

April 7, 1925.

1,532,735

E. B. DICKERSON

VARIABLE CAPACITY PUMP

Filed April 11, 1919

7 Sheets-Sheet 1

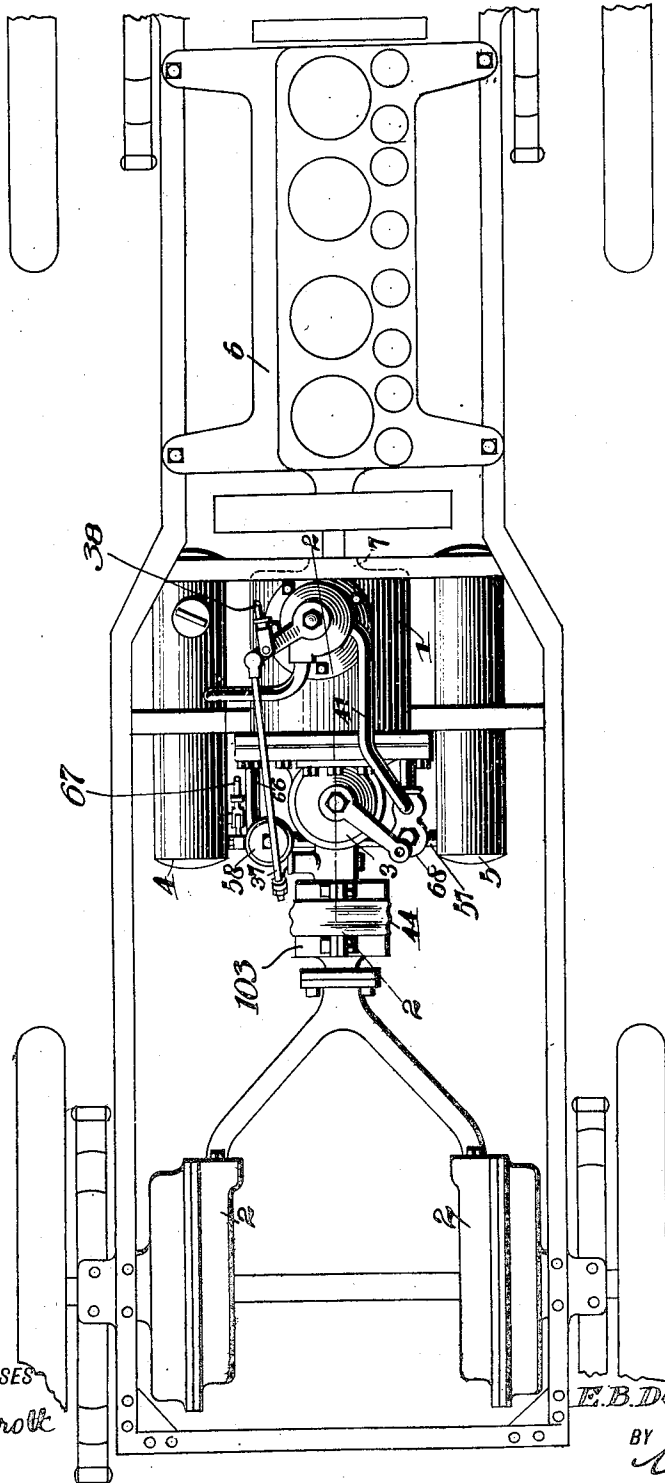


Fig. 1.

WITNESSES

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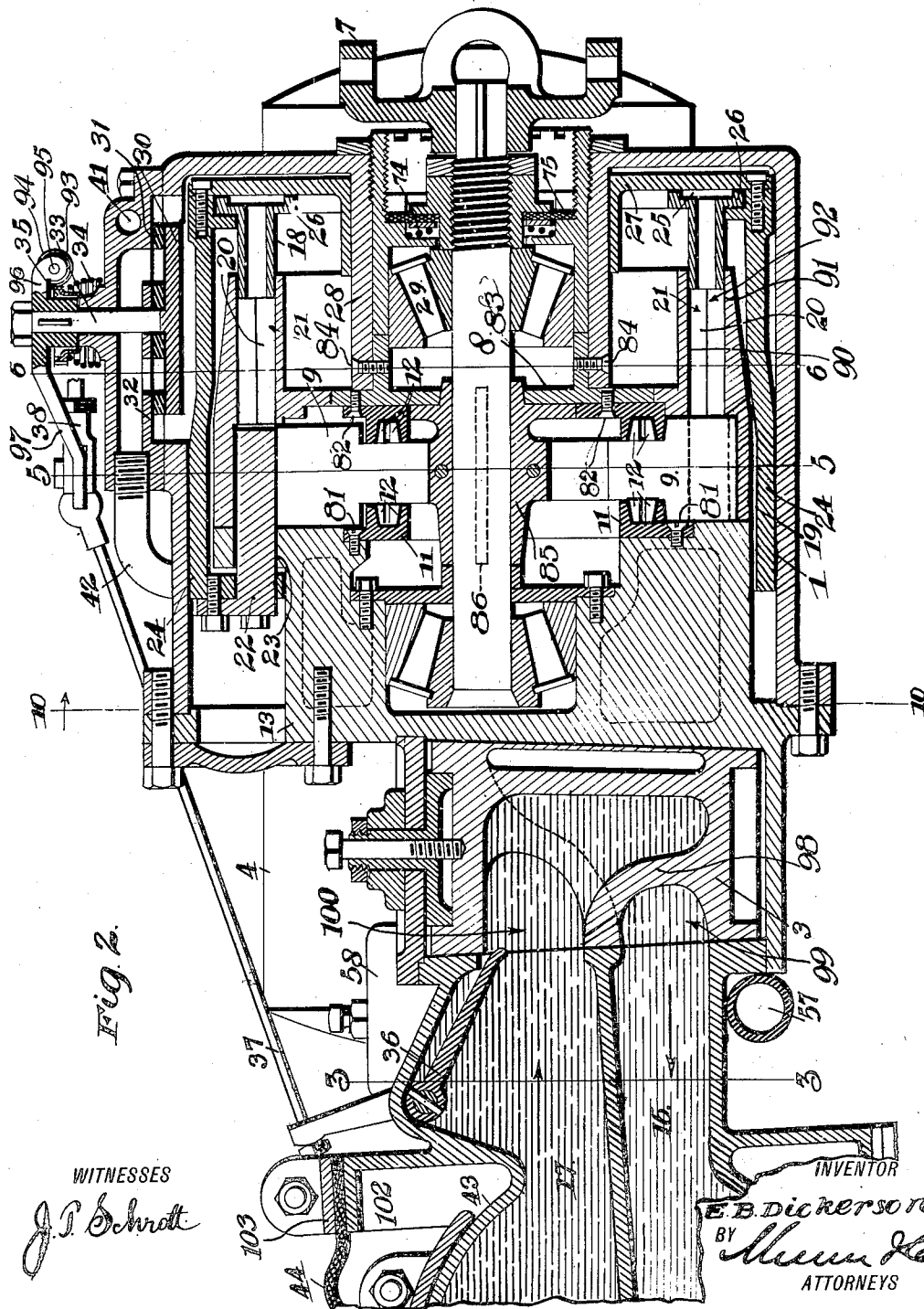
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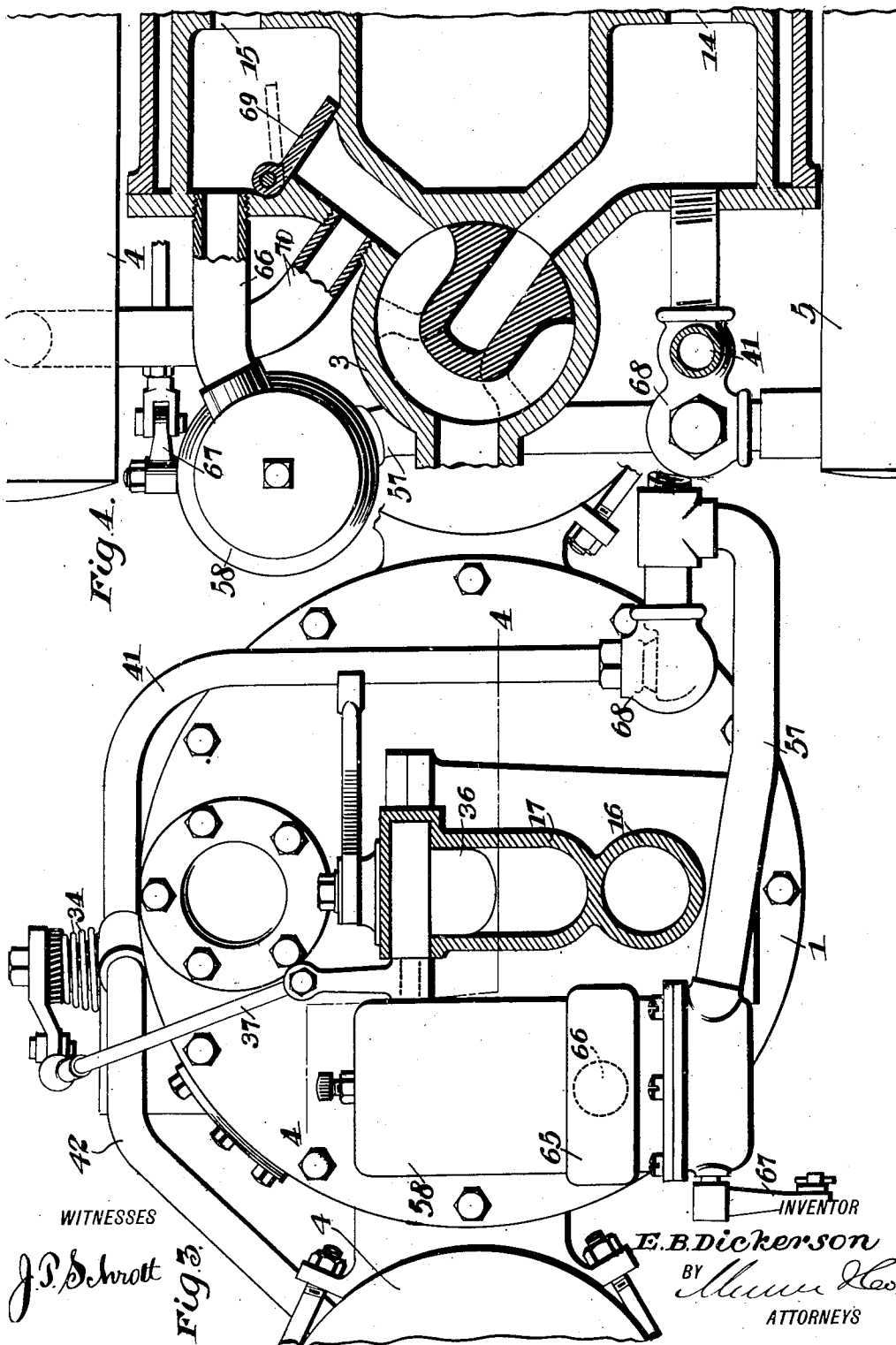
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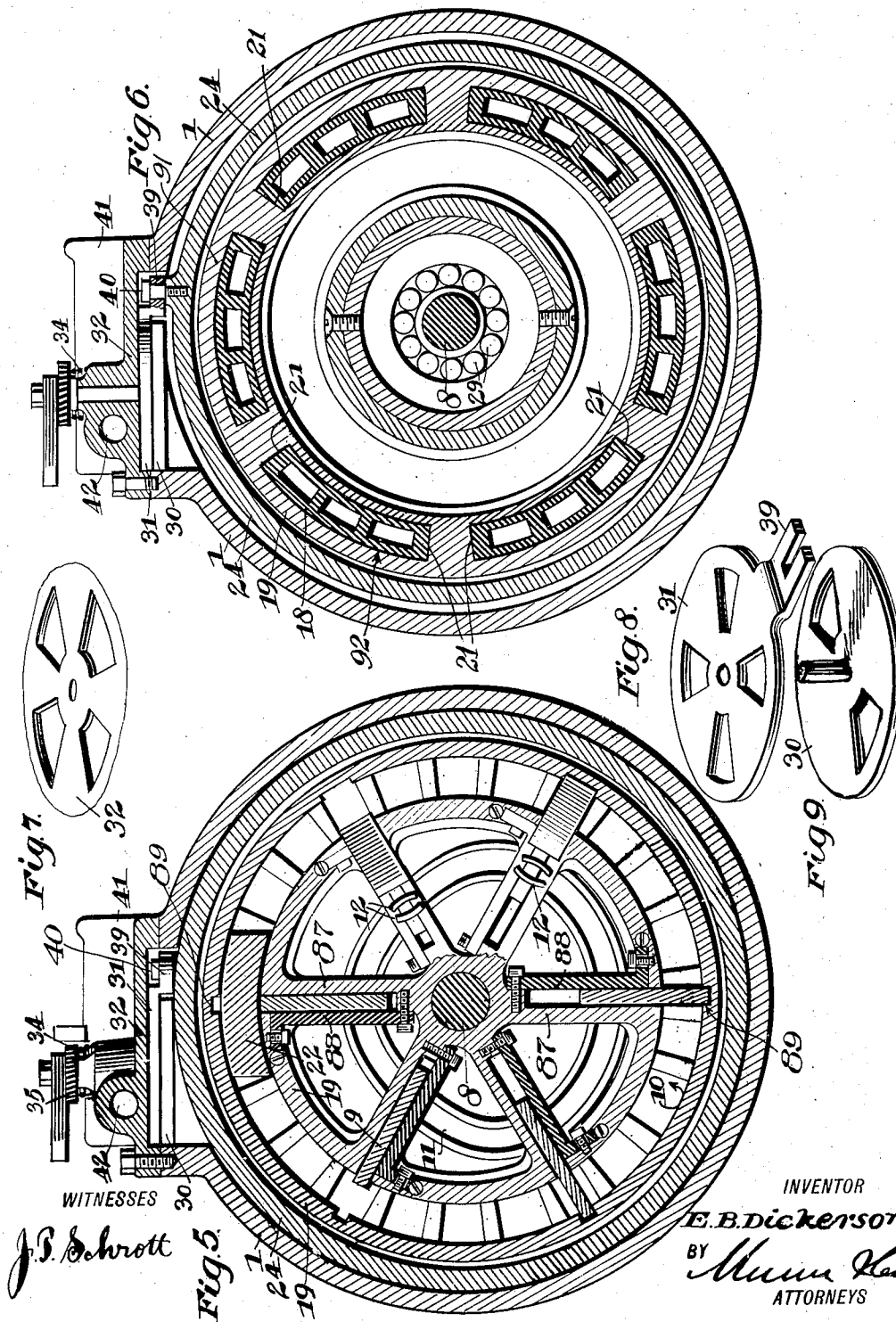
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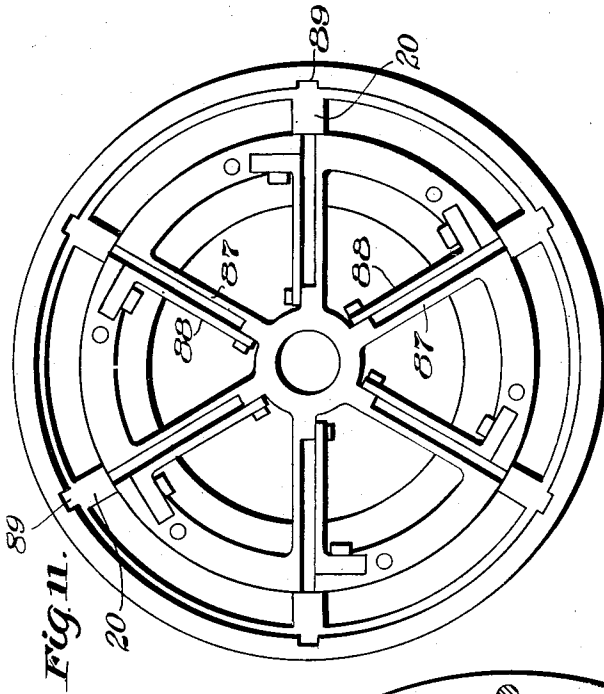


Fig. 11.

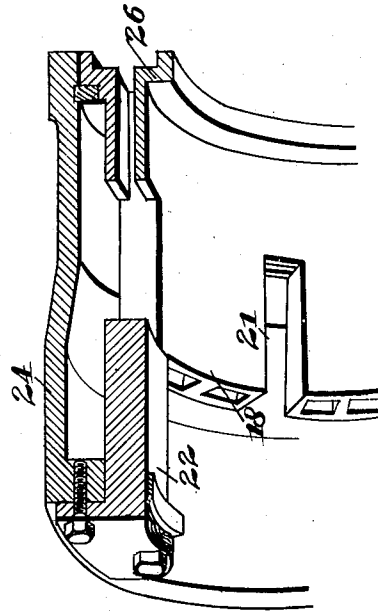


Fig. 12.

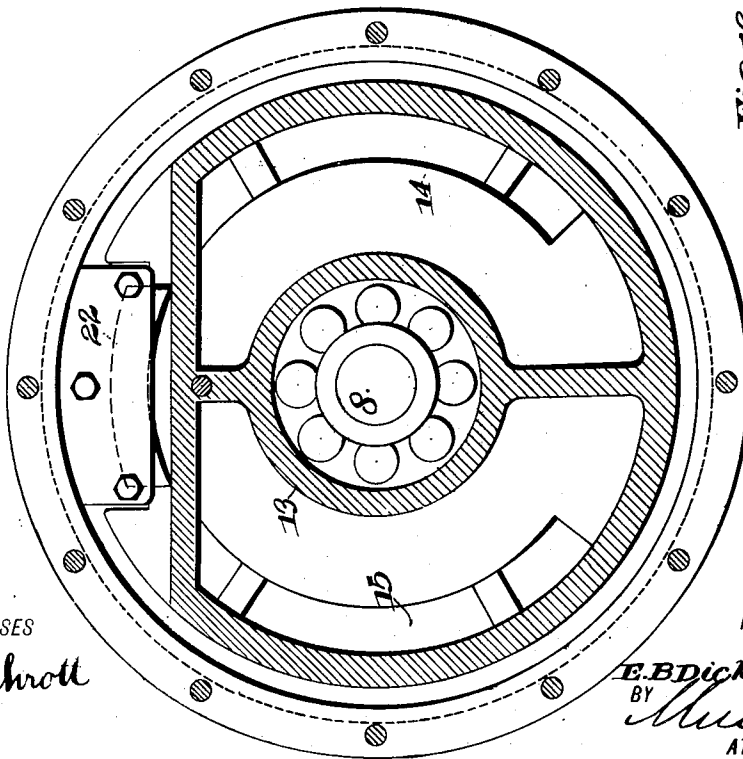


Fig. 10.

WITNESSES

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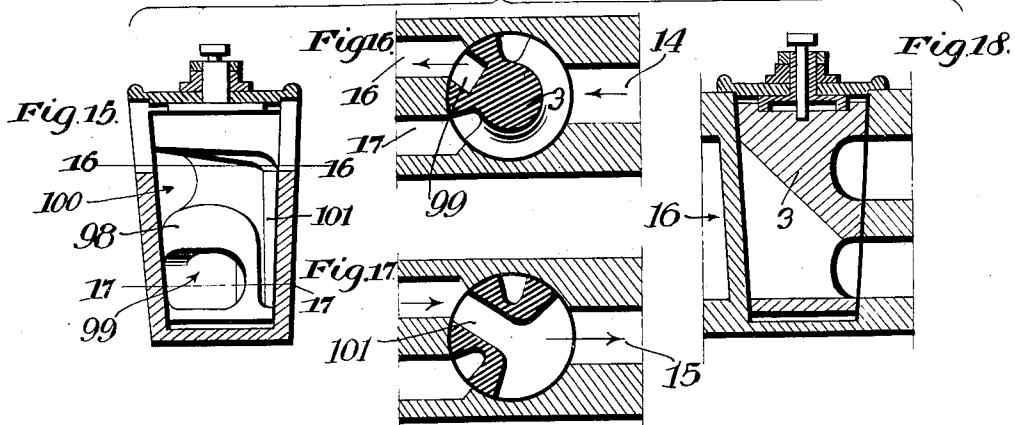
E. B. DICKERSON

VARIABLE CAPACITY PUMP

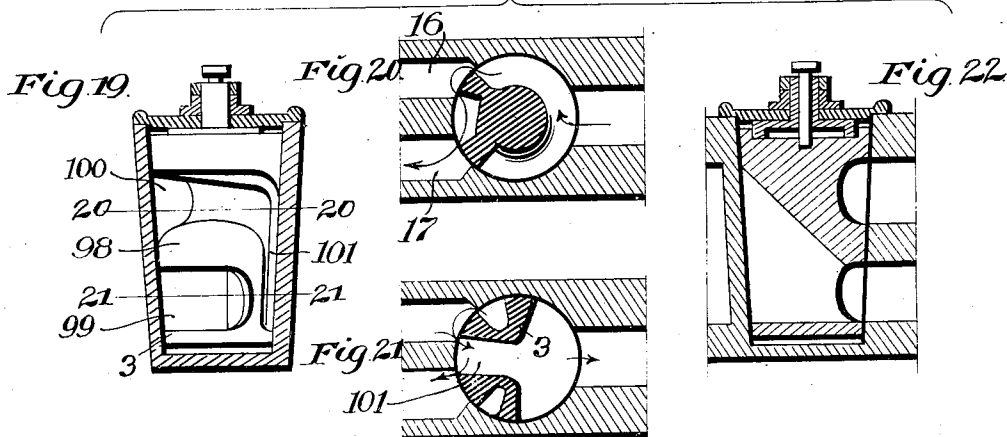
Filed April. 11. 1919
Goathead positions

7 Sheets-Sheet 7

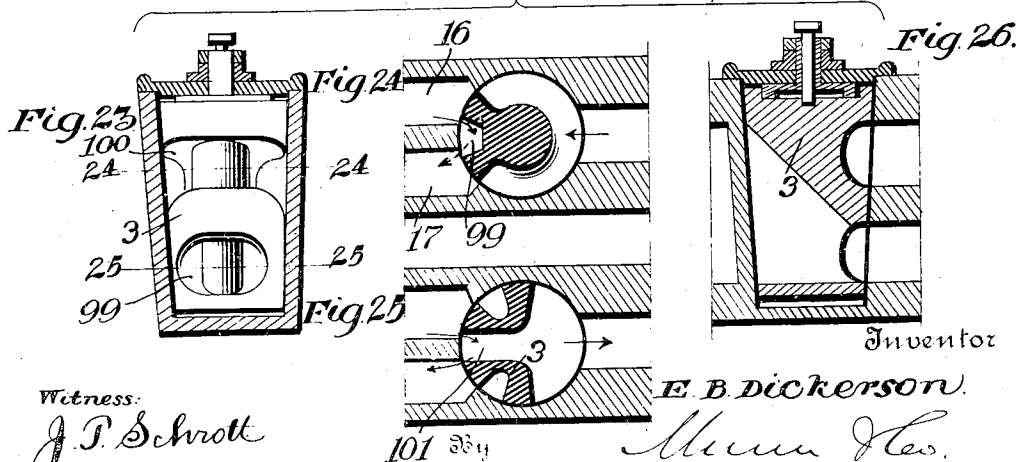
Goathead positions



Neutral positions



Brake positions



Witness:

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UNITED STATES PATENT OFFICE.

ERNEST BISHOP DICKERSON, OF BISHOP, TEXAS.

VARIABLE CAPACITY PUMP.

Application filed April 11, 1919. Serial No. 289,243.

To all whom it may concern:

Be it known that I, ERNEST BISHOP DICKERSON, a citizen of the United States, and a resident of Bishop, in the county of Nueces and State of Texas, have invented a certain new and useful Improvement in Variable Capacity Pumps, of which the following is a specification.

My invention relates to improvements in power transmission mechanisms for self propelled vehicles such as gas tractors, motor trucks and railway cars, automobiles, and other machines where the speed of either the prime moving shaft or driven shaft is to be increased, decreased, or accelerated in relation to the other, and it consists in the constructions, combinations, and arrangements herein described and claimed.

An object of my invention is to provide a hydraulic power transmission mechanism, by means of which all of the ordinary functions of the usual power transmitting and speed controlling devices are readily performed, and this largely by automatic action of certain of the parts on others.

Another important object of the invention resides in the provision of the reduction ring by means of which the area of the working chamber of the hydraulic pump is regulated automatically by the velocity of the fluid in the return conduit from the hydraulic motors, the same function also being obtained by manual operation.

Another object of the invention lies in the peculiar formation of the control valve, by means of which the forward, reverse, neutral and braking functions of the mechanism are obtained.

A further object of the invention consists in the provision of a self starting valve, the functions of which will be more fully explained later.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawings, in which:

Figure 1 is a plan view of an automobile chassis showing the improved hydraulic drive mechanism applied,

Figure 2 is a longitudinal section of the hydraulic pump taken on the line 2—2 of Figure 1,

Figure 3 is a cross section on the line 3—3 of Figure 2,

Figure 4 is a horizontal section taken substantially on the line 4—4 of Figure 3,

Figure 5 is a cross section on the line 5—5 of Figure 2,

Figure 6 is a cross section on the line 6—6 of Figure 2,

Figures 7, 8, and 9 are perspective views of various parts of the variable speed valves shown in Figure 2, which will hereafter be more fully described,

Figure 10 is a cross section on the line 10—10 of Figure 2,

Figure 11 is an end elevation of the pump rotor,

Figure 12 is a detail sectional perspective view illustrating the co-relationship of the reduction ring to the arcuate abutment block,

Figure 13 is a sectional view of the starting valve,

Figure 14 is a cross section on the line 14—14 of Figure 13,

Figure 15 is a vertical section of the control valve in the go-ahead position,

Figures 16 and 17 are cross sections on the lines 16—16 and 17—17 of Figure 15,

Figure 18 is a vertical cross section,

Figure 19 is a vertical section of the control valve in the neutral position,

Figures 20 and 21 are cross sections on lines 20—20 and 21—21 of Figure 19,

Figure 22 is a vertical cross section of the valve,

Figure 23 is a vertical section of the control valve in the braking position,

Figures 24 and 25 are cross sections on the lines 24—24 and 25—25 of Figure 23,

Figure 26 is a vertical section of the valve,

The hydraulic power transmission mechanism comprises four principal parts, namely: the hydraulic pump 1, the hydraulic motors 2, the control valve 3 and the supply and starting tanks 4 and 5, respectively. The crank shaft of the engine

6 is coupled to the coupling 7 of the pump shaft 8. The engine 6 is preferably operated at its highest speed under all circumstances, thus being enabled to work to best advantage.

A plurality of vanes or blades 9 operate in the working chamber 10 which is concentric with the shaft 8. The blades 9 are made to enter and retract from the working chamber as the shaft 8 revolves, by means of companion cams 11. These are respectively fixed at 81 and 82 to the structure 13 and to a circular base 83. The base is secured at 84 to the bearing hub of the casing. The cams receive the lugs 12 on opposite sides of each blade.

The vanes or blades are carried by a rotor 19 which has a hub 85 keyed at 86 to the shaft 8. The vanes are adapted to slide radially beside spokes 87 (Fig. 5) against which they are held by retainers 88. The tips of the blades are adapted to enter pockets 89 in the outer part of the rotor at certain times in the rotation of the rotor.

The casing of the pump 1 includes the stationary internal structure 13 shown in Figure 2, which in itself is formed to provide a fluid outlet port 14 on the right side in Figure 10 and a fluid return port 15 on the left side. The blades 9 as they are made to revolve and at the same time enter and retract from the working chamber 10, set up a circulation of oil or other fluid in the outlet and return conduits 16 and 17, respectively. These branch off as shown in Figure 1, to the respective motors.

It will be understood that the speed of operation of the motors 2, which incidentally are constructed on the same principle as the pump 1 depends on the volume and velocity of the fluid pumped through the conduits 16 by the operation of the pump. It must be borne in mind that the pump is supposed to operate at a uniform rate of speed under all circumstances, and since the speed of the pump is a fixed factor, it becomes necessary to vary the output in order to vary the speed of the motors 2.

This is accomplished by the reduction ring 18 which is forced in and out of the working chamber by fluid pressure. When it is forced in, the area of the working chamber is diminished and consequently the output of fluid is diminished. Accordingly the volume of fluid delivered to the motors 2 is lessened and so the speed is diminished in proportion.

The rotor 19 which divides the working chamber 10 includes two concentric circular parts 90 and 91 (Fig. 2) that are joined by a plurality of spokes 20 (Figs. 6 and 11). The arcuate spaces 92 (Figs. 6 and 11) between the spokes are the places where the reduction ring 18 enters the working chamber. These spaces are regarded as parts or ex-

tensions of the working chamber 10 inasmuch as they have immediate communication therewith. The reduction ring is slotted at 21 (Fig. 12) in a number of places to make room for and permit movement around the spokes 20 which connect the outer part of the working chamber with the rotor. An abutment block 22 extends through an arcuate opening 23 in the structure 13, and faces the adjacent part of the reduction ring as clearly shown in Figure 12.

The slots 21 are long enough to accommodate both the working chamber spokes and the blades 9 when the reduction ring is pushed completely into the working chamber, and when the reduction ring slides out of the working chamber to allow the pump to work to full capacity the end of the reduction ring slides out just far enough to clear the working chamber. The spokes 20, however, still occupy the slots of the reduction ring causing the latter to rotate with the rotor and blades.

The reduction ring and abutment block work together. That is to say, they slide together. When the reduction ring is moved toward the working chamber 10, the abutment block moves out, and vice versa. This is necessarily so because both are carried by the sleeve piston 24 which occupies the casing of the pump. The sleeve piston 24 does not revolve but is only adapted to slide by virtue of the engagement of the block 22 with the opening 23 of the structure 13. In order to obtain an equalization of fluid pressure at both sides of the reduction ring, the body of the ring is longitudinally channeled as shown in Figure 6.

These channels all communicate with depression 25 which extends around the flange 26 at the base of the reduction ring. A facing plate 27 holds the reduction ring against an annular flange inside of the piston 24, and the central sleeve of the facing plate slides on the hub 28 in which the roller bearings 29 of the shaft are located. The reduction ring 18 is capable of movement relatively to the piston 24. The facing plate 27 keeps the reduction ring in position and provides what may be termed a swivel mounting. This permits the rotation of the reduction ring with the pumping chamber without affecting the stationary condition of the piston 24.

The variable speed valves 30 and 31 shown in Figure 2, control the admission of fluid under pressure behind the facing plate 27. When fluid is admitted, the reduction ring 18 is forced into the working chamber and the area of the chamber is diminished in accordance with the distance of movement of the reduction ring. There are two movable disks: the lowermost disk 30 is turned either by the operator or through the influence of

the returning fluid in the conduit 17. The intermediate disk 31 is turned when the sleeve piston 24 slides.

The valve seat 32 does not move. The stem 33 is carried by the disk 30 and extends through the intermediate disk 31 and through the seat 32. A spring 34 which encircles the upper portion of the stem operates in such a way to keep the disk 30 in a closed position. The spring operates on the valve disk 30 by torsion which can be regulated by means of a worm gear 35 to which one end of the spring is attached. A worm pinion 93 meshes with the worm gear and is adapted to be turned by a thumb screw 94 at one side. All of this can be plainly perceived in Figure 2. The worm pinion shaft 95 has bearing in an extension of the hub 96 which carries a handle 97 by which the valve 30 is manually turned.

A flap or gate valve 36 occupies a part of the conduit 17 and might be said to float on the fluid. The flap 36 is free to swing in either direction depending on which way the oil is flowing. As the velocity of the returning fluid increases, the flap or valve 36 is caused to rise higher so that the valve disk 30 in turn is opened farther through the medium of the connection 37. The oil is released instead of admitted to the casing 1, allowing the oil under pressure in working chamber to force the sleeve piston 24 back toward the end of the casing which pulls the reduction ring 18 out of the working chamber and increases the capacity of the same. The oil behind the piston 24 is forced out through the variable speed valve to supply tank 4 until the disk valve 31, which is connected to the piston 24, closes the outlet port of disk valve 30. The adjusted degree of torsion of the spring 34 determines the speed of the vehicle at which the valve 30 shall open and perform the foregoing function.

A connection 38 extends to a place within convenient reach of the operator so that the disk 30 can be actuated by manual effort. The disk 31 has a bifurcated tongue 39 that fits on a stud 40 of the piston 24. When the piston 24 has moved a certain distance the disk 31 will have turned sufficiently far to cut off the supply of fluid to the casing.

The fluid in respect to which the aforesaid cutting off function occurred enters from the outlet port of the pump through a pipe 41. A second pipe 42 leads to the supply tank 4, and through which the oil in back of the plate 27 is returned upon the retraction of the reduction ring when again forced out of the working chamber.

The valve 3 is adapted to assume four control positions, namely, forward; neutral, brake and reverse. In order to carry out these functions the valve is provided with a partition 98 (Figs. 2 and 15) which divides

the valve into passages 99 and 100. When the valve assumes the "forward" position (Figs. 2 and 15) the passage 99 offers communication between the conduits 14 and 16 so that the fluid may flow toward the motors 2. The fluid returns via conduit 17, passage 100 and conduit 15 of the pump.

A port 101 in communication with the passage 100 permits a free circulation of the fluid when the valve is set in the "neutral" position (arrows Figs. 19 to 21) so that no driving motion of the motors results. A slight additional turn of the valve from the position in Figs. 20 and 21 to that in Figures 24 and 25 causes the various conduits and passages to be so constricted that very little fluid can flow from the motors. This latter is the "brake" position. Upon turning the valve 3 still farther so that the passage 99 (Fig. 16) communicates with the conduit 17 instead of 16, a reversal of the motors 2, and consequently of the direction of travel of the vehicle, results.

It should be explained in passing, that vertical as well as horizontal movement between the parts is compensated for by the cup joint 43 that is partly shown in Figure 2. The parts of this joint are in the shape of circular cups that fit within each other very much like a ball joint. A leather boot 44 on the outside catches any escaping oil and keeps dust out of the joint. The ends of this boot are clamped upon flanges 102 by rings 103. By this means the fluid line is kept intact from the pump to the motors, and the twisting of the parts in the running of the vehicle will have no effect on the conduits.

The operation may now be reviewed in order that all of the features of the invention may be clearly understood, and in this review of the operation, other parts of the mechanism will be brought in.

An air pressure of approximately 150 lbs. is initially maintained in the tank 5. A pipe 57 leads from the tank 5 to the bottom of the casing 58 of the starting valve in Figure 13.

Ordinarily the piston 59 is held against the shoulder 60 on the inside of the valve by the initial internal pressure and against the tension of the spring 61. This spring may be adjusted. The ports 62 in the sleeve 63 are normally in a position above the bottom of the piston 59, and thus out of registration with the ports 64 that communicate with the chamber 65 to which the pipe 66 is connected.

On operating the starting lever 67, the sleeve 63 is pulled down so that the various ports communicate, and thus the oil in the tank 5 is forced into the return or inlet portion 15 of the pump. The initial pressure is sufficient to operate the pump and turn the motor 6 over. After the mechanism is once

set into operation, sufficient oil is forced back into the starting tank 5 to bring the pressure back to the original amount. The check valve 68 in Figure 4 accomplishes this purpose by retaining the oil in the tank 5.

In Figure 4, the swinging check valve 69 in the inlet port of the pump, occupies an open position until the oil under pressure from the starting valve is admitted to the inlet port and starts the engine. This valve then closes to prevent the oil under pressure from passing back through the control valve, (when said valve is moved to the neutral position for starting the engine), to the outlet port of the pump and neutralizing the pressure on both sides of the abutment block 22.

When the oil under pressure from the starting valve and tank 5 passes through the pump to start the engine, it passes on out through the outlet port and around the control valve plug, then out through pipe 70 to the supply tank 4. Oil is also drawn back through pipe 70 to replenish the oil that is forced into the starting tank 5, when the pump is forcing oil through the motors.

The flap or valve 36 constitutes a governing device which automatically controls the speed of the vehicle. To understand this statement the reader must recall that the valve 30 is held toward the closed position by the torsional spring 34. The torsion of this spring is adjustable by the thumb screw 94 which operates the worms 93 and 35.

As the oil increases in flow in the return conduit 17, due to the increased speed of the motors, the flap 36 will rise higher and cause the valve 30 to open against the torsion of the spring 34. As this valve opens, the space behind the facing plate 27 decreases by virtue of the piston 24 moving toward the right thereby increasing the capacity of the pump.

The oil admitted behind the plate 27 is from the pump. As the piston 24 moves toward the left, the stud 40 (Fig. 5) carries the intermediate valve 31 with it until the inflow of oil is stopped. The capacity of the working chamber 10 is decreased by virtue of the reduction ring 18 entering the working chamber.

To again increase the capacity of the working chamber the valve 30 is manually shifted in the opposite direction again opening the ports, allowing the oil under pressure between the sleeve piston 24 and the adjacent end of the casing to be forced out through said ports and into the supply tank 4. The oil under pressure in the working chamber forces the piston 24 toward the right (Fig. 2) so that the foregoing action is produced. This movement of the piston again causes the intermediate valve 31 to again close the ports so that the outflow of oil to the supply tank 4 stops.

When the capacity of the working cham-

ber or pump is increased the speed of the vehicle is increased due to the increase in the flow of oil through the hydraulic motors 2. The automatic governing valve 36 of the pump works only when the speed of the vehicle is below a certain number of miles per hour, for example, 8 or 10 in automobiles.

When the engine is started and the control valve 3 is turned to the forward position, thereby allowing the pump to force oil through the motors 2, the vehicle will begin to move and as it increases in speed due to the increase in speed of the engine, the swinging check valve 36 in the conduit 17 will rise and turn the disk valve 30. This action will permit oil behind the piston 24 to be forced out through the variable speed valves to the supply tank 4.

When the speed of the vehicle is 8 or 10 miles per hour the valve 36 will have turned the disk valve 30 far enough to allow all of the oil from behind piston 24 to pass into the supply tank. Then the pump is working full capacity and the transmission is in high speed.

Upon slowing the vehicle down (by slowing the engine) the flap valve 36 will begin to fall and when the speed has fallen below 8 or 10 miles per hour and turned variable speed valve 30 so that it will admit oil from the outlet port of the pump into the space behind the piston 24, the reduction ring will be forced into the working chamber. When the vehicle has slowed down to 2 or 3 miles per hour the valve 36 will have fallen farther due to the decrease in flow of oil in the conduit 17 and thereby turned the valve 30 until it will have admitted enough oil in behind the piston 24 to have forced the reduction ring $\frac{3}{4}$ or more into the working chamber.

When the disk valve 31, connected to piston 24, stops the inflow of oil in behind the piston 24 then the transmission is said to be in "low" speed, or nearly so. This allows the engine and pump to increase speed in relation to the speed of the motors 2.

The control valve in Figures 15 to 26 inclusive is designed so that when it is placed in the "forward" position the oil from the pump will flow through one side of the valve to the hydraulic motors 2 and back through the opposite side of the valve into the inlet side of the pump, and when placed in the "brake" position, the oil will be partly or completely stopped from the hydraulic motors. The oil from the pump however may circulate freely around the valve from the outlet to the inlet of the pump.

When the valve is placed in "neutral" position, both the pump and motors are free and can rotate independently of each other. When the valve is placed in "reverse" position, the outlet of the pump is connected to the opposite side of the hydraulic motors

while the other ports of the motors are connected to the inlet of the pump thus reversing the liquid flow through the motors.

Having the general operation in mind, the remainder can be understood without difficulty. The pressure in the tank 5 will soon fall and then the spring 61 will press the piston 59 downwardly and close the then alining ports 62, 64. It has already been explained how the reduction ring 18 operates through the medium of the variable speed valves in Figure 2. All of the ordinary functions of the power transmitting and control mechanisms of the modern motor vehicle are obtained by the present invention with the added advantage of great flexibility in so far as the range of power is concerned.

While the construction and arrangement of the hydraulic drive mechanism as herein described and claimed, is that of a generally preferred form, obviously modifications and changes may be made without departing from the spirit of the invention or the scope of the claims.

I claim:—

1. In a hydraulic transmission, a pump shaft, a rotor carried by the shaft including means defining a working chamber, said working chamber having extensions, blades carried by the rotor adapted to move in and out of the working chamber, an abutment adapted to enter the working chamber and toward which the blades are adapted to move, a reduction ring occupying said extensions, and means carrying both the abutment and said reduction ring adapted to move so as to shift the abutment and ring in corresponding degrees in respect to the working chamber in order to vary the fluid capacity of the working chamber.

2. In a hydraulic transmission, a pump casing, a circular piston situated within the casing, an abutment carried thereby adjacent to one end, a reduction ring carried thereby adjacent to the other end, a pump shaft revoluble in the casing, a rotor carried by the shaft and having means defining a working chamber within the rotor adapted to be entered by the abutment, said working chamber having extensions adapted to be occupied by the reduction ring, blades carried by the rotor adapted to move across the working chamber and act on fluid contained by the working chamber, and means to move the piston in order to change the positions of the abutments and reduction ring in respect to the working chamber to vary the fluid capacity of the working chamber.

3. In a hydraulic transmission, a pump casing, a piston situated within the casing, an abutment carried by the piston adjacent to one end, a reduction ring carried thereby adjacent to the other end, a facing plate attached to the piston over a part of the re-

duction ring at an adjacent end of the casing, a pump shaft, a rotor carried by the pump shaft having a working chamber formed in the rotor adapted to be entered by the abutment, said working chamber having extensions occupied by the reduction ring, blades carried by the rotor adapted to move into the working chamber, and means for controlling the admission of fluid into the casing behind the piston and between the facing plate and casing to move the piston, abutment and reduction ring to cause a variation in the fluid capacity of the working chamber.

4. In a hydraulic transmission, a pump casing, a piston situated within the casing, a rotor situated within the piston, a pump shaft by which the rotor is carried, means formed in the rotor to define a working chamber and an extension thereof, blades carried by the rotor adapted to enter the working chamber, an abutment carried by the piston adjacent to one end adapted to enter the working chamber so that the blades may move fluid thereagainst, a reduction ring carried by the piston adjacent to the other end, said ring occupying said extension, and valve mechanism for controlling the flow of fluid into the casing behind the piston, thereby to slide the piston and cause relative adjustments of the abutment and reduction ring for varying the fluid capacity of the working chamber.

5. In a hydraulic transmission, a pump casing, a piston situated in the casing, a rotor situated inside of the piston, means in the rotor defining a working chamber and an extension thereof, a reduction ring occupying the extension, a flange on the reduction ring, a facing plate secured to the adjacent end of the piston and engaging the flange to provide a swivel mounting for the reduction ring, valve mechanism for admitting fluid to the casing behind the facing plate to drive the piston to one side of the casing and the reduction ring into the working chamber to thereby vary the fluid capacity of the working chamber, and an abutment carried by the piston adjacent to the other end also occupying the working chamber but being adjusted therein as said piston moves.

6. In a hydraulic transmission; a pump casing, a piston situated in the casing, a rotor situated inside of the piston, means in the rotor defining a working chamber and an extension thereof, a reduction ring occupying the extension, a flange on the reduction ring, a facing plate secured to the adjacent end of the piston and engaging the flange to provide a swivel mounting for the reduction ring, valve mechanism for admitting fluid to the casing behind the facing plate to drive the piston to one side of the casing and the reduction ring into the ex-

tension to thereby vary the fluid capacity of the working chamber and the output to the motor, an abutment carried by the piston adjacent to the other end also occupying the working chamber but being adjusted there-
 5 in as said piston moves, a pump shaft with which the rotor revolves, blades carried by the rotor, and means causing the blades to slide radially into the working chamber but retract therefrom before said abutment is
 10 reached.

7. In a hydraulic transmission, a pump casing, a piston situated within the casing, a rotor situated inside of the piston, means
 15 in the rotor defining a working chamber and an extension thereof inside of the rotor, a reduction ring occupying said extension, said reduction ring having channels communicating with both ends, a flange formed
 20 on that end of the reduction ring opposite to said extension and having a depression, and a facing plate secured to the end of the piston providing a swivel mounting for the ring at said flange said depression provid-
 25 ing for an equalization of fluid pressure at both ends of the reduction ring.

8. In a hydraulic transmission, a pump casing having a hub, an internal structure mounted on the casing, a piston situated
 30 within the casing, having one end formed to slide on said structure, a facing plate affixed to the other end adapted to slide on said hub the piston being thereby supported, a rotor arranged to revolve within the
 35 piston, means providing a working chamber and an extension thereof inside of the rotor, an abutment block carried adjacent to one end of the piston and passing through the internal structure for projecting into the
 40 working chamber, a reduction ring carried by the piston adjacent to the facing plate extending into the extension, a pump shaft by which the rotor is carried, and blades also carried by the rotor adapted to reciprocate
 45 in respect to the working chamber for action on a fluid contained by the working chamber.

9. In a hydraulic transmission, a pump casing having a hub, an internal structure mounted on the casing, a piston situated
 50 within the casing having one end formed to slide on said structure, a facing plate affixed to the other end adapted to slide on said hub the piston being thereby supported, a rotor arranged to revolve within the
 55 piston, means providing a working chamber and an extension thereof inside of the rotor, an abutment block carried adjacent to one end of the piston and passing through the internal structure for projecting into the
 60 the working chamber, a reduction ring carried by the piston adjacent to the facing plate extending into the extension, a pump shaft by which the rotor is carried, blades
 65 also carried by the rotor adapted to reciprocate

in respect to the working chamber for action on a fluid contained by the working chamber, and means for causing the piston to slidably move within the casing so as to shift the abutment and the reduction ring
 70 simultaneously in reference to the working chamber to vary the fluid capacity of the working chamber.

10. In a hydraulic transmission, a pump casing having a hub, an internal structure mounted on the casing, a piston situated
 75 within the casing having one end formed to slide on said structure, a facing plate affixed to the other end adapted to slide on said hub the piston being thereby supported, a rotor arranged to revolve within the
 80 piston, means providing a working chamber and an extension thereof inside of the rotor, an abutment block carried adjacent to one end of the piston and passing through the internal structure for projecting into
 85 the working chamber, a reduction ring carried by the piston adjacent to the facing plate extending into the extension, a pump shaft by which the rotor is carried, blades also carried by the rotor adapted to reciprocate
 90 in respect to the working chamber for action on a fluid contained by the working chamber, and valve mechanism for controlling the passage of fluid into the casing to cause the sliding of the piston and the simultaneous
 95 movement of the abutment and reduction ring in reference to the working chamber and extension so as to vary the fluid capacity of the working chamber.

11. In a hydraulic transmission a hub, an internal structure mounted on the casing, a piston situated within the casing hav-
 100 ing one end formed to slide on said structure, a facing plate affixed to the other end adapted to slide on said hub the piston being thereby supported, a rotor arranged to revolve within the piston, means providing a working chamber and an extension thereof
 105 inside of the rotor, an abutment block carried adjacent to one end of the piston and passing through the internal structure for projecting into the working chamber, a reduction ring carried by the piston adjacent to the facing plate extending into the ex-
 110 tension, a pump shaft by which the rotor is carried, blades also carried by the rotor adapted to reciprocate in respect to the working chamber, valve mechanism for controlling the passage of fluid into the casing to cause the sliding of the piston and the simultaneous
 115 movement of the abutment and reduction ring in reference to the working chamber and extension so as to vary the fluid capacity of the working chamber, a fluid conduit leading into the working chamber, and means situated in the conduit so as to swing according to the strength of the fluid
 120 current flowing therein and being adapted to shift the valve mechanism so as to auto-
 125
 130

atically control the admission of fluid for the sliding of the piston.

12. In a hydraulic transmission, a casing, a rotor which is revoluble inside of the casing and has means defining a working chamber and an extension thereof, a piston in the casing containing the rotor, an abutment carried adjacent to one end of the piston extending into the working chamber, a reduction ring carried adjacent to the other end of the piston extending into said extension, a valve for controlling the admission of pressure fluid into the casing behind the piston, a fluid conduit leading into the working chamber, a flap mounted to swing in said conduit by the current of fluid flowing therein, and connecting means between the flap and said valve for automatically turning the valve and thus regulating the flow of fluid into the casing and automatically positioning the abutment and reduction ring in reference to the working chamber and extension thereof.

13. In a hydraulic transmission, a casing, a rotor which is revoluble inside of the casing and has means defining a working chamber and an extension thereof a piston in the casing containing the rotor, an abutment carried adjacent to one end of the piston extending into the working chamber, a reduction ring carried adjacent to the other end of the piston movable into said working chamber, a valve for controlling the admission of pressure fluid into the casing behind the piston, a fluid conduit leading into the working chamber, a flap mounted to swing in said conduit by the current of fluid flowing therein, connecting means between the flap and said valve for automatically turning the valve and thus regulating the flow of fluid into the casing and automatically positioning the abutment and reduction ring in reference to the working chamber and extension thereof, a second valve associated with the aforesaid valve, and connecting means joining said second valve with the piston cutting off the flow of fluid into the casing as the piston, abutment and reduction ring slide in reference to the rotor as aforesaid.

14. In a hydraulic transmission, a casing, a rotor which is revoluble inside of the casing and has means defining a working chamber and an extension thereof, a piston in the casing containing the rotor, an abutment carried adjacent to one end of the piston extending into the working chamber, a reduction ring carried adjacent to the other end of the piston extending into said extension, a valve for controlling the admission of pressure fluid into the casing behind the piston, a fluid conduit leading into the working chamber, a flap mounted to swing in said conduit by the current of fluid flowing therein, connecting means between

the flap and said valve for automatically turning the valve and thus regulating the flow of fluid into the casing and automatically positioning the abutment and reduction ring in reference to the working chamber and extension thereof, and means permitting manual operation of said valve independently of the automatic function of said flap.

15. In mechanism of the character described a casing, a piston situated in the casing being adapted to slide therein, a valve for controlling the admission of fluid into the casing behind the piston whereby the sliding of the piston is regulated, a stem supporting the valve and extending to a point exteriorly of the casing, means attached to the stem by which the valve is turned, a spring having connection with both the turning means and casing and being adapted to close the valve, and means for adjusting the spring so that an opening effort of the valve and the turning means must vary.

16. In mechanism of the character described a casing, a piston situated and adapted to slide in the casing, a valve seat, formed on the casing having ports through which pressure fluid is adapted to be admitted to the casing, a valve associated with the seat, a second valve spaced intermediately of said valve and the seat both having suitable ports, a stem carried by the first valve and extending from the casing, means for turning the stem to control the passage of fluid through the seat and intermediate valve port, to thereby regulate the sliding of the piston in the casing, and means forming a connection between the intermediate valve and the piston causing a closure of the port and a cutting off of the inflow of fluid as the piston slides.

17. In mechanism of the character described a casing, a piston situated and slidable in the casing, a valve and an intermediate valve both having ports coacting with fluid intake ports situated in the casing, a stem carried by the valve and extending out of the casing, a hub mounted on the stem and having means by which the stem is turned, a spring having connection with the casing and hub at the respective ends serving to press in such a direction as to cause the valve to hold the intermediate valve in position, and means for adjusting the torsion of the spring requiring a varying effort to turn said valve.

18. In mechanism of the character described a casing, a piston which is slidable within the casing, a valve stem extending into the casing and having a valve, an intermediate valve contacting said valve and a ported seat in the casing, means carried by the stem by which said valve may be turned, a spring adapted to both keep the valve in

a closed position and press up thereon so as to keep the intermediate valve in position, a worm gear carried by the turning means to which one end of the spring is 5 attached the other end of the spring being attached to the casing, a worm pinion supported by said turning means and meshing with the gear, and a thumb screw for turning the pinion to in turn adjust the gear 10 and vary the torsion of the spring so that different degrees of effort are required to turn said valve to an open position in reference to both the intermediate valve and said ported seat.

15 19. In mechanism of the character described comprising a casing having a hub, a circular base affixed to the hub, a pump shaft, a rotor carried by the shaft and including a portion adapted to revolve on 20 said circular base, means providing a working chamber inside of the rotor, blades carried by the rotor each having a lug, and an eccentric affixed to said circular base receiving the lugs to cause the blades to slide 25 radially in respect to the working chamber as the rotor revolves.

20 20. In mechanism of the character described comprising a casing having a hub adjacent to one end, a cover plate at the 30 other end having an internal structure occupying a part of the casing, a circular base

affixed to the hub, a pump shaft, bearing means by which the shaft is journalled on the internal structure and in the hub, a 35 rotor carried by the shaft including a portion which is adapted to revolve on said circular base, blades carried by the rotor, means which defines a working chamber inside of the rotor, a pair of lugs carried by 40 each blade, and eccentrics respectively mounted on the circular base and the internal structure receiving the lugs and causing the blades to slide radially in respect to the working chamber as the rotor revolves.

21. In mechanism of the character de- 45 scribed comprising a casing, a circular piston situated in the casing, a rotor situated inside of the piston, means defining a working chamber, other means defining an extension of the working chamber, a wall be- 50 tween the two having cut-out portions furnishing communication and leaving supporting spokes, an abutment carried by the piston and extending into the working chamber, and a reduction ring carried by the 55 piston extending into said extension, said abutment and reduction ring being slidable in unison with the piston, the reduction ring being adapted to vary the fluid capacity of the working chamber by movement 60 into and out of the working chamber.

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