No. 654,721. Patented July 31, 1900.

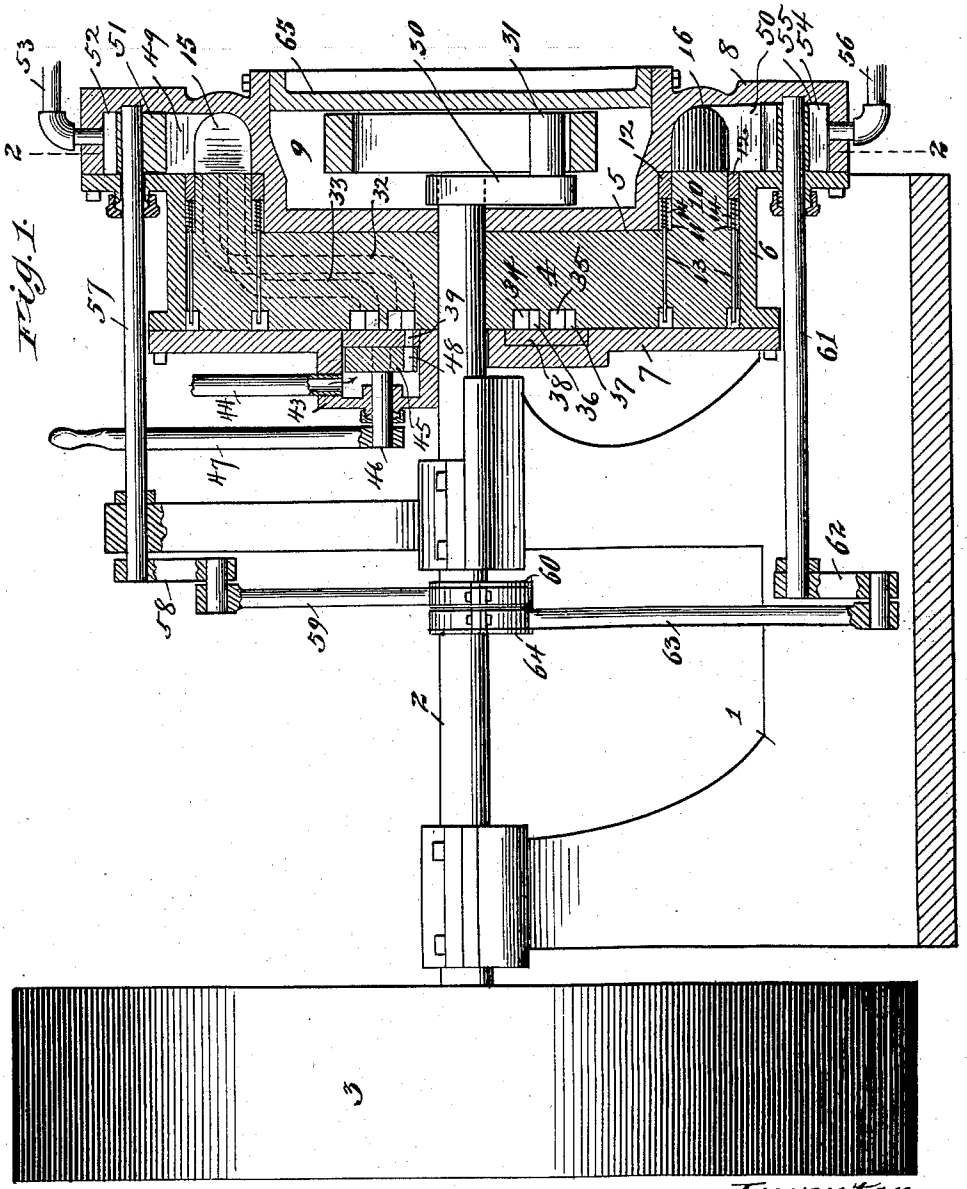
F. W. FLINT.

FLUID PRESSURE MOTOR.

(Application filed Sept. 28, 1899.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

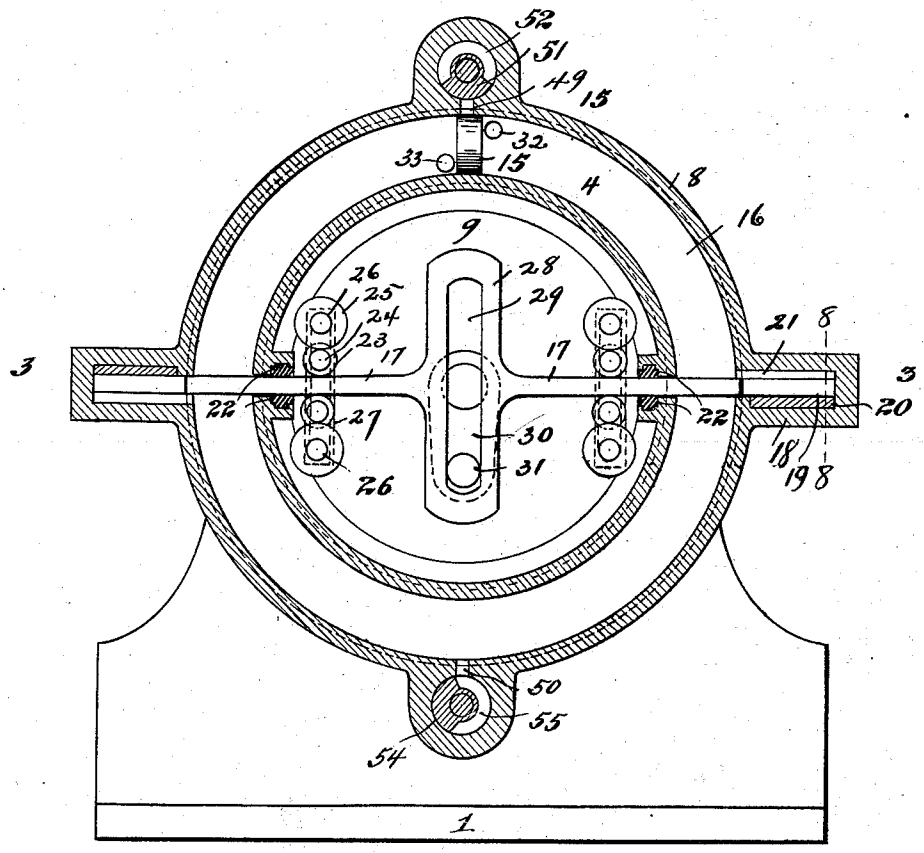
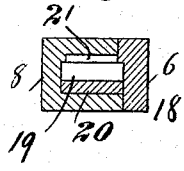


Fig. 8.



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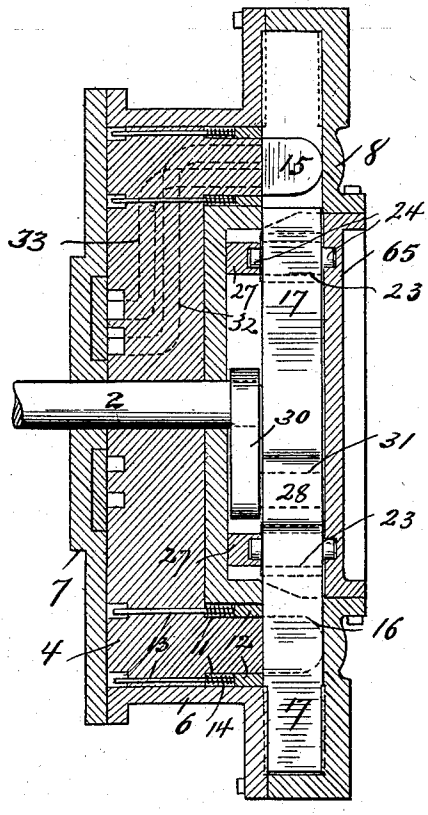
(No Model.) 4 Sheets—Sheet 3.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 4.

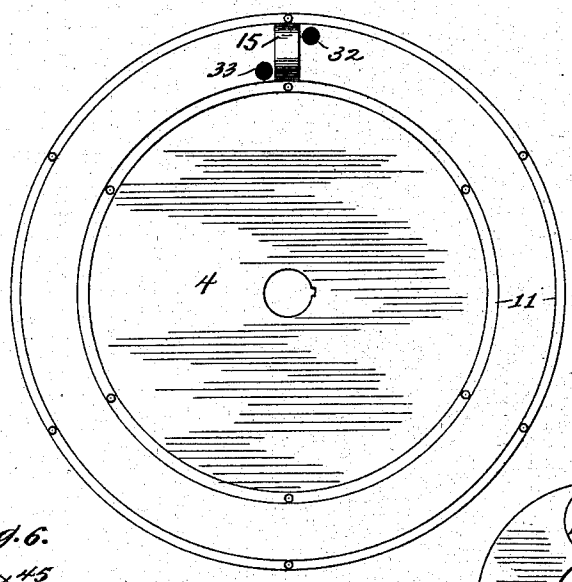


Fig. 7

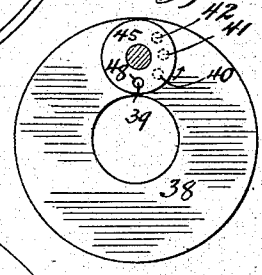


Fig. 6.

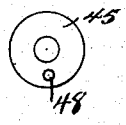
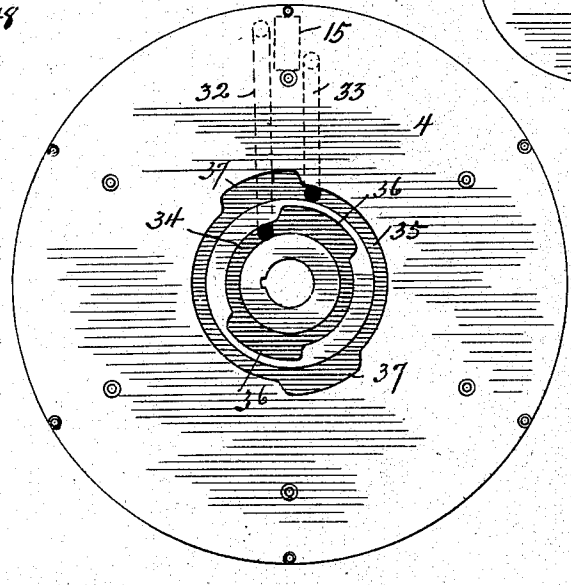


Fig. 5.



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UNITED STATES PATENT OFFICE.

FREDERICK W. FLINT, OF CHICAGO, ILLINOIS.

FLUID-PRESSURE MOTOR.

SPECIFICATION forming part of Letters Patent No. 654,721, dated July 31, 1900.

Application filed September 28, 1899. Serial No. 731,959. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. FLINT, of Chicago, Illinois, have invented certain new and useful Improvements in Fluid-Pressure Motors, of which the following is a specification.

This invention relates to fluid-pressure motors, and has for its object to provide a simple and efficient mechanism wherein the pressure of the motor fluid upon the moving part against which it is exerted may be continuous during the operation of the apparatus.

To this and other ends my invention consists in certain novel features, which I will now proceed to describe, and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a vertical central section, partly in elevation, of a motor embodying my invention in one form. Fig. 2 is a vertical sectional view, partly in elevation, taken at right angles to the view shown in Fig. 1 upon the line 2 2 of said figure. Fig. 3 is a plan section, partly in elevation, taken on the line 3 3 of Fig. 2. Fig. 4 is a front elevation of the rotating disk. Fig. 5 is a rear elevation of the same. Fig. 6 is a detail view of the controlling-valve. Fig. 7 is a view of the controlling-valve and the packing-ring coöperative therewith, and Fig. 8 is a detail sectional view taken on line 8 8 of Fig. 2.

In the said drawings, 1 indicates a suitable base in bearings, in which is mounted the main shaft 2, which may be provided with the usual fly-wheel or pulley 3. Upon the shaft 2 is secured a disk 4, which is inclosed within a suitable casing or cylinder 5. This casing is preferably constructed in the manner shown, consisting of a cylindrical body 6, closed at the rear by a head 7 and at the front by a head 8. The disk 4 is preferably recessed in its front face to receive the correspondingly rearward-extending central portion of the head 8, which latter is thus provided with a central recess or chamber 9. The disk 4 is thus provided with an annular laterally-extending flange 10, having at each of its margins a recess 11, in which is located a packing-ring 12, supported by rods 13 and held in place by springs 14. This packing-ring provides a tight joint between the disk 4 and the two sections 6 and 8 of the casing. The disk 4 is provided with a laterally-extending vane 15, while the casing is provided with an annular chamber 16, in which said vane fits and travels. This annular chamber lies at one side of the disk and is in the form of a groove or circular open passageway in the inner face of the head 8, near the margin thereof, opposite the annular portion 10 of the disk 4.

17 indicates a reciprocating abutment which extends through the annular chamber 16 at diametrically-opposite points. The inner and outer walls of the chamber are slotted at these points in a radial direction to permit the passage of the abutment, and the casing is provided with opposite extensions 18, having a recess 19 therein, in which the ends of the abutment may slide. In one side of this recess 19 is located a packing 20, while in the other side there is formed a groove 21, communicating with the chamber 16 and permitting the escape of the motor fluid from the recess 19 as the abutment advances into the same. A suitable packing 22 is also provided at the points where the sliding abutment passes through the inner wall of the chamber 16, and in order to support the abutment against the motor-fluid pressure and cause it to operate with a minimum of friction it travels between rollers 23, having reduced trunnions 24, which trunnions bear against rollers 25 of larger diameter, these latter in turn having trunnions 26, which are supported by a bearing-yoke 27 on the casing. The abutment 17 has a motion of reciprocation imparted to it from the main shaft 2 in the following manner: The central portion of the abutment lies within the recess 9 in the head 8 and is provided with a transverse yoke or cross-head 28, having a longitudinal slot 29, while the end of the shaft 2 also extends into said recess and is provided with a crank-arm 30, having a crank-pin 31, which fits within the slot 29. Rotation of the shaft 2 will obviously thus impart a reciprocating motion to the abutment 17.

The motor fluid is admitted to the chamber 16 through either one of two ports or passages 32 and 33, (indicated in dotted lines in Figs. 1 and 5 of the drawings,) the said ports being

formed in the body of the disk 4 and extending from the front to the rear face thereof. One of said ports opens into the chamber 16 immediately at one side of the vane 15, while the other port opens into said chamber immediately on the opposite side of said vane. The port 32 terminates in an annular groove 34 in the rear face of the disk 4, while the port 33 terminates in a similar groove 35 in the rear face of said disk.

36 indicates a segmental groove lying between the grooves 34 and 35 and communicating with the former groove, while 37 indicates a similar segmental groove lying immediately outward beyond the groove 35 and communicating with this latter.

38 indicates a packing-ring mounted in a suitable seat in the inner face of the head 7 and covering the several grooves and segmental grooves 34, 35, 36, and 37. This packing-ring is provided with a series of apertures 39, 40, 41, and 42, corresponding in number and location with the grooves just referred to, the aperture 39 communicating with the groove 34, the aperture 40 with the segmental groove 36, the aperture 41 with the groove 35, and the aperture 42 with the segmental groove 37.

43 indicates a valve-chest formed in or attached to the head 7 in any suitable manner, the motor fluid being supplied thereto from any suitable source through a pipe or conduit 44. Within said chest is arranged the controlling-valve 45, which is mounted on an axis 46 and operated by a lever 47 or in any suitable manner. This valve is a rotary valve seated upon the rear or outer face of the packing-ring 38 and having an aperture 48, which may be either brought opposite the imperforate body of the packing-ring to cut off the admission of the motor fluid to the machine or which may be caused to register with any one of the apertures in the packing-ring, so as to cause the motor fluid to pass into any one of the grooves or segmental grooves in the rear of the disk 4 and thence either to the port or passage 32 or to the port or passage 33, as the case may be. The motor fluid is exhausted from the chamber 16 by means of suitable ports 49 and 50, located at diametrically-opposite points of said casing and each midway between the two points where the reciprocating abutment 17 intersects the chamber 15. The port 49 is controlled by an oscillating valve 51, located in a valve-chamber 52, connected with an exhaust-pipe 53, while the port 50 is similarly controlled by an oscillating valve 54, located in a valve-chamber 55, communicating with an exhaust-pipe 56. The valve 51 is mounted on a rock-shaft 57, supported in suitable bearings on the frame and having at its rear end an arm 58, connected by a rod 59 with an eccentric 60 on the main shaft 2. The valve 54 is similarly mounted on a rock-shaft 61, having an arm 62 connected by a rod 63 with a second eccentric 64 on the main shaft 2.

The recess 9 in the head 8 is preferably closed by a plate 65, which is readily removable to give access to the mechanism inclosed in said recess.

The operation of my improved motor will be readily understood from the preceding description. When the valve 45 is so moved as to bring the opening 48 thereof opposite one of the apertures in the packing-ring 38— for instance, the aperture 39—the motor fluid will pass into the annular groove 34 and thence through the port or passage 32 into the chamber 16. The expansive force of the motor fluid acting between the abutment 17 and the vane 15 will impart movement to this latter, and consequently to the disk 4 and shaft 2. This pressure of the motor fluid against the vane 15 will always take place at every part of the stroke of the engine, for the reason that if the abutment is open at that side of the vane to which it lies nearest the motor fluid may still act between the other side of the abutment and the vane. As the vane approaches one end of the abutment said end is withdrawn out of its way to permit its passage, this withdrawal commencing as soon as the vane has passed the exhaust-port ahead of that end of the abutment which is to be passed and said exhaust-port closing before the vane has completely passed it. It will be understood, of course, that the opposite exhaust-port opens at the same time that the exhaust-port just mentioned closes, so that the motor fluid ahead of the vane is always free to escape and back pressure is thus avoided, while a continuous actuating-pressure is always maintained on that side of the vane on which the admission-port is located. Should it be desired to use the motor fluid expansively by cutting off the supply after a portion of the stroke is completed, the valve 45 is moved so as to cause its aperture 48 to register with the aperture 40 in the packing-ring 38, whereby the motor fluid will be admitted to the cylinder only during that period in which the segmental slot 36 is in communication with the aperture 40. The engine may be made to travel in the reverse direction by so shifting the valve 45 as to bring its aperture 48 opposite the aperture 41 of the packing-ring 38, thus admitting motor fluid to the annular groove 35 and thence through the port or passage 33 to the chamber 16 on the opposite side of the vane 15. Cutting off may be effected by so shifting the valve 48 as to admit motor fluid through the aperture 42 into the segmental groove 37.

It will be noted that the motor is simple in construction and that a continuous pressure of the motor fluid upon the vane which imparts motion to the main shaft may be maintained and loss of power thus avoided. By locating the annular chamber within which the vane travels at one side of the disk I am enabled to operate the abutment directly from the main shaft without the intervention of gearing of any kind and to materially in-

crease the compactness and simplicity of the structure. The roller-bearings for supporting the abutment relieve it of the friction which would otherwise require an excessive amount of power to operate the same. The motor may, moreover, be readily controlled, reversed, and made to operate expansively through the medium of a single controlling-valve.

I do not wish to be understood as limiting myself strictly to the precise details hereinbefore described, and shown in the accompanying drawings, as it is obvious that these may be varied without departing from the principle of my invention.

I claim—

1. In a motor of the character described, the combination, with a casing having an annular chamber and a reciprocating abutment, of a main shaft, a disk thereon in the casing having a vane to fit and travel in the annular chamber, said disk being provided with a port or passage opening into the annular chamber adjacent to the vane and with a circular groove and segment of a groove with which the other end of said port or passage communicates, and said casing being provided with apertures registering respectively with the groove and with the segmental groove, and means for admitting the motor fluid through either of said apertures, substantially as described.

2. In a motor of the character described, the combination, with a casing having an annular chamber and a reciprocating abutment, of a main shaft, a disk thereon having a vane to fit and travel in the annular chamber, said disk being provided with two inlet ports or passages opening into the annular chamber on opposite sides of the vane and with concentric circular grooves and segmental grooves, with two of each of which the opposite ends of said ports or passages respectively connect, the casing having a series of apertures each connected with one of said grooves or segmental grooves, and a valve having an opening which may be caused to register with any one of said apertures in the casing, substantially as described.

3. A fluid-pressure motor, comprising a suitable casing having a laterally-arranged annular chamber, a main shaft, a disk thereon having a laterally-extending vane which fits and travels within the annular chamber, and a reciprocating abutment extending across the face of the disk and intersecting the annular chamber at diametrically-opposite points, substantially as described.

4. A fluid-pressure motor, comprising a suitable casing having a laterally-arranged annular chamber, a main shaft, a disk thereon having a laterally-extending vane which fits and travels within the annular chamber, said casing being centrally recessed, and a reciprocating abutment extending across said recess intersecting the annular chamber at diametrically-opposite points and having its actuating mechanism located within the recess of the casing, substantially as described.

5. A fluid-pressure motor, comprising a suitable casing having a laterally-arranged annular chamber and a centrally-recessed or inwardly-extending portion, a main shaft, a disk thereon having a central recess to receive the inwardly-extending portion of the casing and a laterally-extending annular portion provided with a laterally-extending vane which fits and travels within the annular chamber, packing-rings located at the outer margins of said annular portion of the disk, and a reciprocating abutment intersecting the annular portion at diametrically-opposite points and having its actuating mechanism located within the recess of the casing, substantially as described.

6. A fluid-pressure motor, comprising a centrally-recessed casing having a laterally-arranged annular chamber, a main shaft extending from said casing into said chamber and provided with a crank arm and pin therein, a disk secured on the main shaft within the casing and having a laterally-extending vane which fits and travels within the annular chamber, and a reciprocating abutment intersecting the annular chamber at diametrically-opposite points and provided within the recess of the casing with a slotted cross-head with which the crank-pin of the main shaft engages, substantially as described.

7. In a motor of the character described, the combination, with a casing having an annular chamber and a reciprocating abutment constantly exposed to the pressure of the motor fluid within the chamber, of rollers on the casing between which said abutment passes and bears, and other rollers carried by the casing and forming bearings for the first-mentioned rollers, substantially as described.

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