Oct. 25, 1960 P. I. NAGLE 2,957,425

PUMP WITH PACKING GLAND

Original Filed May 27, 1952 2 Sheets-Sheet 1

Fig. 1

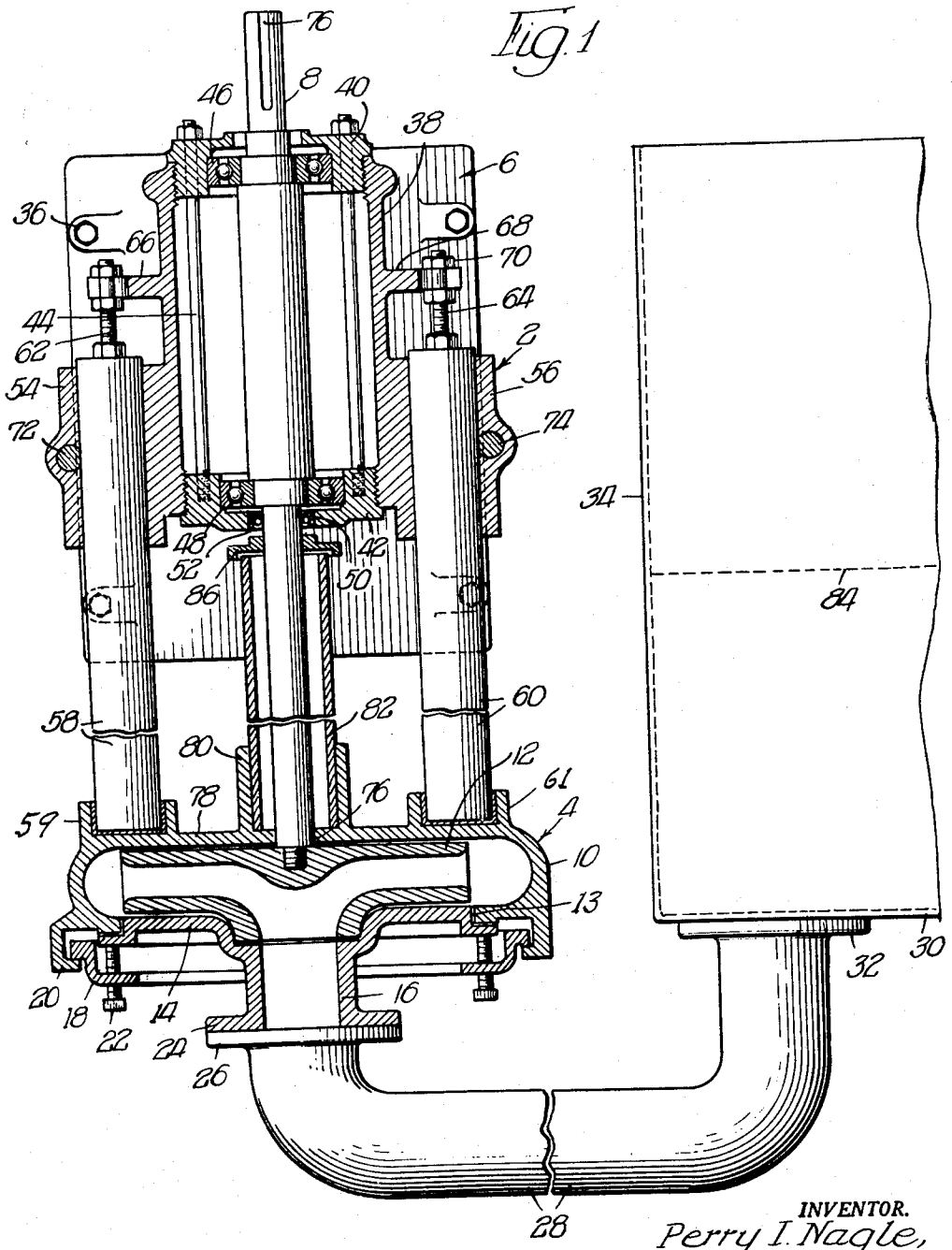

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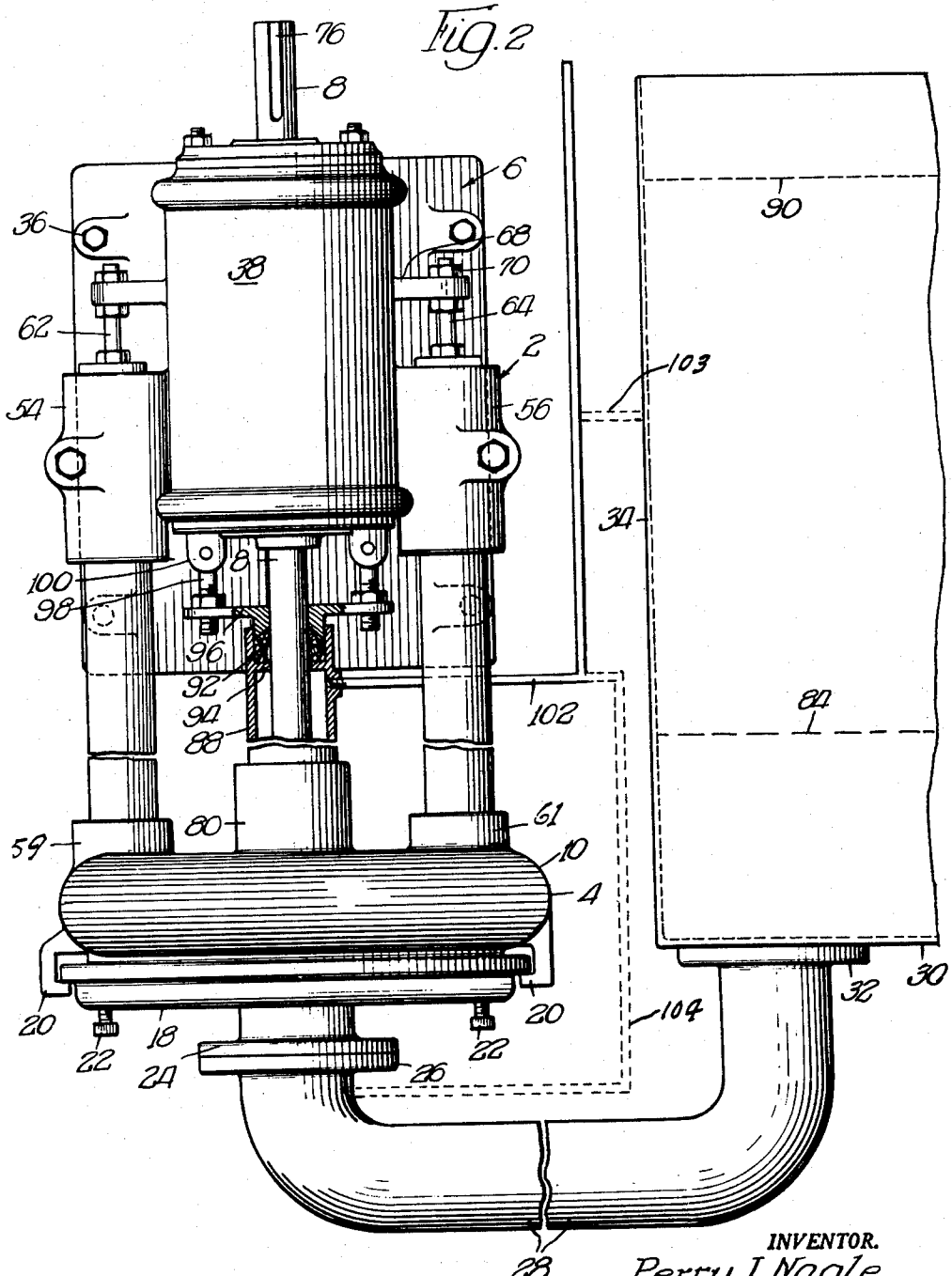
Fig. 2



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PUMP WITH PACKING GLAND

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Original application May 27, 1952, Ser. No. 290,143, now Patent No. 2,868,134, dated Jan. 13, 1959. Divided and this application Aug. 7, 1958, Ser. No. 753,830

2 Claims. (Cl. 103—103)

The present invention relates to fluid impelling devices and has reference in particular to fluid impelling devices of the vertical type, such as centrifugal pumps for pumping water or other liquid containing large amounts of sand, clay, etc., from pits, sumps and the like.

Among the objects of the present invention is to provide a novel centrifugal pump of the vertical type of simplified and compact construction wherein the various elements thereof are readily fabricated and assembled in operative association with one another with ease and facility.

One of the objects within the purview of the present invention is to provide a novel centrifugal pump assembly of the type designated hereinabove which may be readily mounted within a dry sump or pit for pumping a liquid medium and which is of such construction that the electric motor or other driving means may be readily mounted at any desired distance above the assembly.

As a further object, the present invention contemplates a novel centrifugal pump assembly of the general type immediately hereinabove referred to and, although being provided with a packing gland for the power shaft, is so constructed that said packing gland is in contact with the liquid material only when the pump is inoperative.

The invention further contemplates a novel pump structure as immediately hereinabove set forth incorporating a packing gland, however, at the upper end of the sleeve to prevent discharge of liquid material therefrom in those instances where the liquid level in the sump rises above the top of the sleeve, such assembly also being provided with a vent conduit for venting purposes. In such structure, the liquid level within the sleeve conforming substantially to the liquid level in the sump is below the packing gland during normal operation of the pump and contact of the liquid material and packing gland takes place only when the pump is inoperative.

Still a further object of the invention is to provide novel centrifugal pumps as hereinabove set forth in which a bearing assembly is provided for rotatably supporting the power shaft of the pump and which is provided with means for adjustably supporting the pump housing and its appurtenances.

The present invention further contemplates a novel centrifugal pump of the vertical type having a pump housing and its appurtenances supported upon a suitable foundation or support and which adjustably supports a bearing housing for the power shaft for said pump.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a vertical cross-sectional view of a pump incorporating certain features of the present invention; and

Figure 2 is a view in front elevation of another form of pump having parts shown in vertical cross-section to disclose certain of the structure more in detail.

Referring more in detail to the drawings and particularly to the embodiment shown in Figure 1, there is disclosed a pump assembly generally referred to by the reference numeral 2, which comprises a centrifugal pump 4 and bearing stand 6 for rotatably supporting the power shaft 8 of the pump.

The centrifugal pump 4 is formed with a casing 10 within which is disposed an impeller 12 connected to the lower end of the power shaft 8. The casing 10 is formed with an opening 13 closed by the plate 14 provided with the intake 16 communicating with the eye of the impeller 12 in the usual manner. The casing 10 is also formed with a tangential outlet (not disclosed) in accordance with common practice in the art. The plate 14 is held in place by a ring 18 adapted to engage the shouldered flanges 20 of the casing 10 by means of a plurality of set screws or bolts 22. The plate 14 at the inlet end is provided with a flange fitting 24 adapted to be secured by bolts or any other desired means to the flange fitting 26 of a conduit 28 which is connected to the bottom 30 of a sump 34 through the flange fitting 32.

The bearing stand 6 is adapted to be secured to any suitable supporting medium through bolts such as 36 whereby the shaft 8 is properly aligned with respect to the impeller 12. The said bearing stand is further provided with a bearing housing 38 having end closure members 40 and 42 screw threaded into the bearing housing 38 and held in place by the bearing studs 44. The end closure members 40 and 42 provide a suitable recess for the radial and thrust bearings 46 and 48, respectively, for the shaft 8 which extends downwardly through the opening 50 which is closed by a thrust seal 52.

The bearing stand is further provided with the laterally arranged bearing elements 54 and 56 having axially arranged bores substantially parallel with the shaft 8 adapted to receive struts 58 and 60, respectively, which have their lower ends connected to the casing 10, as at 59 and 61. The struts 58 and 60 are axially adjustable for adjusting the centrifugal pump 4 with respect to the bearing stand through the medium of the jack screws 62 and 64, respectively. The jack screws 62 and 64 are threadedly mounted in the ends of struts 58 and 60 and extend through the laterally extending ears 66 and 68 of the housing 38, the same being locked in any adjusted positions by means of the lock nuts 70. The struts 58 and 60 are securely locked in any of their adjusted positions by means of the clamp bolts 72 and 74, each having a cam surface adapted to engage the said struts for clamping the same in position.

In the present embodiment, the upper end of the power shaft 8 is provided with a key slot 76 for coupling the power shaft to the shaft of an electric motor or the like which may be mounted for operation at any desired level above the end of the power shaft 8. This makes a very convenient assembly for attachment to the drive shaft of the motor to accommodate various operating conditions particularly where it is desirable to mount the pump within a dry pit or sump for pumping liquid from a sump such as 34 or the like.

The pump disclosed in Figure 1 is particularly adapted for use in pumping liquid material such as dense media used in washing coal and for ore segregation. In such instances the liquid is laden with particles of abrasive character which when pumped by the usual pump mechanism causes considerable damage to bearings, packing glands and the like. It is one of the objects of the present invention to provide a structure in which the dense media or similar liquid material being pumped from the sump 34 does not come in contact with any bearings or packing gland structure, and accordingly the life of a pump made in accordance with the present disclosure far exceeds any conventional pump design.

In order to accomplish such results, the shaft 8 adja-

cent its connection to the impeller **12** extends through an opening **76** in the upper substantially horizontally disposed wall **78** of the casing **10** and no attempt is made to provide a fluid tight joint at that point. Surrounding the opening **76** is an upstanding flange or wall **80** to which is connected the upwardly extending sleeve or hollow member **82** which extends upwardly to a point above the normal liquid level **84** of the material being pumped from the sump **34**. It will, therefore, be seen that there is intercommunication between the interior of the sleeve or hollow member **82** and the chamber within the pump casing **10** through the opening **76** so that during normal operation of the pump the liquid material reaches a level within the hollow member **82** substantially equal to the liquid level **84** in the sump **34**. While it is not absolutely necessary to provide any protective covering for the open end of the sleeve or hollow member **82**, nevertheless the present construction contemplates a finger **86** which is secured in any desired manner to the power shaft **8**, as by way of a set screw or the like, in spaced relation to the upper end of the hollow member **82**. This flinger is adapted to deflect any grease or lubricant which may seep through the thrust seal **50** and deflects any material which might tend to escape from the upper end of the hollow member **82** in the event that there is any substantial variation in the liquid level **84** in the sump.

A pump in accordance with the disclosure of Figure 1 incorporates all of the desired characteristics as hereinabove enumerated and is particularly adapted for use in connection with the pumping of dense media and the like.

Referring to the modification as shown in Figure 2 of the drawings, the same embodies in substance the structure of Figure 1 of the drawings, and accordingly like reference numerals have been applied thereto to designate similar parts found in the structure of Figure 1.

The modification shown in Figure 2, however, is constructed for use where the liquid level **84** of the sump **34** may vary from a plane below the upper end of the sleeve or hollow member **88** which is associated with the pump casing **10** as hereinabove described in the same manner as the sleeve **88**. Such variations in the liquid level within the sump **34** may take place by virtue of the fact that during the operation of the pump the normal level is at **84**, whereas back flow of the supply to sump **34** may cause the liquid level to rise to a height as indicated at **90** when the pump is rendered inoperative. Here again, however, the structural provision for the pump assembly is such that during operation of the pump under normal conditions, liquid material in the form of dense media or the like does not come in contact with any packing gland or bearing. Should the liquid level in the sump **34** rise, the liquid material may come in contact with mechanism to be described, but under such conditions the pump is inoperative so that the same is not subjected to any material wear.

In order to accomplish these results, the power shaft **8**, adjacent the upper end of the sleeve or hollow member **88**, is provided with a stuffing gland **92** seated on the inwardly disposed shoulder **94** of the sleeve **88**, the same having a gland nut **96** adjustably positioned for assuring a fluid tight joint between the gland and the shaft through adjustable mechanism **98** connected to the depending ears **100** formed as a part of the bearing housing **38**. This packing gland accordingly prevents leakage between the shaft **8** and the sleeve **88** at its upper end when the liquid level in the sump **34** rises above the upper end of sleeve **88**. In order to vent the sleeve **88** a vent conduit **102** is connected laterally of the sleeve **88**, the same extending upwardly and above the expected upper level of the liquid material in the sump **34**. Accordingly, should the liquid level rise to the point **90**, the liquid material within the interior of sleeve **88** would

rise to substantially the same level in the vent conduit **102**, yet when the liquid level recedes to the normal operating level **84**, the interior of the sleeve **88** is vented to permit the liquid level in the sleeve **88** to assume its normal relation to the liquid level in the sump **34**.

Another system for venting the sleeve **88** is disclosed in the modification shown in Figure 2, wherein the vent conduit **102** and the connecting part **103**, illustrated by dotted lines, serves to connect the sleeve with the sump **34** approximately centrally of the height of the sump. The operation is the same as explained for vent **102** since when the liquid level recedes to the normal operating level the interior of sleeve **88** will be vented to permit the liquid level in the sleeve to assume its normal relation to the liquid level in the sump. Another modification includes the vent conduit **104**, also indicated by dotted lines in Figure 2, which will likewise function to vent the sleeve **88** during operation of the pump. The complete system includes conduit **102** and the connecting conduit **104**, and it is clearly apparent that said system joins the interior of the sleeve with inlet **28** relatively close to the suction side of the impeller.

This patent is a division of my prior Patent No. 2,868,134 dated January 13, 1959 and entitled Pump.

The invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated by the drawings as various other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

What is claimed is:

1. In a fluid impelling device, the combination with a sump for containing a liquid, of a pump operable under a hydrostatic head determined by the normal operating liquid level within the sump, said pump having a housing provided with an inlet communicating with said sump and with an outlet for discharge of liquid material therefrom, said housing being provided with a substantially horizontally disposed wall having an opening therein, a hollow member secured at one end of said wall and extending upwardly above the liquid level in said sump and having its interior in communication with the interior of said housing through said opening, a bearing stand disposed above the upper end of said hollow member, a power shaft mounted in said bearing stand and extending downwardly through said hollow member and said opening, an impeller mounted on the lower end of said shaft within said housing, strut members connecting said housing and bearing stand, means for adjustably securing said struts for adjustably positioning said housing with respect to said bearing stand, the liquid level in said sump varying in heights at different times from a plane disposed below to a plane disposed above the upper end of said hollow member, a packing gland for said shaft at the upper end of said hollow member normally disposed above the lower liquid level in said sump, adjustable means for said packing gland connected to said bearing stand, and a vent conduit communicating with the interior of said hollow member.

2. In a fluid impelling device, the combination with a sump for containing a liquid, of a pump operable under a hydrostatic head determined by the normal operating liquid level within the sump, said pump having a housing provided with an inlet communicating with said sump and with an outlet for discharge of liquid material therefrom, said housing being provided with a substantially horizontally disposed wall having an opening therein, a hollow member secured at one end to said wall and extending upwardly above the liquid level in said sump and having its interior in communication with the interior of said housing through said opening, a bearing stand disposed above the upper end of said hollow member, a power shaft mounted in said bearing stand and extending downwardly through said hollow member and said opening, an impeller mounted on the lower end of

said shaft within said housing, strut members connecting said housing and bearing stand, means for adjustably securing said struts for adjustably positioning said housing with respect to said bearing stand, the liquid level in said sump varying in height from a plane below the upper end of said hollow member during operation of said pump to a plane above the upper end of said hollow member when said pump is inoperative, a packing gland for said shaft at the upper end of said hollow member normally disposed above the lower liquid level in said sump, adjustable means for said packing gland connected to said bearing stand, and a vent connection for the hollow member having location in the upper end of the member immediately below the packing gland.

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