A. M. ROBESON & A. DAVIDSON.

CENTRIFUGAL PUMP.

APPLICATION FILED NOV. 18, 1909.

1,025,425.

Patented May 7, 1912.

4 SHEETS—SHEET 1.

Fig. 1.

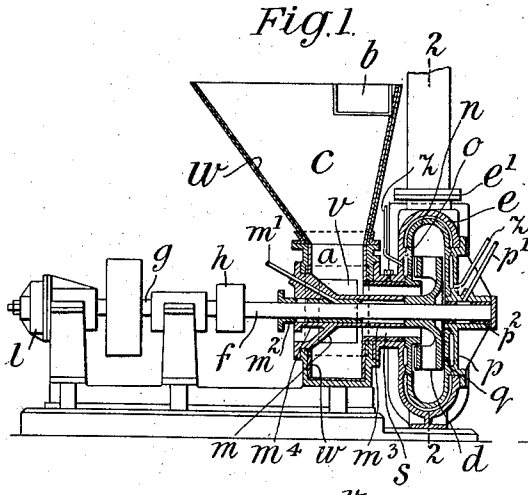
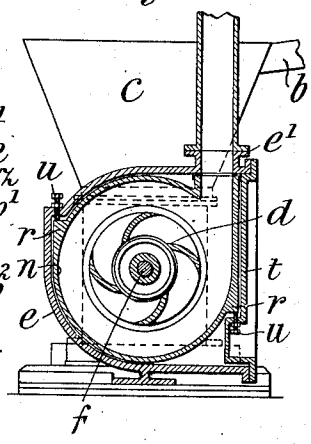


Fig. 2.



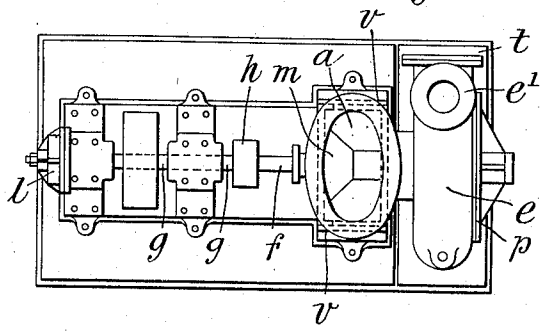


Fig. 3.

Fig. 4.

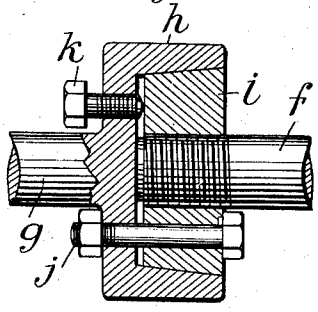
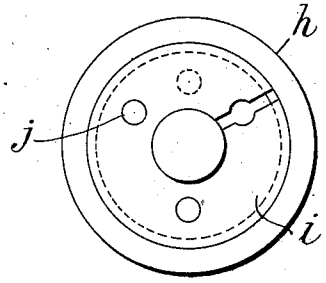


Fig. 5.



WITNESSES.

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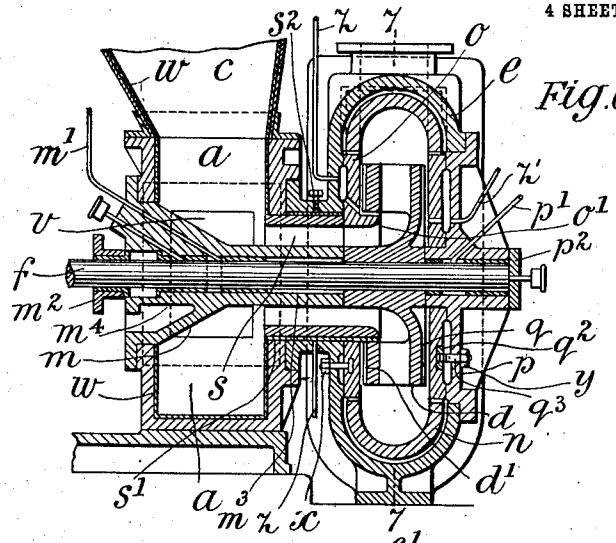

Fig.6.

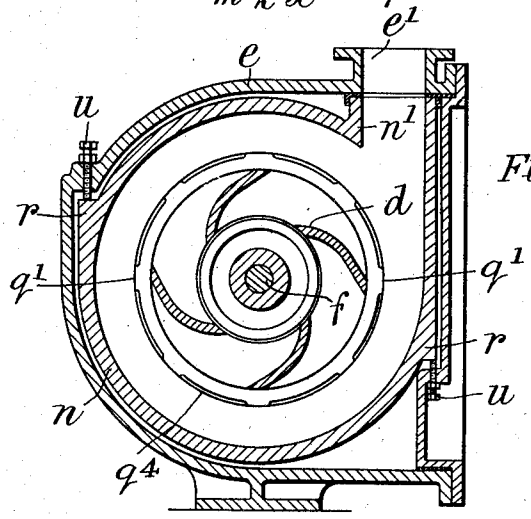

Fig.7.

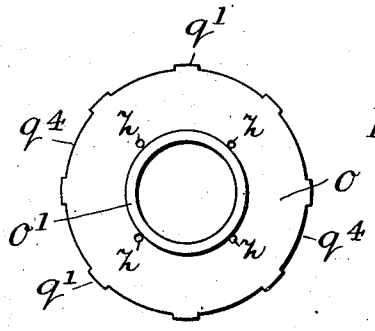

Fig.8.

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4 SHEETS—SHEET 3.

Fig. 9.

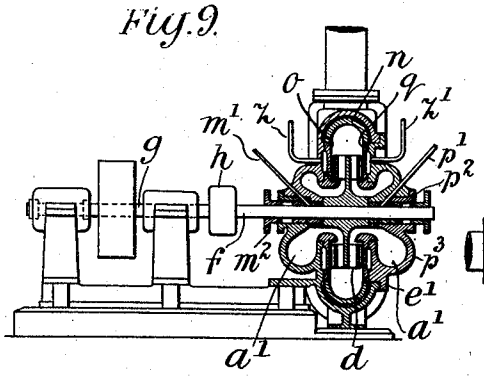
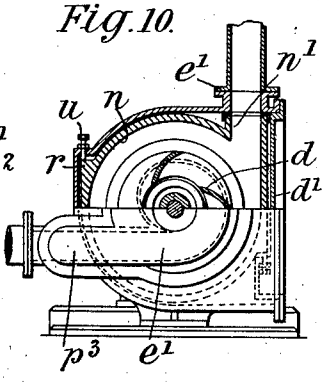


Fig. 10.



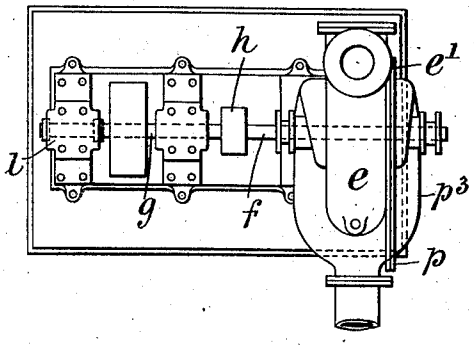


Fig. 11.

Fig. 12.

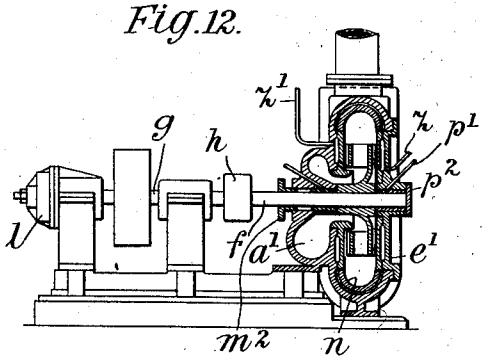
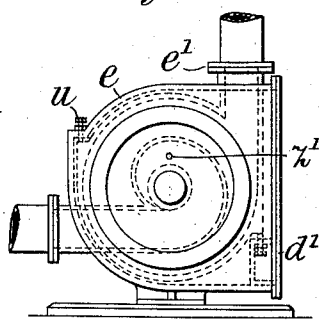


Fig. 13.



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4 SHEETS—SHEET 4.

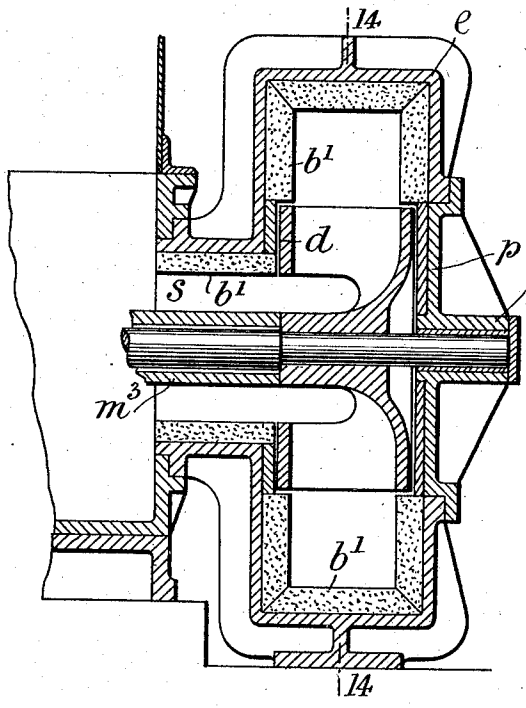
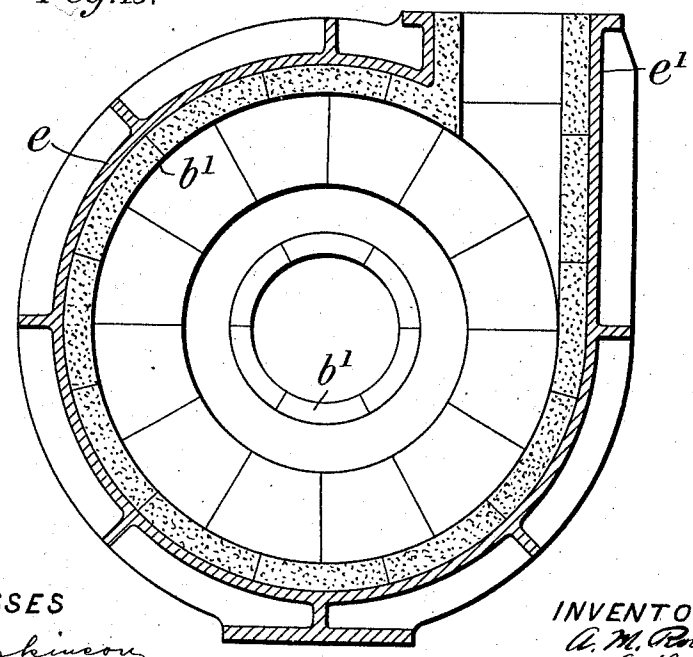


Fig. 14.

Fig. 15.



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UNITED STATES PATENT OFFICE.

ANTHONY MAURICE ROBESON AND ANDREW DAVIDSON, OF JOHANNESBURG, TRANSVAAL.

CENTRIFUGAL PUMP.

1,025,425. Specification of Letters Patent. Patented May 7, 1912.

Application filed November 18, 1909. Serial No. 528,840.

To all whom it may concern:

Be it known that we, ANTHONY MAURICE ROBESON and ANDREW DAVIDSON, both subjects of His Majesty the King of Great Britain and Ireland, and residents of Johannesburg, Transvaal, the latter residing temporarily at Rochdale, Lancashire, England, have invented certain new and useful Improvements in Centrifugal Pumps, of which the following is a specification.

The present invention has reference to centrifugal pumps, and more particularly to such pumps intended for moving liquids containing solid matter, especially when such matter is of a gritty nature.

The object of the invention is to improve the construction and arrangement of centrifugal pumps in several particulars whereby they are better adapted to handle mixtures of solid and liquid, are protected against wear thereby, and their repair and adjustment is facilitated.

To this end the invention consists in the combination with the pump proper of a novel suction chamber: in the means for shielding the moving parts from lodgment of grit: in the improved form and construction of the liners: and in the novel means facilitating the disassembling and renewal of the parts, all as hereafter described and specified in the claims.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a longitudinal section of a complete centrifugal pump constructed according to the invention. Fig. 2 is a sectional view on the line 2—2 Fig. 1. Fig. 3 is a plan view of Fig. 1. Fig. 4 is a sectional view and Fig. 5 an end view drawn to an enlarged scale, of the coupling employed between the pump and the motor. Figs. 6 and 7 are views of portions of Figs. 1 and 2 respectively, drawn to an enlarged scale. Fig. 8 is an elevation of a side liner. Figs. 9, 10 and 11 are views similar to Figs. 1, 2 and 3 respectively but illustrating a double special suction or pump intake and Figs. 12 and 13 are sectional front and side elevations respectively of a similar pump having a side suction. Fig. 14 is a longitudinal section of an impeller casing of a pump having a silex or similar lining, drawn to an enlarged scale. Fig. 15 is a section on the line 14—14 Fig. 14.

Referring more particularly to Figs. 1 to 7 *a* represents a suction chamber constructed in the form of a rectangular box and extending all around the pump intake *s*. Said suction chamber is surmounted by a feed hopper *c* into which the material to be pumped is fed by such means as a launder *b*.

At a convenient point in the suction chamber is fitted a cleaning door *v* and the chamber, particularly in the parts below the intake *s*, is made roomy enough to permit heavy or bulky masses of rock or other material, which might injure the pump if passed into it, to settle and collect, whence they are removed from time to time through door *v*. The suction chamber is as indicated formed with plane walls and is lined internally with renewable lining plates or slabs *w* of any desired material. It will be understood that a suction chamber as described is more accessible, insures greater safety to the impeller and is more readily refitted when worn, than the usual suction pipe.

The impeller *d* which may be of any ordinary or convenient type is mounted upon the spindle *f*. Said spindle passes, on the suction chamber side, through a combined spindle bearing and cover *m*, which is bolted externally to the outer wall of the suction chamber and extends in the form of a sleeve m^3 up to the impeller thereby shielding the spindle from the flowing material.

m^4 represents the bearing proper to which water is supplied through a pipe m^1. Such water passes away through the hollow interior of sleeve m^3 and thence between the adjacent faces of the sleeve and the impeller; the purpose being to prevent access of grit to the spindle *f*.

m^2 indicates the usual stuffing box for the spindle. On the opposite side of the impeller the spindle is supported in a bearing p^2 formed in cover *p* of the lateral door through which access is had to the impeller; said bearing being kept clean similarly to bearing m^4 by means of water injected through pipe p^1.

Spindle *f* is connected to the pulley or motor shaft *g* by means of a novel coupling: consisting of an internally conical socket *h* formed or secured rigidly upon shaft *g*: a split cone *i* adapted upon compression, to engage spindle *f* and means such as the bolts *j* for drawing the cone into the socket. The cone *i* engages the spindle *f* by means

of screw threads as shown. The coupling described permits a slight angular play between the coupled shafts; it may be readily unshipped by slacking bolts j and parting the cone and socket by means of the starting screw k which is provided for the purpose, whereupon the split cone i expands slightly thus freeing itself from the spindle f which may then be withdrawn. By the reverse operation coupling is effected with equal facility.

I is the usual thrust bearing for taking up the end thrust of a single suction pump.

The intake s is made of substantially cylindrical form, and is fitted with a similarly shaped renewable liner s^1 retained by set screws s^2 or other serviceable means.

Internally the casing is shielded by the two side liners o and q and by the peripheral liner n. Liner o, shown enlarged in Fig. 8 and in the upper half of Fig. 6, may be provided centrally with a lip o^1 constituting a continuation of the intake liner s^1 and being suitably shaped at its free edge to deliver the fluid to the impeller. The side liners o, q are secured to the adjacent casing parts by T headed bolts X Fig. 6 and by screw studs q^3 which project through the outer casing into soft metal disks q^2 cast or worked into the hard metal of the liners, said studs being secured by external studs y. Both these fastenings avoid grooving or interruption of the inner surface of the liners and so materially minimize their liability to scouring; while the last described fastening will hold until the liner is practically worn through.

Lodgment of grit between the impeller and the side liners and consequent abrasion of those parts is minimized by passing water through pipes z and z^1 to the central zone of the impeller and forming small vanes d^1 externally of the impeller. Said vanes are such as, when the pump is at work, to cause the injected water to flow outwardly and prevent reverse flow of the pumped liquid outside the impeller which is often found to occur at present.

The peripheral liner n is preferably a single annular piece as illustrated, having an integral outlet pipe n^1 which joints with the outlet pipe e^1 of the casing e. It is retained in place by means of the oppositely disposed set screws u which extend through the casing, on opposite sides thereof, and make contact with lugs r formed on the opposite sides of the liner. By means of said set screws the pipe e^1 may be forced up to make joint with the casing.

The jointing between the side liners and the peripheral liner is effected by forming upon said side liners a number of lugs q^1 separated by depressions q^4. The edges of the lugs are worked up to fit accurately within the orifices of the peripheral liners and said depressions are in practice calked up with suitable calking material. The lugs both retain the calking in place and prevent circulation of grit within the joint.

Access to and removal of the peripheral liner n is effected by means of a door t which is bolted to the fixed casing e at the discharge pipe end thereof.

Figs. 9 to 11 show the above described arrangements modified for application to a double suction pump having spiral intakes a^1 a^1. The suction chamber and its appurtenances being omitted, and one inlet passage p^3 being formed in the cover p. It is thought the figures are sufficiently covered by the foregoing description. A similar pump having one suction a^1 is shown in Figs. 12 and 13.

A further method of lining is illustrated in Figs. 14 and 15. In this instance suitably shaped blocks b^1 of silex, concrete or vitreous material are secured within the casing e by any convenient means. This method of lining may be applied to the feed hopper and suction chamber hereinbefore described.

It will be understood from the foregoing description that among other advantages of the invention, it enables any part to be inspected or renewed without breaking and subsequently remaking any difficult or inaccessible joint.

What we claim is—

1. In a centrifugal pump, a casing having a peripheral door opening, an impeller in said casing, removable linings around said impeller, the said casing extending around said linings for more than one half of the circumference and the said door opening being large enough to permit the radial removal of the linings, and a door for said door opening.

2. In a centrifugal pump, a one part casing, an impeller in said casing, removable linings around said impeller, the said casing extending at its sides and periphery more than half way around said linings and having an open end sufficiently large to permit the bodliy removal of said linings radially, and a closure for said open end.

3. In a centrifugal pump, a casing open at one end and semi-circular at its other end, the said casing being provided with an outlet in its top near the open end, an annular peripheral liner fitted within said casing having a tangential outlet registering with said casing outlet, a removable door for closing said open end of said casing, and means for clamping said liner in said casing.

4. In a centrifugal pump, a casing having an outlet pipe, an impeller in said casing, an annular peripheral lining having a tangential outlet adapted to fit said outlet pipe, and a removable door in the periphery of

said casing immediately back of said outlet pipe, the length of the door opening being as great as the diameter of the lining.

5. In a centrifugal pump, a casing having an outlet pipe, an annular peripheral lining having a tangential outlet fitting said casing outlet pipe, and tangential connections between said lining and casing for turning said lining to bring said lining outlet in contact with said casing outlet and to clamp the lining in place.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

ANTHONY MAURICE ROBESON.
ANDREW DAVIDSON.

Witnesses as to Anthony Maurice Robeson:
EDWIN N. GUNSAULUS,
W. KRUGER.
Witnesses as to Andrew Davidson:
JAMES L. MAXIM,
R. D. DAVIDSON.