Sept. 26, 1933. J. S. RODGERS 1,928,136

TRACTOR

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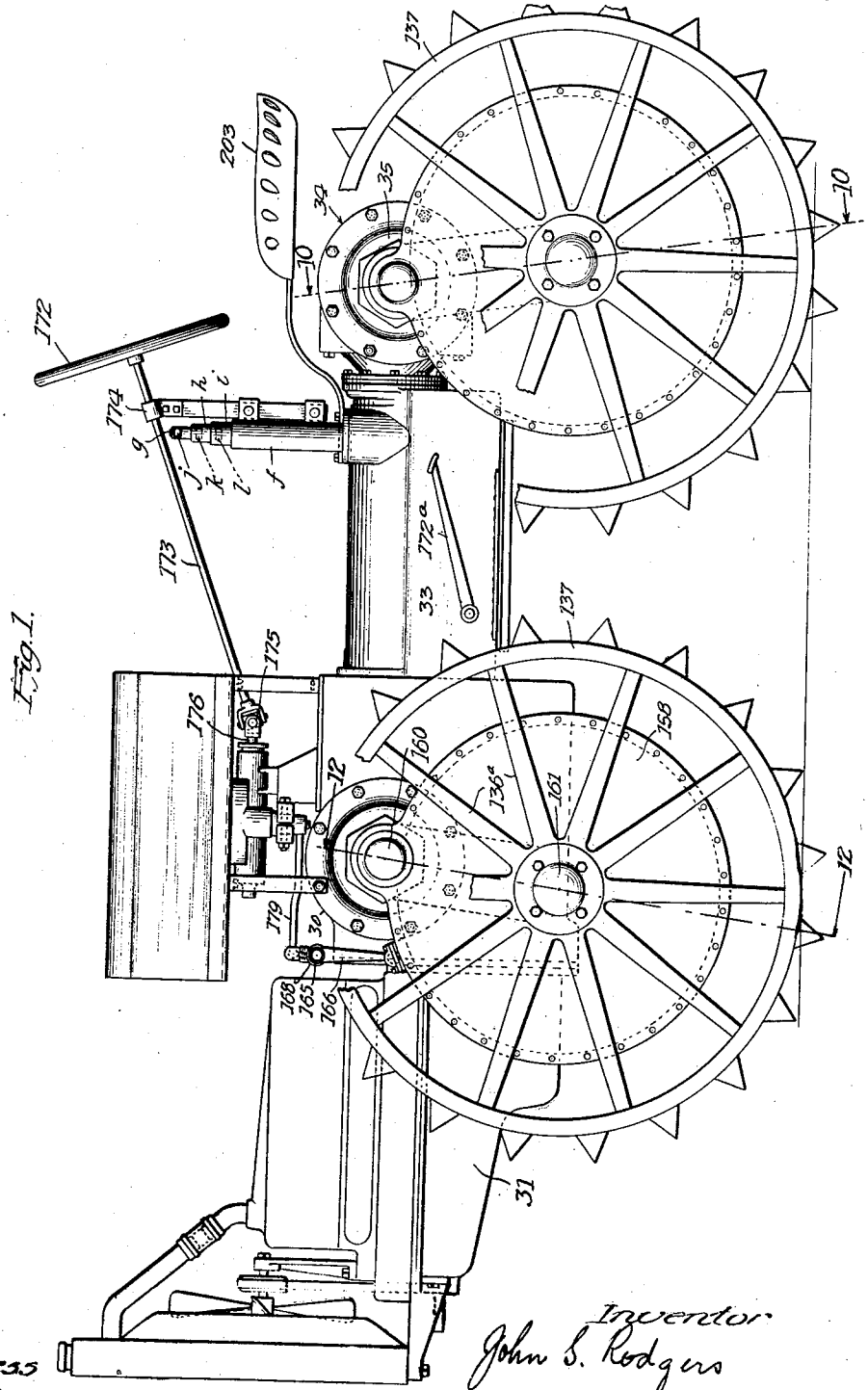


Fig. 1.

Witness
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TRACTOR

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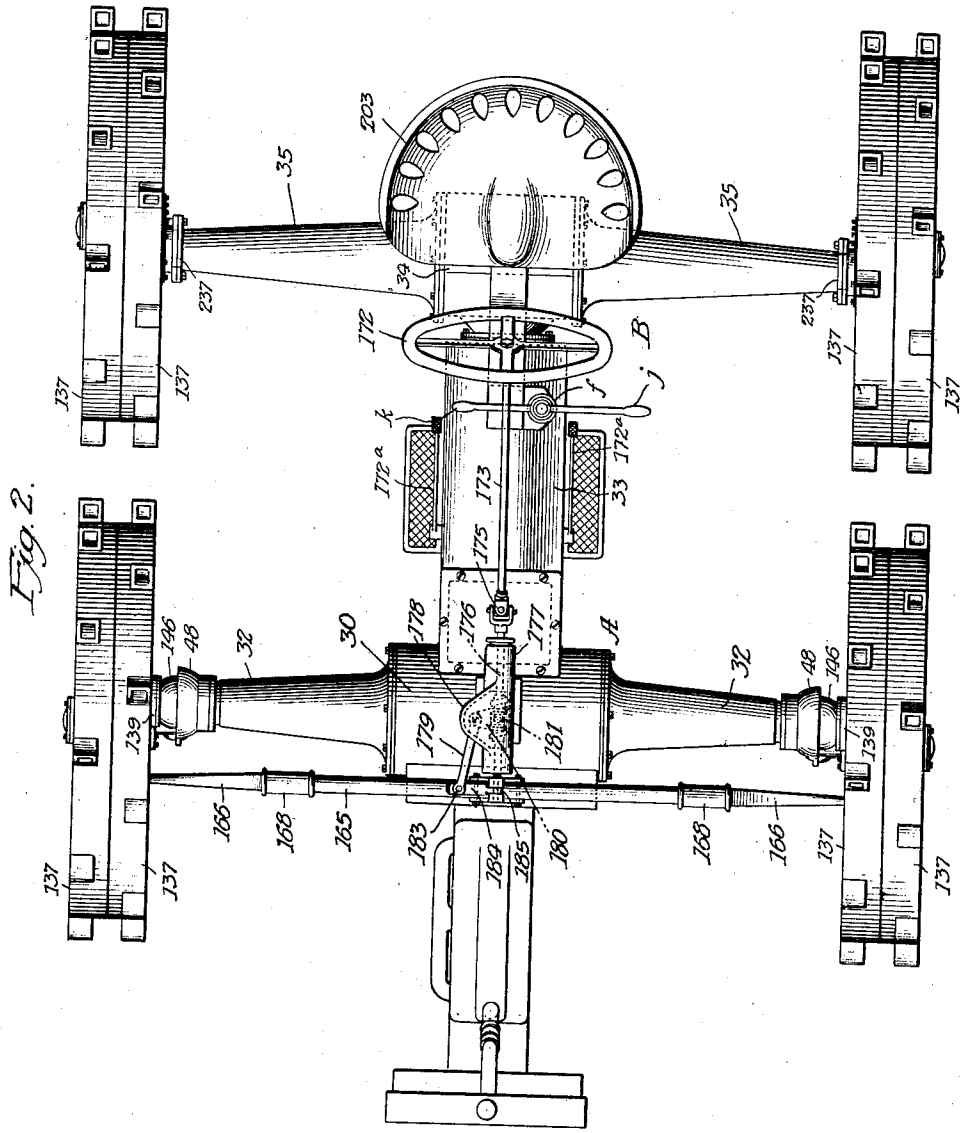


Fig. 2.

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TRACTOR

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Fig. 3.

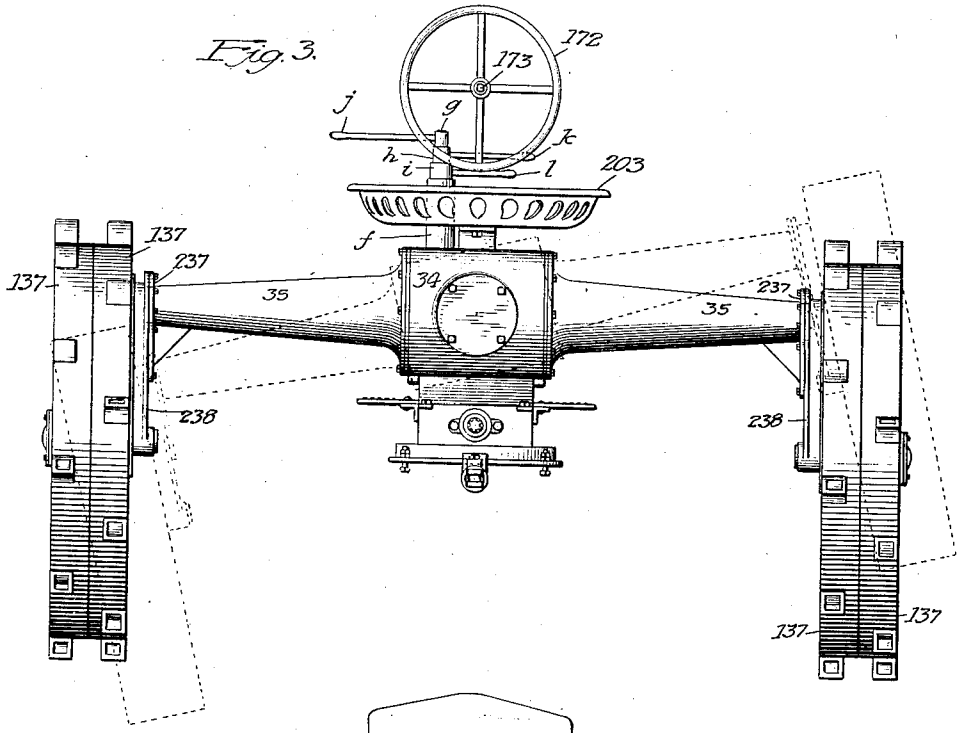
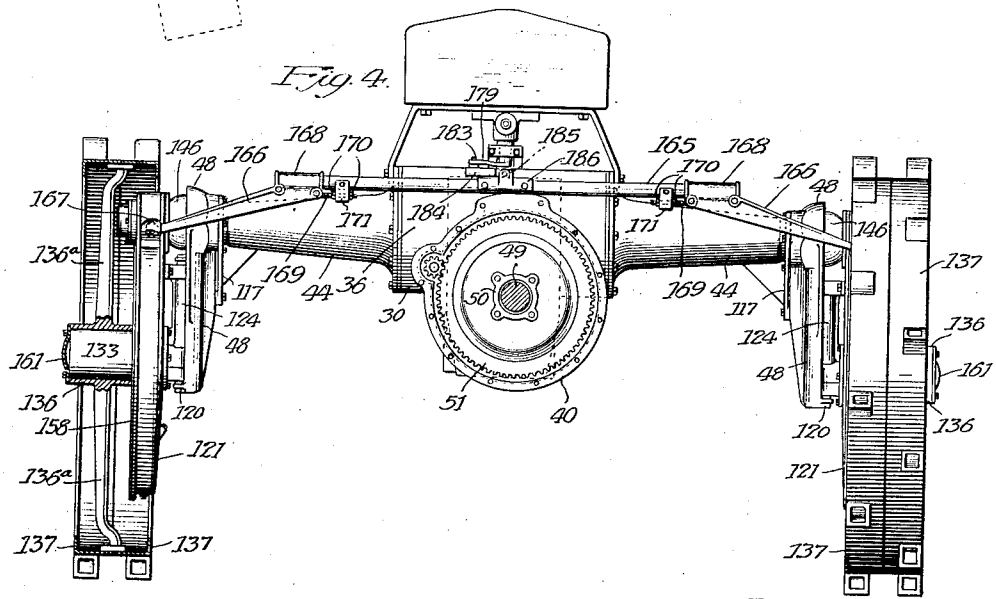


Fig. 4.



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Sept. 26, 1933. J. S. RODGERS 1,928,136

TRACTOR

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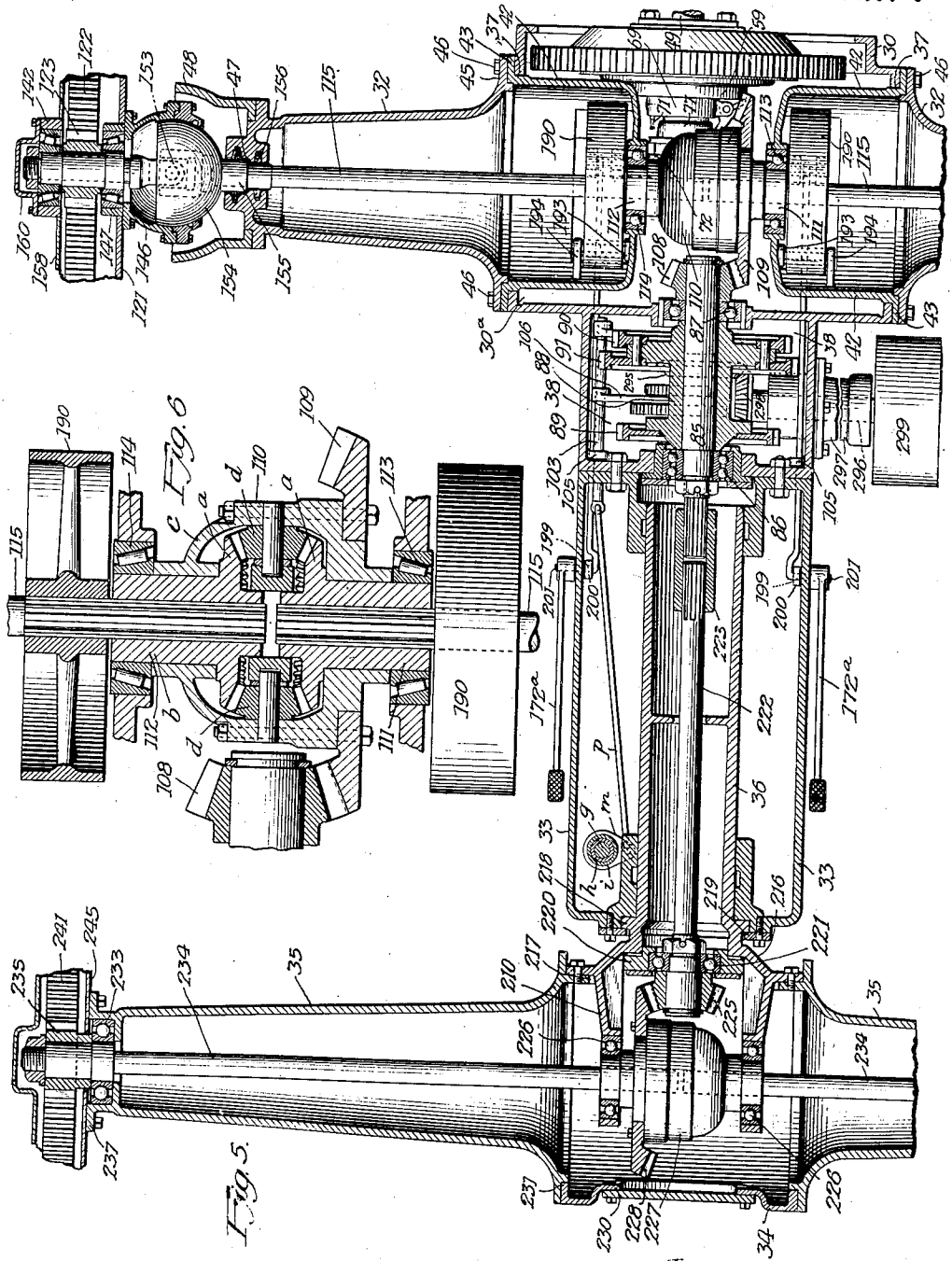


Fig. 5.

Fig. 6

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Sept. 26, 1933. J. S. RODGERS 1,928,136

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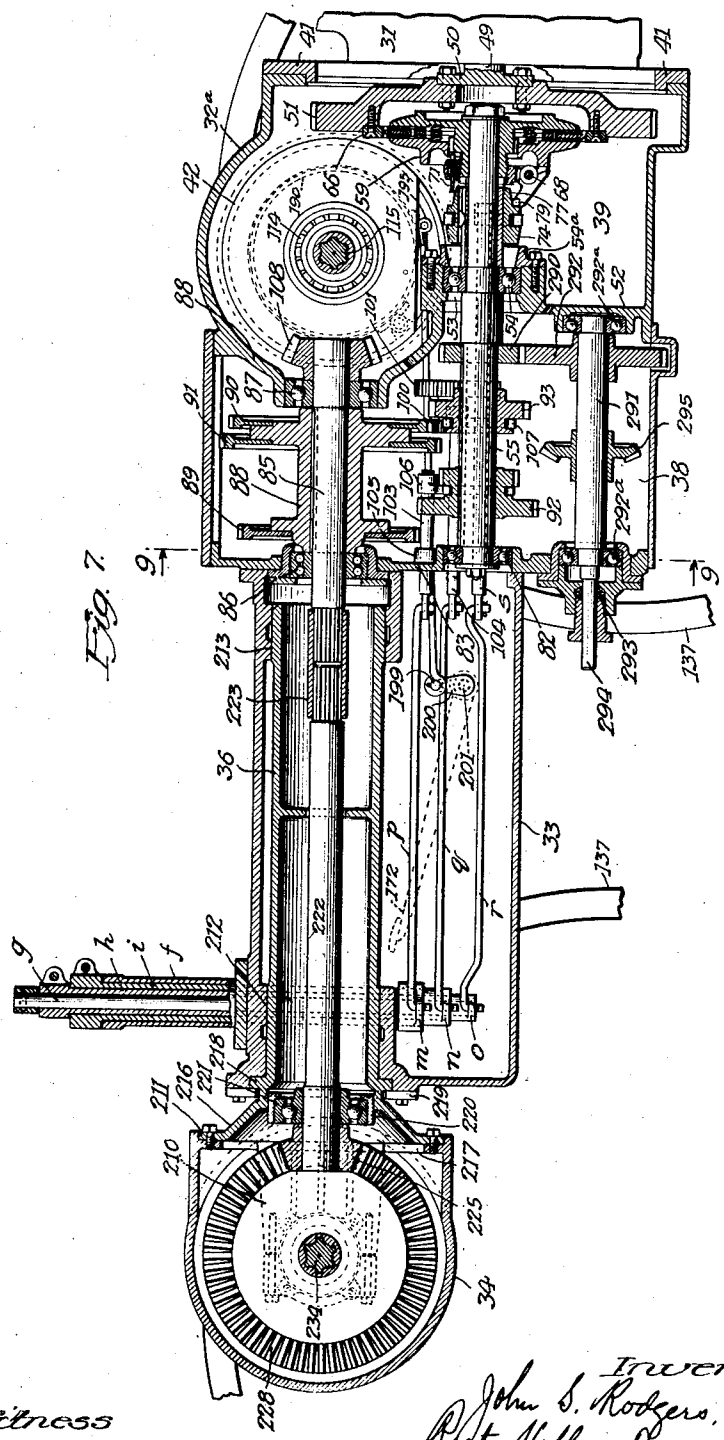


Fig. 7.

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R. B. Davison

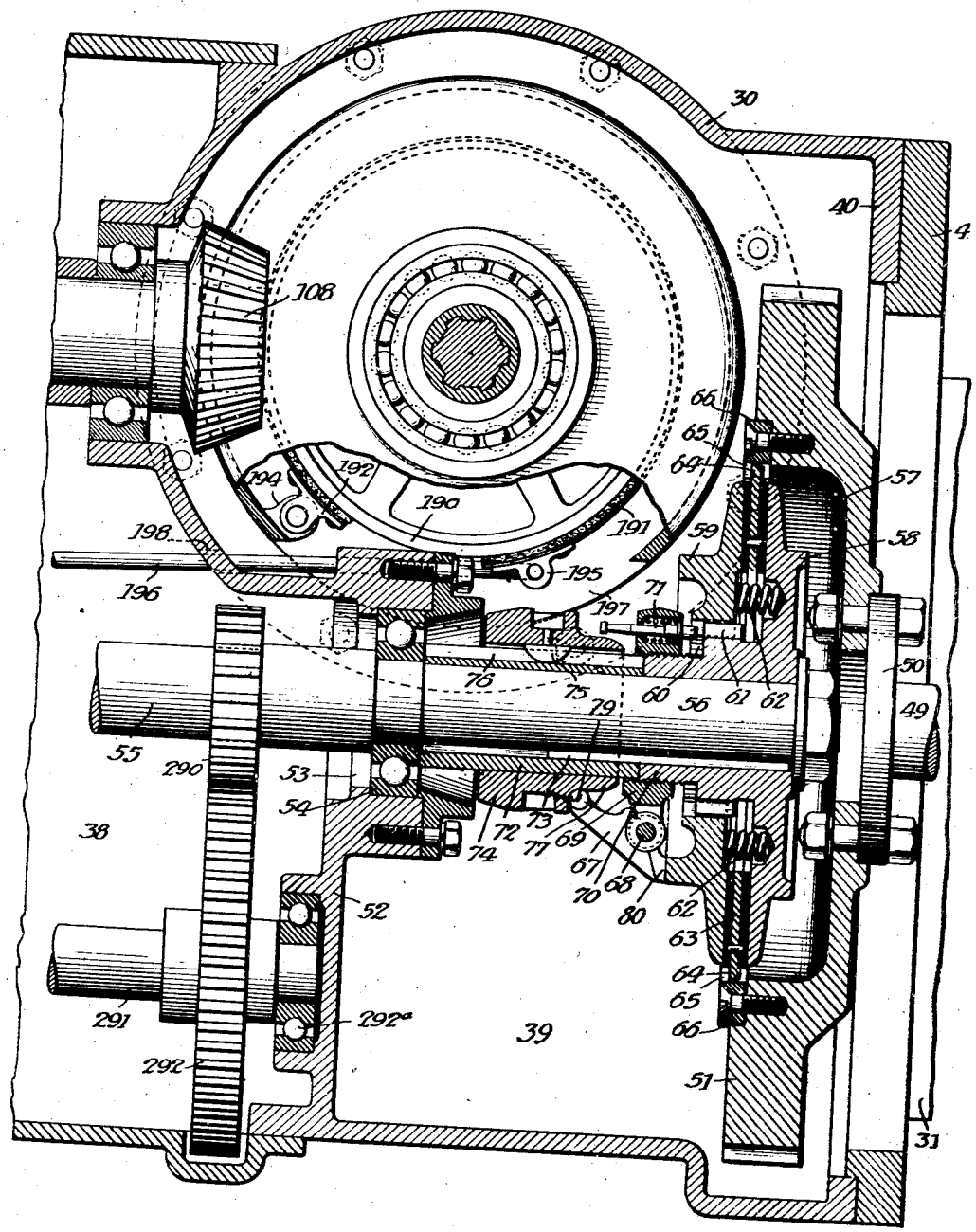
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Sept. 26, 1933. J. S. RODGERS 1,928.136

TRACTOR

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Fig 8.



Witness

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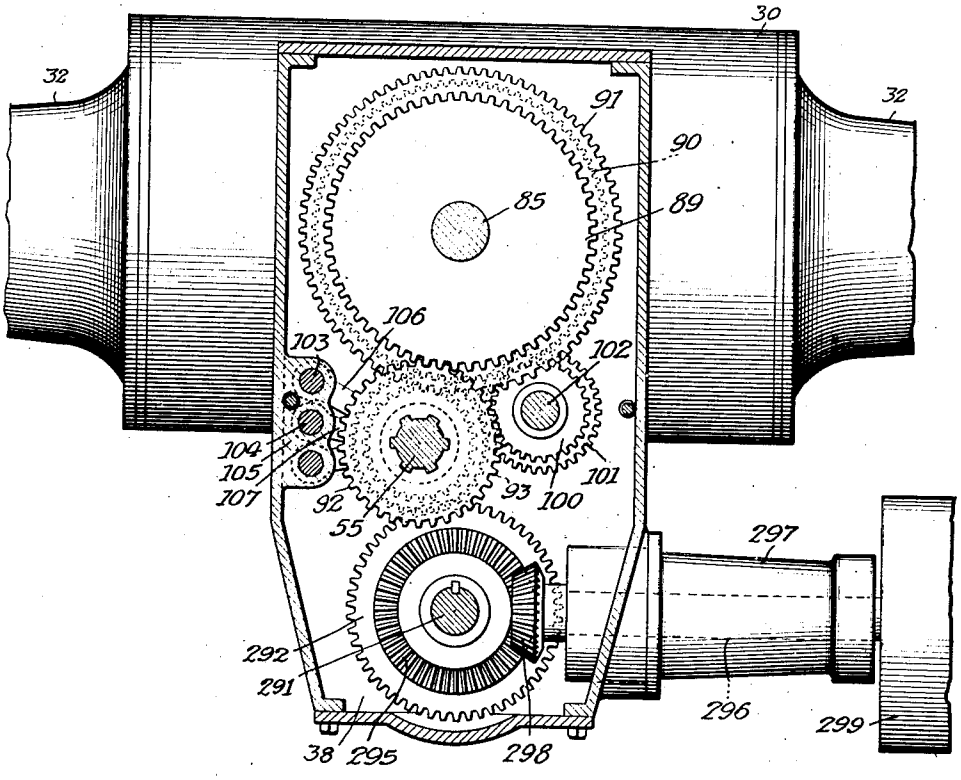
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Sept. 26, 1933. J. S. RODGERS 1,928,136

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Fig. 9.



Witness
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TRACTOR

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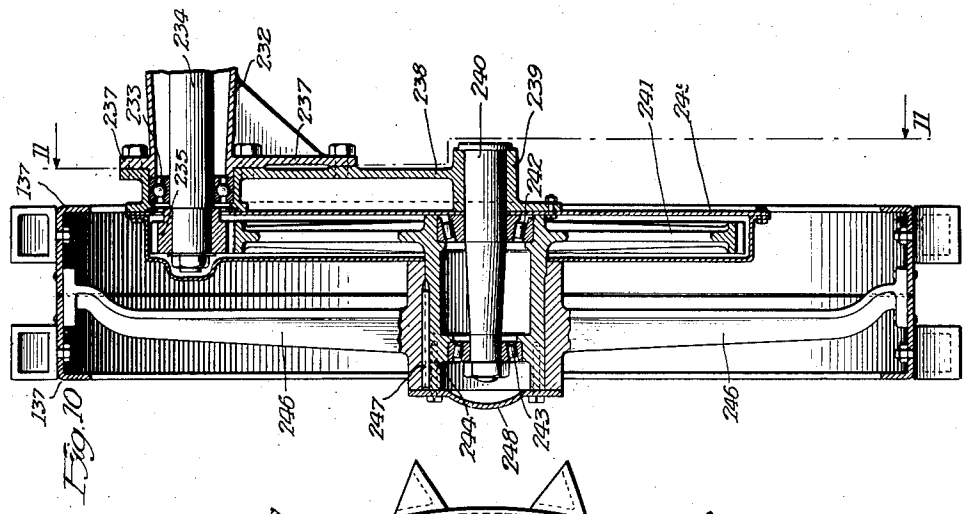


Fig. 10

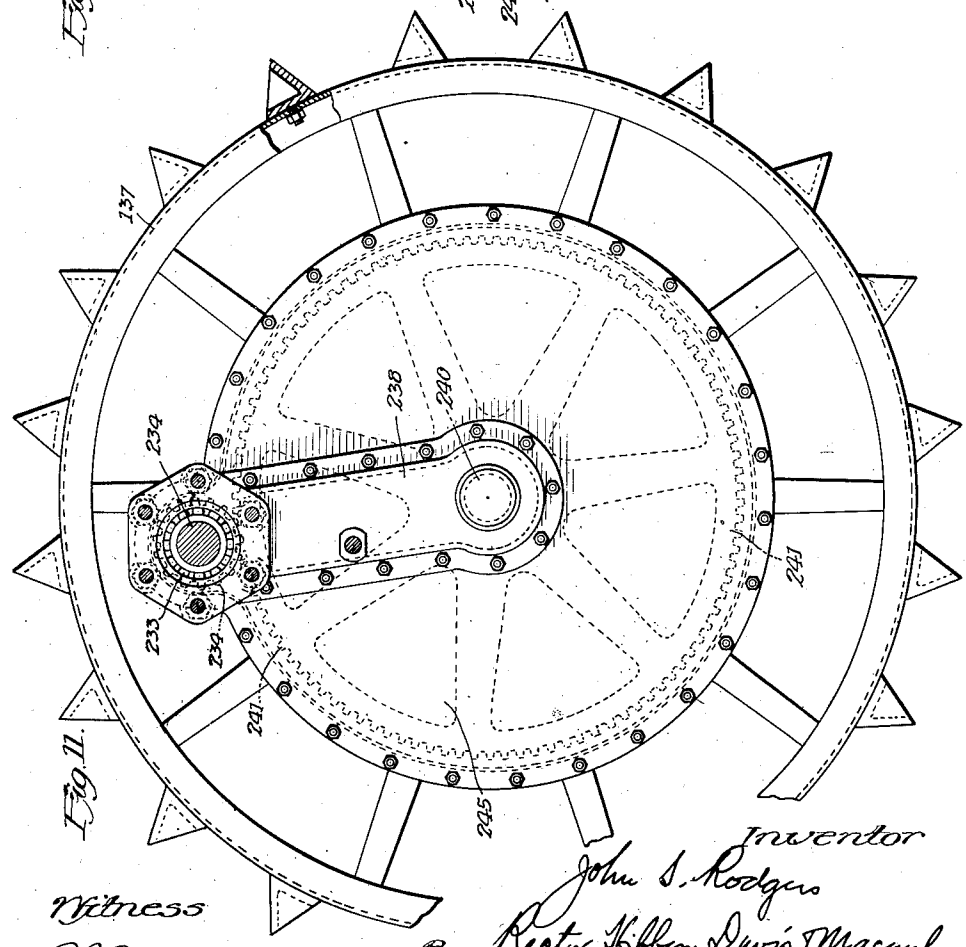


Fig. 11.

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Sept. 26, 1933. J. S. RODGERS 1,928,136

TRACTOR

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Fig. 12.

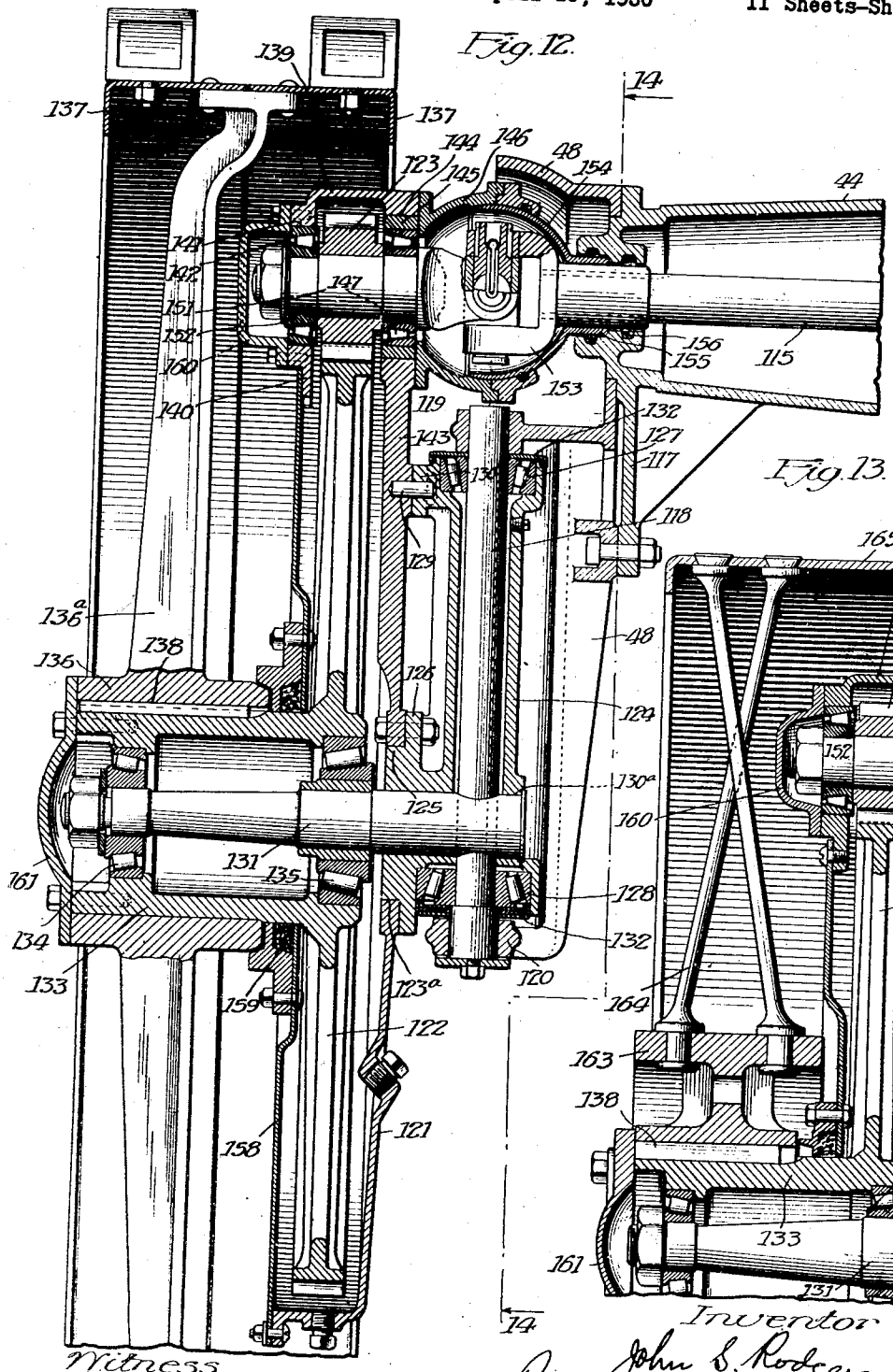


Fig. 13.

Witness

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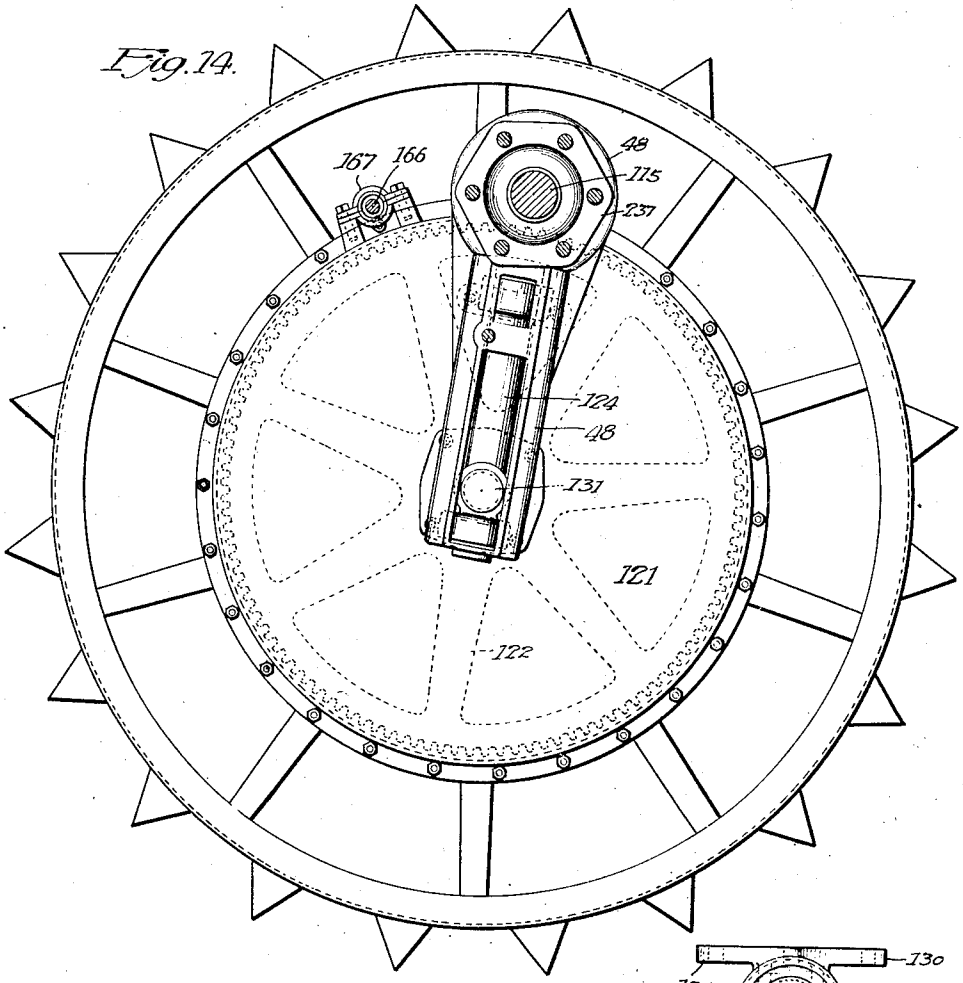
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Sept. 26, 1933. J. S. RODGERS 1,928,136

TRACTOR

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Fig. 14.



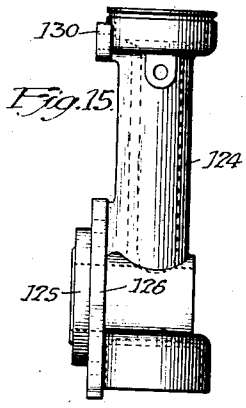


Fig. 15.

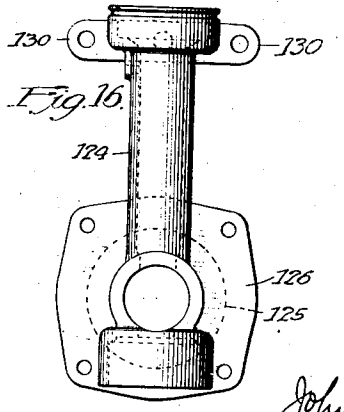


Fig. 16.

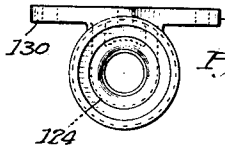


Fig. 17.

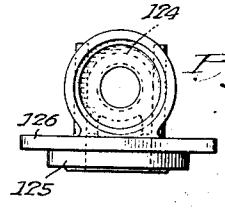


Fig. 18.

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Fig. 19.

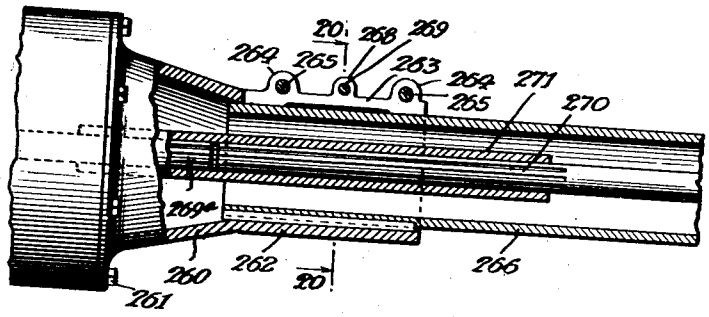


Fig. 20.

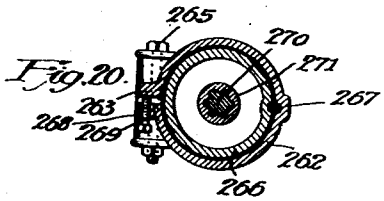


Fig. 21.

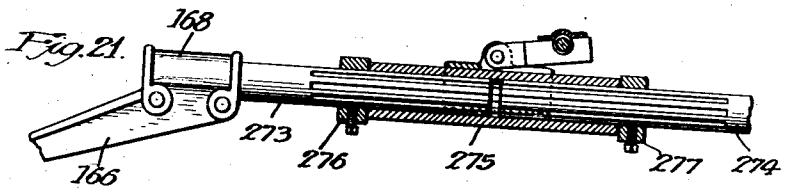
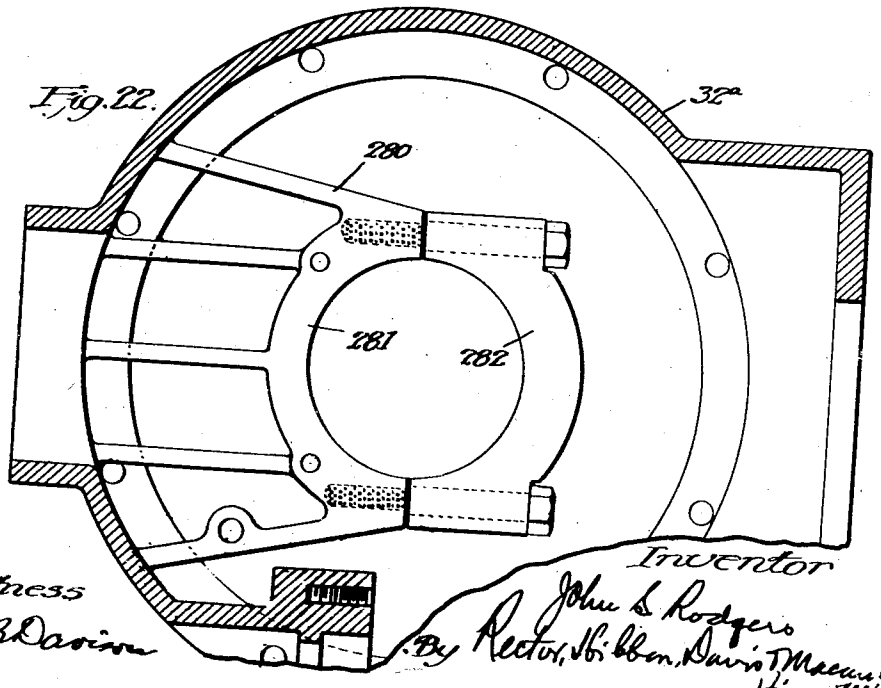


Fig. 22.



Witness
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Patented Sept. 26, 1933 1,928,136

UNITED STATES PATENT OFFICE

1,928,136

TRACTOR

John S. Rodgers, Racine, Wis., assignor to The Massey-Harris Co., Racine, Wis., a corporation of Maryland

Application April 19, 1930. Serial No. 445,549

14 Claims. (Cl. 180—44)

My invention relates to a four wheel tractor each of the wheels of which is driven from the power plant. The tractor is especially designed and intended for agricultural and similar work where soft, uneven and irregular ground is to be traversed and with this in view it is so constructed that not only are each of the four wheels positively driven, but each of them is at all times and under all circumstances in contact with the ground or bed over which the machine is traversed and at the same time sustains a sufficient proportion of the weight of the machine so that maximum traction is at all times available. With this in view the rear axle assembly is so mounted upon or connected to the main body of the machine, comprising the front axle assembly, that either assembly may tilt laterally of the machine with respect to the other. Furthermore, the spindles or arbors on which the front wheels are journaled are in a vertical plane more or less in advance of that in which the axis of the front axle assembly is located and the spindles or arbors on which the rear wheels are journaled are in a vertical plane more or less to the rear of the center of the rear axle assembly so that though the machine is so simple and relatively compact as to the body portion thereof comprising the two axle assemblies and the structure connecting them, the spread or span between the front and rear wheels is materially greater thus increasing the stability of the machine with respect to the tendency to tilt in a longitudinal direction. Furthermore, in my improved tractor the motor and the immediately associated parts are mounted substantially in advance of the ground contact points of the front wheels, thereby throwing the center of gravity well forward. It is well known that tractors as commonly constructed heretofore, when hauling a heavy load, tend to rear or lift up in front, the center of gravity in the circumstance tending to shift to the rear of the machine, and in some instances where the load is very heavy the front wheels actually leave the ground. This is a serious defect even in a tractor driven only through the rear wheels. But the defect would be particularly disadvantageous in a tractor in which all four wheels are driven as it would deprive the machine for the time being of the tractive efforts of the front traction wheels as well as affect the steering of the tractor. By mounting the motor and associated parts in advance of the transverse plane of contact of the front wheels with the ground, or substantially so, the center of gravity of the machine, when at rest, is brought well forward toward the front axle, but not sufficiently so to endanger forward tipping of the machine, and the weight is well distributed between the front and back pairs of wheels when the pull of the implement or vehicle being pulled is heavy and the greatest tractive effort is desired.

Thus, though each pair of wheels is differentially driven, both wheels of each pair at all times maintain traction and in no circumstances will either wheel revolve idly, as sometimes happens in a four wheel tractor in which there is no provision for relative tilting between the pairs of wheels. The tractor of my invention is compact, relatively simple in construction and mode of operation, rugged and otherwise well adapted to the particular uses for which it was designed. Other features and advantages of the invention will appear from the following detailed description; it is to be understood, however, that the specific disclosure is for the purpose of exemplification only and that in the following claims I have endeavored to set forth the invention as broadly as the prior art will admit.

In the drawings,

Figure 1 is a side elevation partly broken away of a preferred embodiment of my invention;

Fig. 2 is a plan view of the same;

Fig. 3 is a rear elevation thereof;

Fig. 4 is a front elevation partly in section and with parts removed;

Fig. 5 is a horizontal section, parts being shown in elevation, and other parts broken away;

Fig. 6 is a horizontal section, on the same plane as Fig. 5, of a portion of the machine, certain parts shown in elevation in Fig. 5 being shown in section in Fig. 6;

Fig. 7 is a vertical section longitudinally of the machine, parts being broken away and other parts being shown in elevation;

Fig. 8 is a section on the same plane as Fig. 7 but on a larger scale and partially broken away;

Fig. 9 is a transverse section on the line 9—9 of Fig. 7 but on an enlarged scale;

Fig. 10 is an inclined transverse section on the plane of line 10—10 of Fig. 1;

Fig. 11 is a vertical section on the plane of line 11—11 of Fig. 10 looking in the direction of the arrow, parts being shown in elevation;

Fig. 12 is a transverse section on the plane of the line 12—12 of Fig. 1, parts being broken away and other parts shown in elevation;

Fig. 13 is a fragmentary view on the same plane of section as Fig. 12, but showing certain modifications;

Fig. 14 is a vertical longitudinal section of a portion of the machine on the line 14—14 of Fig. 12;

Figs. 15 and 16 are respectively front and side elevations of a detail of the construction;

Figs. 17 and 18 are respectively top and bottom views of the same;

Fig. 19 is a fragmentary view, partly in front elevation and partly in transverse section of a modified form of one part of the machine;

Fig. 20 is a transverse section of the same element on the plane of the line 20—20 of Fig. 19 looking in the direction of the arrows;

Fig. 21 is a fragmentary view partially in elevation and partially in vertical section of a modified from of another element of the machine; and

Fig. 22 is a vertical longitudinal section partially in elevation and partially broken away of a modified form of another of the elements of the machine.

In the several views and throughout the following detailed description each part is identified by the same reference numeral.

Referring now more particularly to Figs. 1 to 5, inclusive, of the drawings, the frame of the preferred embodiment of my invention consists of a main body A comprising the front axle assembly and supporting the engine, transmission mechanism, etc., and a rear axle assembly B so connected to the main body as to have a tilting motion on a horizontal axis relative thereto. The front traction wheels are attached to the main body and the rear traction wheels to the rear axle assembly. The main body framework comprises a front housing casting 30, which contains the flywheel and clutch, front differential, brake and transmission, the engine support 31, the laterally-extending axle assembly sleeves 32 and the cylindrical casting 33 in which the rear axle assembly is journaled. The rear axle assembly framework comprises a rear housing 34, laterally-extending rear axle sleeves 35 and a sleeve 36 by which said assembly is journaled in the cylinder 33 of the main body of the machine.

Any suitable form of engine may be mounted on the support 31 and I have shown this part of the construction diagrammatically.

In the form of the invention illustrated in Figs. 1 to 7, inclusive, and in certain detailed illustrations to which reference will be made hereafter, the hollow casting which forms the front housing is formed with a generally cylindrical transverse chamber 30^a containing the front differential and open at its respective ends, at 37, a generally rectangular rear chamber 38 containing the transmission and a generally rectangular front chamber 39, which latter is open to the cylindrical transverse chamber and also at its front, where it is formed with a circumferential flange 40 to which a flange 41 on the engine supporting casting 31 is bolted. Bowl-shaped castings 42 are seated in the above-mentioned lateral openings 37 of the front housing with their flanges 43 abutting against the outside of the housing and the axle sleeves 32 with outwardly projecting flanges 45 at their respective inner ends seat upon the outturned flanges of the bowl casting, the sleeves and bowls being firmly bolted to the housing by bolts 46. The outer ends of sleeves 32 are closed except for central openings 47 which constitute bearings for the shafts presently to be described.

The crankshaft 49 of the engine projects into the front opening of the front casting or housing and is formed with a flange 50 to which is bolted the flywheel 51 located within the housing. In the web or septum 52 separating chambers 38, 39 of the front housing is formed a circular opening 53 in which is located a ball bearing 54 for the jack shaft 55 of the transmission mechanism to be presently described. A collar 54^a holds the bearing in its seat. The jack shaft is in axial alignment with the crankshaft 49 of the engine, before mentioned, and the reduced end 56 thereof extends into the hollow 57 of the flywheel thereon.

A clutch, which may be and is shown as of known construction, is interposed between the jack shaft and the flywheel. As shown, the clutch comprises a fixed clamping plate 58 attached to the jack shaft and revoluble therewith and a floating plate 59 which is interiorly toothed or ribbed as at 60 to engage teeth 61 formed on the fixed clamping plate, so that the two plates must revolve together but the floating clamping plate is permitted a limited movement axially of the fixed plate. Springs 62 under compression between the two clamping plates tend to repulse the floating plate from the other. The clamping plates are adapted to engage the respective opposite sides of a friction plate 63 provided as usual with friction facing and formed with teeth or projections 64 on its periphery which engage in notches or grooves 65 formed in the inner periphery of a ring 66 screwed to the flywheel. The friction plate is thus permitted axial play but turns with the flywheel, and when the clutch is closed the flywheel, driven by the engine, will drive the jack shaft through said clutch. The floating plate is actuated against the pressure of the spring by a number of small levers 67 which are pivoted at 68 to a ring 69 screwed upon a threaded hub 70 of the fixed clamping plate. The ring may be adjusted upon the hub to take up wear and is locked by means of the spring 71 engaging between the teeth 61 on the fixed clamping plate.

A sleeve 72 is splined with the fixed clamping plate upon the shaft by the spline 73 and is of sufficient length to properly space the fixed clamping plate from the ball bearing 54 above mentioned. A collar 74 slides freely upon the last-mentioned sleeve but is prevented from turning thereon by its spline 75 engaging the groove 76 in the sleeve. The end 77 of the collar is tapered as shown in Fig. 8 and is adapted to engage the rounded ends 79 of the levers, and when the collar is shifted to the right, referring to Fig. 8, the rounded ends of the levers ride up the tapered end of the collar and the flat ends 80 of the levers engage the floating clamping plate and force it into close engagement with the friction plates of the platen. The means for operating the shifting collar 74 will be presently described.

The jack shaft 55 extends through opening 53 into the gear or transmission chamber 38 and is journaled near its rear end in a ball bearing 82 seated in an opening in the rear wall 83 of the front housing, see Fig. 7, and carries the shifting gears of the transmission (except the reverse gear). A shaft 85 is journaled within the rear chamber of the front housing above and parallel to the jack shaft 55 and is provided with the usual gears for meshing with the shifting gears on the jack shaft. Shaft 85 is journaled in a ball bearing 86 in the rear wall of said housing and at its front end is journaled in a ball bearing 87 mounted in an opening in the wall or septum 88 separating the rear chamber from the transverse cylindrical chamber of the housing. An ordinary system of transmission gearing is shown for the purpose of illustration, see also Fig. 9. A flanged sleeve 88 is keyed upon the shaft 85 and small, intermediate and large gears 89, 90 and 91 are fixed to the flanges of said sleeve. The double shifting gear 92 on the jack shaft 55 may be shifted into engagement with the largest gear 91 on shaft 85 for driving forward at lowest speed or into engagement with the smallest gear 89 on shaft 85 for driving forward at the highest speed. The shifting gear 93 on shaft 55 may be shifted into mesh with the intermediate gear on shaft

85 for intermediate speed or into engagement with the double reversing gear 100—101 for driving the tractor backward, said reversing gear as usual being idly journaled on a shaft 102, and always in engagement with the intermediate gear 90 through its pinion 100 of smaller diameter. For the gearing just described may be substituted any known and common transmission mechanism by which the shaft 85 may be driven from the jack shaft 55.

In order to shift the gears 92 and 93, shifting rods 103, 104 are reciprocably mounted in a boss 105 projecting inwardly from the rear wall 38 of the rear chamber of the front housing and provided with shifting forks 106, 107 embracing, respectively, reduced portions or necks in the gears 92, 93. The means for sliding these rods will be later described.

For driving the front wheels the shaft 85 is provided on its forward end with a bevel pinion 108 which is in mesh with a bevel gear 109 on the differential housing 110. The latter, which may be of usual or approved design, is formed with hubs 111, 112 which are journaled in ball-bearings 113, 114, respectively, located centrally in the bottoms of the bowl-shaped castings, 42, 42 to which reference has been made. A suitable differential, and the one which has been actually employed by me, is shown in Fig. 6. It comprises gears *a* the extended hubs *b* of which are journaled in the bearings 113, 114, a housing *c* which is journaled on the hubs of said gears and an annular series of bevel pinions *d* between and gearing with said gear wheels. The above-mentioned bevel gear 109 is bolted to the differential housing.

The shafts 115 for transmitting motion from the differential mechanism to the front wheels are keyed to the respective bevel gears of the differential mechanism. These shafts extend through the front axle sleeves 32, above mentioned, and near their outer ends are journaled in the bearings 47 in the ends of the sleeves. The outer ends of the shafts are connected by universal joints with pinions 123 which drive the respective front wheels as will be presently described.

Referring now more particularly to Fig. 12 and Figs. 14 to 18, inclusive, each front wheel assembly comprises, in addition to the wheel, a gear wheel or bull wheel secured thereto and driven by the last-mentioned pinion, the gear wheel and pinion being enclosed in a casing which is pivoted to have a limited movement about a vertical axis on the end of its respective axle sleeve 32. Sleeve 32 is formed with a flat surfaced end plate or flange 117 to which is bolted a depending bracket 48. A hinge pin or pintle 118 is secured, at its upper and lower ends, in bosses 119, 120 formed in said bracket casting, said pintle forming the axis about which the wheel assembly swings. The housing of the wheel assembly comprises a hollow casting 121 of approximately circular outline and surrounds both the bull wheel 122 and the above-mentioned pinion 123 by which the bull wheel is driven. This housing is cast with an opening 123^a concentric with its main body. A sleeve casting 124, which surrounds and is journaled upon the pintle 118 above mentioned, is formed with a boss 125 which fits within the opening 123^a in the housing and with a flange 126 surrounding the boss and which is bolted to the housing. Roller bearings 127, 128 are seated in rabbets formed to receive them in the respective opposite ends of the sleeve casting and the pintle 118 is journaled in said bearings. Relative movement between the sleeve and housing is further prevented by a dowel pin 129 and bolts extending through lugs 130 into the wall of the housing. A stub-shaft or arbor 131 on which the bull wheel is journaled is secured in registering openings in the boss 125 and the inner wall of the sleeve casting at 130^a. In assembling the structure the pintle 118, the upper portion of which is somewhat reduced in diameter, is passed through a cylindrical bore in the stub-shaft or arbor, the fit of the pintle within the bore being sufficiently loose to permit the stub-shaft to turn freely on the pintle. The bearings in the sleeve are protected against dust by caps 132 on the ends of the sleeve.

The bull wheel is formed with an elongated hub 133 and is journaled to the stub-shaft 131 on roller bearings 134, 135. The ground or traction wheel, in the specific form thereof shown in Fig. 12, comprises a casting, which includes the hub 136 and the spokes 136^a, and the felly is formed of sheet metal in two annular sections 137, 137 which are riveted to the enlarged ends of the spokes. The hub 135 of the wheel is splined at 138 to the hub of the bull wheel.

The housing casting comprises, in its upper portion, an upward extension or bay 139 to accommodate the pinion and a depending lip or extension 140 formed with a bore or opening 141 in which is seated the roller bearing 142. The main wall 143 of the housing is formed with an opening 144 in registry with, but of somewhat larger diameter than the last-mentioned opening and which receives the cylindrical neck 145 of the semi-spherical hollow casting 146. A roller bearing 147 is seated within said neck 145. The pinion 123 is mounted on a stub shaft 151 which is journaled in the last-mentioned roller bearings 142, 147. The inner end of the stub-shaft 151 is connected by a universal joint 153 of well-known form, with the shaft 115 above mentioned. The universal joint is coaxial with the pintle 118 and thus the bull wheel and the traction wheel may be driven from the shaft 115 and at the same time the wheel assembly may be swung about the pintle as an axis. A semi-spherical cup 154 extends into and has a universal movement within the semi-spherical casting 146, and is formed with a reduced neck 155 which surrounds the cylindrical end of the shaft 115 and is packed at 156 within the end opening of the sleeve 44, to prevent access of dirt and dust to the moving parts of the device. With the same end in view, the housing 121 is provided with a cover plate 158 which is packed at 159 about the hub of the bull wheel, and the opening 141 in said housing is covered by a dust cap 160. Furthermore, access of dust to the bearings 134, 135 is prevented by a dust plate 161 on the hub of the bull wheel, which dust plate also secures the traction wheel casting against axial movement on the hub of the bull wheel.

In Fig. 13 is shown a different type of traction or ground wheel, as employed in my tractor, in which, for the integral hub and spoke, is substituted a cast hub 163 and wire or steel spokes 164 together with a one-piece felly 165 in which the outer ends of the spokes are upset or riveted.

The means for steering the machine by turning the front wheel assemblies in unison may best be understood by reference to Figs. 1, 2, 4 and 14. A transverse horizontal bar 165 is connected at its respective ends to the housings 121 by end members 166, the outer ends of which are spherical and are received in spherical sockets 167 on the respective bull wheel casings 121, said sockets

being so designed as to permit the necessary play and located a sufficient distance from the pintles about which the housings swing as to give the required leverage. In order to permit adjustment the end members 166 are sleeved upon the ends of the rod 165 at 168 and may be adjusted longitudinally of said rod by the swinging eye-bolts 169 and the nuts 170 thereon engaging the fixed abutments 171 through which the bolts extend, respectively. The connecting rod 165 is swung transversely of the tractor by rotating the steering wheel 172. The shaft 173 of the steering wheel is journaled in a bracket 174 extending upwardly from the cylindrical section 33 of the body of the tractor and it is connected by a universal joint 175 with a short worm shaft 176 (see dotted lines, Fig. 2) which is journaled in a housing 177 mounted on the front housing 30. The housing 177 is formed with a horizontal fin 178, see Fig. 2, on which is fulcrumed a bell crank lever 179 one end of which is bifurcated at 180 to straddle a nut 181 which may be reciprocated longitudinally of the housing 176, in an obvious manner, by rotating the worm shaft through the medium of the wheel. The other, longer arm of the bell crank lever is pivoted at 183 to one end of a link 184 the other end of which is pivoted at 185 to a bracket 186 upon the rod 165. Obviously, by turning the steering wheel the worm shaft is rotated, the nut thereon shifted longitudinally, the bell crank lever swung about its pivot and the rod 165 swung laterally of the tractor through the link 184 and thereby the front wheel assemblies are swung together about their vertical pintles to guide the tractor.

In the preferred embodiment of the invention, I have provided for independently braking either of the front wheels. With revolution of one of the wheels prevented and power applied to the remaining three wheels the tractor may be made to swing about the locked wheel as a center. This short turning radius is of particular importance in plowing and other agricultural operations. For this purpose each of the shafts 115 is provided near its inner end and within the corresponding bowl casting with a brake drum 190, see particularly Fig. 5 of the drawings. A brake band 191 encircles each drum, one end thereof being provided with an ear 192 which is pivoted between lugs 193, 194, projecting from the wall of the bowl casting. The other end of the brake band is provided with lugs 195, between which is pivoted the end of a link or rod 196. As will be noted by reference to Figs. 5 and 8, the bowl is cut away at its lower periphery as at 197 and rod 196 extends rearwardly through said opening and through a hole 198 in the septum or division wall 88 above mentioned and into the intermediate housing 33 where it is pivoted at 199 to an arm 200. The latter is mounted on a short shaft 201 extending through the wall of the housing 33, and on the outside of which a treadle lever 172a is secured to the shaft, see Figs. 5 and 7. The treadles are within easy reach of the operator from his seat 203. Manifestly, by depressing either or both of the treadle levers either or both of the front traction wheels may be locked.

Within convenient reach of the operator and to one side of the central plane a hollow column *f* is mounted on the cylindrical casing 33. Extending through the column *f* and into the interior of casing 33 are a central rod *g* and nested tubular members *h*, *i*, each independently rotatable and each provided with its operating handle, *j*, *k*, *l*. The outer tubular member *i* is provided at its lower end with an arm *m*, the inner tubular member *g* with an arm *n* and the rod *g* with an arm *o*. The arms *m* and *n* are respectively connected by links *p*, *q* with the slide rods 103, 104 for shifting the gears of the transmission as previously described. The arm *o* is connected by a link *r* with a similar slide rod *s* for shifting the previously described clutch operating collar 74. Thus the clutch and transmission operating apparatus is readily controlled from the operator's seat.

The intermediate body section 33 is bolted or otherwise secured at its front end to the rear wall of the front housing previously described. It is cast with aligned bearings 212, 213 to receive a cylindrical sleeve 36 by means of which the rear axle assembly is journaled to the main body of the tractor. At its rear end, the sleeve is formed with a flange or bead 218 which is received in a rabbet in the rear wall of the section 33 and held therein by means of an annulus 219 bolted to section 33. Beyond the flange 218 the rear end of the sleeve is flared or expanded as at 216 and formed with a flange 211 which is bolted over the front opening 217 in the housing 34 forming the central portion of the rear axle assembly. A thimble 220 is seated in the end of the sleeve and supports a bearing 221. An extension shaft 222 is spliced to the shaft 85 by a keyed sleeve 223 and is journaled in the last-mentioned ball bearing. Beyond the bearing it is provided with a beveled pinion 225.

The sleeve 36 is formed at its rear end with webs 210 which, when the parts are assembled, project into the rear housing 34 and support ball bearings 226 in which the rear differential 227 is journaled. This differential is or may be similar to that previously described in connection with the front driving mechanism and is provided with a bevel gear 228 by which it is driven from pinion 220 mentioned above.

Over the opposite end openings of the rear housing are bolted the axle sleeves 35, in the outer ends of which are seated ball bearings 233. Transmission shafts 234 are keyed at their respective inner ends to the bevel gears of the differential mechanism and at their outer ends are journaled in the bearings 233 just mentioned. Beyond the bearings and outside the sleeves 35, shafts 234 are provided with pinions 235 for driving the bull wheels on the rear traction wheels.

At their outer ends sleeves 232 are provided with webs or flanges 237 to which are bolted, respectively, depending brackets 238, the latter being formed at their lower ends with bosses 239 in which are secured arbors or stub-shafts 240, see Figs. 3, 10 and 11. The bull wheels 241 are formed with hubs 244, journaled on the respective stub-shafts through roller bearings 242, 243. The bull wheels are driven by the pinions 235 above mentioned, both bull wheels and pinions being enclosed in dust proof housings 245. The rear driving or traction wheels 246 may be similar to either form of front traction wheels heretofore described, and in Fig. 10 are shown as similar to that disclosed in Fig. 12. As in the case of the front wheels the rear traction wheels are keyed to the hubs of the respective bull wheels at 247 and a dust proof cap 248 is secured over the end of the hub.

For agricultural purposes it is sometimes desirable to vary the distance or spread between the wheels on the respectively opposite sides of the tractor. For this purpose the sleeve castings on which the wheels are mounted may be made ex-

tensible as shown in Figs. 19 and 20. As there shown, relatively short sleeves 260 are bolted at 261 to the ends of the respective front and rear housing, the outer portions of the sleeves being cylindrical as at 262, slitted at 263 and formed with lugs 264. The lugs 264 are arranged at the respective opposite ends of the slit portions of the sleeves and tension bolts 265 extend through said lugs. A substantially cylindrical extension sleeve 266 is splined to sleeve 262 at 267 and is longitudinally adjustable therein. Intermediate the lugs 264 heretofore described, the short sleeves 262 are formed with lugs 268, adjacent the slits, and a compression screw bolt 269 is threaded through one of the lugs and bears upon the other. To adjust the extension sleeve, the tension bolts are slackened and the slit ends of the sleeves slightly expanded by bolt 269, and after adjustment has been made bolt 269 is retracted and tension bolts 265 tightened. The shafts by which power is transmitted from the respective differentials to the wheels are likewise made adjustable, being formed in two sections 269^a, 270 splined to a long connecting sleeve 271.

Referring to Figs. 5, 7 and 9, shafts 55 of the transmission mechanism, above described, may be provided with a gear 290 and a shaft 291 carrying a gear 292 journaled in the lower part of housing 34. Shaft 291 is reduced beyond the bearing 292 and extends through a stuffing box 293, the reduced end 294 being available for power purposes. The shaft 291 may also be provided with a bevel gear 295 and a stub shaft 296 may be journaled in a boss 297 formed with the housing, said shaft 296 being provided with a bevel pinion 298 meshing with gear 295. A belt pulley 299 on shaft 296 may be used to drive any desired machine.

Manifestly, if desired, braking means similar to that described and shown in connection with the front axle assembly could be applied to the rear axle assembly and the shafts 234 thereof, either with or without employing the brake mechanism in connection with the front axle and wheels.

By reference to Figs. 1, 11 and 14 it will be seen that the spindles or stub shafts on which the front wheels are journaled are located somewhat in advance of the axis of the front axle assembly and the spindles or stub shafts on which the rear wheels are mounted are located somewhat to the rear of the axis of the rear axle assembly so that the body of the machine may be short and compact and at the same time the pairs of wheels so spaced apart as to provide a firm base for the machine and minimize the tendency to tip either forward or backward and this construction also causes the front wheels to tend to return to normal intermediate position after having been deflected therefrom. Moreover, as best seen in Fig. 1, the bracket 31 which supports the motor and its associated parts, being secured to the front wall of the front housing and extending forwardly thereof, the weight of the tractor as a whole is so distributed that the center of gravity thereof is just sufficiently remote from the plane of support of the front wheels and between the latter and the rear wheels as to avoid forward tipping at all times and at the same time provide the proper weight distribution when the machine is exerting a heavy pull to properly distribute the weight between the two pairs of traction wheels. Preferably, when the tractor is prepared for operation, sufficient oil is introduced into the casing to supply a pool in transmission chamber 38 up to the level of opening x by which said chamber communicates with chamber 39 and the latter contains a pool of oil of sufficient depth to submerge the lower edge of the flywheel 51, which may have a toothed or serrated edge. When the tractor is in operation, the flywheel sprays the oil within chamber 39 and, through bearing 87 and opening y into the transmission chamber and the revolution of the gears in the latter sprays the oil from the pool therein through bearings 86 and 82 into chamber 33, the oil overflowing from chamber 33 into chamber 38 and thence into chamber 39. Thus all parts of the forward assembly are thoroughly lubricated.

I claim:

1. In a four wheel tractor all of the wheels of which are driven, a main body comprising a front axle assembly on which the front wheels are journaled and on which the engine and transmission mechanism are carried, a front differential mechanism in the front axle assembly, connections for driving the front wheels from said differential mechanism, bearings in said main body, a rear axle assembly on which the rear wheels are journaled, having a forwardly projecting sleeve journaled in said bearings of the main body, a rear differential mechanism mounted in said rear axle assembly, common means for driving both said differential mechanisms, and means for driving the rear wheels from the rear differential mechanism.

2. In a four wheel tractor all of the wheels of which are driven, a main body comprising a front axle assembly, a motor and transmission mechanism carried by said body, a front differential mechanism journaled in the front axle assembly, traction wheels journaled on the front axle assembly, means intermediate the front differential mechanism and front wheels for driving the latter, a rear axle assembly axially journaled on the main body, rear wheels and a rear differential mechanism journaled on the rear axle assembly and connections for driving the rear wheels from the rear differential mechanism.

3. In a tractor, a main body comprising a front axle assembly, a motor and transmission mechanism carried by said body, a front differential mechanism in the front axle assembly, front wheels journaled on the front axle assembly, means intermediate the front differential mechanism and front wheels for driving the latter, a rear axle assembly, a sleeve connected thereto and journaled in the main body, a rear differential mechanism journaled on the rear axle assembly, shafting connecting said differential mechanisms and driven by said transmission mechanism, rear wheels journaled on the rear axle assembly and connections for driving the rear wheels from the rear differential mechanism.

4. In a tractor, a main body comprising a front axle assembly, a motor and a transmission mechanism carried by said body, a front differential mechanism in the front axle assembly, housings pivoted to the respective ends of the front axle assembly, front wheels journaled on the respective housings, means intermediate the front differential mechanism and front wheels for driving the latter, means for swinging said housings about their pivots, a rear axle assembly journaled on said main body, rear wheels mounted thereon and a rear differential mechanism therein, connections for driving the rear wheels from the rear differential mechanism, and means for driving said differential mechanisms from said transmission mechanism.

5. In a tractor, a front and a rear axle assembly, each comprising a central housing and a pair of oppositely disposed sleeve members attached thereto, pivotal means connecting the assemblies for relative tilting movement about a horizontal axis, front and rear differential mechanisms in the respective central housings, end housings rigidly secured to the outer ends of the respective sleeve members of the rear axle assembly, rear traction wheels journaled on the last mentioned housings, shafts in the sleeves of the rear axle assembly, connections between said shafts and differential mechanisms for driving said shafts, gearing intermediate said shafts and the respective traction wheels for driving the latter, housings pivotally mounted at the ends of the respective sleeves of the front axle assembly, front traction wheels journaled on the last mentioned housings, a differential mechanism in the central housing of the front axle assembly, shafts driven by the last mentioned differential mechanism and extending, respectively, through the sleeves of the front axle assembly, gearing intermediate said shaft and the respective front traction wheels for driving the latter, means for swinging said pivoted housings to steer the tractor, shafting connecting said differential mechanisms, and means for driving said shafting.

6. In a tractor, a front and a rear axle assembly each comprising a central housing and a pair of oppositely disposed sleeve members attached thereto, a housing section extending rearwardly from the central housing of the front axle assembly, a sleeve secured to the central housing of the rear axle assembly and extending into and journaled in said housing section, a differential mechanism in each said central housing of the axle assemblies, a shafting extending through said journaled sleeve and geared to the respective differential mechanism, means for driving said shafting, traction wheels journaled respectively at the ends of said oppositely-disposed sleeve members of the front and rear axle assemblies, shafts in said sleeves driven by said differential mechanism, gearing connecting the last-mentioned shafts with the respective traction wheels.

7. In a tractor of the class described, a front axle assembly, housings pivoted to the respective opposite ends thereof for swinging movement about approximately vertical axes, means for swinging said housings, traction wheels journaled on said housing, a differential mechanism journaled in said assembly, means for driving the differential mechanism, shafts driven by said differential mechanism and geared respectively to said wheels, brake drums on the respective shafts adjacent the differential mechanism, braking means for engaging said drums, respectively, and means for independently operating said braking means.

8. In a tractor of the class described in which the steering ground wheels are driven, an axle assembly, a bracket secured thereto, an approximately vertical pivot pin on the bracket, a housing, a bearing sleeve secured to the housing and surrounding and journaled upon said pivot pin, a stub-shaft lying substantially in an approximately vertical plane in which said pivot pin also lies, said stub-shaft being rigid with the housing and sleeve, a traction and bull wheel assembly journaled on the stub-shaft, a drive shaft in said axle assembly, a pinion in the housing and engaging the bull wheel and a universal joint between the drive shaft and pinion.

9. In a tractor in which the steering ground wheels are driven, an axle assembly, a bracket secured thereto, an approximately vertical pivot pin on the bracket, a housing, a bearing sleeve secured to the housing and surrounding and journaled upon said pin, a stub-shaft secured to said sleeve and through the end of which said pivot pin extends, a traction and bull wheel assembly journaled on the stub-shaft, a drive shaft in said axle assembly, a pinion journaled in the housing and engaging the bull wheel, and a universal joint between the drive shaft and pinion.

10. In a tractor of the class described, an axle assembly comprising laterally extending sleeves, tubular members longitudinally adjustable in said sleeves, means for locking the tubular members in adjusting position, traction wheels mounted on said tubular members, extensible shafts extending through the sleeves and tubular members, a differential mechanism for driving said shafts, and gearing connecting respective shafts and traction wheels.

11. A four wheel drive tractor comprising front and rear axle assemblies pivoted together on an axis longitudinal of the tractor, a motor support secured to the front axle assembly in advance thereof and a motor located on said bracket support and connected to the wheels for driving the latter.

12. A four wheel drive tractor comprising front and rear axle assemblies pivotally connected together on an axis longitudinal of the tractor, pairs of tractor wheels journaled thereon, the journals of the front wheels being in advance of the axis of the front axle assembly and the journals of the rear wheels being to the rear of the axis of the rear axle assembly.

13. A four wheel drive tractor comprising front and rear axle assemblies pivotally connected together on an axis longitudinal of the tractor, pairs of traction wheels journaled thereon, the journals of the front wheels being in advance of the axis of the front axle assembly and the journals of the rear wheels being to the rear of the axis of the rear axle assembly, a motor support connected to and extending in advance of the front axle assembly, a motor thereon and means connecting the motor and wheels for driving the latter.

14. In a tractor of the class described, a front axle assembly, housing means for the assembly, housings pivoted to the respective opposite ends of the assembly for swinging movement about approximately vertical axes, means for swinging said housings, traction wheels journaled on said housings, a differential mechanism journaled in said assembly, means for driving the differential mechanism, shafts driven by said differential mechanism and geared respectively to said wheels, brake drums on the respective shafts adjacent the differential mechanism enclosed within the housing means for the assembly, braking means for engaging said drums, respectively, and means for independently operating said braking means.

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