No. 832,518. PATENTED OCT. 2, 1906.

A. E. WOLCOTT.

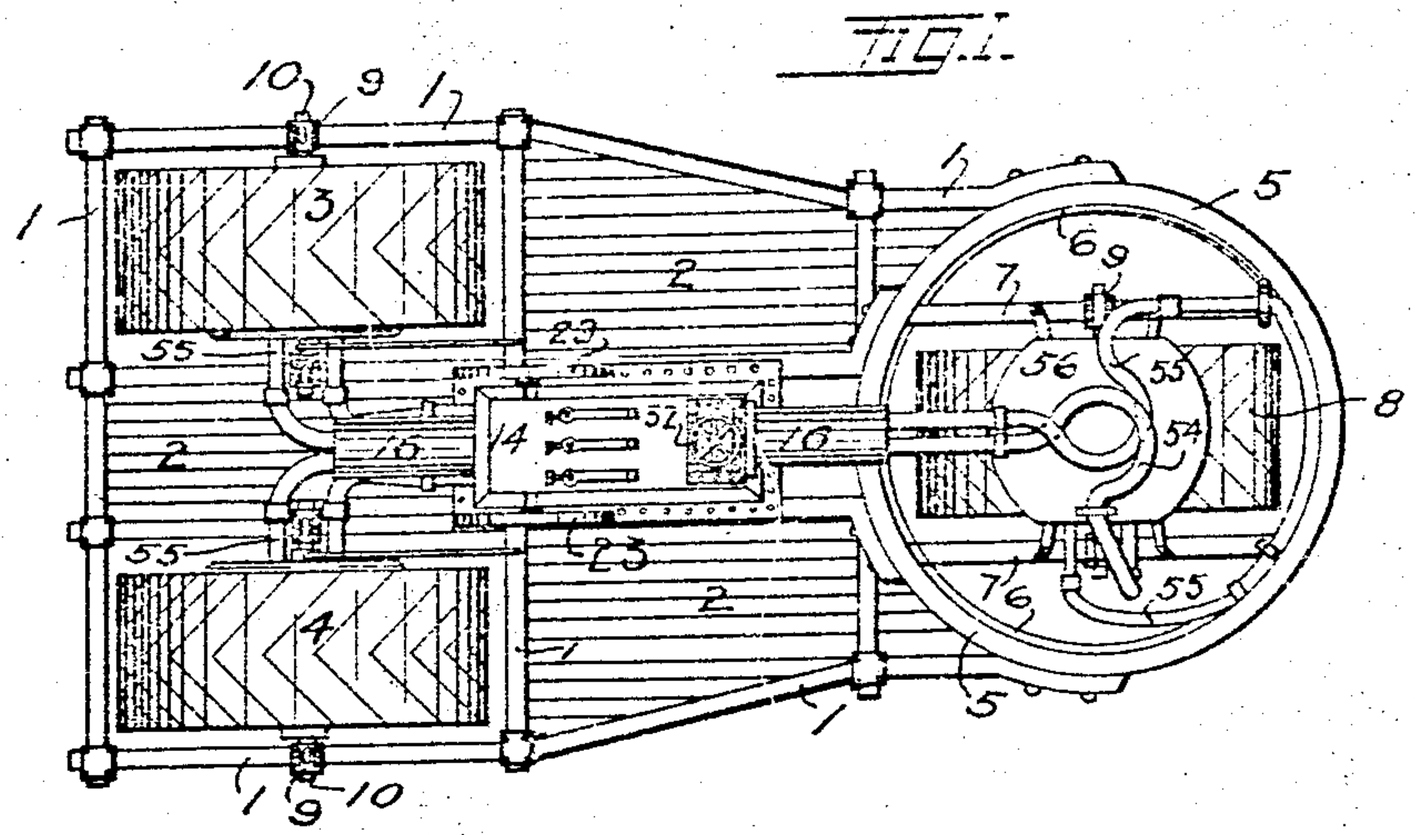
TRACTION ENGINE.

APPLICATION FILED MAR. 1, 1905.

6 SHEETS—SHEET 1.

For wheel motor - see Fig. 15.

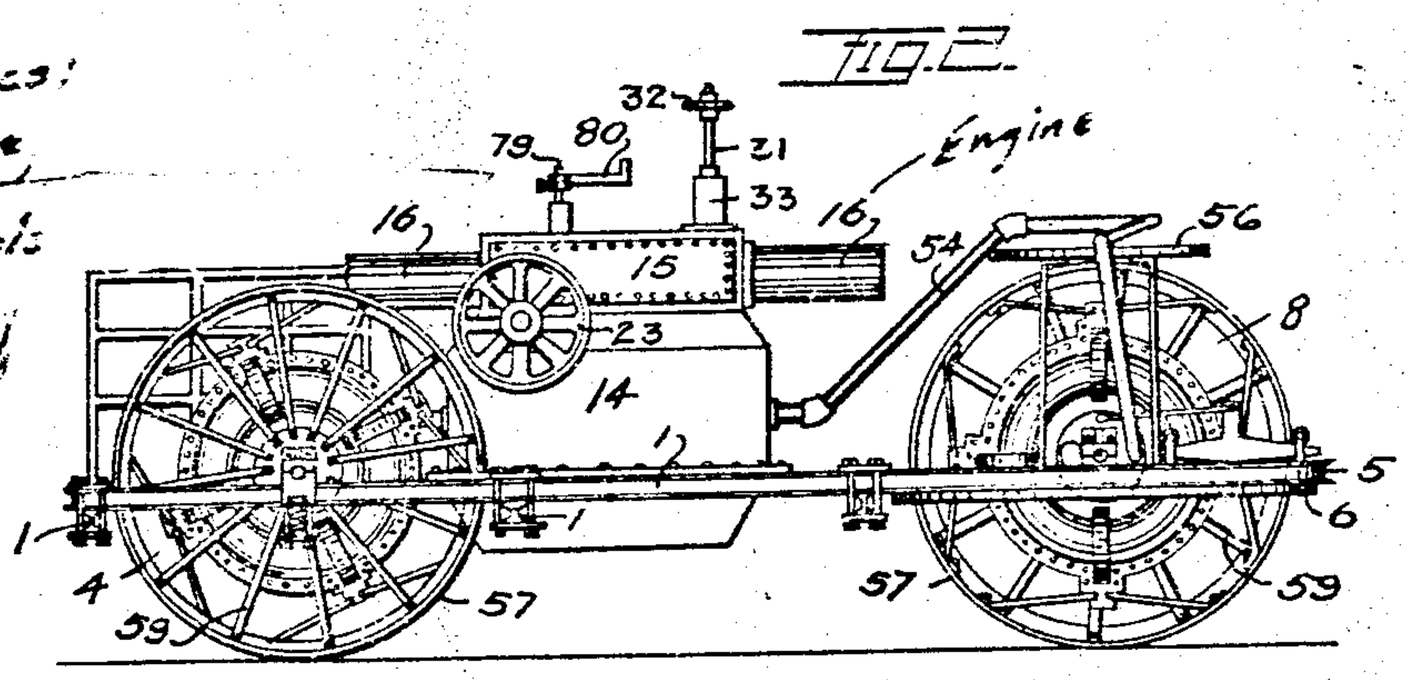
FIG. 1.



oil or water

3 Individual valves: By turning any one the wheel it controls may stop propelling or be reversed

FIG. 2.



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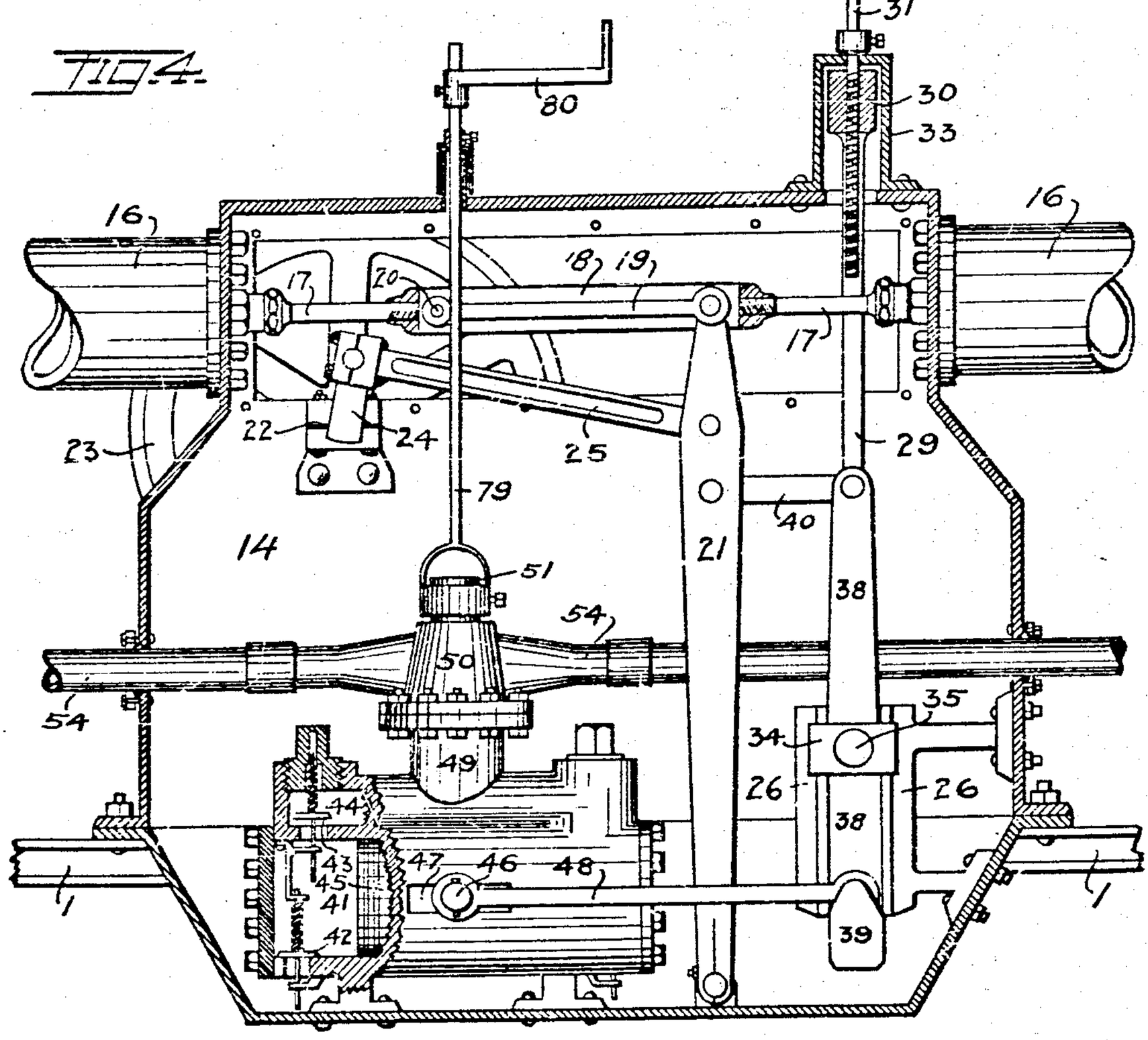
6 SHEETS—SHEET 2.

FIG. 3.

FIG. 4.



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6 SHEETS—SHEET 3.

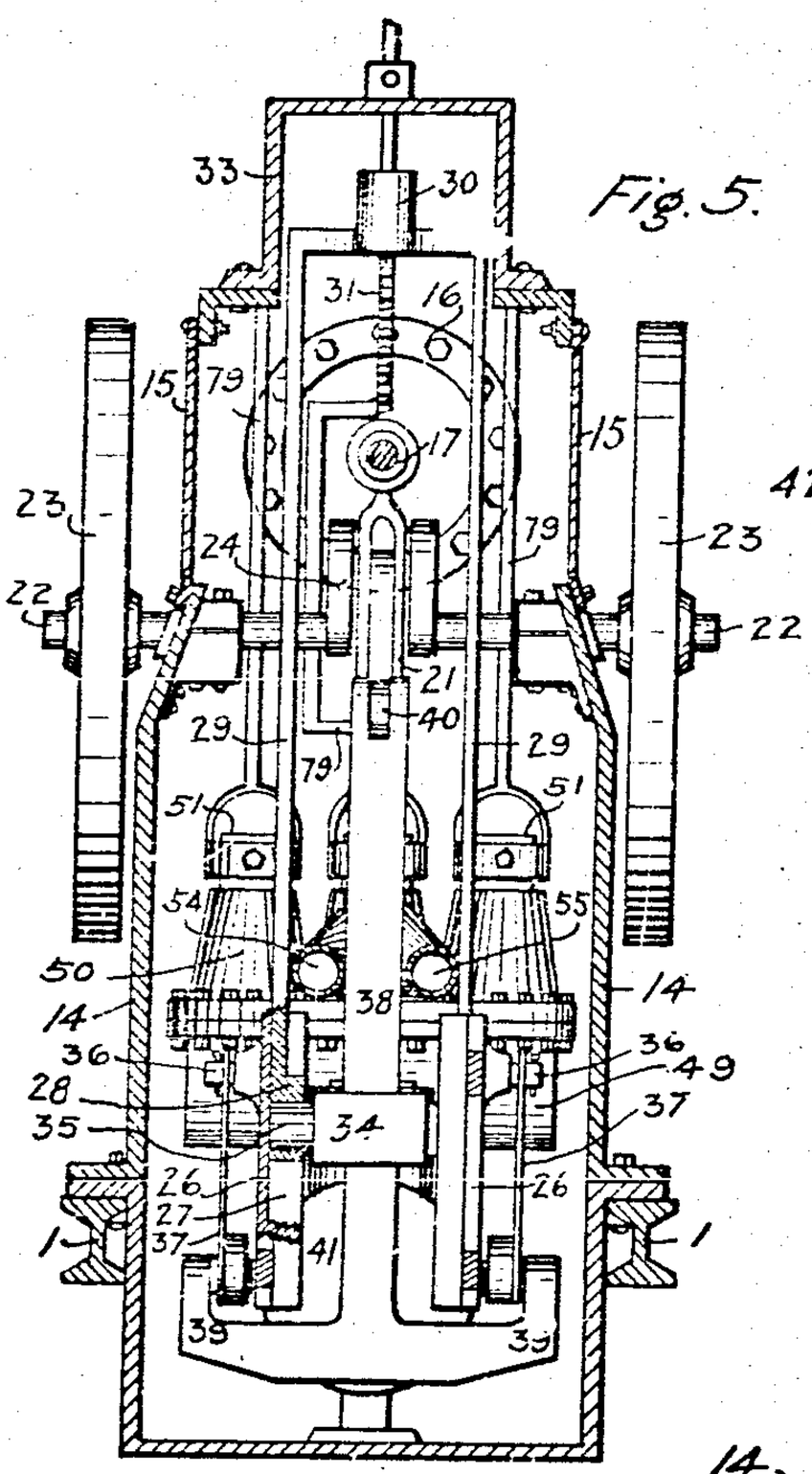

Fig. 5.

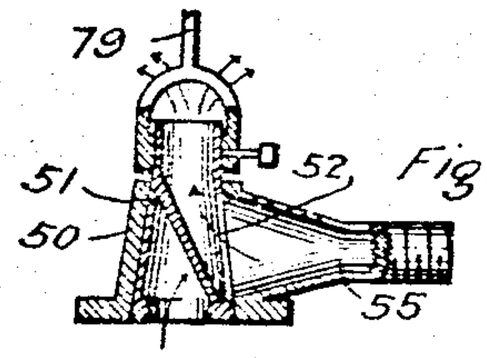

Fig. 7.

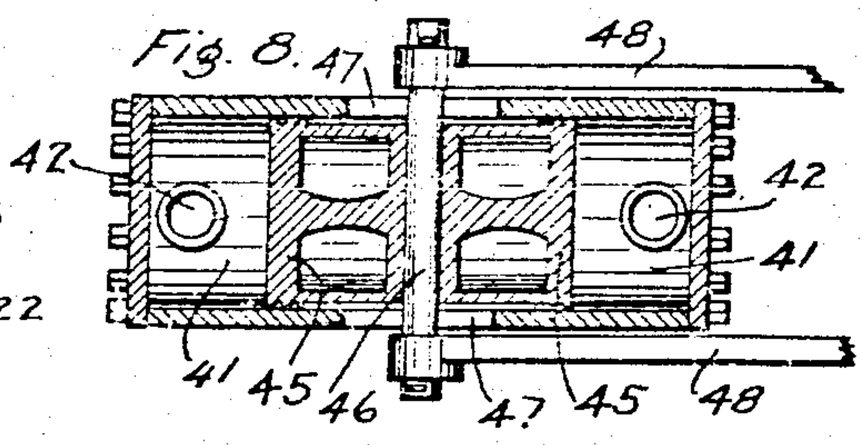

Fig. 8.

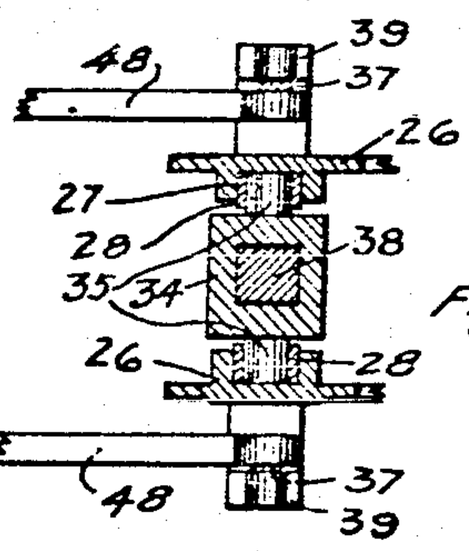

Fig. 9

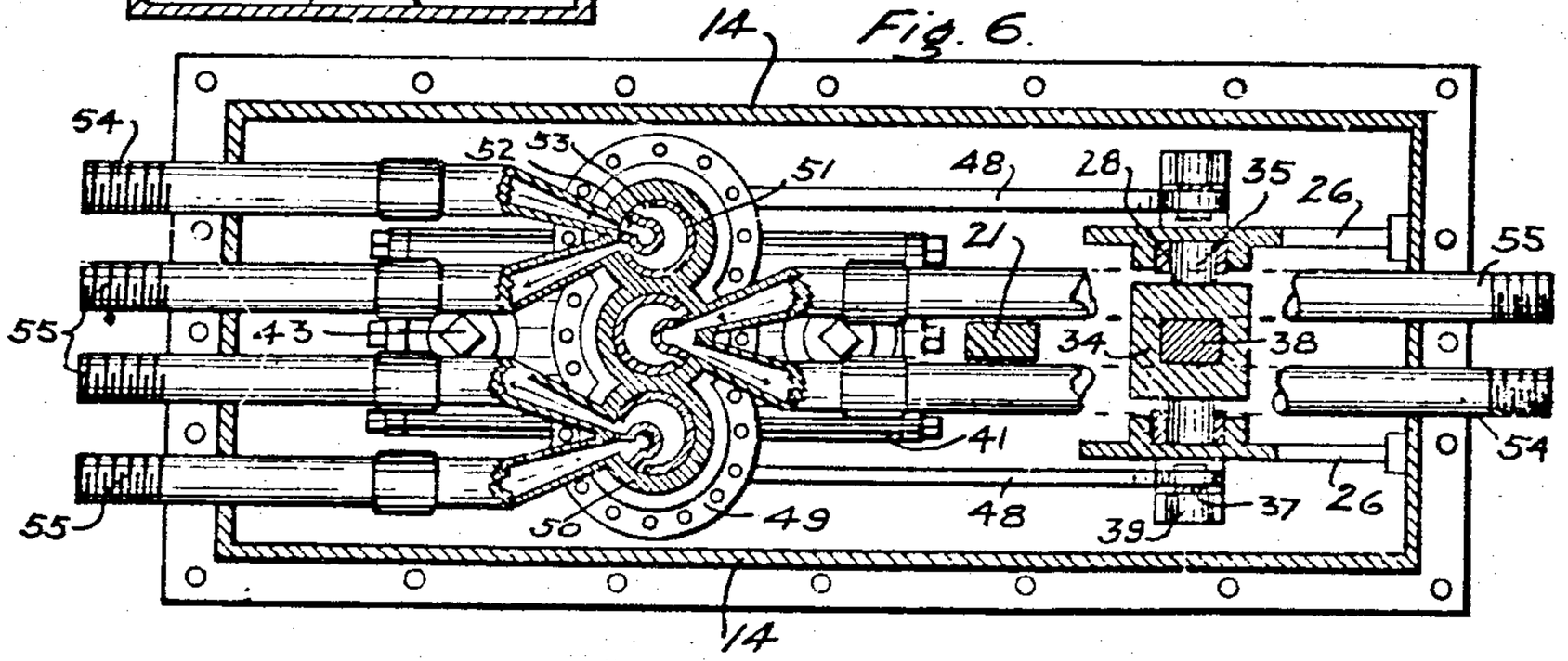

Fig. 6.

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6 SHEETS—SHEET 4.

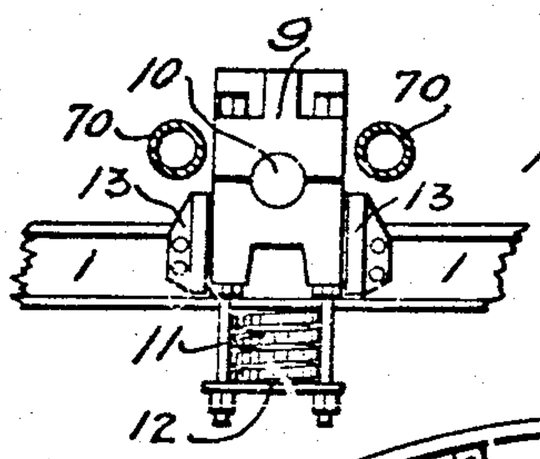


Fig. 11

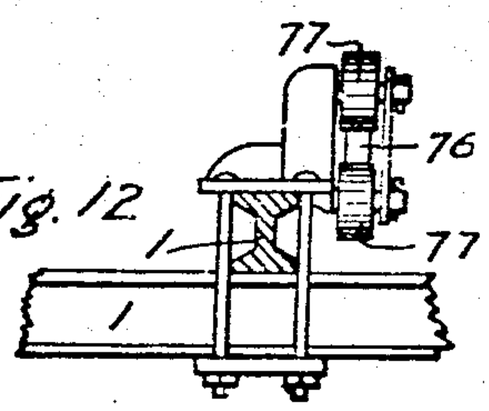
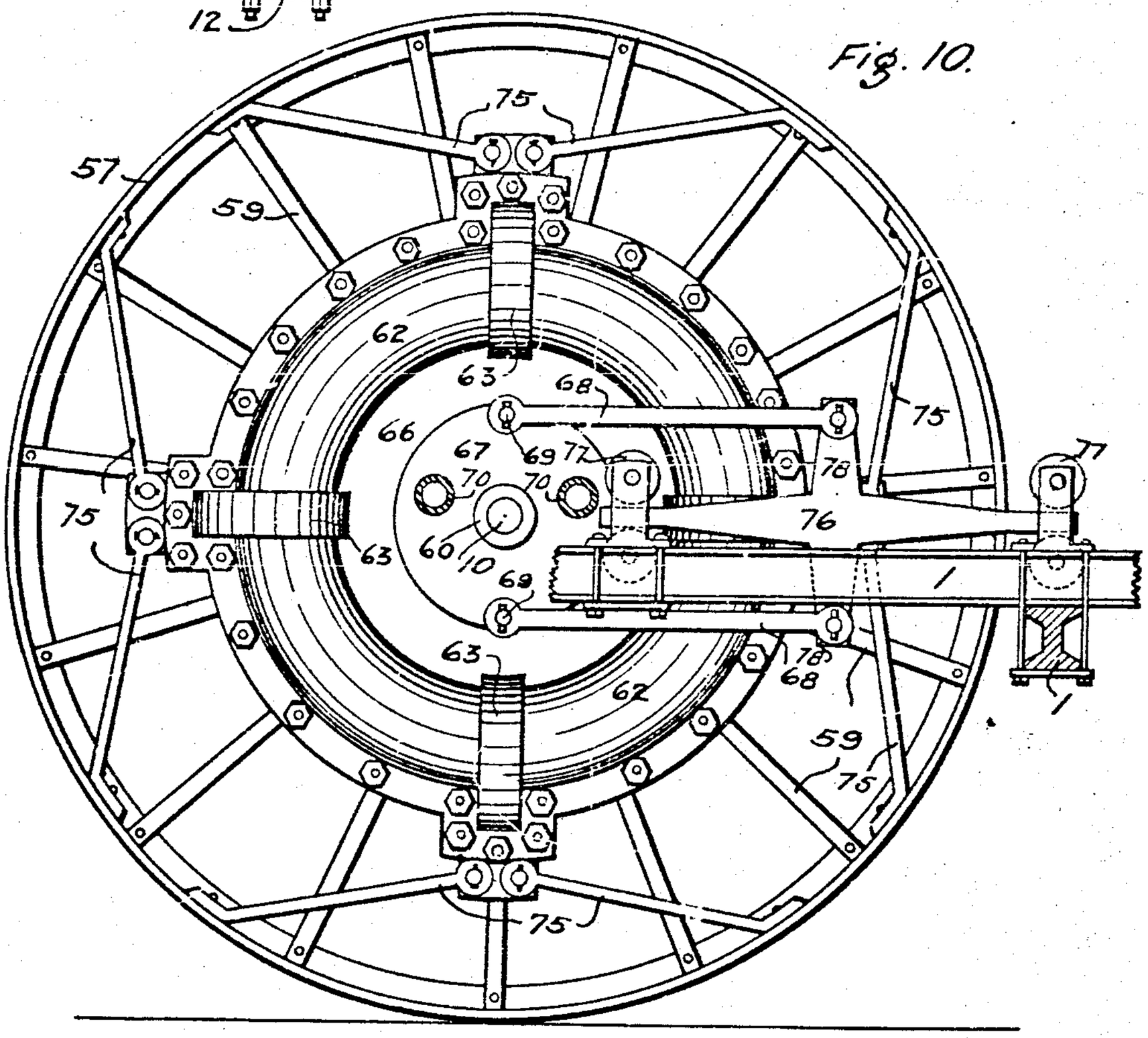


Fig. 12

Fig. 10.



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TRACTION ENGINE.

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6 SHEETS—SHEET 5.

Fig. 14.

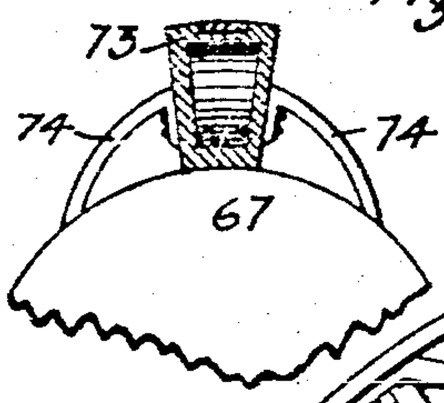
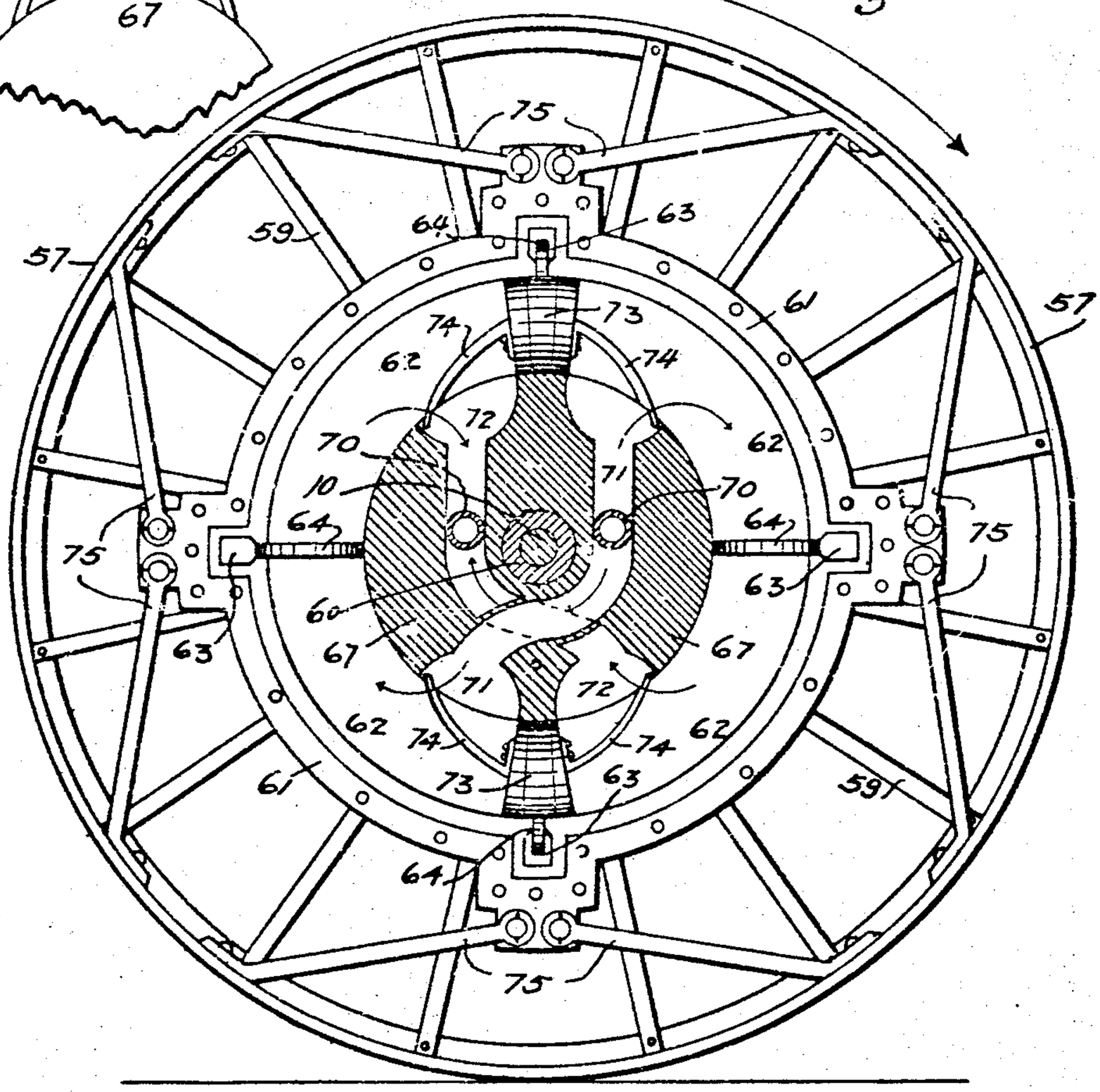


Fig. 13.



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No. 832,518. PATENTED OCT. 2, 1906.

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6 SHEETS—SHEET 6.

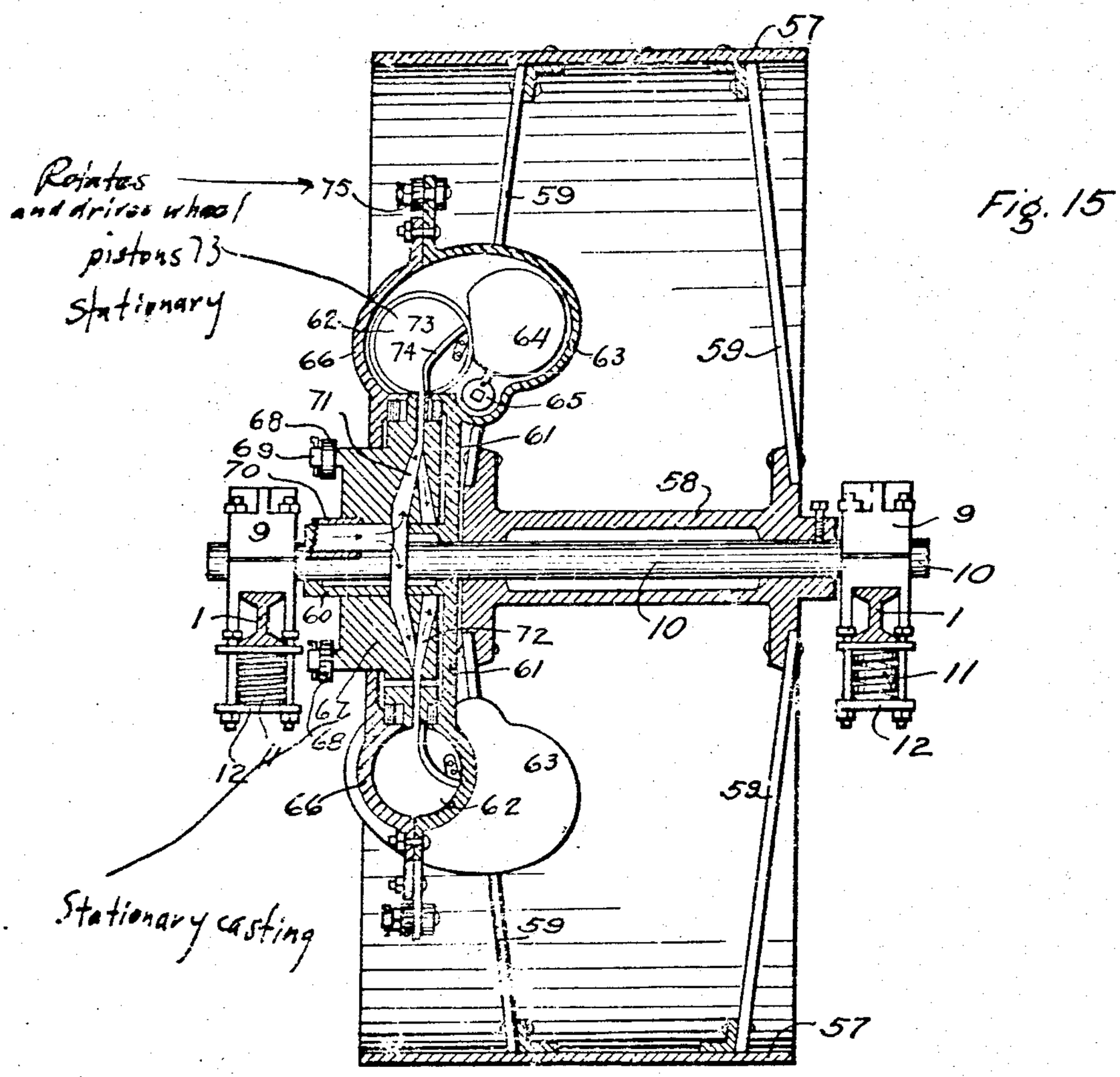

Fig. 15

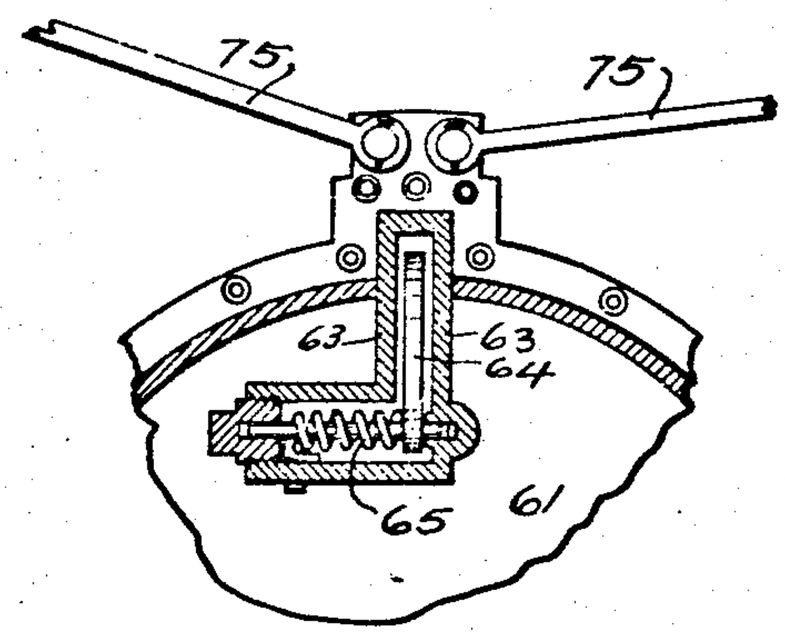

Fig. 16.

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UNITED STATES PATENT OFFICE.

ALVEN E. WOLCOTT, OF TACOMA, WASHINGTON.

TRACTION-ENGINE.

No. 832,518. Specification of Letters Patent. Patented Oct. 2, 1906.

Application filed March 1, 1905. Serial No. 247,913.

To all whom it may concern:

Be it known that I, ALVEN E. WOLCOTT, a citizen of the United States of America, residing at Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Traction-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to road-vehicles, especially to that class known as "traction-engines," and has for its objects to increase the ratio between tractive force and weight; to increase its ability to turn on sharp corners without reducing its tractive force; to make the relations between the speed and the tractive force inversely proportionate without affecting the power of the driving-engine; to suit the varying grades and other external circumstances; to make each wheel a traction-wheel revolving in exact accord with the other wheels, but independently reversible; to provide a simple and effective adjustable mechanism whereby the speed and power of the traction-engine is controlled; to provide a power-transmitting medium which will lubricate the main engine and the motors on the traction-wheels; to improve the construction of the rotary motors on the wheels, and to provide a mechanism which will hold the stationary portions of the rotary motors from turning, but which will give them perfect freedom of longitudinal and vertical movement. I attain these objects by the devices illustrated in the accompanying drawings, in which—

Figure 1 is a plan of my traction-engine, and Fig. 2 is a side elevation thereof. Fig. 3 is a plan of the connecting-link between the explosion-engine and the pump-operating mechanism. Fig. 4 is a vertical longitudinal section of the power-box. Fig. 5 is a vertical cross-section, and Fig. 6 is a horizontal section thereof. Fig. 7 is a vertical section of the controlling-valve. Fig. 8 is a horizontal section of the pump. Fig. 9 is a horizontal section through the adjustable fulcrum-block. Fig. 10 is a side elevation of one of the traction-wheels. Fig. 11 is a side view of the axle-box. Fig. 12 is an end view of the hanger for the equalizer-bar. Fig. 13 is a side view of a wheel with the cover of the motor removed and the central portion in section. Fig. 14 is a section of one of the piston-blocks. Fig. 15 is a vertical cross-section of a wheel. Fig. 16 is a section of one of the recess-chambers with the swinging plate of the motor pivoted therein.

Similar numerals of reference refer to similar parts throughout the several views.

The frame of my traction-engine is constructed, preferably, of light rolled-steel beams 1, which are connected and cross-connected, so as to form a substantial and stiff frame on which the platform 2 is built. The frame has a wheel-space on each side of the rear thereof adapted to receive the rear wheels 3 and 4 of the engine, and, further, it has a turn-table 5, resting on the circular plate 6, which has suitable cross-bars 7, adapted to receive the bearings of the front wheel 8.

The bearings of the wheels 3, 4, and 8, from which the frame 1 is hung, are illustrated in detail in Figs. 11 and 15 and consist of an ordinary bearing-box 9, through which the axle 10 passes and having beams 1 of the frame supported on the spring 11, which is itself supported from a plate 12, hung from the box 9. Side guide-flanges 13 allow a vertical relative movement of the axle 10 and the frame-beam 1, but prevent any considerable relative longitudinal motion. The bearings of the rear wheels 3 and 4 are secured to the frame-beams 1, but those of the front wheel 8 are secured to the cross-bars 7 of the circular plate 6, which allows said wheel to be turned on a vertical axis through one hundred and eighty degrees. The means employed to control this turn-table support is not shown in the drawings, but may be any of the well-known steering devices. Each of said wheels 3, 4, and 8 is provided with a hydraulic or fluid motor and is a driving-wheel, and I am therefore enabled to use a much lighter machine to get a certain tractive force, as the entire weight is supported on the drivers.

The power which is supplied to the moters on the wheels is derived from an engine and transmitting mechanism supported by and located in a power-box 14, which is supported in any convenient position on the frame-beams 7. This power-box is illustrated in Figs. 1, 2, 4, 5, and 6 and consists of a closed box, the lower portion thereof being water-tight and the upper portion having removable side plates 15, which are normally se-

curely fastened to the box 14, but which may be removed for the purpose of inspection or repairs. This power-box 14 is kept about one-half full of the liquid (water or oil) used in the motors on the wheels 3, 4, and 8, and the mechanism for forcing said liquid through the motors and for controlling said motors is located within said box and mostly immersed in said liquid.

I have indicated in the drawings that the preferred prime mover is a double-cylindered explosion-engine whose cylinders 16 are secured to the front and rear ends of the upper portion of the box 14. These cylinders are built in alinement and their piston-rods 17 are fastened together by the double yoke or strap bars 18, Figs. 3 and 4, so that both engines work together. I have not illustrated any of the details connected directly with these complementary engines, for any of the well-known types of engines may be used, though I believe that two-cycle explosion-engines will be found to have the most all-round advantages under the circumstances under which these traction-engines will be used.

In the space between the yoke-bars 18 is pivotally secured the connecting-link 19 by the pin 20 passing through it and the bars 18. The other end of this connecting-link 19 is forked, so as to pass on each side of the end of the vibrating bar 21, to which it is secured by a pin. This vibrating bar 21 is pivoted to the bottom of the power-box 14 and simply vibrates with the motion of the piston-rods 17 of the engine, being controlled by the connecting-link 19.

In the upper part of the box 14 and near one end thereof is journaled the shaft 22, which passes through the box 14 and is provided with fly-wheels 23 at its ends. The crank 24 is located centrally in said shaft 22. The connecting-rod 25 joins the crank 24 with the vibrating bar 21. Thus the motion of the bar 21 and the piston-rods 17 is controlled by the rotation of the fly-wheel shaft 22 through the connecting-rod 25.

Secured to the lower portion of the front end of the power-box 14 are two guide-castings 26, having vertical guide-channels 27 therein, as shown in Figs. 4, 5, 6, and 9. Within these channels slide the vertically-adjustable fulcrum-bearings 28, which are formed on the ends of the vertical rods 29. These rods 29 join at their upper end to form a boss 30, through which the adjusting-screw 31 passes. Screw 31 passes vertically out of the power-box 14 and has an operating hand-wheel 32 at its upper end. These parts preferably pass up into a box 33, secured to the top of the power-box, 14 out of which the screw 31 projects.

The fulcrum-block 34 has trunnions 35, which engage in the fulcrum-bearings 28, and consists of a rectangular piece with a rectangular vertical hole therethrough. This fulcrum-block 34 moves up or down with the bearings 28 and forms an adjustable fulcrum for the hereinafter-described transmitting mechanism.

On the outside of the guide-castings 26 are formed, near the upper ends thereof, the lugs 36, from which hang the links 37. A transmitting-lever 38, formed with side arms 39 at its bottom end, like an inverted T, is hung by said arms 39 from said links 37, and its central part passes freely through the rectangular hole in said fulcrum-block 34 and extends upward therefrom. The upper end of this transmitting-lever 38 is connected to the vibrating bar 21 by the link 40. Thus the motion of the bar 21 swings the lever 38 about the adjustable fulcrum-bearings 28, and since the supporting-links 37 are of constant length the lever 38 will also slide through the block 34 if the bearings 28 are not concentric with the lugs 36. Thus I am able to alter the length of the stroke of the side arms 39 without altering the engine-stroke at all by simply sliding the fulcrum-block 34 up or down in the guide-channels 27 of the castings 26. The side arms 39 are below the bottom of the castings 26. The ends of the side arms are upturned a sufficient distance so that the fulcrum-bearings 28 may be lowered to come in line therewith, thus stopping all motion of said upturned ends, and therefore stopping the stroke.

The pump-cylinder 41 is mounted on the bottom of the power-box 14 and is provided with inwardly-opening inlet-valves 42 at each end of the bottom thereof and also with outwardly-opening outlet-valves 43 at each end of the top thereof, said inlet-valves communicating with the interior of the power-box, so as to admit the oil or water therein contained into the pump-cylinder, and said outlet-valves opening into a discharge-passage 44, formed on the top of the cylinder. The plunger 45 fits the cylinder 41 and has packing-rings at each end and an operating-pin 46 passing horizontally through it. This pin 46 extends out on each side of the plunger through horizontal slots 47 in the sides of the cylinder 41. The connecting-rods 48 join the ends of the pin 46 with the upturned ends of the side arms 39 of the transmitting-lever 38. Thus the plunger 45 moves with the lower end of the transmitting-lever and is therefore controlled in the length of its stroke by the position of the fulcrum-block 34. The length of the slots 47 is such as to allow the pin 46 to travel the longest stroke, and the length of the plunger is such that the slots 47 are never uncovered by the ends thereof, even with the longest stroke. The connecting-rods 48 are secured to the side arms 39 at the same points that the hanging links 37 are. Since the length of the stroke of the plunger is variable and is controlled by the

position of the fulcrum-block, it is evident that the quantity of oil or water passed through the outlet-valves 43 will vary with and be controlled by the position of said fulcrum-block.

The distributing-chamber 49 extends at right angles to and above the discharge-passage 44 and is connected therewith. This chamber receives the oil or water from the discharge-passage 44 and distributes it through the three valves placed above it to the motors on the three wheels 3, 4, and 8.

The three valve-seats 50 are secured to the top of the distributing-chamber 49 and are conical in form, and each has two narrow vertical ports therein leading to the two pipes which conduct the oil or water to or from the motors on the wheels 3, 4, and 8. Within the valve-seats 50 are placed the conical valves 51, which are so formed with a partition therein that the top central hole communicates with a port or passage 52, which is wide enough to connect both the ports in the valve-seat 50 and so that the bottom central hole connects with ports 53 on each side of the port 52 and so spaced that if one of the ports 53 is connected to one of the ports in the valve-seat 50 the central port 52 is connected to the other port in the valve-seat. The shape of the valve and seat being conical and the pressure coming from the base or below, it is evident that while the pump is working it will be difficult to move the valve on the seat. It is evident that if the valve 51 is turned, as shown, in the upper valve in Fig. 6, then the outer pipe is the exhaust-pipe connecting to port 52 of the valve, and the inner pipe is the pressure-pipe; but if it is turned, as in the central valve in said Fig. 6, so that the port 52 connects with both ports of the valve-seat 50, then both pipes are connected to the exhaust-passage and are shut off from the pressure, so that the wheel 8 (which is controlled by the central valve) is in this case shut off and supplies no tractive force. If, however, the valve is in the position shown in the lowest valve in said Fig. 6, then the outer pipe is the exhaust-pipe and the inner pipe is the pressure-pipe. These valves are all turned by rods 79 passing up therefrom and having handles 80 on the outside of the power-box.

The above-mentioned ports in each of the valve-seats 50 connect with the pairs of pipes 54 and 55, which pass through the power-box 14. The pipes 54 and 55, which lead to the front wheel, are directed forward; but those leading to the two rear wheels pass toward the rear. I have indicated the pipes 54 as the "pressure-pipes" if all three wheels are directed to pull forward, and therefore the pipe 55 is the exhaust-pipe in this case. It is evident, as above stated, that by turning any one of the valves the wheel controlled thereby may be made to cease pulling or may be reversed. Thus I am enabled to turn my traction-engine in very small space by turning the wheel 8 in the turn-table at right angles to the normal position and by reversing one of the motors on the rear wheels 3 or 4.

After the pipes 54 and 55 leave the power-box 14 they are led to the motors by metal and flexible pipes. The pipes leading to the front wheel 8 are led to a table 56, supported over the wheel, and a pair of flexible connections lead therefrom to the motor, the flexible connecting-pipe of the pipe 54 passing almost directly down to its connection with the motor, but the flexible connecting-pipe of the pipe 55 passing down from the upper table 56 on the other side and passing to the circular plate 6 of the turn-table and being secured thereto and passing along said plate 6 to a connection with the motor. This arrangement of the flexible pipes allows the wheel 8 to be turned about a vertical axis without tangling the flexible pipes connecting therewith.

The wheels 3, 4, and 8 are similar in all respects except that if they are provided with grousers on their tires those on the wheel 4 are set at the reverse position from those of the wheels 3 and 8, so that when it is assembled into the engine and turned with its motor toward the inside of the engine the grousers on its surface will correspond with those on the wheels 3 and 8. A description of one wheel and motor will therefore apply to all three wheels and their motors.

The tires 57 are made broad enough so as to give sufficient surface to support the engine in soft ground. Referring to Fig. 15, it will be observed that the hub 58 is connected to the tire by the double set of spokes 59, one of said sets being placed well within the wheel, so that the motor-body will not extend much beyond the wheel. The axle 10 passes through the hub 58, being secured thereto, and passes through the above-described bearing-box 9. The hub 58 does not extend the entire length of the axle between the boxes 9.

The motor consists of a sleeve on the axle and holding the circular cylinder, in which the stationary piston-blocks work, and a series of four swinging plates secured to the circular cylinder and which transmit the pressure and cause the cylinder and the wheel to rotate. Considering first the revolving circular cylinder, this is formed of a sleeve 60, through which the axle 10 passes and which carries a circular plate 61, formed in a half of the cylinder 62. This portion also has four recess-chambers 63 symmetrically placed thereon, in which the swinging plates 64 are pivoted, Figs. 15 and 16, being kept pressed toward the cylinder by the spring 65. These plates 64 are larger than the cylinder 62 and bear against recesses therein, so that the

strain thereon is transmitted entirely by the periphery and not at all through the pivot of the plate 64. The remainder of the circular cylinder is formed by the casting 66, which is secured to the plate 61. This part 66 does not quite meet the plate 61 at the inner radius of the circular cylinder, but leaves a space therein for the stationary casting. Further, there is a circular hole in said casting 66, through which the main body of the stationary casting passes to lead to the interior of the circular cylinder.

The stationary casting 67 fits over the sleeve 60 and projects inward between the plates 61 and 66, having a thin portion reaching to the circular cylinder 62. This casting 67 is kept from rotating with the wheel by the holding-bars 68, engaging the two diametrically opposite lugs 69 on the casting 67 and secured at their other ends to the equalizer, as hereinafter described. These bars 68 prevent any rotary motion of the casting 67, but allow it to have perfectly free motion horizontally and vertically, thus allowing it to move in the parts 61 and 66, secured to the wheel without binding thereon. A pair of pipes 70 extend out from the casting 67 on each side and a little above the center thereof and enter a pair of passages 71 and 72 therein. These passages lead straight inward and then flatten and broaden and turn, so as to lead up to form ports on each side of the hereinafter-described piston 73, and a branch from each leads downward and cross each other below the sleeve 60 to form ports corresponding with but diametrically opposite to the ports formed by the upper passages. The ports formed by these passages are of about the same area as the supply-pipes; but since they have to be very narrow where they connect with the interior of the circular cylinder they must therefore be broad in the other direction, as shown in Fig. 13. The ports are arranged so that the distance between them is one-quarter of the circle, and they all extend from said quarter-points to the piston-blocks 73. These pistons 73 are formed on the edge of the stationary casting 67 and fit in the circular cylinder 62, which revolves about the center of the axle. The piston 73, however, remains stationary. Spiral cam-tracks 74 lead from points close to the quarter-points above mentioned to the sides of said pistons in such a manner as to lift the swinging plates 64 from their working position into the chambers 63 as they approach the pistons 73. Since the plates 64 are set at the quarter-points, it is evident that when one of them reaches the point of the exhaust-port the succeeding plate has just taken the pressure from the feed-port, so that the plates which are being lifted by the cam-tracks are not under pressure and can therefore be easily lifted. Since the pistons are stationary, it follows that the cylinder must revolve, and I have therefore arranged the driving-bars 75 to connect the casting 61 with the tire 57.

The equalizer above mentioned consists of a bar 76, extending longitudinally of the engine and having each end between the double rollers 77 secured to the frame 1. The bar 76 has upper and lower cross-arms 78 extending from near its center, and said cross-arms 78 have pins therein to which the holding-bars 68 are secured. These pins are spaced so that they are as far apart as the lugs 69 on the casting 67, thus allowing the bars 68 free vertical movement between the frame 1 and the casting 67. Since the ends of the bar 76 are between the rollers 77, it is evident that there can be free longitudinal movement between said parts, so that the tractive force of the wheels is transmitted through the axles 10, the boxes 9, and the guide-flanges 13 to the frame 1 of the engine, and none of it is transmitted through the stationary casting 67.

Having thus described my invention, what I claim is—

1. A traction-engine, having a primary engine mounted thereon and independently-controlled motors driven thereby mounted on the wheels thereof.

2. In a traction-engine, the combination of a primary engine mounted thereon, motors mounted on the wheels thereof, controllable transmitting mechanism driven by said primary engine and driving said motors, and means between said primary engine and said motors whereby each of said motors are independently controlled.

3. In a traction-engine, the combination of a primary engine mounted thereon, a pump, intermediate driving mechanism, fluid motors mounted on the wheels thereof, connections between said pump and said motors whereby said motors are driven and valves in said connections whereby said motors are independently controlled.

4. In a traction-engine, the combination of a primary engine mounted thereon, a pump, intermediate controllable driving mechanism, fluid-motors mounted on the wheels thereof, and connections between said pump and said motors whereby said motors are driven.

5. In a traction-engine, the combination of a primary engine mounted thereon, vibrating lever mechanism connected therewith and operated thereby, a pump operated by said lever mechanism, fluid-motors mounted on the wheels thereof, and connections between said pump and said motors whereby said motors are driven.

6. In a traction-engine, a transmitting-lever having a confined motion at one end and an adjustable motion at the other end.

7. In a traction-engine, a transmitting-lever having a confined motion at the applying

end and an adjustable motion at the transmitting end.

8. In a traction-engine, the combination with a supporting-frame, of links pivotally secured thereto, a transmitting-lever pivotally secured to the other end of said links and passing through a fulcrum-block, and an adjustable fulcrum-block engaging said frame.

9. In a traction-engine, the combination with a supporting-frame having a guide-channel therein, of links pivotally secured to said frame, a transmitting-lever pivotally secured to the other end of said links and passing through a fulcrum-block, a fulcrum-block having trunnions engaging said guide-channel, and means for adjusting the position of said trunnions in said guide-channel.

10. In a traction-engine, the combination with a supporting-frame having a guide-channel therein, of links pivotally secured to said frame, a transmitting-lever pivotally secured to the other end of said links and passing through a fulcrum-block, a fulcrum-block having trunnions, and fulcrum-bearings engaging said trunnions and being adjustable in said guide-channel.

11. In a traction-engine, the combination with a supporting-frame having a guide-channel therein, of links pivotally secured to said frame, a transmitting-lever pivotally secured to the other end of said links and passing through a fulcrum-block, a fulcrum-block having trunnions, fulcrum-bearings engaging said trunnions and said guide-channel, and screw-adjusted bars secured to said fulcrum-bearings whereby said bearings may be moved in said guide-channel.

12. In a traction-engine, the combination of a primary engine mounted thereon, a pump, intermediate transmitting mechanism whereby the piston of said pump is actuated, adjustable mechanism whereby the length of the stroke of the piston of the pump is adjustably controlled, fluid-motors mounted on the wheels thereof, and connections between said pump and said fluid-motors whereby said motors are driven.

13. In a traction-engine, the combination of a primary engine mounted thereon, a vibrating bar connected therewith, a crank and connecting-rod connected to said vibrating bar whereby the vibrations thereof and the motion of the piston of said engine is limited, a vibrating lever linked at one end to said vibrating bar and actuated thereby, means for supporting said lever independent of the fulcrum thereof, a fulcrum-block engaging said lever and sliding thereon, means for holding said fulcrum-block in various positions on said vibrating lever, and means actuated by the other end of said vibrating lever whereby the wheels of said engine are driven.

14. In a traction-engine, an adjustable transmitting mechanism consisting of a vibrating bar having a confined motion, a vibrating lever linked at one end to said vibrating bar and passing through an adjustable fulcrum-block whereby the transmitting end of said vibrating lever has a motion dependent for its length on the position of said fulcrum-block.

15. In a traction-engine, an adjustable transmitting mechanism consisting of a vibrating bar having its motion confined by crank connection with a rotating shaft, a vibrating lever linked at one end to said vibrating bar and actuated thereby, said vibrating lever passing through an adjustable fulcrum-block whereby the transmitting end of said vibrating lever has a motion dependent for its length on the position of said fulcrum-block.

16. In a traction-engine, a primary engine mounted thereon, a power-box containing a fluid, a pump immersed in said fluid and sucking said fluid therefrom, transmitting mechanism within said power-box between said primary engine and said pump, fluid-motors on the wheels of the traction-engine, pipes leading from the pressure-chamber of said pump to said fluid-motors whereby said motors are supplied with the fluid under pressure and return-pipes leading from said motors to said power-box and returning the fluid thereto.

17. In a traction-engine, a pump adapted to supply a fluid under pressure, consisting of a stationary cylinder having inward-opening inlet-valves and outward-opening outlet-valves at each end thereof and having opposite longitudinal slots in the central portion thereof, a piston reciprocating in said cylinder and having its surfaces spaced so that said slots are always therebetween, and a pin passing transversely through the piston and through said longitudinal slots in said cylinder and adapted to be engaged and reciprocated by operating connecting-rods.

18. In a traction-engine, the combination of a pump adapted to supply a fluid under pressure, a pressure-chamber connecting the outlet-valves of said pump, a distributing-chamber communicating with said pressure-chamber, hollow valve-seats secured to said distributing-chamber, two pipes leading from ports in the sides of each of said valve-seats to fluid-motors on the wheels of said traction-engine, and hollow valves within said valve-seats and having three ports in the side thereof, and being open at top and bottom but having a partition therein whereby the top opening is connected to the central port thereof and the bottom opening with the side ports thereof whereby fluid under pressure from said pressure-chamber is transmitted to one of said pipes and the returned fluid from the other pipe is exhausted through the top hole.

19. In a traction-engine, the combination of a pump adapted to supply a fluid under

pressure and having a controlled variable stroke, a pressure-chamber connecting the outlet-valves of said pump, a distributing-chamber communicating with said pressure-chamber, hollow conical valve-seats secured to said distributing-chamber, two pipes leading from ports in the sides of each of said valve-seats to fluid-motors on the wheels on said traction-engine, and hollow conical valves within said valve-seats and having three ports in the side thereof and being open at top and bottom but having a partition therein whereby the top opening is connected to the central port thereof and the bottom opening with the side ports thereof whereby fluid under pressure from said pressure-chamber is transmitted to one of said pipes and the returned fluid from the other pipe is exhausted through the top hole.

20. A traction-engine having a common source of power and traction-wheels each having a separately-controlled motor mechism driven by said power.

21. A traction-engine having a common source of power and traction-wheels each having a separately-reversible motor mechanism driven by said power.

22. In a traction-engine, the combination of a traction-wheel, a revolving circular cylinder secured thereto and turning therewith, a stationary circular casting engaging said revolving cylinder, stationary piston-blocks within said circular cylinder, plates in recesses in said revolving cylinder and adapted to swing away therefrom, and pressure and exhaust passages in said stationary casting and forming ports in said revolving cylinder on each side of the stationary pistons therein.

23. In a traction-engine, the combination of a traction-wheel, a revolving circular cylinder secured thereto and turning therewith, a stationary circular casting engaging said revolving cylinder, two stationary piston-blocks within said circular cylinder at points diametrically opposite each other, four plates in recesses at the quarter-points in said revolving cylinder and adapted to swing away therefrom, and pressure and exhaust passages in said stationary casting and forming ports in said revolving cylinder said ports extending on each side of said piston-blocks to the quarter-points and being cross-connected in pairs.

24. In a traction-engine, the combination of a traction-wheel, a revolving circular cylinder secured thereto and turning therewith, a stationary circular casting engaging said revolving cylinder, two stationary piston-blocks within said circular cylinder at points diametrically opposite each other, two oppositely-curved spiral cam-tracks secured to opposite sides of each of said stationary pistons and extending therefrom to said stationary casting, four plates in recesses at the quarter-points in said revolving cylinder and adapted to swing therefrom on said spiral cam-tracks into rear recesses therefor, and pressure and exhaust passages in said stationary casting and forming ports in said revolving cylinder, said ports extending on each side of said piston-blocks to the quarter-points and being cross-connected in pairs.

25. In a traction-engine, the combination of a traction-wheel mounted on an axle, a sleeve mounted on said axle beside the hub of said wheel, a circular plate formed with said sleeve and forming a portion of a circular cylinder and recess-chambers, bars connecting said circular plate with said wheel, a supplementary plate secured to said circular plate and forming the remainder of said cylinder, a stationary casting mounted on said sleeve and projecting between said circular plate and said supplementary plate into said circular cylinder, two stationary piston-blocks formed on said stationary casting and fitting within the circular cylinder formed by said plates at points diametrically opposite each other, two oppositely-curved spiral cam tracks secured to opposite sides of each of said stationary piston-blocks and extending therefrom to said stationary casting, four spring-actuated plates pivoted in recesses at the quarter-points in said revolving cylinder and adapted to swing therefrom on said spiral tracks in said recess-chambers, and pressure and exhaust passages in said stationary casting and forming ports in said revolving cylinder said ports extending on each side of said piston-blocks to the quarter-points and being cross-connected in pairs.

26. In a traction-engine, the combination of a traction-wheel, a revolving circular cylinder concentrically secured thereto, a circular casting concentric with and engaging said circular cylinder, a pair of holding-bars pivotally secured to said circular casting, a cross-shaped equalizer-bar to whose cross-arms are pivotally secured the other ends of said holding-bars, and double rollers secured to the frame of the traction-engine and adapted to hold the two ends of said equalizer-bar whereby relative longitudinal and vertical motion between the frame and the circular casting is permitted but rotary motion thereof is prevented.

27. In a traction-engine, the combination of a primary engine mounted thereon, a pump driven thereby, means for adjustably controlling the amount of discharge of said pump, fluid-motors mounted on the wheels thereof, and separate connections between said pump and each of said fluid-motors whereby said motors are driven.

28. In a traction-engine, the combination of a primary engine mounted thereon, a pump driven thereby, means for adjustably controlling the amount of discharge of said pump, separate connections between said pumps and each of said fluid-motors whereby said

motors are driven, and separate controlling-valves in said connections whereby each of said motors are independently controlled.

29. In a traction-engine, the combination of a power-box, a primary engine mounted thereon, a pump mounted therein, connecting mechanism by which said pump is driven, and a fluid within said box and immersing said pump and said driving mechanism therein.

30. In a traction-engine, the combination of a frame, a traction-wheel mounted therein, a rotating motor part mounted on and concentric with said wheel, a non-rotating reactive motor part mounted on said wheel and in contact with and concentric with said rotating part, and flexible means linking said frame to said non-rotating part whereby said part is held from rotating.

31. In a traction-engine, the combination of a primary engine mounted thereon, a pump, intermediate controllable driving mechanism, fluid-motors mounted on the wheels thereof, connections between said pump and said motors whereby said motors are driven, and controlling-valves in said connections whereby said motors are controlled.

32. In a traction-engine, the combination of a primary engine mounted thereon, vibrating-lever mechanism connected therewith and operated thereby, a pump operated by said lever mechanism, fluid-motors mounted on the wheels thereof, connections between said pump and said motors whereby said motors are driven, and controlling-valves in said connections whereby said motors are controlled.

In testimony whereof I affix my signature in presence of two witnesses.

ALVEN E. WOLCOTT.

Witnesses:
W. M. KENNEDY,
M. H. COREY.