March 11, 1930. A. FRISCH 1,750,170

PUMPING APPARATUS

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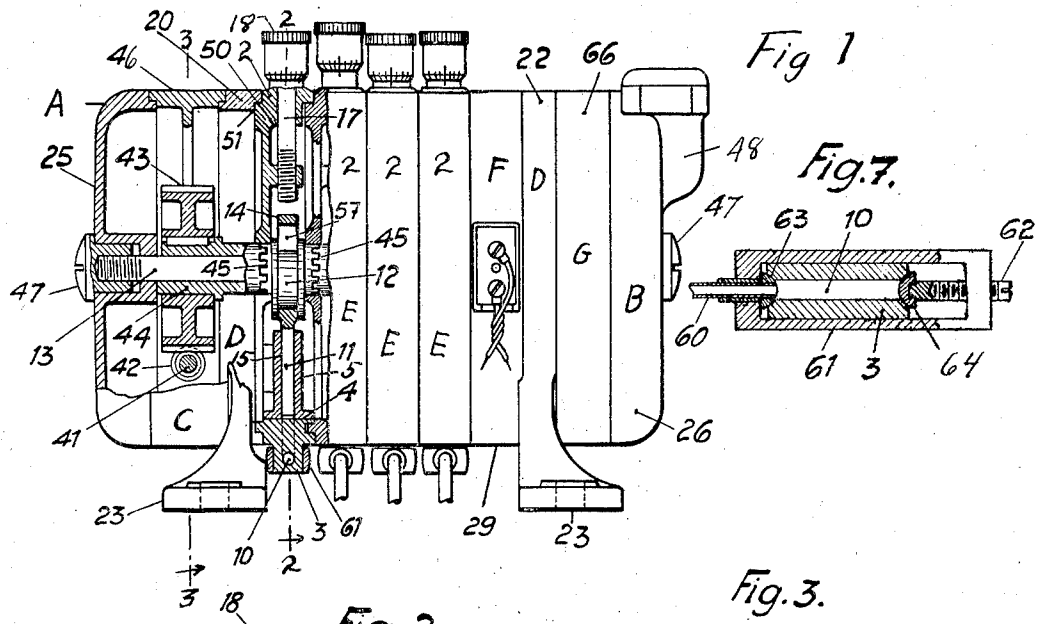


Fig 1

Fig.7.

Fig.2.

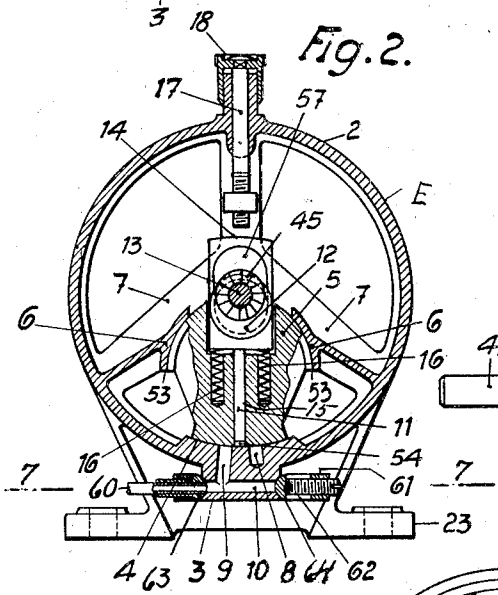
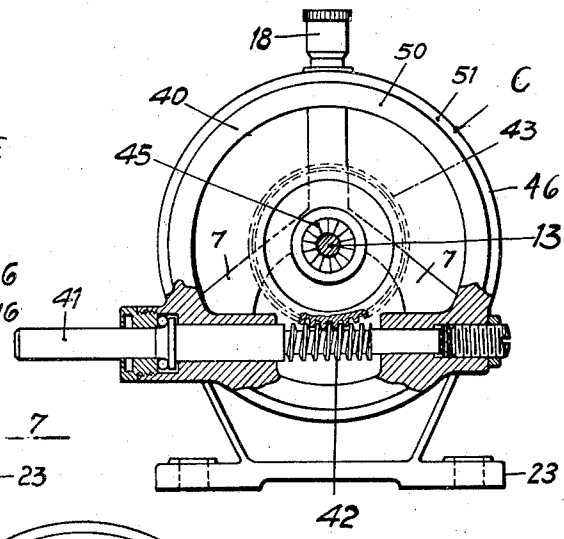


Fig.3.



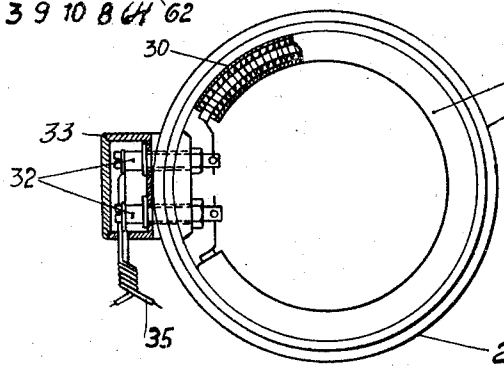


Fig.4.

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Fig. 5.

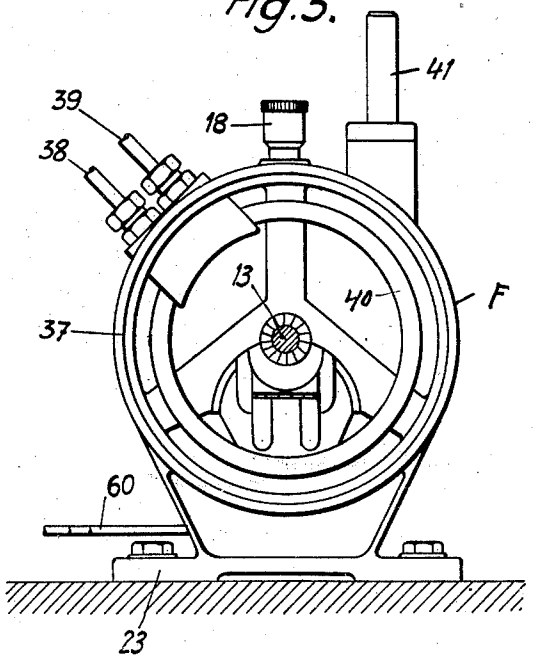
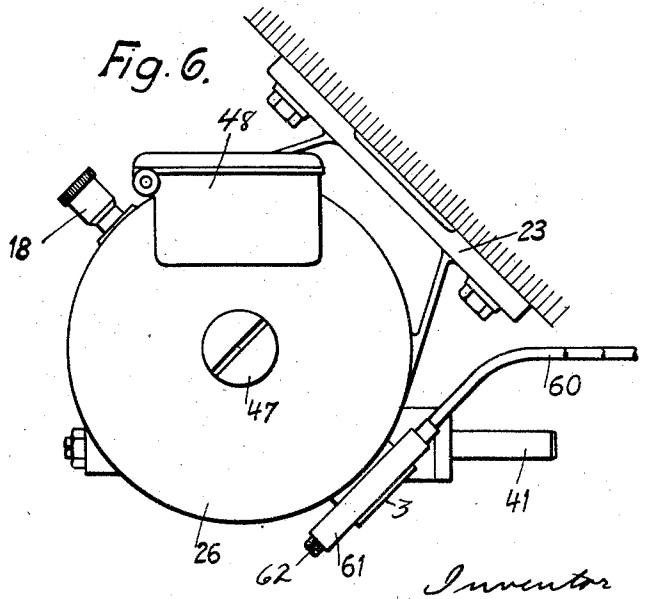


Fig. 6.



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UNITED STATES PATENT OFFICE

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PUMPING APPARATUS

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This invention relates to that type of pumping apparatus which is adapted to deliver liquid from a source of supply through a plurality of pipes and by the use of a plurality of separate pumps. Although the invention, in a broad sense, may be utilized for the pumping and distributing of any desired liquid, I have in mind particularly the pumping of lubricating oil to a plurality of points to be lubricated, for instance, the bearings of a machine.

The conditions of use of such an apparatus vary through a comparatively wide range. This includes the number of points to be lubricated; the need or lack of need of warming the oil; the character of the heating medium, if such be used; the character and position of the surface or part from which the pumping apparatus is supported; the direction in which the several liquid delivery pipes lead; relative positions of the pumping apparatus and the pump driving shaft; the capacity of the oil storage reservoir, etc.

The main object of the present invention is to so construct the apparatus that it may be readily modified, adjusted or changed to suit the particular conditions of use. This object is secured by providing a plurality of separate elements, parts or sections adapted to be assembled to form the complete apparatus, said elements, parts or sections being so designed that they may be assembled in a wide variety of different arrangements or combinations according to the wishes or needs of the user.

As a further important feature the elements are so designed that they form the liquid storage or supply receptacle and enclose all of the working parts. These different sections may serve for pumping, pump driving, heating, supporting, capacity increasing, etc. Any desired number of the section of each particular kind may be employed in making up the complete apparatus. All of the units of certain kinds, such for instance, as heating and capacity increasing may be omitted, if not needed.

In the accompanying drawings, I have illustrated one embodiment of my invention. It will be understood that this is merely for purposes of illustration and that a wide variety of changes may be made in the details of construction without departing from the scope or spirit of my invention.

In these drawings:

Fig. 1 is a side elevation partly in axial section of an apparatus embodying my invention;

Fig. 2 is a transverse section on the line 2—2 of Fig. 1, through one of the pumping sections;

Fig. 3 is a transverse section on the line 3—3 of Fig. 1, showing partly in end elevation and partly in section the driving element;

Fig. 4 is an end view partly in elevation showing one form of heating unit;

Fig. 5 is an end view showing another type of heating unit, and also showing the drive shaft at right angles to the supporting surface;

Fig. 6 is an end view of the entire apparatus showing the same suspended from an overhead inclined surface; and

Fig. 7 is a transverse section on the line 7—7 of Fig. 2 showing the oil pipe connections.

The device as illustrated in Fig. 1 is made up of a plurality of sections or elements each having an annular wall and adapted when assembled to form an oil storage reservoir. These sections include end sections A and B, a driving or power section C, a pair of supporting sections D, a plurality of pumping sections E, a heating section F and a capacity increasing section G. These all have cylindrical peripheral walls of the same diameter and general character and so constructed that when the sections are placed end to end and clamped together they form a substantially fluid tight liquid receptacle. Other kinds of sections may be employed, if desired, and certain of the kinds of sections, such for instance, as heating and capacity increasing may be omitted. There may be any number of the pumping sections.

Although, within the broad scope of my invention, I may provide any suitable form of pumping mechanism within each pumping section E and adapted to be operated

from an axially disposed shaft, I preferably employ the type of mechanism illustrated in Figs. 1 and 2. The pumping element or section has a peripheral wall 2 which is provided at one point with a projection or boss serving as an oil pipe connection 3. Adjacent to this connection, the wall provides a cylindric surface 4 constituting the valve surface of the pump. Within the section there is provided a valve member 5 which is adapted to oscillate about a center eccentrically disposed in respect to the axis of the section. The peripheral wall carries inwardly extending flanges or bracket parts 6 provided with cylindric surfaces concentric with the axis of oscillation of the valve 5 and serving to guide and position the latter and hold it against the valve surface 4. The peripheral wall 2 also carries brackets or a spider 7 which may carry the parts 6 and also serve as a bearing to hold the rotatable element of the pump concentric with the peripheral wall.

The valve surface 4 of the peripheral wall has an oil suction passage 8 which communicates with the interior of the reservoir. It also has an oil delivery passage 9 which communicates with a passage 10 in the oil pipe connection 3. The valve member 5 carries a piston 11 movable radially of the valve in a pump cylinder 15 which communicates alternately with the suction passage 8 of the delivery passage 9 as the valve 5 is oscillated.

The piston is operated by an eccentric disk or cam 12 mounted on a shaft or tie rod 13 and engaging a slidable member or cross head 14 connected to the piston 11 and movable radially in respect to the axis of oscillation of the valve. The eccentric 12 has lost motion connections with the slidable member or cross head 14 and acts to force the latter during the delivery stroke while springs 16, mounted in the valve 5, engage the slidable member to force the latter in the opposite direction and hold it against the eccentric 12.

For limiting the stroke of the piston 11, there is provided an adjustable stop in the path of the cross-head 14. This means is shown as an adjusting screw 17 extending through the peripheral wall 2 from the side opposite to the oil connection 3 and provided with a head 18 whereby the position of the adjusting screw may be varied at will. This head or handle 18 is provided with a pointer or indicating mark which is movable over a scale on a supporting or guiding boss on the peripheral wall so that the operator may regulate the stroke of the piston and the quantity of oil which is sucked in at each suction stroke and conducted to the point to be lubricated.

In the operation of the pumping element, the eccentric 12 is rotated by means hereinafter described and acts to not only force down the piston and permit its upward movement by the spring 16, but also acts to oscillate the valve 5 so that during the suction stroke of the piston, the cylinder 15 is in communication with the suction passage 8 and during forcing stroke it is in communication with the delivery passage 9. The down stroke is a positive one so that the oil is forced out under pressure, but the suction stroke is due to the springs and may be limited by the stop 17. Therefore it is not essential that the cylinder 15 be in communication with the suction passage 8 during the entire up stroke.

The shaft 13 is not necessarily rotatable. As shown it serves primarily as a connecting or tie bolt for holding the sections together in assembled relationship. The eccentric disk has a hub which is provided with clutch teeth at opposite ends so that the hub of each pump may interengage with the hub of an adjacent pump or with the hub of the driving gear. Thus power may be transmitted from one pumping element to the next and any desired number of the pumping elements may be assembled with their eccentrics interlocked and the eccentric of the end of one such pumping element connected to the drive. The eccentric disks may be oriented so that they do not give their respective forcing strokes at the same time. Thus the torque on the drive may be distributed and maintained substantially constant, and the delivery pipes may lead from different points around the periphery of the apparatus.

For supporting the device and for attaching it to any surface irrespective of whether the latter be, below, above, at the side of, or inclined, there are provided the supporting sections or elements D. Each of these includes a peripheral wall section 22, and a foot or bracket 23. These sections may be assembled with the foot below as shown in Figs. 1, 2, 3 and 5 or in any other position, as for instance, above and inclined as shown in Fig. 6. I have illustrating only two of these supporting sections, but it will be evident that a larger number may be provided, if desired, and that they may be positioned at other places in the assembled device than that illustrated in Fig. 1.

In some cases, it is desired to heat the oil or other liquid in order to reduce its viscosity and facilitate its distribution. For this purpose, there may be employed a heating section F, shown in Figs. 1 and 4. This unit includes a peripheral wall 29 and a heating coil 30 arranged in a tube 31. The ends of the wire project through insulation in the peripheral wall, and connected to terminals 32 which may be mounted in a housing 33 and into which the lead wires extend.

The heating may be effected by the action of a fluid instead of by electricity. In Fig. 5 there is illustrated a heating unit having a peripheral wall 37 through which extend pipes 38 and 39. These are connected to the opposite ends of a pipe or coil 40 so that hot

air, hot gases, steam or other heating fluid may be circulated through the pipe 40 to heat the liquid in the storage space. Either form of heating section may be rotated to bring the connections for the wires or pipes to the most convenient point on the periphery of the apparatus.

For driving the pump there is provided a driving element C. This has bearings for a shaft 41 which may carry a gear, such for instance, as a worm 42 meshing with a gear such as a worm wheel 43 encircling the shaft 13. The worm wheel is mounted on, or is secured to, a rotatable sleeve 44 which may have one end thereof provided with clutch teeth for meshing with the hub of the eccentric disk 12 of one of the pumping elements. The peripheral wall 46 of this unit carries oil tight bearings for the shaft 41 and in assembling the parts of the device, the shaft may be caused to project in any desired direction and from either side of the apparatus. In Fig. 3 I have shown it horizontally disposed and in Fig. 5 I have shown it extending vertically.

The ends of the apparatus may be closed by suitable elements, such as the caps A and B. These provide means for supporting the shaft or tie bolt 13 and comprising end walls 25 and 26 as well as flanges constituting portions of the peripheral wall of the apparatus. The bolt 13 serves to tie the entire apparatus together and at its ends may be provided with nuts or heads 47. One of the end elements, for instance, the element B may be provided with a filling opening 48.

There may be as many of the oil delivery pipes 60 as there are of the pumping elements. The several pumping elements may be rotated so that these pipes are attached at different points around the periphery of the apparatus. The attaching means is preferably such that the pipes may be readily disconnected, if desired. As shown, particularly in Fig. 7, each pipe 60 has a yoke or strap 61 which may extend around the oil pipe connecting port 3 and is provided with a head 63 which may be forced into the end of the oil passage 10 by the action of a clamping screw 62 which may also have a head 64 for closing the other end of the oil passage 10. Thus the oil pipe may be readily connected to either end of the oil passage 10 as the heads 63 and 64 may be similar.

To increase the storage capacity of the apparatus there may be provided sections G each of which includes merely a peripheral wall 66. As many of these sections may be employed as desired.

In assembling the apparatus, the user may take as many of the different sections as he desires and connect them together in any desired sequence. The only part which requires change is the connecting part or bolt 13 which must be longer if a large number of sections or elements be used. The wall sections may be formed in any desired manner to provide liquid tight joints between the sections and to permit any section to be rotated when the tie bolt is loosened. As shown each joint includes a flange 50 for entering a groove 51 of the next section.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A pumping apparatus comprising a liquid receptacle formed of a plurality of elements each including a cylindrical wall, means for detachably securing said elements together, one of said elements having a pump driving means, another having a pump having its inlet leading from said receptacle, and a third having a liquid heating means within said receptacle.

2. A liquid pumping apparatus having a peripheral wall sub-divided into a plurality of annular sections, a pair of end sections, a tie bolt connecting said sections together, a pump carried by one of said sections and having a member rotatable on said tie bolt and another of said sections having pump driving means including a member rotatable on said tie bolt, said members having detachable driving connections.

3. A pumping mechanism including a receptacle having a peripheral wall sub-divided in sections adapted to be assembled in series, a centrally disposed tie bolt for holding said sections together, a plurality of said sections each including a pump having an element rotatable on said tie bolt, and said rotatable elements presenting oppositely disposed clutch faces for detachably connecting the pumps in series.

4. A pumping apparatus including a plurality of sections adapted to be connected together in series, a centrally disposed shaft, a driving member in one of said sections and carried by said shaft and a plurality of pumps, each mounted in a separate section and each having a driving sleeve, said sleeves having means for interengaging end to end assembly for transmitting power from one to the next.

5. A pumping apparatus including an oil storage receptacle having a peripheral wall formed of a plurality of annular sections connected together in series, a pair of end walls, a shaft carried by said end walls and projecting through the receptacle, a plurality of pumps each mounted in a separate section in said receptacle and each having a member encircling said shaft, said members being detachably connected in series and means for transmitting power to the end one of said series.

6. A pumping apparatus including a liquid receptacle having a peripheral wall formed of a plurality of annular sections detachably connected whereby the capacity of the storage space of the receptacle may be

varied by varying the number of said sections, one of said sections having means for heating the liquid within the receptacle and another of said sections having a liquid pump for delivering liquid from said receptacle.

7. A pumping apparatus including a storage receptacle having a peripheral wall formed of a plurality of detachably connected annular sections, each of said sections being rotatable in respect to the other sections, one of said sections having a driving shaft projecting through the wall thereof and another having a pump disposed therein and having an inlet from said receptacle and an outlet through the peripheral wall of said section.

8. A pumping apparatus including a plurality of cylindrical wall sections assembled in end to end relationship and each rotatable in respect to the others, each of said sections having a pump therein with a liquid outlet through the peripheral wall whereby the outlets from said pumps may be disposed at different points around the periphery of the receptacle and means for driving said pumps.

9. A pumping apparatus including a cylindrical receptacle having a peripheral wall sub-divided into a plurality of annular sections arranged end to end relatively rotatable, one of said sections including a pump having a liquid outlet through the wall of the section and an inlet from said receptacle, and another of said sections having means for supporting the receptacle.

10. A pumping apparatus including a cylindrical receptacle having a peripheral wall sub-divided into a plurality of annular sections arranged end to end and relatively rotatable, one of said sections including a pump having a liquid outlet through the wall of the section and an inlet from said receptacle, and another of said sections having means for heating the receptacle.

11. A pumping apparatus including a receptacle having a peripheral wall sub-divided into a plurality of annular relatively rotatable sections, one or more of said sections being removable for varying the capacity of the storage space of the receptacle and one of said sections having a pump with an outlet through the wall of said last mentioned section and an inlet from said receptacle.

12. A pumping apparatus including a receptacle having a peripheral wall sub-divided into a plurality of annular relatively rotatable sections, one or more of said sections being removable for varying the capacity of the receptacle, and one of said sections having a pump for delivering from said receptacle to the exterior, and another of said sections having a driving member for operating said pump and projecting through the wall of the last mentioned section.

13. A pumping apparatus including a receptacle having a peripheral wall sub-divided into a plurality of annular relatively rotatable sections, one or more of said sections being removable for varying the storage capacity of the receptacle and one of said sections having a pump with an inlet from said receptacle and an outlet through the wall of said section, and another of said sections having means for heating the liquid within the receptacle.

14. A pumping apparatus including a peripheral wall sub-divided into a plurality of annular sections two of said sections constituting end walls, and a centrally disposed shaft carried by said end walls, one of said sections including a pump having a driving element carried by said shaft and another of said sections having a heating element encircling said shaft.

15. A pumping apparatus including a supply receptacle made up of a plurality of sections, said sections including one or more sections for delivering liquid from said receptacle, one or more liquid heating sections for heating the liquid in said receptacle, one or more capacity increasing sections, and one or more receptacle supporting sections, said sections having similar end portions whereby they may be assembled in various sequences or numbers.

16. A pumping apparatus including a plurality of detachably connected elements, certain of said elements each including a peripheral wall having a liquid outlet, an oscillatory member for controlling the delivering through said outlet, a piston in said oscillatory member and a rotatable member reciprocating said piston and oscillating said first mentioned member.

17. A pumping apparatus including a plurality of detachably connected elements, certain of said elements each including a peripheral wall having a liquid outlet, an oscillatory member for controlling the delivering through said outlet, a cylinder within said oscillatory member, a piston in said cylinder, and a rotatable member for reciprocating said piston, said rotatable member having oppositely disposed clutch faces for transmitting power to or from the corresponding rotatable element of another section.

18. A pumping appartus including a peripheral wall having a plurality of annular sections adapted to be connected together in series to form a storage receptacle, each sections having a tangentially disposed liquid outlet passage, means for connecting a delivery pipe to either end of said passage, and a pump within the section for forcing the liquid from the receptacle, each pump having means for driving it from the pump of another section.

19. A pumping apparatus including a receptacle having a peripheral wall formed of a plurality of rotatable annular sections connected together end to end to form a supply chamber, each of said sections having an in-

let from said chamber and a tangentially disposed liquid delivery outlet, a pump within the section, means for connecting delivery pipes to either end of each of said passages, and means for driving one pump from an adjacent pump.

20. A pumping apparatus including a storage receptacle having a peripheral wall formed of a plurality of detachably connected annular sections, each of said sections being rotatable in respect to the other sections, one of said sections having a pump disposed therein having an inlet from said receptacle and an outlet from said pump through the peripheral wall of said section.

21. A pumping apparatus including a storage receptacle having a peripheral wall formed of a plurality of detachably connected annular sections, each of said sections being rotatable in respect to the other sections, one of said sections having a driving shaft projecting through the wall thereof and another having a pump disposed therein and having an inlet and an outlet, one of which communicates with the interior of said receptacle.

22. A pumping apparatus including a peripheral wall having a plurality of annular sections adapted to be connected together to form a receptacle, one of said sections having a tangentially disposed passage, means for connecting a delivery pipe to either end of said passage, and a pump within the section having an inlet from said receptacle and an outlet to said passage for forcing the liquid from the receptacle.

23. In a pumping apparatus an annular wall section having a pump therein including, a pump cylinder, a pump piston and a rotatable member concentrically disposed in respect to said wall section for operating said piston, said rotatable member having a hub presenting oppositely disposed clutch faces whereby a plurality of said sections may be assembled end to end with their respective pumps operatively connected.

24. A pumping apparatus including a casing having an annular wall section, a pump within said casing, a pump driving gear concentric with said section for operating the pump, and a drive shaft projecting through the wall of said section for rotating said gear, said section being rotatable whereby the drive shaft may project from any point about the periphery of the casing.

25. A pumping apparatus including a casing having an annular wall section, a pump within said casing and an attaching bracket carried by said annular wall section, said section being rotatable whereby said bracket may be disposed at any point about the periphery of the casing.

26. A pumping apparatus including a casing having an annular wall section, a pump within said section and having a liquid outlet through the wall thereof, and means concentric with said casing for driving said pump, said section being rotatable whereby said liquid outlet may be disposed at any point about the periphery of the casing.

27. A pumping apparatus including a casing having an annular wall section, a pump within said casing, and having terminals extending through the wall thereof, said section being rotatable whereby said terminals may be disposed at any point about the periphery of the casing.

Signed at Zurich in the Canton of Zurich and Confederation of Switzerland this 24th day of February A. D. 1927.

AUGUST FRISCH.