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G. C. JESSUP

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HYDRAULIC MOTOR, PUMP, AND THE LIKE

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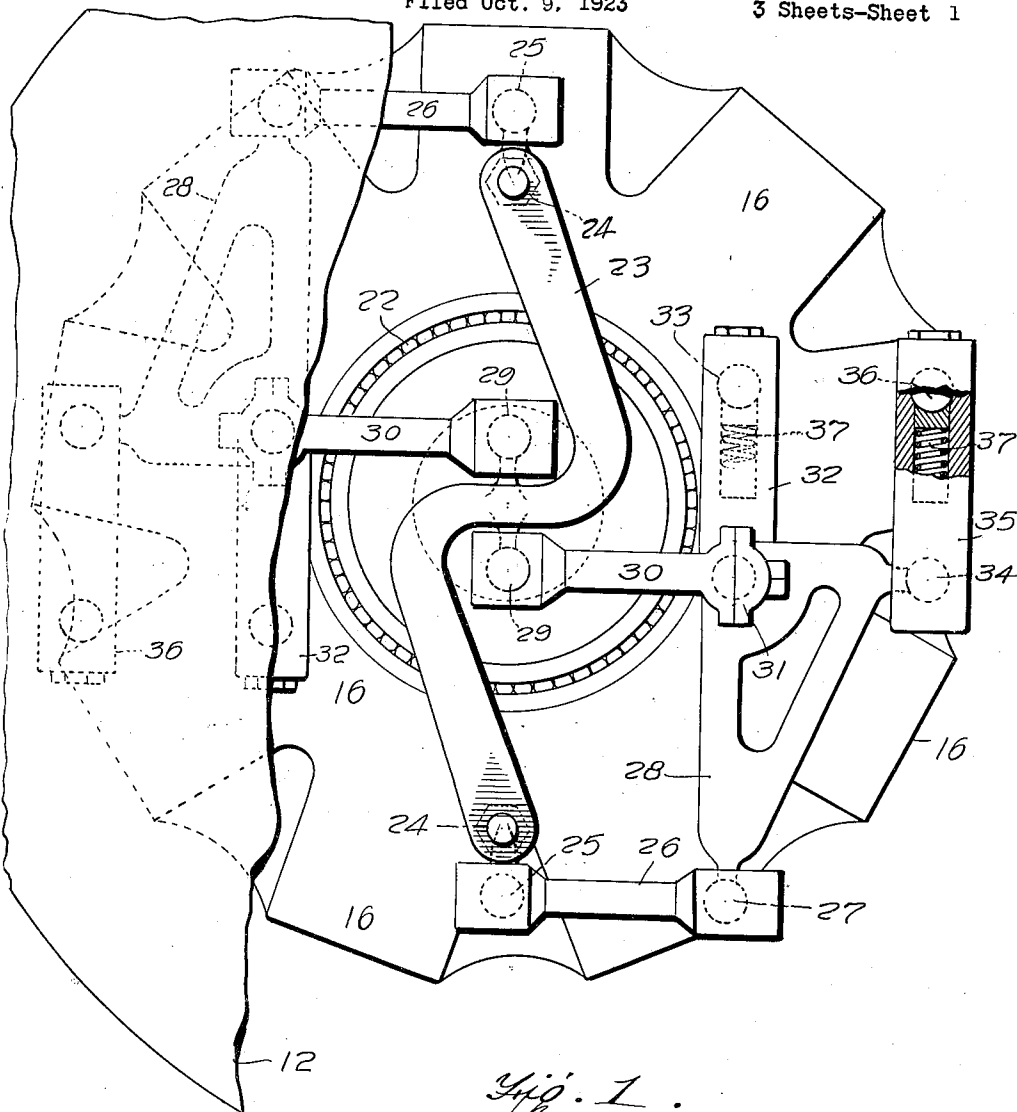


Fig. 1.

Inventor
George Carr Jessup,
By *Chas. Williamson*
Attorney

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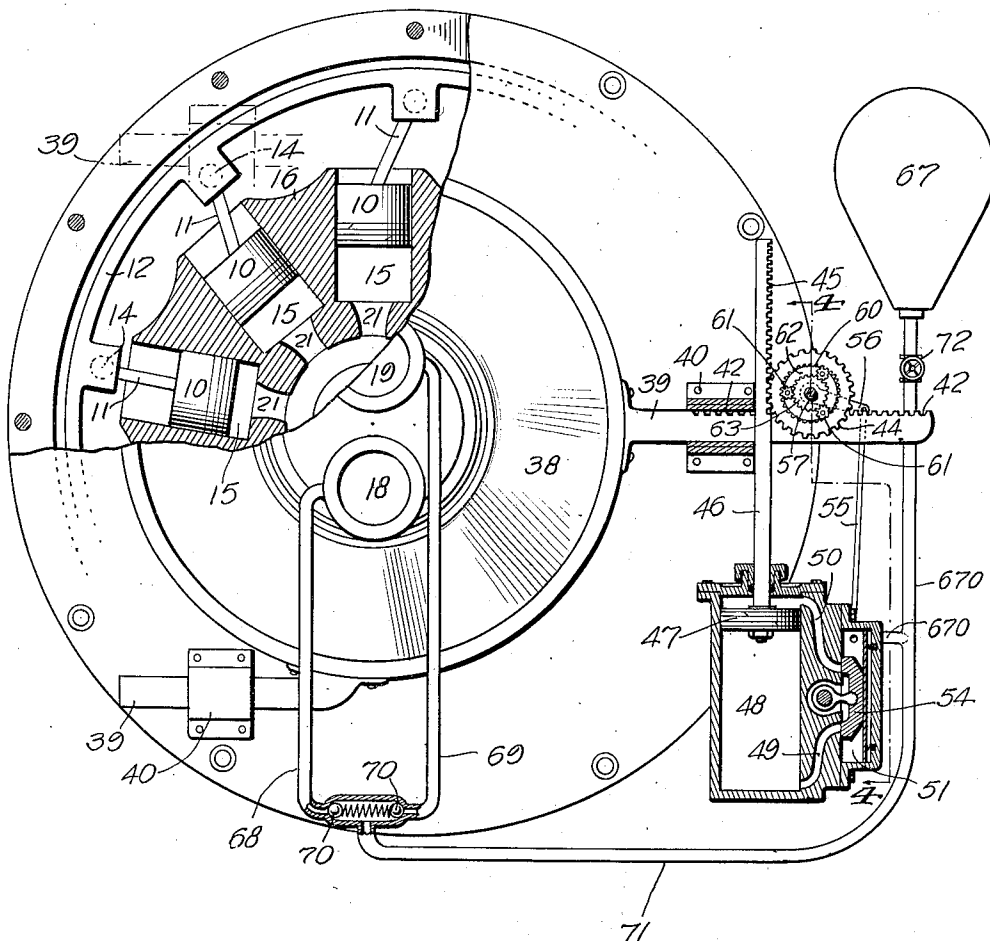
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Fig. 2.



Inventor
George Carr Jessup,
By *Chas. Williamson*
Attorney

Nov. 24, 1925.

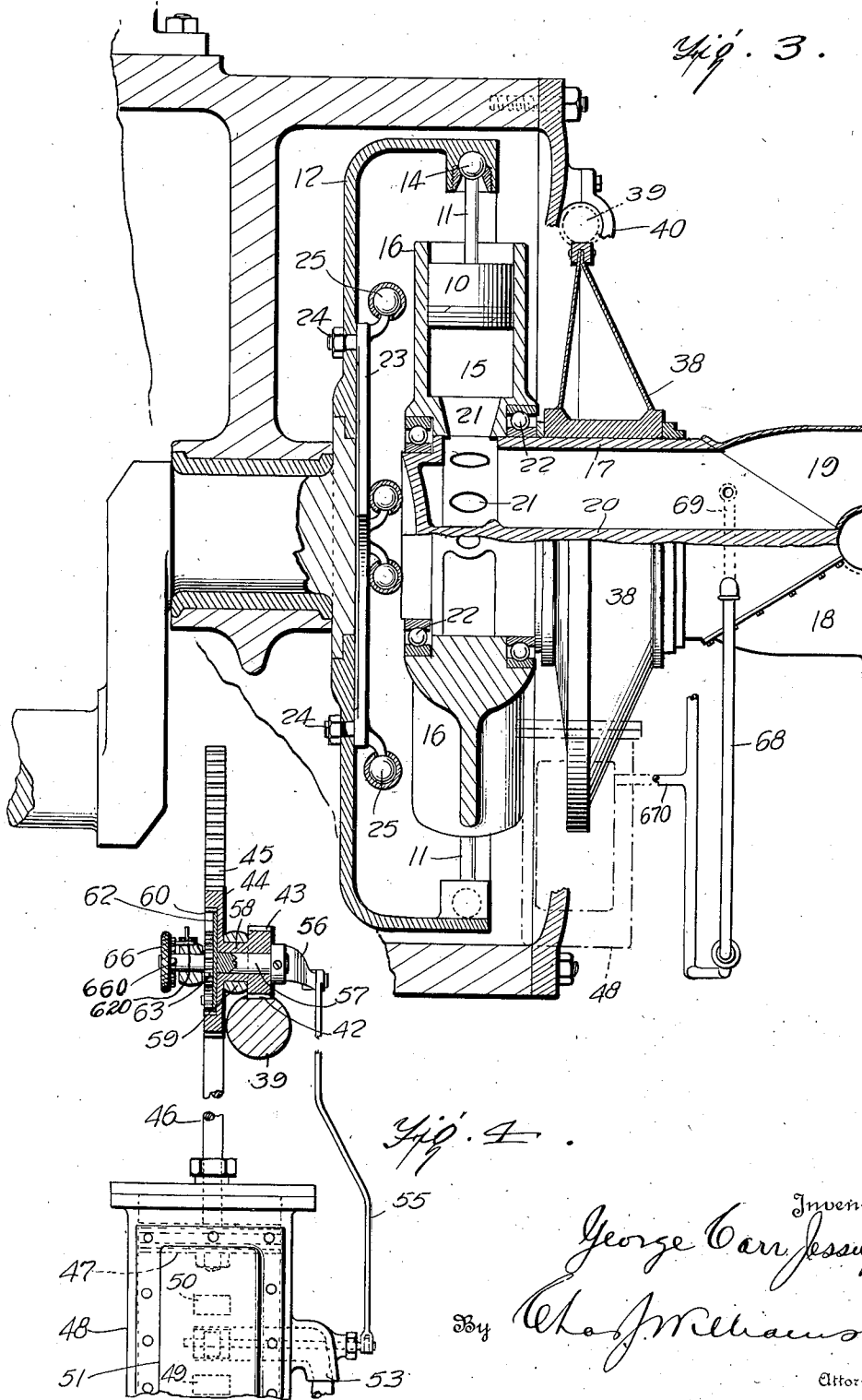
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UNITED STATES PATENT OFFICE.

GEORGE CARR JESSUP, OF CAMDEN, NEW JERSEY.

HYDRAULIC MOTOR, PUMP, AND THE LIKE.

Application filed October 9, 1923. Serial No. 667,538.

To all whom it may concern:

Be it known that I, GEORGE CARR JESSUP, residing at Camden, in the county of Camden and State of New Jersey, a citizen of the United States, have invented certain new and useful Improvements in Hydraulic Motors, Pumps, and the like, of which the following is a specification.

More particularly, my invention has to do with apparatus for the hydraulic transmission of power used, for example, in motor vehicles to utilize the energy of the gas engine for propulsion purposes, and having this particular application of my invention in view, my object is to provide mechanism by which the torque of the engine will be most advantageously utilized and the construction in other respects be mechanically and operatively desirable as will appear from the following description or will be understood by those skilled in the art without elucidation. My invention consists in any construction that is defined by or is included within the language or scope of the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation with parts broken away of a hydraulic transmission apparatus embodying my invention;

Fig. 2 is a similar view from the opposite side;

Fig. 3 is a view partly in vertical section and partly in end elevation;

Fig. 4 is a detail view in section on line 4—4 of Fig. 3.

I illustrate and shall describe my invention in its embodiment for hydraulic transmission of power from the engine to the driving wheels of motor vehicles. I have not considered it necessary to illustrate and shall not describe the connections between the pump or liquid circulating mechanism and the vehicle wheels. In its general construction the pump or liquid circulating means in which I embody my invention is of the type having a circular series of radial cylinders and pistons, the series of cylinders and pistons being shiftable relative to one another from a position of concentricity, at which occurs no circulation or substantial circulation of the liquid, to positions of varying degrees of excentricity according to the speed that is desired, reversal of direction of propulsion of the vehicle being accomplished by changing the position of excentricity.

The pistons, 10, are respectively connected

by outwardly extending rods, 11, with a wheel-form member, 12, that is mounted upon the engine crank shaft, 13, and in effect answers to the engine fly-wheel, the connection between each piston and the wheel, 12, being preferably by a ball and socket joint, 14. The cylinders, 15, are preferably formed in a circular block or disk, 16, which is journaled upon a tubular shaft, 17, which is closed at one end and at its other end has an inlet port, 18, and an outlet port, 19, the two ports being separated by a diaphragm or partition, 20, which extends to the closed end of the tubular shaft and thus provides a passage leading from the inlet port into certain of the cylinders at one point of the revolution of the block, 16, and a passage communicating with the cylinders at the opposite point of their revolution, each cylinder having at its inner end a port, 21, for the intake or the exhaust of liquid as the case may be according to the position of the cylinder in its rotation with reference to the inlet and exhaust passages in the tubular shaft. Preferably the cylinder block, 16, is journaled on the shaft, 17, by ball-bearings, 22.

From what has been said, it will be seen that the cylinder block, 16, rotates about the shaft, 17, and it is caused so to rotate by a connection between the wheel, 12, and the cylinder block in the nature of a parallel link motion as best shown in Fig. 1 which admits of such automatic compensatory adjustment under variations in extent of excentricity of cylinder block and wheel, 12, as will result in smooth running of the mechanism and avoidance of wear upon pistons and cylinders from lateral or sidewise pressure. Referring to Fig. 1 it will be seen that the link motion comprises an arm or bar, 23, which at diametrically opposite points is secured by bolts, 24, to the web of the wheel, 12, and which is connected by similar but oppositely located lever and link members with the cylinder block, 16. The arm, 23, at its outer end by a ball and socket joint, 25, is connected to one end of a link, 26, whose other end is connected by a ball and socket joint, 27, with a lever, 28, and near its middle said arm 23 is connected by a ball and socket joint, 29, with a link, 30, parallel with the link, 26, which at its other end is connected by a split bearing, 31, with the lever, 28. The lever, 28, is connected at the bearing, 31, with one end of a link, 32,

whose other end is pivoted to a stud, 33, on the side of the cylinder block, 16, and said lever, 28, is also connected by a ball and socket joint 34, with one end of a link, 35, arranged parallel with the link, 32, and pivoted by a stud, 36, to the side of the cylinder block, 16. Preferably a cushioned connection comprising a coil spring, 37, is interposed in the link connection with the cylinder block studs, 33 and 36, in order to take up or absorb any unusual shocks. Preferably the arm, 23, is cast or made in the S-shape shown because it enables large and substantial ball and socket bearings to be provided between the arm and the link, 30, without increase of distance between centers and diminishes the unit stresses on the parts.

The shaft, 17, is mounted within a circular or disk-form member, 38, which by parallel equi-distant arms, 39, is supported so that it may be shifted to and fro in a straight line, each arm, 39, being slidable in a bracket, 40, on the main frame or casting, 41. By the sliding movement of the disk, 38, the shaft and the cylinder block may be moved to and from concentricity with the wheel, 12, and the circular series of pistons, 10, and to either side of the point of concentricity and to any desired degree of excentricity. One of the arms, 39, has rack teeth, 42, which mesh with a pinion, 43, fixed to a gear, 44, that meshes with a rack, 45, on a piston rod, 46, connected with a piston, 47, and a cylinder, 48, which by the introduction of pressure at either side of the piston, 47, will move the piston and through the connections just described will move the cylinder block, 16, to the desired position. Near the opposite ends of the cylinder, 48, are ports, 49 and 50, that connect with a valve chest, 51, such chest having an exhaust, 53, which together with the ports, 49 and 50, are under the control of a slidable valve, 54, which is shiftable by manually operated devices to change the port connections to determine the direction of movement of the piston, 47.

The slide valve, 54, is connected by a suitable link, 55, with a crank arm, 56, on a shaft, 57, which passes through and is journaled by a sleeve, 58, journaled in a bearing, 59, and at one end carrying the gear, 44, which meshes with the piston rod rack, 45, while at its other end it has the pinion, 43, which meshes with the rack, 42. Within the gear, 44, are internal gear teeth, 60, with which mesh equi-distant pinions, 61, journaled on a disk, 62, that is fixed to the shaft, 57, and said pinions, 61, mesh with a gear, 63, concentric with the internal gear, 60, and which is mounted on a shaft, 64, journaled in bearings, 65, and having a hand wheel, 66, for turning the shaft, 64, and the gear, 63. It will be seen that if the slide valve, 54, is in a position to close the ports, 49, and 50,

that by turning the gear, 63, through the hand wheel, 66, the planet pinions, 61, since they mesh with both the gear, 63, and the internal gear, 60, will rotate and move in an orbital path, (because the internal gear, 60, at such time is stationary, being so held by the now stationary piston rod rack,) and thus the disk, 62, will be partially turned and through the shaft, 57, and its connection with the crank, 56, the latter will be moved to shift the slide valve to open one of the ports, 49 or 50, place one end or the other of the cylinders, 48, in communication with the source of pressure. Such source of pressure is a dome or pressure chamber, 67, with which the two ports, 49 and 50, may communicate by a pipe, 670, to the position of the slide valve and such chamber, 67, is connected by a pipe, 68, with the intake side of the pump and by a pipe 69, with the exhaust side of the pump, each pipe having a check valve, 70, which seats under pressure within the chamber, and both, in effect, being branches of a prolongation, 71, of pipe, 670. Thus liquid flowing into the chamber, 67, from either pipe, 68, or pipe, 69, according to the direction of circulation through the chamber will place air in the chamber, 67, under pressure, and such air acting upon the liquid in the chamber when the slide valve opens one port, 49, or the other, 50, will force liquid through either port, 49, or port, 50, to the cylinder, 48, and move the piston therein in one direction or the other according to which end of the cylinder receives the pressure. The rack, 45, moving with the piston will rotate the gear, 44, and as the gear, 63, is now stationary, the planet pinion, 61, will revolve and move in an orbital path in the reverse direction from that caused when the gear, 44, is stationary and the disk, 62, partially turned and through the crank and link connections with the slide valve, the latter will be moved to close both ports, 49 and 50, and thus the shifting of the cylinder block, 16, will stop. The exhaust pipe, 53, is always in communication with the passage of the slide valve and such pipe leads to the supply tank of the system so that liquid exhausted from the cylinder, 48, will be delivered back to such tank.

The wheel 66, of course, should be held in what ever position to which it is turned and this may be accomplished by any suitable stop device, such for example as a slidable bolt or dog, 620, mounted on the bearing, 65, and notches or teeth, 660, in the side of the wheel, 66, with which the end of said bolt may engage. The bolt is slid into and out of engagement with the teeth or notches in the side of the wheel by hand.

It will be seen that when the cylinder block, 16, is shifted to excentric position with reference to the circular series of pistons and the engine shaft, the block may

be revolved around its thus excentrically located axis by reason of the link motion which connects it with the engine shaft and that by such link motion it is positively rotated about its axis without being dependent upon the side thrust of the pistons to produce the rotation of the block along with the pistons.

A valve, 72, may be placed in the pipe, 670, close to the pressure chamber, 67, so that during times of non-use the valve by being closed will prevent leakage of pressure from the dome or pressure chamber, 67.

A pipe or tube connection between the pressure chamber, 67, and the ports, 18 and 19, is flexible to permit the shifting of the ports when the disk, 38, is shifted.

What I claim is:

1. In apparatus of the kind described, the combination of pistons and cylinders arranged in a circular series, an engine rotated member, and means connecting both pistons and cylinders with said member acting to rotate pistons and cylinders whereby such rotation is not dependent upon the thrust between cylinders and pistons in the direction of rotation.

2. In apparatus of the kind described, the combination of pistons and cylinders arranged in a circular series, an engine rotated member, and means connecting both pistons and cylinders with said member acting to rotate pistons and cylinders whereby such rotation is not dependent upon the thrust between cylinders and pistons in the direction of rotation, one of said connecting means being links joined on axes parallel with the axis of the engine rotated member.

3. In apparatus of the kind described, the combination of pistons and cylinders arranged in a circular series, an engine rotated wheel, means connecting the pistons with said wheel, and an independent jointed connection between said wheel and the cylinders.

4. In apparatus of the kind described, the combination of pistons and cylinders arranged in a circular series, a shaft, separate members carrying such pistons and cylinders, a driving connection between the shaft and one of said members, and a link motion connecting the shaft and one of said members.

5. In apparatus of the kind described, the combination of pistons and cylinders arranged in a circular series, a shaft, separate members carrying the pistons and cylinders, a driving connection between the shaft and one of said members, a link motion connecting the shaft and one of said members comprising an arm, a lever, and parallel links connecting the arm and said lever.

6. In apparatus of the kind described, the combination of pistons and cylinders arranged in a circular series, a shaft, separate members carrying pistons and cylinders, a driving connection between the shaft and one of said members, a link motion connecting the shaft and one of said members comprising an arm, a lever, parallel links connecting the arm and said lever, and parallel links connecting said lever and the cylinder carrying member.

7. In apparatus of the kind described, comprising coacting pistons and cylinder members arranged in a circular series, a shiftable support for one set of members of the series, a fluid pressure device adapted to act on said support and comprising a piston and a cylinder, a valve to control the supply of fluid pressure to such cylinder, a manually operated valve shifting means for opening communication with said cylinder and a source of supply of fluid pressure, and automatic valve shifting means to cut off such supply.

In testimony whereof I hereunto affix my signature.

GEORGE CARR JESSUP.