Dec. 29, 1936. B. A. SWENNES 2,065,834

WATER PUMP

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Fig. 1

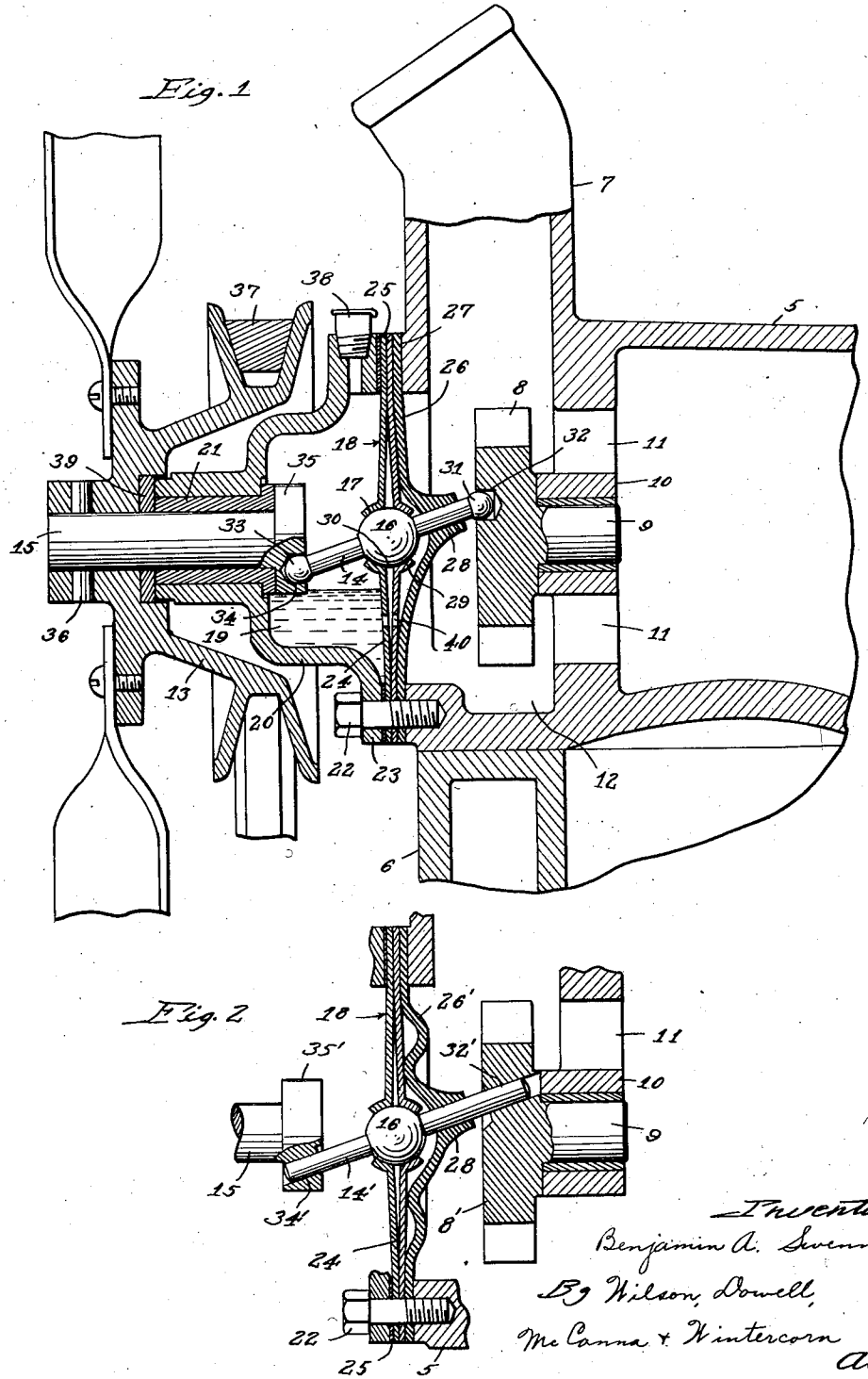

Fig. 2

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WATER PUMP

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Fig. 3

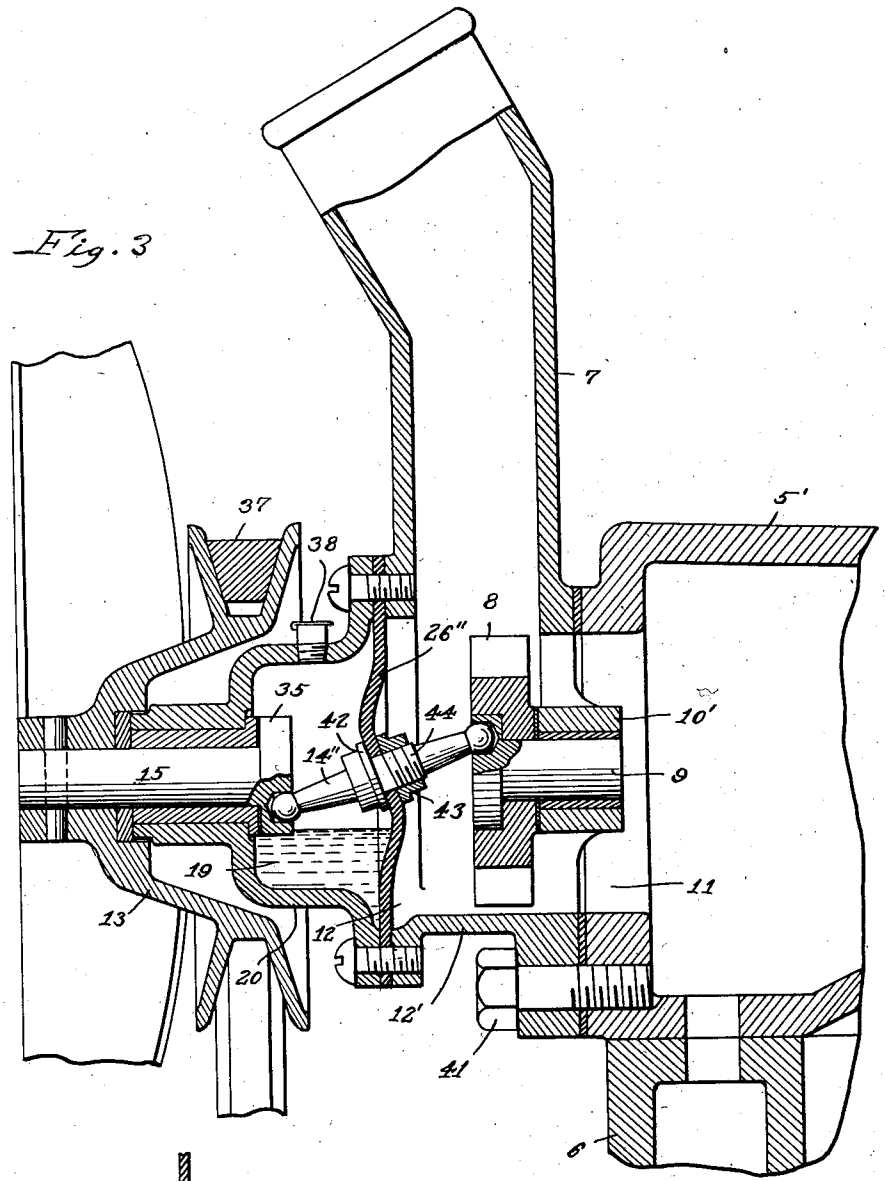

Fig. 4

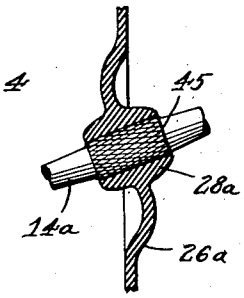

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Fig. 5

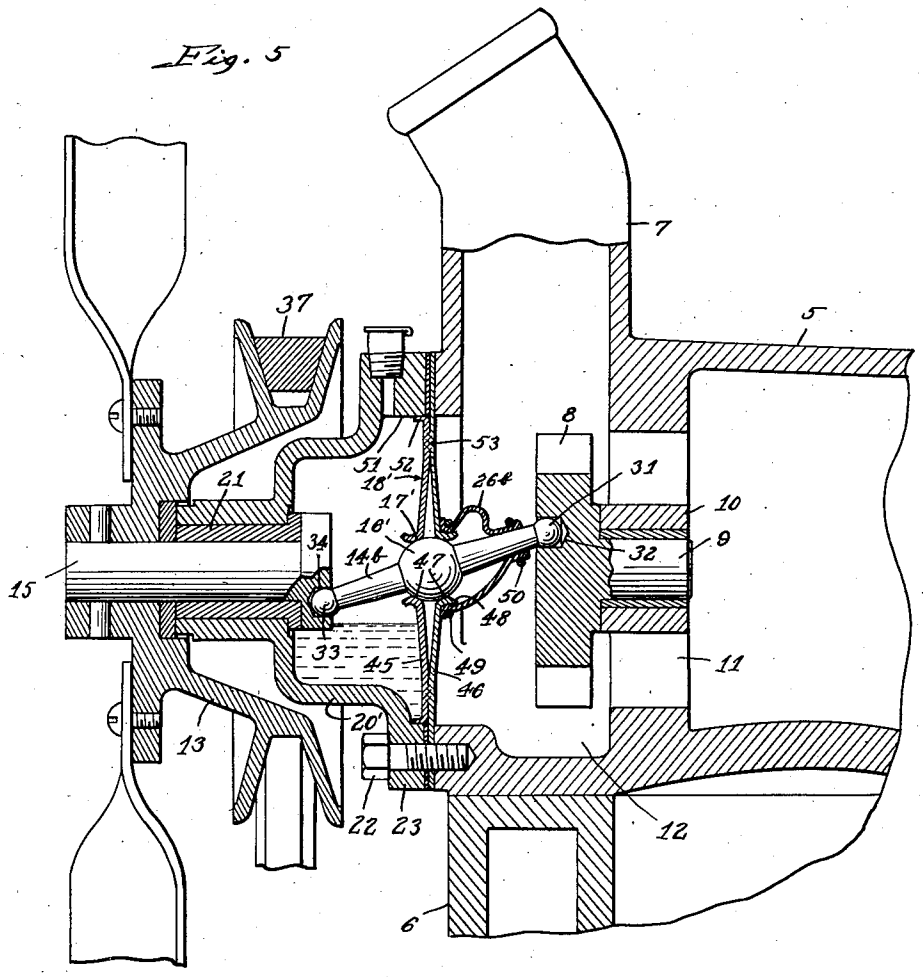
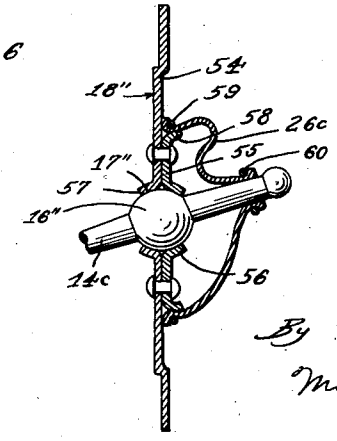


Fig. 6



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2,065,834

WATER PUMP

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Application June 12, 1933, Serial No. 675,376

33 Claims. (Cl. 103—111)

This invention relates to pumps generally, but more particularly a water pump for automobile engines.

One of the serious objections to water pumps has been that of leakage along the shaft through the stuffing box, and this leakage, in most cases, also gave rise to the further objection of improper lubrication, because of the water contaminating the lubricant. Many improvements have been made to combat this trouble but so far as I am aware, no really practical solution has been found for the difficulty. For one thing, any positive method of packing to prevent leakage gave rise to the objection that too much drag was imposed on the shaft to make it practical to drive the same with a fan belt and pulley, without excessive slippage. It is, therefore, the principal object of my invention to provide a packingless water pump which is free from the objection as to leakage and poor lubrication and is, furthermore, easy to drive so that there will be no danger of the belt slipping.

In accordance with my invention, a partition wall and boot or diaphragm is provided between an impeller chamber and an oil chamber, and a non-rotating wabble shaft is supported intermediate its ends on the partition for the transmission of power to one end by a rotary disc operating in the oil chamber and the driving of an impeller disc from the other end. With this construction it is obvious that the water is nicely retained behind the partition without any opportunity of leakage in the operation of the wabble shaft, and the driving parts are also assured of good lubrication so that they will operate easily and smoothly and give long service. Incidentally, the arrangement permits of unusual compactness in construction, and so few parts are required that the cost of manufacture is kept to a minimum.

The invention will be better understood as reference is made in the following detailed description to the accompanying drawings, wherein—

Figure 1 is a vertical section through a portion of an automobile engine block showing a pump thereon made in accordance with my invention;

Fig. 2 is a fragmentary sectional detail of a modified or alternative construction of this type;

Fig. 3 is a section similar to Figure 1 showing still another pump construction and also showing the pump as a separate removable unit instead of built partly into the block;

Fig. 4 is a fragmentary sectional detail showing a modified or alternative construction of this type;

Fig. 5 is a view similar to Fig. 1 showing another pump construction which because of its simplicity is at present considered the preferred form of this invention, and

Fig. 6 is a fragmentary sectional detail of a modified or alternative construction of this type.

Similar reference numerals are applied to corresponding parts throughout the views.

Referring first to Fig. 1, the numeral 5 designates a head on an engine block 6 having an upwardly extending water discharge neck 7 adapted for connection in the usual way with the automobile radiator. An impeller 8 of any suitable or preferred form is supported by its journal 9 in a bearing 10 provided in the front end of the head 5, and is arranged to draw water through the intake openings 11 into the impeller chamber 12 from whence it is discharged tangentially through the neck 7 in a well known manner. Now, in accordance with my invention, the impeller 8, instead of being driven directly by a shaft connection with the fan pulley 13, with the shaft extending through a suitable stuffing box, is driven by a non-rotating wabble nutating shaft 14 driven in turn by the shaft 15 carrying the fan pulley. The wabble shaft 14 has a ball-shaped enlargement 16 intermediate its ends universally fulcrumed in a socket or bearing 17 at the center of a partition wall 18 separaing the impeller chamber 12 from an oil chamber 19. A bell housing 20 provides the oil chamber 19 therein and has a central bearing 21 for reception of the fan shaft 15. The housing 20 is suitably secured to the head 5 by cap screws 22 entered through holes in the flange 23 and registering holes in the two discs 24 which make up the partition wall 18, and threaded in holes provided in the head 5. A suitable gasket 25 of material not deteriorated by lubricating oil or tending to absorb the same is provided between the flange 23 and the partition wall 18 to insure against leakage of oil from the chamber 19. A flexible diaphragm 26 of circular form has the marginal edge portion entered between the seat 27 on the front end of the head 5 and the partition wall 18 and is of rubber or other material not deteriorated by water nor tending to absorb water, to serve as a gasket at that point and prevent leakage of water from the impeller chamber 12. An enlarged neck portion 28 is formed on the diaphragm 26 at the center snugly receiving that portion of the wabble shaft 14 projecting into

the impeller chamber 12, whereby to prevent passage of water from the chamber 12 to the bearing 17 along the shaft 14. The annular flanges 29 formed at the centers of the discs 24 to provide the socket or bearing 17 are small enough in diameter to leave a space, as indicated at 30, between the centers of the discs 24 when the discs are assembled on the enlarged ball portion 16 of the wabble shaft from opposite sides. By virtue of this fact, it follows that when the screws 22 are tightened and force the marginal portions of the discs 24 together, so as to compress the gasket 25 and the marginal portion of the diaphragm 26, the ball portion 16 of the wabble shaft 14 is gripped resiliently between the halves of the socket or bearing 17 so that there will not be any noticeable play and the pump will operate smoothly and quietly. Furthermore, as wear occurs, the central portions of the discs 24 will come together more and more and take up the play that would otherwise be there, thus giving a pump that will operate quietly over a long period of service. That end of the wabble shaft 14 projecting into the impeller chamber 12 has a ball-shaped end 31 received in a hole 32 in the face of the impeller 8, and the other end 33 of said shaft is similarly received in a hole 34 in the face of a drive disc 35 formed on the inner end of the fan shaft 15.

In operation, assuming that the pulley 13 is suitably fixed to the fan shaft 15, as by a pin 36, and has the fan belt 37 working thereon, the rotation of the disc 35 causes the shaft 14 to have nutating motion, or what may be described as circular oscillation, that is, the forward end of the wabble shaft 14 moves in a circle, and this circular motion results in a corresponding circular motion of the rear end of the shaft and produces rotation of the impeller 8. The wabble shaft 14 merely fulcrums universally intermediate its ends in the socket or bearing 17; it does not revolve. As a result, the problem of preventing leakage along the shaft is greatly simplified; the diaphragm 26 need only hug the shaft tightly enough to provide a static seal, as distinguished from the old rotary type shaft seals. The seal is not only simpler to make but much more effective, and is really positive. The oil chamber 19 is filled through a cup 38 approximately to the level indicated, so as to furnish ample lubrication for the bearings 17 and 34 as well as the fan shaft bearing 21, the outer end of which, by the way, is sealed by a suitable felt washer 39 to prevent loss of lubricant. The fact that the chamber 19 is at atmospheric pressure reduces tendency for oil leakage, and, since the water is completely segregated from the oil, there is no contamination of oil, such as occurred invariably in the ordinary unimproved pumps. If desired, one or more openings may be provided at 40 to allow any oil to drain back into the oil chamber 19 that may find its way in between the partition wall 18 and diaphragm 26. The latter may be of any flexible material, although rubber is at present preferred, and more particularly a synthetic thermo-plastic rubber material, such as thiokol, derived from the inter-action of compounds of olefins with soluble polysulfide. This material is unaffected by oil and does not suffer any ill effects when subjected to the action of hot water and anti-freeze solutions. The impeller 8 is suitably die cast of a special bronze alloy found to have good bearing properties in water.

In Fig. 2 I have shown a similar construction modified to the extent of having the ends of the wabble shaft 14' left plain, that is, cylindrical, so as to fit like journals in inclined holes 32' and 34' provided in the impeller disc 8' and drive disc 35', respectively. This construction will, of course, give the same kind of operation as the one previously described. The diaphragm 26' is similar to the diaphragm 26 of the previous construction but is dished so as to have fullness sufficient to make it unnecessary for the same to stretch at all in the operation of the wabble shaft. In that way, it is considered there will be less strain imposed upon the diaphragm and less likelihood of the same breaking down and requiring replacement.

In the construction of Fig. 3, it will be observed that a separate pump housing 12' is provided bolted, or otherwise suitably secured, as at 41, on the front end of the head 5' and providing a mounting therein for the impeller 8 on a bearing 10' formed on the back wall of the pump housing, as shown. This pump is otherwise the same as that of Fig. 1 except that a different form of wabble shaft 14'' is provided, mounted directly on the flexible diaphragm 26'', the partition wall 18 being eliminated along with its bearing for support of the wabble shaft. The shaft 14'' has an annular shoulder 42 for abutment with one side of the diaphragm at the center and has a nut 43 threading on the threaded portion 44 to have abutment with the other side of the diaphragm so as to clamp it between the flange and nut, as shown. The flexing of the diaphragm permits wabble action to occur so that the shaft 14'' transmits drive from the drive disc 35 to the impeller disc 8. Instead of having the wabble shaft clamped to the diaphragm, I may have the same molded thereon, as shown in Fig. 4, in which the diaphragm is numbered 26*a*, and the wabble shaft 14*a*. The shaft with such a construction is preferably knurled, as at 45, to insure a better bond with the neck portion 28*a* of the diaphragm.

Referring now to Fig. 5 showing the, at present, preferred form of this invention, it will be observed that the wabble shaft 14*b* has its ball-shaped enlargement 16' universally fulcrumed in the socket or bearing 17' at the center of a partition wall 18'. The latter separates the impeller chamber from the oil chamber in much the same way as the partition 18 of Figure 1, except that there are no openings 40 in the partition 18' and no diaphragm corresponding to the diaphragm 26. Instead of the diaphragm 26 a boot or sleeve 26*b* is provided serving merely to seal the bearing 17' against the entry of water from the impeller chamber. The partition 18' is made up of two sheet metal discs 45 and 46 flanged centrally as at 47 to provide frusto-conical bearing portions to form the bearing 17'. The rim 48 of the flange on the disc 46 is bent outwardly as shown so as to form an annular groove externally of the bearing 17' in which to seat the forward and larger end of the boot 26*b* which, as shown, is held tightly on the seat by a suitable locking ring 49 to provide a water-tight joint. The other end of the boot is small enough to fit tightly on the shaft 14*b*, and at that point another locking ring 50 is provided to make a water-tight joint. The boot may be molded in one piece of synthetic rubber like the diaphragms in the other constructions, although any other flexible material suitable for the present purposes may be used. It is obvious that the small boot may be provided at much lower cost than a

diaphragm and it is found that it offers less resistance to the motion of the wabble shaft, so that it is preferred for two important reasons.

In practice, it has been found to be very important to have the bearing 17' accurately located coincident with the axes of the fan shaft 15 and impeller shaft 9, and unless special provision were made for properly locating the partition 18' with respect to the bell housing 20', it follows that much time would be lost in assembling the pump on the motor and there would always be likelihood of the working parts binding and wearing excessively. I therefore make a counterbore 51 in the housing 20' in exact concentricity with the bearing 21 for the fan shaft 15, and provide an annular flange 52 on the periphery of the disc 45 exactly concentric with the bearing 17' adapted to fit snugly in said counterbore. In that way it is only necessary in assembling to first interfit the partition 18' with the bell housing 20' and then enter the rear end 31 of the wabble shaft in its bearing 32 on the impeller 8, and there is every assurance of the parts being properly located for smooth and easy operation. The disc 45 may be fastened in any suitable way to the disc 46; I have shown spot welding at 53. The screws 22 which fasten the housing 20' to the head 5 are passed through holes in the flange 23 of the housing 20' and through registering holes in the marginal portion of the disc 46, and gaskets may be provided in front of and behind the disc 46 to prevent leakage of oil from the oil chamber or leakage of water from the impeller chamber when the screws are tightened.

As shown, the discs 45 and 46 may have the bearing flanges 47 provided of slightly smaller diameter than the ball portion 16' of the wabble shaft in the same way as described in Fig. 1 in order to provide a space between the discs at the bearing flanges and make it necessary to spring the discs slightly in welding them together at 53, whereby to cause the bearing flanges 47 to grip the ball 16' resiliently therebetween for the purpose previously mentioned.

In Fig. 6 a slightly modified construction is shown in which the wabble shaft 14c has its ball portion 16'' received in a bearing 17'' provided at the center of a partition 18'' made up almost entirely of one sheet metal disc 54 arranged to be clamped in place under the bell housing similarly as the disc 46 in Fig. 5. In this construction a small ring 55 is riveted or otherwise suitably secured to the disc 54 and has an inner annular flange 56 to cooperate with the flange 57 on the disc 54 to form the bearing 17''. An outer annular flange 58 is also provided on the ring 55 which projects rearwardly from the disc 54 so as to provide a seat externally of the ring for the front and larger end of the flexible boot 26c. A locking ring 59 fastens this end of the boot in place on the seat with a water-tight joint. The other end of the boot is small enough to fit tightly on the wabble shaft and has another locking ring 60 thereon to make a water-tight joint at that place. With this construction it is manifest that the disc 54 may be dished so as to provide an annular shoulder 61 to correspond with the flange 52 of Fig. 5 whereby to accurately center the partition 18'' with respect to the bell housing and properly correlate the bearing 17'' with the fan shaft and impeller shaft as previously stated.

It is believed the foregoing description conveys a good understanding of all of the objects and advantages of my invention. While reference has been made to the special adaptability of my invention to use on automobile engines, it will, of course, be understood that the same is applicable to pumps generally, whether it be for the pumping of water or any other liquid or fluid medium. The appended claims have, therefore, been drawn so as to cover all legitimate modifications and adaptations.

I claim:

1. In an automobile engine water circulating pump, means providing an impeller chamber, means providing an oil chamber for lubricating oil, a drive shaft extending into the oil chamber through a bearing communicating therewith for lubrication, an impeller mounted for rotation in the other chamber, a partition separating the two chambers and having a bearing supplied with lubricant from the oil chamber, and a wabble shaft universally fulcrumed intermediate its ends in the bearing on the partition whereby movement communicated to one end of said shaft in a circle results in movement of the other end correspondingly, said shaft being pivotally connected at one end to said drive shaft at a section spaced laterally from the axis of rotation thereof, and being pivotally connected at the other end to said impeller at a section spaced laterally from its axis of rotation.

2. A device as set forth in claim 1 wherein the shaft has a ball-shaped bearing portion for its fulcrum, and said partition comprises two wall sections having opposed frusto-conical bearing portions formed thereon and receiving the ball portion therebetween, the bearing portions being spaced from one another when the ball portion is engaged thereby, and said wall sections being flexible and being forced together at points remote from the bearing whereby to urge the bearing portions resiliently into engagement with the ball portion.

3. In an automobile engine water circulating pump, means providing an impeller chamber, means providing an oil chamber for lubricating oil, a drive shaft extending into the oil chamber through a bearing communicating therewith for lubrication, an impeller mounted for rotation in the other chamber, a partition separating the two chambers, said partition having a bearing therein adapted to receive oil from the oil chamber for lubrication, a wabble shaft universally fulcrumed in said bearing intermediate its ends, whereby movement communicated to one end of said shaft in a circle results in movement of the other end correspondingly, without necessitating rotation of the shaft, said shaft being pivoted at one end on the drive shaft at a given radius and pivoted at its other end on the impeller at a given radius, and a flexible shield for isolating the bearing from the impeller chamber to prevent contamination of lubricant in said bearing by liquid in the impeller chamber, said shield having a fluid-tight connection on the one hand with the partition and on the other hand with the wabble shaft.

4. A device as set forth in claim 3 wherein the flexible shield is provided of a form having sufficient fullness between its fluid-tight connections whereby to allow freedom of movement of the shaft without stretch or strain on the shield.

5. A device as set forth in claim 3 wherein the shaft has a ball-shaped bearing portion for its fulcrum, and said partition comprises two wall sections having opposed frusto-conical bearing portions formed thereon and receiving said

ball portion therebetween, the bearing portions being spaced from one another when the ball portion is engaged thereby, and said wall sections being flexible and being forced together at points remote from the bearing whereby to urge the bearing portions resiliently into engagement with the ball portion.

6. In a water circulating pump for an automobile engine, the combination of an impeller in the cooling water circulating passage of the engine, a fan pulley shaft supported in coaxial spaced relation to the impeller, a vibratory spindle extending from the fan shaft to the impeller and disposed at an angle to the axes thereof and pivotally connected at one end to the fan shaft at a certain radius measured from the axis of the latter and at the other end to the impeller at a certain radius measured from the axis of the latter, means supporting the spindle intermediate its ends for universal fulcrum motion, and a flexible shield member having a water-tight connection with the spindle and extending therefrom to the fulcrum means to isolate the fulcrum from the water circulating passage of the engine.

7. In a water circulating pump for an automobile engine, the combination of an impeller in the cooling water circulating passage of the engine, a housing adapted to be secured to the engine adjacent said passage, a fan pulley shaft supported in said housing in coaxial spaced relation to the impeller, a partition for separating the housing from the circulating passage of the engine and adapted to be secured between the housing and the engine, said partition having a central bearing, and a wabble shaft universally fulcrumed intermediate its ends in said bearing and extending forwardly from the partition to the fan shaft and rearwardly from the partition to the impeller and detachably pivotally connected at the front and rear ends to said fan shaft and impeller, respectively, for vibratory motion circlewise at both ends.

8. A pump as set forth in claim 7 including interfitting portions on the partition and housing for accurately locating the bearing on the partition in coaxial relation to the fan shaft, whereby to insure coaxial relationship between said bearing and the fan shaft and impeller when the wabble shaft is pivotally connected to the fan shaft and impeller.

9. A water pump as set forth in claim 7 including a boot of flexible material surrounding that portion of the wabble shaft projecting into the circulating passage of the engine, said boot having the forward end connected with a water-tight joint to the partition and the rear end connected with the water-tight joint to the wabble shaft whereby to isolate the bearing from the circulating passage of the engine.

10. In a mechanism for transmitting power from a drive member on one side of a fluid-tight partition to a driven member on the other side of said partition, the combination with such partition of a wabble shaft extending through the partition from the drive member to the driven member, a ball-shaped bearing portion on said shaft substantially in the plane of the partition, said partition having two wall sections with opposed frusto-conical bearing portions formed thereon and receiving said ball portion therebetween for universal fulcrum action, and a diaphragm on the fluid side of the partition having the wabble shaft extending therethrough with a fluid-tight joint, said diaphragm extending from the shaft to the partition so as to isolate the bearing from the fluid, said diaphragm being constructed of flexible material and so as to give the shaft freedom for circular oscillation relative to the partition.

11. A mechanism as set forth in claim 10 wherein the bearing portions are spaced from one another when the ball portion is engaged thereby and wherein said wall sections are flexible and adapted to be forced together at points remote from the bearing whereby to urge the bearing portions resiliently into engagement with the ball portion.

12. A mechanism as set forth in claim 10 including a support for one of the said drive and driven members, and interfitting means on the partition and support for locating the fulcrum bearing accurately in coaxial relation with the drive and driven members.

13. The combination in a device of the class described, of a housing having a bearing and a driving shaft supported therein, a driving member on the inner end of the shaft in the housing, a pump housing to which the first housing is detachably secured having a bearing and an impeller supported therein in coaxial relation with the driving member, a rigid partition separate from the two housings but fixed therebetween, a wabble shaft extending through and mounted for oscillation in an axial bearing opening provided in said partition, means providing pivotal driving connections at the opposite ends of the wabble shaft with the driving member and impeller in spaced relation to the axis of rotation, the first housing containing fluid lubricant at atmospheric pressure for lubrication of the bearings for the driving and wabble shafts, the pump housing containing fluid under pressure in the normal operation of the device, and a flexible diaphragm surrounding the wabble shaft in the pump housing and sealing the bearing opening in the partition to prevent passage of fluid from the pump housing under pressure into the first housing.

14. The combination in a device of the class described, of a housing having a bearing and a driving shaft supported therein, a driving member on the inner end of the shaft in the housing, a pump housing to which the first housing is detachably secured having a bearing and an impeller supported therein in coaxial relation with the driving member, said bearing and impeller being constructed for operation using the fluid being pumped as a lubricant for the bearing, a rigid partition separate from the two housings but fixed therebetween, a wabble shaft extended through and mounted for oscillation in an axial bearing opening provided in said partition, said shaft having driving connections at the opposite ends thereof with the driving member and impeller in spaced relation to the axis of rotation, the first housing containing fluid lubricant for splash lubrication of the bearings for the driving and wabble shafts, and means sealing the wabble shaft bearing against passage of fluid from the pump housing to the first housing.

15. In a device of the class described, a housing having an outer bearing, a pump housing having a coaxially arranged inner bearing, a partition between the housings serving to seal the first housing to form an oil chamber therein, and serving to seal the pump housing to prevent loss of fluid therefrom, the partition having a middle bearing coaxial with but axially spaced from the outer and inner bearings, a pulley shaft received in the outer bearing and carrying a drive pulley

on the outer end and a drive member on the inner end, an impeller received in the inner bearing, a wabble shaft mounted for non-rotating circular oscillation in the middle bearing and projecting into the oil chamber for pivotal connection with the drive member and into the pump housing for pivotal connection with the impeller, and a freely moving seal member having a static sealing connection with the wabble shaft at one point and a static sealing connection with the partition at another point, said wabble shaft being non-rotatable in its circular oscillation.

16. In a device of the class described, a housing having an outer bearing, a pump housing having a coaxially arranged inner bearing, a partition between the housings forming one wall for an oil chamber in the first housing and also forming one wall for the pump housing, the partition having a middle bearing coaxial with but axially spaced from the outer and inner bearings, a pulley shaft received in the outer bearing and carrying a drive pulley on the outer end and a drive member on the inner end, an impeller received in the inner bearing, and a wabble shaft mounted for non-rotating circular oscillation in the middle bearing and projecting into the oil chamber for pivotal connection with the drive member and into the pump housing for pivotal connection with the impeller, a gasket interposed between the first housing and one side of the partition to seal the oil chamber, and a flexible diaphragm on the other side of the partition having a marginal portion interposed between the partition and pump housing to seal the housing, and having a central portion forming a static seal by connection with the wabble shaft to isolate the middle bearing from the pump housing.

17. A device as set forth in claim 16 wherein the first gasket is of different material from the diaphragm whose marginal portion forms the second gasket, the first gasket being selected for oil-proof characteristics and the diaphragm being selected for water-proof characteristics.

18. In an automobile construction, the combination with an engine head having water passages therein and an open impeller chamber communicating therewith, together with a rotatable impeller received in a central bearing in said chamber, of a bell housing having a marginal flange detachably secured to the engine head closing the impeller chamber, the bell housing having a central bearing in coaxial relation with the impeller, a pulley shaft received in said bearing and carrying a drive pulley on the outer end and a drive member on the inner end, an intermediate bearing support fixed between the bell housing and engine head to form an oil containing chamber in the bell housing whereby to lubricate the aforesaid bearing and an axial bearing on said support, and a wabble shaft mounted in the axial bearing on said support for circular oscillation and extending into the oil chamber for pivotal connection with the drive member and into the impeller chamber for pivotal connection with the impeller.

19. An automobile construction as set forth in claim 18, including a static seal in the impeller chamber for the axial bearing, said seal comprising a flexible member enveloping the wabble shaft engaging the same at one point snugly to prevent passage of fluid from the impeller chamber along the shaft, the shaft being non-rotatable with respect to said member, and said member engaging the bearing support at another point to provide a similar fluid-tight connection.

20. An automobile construction as set forth in claim 18, wherein the bearing support is concentrically located with respect to one of said chambers to locate the axial bearing in coaxial relation with one of the two other bearings, said bearing support having an annular shoulder provided thereon for a telescoping fit in an annular recess in the other chamber whereby to coaxially arrange the axial bearing with relation to the other bearing in said chamber.

21. In a device wherein fluid under pressure is utilized, the combination with a housing containing such fluid and having a securing surface, and a wabble shaft extending in angular relation to the surface and arranged to have circular oscillation, of a two-piece plate constructed for attachment to the securing surface, having the two pieces thereof formed to provide a socket to receive with a working fit a ball-shaped portion provided on the shaft, with a working fit, and a flexible diaphragm of substantially the same dimensions as the plate for engagement also with the securing surface, the diaphragm having an axially projecting portion fitting snugly on the shaft and movable therewith in its circular oscillation, the shaft being non-rotatable with respect to said portion.

22. A structure as set forth in claim 21 wherein the two plate pieces have the socket portions spaced from one another when the ball portion of the shaft is engaged therebetween, and wherein said plate pieces are flexible and are forced together at points remote from the socket whereby to urge the socket portions resiliently into engagement with the ball portion.

23. In an automobile engine water circulating pump, means providing an impeller chamber, means providing an oil chamber for lubricating oil, a drive shaft extending into the oil chamber through a bearing communicating therewith for lubrication, an impeller arranged to operate in the other chamber, a partition separating the two chambers and having a bearing supplied with lubricant from the oil chamber, and a wabble shaft universally fulcrumed intermediate its ends in the bearing on the partition whereby movement communicated to one end of said shaft in a circle results in movement of the other end correspondingly, said shaft being pivotally connected at one end to said drive shaft at a certain radius relative to the axis of rotation of the latter, and being operatively connected at the other end to said impeller.

24. A device as set forth in claim 23 wherein the shaft has a ball-shaped bearing portion for its fulcrum, and said partition comprises two wall sections having opposed frusto-conical bearing portions formed thereon and receiving the ball portion therebetween, the bearing portions being spaced from one another when the ball portion is engaged thereby, and said wall sections being flexible and being forced together at points remote from the bearing whereby to urge the bearing portions resiliently into engagement with the ball portion.

25. In an automobile engine water circulating pump, means providing an impeller chamber, means providing an oil chamber for lubricating oil, a drive shaft extending into the oil chamber through a bearing communicating therewith for lubrication, an impeller arranged to operate in the other chamber, a partition separating the two chambers, said partition having a bearing therein adapted to receive oil from the oil cham-

ber for lubrication, a wabble shaft universally fulcrumed in said bearing intermediate its ends, whereby movement communicated to one end of said shaft in a circle results in movement of the other end correspondingly, without necessitating rotation of the shaft, said shaft being pivoted at one end to the drive shaft at a given radius and operatively connected at its other end to the impeller, and a flexible shield for isolating the bearing from the impeller chamber to prevent contamination of lubricant in said bearing by liquid in the impeller chamber, said shield having a fluid-tight connection on the one hand with the partition and on the other hand with the wabble shaft.

26. In an automobile engine water circulating pump, means providing an impeller chamber, means providing an oil chamber for lubricating oil, a drive shaft extending into the oil chamber through a bearing communicating therewith for lubrication, an impeller arranged to operate in the other chamber, a wabble shaft universally fulcrumed intermediate its ends between the impeller and drive shaft, whereby movement communicated to one end of said shaft in a circle results in movement of the other end correspondingly without necessitating rotation of the shaft, said shaft being pivoted at one end to the drive shaft at a given radius and operatively connected at its other end to the impeller, and a flexible shield for isolating the oil chamber from the impeller chamber, said shield having a fluid-tight connection with the wabble shaft adjacent the fulcrum therefor.

27. In a water circulating pump for an automobile engine, the combination of an impeller in the cooling water circulating passage of the engine, a fan pulley shaft, a vibratory spindle extending from the shaft to the impeller and disposed at an angle to the shaft axis and pivotally connected at one end to the shaft at a certain radius measured from the axis of the latter and operatively connected at the other end to the impeller, means supporting the spindle intermediate its ends for universal fulcrum motion, and a flexible shield member having a water-tight connection with the spindle and extending therefrom to the fulcrum means to isolate the fulcrum from the water circulating passage of the engine.

28. In a water circulating pump for an automobile engine, the combination of an impeller in the cooling water circulating passage of the engine, a housing adapted to be secured to the engine adjacent said passage, a fan pulley shaft supported in said housing, a partition for separating the housing from the circulating passage of the engine and adapted to be secured between the housing and the engine, said partition having a central bearing, and a wabble shaft universally fulcrumed intermediate its ends in said bearing and extending rearwardly from the partition and operatively connected to the impeller, and extending forwardly from the partition to the fan shaft and pivotally connected thereto for vibratory motion of said wabble shaft circlewise at both ends.

29. A water pump as set forth in claim 28 including a boot of flexible material surrounding that portion of the wabble shaft projecting into the circulating pasage of the engine, said boot having the forward end connected with a water-tight joint to the partition and the rear end connected with the water-tight joint to the wabble shaft whereby to isolate the bearing from the circulating passage of the engine.

30. In a device of the class described, a housing having an outer bearing, a pump housing, a partition between the housings serving to seal the first housing to form an oil chamber therein and serving to seal the pump housing to prevent loss of fluid therefrom, the partition having a central bearing in coaxially spaced relation to the outer bearing, a pulley shaft received in the outer bearing and carrying a drive pulley on the outer end and a drive member on the inner end, an impeller in the pump housing, a wabble shaft mounted for non-rotating circle oscillation in the central bearing and projecting into the oil chamber for pivotal connection with the drive member and into the pump housing for operative connection with the impeller, and a freely moving seal member having a static sealing connection with the wabble shaft at one point and a static sealing connection with the partition at another point, said wabble shaft being non-rotatable in its circular oscillation.

31. A pump as set forth in claim 26, wherein the flexible shield is formed of a synthetic thermo-plastic rubber material derived from the interaction of compounds of olefins with soluble polysulfide, whereby to resist deterioration from contact with oil in the oil chamber and hot water and anti-freeze solutions in the impeller chamber.

32. A pump as set forth in claim 27, wherein the flexible shield member is formed of a synthetic thermo-plastic rubber material derived from the inter-action of compounds of olefins with soluble polysulfide, whereby to resist deterioration from contact with hot water and anti-freeze solutions in the water circulating passage of the engine.

33. A device as set forth in claim 30, wherein the freely moving seal member is formed of a synthetic thermo-plastic rubber material derived from the interaction of compounds of olefins with soluble polysulfide, whereby to resist deterioration from contact with oil from the first housing and the fluid in the pump housing.

BENJAMIN A. SWENNES.

CERTIFICATE OF CORRECTION.

atent No. 2,065,834. December 29, 1936.

BENJAMIN A. SWENNES.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows; Page 5, second column, line 20, claim 21, strike out the words and comma "with a working fit,"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of March, A. D. 1937.

Seal)

Henry Van Arsdale
Acting Commissioner of Patents.