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P. I. NAGLE

ROTARY PUMP WITH LINER PLATE

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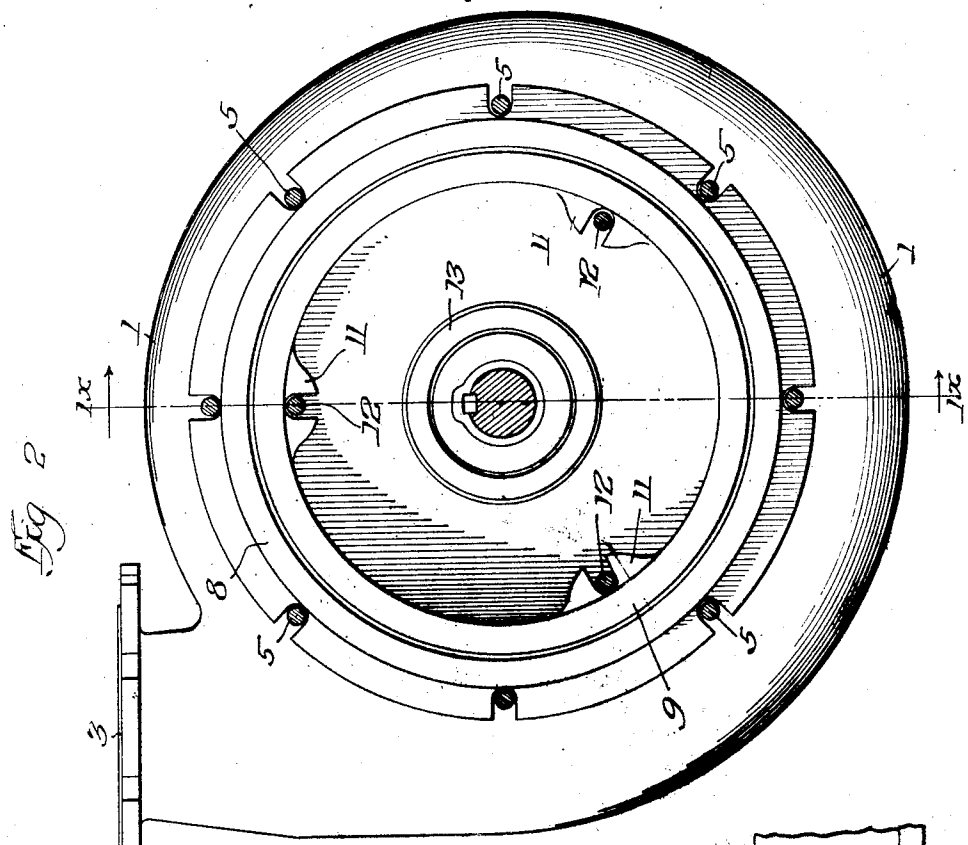

Fig. 2

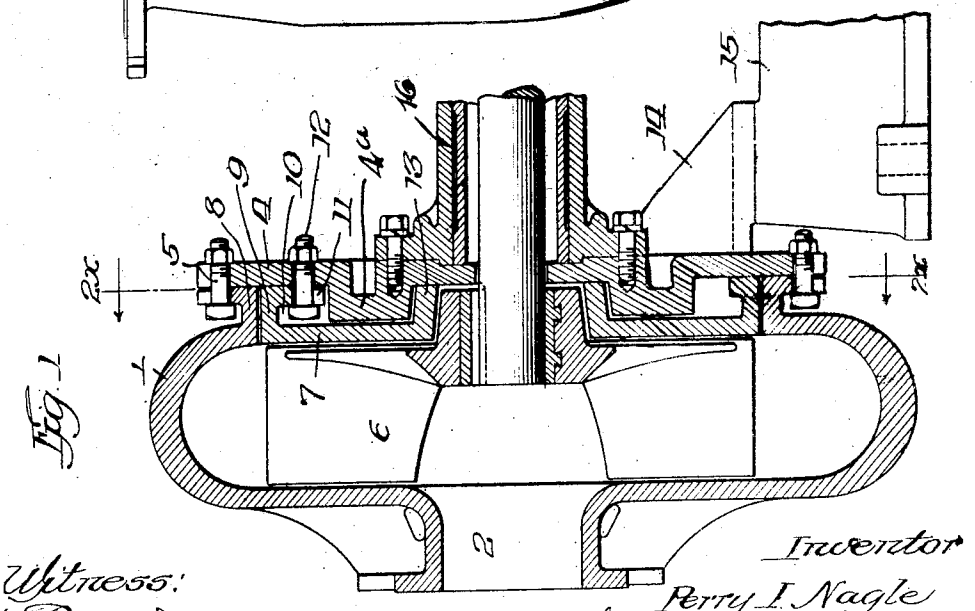

Fig. 1

Witness:
E. C. Brown

Inventor
Perry I. Nagle
By Wilkinson, Huxley Byron & Knight
Attys

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UNITED STATES PATENT OFFICE.

PERRY I. NAGLE, OF CHICAGO HEIGHTS, ILLINOIS, ASSIGNOR TO AMERICAN MANGANESE STEEL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF MAINE.

ROTARY PUMP WITH LINER PLATE.

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This invention relates to pumps of the kind in which an impeller rotating within a shell, draws in fluid through an axial opening in one end of the shell and expels it through a discharge port at a tangent to the shell, and particularly to rotary pumps of the kind in which one end wall of the pumping chamber is provided with a liner plate to save the wall, proper, from wear which is very considerable, particularly when the pump is used for dredging sand, gravel, and the like.

In rotary pumps with liner plates as heretofore constructed, it has been the practice to apply the plate to the flat inner surface of the end wall and secure it there by screws passing through the end wall and into the plate, but this method of providing the end wall with a liner plate is objectionable because of the relatively light and unsubstantial construction of liner plate admissible in the space available between the end wall and the impeller, also the relatively insecure attachment afforded by tapping screws directly into the plate, as well as the unsatisfactory bearing between the liner plate and the end wall, developed by such securing means, and the difficulty of providing screw threads in a plate which, to render the best service, should be made of cast manganese steel.

The object of the present invention is to improve the construction of the liner plate for use in the situation named, as well as the construction of the shell and end wall which develop the recess in which the liner plate is received and thereby avoid all of the enumerated objections and obtain other advantages which will be apparent as the description proceeds. In carrying out the present invention, a relatively deep recess is developed between the pumping chamber or working space of the shell, and the inner end wall which carries the liner plate, and the liner plate is provided near its center and perimeter with offsetting lugs extending in the direction of the axis of rotation, away from the working chamber of the pump and toward the back wall, and through means of these lugs the liner plate is stepped against the end wall. The dimensions of these lugs are such that the inner face of the liner plate is positioned to form a continuation of that portion of the inner wall of the working chamber which is provided by the shell, and provide a deep recess which admits of the back wall being made more substantial, besides providing space for special bolting means in the form of radially extending slotted lugs of a kind that will receive the necks and heads of securing bolts and which can therefore be produced in the casting process and without resort to threading, machining or finishing work, other than that of grinding, which method alone is commercially feasible in manganese steel work. Such a construction of liner plate is very much more substantial both in its inherent structure and in its application to the end wall of the shell, besides being more readily applied; and the radially spaced offsets at the center and perimeter of the plate, leave a very substantial intermediate annular space which admits of a hub-like formation in the end wall itself, that renders the latter more substantial in its structure and better adapted for articulation with the barrel or cylindrical portion which surrounds the pump shaft.

In the accompanying drawing,

Figure 1 is a vertical axial section, and

Figure 2 is an inner end elevation of a pump in which the preferred form of the invention is embodied; the inner end wall and ports in the rear thereof being omitted in Figure 2 and the pump shaft being shown in transverse section.

1 represents the shell, 2 the axial intake port in the front or outer end wall thereof, and 3 the tangential discharge port of a known type of centrifugal rotary pump. It is customary to provide pumps of this kind with centrically bored inner end walls 4 secured to the shell 1 through means of an annular series of bolts 5 and to protect that surface of the end wall 4 which is presented toward the impeller 6, through means of a liner plate, secured to the said end wall and accommodated in a recess provided by an offset in the shell. The present invention employs a liner plate 7 in substantially this relation and develops the offset to receive it through means of a flange 8 on the shell 1, extending axially to the rear and then radially to provide engagement for the bolts 5; but the present invention makes the offsetting flange 8 very much deeper than heretofore, so that instead of merely accommodating the thickness of the plate 7, it will develop a recess sufficient to accommodate a

deep axially extending flange 9 on the liner plate, through which the outer margin of the liner plate may be stepped against the end wall 4, and which liner plate flange 9, in turn, develops a substantial recess 10 sufficient to accommodate slotted bolting lugs 11 extending radially inward from the rear margin of the stepping flange 9 and also sufficient to receive the heads of bolts 12 inserted in the slots of said lugs and extending rearwardly through and nutted upon the end wall. By this expedient, it becomes practicable to bring the center annular flange 13 with which liner plates have generally been provided, into stepped bearing against the inner face of the rear wall of the shell, in substantially the same plane with the face that receives the marginal stepping flange 9 and thereby eliminate the annular recess in the end wall which has heretofore been provided at some additional expense, to receive said central flange; besides a more substantial articulation of the liner plate with the end wall is afforded by the system of bolts and lugs, offset radially inward from the outer perimeter of the liner plate, which in turn insures a better stepped bearing of the flange 13 against the inner face of the end wall; a much more rigid and substantial liner plate is provided, as a result of the stiffening effect of the stepping flanges; and the end wall itself can be made of more substantial and rigid design, by providing it with axially extending annular offset 4a, occupying said recess 10, and one that is better adapted to transfer the very substantial load of the pump to the barrel or support 16 which is united through the brackets 14 to the bed 15.

I claim:

1. In a rotary pump, an end wall member and a shell member, one of which is provided with an axially extending annular offset through which said members meet and by which is provided a recess between the end wall and the working space of the pump; and a liner plate located in said recess and having an annular stepping flange that is radially within the said offset and extends axially away from said working space and meets said end wall member and means interengaging with said flange to secure the plate and wall member together.

2. In a rotary pump, a wall member and a shell member one of which has an annular coupling flange extending in the direction of, but remote from, the axis of revolution of the pump and through which the said members are united, and a recess is developed between the wall member and the working space of the shell; and a liner plate located in said recess, and having radially within the flange first named, an axially extending annular stepping flange through which it meets the wall member and radially extending bolt receiving means located on said stepping flange and through which the plate is bolted to the wall member.

3. In a rotary pump, a shell member having a working space, a wall member, an axially extending flange through which said members are united, providing a deep recess between said working space and said wall member, a liner plate having an axially extending annular flange through which it is stepped against the wall member, and a radially extending bolt receiving means carried by said flange, all received within said recess, the bolt receiving means being spaced in axial direction from said liner plate a distance sufficient to admit the heads of bolts engaging said bolt receiving means and bolts securing said plate to said wall member.

4. In a rotary pump, a shell member having a working space, a wall member united to said shell member in a plane offset in the direction of the axis of rotation from said working space thereby developing a recess to one side of said working space, a liner plate located between said wall member and said working space and constructed with central and marginal stepping flanges extending axially away from said working space and through which it meets said wall member, said flanges sustaining the liner plate in position to form a continuation of the inner wall of the working space and leaving an annular space between said flanges, and an inwardly extending annular portion on the wall member, entering the space between said flanges.

5. In a rotary pump, a shell member provided with a working space, an end wall connected with said shell member but offset therefrom in the direction of axis of rotation to leave a recess between the working space and the end wall, said end wall having annular portions near its center and perimeter, in substantially the same plane, and a liner plate located in said recess and having axially extending flanges presented away from said working space and stepped against the said annular portions of the end wall, and preserving a portion of said recess for the reception of bolting means.

6. In a rotary pump, a supporting barrel having an attaching flange, an end wall secured to said barrel, a shell constructed with a working space and secured to said end wall with its working space axially offset from said end wall, thereby providing a recess between the working space and the end wall, said end wall being constructed upon its inner face with an axially extending annular offset in position to receive securing means extending from the attaching flange of the barrel and with annular stepping portions located radially within and without said offset, and a liner plate located in the recess

between the working space and the back plate constructed with flanges extending axially in the direction away from said working space and stepped against the annular portions of the back plate, said liner plate flanges thereby presenting the inner face of the liner plate in position to form a continuation of a wall of the working space and preserving said recess for the reception of the offset on the back plate and bolting means for the liner plate.

Signed at Chicago Heights, Illinois, this 26th day of August, 1926.

PERRY I. NAGLE.