I. RADER.

TRACTOR.

APPLICATION FILED JULY 13, 1917.

1,290,347.

Patented Jan. 7, 1919.

7 SHEETS—SHEET 1.

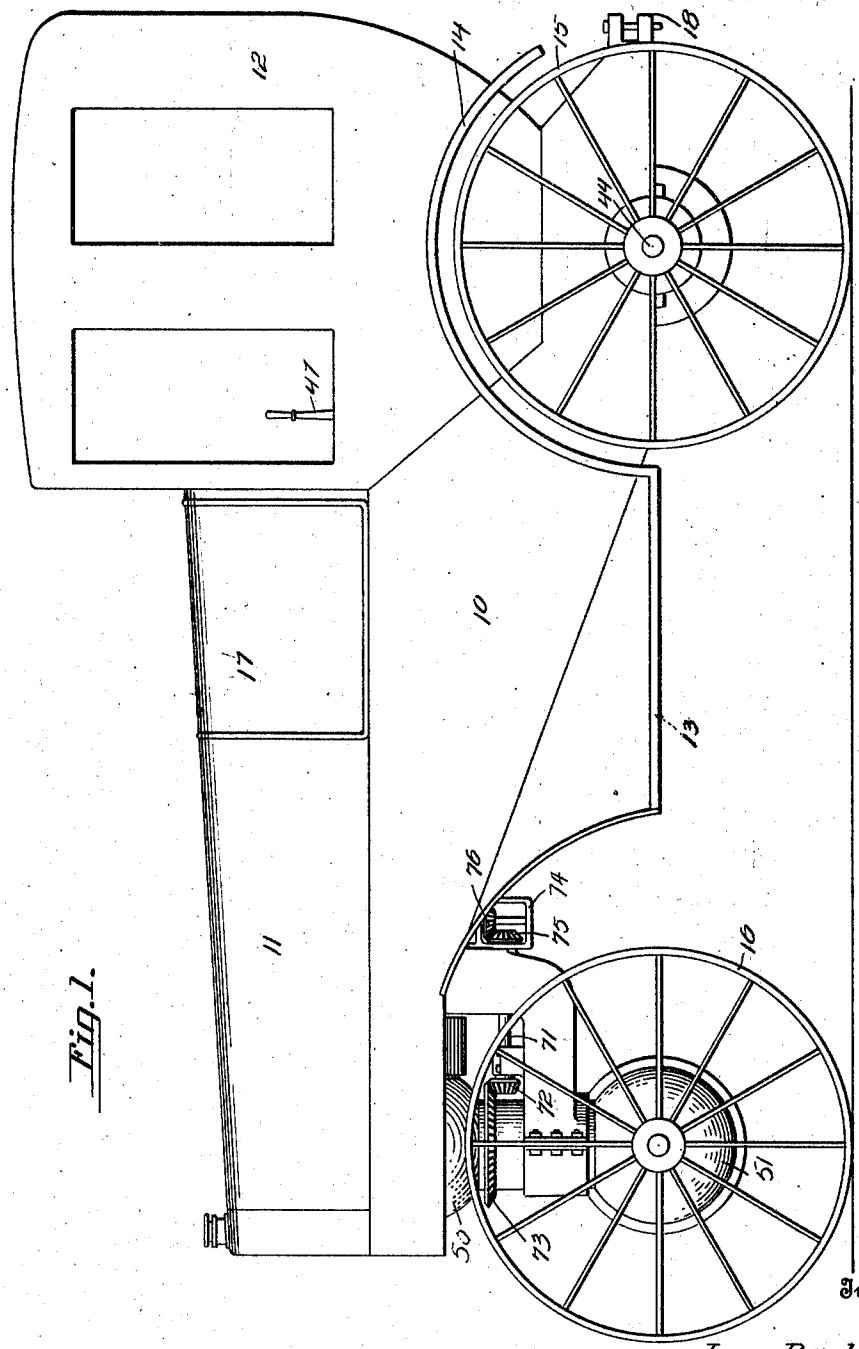


Fig. 1.

Witness

F. L. Gibson.

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Inventor

Ira Rader.

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TRACTOR.

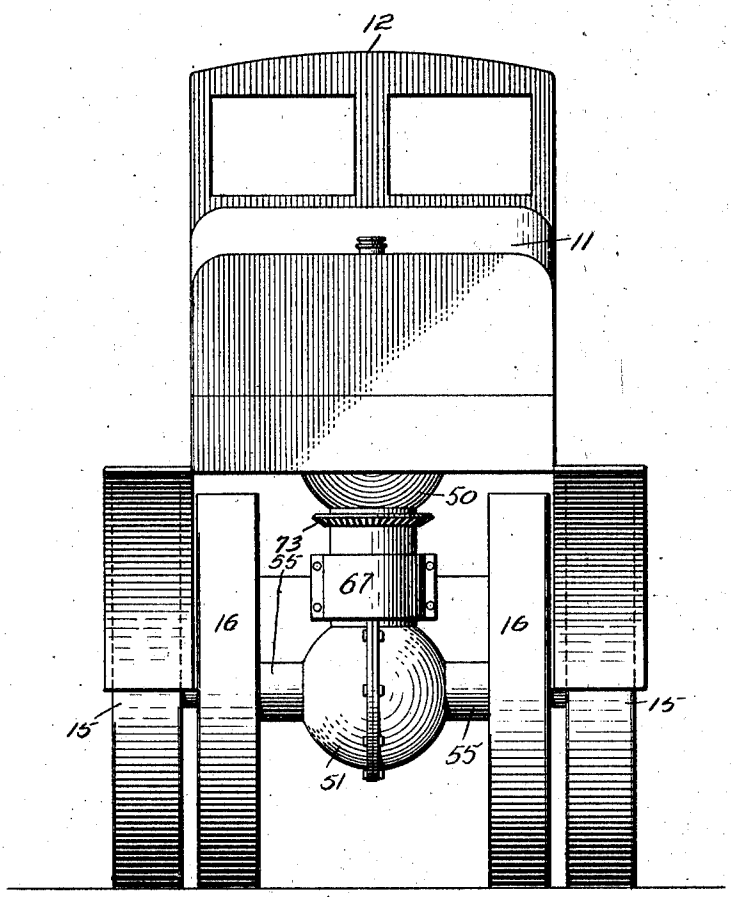
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7 SHEETS—SHEET 2.

Fig. 2.



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7 SHEETS—SHEET 3.

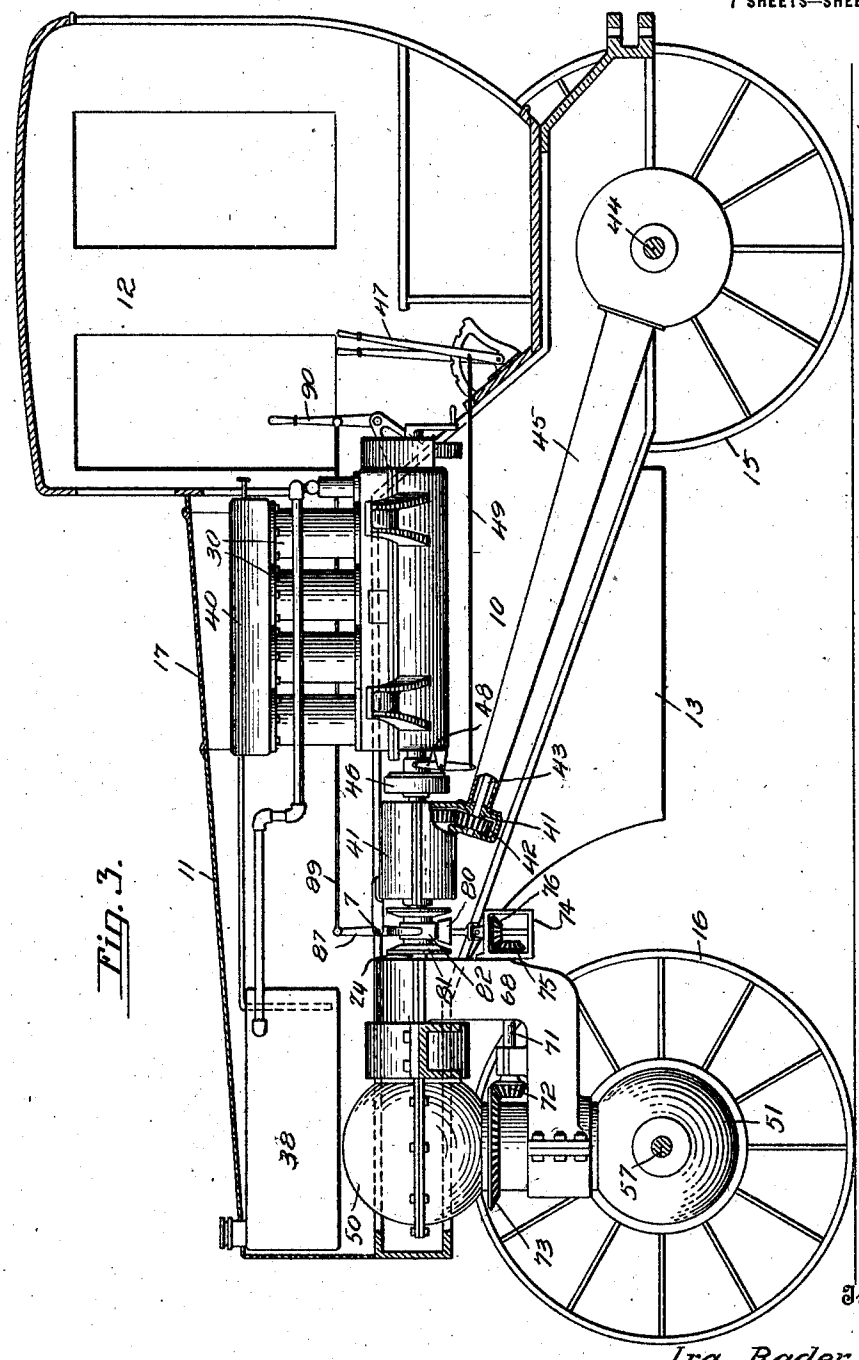


Fig. 3.

Witnesses

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7 SHEETS—SHEET 4.

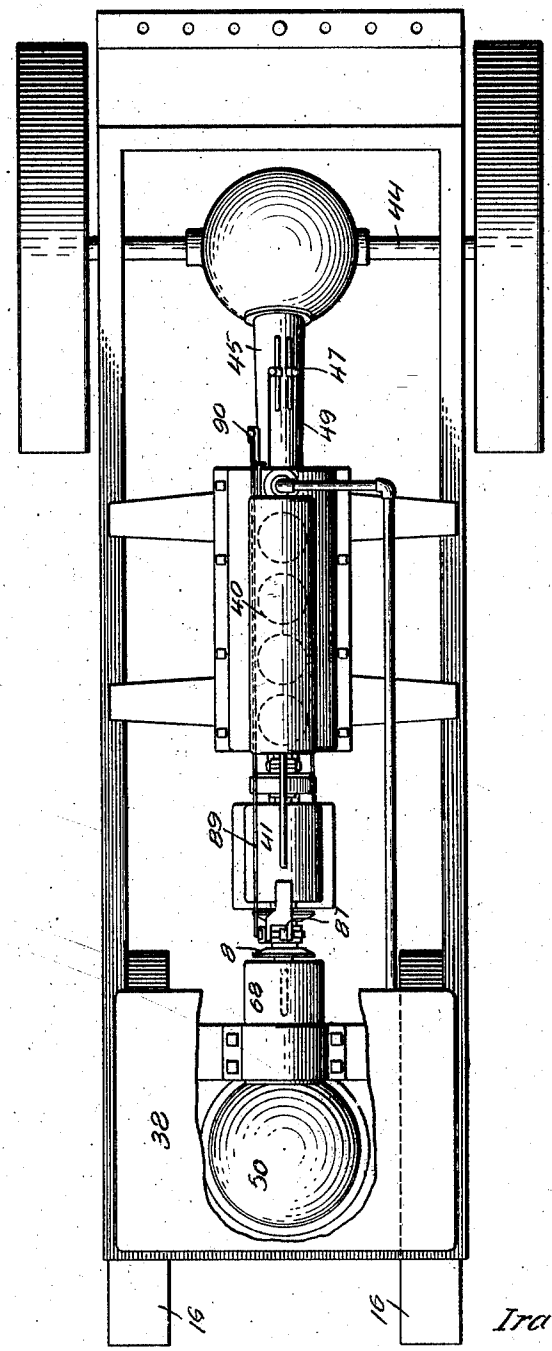


Fig. 4.

Witnesses

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7 SHEETS—SHEET 5.

Fig. 7.

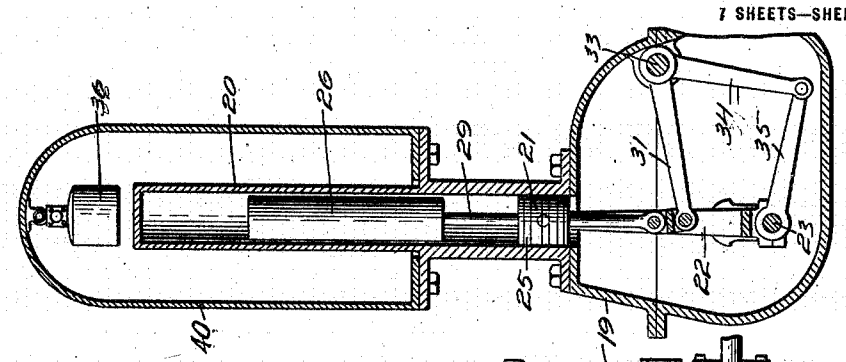


Fig. 5.

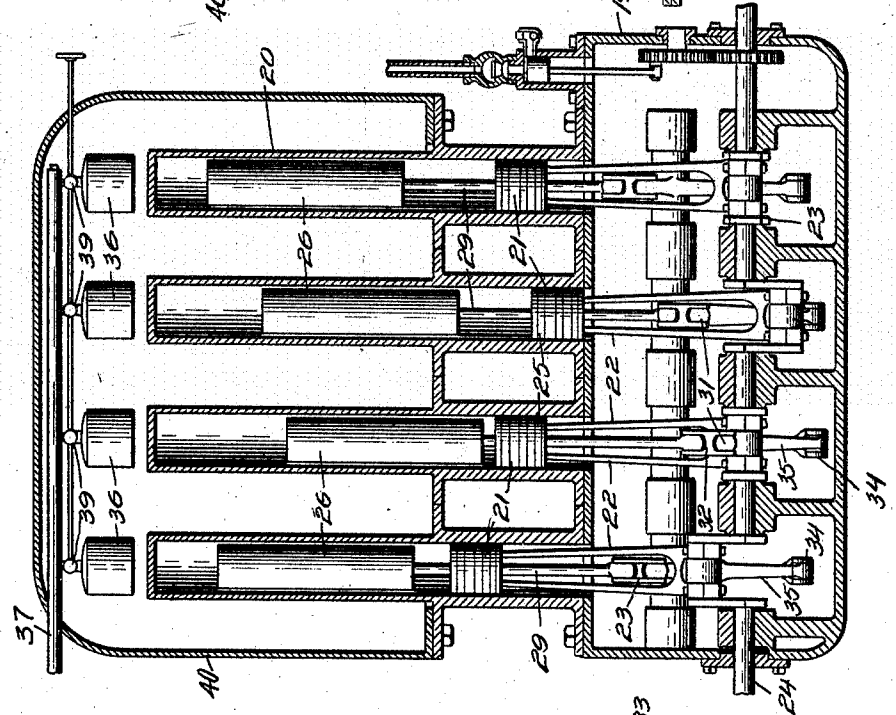
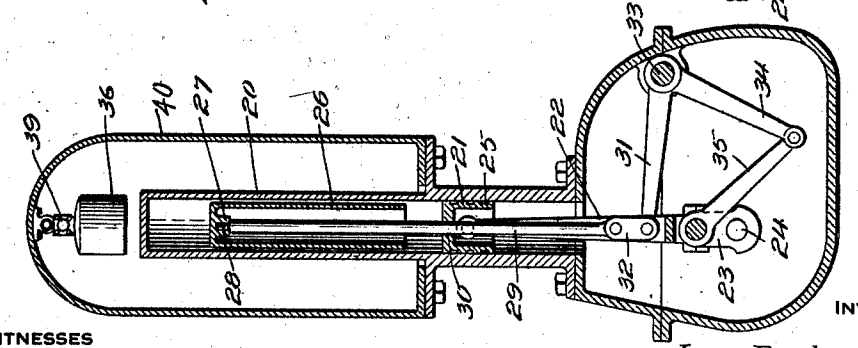


Fig. 6.



WITNESSES

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7 SHEETS—SHEET 6.

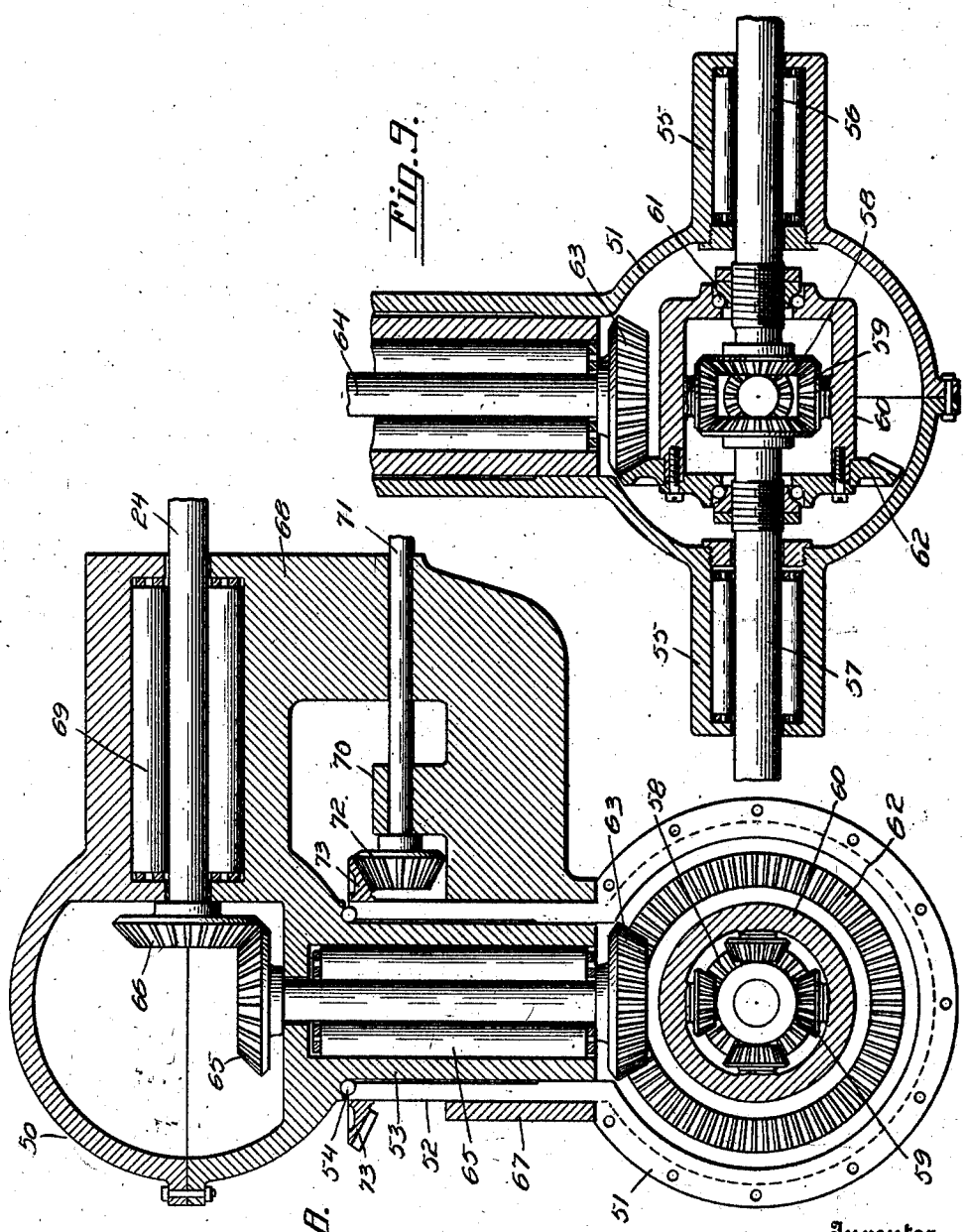


Fig. 9.

Fig. 8.

Witness

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7 SHEETS—SHEET 7.

Fig. 12.

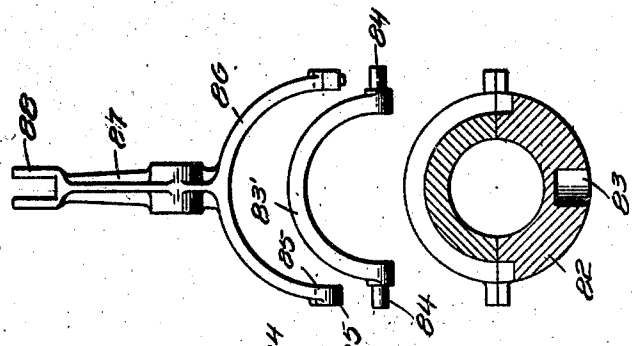


Fig. 11.

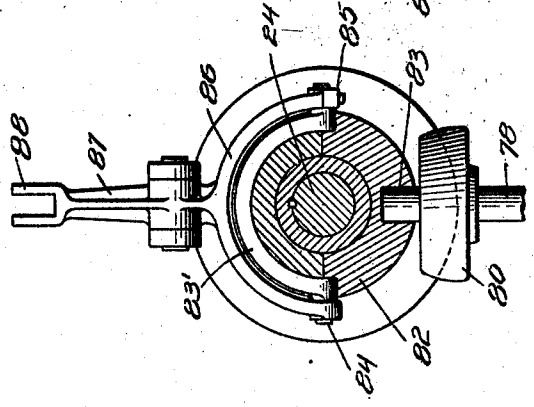
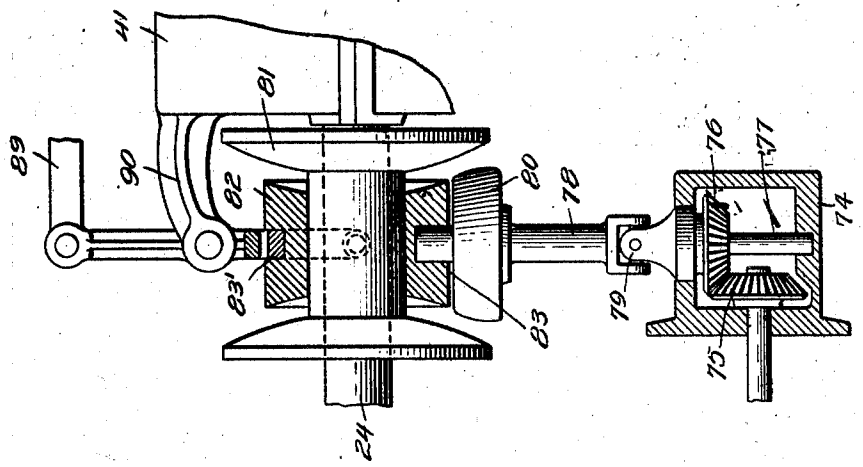


Fig. 10.



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WITNESSES

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UNITED STATES PATENT OFFICE.

IRA RADER, OF KANSAS CITY, MISSOURI.

TRACTOR.

1,290,347. Specification of Letters Patent. Patented Jan. 7, 1919.

Application filed July 13, 1917. Serial No. 180,440.

To all whom it may concern:

Be it known that I, IRA RADER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented new and useful Improvements in Tractors, of which the following is a specification.

This invention relates to tractors wherein all the wheels thereof are motor driven through the instrumentality of a motor of novel construction.

In carrying out the invention I provide a mechanism which is actuated from the motor power of the machine, with a view of facilitating the turning of the latter.

Other objects of importance will appear as the nature and advantages of the invention are better understood from the following detail description when read in connection with the accompanying drawings, the invention residing in the construction, combination and arrangement of parts as claimed.

In the drawings forming part of this specification like numerals of reference indicate similar parts in the several views and wherein:—

Figure 1 is a side elevation of my tractor,

Fig. 2 is a front elevation.

Fig. 3 is a longitudinal section through the tractor.

Fig. 4 is a top plan view.

Fig. 5 is a sectional view through the engine.

Fig. 6 is a sectional view through one of the cylinders showing one position of the pistons.

Fig. 7 is a similar view showing another position of the pistons.

Fig. 8 is a vertical section through the front wheel supports showing the driving mechanism thereof.

Fig. 9 is a horizontal sectional view therethrough.

Fig. 10 is an enlarged detail view of the steering mechanism partly in section.

Fig. 11 is a vertical transverse sectional view therethrough.

Fig. 12 shows detail views of several of the component parts of the steering mechanism.

Referring to the drawings in detail, 10 designates the body of the tractor including the hood 11, cab 12, running board 13 that terminates in a guard 14 arranged over the rear wheel 15, the front wheels of the tractor being indicated at 16. The hood 11 is provided with a hinged section 17 whereby access may be readily had to the engine. The body 10 is formed at the rear to provide a coupling 18 by which the tractor may be connected to the load to be drawn.

The invention makes use of a compressed hot air motor arranged within the hood 11, the motor comprising a two-part crank case 19 rising from which are the cylinders 20 and preferably four in number. Slidably mounted within each cylinder is a piston 21 depending from which are spaced parallel piston rods 22 which are connected to the crank portion 23 of the engine shaft 24. The piston 21 is provided with piston rings 25 of any suitable character for the purpose of providing a fluid-proof disposition of parts. Arranged within each cylinder above the piston 21 is a second piston 26 preferably of cup-shaped formation in cross section. In other words the piston 26 is hollow and open at one end, and formed with a centrally depending boss 27 which is interiorly threaded to provide for a connection with the threaded extremity 28 of a piston rod 29, the latter being slidably fitted in an opening 30 in the top of the piston 21. The piston rod 29 projects an appreciable distance below the piston 21, and is disposed between the piston rods 22 of the latter, and is connected to the extremity of one branch 31 of a bell-crank lever, through the instrumentality of a pivoted link 32. The bell crank lever is mounted for rocking movement upon a shaft 33 disposed at one side and in parallelism with the engine shaft 24, the other branch 34 of said bell crank lever being connected with the crank 23 of the engine shaft through the instrumentality of an arm 35. From this construction and arrangement of parts it is manifest that the pistons 21 and 26 respectively move toward and away from each other in opposite directions, during the operation of the motor, but transmit to the engine shaft a rotary motion in the same direction. As above stated the motor is of the compressed hot air type, and for the purpose of heating the air for expansion within the cylinders 20, I preferably make use of a series of torches 36. There is provided, one torch for each cylinder, the torch being disposed in close proximity to the head of each cylinder and immediately above the latter. The torches 36 depend from a manifold 37 that communi-

cates with a tank 38 in which is confined gas under air pressure. Each torch is provided with an individual control valve 39 whereby the supply of gas to that particular torch may be controlled. Inclosing all of the torches and the manifold is a semicircular casing 40 for the purpose of preventing the radiation of heat therefrom, the casing having detachable connection with the heads of the cylinders as shown. When the air within the cylinders 30 is heated to the proper temperature for expansion, the air passes around the piston 26 into the space between the respective pistons 21 and 26, the latter being spaced from the wall of the cylinder to permit the air to pursue this course. As the pistons move toward each other during the operation of the motor, the air is compressed and further expansion forcibly drives the pistons in opposite directions, and imparts a rotary motion to the engine shaft.

Disposed within the casing 41 surrounding the engine shaft 24, is the transmission gearing which may be of any particular type, the casing 41 having inclosed therein a gear 42 carried by one extremity of a propelling shaft 43, the gear 42 meshing with one of the gears of the transmission as clearly shown. The shaft 43 extends in the direction of the rear axle 44 of the machine and is connected therewith by any suitable differential gearing. The shaft 43 is housed within a suitable casing 45 which also extends about the differential as illustrated. Disposed at the rear of the casing 41 is a clutch 46 which may be of any suitable construction, preferably of the dry disk type, the clutch being operated through the instrumentality of a hand lever 47 disposed within the cab 12 within convenient reach of the operator, the lever being connected to a pivoted yoke 48 associated with the moving element of the clutch, by means of a rod 49.

The support for the front wheels of the machine comprises vertically alined spherical casings 50 and 51 respectively, the latter being formed with a vertically disposed tubular extension 52 which receives for rotation a similar extension 53 depending from the casing 50. The casings are formed to unitedly define a raceway in which are disposed roller bearings 54 with a view of minimizing friction as will be readily understood. The casing 51 is further provided with laterally extending tubular members 55 which are disposed between the front wheels 16 of the machine. Passing through the tubular members are axles 56 and 57 respectively which are rigidly connected to the front wheels 16, and as shown have their inner extremities provided with beveled gears 58 which are constantly in mesh with the radially disposed beveled gears 59, which latter number four in this particular instance. The bevel gears 59 are provided with stub shafts that are journaled in a frame 60 that is rotatably mounted upon the hereinabove mentioned axles 56 and 57 respectively. Roller bearings 61 are interposed between the casing 60 and said axles for the purpose of minimizing friction between these parts. Rigidly secured to the frame 60 is a bevel gear 62 which meshes with a similar gear 63 secured to the lower extremity of a vertically disposed shaft 64. The latter extends centrally through the tubular member 53 and has its upper extremity disposed within the casing 50. Suitable anti-friction bearings 65 are disposed within the tubular member 53 and surround the shaft 64. Carried by the upper extremity of the shaft 64 is a bevel gear 65 which meshes with a similar gear 66 carried by the adjacent extremity of the engine shaft 24, by reason of which construction and arrangement of parts rotary motion is imparted to the shaft 64 from the engine shaft 24 with a view of driving the front wheels of the machine by the motor power thereof. The tubular members providing the connection between the respective casings 50 and 51 are supported by an annulus 67 forming part of a bracket 68 the latter also providing a bearing from the engine shaft 24, about which and in said bracket are disposed anti-friction rollers 69.

With a view of steering the machine by the motive power thereof, I provide the bracket 68 with a bearing 70 in which is journaled a horizontally disposed shaft 71, the latter carrying at the forward extremity thereof a bevel gear 72 which meshes with a ring gear 73 fixed upon the tubular member 52. The shaft 71 projects beyond the bracket 68 into a casing 74 and carries at its opposite extremity a bevel gear 75 which meshes with a similar gear 76 arranged within the casing 74 and fixed upon a relatively short vertically disposed shaft 77 journaled within the casing. The shaft 77 projects through the top of the casing 74 and is connected with a vertically disposed shaft 78 by means of a universal connection 79. Fixed upon the shaft 78 at an appropriate distance from the upper end thereof is a horizontally disposed friction roller 80 which is disposed between a pair of rotating disks 81 but normally spaced therefrom. The disks 81 are fixed upon the engine shaft 24 for rotation therewith and have their confronting faces beveled as shown, the disks being disposed in right angular relation with respect to the friction roller 80. Slidably mounted upon the engine shaft 24 is a collar 82 the latter being mounted upon the shaft 24 between the disks 81. The collar 82 is non-rotatable, and is provided with a recess 83 for the reception of the ad-

jacent extremity of the shaft 78, so that when the collar is slid upon the shaft 24 the friction roller 80 will be brought into operative engagement with one of the disks 81, depending of course upon the direction of adjustment of the collar 82. For instance if it is desired to turn the machine to the right the collar is slid upon the shaft 24 in a rearward direction to bring the friction roller 80 into contact with the rearmost disk 81, the universal joint 79 permitting the shaft 78 with the friction roller 80 to be moved accordingly. When in contact with the rotatable disk 81, the friction roller 80 is rotated to impart a similar motion to the shaft 78, and by reason of the connection between the latter and the shaft 71, the said shaft 71 is also rotated to turn the tubular member 52 with a consequent turning of the front wheels to the right. Of course when it is desired to turn the front wheels of the machine to the left, the collar 82 is slid upon the engine shaft 24 in a reverse direction to that just described, in order to throw the friction roller 80 into contact with the foremost rotatable disk 81.

For the purpose of shifting the collar 82 in the manner stated, I preferably provide the collar with a semicircular groove in which is fitted a member 83′ of similar contour, the extremities of the member terminating to provide diametrically opposed lugs 84 extending in opposite directions. The lugs are received within the openings 85 provided in the extremities of a yoke 86 which straddles the collar 82, the yoke being provided with a vertically disposed stem 87 which is bifurcated at its upper extremity as at 88 to provide for the reception of a manually operable reciprocating rod 89 the forward extremity of which is pivoted between the separated portions of the stem 87 defined by the bifurcation 88. The stem 87 of the yoke is pivotally mounted at a point in its length upon a bracket arm 90′. The rod 89 extends rearwardly terminating within the cab 12 of the machine and is operatively associated with a pivotally mounted hand lever 90 through the instrumentality of which the yoke is actuated to effect an adjustment of the collar 82 in the proper direction, depending upon the course the machine is about to pursue. It is thus obvious that the steering mechanism can be quickly and easily adjusted, with a view of facilitating the turning of the machine by the motor power thereof.

While it is believed that from the foregoing description the nature and advantages of the invention will be readily apparent, I desire to have it understood that what is herein shown and described is merely illustrative of the preferred embodiment of the invention to which I do not limit myself, and that such changes may be resorted to when desired as fall within the scope of what is claimed.

What I claim:—

A tractor comprising a frame, a bracket at the front thereof having a depending part, front and rear axles, wheels carried by said axles, a spherical casing connected with the front axles and having an upwardly extending tubular member, a gearing on the upper end of said tubular member, a frame within said casing rotatably mounted on the ends of said front axles, gears carried by said frame, gears on the ends of the front axles engaging the gears on the frame, a beveled gear on the exterior of the frame, a second spherical casing carried by the bracket and having a downwardly depending tubular member extending into the aforementioned tubular member, anti-friction means located between a part of the second casing and the upper end of the upwardly extending tubular member, a vertical shaft passing through the downwardly extending member, a gear at each end of said shaft, the lower one engaging with the beveled gear on the frame, a drive shaft supported by the bracket and having its end extending into the second spherical casing, a gear thereon meshing with the gear at the upper end of the vertical shaft, an annulus on the depending part of the bracket engaging the lowered part of the upwardly extending tubular member, a steering shaft and a gear thereon engaging with the gear at the upper end of the upwardly extending tubular member.

In testimony whereof I affix my signature.

IRA RADER.

Witnesses:
GEO. W. WILLIS,
WARREN E. WALTERS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."