E. E. CHANDLER.

TRACTOR OR OTHER AUTOMOTIVE VEHICLE.

APPLICATION FILED FEB. 2, 1920.

1,376,921.

Patented May 3, 1921.

2 SHEETS—SHEET 1.

Fig 1

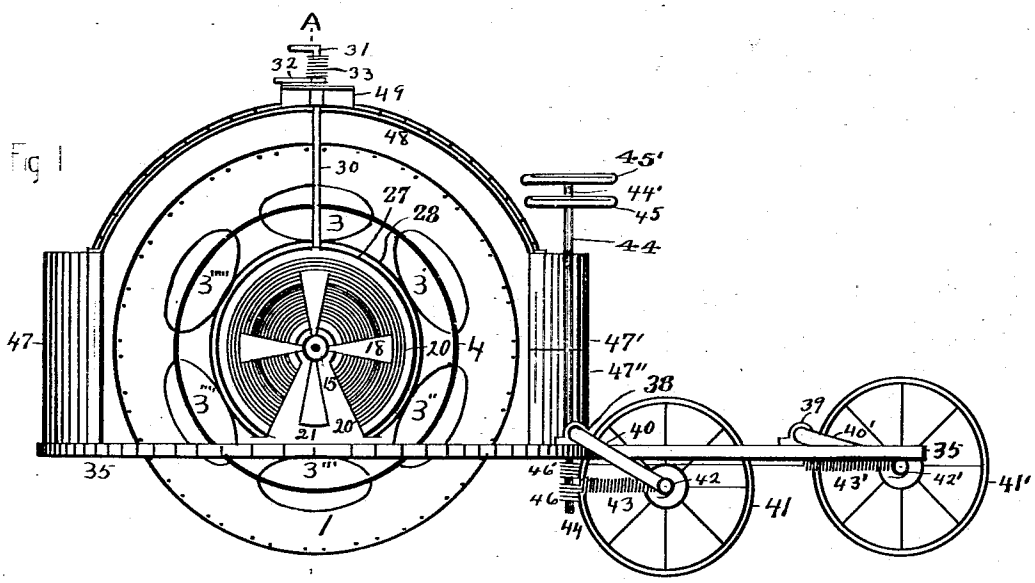
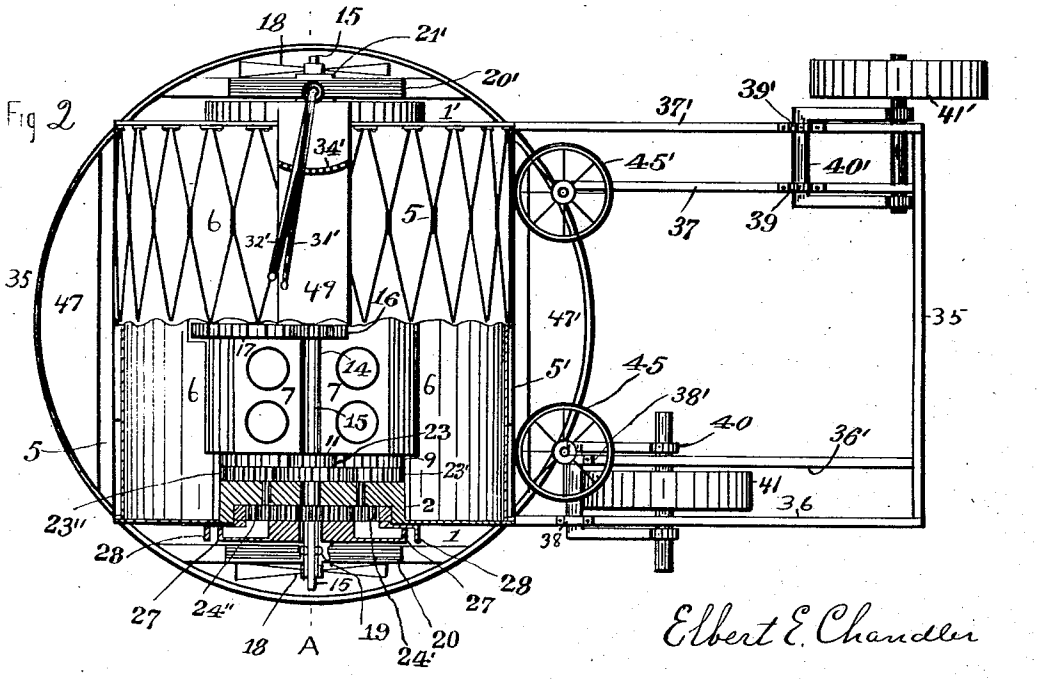


Fig 2



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Fig 3

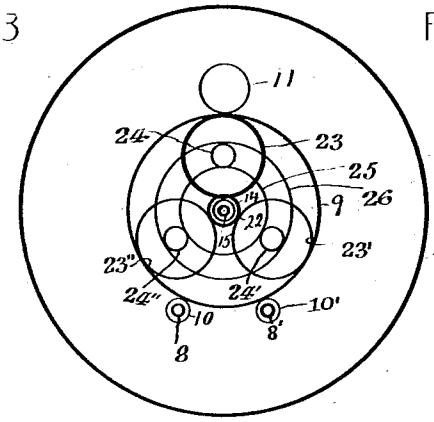


Fig 4

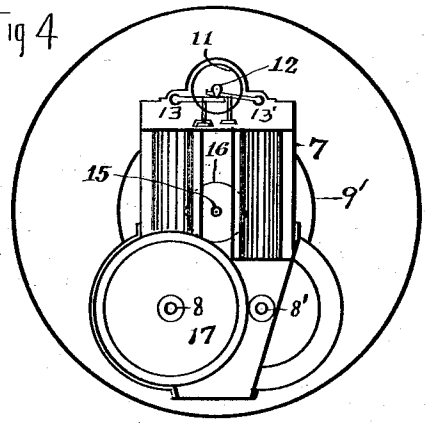


Fig 5

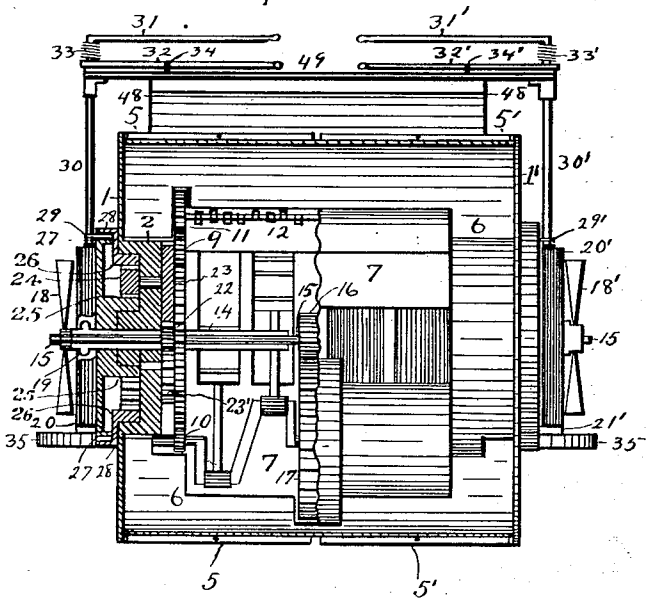
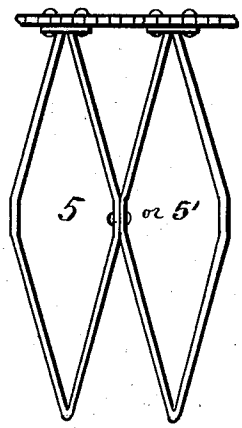


Fig 6



Elbert E. Chandler

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UNITED STATES PATENT OFFICE.

ELBERT E. CHANDLER, OF EAGLE ROCK, CALIFORNIA.

TRACTOR OR OTHER AUTOMOTIVE VEHICLE.

1,376,921. Specification of Letters Patent. Patented May 3, 1921.

Application filed February 2, 1920. Serial No. 355,831.

To all whom it may concern:

Be it known that I, ELBERT E. CHANDLER, a citizen of the United States, residing at Eagle Rock, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Tractors or other Automotive Vehicles, of which the following is a specification.

My invention relates partly to improvements in a tractor patented by me, June 24th, 1919, and numbered 1,307,481, which patent is still owned by me. The objects of my improvements are a better grid wheel construction, planetary transmissions carried by the driving wheels, a wheel frame completely rotatable in the main frame, so that progressing and reversing gears of different speed may be used for opposite purposes after turning the wheel frame half way around in the main frame, an improved steering mechanism and a double crankshaft unit engine.

I attain these objects by means of the mechanism, set forth in the accompanying drawings, in which Figure 1 is a side view, Fig. 2 is a top view, Fig. 3 is a diagrammatic representation of the pitch lines of one of the transmissions, Fig. 4 is a cross section of the double engine, Fig. 5 is a cross section of Figs. 1 and 2 along the line A—A and Fig. 6 is an enlarged view of two of the new grids. Similar figures refer to similar parts in all views.

Driving wheels.

1 and 1′ are left and right driving wheels. They are preferably made by attaching flat steel disks to cast hubs, such as 2, which carry the gears to be described later. These disks are provided with elliptical manholes 3—3′′′′′, which give access to the interior. The manholes are usually kept closed by the plates formed in cutting them. These plates are attached together by a band such as 4 so that they may be manipulated as a unit. These covers prevent the entrance of dirt through the disk wheels. Fastened to the disks are the diamond shaped grids or T's such as 5 and 5′ and these are also fastened to each other as best shown in Fig. 6. They are preferably made of strap steel, forged to the proper shape. They are given this shape to produce rigidity of construction and also to present a smooth rolling surface to the ground no matter in which direction the wheel may be rolling. Inclosed between the driving wheels and surrounded by the grids is the shell or drum wheel 6. This is also preferably constructed from sheet steel and the edges may be welded together. The drum wheel prevents the entrance of dirt through the grids to the inclosed power plant. It is not directly driven. It turns with the driving wheels when they are rotating together, but since, as will be shown, they may rotate independently and even oppositely in guiding by driving and in turning, one or the other of the sets of grids will scrape over the drum wheel and thus serve to disengage any dirt that may have packed between the grids.

The engine.

7 is a double engine. It has the two crankshafts 8 and 8′. Each has its own flywheel. These are staggered at the middle portion of the shafts. These shafts operate the spur gears 9 and 9′ by means of small spur gears such as 10 and 10′, one at each end of each shaft. These gears give the first reduction between driving and driven parts as will be shown later. The gear 9 also serves to actuate the overhead valve system, by the gear 11, the cam shaft 12 and the cam levers such as 13 and 13′, as best shown in Fig. 4. The double four cylinder engine indicated would require sixteen cams. The cams are so placed with reference to the crankshafts that the four explosions per revolution will occur ninety degrees apart as in the V motor of eight cylinders. This double motor has several advantages. It allows the power plant to be symmetrically suspended from the two hollow shafts such as 14, which also serve as the axles of the driving wheels and which are attached to the exterior supports. This could also be accomplished by a V motor, but for tractor purposes, because of continuous heavy loads, more crankshaft bearing is required than in automobile practice. Multicylinder motors are also desirable as they provide more piston surface for a given displacement and thus give the cylinder walls a longer life than where fewer cylinders are provided. Passing through the center of the support or axle shaft 14 and a similar one is the live shaft 15. Attached to this is the spur gear 16 meshing with the cogs cut in the flywheel 17. As the crankshafts are not accessible to the exterior of the driving wheels without re-

moving the manhole covers, this central shaft provides a means for starting the engine and for transmission of power for stationary purposes. Attached to this shaft are the fans 18 and 18′ and the water pump 19. 20 and 20′ are radiators formed of small copper tubes bent circularly with their ends fastened to the axle supports 21 and 21′. It is intended for the water to be circulated in series through the engine and the two radiators, the hollow supporting axles serving as a part of the conduit system. The hollow axles are rigidly attached to the supports to prevent the engine from rotating when rotating the driving wheels. They may however be freed from this attachment and the whole power plant rotated to make its parts more accessible in repair work.

Transmission.

The driving mechanism is of the planetary type. This requires the use of brake drums and bands instead of clutches. When the machine guides by driving, necessitating frequent disengagement of driving and driven parts the planetary type of transmission presents advantages. It is easier to maintain brakes than clutches, because the former are stationary when engaged and the latter are moving. As both driving wheels are similarly actuated it will be sufficient to describe only the left one in Figs. 2, 3 and 5. As before stated the crankshafts both drive the spur gear 9, which rotates on the axle 14. Attached to it is the spur gear 22. This engages the planetary gears 23, 23′ and 23″. These are attached by shafts bearing in the hub of the driving wheel 2, to the smaller gears 24, 24′ and 24″ and these engage simultaneously the external and internal gears 25 and 26. To these are attached the brake drums 27 and 28 and these are engaged by the brake band 29 on contracting or expanding. The brake band is actuated by cams on the steering shaft 30 and the steering lever 31. Rotatably mounted on the shaft is the turning lever 32. The steering and turning levers are attached to each other by the coil spring 33. The turning lever may be held in position to cause the brake band to engage either of the drums by means of the ratchet segment 34. When the driver desires to turn slightly to one side as in guiding by driving he simply pulls back on the steering lever on that side until the brake drum is released. If he desires to turn more sharply he may pull it far enough back to engage the other drum and reverse this wheel. He stops by placing the turning lever in the middle position on the ratchet segment. He may pull both steering levers far enough back to reverse both wheels and thus back the tractor. He changes the progressing speed of the machine by turning the wheel frame half way around in the main frame and then utilizes the other brake drum for progressing as the internal and external gears attached to the drums give different speeds. This change is accomplished by manipulating the turning levers as follows: They are disengaged from their segments. One is pulled back and the other held forward. When the opposite rotation of the wheels has turned the wheel frame half way around the second lever is pulled to the same position as the first and both are ratcheted in this position. The tractor now moves forward again but at a different speed.

Frames.

As before stated there is a main frame and a wheel frame. The latter may bear in the former by means of rollers in order to reduce the friction otherwise arising from such large bearing surfaces. 35 is the main or trailer frame. It is provided with the side members 36, 36′, 37 and 37′. These serve as supports for the boxes 38, 38′, 39 and 39′, which carry the double cranks 40 and 40′, which carry the trailer wheels 41 and 41′, by means of the bearing shafts 42 and 42′, which are longitudinally adjustable in the crank arm supports. The trailer wheels may thus be set on either side of the side bars or between them. They may also be moved forward or backward on the side bars and thus accommodate themselves to any implement that may be carried by the trailer frame. They are also perpendicularly adjustable by the rotation of the crank arms in the boxes. Attached to the wheel shafts are the coil springs 43 and 43′, which are in turn attached to the perpendicular shafts 44 and 44′ operated by the wheels 45 and 45′ to wind up or unwind the coils 46 and 46′ and thus change the elevation of the trailer frame. One wheel may be set lower than the other so that it may follow the furrow when plowing. The coil springs allow both trailer wheels to follow uneven ground, without tending to lift each other from it. Mechanism may also be easily applied to automatically lift the trailer frame by the revolution of the wheel frame in the main frame when turning.

47, 47′ and 47″ are tanks carried by the wheel frame. 47 may contain heavier fuel, 47′ lighter fuel for starting and 47″ water which may be in series with the two radiators. After passing around the engine cylinders the hot water would pass through the annular space between the hollow axle and the starting shaft, thence through the pump, thence around the radiator, thence to the tank 47″, thence to the other radiator if a second one is provided, thence through the other hollow axle and to the engine again. The fuel pipe may also pass through

this annular space, either through the hot water side or the cool water side as may be preferred. The exhaust gases pass between the two rows of cylinders in opposite directions and may exit through the planetary gear system and by the brake drums. This will serve to prevent the entrance of dirt there and may catch some of the exhaust oil that would otherwise be lost. The tortuous passage will provide a muffler and serve to prevent ignition of grain fields by the exhaust.

Having thus described my invention I desire to claim certain combinations of the features shown.

I claim:

1. The combination in a tractor of right and left driving wheels, a shell wheel between them and diamond shaped T's, attached to the wheels and to each other and resting on the shell wheel.

2. The combination in a tractor of a main frame, a wheel frame, entirely rotatable within the main frame, driving wheels within the wheel frame, a power plant within the driving wheels, with crank shaft parallel to their axis and independently operating transmission systems between the opposite ends of the power plant and the driving wheels.

3. The combination in a tractor of a main frame, a wheel frame entirely rotatable within the main frame, driving wheels within the wheel frame and supporting it, a power plant within the driving wheels and independent transmissions between the power plant and driving wheels, each of which is provided with unequal speed progressing and reversing gear, so that each may serve the opposite purpose, after turning the wheel frame half way around in the main frame.

4. The combination in a tractor of driving wheels, driving gears concentric with the driving wheels, planetary gears engaging the driving gears and carried by the driving wheels, other planetary gears attached to the first ones, internal and external gears, engaging the second planetary gears and brakes engaging the internal and external gears.

5. The combination in a tractor of driving wheels, planetary gearing carried by the driving wheels, internal and external gears engaging the planetary gears and concentric with the driving wheels, brakes engaging the concentric gears, brake levers engaging the brakes and ratchet levers elastically attached to the brake levers.

6. The combination in a tractor of a wheel frame, a hollow axle attached to the wheel frame, driving wheels bearing on the axle, a power plant within the driving wheels and suspended from the hollow axle and a radiator system in circuit with the hollow axle.

7. The combination in a tractor of a wheel frame, a hollow axle attached to the wheel frame, driving wheels bearing on the hollow axle, a power plant within the driving wheels and suspended from the hollow axle and a starting and stationary work shaft within the hollow axle and actuating and actuated by the power plant.

ELBERT E. CHANDLER.