F. V. BRAYMER.

PUMP PLUNGER.

APPLICATION FILED JULY 21, 1911.

1,028,426.

Patented June 4, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

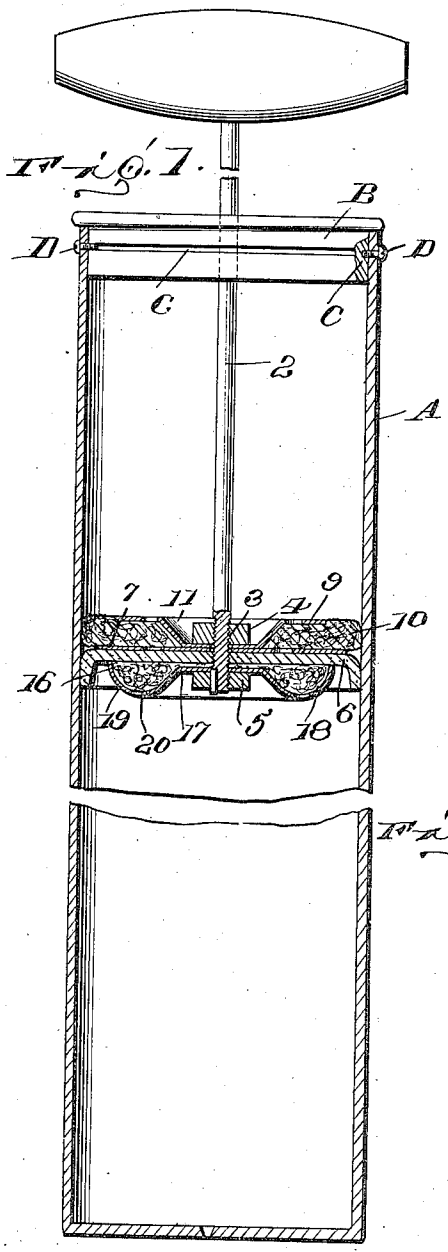

Fig. 2.

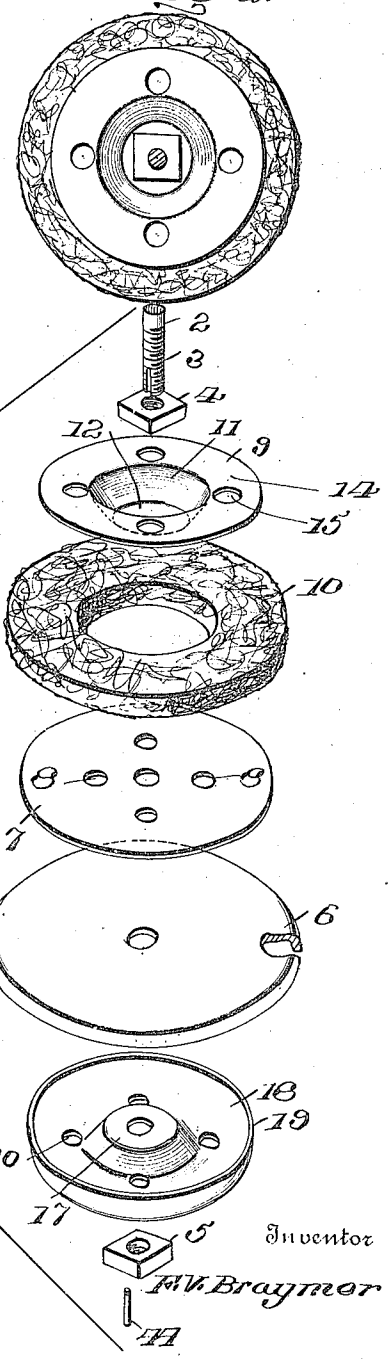

Fig. 3.

Witnesses

Ferdinand Espey

Juana M. Fallin

Inventor

F. V. Braymer

By

Attorneys.

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2 SHEETS—SHEET 2.

Fig. 4.

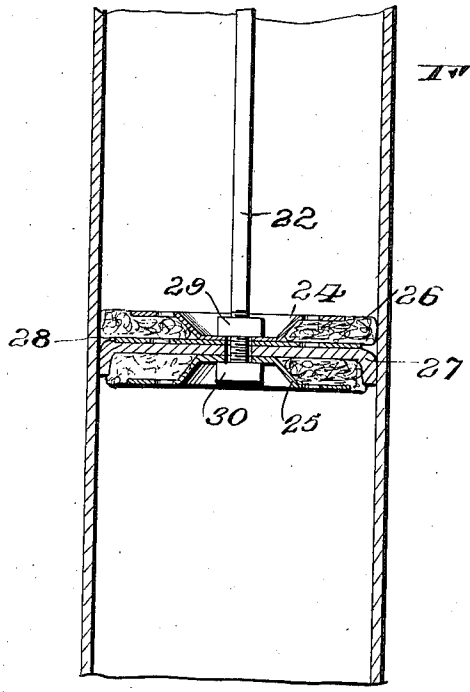
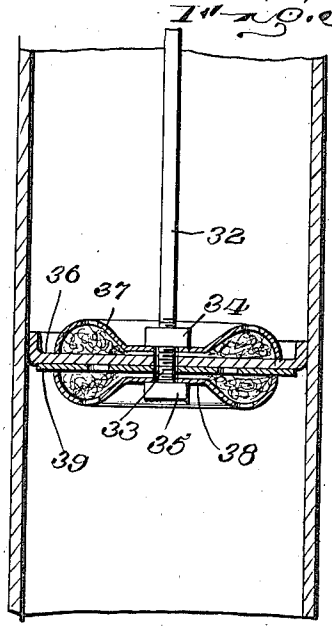


Fig. 5.



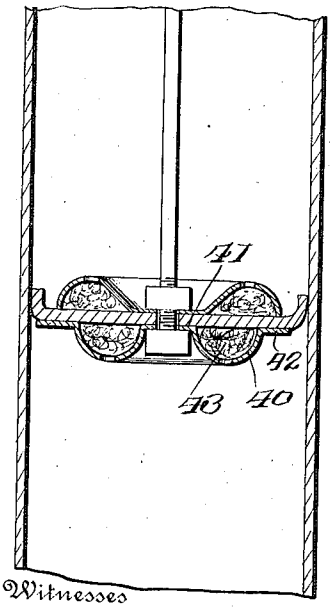


Fig. 6.

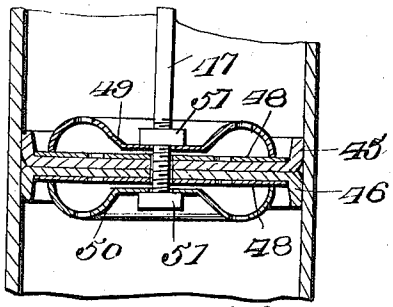


Fig. 7

Witnesses

Inventor

F. V. Braymer

By

Attorneys.

UNITED STATES PATENT OFFICE.

FORREST VICTOR BRAYMER, OF BLOOMING VALLEY, PENNSYLVANIA.

PUMP-PLUNGER.

1,028,426. Specification of Letters Patent. Patented June 4, 1912.

Application filed July 21, 1911. Serial No. 639,810.

To all whom it may concern:

Be it known that I, FORREST V. BRAYMER, citizen of the United States, residing at Blooming Valley, in the county of Crawford and State of Pennsylvania, have invented certain new and useful Improvements in Pump-Plungers, of which the following is a specification.

My invention relates to plungers or pistons, and particularly to the piston or plunger heads of pumps, the invention being adapted to be used for pumping air, water, oil or other fluid either in an exhaust pump or a compression pump.

The primary object of my invention is the provision of a piston head for plunger pumps which is self-lubricating, that is, which is so constructed as to carry a relatively large supply of lubricant, and which while very light in construction may be easily made, is very effective for the purpose, and in which the parts may be easily replaced when worn or otherwise damaged.

Another object is to so construct the piston or plunger head that it will carry hard grease or lubricant to lubricate the packing cup of the plunger.

A further object is to so construct the piston or plunger head that it may carry an absorbent packing capable of retaining a relatively large amount of semi-fluid lubricant, and a still further object is to construct a plunger head adapted to carry both hard grease and fluid or semi-fluid lubricant.

A still further object is to provide a plunger head capable of carrying lubricant, and so constructed that as the plunger is reciprocated the lubricant contained in the head will be subjected to pressure, thus forcing the lubricant out around the packing cup of the head.

A further object is to provide means for supporting the packing cup, and a still further object is to provide a plunger head made up of separable sections, so constructed that the sections are to a degree interchangeable, thus affording means whereby the structure of the plunger head may be varied to suit varying conditions of use.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings wherein:

Figure 1 is a longitudinal section of the cylinder of a pump and the piston head therein. Fig. 2 is a plan view of the piston head shown in Fig. 1. Fig. 3 is a perspective detail view of the parts composing the piston head, the parts being separated from each other. Fig. 4 is a similar view to Fig. 1 but showing a modified arrangement of the parts composing the piston head. Fig. 5 is a like view to Fig. 4 but showing another modified arrangement. Fig. 6 is a like view to Fig. 4 but showing a modification of the lubricant supporting disk. Fig. 7 is a like view to Fig. 6 but showing a modified arrangement of the disks.

Corresponding and like parts are referred to in the following description and indicated in all the views of the accompanying drawings by the same reference characters.

Referring now to Figs. 1 to 3, A designates the cylinder of a pump such as the cylinder of a tire pump, this cylinder being shown merely for illustration. The open end of the cylinder is closed by a disk B of wood or other suitable material, which is provided with a circumferential groove C which is shown as extending entirely around the disk B, this being the preferable form. The open end of the cylinder A is provided with a plurality of screws D which pass through the walls of the cylinder and which engage the disk B to hold it in place within the cylinder. It will be seen that this makes it very easy to set the cap or disk B in place or to easily remove the cap or disk whenever desired. Passing through the disk B is the plunger rod 2 provided at its upper end with any suitable handle or means whereby it may be connected to a power operated member (not shown) where the pump is intended to be operated by machinery. The inner extremity of the plunger rod 2 is screw threaded as at 3, and supported upon the inner extremity of this screw threaded portion is a nut 4 constituting an abutment, against which the parts forming the piston head may be forced or compressed. The inner extremity of the plunger rod is also provided with a nut or like member 5 capable of being screwed up toward the nut 4 to compress the sections of the piston head as will be now described. Surrounding the screw threaded portion of the plunger rod is the leather packing cup 6. This cup is preferably made of leather, though not necessarily so, and is slightly concavo-convex, or,

in other words, is formed with a central relatively flat portion and a deflected rim. In order to give a sufficient support to the flat central portion of the plunger cup 6 against back strain, I preferably mount upon one face of the cup the annular washer 7 which is formed with a plurality of perforations 8 and which has a central opening loosely surrounding the screw threaded portion of the plunger 2. This washer 7 is of course of less diameter than the cup 6.

In the form of my invention shown in Figs. 1 to 3, a circular plate or disk 9 is supported above the washer 7 which is so shaped that it will support a ring 10 of fibrous absorbent material such as felt between the plate 9 and the washer 7. As illustrated in Fig. 3, this plate 9 is dished at its central portion as at 11 so as to provide a flat surface 12 bearing against the washer 7. The side walls of the depressed central portion 11 are upwardly and outwardly inclined, and the plate then forms a flat surface 14 extending out to the circumference of the plate, this flat surface being perforated as at 15 at a number of points. The fibrous packing 10 is somewhat larger in diameter than the plate 9 so as to project beyond the plate and so that when the plate is forced against the packing, the packing will be pressed outward around the edge of the plate as illustrated in Fig. 1. This packing 10 is absorbent and is adapted to hold liquid lubricant. The pressure on the disk or plate 9, and the pressure exerted on the packing through the openings 15 tends to force the lubricant out laterally against the packing cup 6 and against the walls of the cylinder A. These openings also permit the passage of liquid lubricating material to the packing 10.

Mounted below the packing cup 6 is a disk 16. This disk is formed with a central depressed portion 17 defined by an annular chamber 18, the outer wall 19 of which extends inward to a plane beyond the plane of the flat central portion of the disk. There is thus provided an annular chamber 18 which is adapted to contain either absorbent material such as felt, cotton or the like, or to contain lubricant in a semi-solid. Grease and like lubricating materials may be carried within this annular chamber 18 and will be forced out against the face of the cup 6 and thus supplied to the inner surface of the cylinder. It is to be noted in this connection that the circumferential wall 19 extends beyond the plane of the central portion of the disk 16 and that as a consequence the disk 16 is somewhat elastic, that is, the central portion of the disk may be depressed relative to the margin, so that the lubricant contained between the disk and the cup 6 will be subjected to compression upon each stroke of the piston and will thus be caused to flow outward toward the circumference of the packing cup 6. It will further be seen that the circumferential wall 19 of the disk 16 acts to support the cup and hold it in firm engagement with the face of the washer 7, thus permitting the cup to be made of relatively light and flexible material. The disk 16 is formed with a plurality of openings 20 whereby oil may be applied to the packing behind the disk where liquid lubricant and packing is used, and also providing means whereby the pressure of the fluid within the cylinder may be transmitted to the grease or like relatively solid lubricant carried behind the disk and the lubricant forced out.

While I have shown in Fig. 1 a piston or plunger head including a plunger cup 6 having on one side a disk 9 adapted to retain and compress a ring of absorbent material, and on the opposite side a disk 16 adapted to support the plunger cup 6 and hold relatively solid lubricant in contact therewith, it will be obvious that these parts may be interchanged, and further it will be obvious that under some circumstances it might be desirable to use opposed plates 9 with opposed absorbent rings 10, and that in other cases it might be advisable to provide opposed plates 16 adapted to contain semi-solid lubricant on both sides of the plunger cup 6.

In Fig. 4 I show the first suggested modification. In this figure, 22 designates the plunger rod, 23 the plunger cup which is the same as the cup 6, 24 and 25 opposed disks each precisely like the disk 9 previously described, and 26 and 27 oppositely disposed rings of fibrous absorbent material such as felt, these rings being of the same construction as the ring 10. The central flat portion of the plunger is supported by means of the washer 28 which is precisely the same as the washer 7 in Fig. 3. These members are held in place upon the plunger by means of the nuts 29 and 30 which are equivalent to the nuts 4 and 5 previously described. The washer 28 is perforated as are the plates 24 and 25. This form of plunger head is particularly adapted for cases where only liquid lubricant is desired to be used.

In Fig. 5 I show a plunger, the packing cup of which is supported by means of two oppositely disposed disks, so formed as to contain either a fibrous mass of absorbent material for holding liquid lubricant, or to contain semi-solid lubricant such as grease. In this form, 32 designates the plunger rod having thereon the screw threaded portion 33 and the oppositely disposed nuts 34 and 35. The cup 36 is precisely the same as heretofore described. Disposed on opposite sides of the cup 36 are the disks 37 and 38, each having the form of the disk 16 illustrated in Fig. 3, these disks being perforated as described for the disk 16. The space between these disks and the adjacent face of the

plunger or the adjacent face of the washer 39 may be filled either with lubricant soaked fibrous material, or with thick or heavy oil, or with grease. The washer 39 is perforated precisely the same as the washer 7 so as to permit the grease to have access to the face of the plunger cup 36.

In Fig. 6 I show another form of the disk 16 which is particularly adapted to be used where no washer is used. In this form the disk designated 40 is depressed at its center as at 41 and at its margin as at 42 so as to provide an annular chamber 43, the margin 42 being flat so as to secure a flat contact wth the face of the packing cup.

It will be seen that both disks 9 and 16, the disks 37 and 38, the disks 24 and 25 and the disk 40 are all made with a central depressed portion within which are disposed the nuts for holding the disks in their proper position upon the plunger rod, and that these nuts are disposed each within a cup and that thereby the nuts are guarded so that the plunger may be forced down to the extremity of the cylinder without the lower nut contacting with the end of the cylinder, and that the plunger may be brought up to its full height so that it will contact with the inner face of the head B and yet the upper nut will be guarded from contact with the head. This prevents the nuts from being bent and the threads of the nuts damaged, thus preventing the easy removal and replacement of the parts, and this construction also prevents the nuts or projecting end of the plunger rod from damaging the cylinder heads.

It will be seen that in all forms of my invention I provide a cup, and dispose on each side of the cup perforated resilient disks, lubricant being contained between said disks and the face of the cup, and that in all these forms provision is made not only whereby the lubricant retaining disks are rendered resilient so that they may be compressed upon each reciprocation of the plunger rod, but the disks are also provided with perforations whereby the fluid itself within the cylinder by its pressure may force the lubricant out upon the plunger cup. This fluid by reason of the perforations on the disks bears against the lubricant carried by the disks, and as the piston is forced down onto the fluid, the pressure of the fluid transmitted to the lubricant will force a portion of the lubricant out. It will be further seen that the degree of initial compression exerted by the disks upon any packing or grease which may be placed between the disks may be changed at will by screwing up upon the nuts 5, 29 or 35. While I have provided means whereby the lubricant retaining disks are rendered resilient so as to compress the lubricant disposed between the disks and the plunger cup, I do not wish to be limited to the use of resilient disks as while it is possible to make the disks very resilient and the plunger head therefore relatively resilient, it is also possible to make the disks relatively rigid and so associate them as to make a very firm and durable plunger head. This is a preferred construction in some pumps.

In Fig. 7 I show another arrangement of the elements in my piston. In this figure, 45 and 46 designate oppositely disposed suction cups arranged with their marginal flanges extending in opposite directions so that the piston may be used both for drawing in and forcing out fluid. These cups are of course mounted on the piston rod 47 and on opposite sides of the cups are placed the washers or disks 48 which are perforated as before described. Also mounted upon the piston rod 47 are the oppositely disposed lubricant containing disks 49 and 50, each practically like the disk 17 previously described and having a depressed central portion contacting with the face of the adjacent washer and the annularly trough-shaped margin resiliently bearing against the adjacent face of the cup. The disks 49 and 50 are perforated to permit lubricant to be inserted in the disks, and the washers 45 are also perforated for the passage of the lubricant to the plunger cups. The disks are held in contact with the washers 45 and the plunger cups by means of the oppositely disposed nuts 51 engaging the screw threaded portion of the piston rod 47. Absorbent packing or solid lubricant may be placed between the disks 49 and 50 and the adjacent washers as before described.

I do not wish to be limited to the exact form of the circumferential wall of the grease retaining disk as the curvature or angle of this wall may be varied to suit either different classes of lubricant or to correspond with varying degrees of flexibility in the plunger cup. The more inclined this outer wall, which is designated 19 in Fig. 3, the more elastic the disk 16 will be, while the nearer the margin of the wall approximates the direction of the plunger rod 2, the stiffer the wall will be. Where the central depression in the grease supporting disk is not quite so deep as the outer edge, extra support will be given to the outer portion of the plunger cup which will hold it in good contact with the pump barrel or cylinder, particularly where the plunger cup is made of light and shrinkable material. The washer 7 in Fig. 3 may be dispensed with when it is not desired to stiffen the plunger cup. Where it is not used, the plunger head is more flexible than where it is used, and where extra stiffness is required for the plunger head, the washer may be made of greater thickness than is usual. The various parts of the plunger

head are so made that when associated they give a degree of elasticity to the plunger head which admits of producing a high degree of compression within the cylinder without any tendency to bind.

In order to prevent the nuts turning upon the plunger rod I may use any desired form of nut lock, but as shown for this purpose I provide a key 44 driven into place between the lowermost nut and the rod, the key being seated in a suitable seat formed in the adjacent faces of the rod and nut.

My improved plunger head composed of the parts described is adapted for use in air, gas or other like pumps but is more especially capable of use in air pumps, bicycle pumps, and the air pumps connected to hand spraying devices. By its use, the plunger is made self-lubricating and a higher degree of compression may be secured with little friction or wear. The plunger head may be made at a very small expense and yet be thoroughly durable and the parts are of such simplicity that they may be easily replaced at any time.

I have found in practice that it is convenient and often necessary to apply light lubricating oils to a plunger from time to time by squirting the oil through an oil hole in the pump barrel. I have found also that the users of light air pumps such as are used for atomizers and like devices find it most convenient to use relatively light and fine lubricating oils, and they neglect to apply a relatively stiff lubricant which is necessary. By the use of my device when the plunger is made for compression pumps, the lower disk, or front disk as it may be called, is filled with hard grease or lubricant. The light oils are added from time to time as the user may desire by placing a small amount of oil in the inside of the pump barrel behind the plunger head, this oil being absorbed by the absorbent packing and penetrating the plunger cup later. This light oil combines in a measure with the hard grease. Hard grease or like lubricant may be associated with the absorbent packing or be placed adjacent to it for combination with light lubricant that may be added from time to time, or with my device hard grease or lubricant may be used exclusively and no relatively fluid oil be used. This is particularly useful where the plunger is used to displace heated air or heated fluids which will tend to liquefy the hard grease or lubricant. In practice I find that users often use light lubricant such as kerosene oil to lubricate a plunger. This is bad, but by loading the plunger with hard grease I find very good results are secured even under all usages and for a long period.

The pressure of the oil within the cylinder will through the perforations in the several disks tend to force the lubricant to the plunger cup or packing but the perforations in the disks are particularly necessary to permit the filling of the parts with lubricant without taking the plunger head apart. The perforations in the washer are to permit the lubricant readily passing to the plunger cup as this renders the leather pliable, and this in turn makes the plunger quick acting where it is used for compressing. It is to be understood, of course, that the perforations may be made of any form and have any number desired, and that the number and form of these perforations will be changed according to whether it is desired to make the disks more or less resilient. I do not wish to limit myself to the use of grease or hard lubricant in the concaved portions of the disk 16 as absorbent material such as cotton might be placed between the disk 16 and the cup. The oil will enter through the perforations in the disk and be absorbed by the cotton or fiber packing, and by this packing be carried to the cup later as required.

I do not wish to be confined to making the plunger head with the exact combination of parts illustrated in the drawings, it being one of the main features of my invention that the different members of the plunger head may be arranged in a great many combinations so as to adapt the plunger head to different varieties of pumps or different uses. I have only indicated five of these combinations but it is possible to combine these several elements illustrated in the drawings in some twenty-one different combinations. Thus for instance the perforated disk 7 might be combined with the cup 6, packing 10 and the disk 9, or the washer 7 might be combined with the cup 6 and the disk 16, or again the form of disk 40 illustrated in Fig. 6 might be combined with the cup 6 and with the perforated washer 7, or the disk 40 in Fig. 6 might be combined with the cup 6 and the disk 16, as illustrated in Fig. 6; or again, the disk 9 might be combined with the packing 10, the washer 7, the cup 6, packing 10 and another disk 9. As before stated, it is one of the peculiar and vital features of my invention that these disks are adapted to be combined with each other and with the cup 6 so as to adapt the plunger to various different forms and uses.

What I claim is:

1. A plunger head including a plunger cup, a perforated washer on the cup, and a perforated resilient lubricant supporting disk disposed adjacent to said washer, and means for forcing the cup, washer and disk toward each other.

2. A plunger head, including a plunger cup, oppositely disposed lubricant supporting disks on each side of the cup, said disks being perforated, whereby to permit fluid

pressure to force the lubricant out of the lubricant supporting disks, and means for forcing the disks toward the cup.

3. The combination with a plunger rod, of a plunger head therefor including a plunger cup, oppositely disposed disks located on each side of the cup, each of said disks having a central depressed portion extending toward said cup, the disks being adapted to support lubricating material on each side of the cup, said disks being perforated whereby to permit fluid pressure to force a portion of the lubricant out from said disks, and oppositely disposed nuts having screw threaded engagement with the rod and disposed on each side of the plunger head.

4. The combination with a plunger rod having a screw threaded portion, of nuts on the opposite ends of the screw threaded portion, a flexible plunger cup disposed between the nuts, a ring of fibrous absorbent material disposed on one side of the plunger cup, a perforated disk disposed against the outer face of the ring and between the ring and the adjacent nut, said disk having a central depressed portion, a perforated washer on the opposite side of the plunger cup, and a disk located between said washer and the adjacent nut, said disk having a depressed central portion and a depressed marginal portion adapted to contact with the face of the washer, said disk being perforated.

In testimony whereof, I affix my signature in presence of two witnesses.

FORREST VICTOR BRAYMER. [L. S.]

Witnesses:
J. DEWEY BARR,
H. T. JONES.