Sept. 18, 1923. 1,468,459

G. C. DEAKINS ET AL

PACKING FOR PUMP PISTONS AND THE LIKE

Filed Sept. 22, 1921 2 Sheets-Sheet 1

Fig. 1.

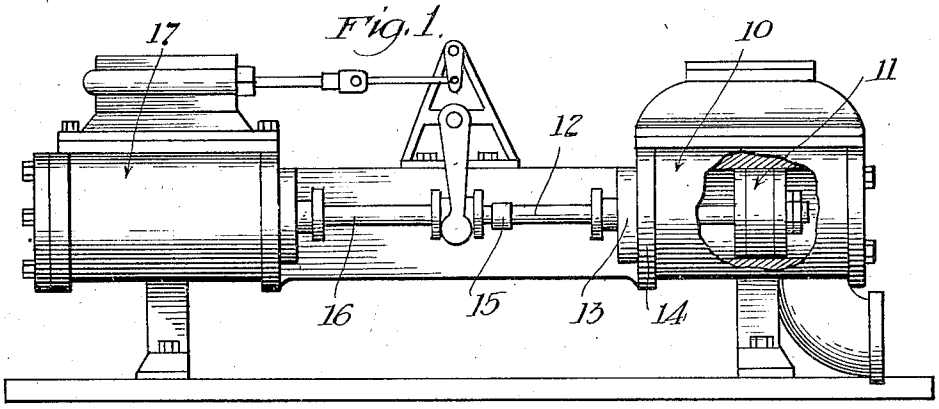
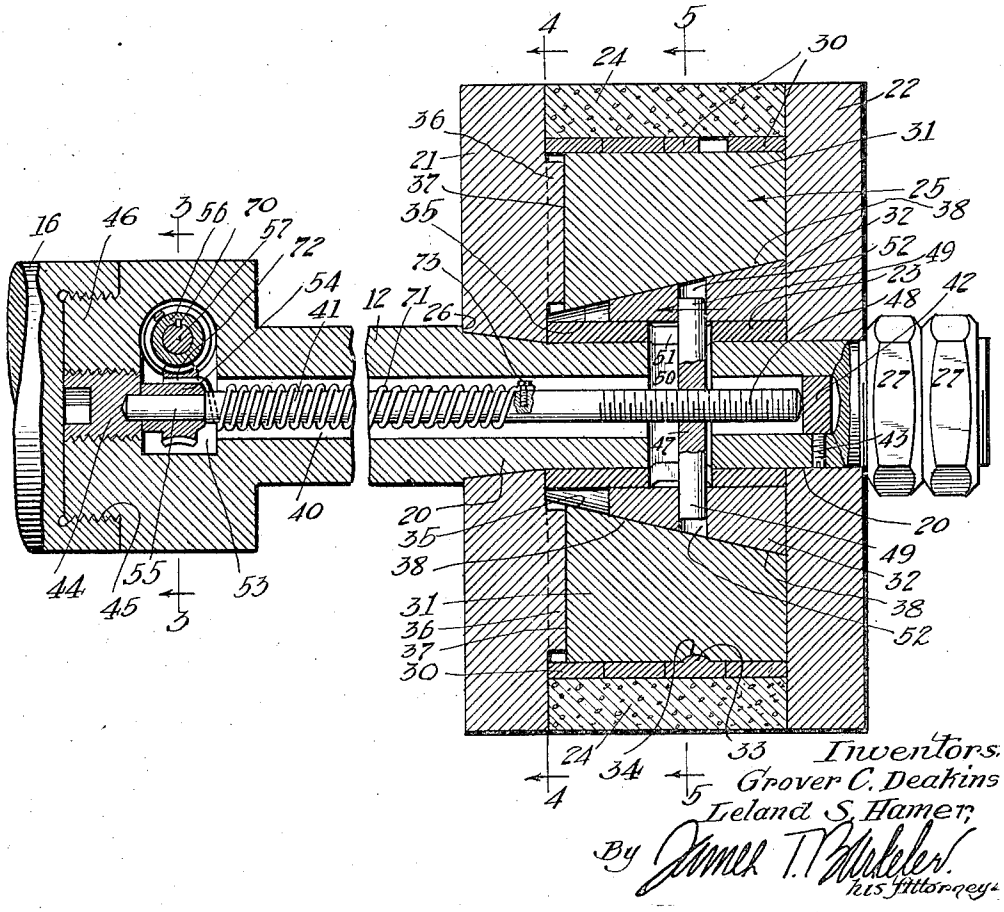



Fig. 2.




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Fig. 3.

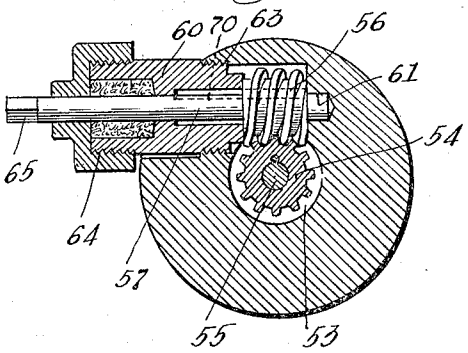



Fig. 4.

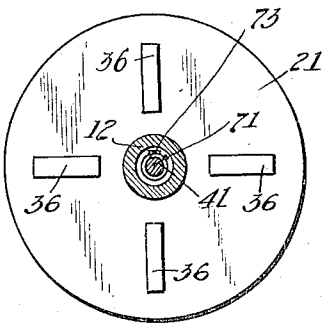
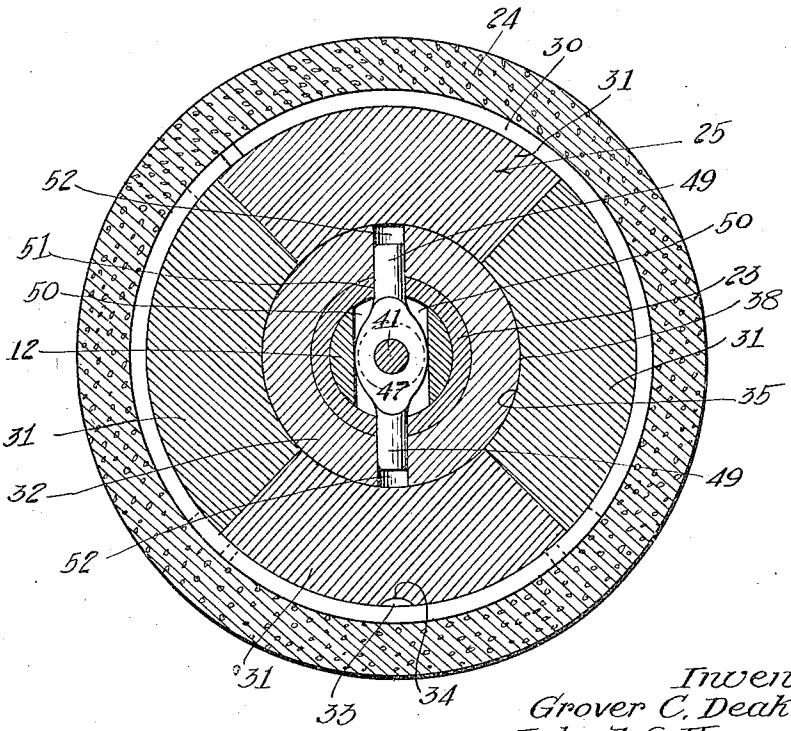



Fig. 5.




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Patented Sept. 18, 1923. 1,468,459

# UNITED STATES PATENT OFFICE.

GROVER C. DEAKINS, OF ANAHEIM, AND LELAND S. HAMER, OF FULLERTON, CALIFORNIA, ASSIGNORS OF ONE-THIRD TO ELIHU C. WILSON, OF LOS ANGELES, CALIFORNIA, AND ONE-THIRD TO BUDD D. McALVAY, OF ANAHEIM, CALIFORNIA.

## PACKING FOR PUMP PISTONS AND THE LIKE.

Original application filed November 11, 1919, Serial No. 337,330. Divided and this application filed September 22, 1921. Serial No. 502,472.

*To all whom it may concern:*

Be it known that we, GROVER C. DEAKINS and LELAND S. HAMER, both citizens of the United States, residing in Anaheim, county of Orange, State of California, and Fullerton, county of Orange, State of California, respectively, have jointly invented new and useful Improvements in Packing for Pump Pistons and the Like, of which the following is a specification.

This invention has to do with packing means for use in reciprocating pumps, engines, and the like, to form a fluid tight joint between two parts which reciprocate relative to each other, and it is an object of the invention to provide a simple, effective, improved means of this character. This application is a divisional continuation of our copending application entitled Expansible packing drums for pump pistons and the like, Serial No. 337,330, filed Nov. 11, 1919.

In the present disclosure we set forth a typical form of the invention in connection with the piston of an ordinary reciprocating pump as such application is typical and will facilitate a clear accurate understanding of the invention. It is to be understood that the invention is not specifically limited in application and that the present disclosure is not to be considered a limitation.

The arrangement and manner of operation of the packing operating mechanism are particularly important and noteworthy phases or features of our invention. The packing operating mechanism is arranged in a manner which permits of the pump being of compact, simple construction and at the same time is comparatively long and of great capacity. This mechanism is operated from a point outside of the cylinder in which the piston works and from one side of the pump or pump part by which it is carried. Further, in operation the mechanism is forceful or powerful and at the same time is capable of delicate adjustment.

The various objects and features of the invention will be best and more fully understood from the following detailed description of a typical application and embodiment of the invention throughout which reference is had to the accompanying drawings in which—

Fig. 1 is a side elevation of a typical direct acting steam pump in which the present invention is embodied in the pump piston and pump piston rod, a part of the pump cylinder being broken away to show in section; Fig. 2 is an enlarged detail longitudinal sectional view of the pump piston and piston rod; Fig. 3 is a transverse detail sectional view taken as indicated by line 3—3 on Fig. 2; Fig. 4 is a somewhat reduced view taken as indicated by line 4—4 on Fig. 2; and Fig. 5 is a transverse detail sectional view taken as indicated by line 5—5 on Fig. 2.

Throughout the drawings the numeral 10 designates the pump cylinder in which operates the pump piston 11. The piston 11 is carried on a piston rod 12 which extends through a suitable packing gland 13 in the inner cylinder head 14 and is attached or coupled at 15 to the piston rod 16 of the steam engine 17. With the construction and arrangement just described, the steam engine 17 is directly connected with the pump 10 so that operation of the engine causes direct operation of the pump, or reciprocation of the piston 11 in the pump cylinder 10.

The piston 11 is carried on the reduced outer end portion 20 of the piston rod 12 and comprises, generally, two flat circular plates 21 and 22 carried concentrically on the reduced portion 20 of the piston rod; a sleeve 23 carried on the reduced portion between the plates 20 and 21 forms a spacer for the plates, packing 24 arranged between the periphery portions of the plates 21 and 22, and a packing expanding mechanism 25 adapted to be operated to feed or force the packing 24 radially outwardly between the plates 21 and 22. The plate 21, which is the innermost plate, is preferably carried tightly on the reduced portion 20 of the piston rod and is arranged to fit against the shoulder 26 formed by reducing the end portion of the piston rod. The plate 22 is slidably carried on the outer part of the reduced portion 20 and is retained on the reduced portion by nuts which screw thread onto the end of the reduced portion 20. The sleeve 23 is slidably carried on the reduced portion 20 between the plates 21 and 22 and in the particular form of the invention illustrated in the drawings is simply a

straight cylindrical sleeve. The nuts 27 are normally set so that the plate 22 bears tightly against the sleeve 23 which in turn bears against the plate 21 to hold it tight on the reduced portion 20 and against the shoulder 26. The packing 24 projects somewhat from the plates 21 and 22 so that it engages the cylinder wall, the plates 21 and 22 preferably being of such size, or diameter, as to operate in the cylinder with a slight clearance. The packing 24 is capable of being expanded or forced outwardly as wear takes place between it and the cylinder wall. The exact construction of the packing 24 or the exact material out of which the packing is formed will of course depend upon the conditions under which the pump is to operate and are not factors which are important as far as the present invention is concerned.

The particular packing expanding means which we illustrate in the drawings comprises, generally, a plurality of expansible rings 30 which carry the packing, a plurality of curved segments 31 which are arranged together to form an expansible body within the rings 30, and curved wedge members 32 arranged between the expansible body formed by the segments 31 and the sleeve 23 and adapted to be operated to cause expansion of said body. The rings 30 are preferably split or ended metal rings which form an effective support or backing for the packing 24. The rings 30 are preferably formed at their inner surfaces with projections 33 which extend into depressions or recesses in the outer surfaces of the segments 31 to prevent rotation of the rings relative to the segments. The rings 30 are arranged edge to edge and extend between the plates 21 and 22 with just sufficient clearance to allow them to operate freely.

The segments 31, of which there are four in the particular construction illustrated in the drawings, are curved members which when arranged together end to end form a continuous annular body. The inner surfaces 35 of the segments 31 are curved concentrically with the body formed by the several segments and extend diagonally between the sides of the segments so that the expansible body has a central tapered opening. The segments 31 fit between the plates 21 and 22 with considerable clearance so that they can be readily operated in the manner hereinafter described. It is preferred that lugs or projections 36 be provided on the inner face of one of the plates to extend into recesses 37 in the segments 31 to hold the segments against rotary movement yet allow them free radial movement.

The wedge members 32, of which there are two, are slidably carried on the sleeve 23 within the expansible body formed by the segments 31. The wedge sections together form a complete annular wedge adapted to operate the expansible body formed by the segments 31. The outer surfaces 38 of the wedge parts 32 are curved and tapered to conform and co-operate with the inner surfaces 35 of the segments 31. It will be noted from inspection of the drawings that the wedge parts 32 are considerably shorter then the space between the plates 21 and 22 thus allowing them considerable longitudinal movement on the sleeve 23 and relative to the expansible body formed by the segments 31. It is obvious from inspection of Fig. 2 how longitudinal movement of the wedge parts 31 in the direction indicated by the arrow in that figure will cause the segments 31 to be forced or wedged outwardly and therefore will cause expansion of the rings 31 and expansion of the packing 24. The extent to which the various parts can be expanded or moved will, of course, depend upon the angle of the co-operating surfaces 35 and 38 and upon the extent of movement of the wedge parts 32. Further, the force with which the parts are wedged or forced outwardly will depend upon the force with which the wedge parts are moved and upon the angle or inclination of the co-operating surfaces 35 and 38.

The piston rod 12 is formed with a central longitudinal opening 40 to carry a rod 41, which upon rotation is adapted to actuate the wedge members 2. The rod 41 is comparatively long in that it extends from within the reduced portion 20 of the piston rod 12 to a point outside of the cylinder in which the piston works and preferably to the point of connection 15 between the piston rod 12 and the engine piston rod 16. Within the reduced portion 20 of the piston rod 12 the end of the rod 41 engages a thrust block 42 slidably carried in the opening 40 and adapted to be set in the desired position by a suitable set screw 43. The other end of the rod 41 is carried in a plug 44 which screw threads into the opening 40 at the end of the connecting rod 12. The rod 41 is adapted to be arranged in the rod 12 through the outer end of the opening 40 when the connecting rod 12 is detached from the connecting rod 16. In the drawings we have illustrated the connecting rods 12 and 16 as being screw threaded together, one of them being formed with a screw threaded socket 45 and the other with a screw threaded projection 46 adapted to co-operate with the socket 45. When the rod 41 is in place in the opening 40 and the piston rods 12 and 16 are connected it is impossible for it to become displaced. In practice, of course, the thrust block 40 and plug 44 are adjusted so that the rod 41 cannot move longitudinally but is free to rotate.

At the reduced portion 20 there is a nut member 47 screw threaded on the screw

threaded inner end portion 48 of the rod 41. Two pins or arms 49 extend radially from the nut 47 from diametrically opposite points through slots 50 and 51 formed longitudinally in the reduced portion 20 and sleeve 23, respectively, and into openings 52 in the wedge members 32. The arms 49 are slidable only longitudinally in the slots 50 and 51 and are slidable only radially in the openings 52. From inspection of the drawings it will be noted that the arms 51 do not extend completely through the openings 52 but that they are sufficiently short that they will not extend completely through the openings 52 and thus project from the wedge members when in any position to which they can be moved. It will be obvious how the arms 49 being carried in the slots 50 and 51 hold the nut 47 against rotation so that rotation of the rod 41 will necessarily cause screw threading of the nut 47 on the screw threaded portion 48 of the rod and will thus cause longitudinal movement of the nut and the arms. The direction in which the nut 47 and arms 49 are moved longitudinally and the extent to which they are moved will depend upon the direction of rotation of the rod 41 and the amount of rotation of the rod 41.

At a point outside of the cylinder 10 and preferably at the end portion of the piston rod 12 the opening 40 is formed with an enlarged part 53. In the drawings we have shown the enlarged part 53 of the opening close to the inner end of the piston rod. A worm gear 54 is mounted on the reduced end portion 55 of the rod 41 which extends through the enlarged part 53 and into the plug 44. The worm gear 54 engages and cooperates with a worm member 56 carried on a shaft 57 which is disposed transversely of the rod 41 and projects somewhat from the rod 41. The outer part of the shaft 57 is carried in a bushing 60 while the inner part is carried in a bore 61 in the rod 41. The bushing 60 may be screw threaded into the rod 41 at 63 and it may be provided at its outer part with a packing gland 64 for carrying the shaft 57. The outer end 65 of the shaft 57 is preferably squared or otherwise formed so that it can be engaged by a key or tool when it is desired to rotate the shaft. The worm 56 is secured on the shaft 57 by a key 70 so that rotation of the shaft 57 causes rotation of the worm 56 and therefore the worm gear 54.

In accordance with the preferred form of the invention the worm gear 54 is not fixed on the rod 41, as it is obvious it might be, for the purpose of driving the rod, but is loose on the rod and is connected with the rod through a helical spring 71. The spring 71 is carried on the rod 41 and has one end attached to the worm gear 54 at 72 and the other end attached to a screw 73 carried by the rod at a point well spaced from the worm gear and preferably close to the screw threaded end portion 48. It will be obvious how the spring 71 when thus attached to the worm gear 54 and rod 41 forms a yielding driving connection between the worm wheel 54 and shaft 41. It will be obvious how rotation of the shaft 57 in the proper direction will put the spring 71 under strain so that it will tend to rotate the rod 41 in a manner to move the nut 47 and arms 49 in the direction indicated by the arrow in Fig. 3. The pitch of the worm gear mechanism comprising the worm 56 and worm gear 54 is such that the spring 71 cannot cause rotation of the worm 56 or shaft 57 through the worm gear 54, or, in other words, the worm gear mechanism automatically locks so that it cannot be operated by the spring 71 but can only be operated by rotation of the shaft 57. The spring 71 when under strain or when tightened by rotation of the worm gear through the worm wheel 56 will cause rotation of the rod 41 to move the arms 49 and thus operate the packing expanding means until the packing engages the cylinder wall in a manner to prevent further operation of the packing expanding means and therefore of the rod 41. The pressure with which the packing 24 actually engages the cylinder wall will depend upon the strain under which the spring 71 is put. It is to be particularly noted that the present invention makes possible the use of a particularly long spring 71 which when under strain will tend to rotate the shaft with substantially uniform force through a long wearing period and therefore will cause expansion of the packing with sbstantially uniform force for a comparatively long time, in some instances from the time it is newly placed in the piston until it is completely worn out. Further with the construction provided by the present invention although the spring 71 continually tends to operate the rod 41 so as to cause operation of the packing expanding mechanism the packing expanding mechanism cannot under any circumstances cause reversing of the rod 41 or rotation of the rod which would allow release or retraction of the packing expanding means. The nut 47 being screw threaded on the rod 41 makes it possible to easily and effectively operate the packing expanding means from the rod 41 but makes it impossible to operate the rod 41 from the packing expanding means. This is a particularly desirable feature in that the packing expanding means can never release or retract even in the event that the rod 41, spring 71, or other like part of the operating mechanism, just described, should fail.

When the pump is in operation it is generally desirable to keep the spring 71 under strain so that the packing expanding

means will be operated to expand the packing and compensate for all wear between the packing and the cylinder wall. However, under certain conditions or with certain packings it may be found desirable to set or adjust the packing to be under the desired pressure through the operating mechanism and then release the spring by reversing the direction of rotation of the shaft 57. Ordinarily, and particularly when the spring 71 is comparatively long one setting of the spring under strain will suffice to operate the packing expanding means for a long time in some instances until the packing is completely worn away. It is to be particularly noted that the packing cannot only be set or adjusted from outside of the cylinder in which the piston operates but can be operated from one side of the pump or the piston rod where it does not require the removal of any part or parts of the pump. It will be obvious that, the arrangement provided by the present invention is far more desirable and advantageous than one wherein the packing may be adjusted from the end of the piston rod or from a point within the cylinder.

Having described only a typical embodiment of our invention we do not wish to limit ourselves to the specific details hereinabove set forth but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or that may fall within the scope of the following claims.

Having described a preferred form of our invention, we claim:

1. In combination with a piston, expansible packing, operating means for expanding the packing, a spring adapted when under strain to tend to actuate said means, and a worm gear mechanism connected to the spring and adapted to be actuated to put the spring under strain and of such pitch that it will not be operated by the spring.

2. In combination with a cylinder, a rod extending into the cylinder, and a piston on the rod in the cylinder, expansible packing carried by the piston, a packing operating mechanism adapted to be actuated by linear movement of one of its parts to expand the packing, a member carried by the rod for rotation only, means actuated by rotation of said member to cause linear movement of said packing operating mechanism part, means operable from a point outside of the cylinder to cause rotation of said member, and a spring operatively connecting said member and said last mentioned means.

3. In combination with a piston, expansible packing, operating means for expanding the packing, a rotatable member, a screw thread connection between the packing expanding means and said member whereby said means is actuated by rotation of said member, a spring connected to said member and adapted when under strain to rotate said member, and a worm gear mechanism connected to said spring and adapted to be actuated to put the spring under strain.

4. In combination with a piston and piston rod, expansible packing carried by the piston, a packing operating mechanism adapted to be actuated by linear movement of one of its parts to expand the packing, a member carried by the piston rod for rotation only, a connecting member engaging said part and being in screw threaded engagement with said rotatable member for linear movement, and means for yieldingly rotating said rotatable member.

5. In combination with a piston and a hollow piston rod, expansible packing carried by the piston, operating means for expanding the packing, a member rotatably carried in the piston rod and operatively connected with the operating means, and means for rotating said member including a spring carried on said member and having one end attached to said member.

6. In combination with a piston and a hollow piston rod, expansible packing carried by the piston, operating means for expanding the packing, a member rotatably carried in the piston rod and operatively connected with the operating means, and means for rotating said member including a worm gear mechanism and a spring carried on said member having an end connected to said member and the other end connected to the worm gear mechanism.

In witness that we claim the foregoing we have hereunto subscribed our names this 12th day of September 1921.

GROVER C. DEAKINS.
LELAND S. HAMER.

Witness:
VIRGINIA BERINGER.