

A. W. JONES.

LINING FOR CASINGS OF ROTARY PUMPS.

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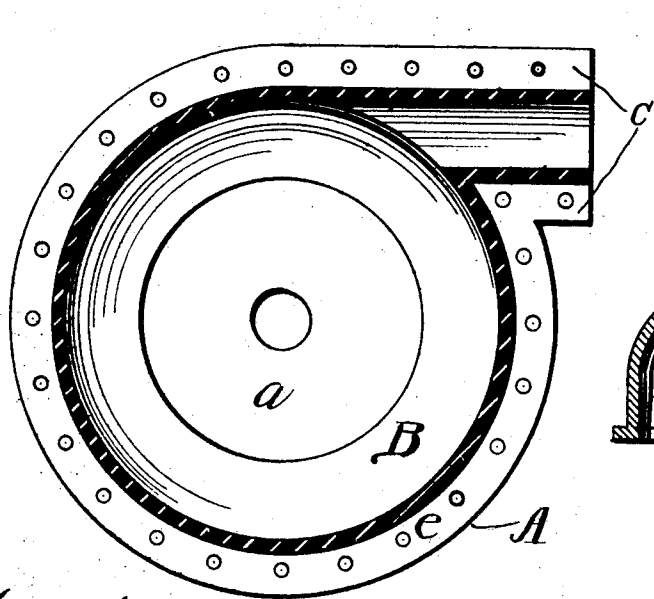


Fig. 1.

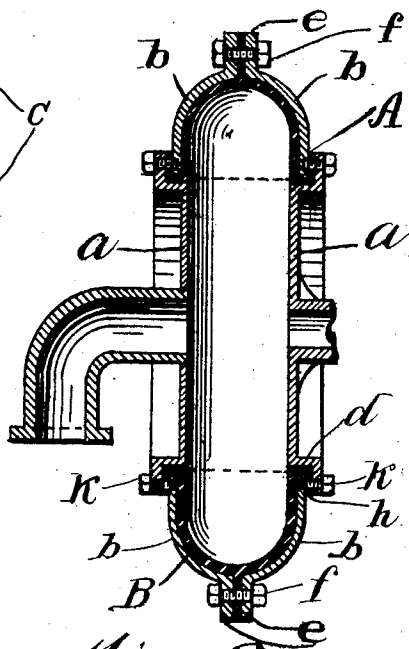


Fig. 2.

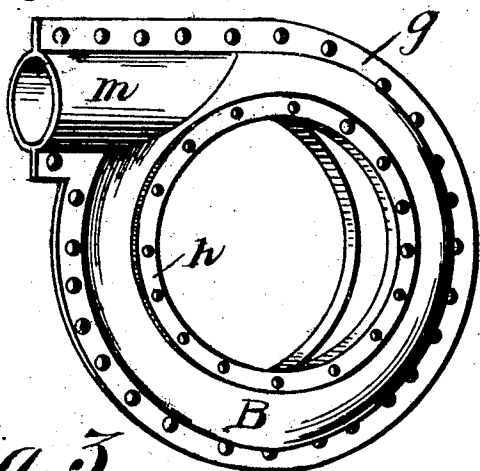


Fig. 3.

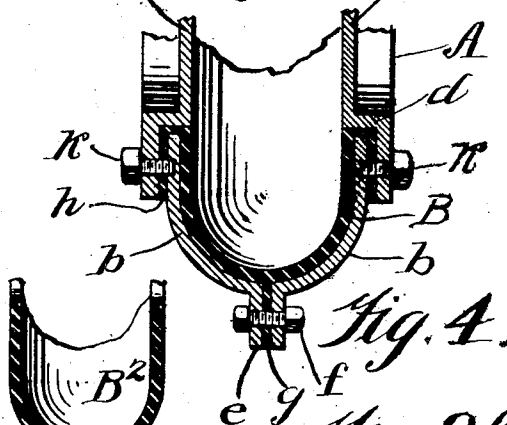


Fig. 4.

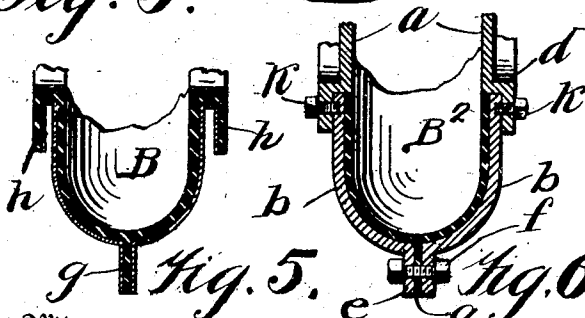


Fig. 5.



Fig. 6.

Witnesses
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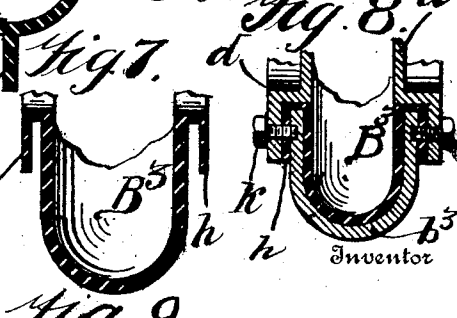


Fig. 7.

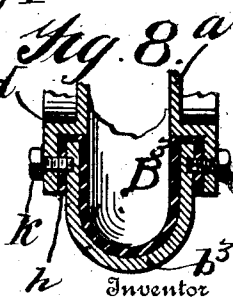


Fig. 8.

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LINING FOR CASINGS OF ROTARY PUMPS.

No. 888,814.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ADAM W. JONES, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Linings for the Casings of Rotary Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to rotary pumps, and more particularly to linings for the casings thereof. Such pumps are used largely in mining phosphate as it occurs in certain formations; and in this application it has been found that the rock very soon wears the casing in such a way as to render the pump useless. To meet this condition, it has been proposed to provide the casing with metal linings, which, through their hardness or by reason of the fact that they were replaceable, were to save the casing from the effects of erosion. Some of these linings were made of manganese steel, because of the superior hardness of this alloy; but experience has shown that the life of metal linings, whatever their composition, is of but a few months duration, at the end of which time a new lining must be inserted or the pump discarded. This constitutes a difficulty, the gravity of which cannot be too strongly emphasized, not so much because of the actual cost involved, but on account of the fact that the repairing or replacing of a pump not infrequently reduces the capacity of the plant by one pump for as much as a day. When it is remembered that this occurrence is repeated every few months and that each pump normally handles a large amount of phosphate rock daily, it will be realized that the loss brought about in this way is a serious factor to be reckoned with. Then when it is remembered that all efforts heretofore to prolong the continuous running of the pumps have been successful only to the extent of a few months, at most, it will be further realized that there is a very imperative demand for a casing lining capable of resisting wear for a considerable period.

Hitherto, it has been presumed that the lining, in order to have resisting qualities, must be made of metal, and all the linings proposed or put in practice have been of metal, the general object being to render the

lining as hard and unyielding as possible. Now I find that the theory that the lining should be metallic is an error, and on the contrary have made the unlooked for discovery that a lining constructed of resilient material, particularly rubber, possesses the long-desired lasting qualities. It has been demonstrated that rubber, when subjected to the same conditions that produce rapid erosion of the metal linings, lasts many times as long as would the metal under these conditions. This apparently paradoxical condition I attribute to the fact that the rubber, or other resilient material, yields to the impact of the fragments of rock or particles of sand, thus escaping injury, whereas the metal lining, being incapable of yielding at each point of impact, suffers abrasion. The abrasion produced on a manganese steel lining by any one particle of rock may be extremely slight, apparently negligible, but the aggregate of abrasion, due to the vast amount of rock passing through the pump, is such as to wear out even this hard metal in a few months. I wish to emphasize, therefore, that I believe myself to be the first to propose the use of a non-metallic lining for rotary pump casings, and consider this as constituting one of the broad phases of my invention. Hitherto, also, great difficulty has been experienced in securing metal linings in place, so that the water and rock particles would not get behind, in this way wearing out the casing itself and rendering the latter, as well as the lining, useless.

Other features of my invention comprehend certain improved methods of securing a lining in a casing of a pump of the class described, the object being to prevent passage of material between the casing and lining. As will become apparent, these methods of attachment might be applied with advantage to linings made of metal, if for any purpose, as it might well be, a metal lining should be more desirable than a non-metallic, resilient one.

A subsidiary feature of the invention relates to the manner in which the lining may be made to serve also as a gasket interposed between sections of the casing.

In the drawings: Figure 1 is a vertical, longitudinal section through a rotary pump casing, showing one of my non-metallic, resilient linings in place; Fig. 2 is a vertical, transverse section of the same; Fig. 3 is a perspec-

tive view of the form of lining shown in these figures; Fig. 4 is a section across the annular rim of the casing and lining shown in the preceding views; Fig. 5 is a similar section through the lining only; Fig. 6 is a section similar to Fig. 4, illustrating a slightly different form of lining; Fig. 7 is a view like Fig. 5, showing the same form of lining illustrated in the last view; Fig. 8 is another view like Fig. 4, there being shown a different form of casing and lining from those hitherto illustrated; and Fig. 9 is a view of the nature of Fig. 5, exhibiting the lining of the last figure.

Referring now to these figures, and for the present more particularly to Figs. 1 to 5, it being understood that the several views merely represent for illustrative purposes certain concrete embodiments of the underlying principle of the invention:—A is the casing of a rotary pump, adapted to contain any usual or preferred form of rotor (not shown). This casing is constructed in sections, comprising the side plates *a*, and the two annular rim sections *b*, *b*. Substantially tangential, half-cylindrical projections *c*, *c* form the outlet of the casing, as will be readily understood, this however constituting no part of my invention. Each side plate *a* is conveniently provided with an outstanding cylindrical flange *d*, the rim of this flange being turned at substantially right angles outward from the center, or parallel to the side plates and spaced slightly therefrom. The inner edges of the annular sections *b*, *b* are supported by the cylindrical portions of the flanges *d*, and the annular rim sections and the side plates are very suitably connected by means of bolts *k* passing through the out-turned edges of the flanges *d* and taking into the sections *b*. Peripheral flanges *e*, *e* are also formed on the rim sections, and these may be connected by means of bolts *f*. B indicates one form of the non-metallic lining forming the substance of my invention. As shown in these views, its trough portion may be formed in any shape to conform to the rim of the casing, a curved form being shown but it being obvious that the lining might be angular in cross-section, or made in any shape to fit the form of casing preferred. The attaching means is shown in the views under discussion as constituting a peripheral flange *g*, which is interposed between the flanges *e* and through which pass the bolts *f*, and side flanges *h*, corresponding to the flanges *d*, being interposed between the inner edges of the rim sections and the flanges *d* and also between these flanges and the sides of the rim sections, thus receiving the securing bolts *k*. By this construction, it will be seen, the lining is securely held to the casing at the top and bottom of the trough, and in this way it is rendered impossible for material to penetrate between the casing and lining.

In Figs. 6 and 7 is shown a form of lining

of slightly different form, labeled for convenience B². This construction is intended for use in connection with the same style of casing previously illustrated and differs from the last form of lining only in lacking the side flanges *h*. This arrangement will be found to be very efficient, since the action of the material passing through the pump will exert a tendency to maintain the sides of the lining trough in place, this action being assisted by the countersunk relation of the lining to the interior of the casing.

Another of the forms in which it has occurred to me to manufacture the lining is illustrated in Figs. 8 and 9 and designated by the reference letter B³. As will be readily recognized, this shape of lining is applicable to casings having a rim region constituted of one integral piece, and is, therefore, not provided with the peripheral flange *g* of the other two constructions. The rim section of the casing has been designated in these last two views as *b*³, it being understood that the side plates may be of the same construction already described.

It will be immediately apparent from the views that, in general, a desirable way of forming the lining is as a trough open around its inner periphery and extending over the sides of the casing so as slightly to overlap the periphery of the rotor as indicated by dotted lines in Fig. 1. As clearly shown in Fig. 3, the trough is intended to be provided with a tubular extension *m*, fitting the outlet of the casing, and the flanges *g* may be continued along this region. In the form of my invention illustrated in Figs. 1-5 the lining serves as a gasket between the side plates and the annular rim sections and also between the rim sections themselves. The other forms of linings possess this same feature in part. It will be noted that where the lining flanges are interposed between the casing sections, these sections do not contact with each other, the whole compression exerted by the securing bolts being thus borne by the lining flanges, thus constituting the latter efficient packing members.

As emphasized at the beginning of the specification, the essence of the invention resides in the material of which the lining is composed, this constituting the radical departure from the prior art. This material is primarily non-metallic. More specifically it is resilient, and preferably it is rubber. The rubber may be pure or it may consist of a duck backing faced with rubber, or of other combination of rubber and textile. Instead of rubber, leather, or in fact any other non-metallic, resilient material might be employed without departing from the spirit of my invention. In Fig. 5 the lining is indicated as being composed of textile next the metal shell and a rubber facing on the inside. It is to be understood that

where in the claims I refer to a rubber lining I do not limit myself to a lining entirely of rubber.

It may be noted that I may avail myself of cement in attaching the lining to the casing. Such cement will be of advantage in causing every portion of the lining to lie close to the surface of the shell, and will be particularly advantageous in connection with such a form of lining as is illustrated in Figs. 6 and 7. However, cement might be omitted even with this form of lining. I desire it to be understood that I regard it as possible that the resilient lining might be held in place entirely by cement, the attaching flanges being dispensed with entirely. All these and other modes of attachment I regard as being applicable to the fundamental idea of a non-metallic, resilient lining.

What is claimed as new is:

1. The combination with the casing of a rotary pump, of a lining therefor formed of resilient material.
2. The combination with the casing of a rotary pump, of a lining therefor composed of rubber.
3. The combination with a rotary-pump casing, of a surface lining of yielding material positioned, relative to the inner face of the periphery thereof, to receive directly there-against the effect of material passing through the pump.
4. The combination with the casing of a rotary pump, of a removable lining therein formed of resilient material.
5. The combination with the casing of a rotary pump, of a lining of rubber covering the inner face of the periphery thereof.
6. The combination with the casing of a rotary pump, of a lining of resilient material countersunk in the inner face of the periphery thereof.
7. The combination with the casing of a rotary pump, of a lining of resilient material covering the inner surface of the periphery thereof and extending part over the sides.
8. The combination with a rotary pump casing formed in sections, of a yielding lining therefor having a flange interposed between the sections.
9. The combination with a rotary pump casing formed in sections, of a lining of re-

silient material serving as a gasket between said sections.

10. The combination with a rotary pump casing comprising sections having a plurality of junctions, of a lining of resilient material having flanges interposed between the casing sections at the several junctions.

11. The combination with a rotary pump casing, of a trough-shaped, yielding lining therefor having attaching means at the top and bottom of the trough.

12. The combination with a rotary pump casing comprising sections, of a trough-shaped, yielding lining having attaching flanges at the top and bottom of the trough received between the casing sections.

13. The combination with a pump-casing having two distinct annular rim regions provided with peripheral flanges, of a trough-shaped, yielding lining having a peripheral flange interposed between the casing flanges, and means for compressing the casing flanges against the lining flange, whereby the latter serves as a gasket.

14. The combination with a pump casing having a peripheral portion and side pieces having L-shaped flanges adapted to receive the edges of the peripheral portion, of a yielding lining having L-shaped marginal flanges received between the peripheral portion of the casing and the flanges of the side pieces, and means for forcing the peripheral region and the side-piece flanges laterally against the lining flanges, whereby the latter serve as gaskets.

15. The combination with a pump casing having two side pieces and two rim sections, the latter being provided on their inner edges with L-shaped flanges receiving the edges of the side pieces and on their outer edges with peripheral flanges, of an annular, trough-shaped, yielding lining having side flanges of L-shape and a single peripheral flange, and means for securing the casing sections together and the lining flanges between the sections.

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

ADAM W. JONES.

Witnesses:

EMORY H. BOGLEY,
EDMUND H. PARRY.