reversing the above operations.

Transmission mechanism.

The transmission mechanism is assembled in a cage so that it can be inserted in or removed from the tractor without changing the adjustments of other parts.

Referring to Figures 3 to 7, the transmission cage 53 has two laterally extending flanges 54, 55 secured to the main frame and supporting the cage thereon. In order to accurately center the cage each flange is bored to closely fit a dowel 56—57 secured in the frame. The driving shaft 38 is journaled in the cage and has three gears 58, 59, 60 splined thereon, the gears 59 and 60 preferably being formed in a single piece. The gears 58, 59 and 60 cooperate with gears 61, 62 and 63 respectively keyed to a driven shaft 64 journaled in the cage and carrying a bevel gear 65 for driving an intermediate shaft presently to be described.

A reverse drive shaft 66 is fixedly mounted in the cage and carries a rotatable sleeve on which two spur gears 67, 68 are secured. The gear 68 meshes with gear 62 and gear 67 is adapted to mesh with gear 58 when the latter is shifted to reverse drive position on the shaft 38. The gear 58 is also adapted to cooperate with an idler gear 69 rotatably mounted on the shaft 64 and with a gear 70 rotatably mounted on a power take off shaft 71 journaled in the upper part of the cage. The power take off shaft is splined near its central portion to slidably receive a clutch element 72 adapted to engage a corresponding clutch element formed on the gear 70. At one end the shaft has a bevel gear 73 for driving the belt pulley and at its opposite end is connected by a screw-threaded sleeve 74 to an implement drive shaft 75.

The gears 58, 59 and 60 are shifted by the gear shift lever 76 mounted in a ball and socket joint partly formed in a cover plate 77. The gear shifter rods 78, 79 are slidably mounted in the cage on opposite sides of the guide 80 and are adapted to be engaged by the lower end of the shifter lever, as is usual in the art. The rod 78 carries a shifter fork 81 engaging in a groove in the gear 58, while the rod 79 has a fork 82 for shifting the gears 59, 60. The rod 78 is provided with three notches 83, Fig. 6, adapted to be engaged by a spring pressed detent 84 to yieldably hold the rod in each of its three positions. The rod 79 is similarly provided with notches and a cooperating detent which do not show in Fig. 6, being directly behind those just described. The transmission cage 53 is open on its top side, the opening being normally closed by a cover 85 having a bearing for a short shaft 86. A clutch lever 87 is fixed to one end of the shaft exteriorly of the cover while the lever 88 carried by the other end extends downwardly into the cage and at its lower end engages a shifter fork 89 rigidly clamped to the shifter rod 90 and engaging in a groove in the clutch element 72. The rod 90 is slidably mounted in the cage and has two notches adapted to be engaged by the spring pressed detent 91 to yieldably hold the clutch in either engaged or disengaged position.

Assuming now that the engine has been started and the transmission gears are in neutral position as shown in Figures 3, 6 and 7. The lever 76 will be moved to shift gear 60 into mesh with gear 63 which will start the tractor at low or first speed. Gears 60, 63 are then disengaged and gear 59 meshed with gear 62 to drive the tractor at intermediate or second speed. If it now be desired to drive the tractor at third or high speed, gears 59—62 are disengaged and gear 58 shifted into mesh with gear 61. For reverse drive the gears 59—60 are in neutral position, while gear 58 is shifted into engagement with reverse gear 67 (Figures 6 and 7), the drive then being through gears 58, 67 and gears 68, 62 to the shaft 64. It is to be noted that when the tractor is at rest or is being driven at first or second speeds, the gear 58 will be in mesh with gear 70 on the power take off shaft and with the idler 69 so that the power take off shaft and the belt pulley and implement drive shaft connected thereto may be driven by proper manipulation of the clutch 72, but when the tractor is being driven at high speed or in reverse the gear 70 is inoperative and the implement drive shaft and belt pulley cannot be driven. This operates as a safety device to prevent reverse or high speed operation of the implement or machine being driven by the tractor. The function of the idler 69 is to carry lubricant from the oil reservoir in the bottom of the frame upward to the gears 58, 70, as will presently appear in the description of the lubricating system. The cage 53 and the mechanism mounted therein are removable as a unit from the tractor, as will now be described.

To remove the transmission mechanism the cover 77 will first be removed, carrying the shifter lever 76 therewith. The sleeve 74 and shaft 75 are next disengaged and the belt pulley assembly 27 removed. The bolts holding the cage in position are then removed. Whereupon the cage and entire transmission mechanism may be lifted out. In thus removing the transmission the clutch element formed on the end of the shaft 38 slides out of engagement with the clutch 37, as will be apparent. When the necessary repairs or adjustments have been made the transmission is again assembled in the tractor, being accurately located by

the dowels 56, 57, and the cover plate 77 and belt pulley assembly secured in their proper positions.

Belt pulley drive.

The belt pulley drive, as shown in Figures 3, 4, 11 and 13, comprises a casing 96 bolted to the main frame and to the transmission cage. The casing is open at the top and is divided interiorly by partition 97 into front and rear compartments 98, 99, the front compartment being open and joining the bell housing 31. The rear compartment extends laterally to provide a hollow arm 100 in which one end of a shaft 101 having a belt pulley 102 splined thereon is journaled. The opposite end of the shaft is supported in a bearing carried by a cap 103 and has a bevel gear 104 keyed thereon meshing with the gear 73 previously described. The rear compartment, in addition to housing the shaft 101 and gears 104, 73, also serves as a lubricant reservoir for the gears and shaft bearings, oil being supplied through an opening 105 in the rear wall registering with a similar opening in the transmission cage. Oil thrown from the gear 70 against the side of the transmission cage collects in a trough 106 from whence it flows through the opening 105 into the compartment 99. The oil level in the compartment is maintained constantly at the level of the top of the trough, any excess oil overflowing the trough and dropping down over the transmission gears to the bottom of the main frame. A removable cover 107 closing the opening in the top of the casing provides access to the gears 73, 104 without removing the assembly from the tractor and also serves as a means for introducing lubricant in an emergency.

Brake shaft assembly and rear axle drive.

Referring to Figures 4 and 14, the bevel pinion 65 meshes with a bevel gear 108 keyed on the intermediate or brake drum shaft 109 journaled in bearings supported by a pair of cages 110, 111 mounted in apertures bored in opposite sides of the main frame. The cage 110 is bored at 110′ to receive a pin for supporting the brake pedal 51 previously described. The shaft extends through the cage 111 and at its outer end carries the brake drum 112. A brake band 113 surrounds the drum and cooperates with the brake lever 114 mounted on the stud 115 secured in the side of the main frame. A pinion 116 keyed to the shaft 109 adjacent bevel gear 108 meshes with and drives the gear 30 which carries the differential mechanism and drives the rear axle, as best shown in Figure 12. The gear 30 is secured to the differential drum 117, which has oppositely extending hollow trunnions supported in the rear axle carriers 118, 119 secured in opposite side walls of the main frame. The differential casing carries the usual differential pinions meshing with bevel gears mounted on the inner ends of the shafts or axles 120, 121, the axles extending through the carriers and being supported in bearings near their outer ends where they are keyed to the traction wheels. A pair of lugs 122, 123 depending from each of the carriers provides a means for attaching a draw bar or other appliance to the tractor by means of pins 124, 125.

Steering assembly.

In Figures 1 and 15 I have shown the steering assembly which forms one unit of the tractor and is preferably mounted on the transmission cage. The assembly comprises a casing 126 secured by three bolts engaging in tapped holes 127 in the transmission cage, Figures 4 and 15. A steering post 128 mounted on the casing carries a hand wheel secured to the upper end of a steering shaft 129, the lower end of which extends into the casing for actuating the usual worm and wheel, the wheel being secured to one end of a shaft 130 journaled in the casing. An arm 131 fixed to the outer end of the shaft 130 is connected by a link 132 to the steering knuckles of the front wheels 21. Intermediate its ends the post 128 is provided with a lug or bracket 133 drilled to receive and support the concentric spark and throttle control rods 134.

Main frame.

The main frame 20 (Figures 1, 8, 9 and 10) is preferably cast in a single piece, but may be a sheet metal stamping or be formed by rigidly securing two or more pieces together. At its front end the frame is relatively wide and shallow, while at its rear end it is relatively narrow and deep, the depth increasing uniformly from front to rear, and the width changing about midway of the two ends. The frame has a two point support at its rear end on the rear axle carriers 118, 119 while the front end is supported at a single point by the bolster 136 which is bolted to the frame and pivotally connected to the front axle 137. This provides a three-point suspension for the frame and minimizes stresses and strains when the tractor is being operated over rough ground.

I will now point out how the several parts or units previously described are supported on the unit frame.

Referring to Figure 8, the frame at its forward end has two opposite bosses 138 drilled and tapped to receive bolts for securing the radiator 23 rigidly to the frame. Next in the rear of the bosses 138 are two bosses 139 tapped to receive bolts for securing the front bracket of the engine 24 to the frame, the rear end of the engine being

supported by the flywheel bell housing 31 which is secured by bolts engaging in the tapped holes 140, 141. The belt pulley casting is secured adjacent the bell housing by bolts screwed into openings 142 in the frame and is also secured to the transmission cage by bolts 143 (Fig. 2). The frame is next provided on one side with three tapped holes 144 and on the opposite side with two holes 145 to receive bolts for securing the transmission cage in position. Between the two sets of tapped holes are drilled holes 146, 147 for the reception of the dowels 56, 57 for accurately locating the cage with respect to the frame and cooperating operative parts of the tractor. The rear part of the frame has a plurality of tapped holes 148 (ten in number) for securing a cover 149 over the mechanism housed therein. The cover 149 is best shown in Figs. 2, 12 and 16 and at its forward end has a raised portion 150 in which is formed a semi-spherical recess 151 forming one half of a bearing for the ball of the gear shift lever 76, the other half of the bearing being provided in the plate 77 which closes the raised portion 150. The cover has a centrally raised portion 152 embracing the gear 30 and wide enough to permit passage of the implement drive shaft 75 which extends rearwardly through the cover and is supported at its rear end in a bearing in a cylindrical sleeve 153 formed integral with the cover and closed at its rear end by a removable cap 154. The implement drive shaft terminates within the cap which serves to exclude dust and dirt from the interior of the tractor when an implement is not being driven from the shaft. At its forward end the cover has vertical flanges 155 for bolting it to the rear of the transmission cage and laterally extending arms or flanges 156 adapted to support the front ends of guards or fenders for the traction wheels, the rear ends of the guards being supported from shoulders 157, 157' formed integral with the rear axle cages 118, 119 (Figures 4 and 12). The guards for the rear wheels are not shown in the drawings, since they are of usual construction and their illustration would only tend to confusion by complicating the drawings. Near the right hand side of the cover are a pair of holes 158 adapted to receive bolts to support the operator's seat 158' shown in Fig. 1. The front end of the frame has a large opening 159 through which access may be had to the oil pan 160 of the engine (Figures 2 and 8). A stay rod socket 161 is secured to the frame adjacent the rear edge of the opening 159, as shown in Figure 1.

Referring now to Figures 2, 3 and 8, the frame is divided by a vertical partition 162 into front and rear parts, the rear part being completely closed by the transmission cage and rear cover and providing a reservoir for a lubricant in which the operative parts run. A dam 163 separates the reservoir into front and rear compartments and serves to maintain lubricant in the front compartment at the proper level for the transmission gears 62, 61, 69, while sufficient lubricant is maintained in the rear compartment to lubricate gears 63, 108, and 30. Each of the compartments is provided with a drain opening 164, 165 normally closed by plugs or drain cocks for draining out the lubricant when desired. A bridge or brace 166 is provided directly over the brake shaft to strengthen the frame and reinforce the sides which are somewhat weakened by the large apertures provided for the reception of the bearing cages. Lubricating oil thrown from the gears 63, 65 and 68 against the side of the frame is caught by a trough 167 (Figures 5 and 8) sloping toward and terminating at the top of the dam 163 over which the oil will flow into the front compartment to maintain the oil at the proper level therein.

Lubricating system.

The construction of the main frame and the arrangement of the parts housed therein affords a very convenient and efficient means for lubricating the operative mechanism of the tractor, as will now be described.

The cover 85 of the transmission cage (Fig. 2) has an oil filling opening 168 through which oil is poured, it running over the transmission gears and filling the front compartment to the height of the dam 163, which it then overflows until the oil reaches the proper level in the rear compartment as indicated by a gauge of usual construction attached to the rear end of the frame, but not shown. When the proper amount of oil has been poured into the frame, the opening 168 is closed. If the tractor is now started the six gears 30, 108, 63, 62, 61 and 69, will all be running in oil. A mist of oil maintained by the gears 63, 62, 61 and 69 will thoroughly lubricate all the transmission gears and bearings and oil carried to the gear 70 by means of the gears 69 and 58 will be thrown against the side of the transmission cage and caught by the trough 106 (Fig. 13) from whence it will run through the opening 105 to maintain oil in the chamber 99 to lubricate the gears 73, 104, and the bearings of the shaft 101. Excess oil from the transmission gears and trough 106 will drain back to the bottom of the frame to be again distributed. The gears 30, 108 and 63 maintain a mist of oil in the rear chamber which thoroughly lubricates all the gears and bearings, oil dripping through apertures 169, 170 in the carriers 118, 119 (Fig. 12) to lubricate the rear axle bearings. Oil flung from the gears 63, 65 against the wall of the frame is caught by the trough 167 and

flows into the front chamber, any excess oil therein running over the dam back into the rear chamber. It will thus be apparent that a very efficient means for lubricating the gears and bearings is provided, since it will require attention only at very infrequent intervals and all the parts are lubricated by oil supplied at a single point.

While I have described one embodiment of my invention in considerable detail and have identified the parts by specific terms, it is to be understood that I do not desire to be limited to exact details shown and described, but that my invention embraces all modifications and rearrangements of parts that may fall within the scope of my claims or be the equivalents of the invention defined thereby.

What I claim as new and desire to secure by Letters Patent is:

1. In a tractor, a main frame having a broad and shallow front part, a relatively narrow and deep rear part, a wall separating the two parts whereby a reservoir for lubricant is provided in the rear part, a transmission assembly closing the reservoir adjacent the partition and extending thereinto, differential gearing mounted in the reservoir at the opposite end, a removable cover closing the reservoir over the differential gearing, and driving connections in the reservoir between the transmission and differential.

2. In a tractor, a main frame having a relatively broad and shallow front part, a relatively narrow and deep rear part, a wall separating the two parts whereby a reservoir for lubricant is provided in the rear part, a transverse dam dividing the reservoir into front and rear compartments, a transmission assembly closing the front compartment and extending below the top of the dam, differential gearing mounted in the rear compartment, a removable cover for the differential gearing, and driving connections between the transmission and differential.

3. In a tractor, a single piece main frame having a transverse partition dividing the frame into front and rear parts; a radiator and an engine mounted on the front part; a transmission, a differential, and a transverse shaft housed in the rear part; driving connections between the transmission, transverse shaft, and differential, and means extending through the partition for driving the transmission from the engine.

4. In a tractor, a main frame formed from a single piece of metal having a partition dividing it into an open front part and a rear compartment and increasing in depth from the front to the rear, the front part being of substantially uniform width and wider than the rear part, radiator and engine supports on the front part, supports for a transmission in the compartment adjacent the partition, and a plurality of transverse bearing supports in the compartment in the rear of the transmission supports.

5. In a tractor having a main frame, a removable assembly comprising a casing adapted to be bolted to the frame, a partition dividing the casing into two compartments, a hollow arm extending laterally from one compartment, a shaft journaled in the arm and compartment and extending beyond the arm, a gear on the shaft in the compartment, and a belt pulley on the extended end of the shaft.

6. In a tractor having a main frame, a removable assembly comprising a casing having a chamber holding lubricant therein, the casing being adapted to be secured to the frame and having an aperture in one side wall opening into the lubricant chamber for supplying lubricant thereto, a shaft journaled in the casing and extending through the chamber and beyond the casing at one end, a gear on the shaft in the chamber, and a belt pulley on the extended end of the shaft.

7. In a tractor, the combination of steering wheels and driving wheels, a main frame formed from a single piece of metal, means for supporting the front end of the frame on the steering wheels, a driving shaft extending thru the rear end of the frame and supporting the frame on the driving wheels, a differential secured to the driving shaft within the frame, a second shaft journalled in the frame and driving the differential, one end of the said shaft extending laterally through the frame and provided at said end with means whereby a braking action may be exerted thereon, a transmission housed within the frame and driving the second shaft, a transverse partition providing with the rear end of the frame a reservoir for lubricant, and an engine mounted on the front end of the frame for driving the transmission.

8. In a tractor, the combination with a unit frame having a transverse partition providing with the rear end of the frame a reservoir for lubricant, of an axle extending thru the reservoir and supporting the rear end of the frame, a differential mounted on the axle within the reservoir, a brake shaft extending transversely of the reservoir and journalled in the side walls of the frame and having one end protruding through the casing and carrying means for exerting a braking action thereon, driving connection between the shaft and differential, one end of a transmission mounted on the frame and extending into the reservoir, driving connections between the transmission and brake shaft, an engine mounted on the frame forward of the partition, and

driving connections between the engine and transmission.

9. In a tractor having a unit frame, the combination of a cage carrying transmission mechanism, a power take off shaft journalled in the cage and driven from the transmission, a clutch mounted in the frame, a driving shaft journalled in the frame, a belt pulley drive assembly mounted on the frame, and means for detachably securing the cage to the frame so that the transmission will cooperate with the clutch and driven shaft and the power take off shaft with the belt pulley drive.

10. In a tractor, a removable unit assembly comprising a cage having supporting flanges, a driving shaft and a driven shaft journalled in the cage below the flanges, cooperating change speed gears on the shafts, a driving element on the driving shaft, a driving gear on the driven shaft, a power take-off shaft in the cage above the flanges, means for driving the power take-off shaft from the driving shaft, and means in the cage for shifting the change speed gears.

11. In a tractor, the combination of a unit frame, a cage carrying a transmission removably mounted on the frame, a belt pulley drive assembly mounted on the frame adjacent the transmission, a power take-off shaft journalled in the cage, means for driving the power take-off shaft from the transmission, and means for driving the belt pulley from the power take-off shaft.

12. In a tractor, the combination of a main frame providing a reservoir for lubricant, a removable cage mounted on the frame and carrying a transmission mechanism projecting into the lubricant reservoir, a power take-off shaft journalled in the cage and driven from the transmission, a belt pulley shaft journalled in a casing removably mounted on the frame, means for driving the pulley shaft from the power take-off shaft, and an implement drive shaft driven from the power take off shaft.

13. In a tractor, the combination of a main frame providing a reservoir for lubricant, a removable cage mounted on the frame and carrying a transmission mechanism projecting into the lubricant reservoir, a power take off shaft journaled in the cage and driven from the transmission, means cooperating with the transmission to convey lubricant from the reservoir to the power take off shaft bearings, a belt pulley shaft journaled in a casing removably mounted on the frame, means for driving the pulley shaft from the power take-off shaft, and an implement drive shaft driven from the power take off shaft.

14. In a tractor, the combination of a unit frame providing a reservoir for lubricant, a removable cage mounted on the frame, a driving shaft journaled in the cage, a plurality of gears slidable on the shaft and rotating therewith, a driven shaft journaled in the cage and having a plurality of gears extending into the reservoir, a reverse drive shaft mounted in the cage and having a pair of gears thereon, means slidable in the cage for shifting the gears on the driving shaft so as to drive the driven shaft at three speeds forward and one reverse, a power take off shaft, and means for driving the power take off shaft only when the driven shaft is at rest or rotating at first or second speed.

15. In a tractor, the combination of a main frame providing a reservoir for lubricant, a removable cage mounted on the frame, a driving shaft journaled in the cage and having a plurality of gears splined thereon, a driven shaft journaled in the cage, a plurality of gears fixed thereon and extending into the lubricant reservoir, a reverse drive shaft mounted in the cage and supporting a pair of gears, means for shifting the gears on the driving shaft to drive the driven shaft at three speeds forward and one reverse, a power take off shaft journaled in the cage above the driving shaft, and means for preventing operation of the power take off shaft when the driven shaft is driven at high speed or reverse.

16. In a tractor, the combination of a main frame providing a reservoir for lubricant, a removable cage mounted on the frame, a driving shaft journaled in the cage and having a plurality of gears splined thereon, a driven shaft journaled in the cage, a plurality of gears fixed thereon and extending into the lubricant reservoir, a reverse drive shaft fixed in the cage and having a pair of gears journaled thereon, means for shifting the gears on the driving shaft to drive the driven shaft at three speeds forward and one reverse, a power take off shaft journaled in the cage above the driving shaft, means for preventing operation of the power take off shaft when the driven shaft is driven at high speed or reverse, and means for conveying lubricant from the reservoir to the bearings of the power take off shaft.

17. In a tractor, the combination of a frame, a transmission casing supported on a frame, a driving shaft journalled in the casing, a plurality of gears slidable on the shaft and rotatable therewith, a driven shaft journalled in the casing and having a plurality of gears, a reverse drive shaft mounted in the casing and having a pair of gears thereon, means slidable in the casing for shifting the gears on the driving shaft so as to drive the driven shaft at a plurality of speeds forward and one reverse, a power take-off shaft, and means for driving the power take-off shaft only when the

driven shaft is at rest or rotating at the lower speeds forward.

18. In a tractor, a single piece main frame of increasing depth from front to rear divided by a partition into a relatively shallow open front end and a relatively deep open topped reservoir at the rear end, a radiator, an engine, and a clutch mechanism mounted on the front end of the frame, a transmission and a differential mounted within the reservoir, and means for closing the open top of the reservoir.

19. In a device of the class described, the combination of a main frame, a partition dividing the frame into front and rear parts, the rear part providing a reservoir for lubricant, a dam dividing the reservoir into front and rear compartments, gearing operating in the rear compartment, means cooperating with the gearing to supply lubricant from the rear compartment to the front compartment, gearing in the front compartment, a casing mounted on the frame above the front compartment, mechanism in the casing driven from the gearing in the front compartment, and means cooperating with the gearing for supplying lubricant to the casing.

20. In a tractor, the combination of a main frame, a lubricant reservoir formed in the frame, a dam dividing the reservoir into front and rear compartments, gearing including a differential mounted in the rear compartment, an inclined trough formed on the frame and directing lubricant thrown from the gearing into the front compartment, a cage mounted on the frame and carrying transmission mechanism operating in the front compartment, a casing mounted on the frame adjacent the cage, gearing operating in the casing, and an inclined trough on the cage receiving lubricant from the transmission gears and discharging into the casing.

21. In a tractor, the combination of a main frame, a lubricant reservoir provided therein, a transmission cage mounted on the frame and extending into the reservoir, transmission gearing mounted in the cage, a casing mounted on the frame above the reservoir and secured to the cage, and an inclined trough in the cage receiving lubricant thrown from the gearing and discharging into the casing to lubricate mechanism mounted therein.

22. In a tractor of the type having steering wheels, the combination of a frame, a casing secured to the side of the frame and having a laterally extending flange secured to the top of the frame, a transverse shaft journalled in the casing and having a steering arm at one end, a steering shaft supported on the casing, means for turning the transverse shaft from the steering shaft, and means operatively connecting the arm and steering wheels.

In testimony whereof I affix my signature.

EDWARD A. JOHNSTON.