July 3, 1928. 1,675,337

F. G. FOLBERTH ET AL

WINDSHIELD CLEANER

Filed Oct. 31, 1923 2 Sheets-Sheet 1

Fig. 1.

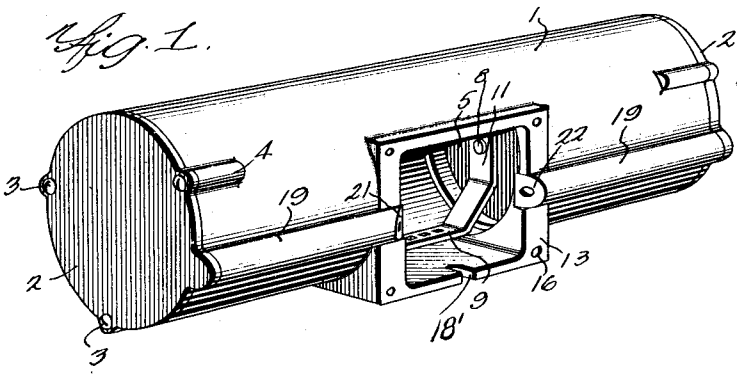


Fig. 2.

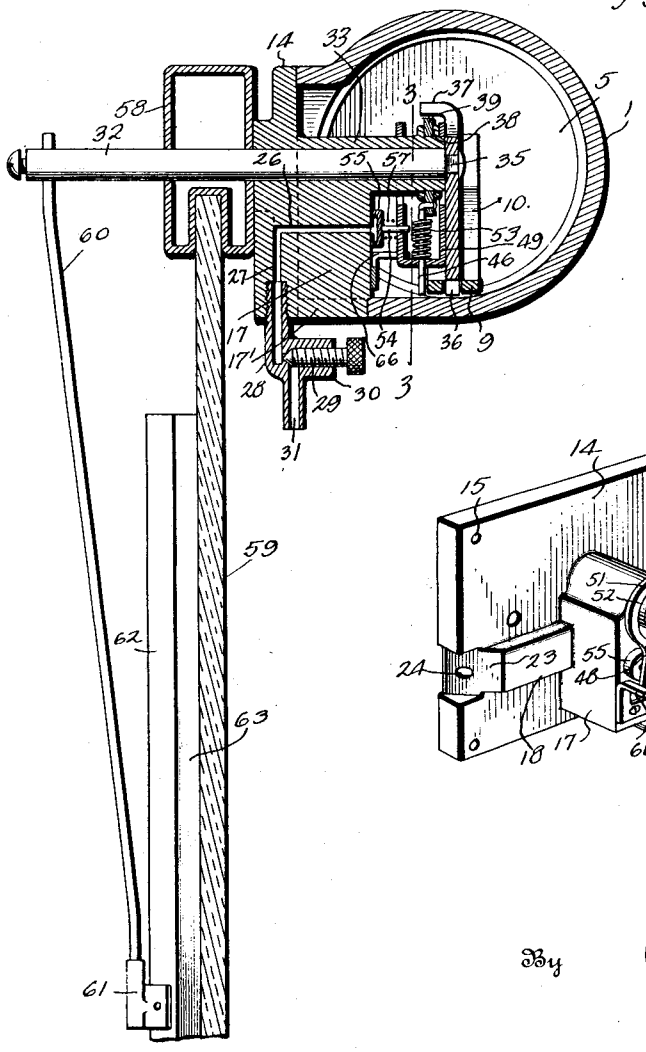


Fig. 3.

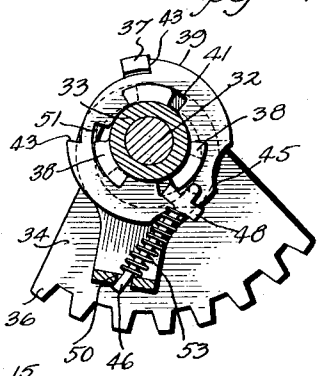
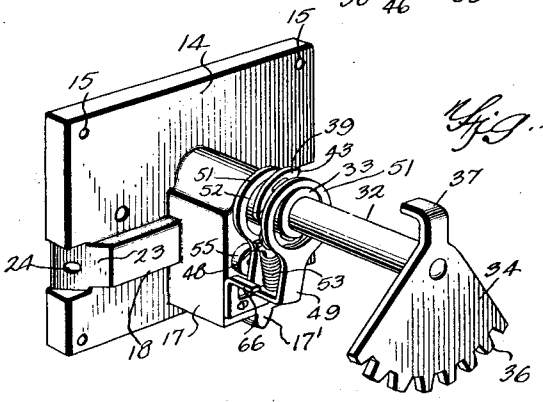


Fig. 4.



Inventors

F. G. Folberth

W. M. Folberth

By Chas. Parker

Attorney

July 3, 1928. 1,675,337

F. G. FOLBERTH ET AL

WINDSHIELD CLEANER

Filed Oct. 31, 1923 2 Sheets-Sheet 2

Fig. 5.

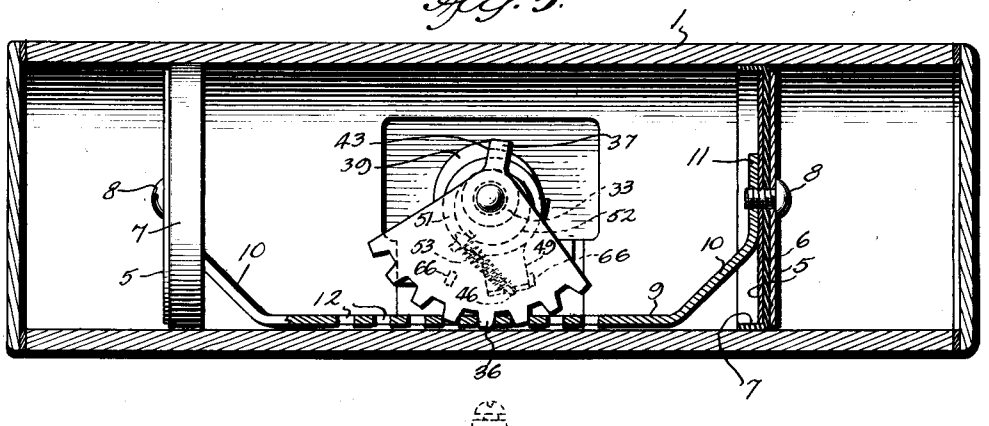


Fig. 6.

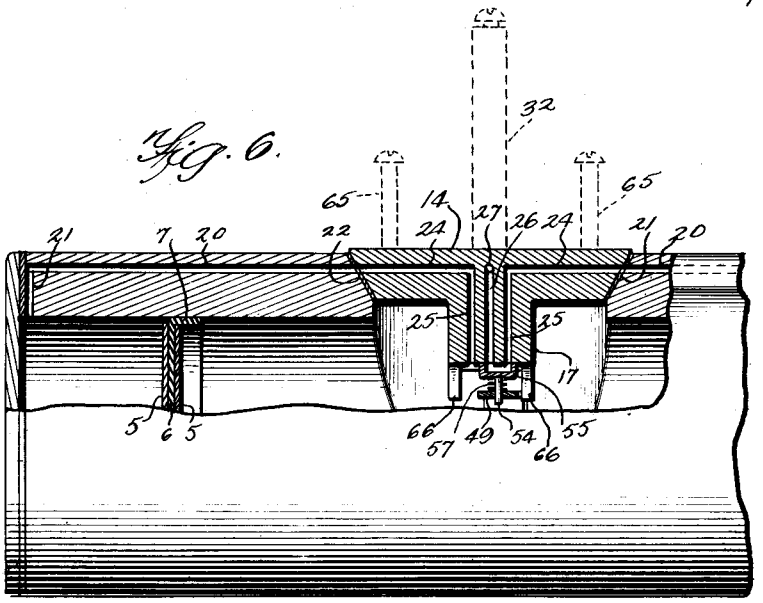


Fig. 8.

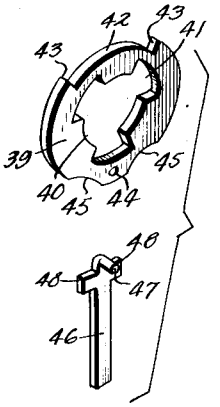
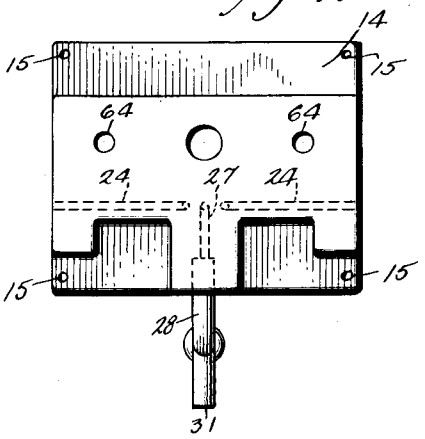


Fig. 7.



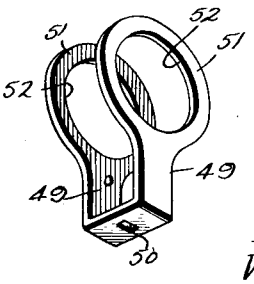


Fig. 9.

Inventors
F. G. Folberth
W. M. Folberth

By

Attorney

Patented July 3, 1928. 1,675,337

UNITED STATES PATENT OFFICE.

FREDERICK G. FOLBERTH AND WILLIAM M. FOLBERTH, OF CLEVELAND, OHIO, ASSIGNORS TO TRICO PRODUCTS CORPORATION, OF BUFFALO, NEW YORK, A CORPORATION OF NEW YORK.

WINDSHIELD CLEANER.

Application filed October 31, 1923. Serial No. 671,937.

This invention relates to windshield cleaners, and more particularly to valve actuating mechanism for windshield cleaner motors.

An object of the invention is to provide a cleaner motor having a transversely arranged, centrally disposed cleaner shaft and a disk freely mounted concentric with the shaft and adapted to be engaged by a movable part of the cleaner to actuate the valves to alternately connect opposite ends of the cleaner motor to a source of suction or pressure.

A further object of the invention is the provision of "snap over" valve mechanism of simple construction, operated by a segmental gear carried by the cleaner shaft through which power is transmitted from the movable element of the cleaner motor to the shaft.

A further object is the provision of an arm for carrying the valve, which arm is actuated by the disk mounted on the cleaner shaft and stops to limit the movement of the arm to properly position the valve.

In the present invention, we employ a closure plate of the type disclosed and claimed in our Letters Patent No. 1,570,598 granted Jan. 19, 1926 which is arranged intermediate the ends of the cleaner motor and which supports the valve and valve actuating mechanism.

In the accompanying drawings, we have shown one embodiment of the invention. In this showing:

Figure 1 is a perspective view of the motor casing with the closure plate and valve mechanism removed,

Figure 2 is a vertical transverse sectional view showing the device in position on a windshield,

Figure 3 is a detail sectional view on line 3—3 of Figure 2,

Figure 4 is a perspective view of the closure plate and valve mechanism removed,

Figure 5 is a central vertical longitudinal sectional view,

Figure 6 is a plan view of a portion of the motor casing, parts being shown in section,

Figure 7 is a front elevation of the closure plate,

Figure 8 is a detail view of the operating disk and an arm associated therewith, and,

Figure 9 is a similar view of the valve supporting arm.

Referring to the drawings, the reference numeral 1 designates the casing of the motor which, as shown, may be cylindrical and which is provided with cylinder heads 2, arranged at opposite ends and retained in position by means of suitable fastening elements 3, received in openings in enlargements 4, formed on the ends of the cylinder. A pair of pistons are arranged within the cylinder and suitably spaced from each other. Each of the pistons consists of disks 5, formed of any suitable material, and a strip of suitable packing material 6 is arranged between the disks. The packing material is of larger diameter than the interior diameter of the cylinder, forming a flange 7. The parts of the piston are secured to each other by means of a centrally arranged screw 8. A connecting member 9 is arranged between the pistons and this connecting member is provided with inclined portions 10, adjacent each end. The ends of the connecting member are arranged at right angles to the body portion, as indicated at 11, and are provided with suitable openings for the reception of the fastening elements 8, whereby the pistons are connected to each other and maintained in spaced relation. The body portion of the connecting member is provided with spaced openings 12, forming a rack for the transmission of power from the pistons.

The cylinder is provided with a relatively large opening arranged intermediate its ends, and this opening is provided with flat faces 13. A closure plate 14 is adapted to be arranged over this opening. The closure plate is provided with openings 15, arranged adjacent each corner for the reception of suitable fastening elements which are received in openings 16 in the flat faces of the cylinder opening. The closure plate is provided with an enlargement 17 on its inner face and is further provided with horizontally disposed ribs 18, extending from each side of the enlargement. The bottom of the enlargement 17 is provided with a rib 17′ adapted to be received in a slot 18′ in the cylinder when the closure plate is placed in position. Conduits 19 are arranged on the exterior of the cylinder, the conduits being pro-

vided with passages 20, communicating with transverse ports 21 in the ends of the cylinder. The inner ends of the conduits are beveled, as at 22, and the adjacent side faces of the closure plate and the ribs are beveled, as at 23, to fit the beveled ends of the conduits. The ribbed portions of the closure plate are provided with passages 24, adapted to register with the ends of the passages 20 and these passages in turn communicate with transverse passages 25, extending inwardly through the enlargement 17 to its inner face. Between the fluid ports or passages 25, there is provided a fluid port or passage 26, which communicates with a vertical passage 27, extending to the bottom of the closure plate. The lower end of this passage is enlarged and threaded to receive a coupling 28. This coupling is provided with a valve seat adapted to be engaged by a valve 29. The valve 29 is provided with screw threads adapted to engage threads formed in an opening in an enlargement 30, formed on the coupling. The coupling is provided with an inlet passage 31 and a flexible tube (not shown) is adapted to be arranged over the inlet opening to communicate with a suitable source of suction or pressure such as the intake manifold of an internal combustion engine (not shown).

A cleaner shaft 32 is arranged in an opening in the closure plate and enlargement 17. As shown, the enlargement is provided with a sleeve 33, extending into the cylinder and the shaft extends through this sleeve. A plate 34 is secured to the inner end of the shaft, the shaft being provided with a squared portion 35, adapted to be received in a square opening in the plate to rigidly secure the plate to the shaft. This plate is arcuate shaped and is provided with teeth 36, adapted to mesh with the openings 12 in the connecting member 9. Beyond the shaft, the plate is provided with an angular portion 37, arranged over the sleeve 33. The sleeve is provided with a plurality of spaced lugs 38, arranged in pairs, as shown in Figure 2 of the drawings, forming a groove between them. A spring positioning member in the form of a disk 39 is mounted over the sleeve, the disk or ring-like plate being provided with a central opening 40, substantially the same size as the diameter of the sleeve and being provided with recesses 41 to permit the disk to pass over the outer set of lugs 38 and be arranged in the groove between the lugs. The upper edge of the disk is provided with a reduced portion 42, forming shoulders 43, adapted to be engaged by the angular member 37 thereby forming a play connection therewith. The bottom of the disk is provided with an opening 44, and the edge of the disk on each side of the opening is provided with cut-out portions 45. A substantially T-shaped arm 46 is operatively connected to the disk. As shown, the upper end of the arm is provided with a pin 47, adapted to be received in the opening 44 in the disk. The arm 46 is provided with transverse arms or shoulders 48 arranged on one side of the disk in the same vertical plane with the inner set of lugs 38. The valve supporting member comprises a substantially U-shaped arm 49, having an opening 50 in its base portion for the reception of the lower end of the arm 46. The upper ends of this member are provided with circular portions 51, having openings 52 adapted to loosely fit the sleeve 33. A spring 53 is arranged over the arm 46 between the transverse portions 48 and the base of the valve supporting member 49. A valve stem 54 is mounted in a suitable opening in one of the arms of the valve supporting member and this valve stem carries a cup-shaped valve 55, adapted to fit over the end of the passage 26 and the end of either of the passages 25, as shown in Figure 6 of the drawings. A spring 57 is arranged around the valve stem to retain the valve in engagement with the face of the enlargement 17.

The shaft 32 projects a slight distance outside of the motor and is adapted to pass through a windshield frame 58. The windshield frame is of the usual construction and is adapted to receive and support a windshield 59 of glass or other transparent material. A cleaner arm 60 is secured to the shaft, the cleaner arm being preferably formed of resilient material to permit adjustment toward the face of the windshield. A retaining device 61 is arranged on the lower end of the cleaner arm and a cleaner member is mounted therein. The cleaner member consists of a backing strip 62 of metal or other rigid material and a flexible strip 63 of rubber or the like. On each side of the shaft, the closure plate is provided with threaded openings 64, adapted to receive bolts 65 (see Figure 6) which pass through the windshield frame to support the motor casing.

In operation, the motor casing is connected to a source of suction or pressure through the coupling 28, and the inlet passages 26, 27. The valve 55 is adapted to be shifted to alternately connect the inlet passage to either of the passages 25 and thus create differential pressure in the ends of the cylinder to move the pistons. The movement of the pistons is transmitted to the cleaner shaft through the connecting member 9 and the segmental gear 34 to oscillate the shaft and swing the cleaner arm in an arc of a circle over the front of the windshield. With the parts in the position shown in Figures 5 and 6 of the drawings, the pistons are moving toward the right, approaching the end of a stroke and the segmental gear is turning in a counter clock-

wise direction. At this time, the finger 37 engages the shoulder 43 to the left in Figure 8 of the drawings and moves the disk in a counter clockwise direction. The T-shaped arm 46 is moved with the disk and as it approaches the perpendicular position, the distance between the head of the T and the base of the valve supporting arm 49 is reduced, placing the spring 53 under compression. As the spring passes the center line, the force of the spring is exerted in an opposite direction to swing the valve supporting arm in a clockwise direction and shift the valve to a position covering the left port 25 and the passage 26. This connects the opposite end of the cylinder to the source of suction and the pistons then move in a reverse direction. Suitable stops 66 are arranged on the inner face of the enlargement and these stops are engaged by the valve supporting member 49 to limit its movement and thus properly position the valve at its limit of movement in either direction. The transverse arms 48 of the T-shaped member engage the lugs 38, as shown in Figure 3 of the drawings at the end of each stroke to limit the movement of the T-shaped member on its pivot. The cut-out portions 45 on the outer edge of the disk receive the spring 53 when the arm 46 swings to its limit of movement in either direction, as shown in Figure 3 of the drawings.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

We claim:

1. Valve actuating mechanism for windshield cleaner motors comprising a pivotally mounted plate, means having a play connection with said plate controlled by the movement of the piston of the motor to oscillate said plate, an arm pivotally connected to said plate, a pivotally mounted valve supporting member connected to said arm, a valve supported thereby, and a spring arranged on said arm and engaging said member, said spring being compressed when said plate and said arm are oscillated to move said valve supporting member and shift said valve.

2. Valve actuating mechanism for windshield cleaner motors comprising a pivotally mounted plate, means controlled by the movement of the piston to oscillate said plate, an arm pivoted at one end on said plate and having a stop-engaging shoulder for limiting the relative movement between said plate and said arm, a pivotally mounted valve supporting member connected to said arm, a valve supported thereby, and a spring arranged on said arm and engaging said valve supporting member, said spring being compressed when said plate and said arm are oscillated to move said valve supporting member and shift said valve.

3. Valve actuating mechanism for windshield cleaner motors comprising a support, a pivotally mounted plate thereon, means controlled by the movement of the piston to oscillate said plate, a substantially T-shaped arm pivotally connected to said plate and having stop-engaging means for abutting the support to limit the movement of said plate, a substantially U-shaped valve supporting member pivotally mounted adjacent said plate, the base of said valve supporting member being provided with an opening through which said arm passes, a valve carried by said valve supporting member, and a spring arranged on said arm above said valve supporting member whereby movement of said arm will compress said spring and move said supporting member to shift said valve.

4. Valve actuating mechanism for windshield cleaner motors comprising a pivotally mounted disk, the edge of said disk being provided with a reduced portion forming shoulders, said shoulders being adapted to be engaged by a movable part of the cleaner motor to oscillate said disk, an arm pivotally connected to said disk, a pivotally mounted valve supporting member connected to said arm, a valve carried thereby, and a spring arranged on said arm and engaging said valve supporting member, said spring being compressed by the movement of said disk to move said valve supporting member and shift said valve.

5. Valve actuating mechanism for windshield cleaner motors comprising a pivotally mounted disk, the edge of said disk being provided with a recess forming shoulders, said shoulders being adapted to be engaged by a movable part of the motor to oscillate said disk, a substantially T-shaped arm pivotally connected to said disk, a pivotally mounted valve supporting member connected to said arm, a valve carried by said member, and a spring surrounding said arm and engaging said valve supporting member, said spring being compressed by the oscillation of said disk to move said valve supporting member and shift said valve.

6. Valve actuating mechanism for windshield cleaner motors comprising a pivotally mounted disk, said disk being provided with a reduced portion forming shoulders adapted to be engaged by a movable part of the motor to operate said disk, a substantially T-shaped arm pivotally connected to said disk, a pivotally mounted substantially U-shaped valve supporting member arranged around said disk and said arm, the base of said member being provided with an opening through which the end of said arm

passes, a valve carried by said valve supporting member, and a spring arranged on said arm above said supporting member, said spring being compressed by the oscillation of said disk to move said supporting member and shift said valve.

7. Valve actuating mechanism for windshield cleaner motors, comprising a support, a valve carrier pivotally suspended thereon, a spring supported at its outer end by the valve carrier, and a spring positioning member connected to the inner end of the spring and suspended on said support coaxially with the valve carrier, operating means for said positioning member having a play connection therewith and oscillated by a moving part of the windshield cleaner motor, said inner end of the spring being movable by said positioning member about an arc between the support and said outer end of the spring whereby said spring will be initially compressed and then relaxed as said positioning member carries its inner spring end back and forth from one side to the other side of the plane which extends radially from the support through the outer end of the spring, and means for limiting the extent of oscillations of said positioning member.

8. In a fluid pressure motor for windshield cleaners, a motor casing part having a sleeve, a shaft journaled in the sleeve, means to rock the shaft from a moving part of the motor, a valve shiftable from and to two positions for effecting operation of the motor, a valve carrier pivoted on the sleeve and engaging the valve to move it back and forth, a spring, a spring positioning member pivoted on the sleeve coaxially with the valve carrier and oscillatable from a moving part of the motor, said spring connecting at one end to its positioning member and at the other end to said valve carrier, said positioning member acting to shift its end of the spring under compression from one side to the other side of the radial plane including the pivotal axis of said valve carrier and the point of connection between the spring and the valve carrier, and means for limiting the extent of oscillation of said positioning member.

9. In a fluid pressure motor for windshield cleaners, a motor casing part having a face with ports for the application of operating fluid pressure to the motor and a sleeve projecting beyond the ported face, a rock shaft journaled in the sleeve and operable by a moving part of the motor, a positioning member oscillatable on the sleeve from said rock shaft through a play connection therewith, a valve cooperating with the ported face, a valve carrier also oscillatable on the sleeve, spring means connecting the positioning member to the valve carrier and moving by said positioning member to opposite sides of said carrier and means coacting with and engageable by said spring means for limiting the degree of oscillation of said positioning member.

10. Valve actuating mechanism for windshield cleaner motors, comprising a support, a plate pivotally mounted thereon, means operable by a moving part of the motor and having a play connection with the plate for oscillating the same, an arm pivoted to the plate, a substantially U-shaped valve carrier pivotally engaged on said support on opposite sides of said plate and having an opening in its base slidably receiving the arm, a valve carried by said valve carrier, and a spring arranged on the arm and compressible on said base upon movement of the arm across the plane of said carrier by said plate whereby energy is stored up in the spring to shift the carrier after said arm is moved beyond the plane of said carrier.

11. A snap action valve mechanism for fluid pressure motors, comprising a casing part having a valve seat and an adjacent overhanging support provided with spaced lugs, a valve engaged with the valve seat, a valve carrier member and a positioning member both having openings by which they may be passed over said support for having bearing support thereon, the opening of one of said members being slightly larger than the support and enlarged at intervals to pass over the spaced lugs and permit said member being interlocked behind said lugs against displacement from said support, an arm pivoted to said valve carrier member with the enlarged opening and having a shouldered part for alternate engagement with the spaced lugs for limiting the oscillatory movement of said member with the enlarged opening, said latter member during its oscillation moving the pivot of the arm back and forth across the other of said members, one of said members being movable back and forth by a moving part of the motor, and a spring interposed between said members for normally urging them in opposite directions about the support.

12. Valve actuating mechanism for windshield cleaner motors, comprising a support, a plate having an opening to receive said support whereby said plate may be pivotally mounted on the support, said plate being oscillatable by a moving part of the motor, said support having spaced lugs on its exterior and the opening of said plate having radial enlargements to permit of said plate passing over said lugs, an arm pivoted to the plate and having a shouldered part for alternately engaging with said lugs, a valve carrier pivotally mounted on said support and having a portion extending radially beyond the plate, said arm being slidably engaged with said valve carrier portion, a

valve carried by said valve carrier, and a spring encircling said arm and compressible thereon upon movement of the arm across said carrier by said plate.

13. A fluid pressure motor comprising a casing, a piston operable therein, a valve seat having spaced ports communicating with the interior of the casing on opposite sides of the piston, a bearing sleeve extending into the casing, a shaft journaled in the sleeve, a member carried by the shaft and operable by the piston, and automatic valve mechanism operable by said member for connecting each of said ports in alternation to differential pressures, said valve mechanism comprising a valve engaging said valve seat, a valve carrier supporting the valve and suspended from said sleeve for oscillatory movement, means for limiting the oscillation of said carrier, spaced lugs on the periphery of said sleeve, a ring-like plate having radial depressions on its inner periphery for passing over the sleeve and lugs for permitting the mounting of said plate on the sleeve behind said lugs, an arm pivoted at one end to the plate and having its opposite end slidably engaged with said valve carrier, said arm having oppositely extending shoulders for alternately engaging with respective ones of said lugs for limiting the oscillation of said plate, said plate being oscillated by and during movement of said member, and a spring encircling the arm and compressible thereby against the valve carrier.

14. In a fluid pressure motor, a support, a valve carrier and a positioning member both oscillatably and coaxially mounted on the support, means having a play connection with said positioning member for oscillating the same, resilient means connecting said carrier and said positioning member and movable under tension by the latter into and beyond the plane of coincidence with said carrier member whereby the compressed resilient means will expand and act to oscillate said carrier member and said positioning member in opposite directions, and stop means engageable by a part of said resilient means for limiting the oscillatory movement of both said carrier and said positioning members.

15. A fluid pressure motor for windshield cleaners, comprising a casing having an open side, a closure therefor having a sleeve and fluid ports, a rock shaft journaled in the sleeve, a piston movable in the casing for actuating the rock shaft, and automatic valve mechanism for operatively admitting operating fluid pressure through said ports into the casing for moving the piston, said valve mechanism comprising a positioning member oscillatable on and about the sleeve by said rock shaft, a valve, a valve carrier oscillatable on the sleeve for moving the valve to control the admission of fluid pressure through the fluid ports, and a spring device connecting a part of the positioning member to the valve carrier and compressible by and during movement of said part and said spring device into radial coincidence whereby energy will be stored up in the spring for expenditure in effecting a valve shifting oscillation of the carrier after said part of the positioning member passes said radial coincidence.

16. In a fluid pressure motor for windshield cleaners, a motor casing part having fluid ports and a projecting support, a valve cooperating with said ports for admitting operating fluid pressure to the motor, a positioning member mounted on said support for oscillatory movement by and during operation of the motor, a valve carrier mounted on said support and having a spring supporting part disposed radially from and outward beyond said positioning member, means for oscillating the positioning member having a play connection therewith to permit of independent movement thereof, and a spring connected to the positioning member and also engaging the supporting part of said valve carrier, said spring having its inner end portion movable under tension by said positioning member back and forth across the carrier to opposite sides of a radial line extending from the pivot axis of said carrier through said spring supporting part.

17. In a fluid pressure motor for windshield cleaners, a motor casing, spaced piston elements therein, a rack member connecting said piston elements, said casing having a shaft bearing, a rock shaft journaled in the bearing and having its opposite ends extending therefrom unsupported, the outer end adapted for operating a wiper part, a gear element secured to the inner end of the shaft and meshing with the rack member against movement axially of the shaft, said gear element abutting the adjacent end of the shaft bearing and held thereagainst by said rack member, said casing also having fluid ports, a valve cooperating with said ports for operatively admitting fluid pressure to the opposite ends of the casing, and means operable by and during movement of the piston for actuating said valve.

18. In a fluid pressure motor for windshield cleaners, a motor casing, spaced piston elements therein, a rack member connecting said piston elements, said casing having a shaft bearing, a rock shaft journaled in the bearing and having its opposite ends extending therefrom unsupported, the outer end adapted for operating a wiper part, a gear element secured to the inner end of the shaft and meshing with the rack member against movement axially of

the shaft, said gear element abutting the adjacent end of the shaft bearing and held thereagainst by said rack member, said casing also having fluid ports, a valve cooperating with said ports for operatively admitting fluid pressure to the opposite ends of the casing, means for actuating the valve, and a connection between said means and said gear element for operating said means, said connection being maintained operative by the meshing relation of said gear element and said rack member.

19. In a fluid pressure motor for windshield cleaners, a motor casing, spaced piston elements therein, a rack member connecting said piston elements, said casing having a shaft bearing, a rock shaft journaled in the bearing and having its opposite ends extending therefrom unsupported, the outer end adapted for operating a wiper part, a gear element secured to the inner end of the shaft and meshing with the rack member against movement axially of the shaft, said gear element abutting the adjacent end of the shaft bearing and held thereagainst by said rack member, said casing also having fluid ports, a valve cooperating with said ports for operatively admitting fluid pressure to the opposite ends of the casing, a positioning member, a valve carrier supporting said valve, spring means interposed between the valve carrier and the positioning member and positionable by the latter for actuating the valve carrier, and a detachable connection between said gear element and said positioning member whereby the latter is operable by and during movement of said gear element, said rack member holding said shaft against axial movement to maintain said connection operative.

20. In a fluid pressure motor for windshield cleaners, a motor casing part having fluid ports and a shaft bearing, a rock shaft journaled in the bearing, a gear element fixed on the inner end of the rock shaft and holding the same against outward displacement, valve mechanism cooperating with said ports for operatively admitting fluid pressure to the motor and including an element having spaced shoulders, and a part carried by said gear element and extending between said shoulders for engaging therewith to effect operation of the valve mechanism, said part being displaceable from between said shoulders upon inward, axial movement of the shaft.

21. In a fluid pressure motor for windshield cleaners, a motor casing, a piston therein having a power-transmitting member, said casing having a shaft bearing, a rock shaft journaled in the bearing and having its opposite ends extending therefrom unsupported, a power element fixed on the inner end of the shaft and operatively connected to said power-transmitting member for rocking the shaft, said power-transmitting member serving to hold the rock shaft and said power element against movement axially of the shaft, valve mechanism for operatively admitting fluid pressure to the opposite ends of the casing, and a part operable by said power element for actuating said valve mechanism, said part being held normally in a position to be operable and adapted to be operatively disconnected from said valve mechanism upon inward, axial movement of the shaft in its bearing after said power-transmitting member has been first disconnected from said power element.

In testimony whereof, we affix our signatures.

FREDERICK G. FOLBERTH.
WILLIAM M. FOLBERTH.