G. C. HICKS, JR.

PACKING SYSTEM.

APPLICATION FILED JUNE 10, 1916. RENEWED JAN. 21, 1918.

1,258,218.

Patented Mar. 5, 1918.

2 SHEETS—SHEET 1.

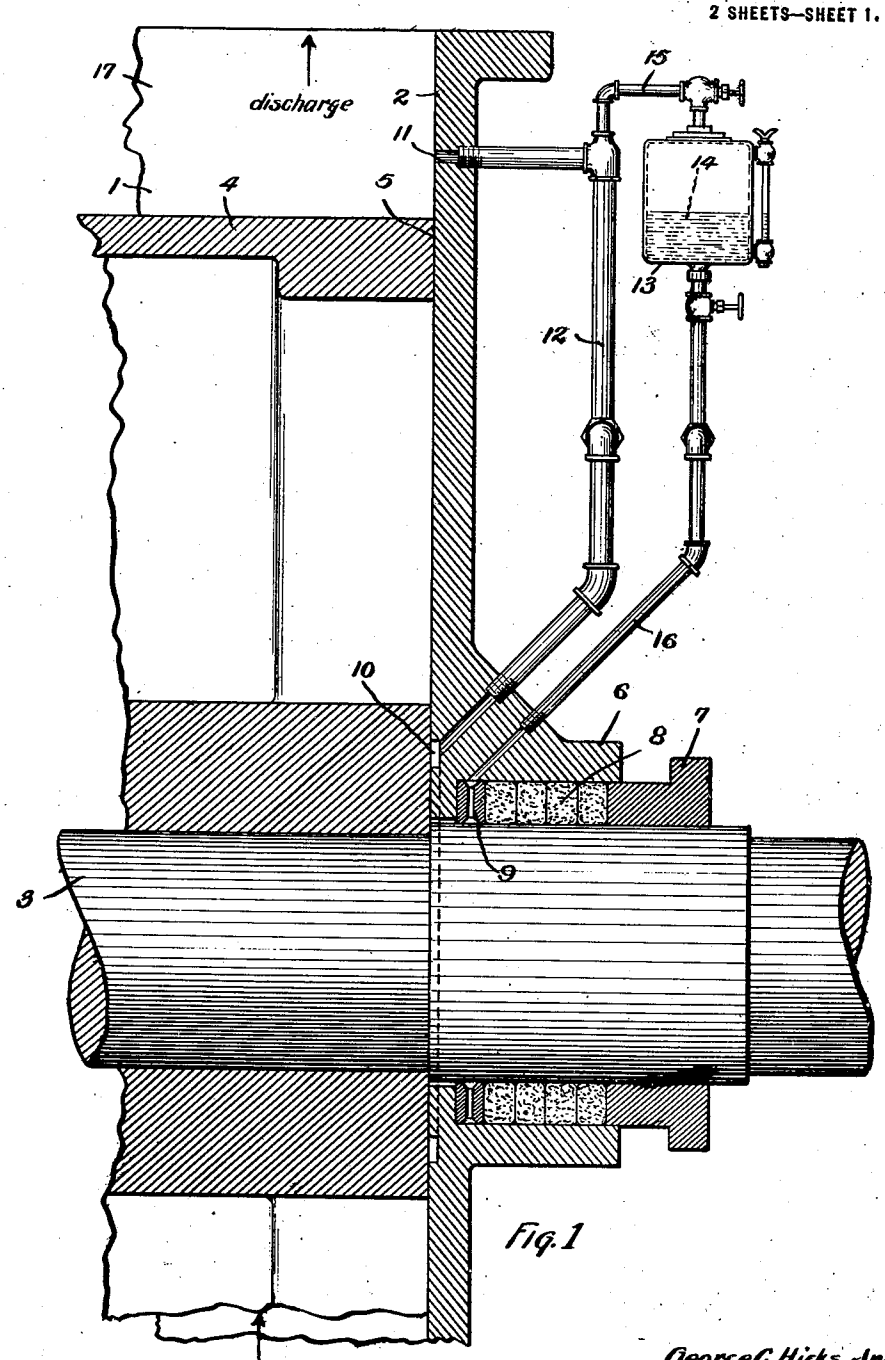


Fig. 1

Witness:
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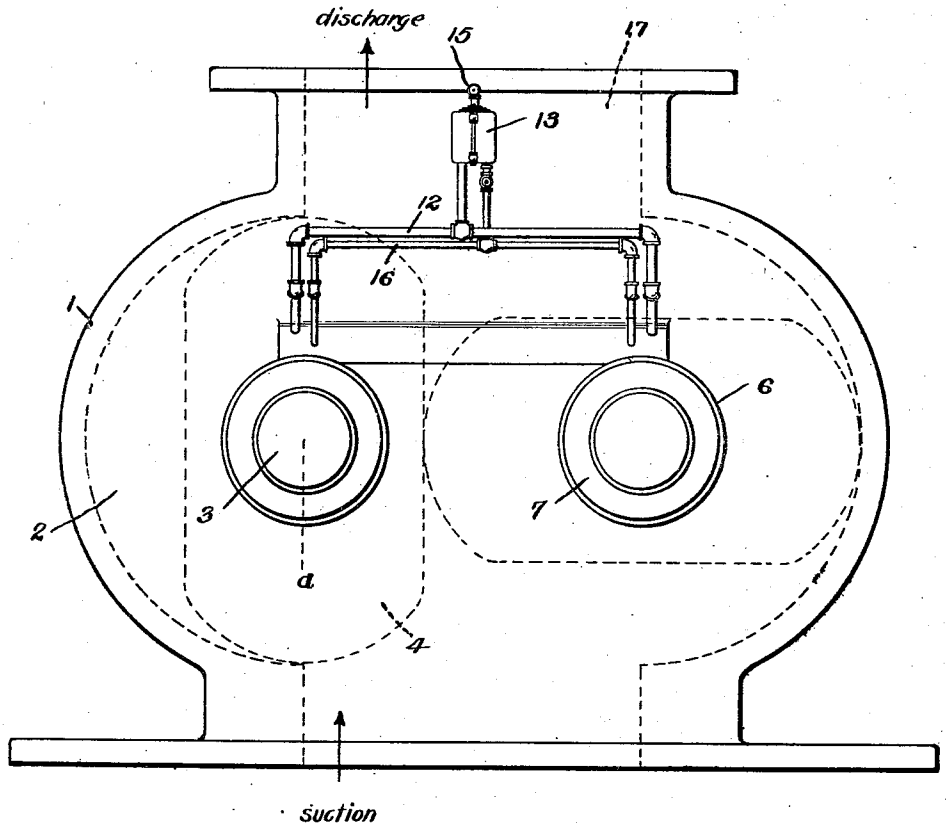


Fig. 2

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UNITED STATES PATENT OFFICE.

GEORGE C. HICKS, JR., OF CONNERSVILLE, INDIANA, ASSIGNOR TO THE P. H. & F. M. ROOTS COMPANY, OF CONNERSVILLE, INDIANA.

PACKING SYSTEM.

1,258,218. Specification of Letters Patent. Patented Mar. 5, 1918.

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To all whom it may concern:

Be it known that I, GEORGE C. HICKS, Jr., a citizen of the United States, residing at Connersville, Fayette county, Indiana, have invented certain new and useful Improvements in Packing Systems, of which the following is a specification.

This invention relates to a construction of packing system adapted for use in connection with pumps of the rotary type, the object being to prevent the material being pumped from escaping along the impeller shafts or from reaching the packing so as to bring about a destructive effect on the packing.

It is not difficult, in pumping machinery dealing with liquid, to pack a shaft or rod against the outward passage of the liquid. The difficulty of packing is somewhat but not seriously increased when the machine deals with steam, but the difficult is much increased when the machine deals with gaseous fluids, owing to the insidious character of the fluid and owing to the destructive effects certain fluids, such as gas, may have upon the ordinary packing.

My invention has in particular view the provision of a packing system for a pumping machine dealing with gas, the object of my invention being to prevent the outflow of the gas past the packing and to prevent gas reaching the packing to such extent as to act destructively upon the packing.

In rotary pumps of the well known Roots type, there is a pair of coöperating impellers working within a suitable casing, these impellers being mounted on shafts rotated by appropriate means, the shafts projecting out through the end of the casing to receive connecting gears and driving mechanism. While in such a pump there are two shafts, with packing at each of the shafts, the present specification will treat the packing system in the singular.

My invention will be readily understood from the following description taken in connection with the accompanying drawings in which:—

Figure 1 is a vertical section through one of the improved packings, in the plane of line *a* of Fig. 2; and

Fig. 2 an end view of a double impeller pump fitted with my improved packing system.

In the drawings:—

1, indicates the general casing of a rotary pump of the well known Roots type:

2, the end plates of the casing:

3, the shafts of the impellers, journaled in the end plates of the casing:

4, the impellers secured to the impeller shafts and working together in the usual manner and having their ends in engagement with the end plates of the casing, as usual:

5, the inner surfaces of the end plates, against which the ends of the impellers run:

6, the stuffing-box surrounding the shaft at the outwardly projecting end of the shaft:

7, the gland coöperating with the stuffing-box in compressing the packing within the stuffing-box:

8, the packing, of any usual well known elastic or semi-elastic material, compressed into the stuffing-box by the gland:

9, a lantern-ring, of known form, disposed at the inner end of the packing in the base of the stuffing-box, this lantern-ring consisting of a ring surrounding the shaft and provided with radial holes extending from its exterior to its interior:

10, an annular recess formed in the inner surface of the end plate of the casing around the shaft at the joint between the end plate and the end of the hub of the impeller, this recess, while shown as being formed in the inner surface of the end plate of the casing finding its full equivalent in an annular recess in the end of the hub of the impeller:

11, an outlet from the discharge side of the casing:

12, a conduit leading from outlet 11 to the recess 10:

13, an oil-tank, disposed above the level of the shaft:

14, oil therein:

15, a conduit leading from the discharge side of the casing to the top of the oil tank so as to cause fluid to press upon the top of the oil in the tank:

16, a conduit leading from the base of the oil tank to the radial perforations of the lantern-ring: and

17, the discharge side of the pump.

Looking at Fig. 1 and disregarding the presence of the present invention, and as-

suming that the pump is dealing with liquid, some liquid might leak from the higher-pressure part of the casing, between the end of the impeller and the end plate of the casing and seek to find its way outward along the shaft to the atmosphere. The packing 8 would satisfactorily take care of such tendency toward outward leakage, and so, also, if the pump were dealing with certain characters of vapors. But in the case of certain fluids, gas, for instance, the packing might not satisfactorily take care of the outward leakage of the fluid and, moreover, the gas reaching the packing might have a more or less destructive effect upon it. It has heretofore been proposed to intercept such leaking fluid and to suck it away before it could reach the packing or pass the packing into the atmosphere.

In the present case, however, the oil goes from its tank 13 through pipe 16 and through the lantern-ring to the shaft. This movement of the oil is under the influence of the pressure at the discharge side of the pump, if there be pressure there, enhanced by the hydrostatic head of the oil-column. The oil of course tends to move outwardly between the shaft and the packing, but the packing will satisfactorily take care of such flow of oil, and such oil as does pass entirely outward of the machine may be caught and re-used. Any tendency of gas to work down between the end of the impeller and the end of the casing against which it works, such gas naturally tending to move outwardly past the packing, is resisted by the oil at the initial end of the packing. In other words, the packing will satisfactorily take care of the outward flowing tendency of the oil, and the oil will satisfactorily prevent the gas from escaping past the packing or from reaching the packing to such extent as to exert any seriously destructive influence upon it.

But as the leaking gas tends to move toward the shaft under the influence of the pressure of discharge, and as the oil reaches the shaft under the influence of the pressure of discharge plus the hydrostatic head of the column of oil, there might be a tendency for the oil to move into the casing. Any oil which gets past the packing and out of the stuffing-box may be recovered, but oil going into the casing and joining the gas is lost, and this loss would increase the consumption of oil. By providing the annular recess 10, between the end of the impeller and the end wall of the casing, and by keeping this recess under discharge pressure, through pipe 12, the tendency of oil to pass into the pump is very much reduced, and oil will not pass into the pump to any considerable degree. It will, of course, be understood that oil employed in this system not only acts as a packing to prevent gas from passing the main packing or from reaching the main packing to such extent as to exert a materially destructive effect upon the main packing, but also forms a lubrication between the shaft and main packing. The radial holes in the lantern-ring form a recess between packing 8 and the interior of the casing into which the oil is delivered. Reference has been made to the hydrostatic head of the oil column as enhancing the pressure of the oil delivery to the lantern-ring. This hydrostatic head, however slight, will give to the oil injected into the lantern-ring a pressure in some excess of that of any gas seeking to leak from the pressure side of the pump to the packing.

The presence of recess 10, constantly under the discharge pressure of the pump, therefore tends to very materially reduce the leakage of oil into the pump, especially as the lower portion of the joint without the recess 10 would be under the lower pressure of suction. There is therefore established, uniformly around the shaft, an area of pressure greater than that at the suction side of the pump so that any leakage, to any degree worth considering, will be that of gas from the pressure side to the suction side of the pump, the leakage of oil to the pump being inconsiderable, and leaking gas from the pressure to the suction side of the pump being fended away from the packing where it might produce injury to the packing, or through the packing to result in wastage. Obviously the discharge pressure may or may not be above atmospheric pressure, and the invention is applicable to pumps with a single impeller or a plurality of impellers.

I claim:—

In a pump of the rotary impeller type a packing system comprising, an impeller-shaft projecting outwardly through the end-plate of the casing, a stuffing-box carried by the end-plate around the shaft, a gland co-operating with the stuffing-box, packing disposed in the stuffing-box and compressible by the gland, a recess formed around the shaft between the packing and the interior of the casing, an oil-tank disposed above the stuffing-box, a conduit leading from the oil therein to said recess, an annular recess surrounding the shaft between the end of the impeller and the end-plate of the casing, and a conduit placing the discharge side of the pump in communication with said annular recess and with the upper portion of the oil-tank, combined substantially as set forth.

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Witnesses:
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