

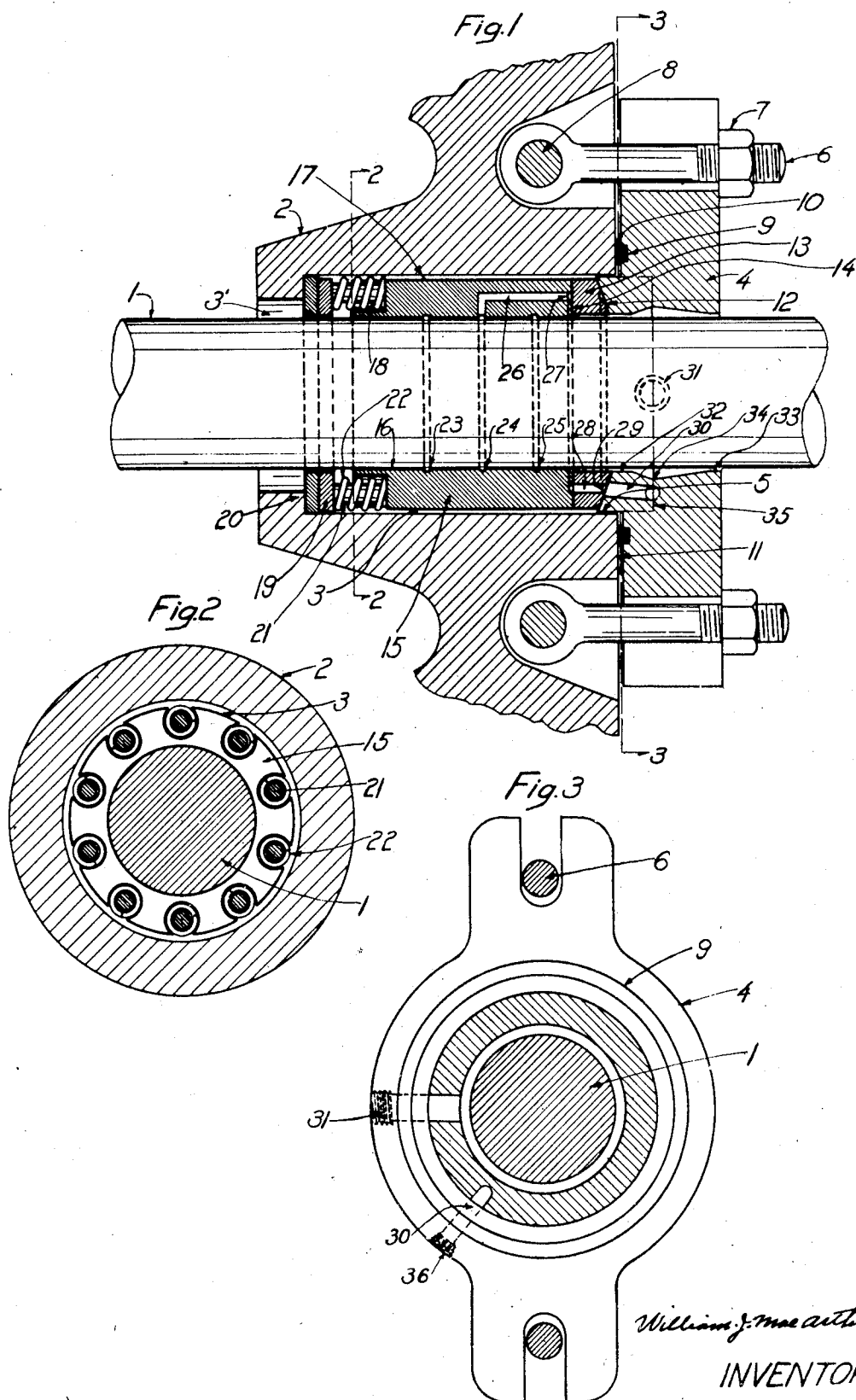
**Nov. 10, 1931.**

**W. J. MacARTHUR**

**1,831,571**

## PACKER FOR CENTRIFUGAL PUMPS

**Filed June 24, 1927**



## UNITED STATES PATENT OFFICE

WILLIAM J. MACARTHUR, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF ONE-HALF TO  
REA E. MAYNARD, OF LOS ANGELES, CALIFORNIA

## PACKER FOR CENTRIFUGAL PUMPS

Application filed June 24, 1927. Serial No. 201,172.

This invention relates to means for packing the drive shaft of centrifugal or rotary pumps in such manner as to avoid leakage into or out of the pump case without having recourse to packing materials of a flexible or compressible nature.

It is an object of this invention to provide a packer of metallic or other essentially rigid material, this packer having an opening formed therethrough through which the pump shaft extends and being brought to an accurate sliding fit with the shaft, depending entirely upon this fit to prevent leakage around the shaft.

It is another object of this invention to provide a rigid packer of this character which is situated in a cavity or box closed at its outer end by a gland, the packer having an accurately ground radial face which is adapted to engage an accurately ground radial face of the gland in order to prevent a radial leakage past the rigid packer.

It is a further object of this invention to provide a rigid packer of this character in which the radial face of the packer is held in pressural contact with the radial face of the gland by springs so situated as to thrust the two radial faces into contact.

It is a still further object of this invention to provide a rigid packer of this character which is radially adjustable and may thus conform to any sidewise movement of the pump shaft.

Other objects and advantages of this invention will be made evident hereinafter.

Referring to the drawings in which I illustrate a preferred embodiment of my invention

Figure 1 is a sectional view through a packer of my invention showing the packer mounted on the shaft and retained by the gland.

Figure 2 is a section taken on the line 2—2 of Figure 1.

Figure 3 is a section taken on the line 3—3 of Figure 1.

With reference particularly to Figure 1 of the drawings, 1 is the shaft which drives the impeller of the pump and which is in rotation when the pump is operating. 2 is that

portion of the casing of the pump immediately surrounding the shaft 1 and which is formed into a box or chamber 3 open at the outer end and communicating with the pump casing by the relatively wide annular opening 3'. 4 is a gland of cast iron or other suitable metal, with a projection 5 extending into the outer end of the chamber 3, and which is held in place and adjusted in position by the swing bolts 6 and the draw nuts 7, the bolts 6 swinging on the pins 8 which are made fast to the pump casing body by any convenient means not shown.

The gland 4 has turned in its inner face a groove 9 for the retention of a ring of flexible packing 10, which ring may preferably be formed of one-quarter inch square hydraulic packing. This ring is drawn against the face 11 of the pump body, which face should at the point of engagement of the packing ring be turned smooth and square with the axis of the pump shaft 1.

The inner face of the projection 5 of the gland 4 is accurately ground to a suitable radius, which may be about twice the diameter of the pump shaft 1, this radial face being indicated at 12. The floating ring 13 may be made of brass or other suitable metal and is accurately ground at its outer end to fit the corresponding arcuately ground inner face of the projection 5. This ring 13 should be greater in inside diameter than the outside diameter of the pump shaft and should be less in outside diameter than the inside diameter of the chamber 3, so that it will be free to move radially as related to the position of the pump shaft. The inner face 14 of the ring 13 should be ground smooth and in a plane at an exact right angle to the axis of the ring.

The packer 15 may be formed of metal or of other suitable rigid material, such as will be hereinafter described. Its inner face 16 should be a close sliding fit over the shaft, a clearance of approximately one one-thousandth of an inch being recommended as a suitable clearance. The tightness of the packer against leakage depends on the forming of a perfect fit at this point and care should be taken that the two surfaces be so

accurately fitted that they will neither leak nor bind. The outer face 17 of the packer should be a loose fit in the chamber 3, a clearance of two or three one-hundredths of an inch being recommended as a suitable clearance. The end face 14 of this packer should be very carefully ground to fit the end face 14 of the ring 13, this ground face being a plane at right angles to the axis of the packer.

On the opposite end of the packer a suitable number of sockets or shallow holes are drilled as indicated at 18. A ring 19 is placed in the bottom of the chamber, resting on the projection 20, and to this ring 19 are affixed a number of pins 21 corresponding in number and position with the holes 18. The pins should be enough smaller than the holes to allow room for the open coil spring 22, one of which springs is placed around each pin 21 and inside each hole 18. The purpose of these springs is to hold the faces 14 of the packer and the floating ring and the faces 12 of the floating ring and the gland in nonleaking contact. The purpose of the pins is to protect the springs against distortion or cramping in case the packer 15 should at any time tend to revolve with the shaft and move from its fixed position in relation to the ring 19. Where the clearance between the shaft and the chamber is small, a circumferential coil spring may be used in place of this assembly of springs and pins.

It is desirable, though not essential, to form in the inner surface of the packer 15 the three grooves indicated at 23, 24 and 25, and to bring the central groove 24 into communication with a small channel 26 drilled longitudinally through the packer towards its outer face 14 where the drill hole communicates with a similar groove 27 formed in the end face 14 of the packer. This last named groove in turn communicates with a narrow hole 28 drilled longitudinally through the metal of the floating ring 13, this drill hole communicating with a groove 29 formed in the face 12 of the floating ring. This groove 29 in turn communicates through the drill holes 30 with a one-quarter inch pipe tap 36 formed in the body of the gland 4, which tapped hole may be connected to the discharge of the pump by a pipe connection not shown. The purpose of these channels is to seal the packer against possible suction leaks with whatever liquid is being pumped. The provision of these grooves and channels is desirable but not requisite.

The gland 4 should be bored out to such diameter that it will not contact with the shaft 1, a clearance of two or three one-hundredths of an inch being recommended as a suitable clearance at the points 32 and 33. Intermediate these two points, as at the point 34, the gland may desirably be hollowed out to form a chamber communicating with the pipe tap 31 which may drain to the open air or into a

suitable receptacle for the purpose of collecting any small leakage and preventing it from reaching the floor or pump base. This tap 31 should be so spotted in the gland as to look downward when assembled.

The inner end of the chamber 3 being in communication with the liquid in the body of the pump, the chamber 3 will be filled with liquid. Leakage between the packer 15 and the shaft 1 will be prevented by the close fit of the packer on the shaft. Leakage from the chamber 3 into the annular space between the gland 4, the floating ring 13 and the pump shaft 1 will be prevented by the close contact of the ground faces 14 and 12. Leakage from the chamber 3 into the space between the gland 4 and the pump body 2 will be prevented by the ring of flexible packing 10 interposed between the gland and the surfaced face of the pump body.

Inasmuch as the retention of fluid depends in the first instance on the closeness of the fit between the packer 15 and the shaft 1, the packer cannot desirably be made too short in relation to its diameter. A length for the packer 15 not substantially less than its internal diameter is essential and it is recommended that where construction conditions permit, the length of this packer be made approximately one and one-half times its internal diameter.

The materials from which the various parts of this device may suitably be constructed is known to those skilled in the art. The pump case will in almost all cases be of cast iron and the gland may be of cast iron or steel as preferred. In any case it is desirable, though not necessary, to bore out the inner face of the gland as indicated at 35 and to press firmly into this bore a ring of brass or bronze on which ring the radial face 12 would be formed, this for the purpose of preventing the formation of rust on the sensitive ground face. For the same reason it is desirable to make the floating ring 13 of a nonrusting metal. The packer 15 should be of some material which will not cut the shaft. If the shaft is of mild steel a ferrous metal packer is not desirable, though either cast iron or steel may be used for such packer in case the shaft is brass or bronze jacketed, as is often the case. A packer made of hard babbitt is recommended.

When I refer in specification and claims to a radially curved face I would be understood to mean a face so formed as to conform in all parts to a portion of the surface of a sphere.

I claim as my invention:

1. In combination with the casing of a pump having a rotating impeller shaft: a box communicating with said casing and surrounding the shaft, said box being closed at its outer end by a gland fitting loosely over the shaft and adapted to be held in non-leak-

ing engagement with the casing, a rigid and substantially incompressible cylindrical packing ring including a longitudinally disposed drainage channel within said box, said ring being brought to a substantially non-leaking fit on the shaft and having an accurately machined radially curved end face resting in non-leaking engagement against a similarly formed inner face on said gland the latter having a channel in communication with the channel of said ring, means for draining the channel in said gland and pivotally disposed means carried by said box extending through said gland for holding said ring in seal tight engagement therewith.

2. A packing assembly for a moving cylindrical pump part, in combination with a pump casing adapted to retain fluids under pressure, said part moving through a wall of said casing; said assembly comprising: a cylindrical box attached to and communicating with the interior of said casing and surrounding said moving part; a packing element disposed about said moving part within said box, said element being in the form of a unitary, rigid and substantially incompressible metallic sleeve slidably and non-leakably fitting around said moving part and having a longitudinally disposed drainage channel, said sleeve being of such outer diameter as to be free to move laterally within said box, the outer end of said sleeve being faced flat; a closure for the outer end of said box, the inner face of said closure, around said moving part, being arcuately curved; a metallic ring surrounding said moving part between the outer end of said sleeve and the inner face of said closure, the inner face of said ring being faced flat for non-leaking slidable engagement with the flat outer end of said sleeve and the outer face of said ring being fitted to the curvature of said inner face of said closure for non-leaking, swivelling engagement therewith, said ring having a longitudinally disposed drainage channel; means for holding said sleeve, said ring and said closure in mutual engagement and means communicating with said channels and carried by said gland for draining surface leakage on said shaft to the atmosphere.

3. A packing ring adapted to be used on a rotating impeller shaft of a pump, comprising: a sleeve adapted to fit the said shaft closely, a plurality of substantially cylindrical channels in said sleeve, a coil spring in each channel of a length suitable for creating compression when the length of the springs is limited to the length of the channels; cylindrical pins substantially of the length of the channels carried within each of said coil springs, a floating ring carried upon the said shaft at each end of the said sleeve, a gland upon the pump side of said sleeve beyond the floating ring on said side, and means for supplying the space between the sleeve and the

shaft with liquid from the discharge of the pump.

In witness that I claim the foregoing I have hereunto subscribed my name this 13th day of June, 1927.

WILLIAM J. MacARTHUR.

70

75

80

85

90

95

100

105

110

115

120

125

130