J. R. BROADLEY AND J. M. LEE.

PUMP.

APPLICATION FILED OCT. 11, 1920.

1,435,513.

Patented Nov. 14, 1922.

3 SHEETS—SHEET 1.

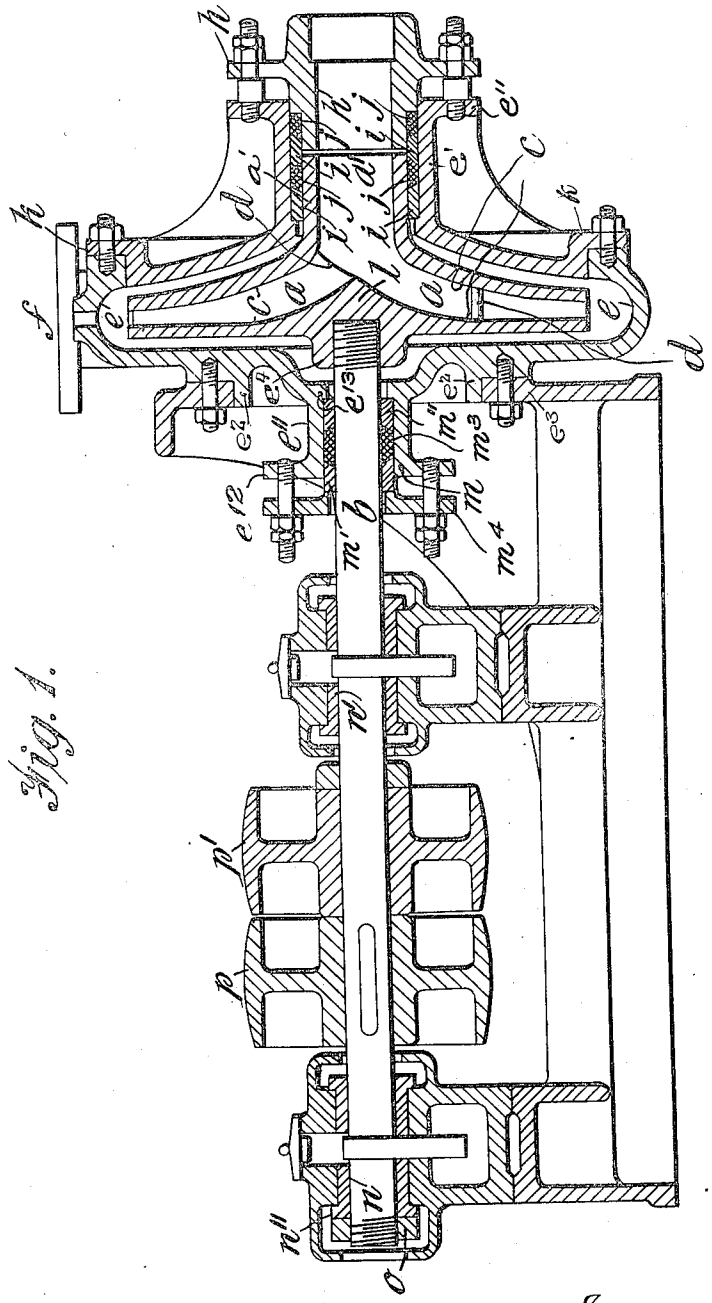


Fig. 1.

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3 SHEETS—SHEET 2.

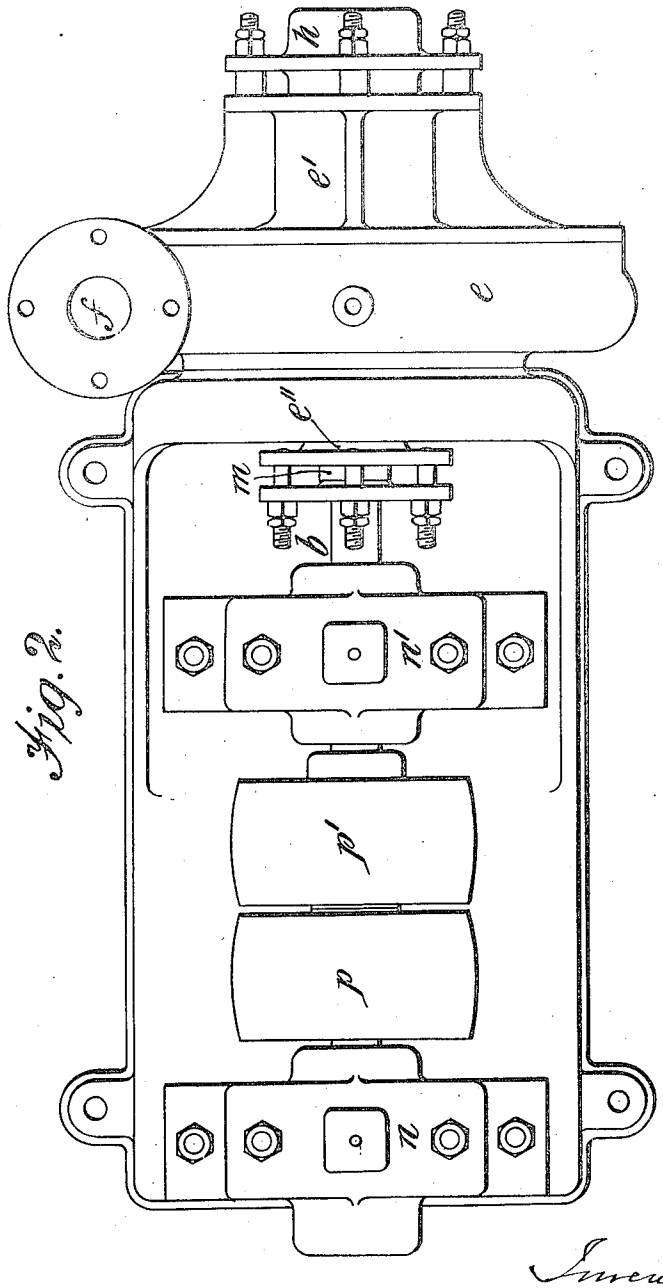


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

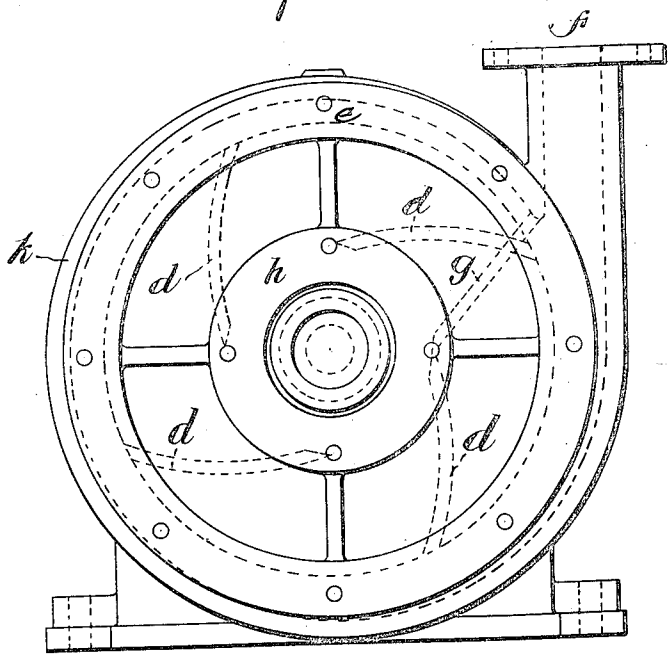


Fig. 4.

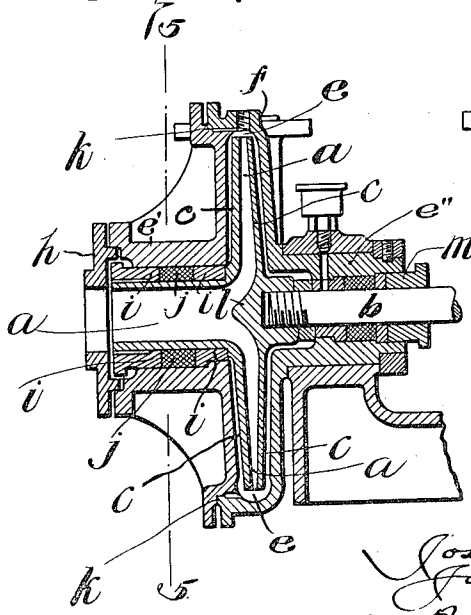
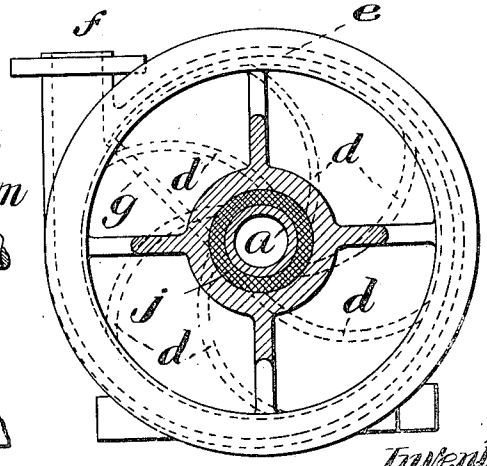


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH RICHARD BROADLEY AND JOHN MORTON LEE, OF LONDON, ENGLAND, ASSIGNORS OF ONE-THIRD TO LAURENCE STEVENS BURT, OF LONDON, ENGLAND.

PUMP.

Application filed October 11, 1920. Serial No. 416,176.

To all whom it may concern:

Be it known that we, JOSEPH RICHARD BROADLEY, a subject of the King of Great Britain, and a resident of London, England, and JOHN M. LEE, a subject of the King of Great Britain, and a resident of London, England, have invented certain new and useful Improvements in Pumps, whereof the following is a specification.

This invention relates to a centrifugal pump for pumping liquids, semi-liquids, pulps and the like, of various densities with or without contained solids.

The object of the invention is to provide a pump of this character constructed so as to produce a high vacuum on the suction side and an easy change of direction of the flow of incoming liquid and to minimize the shock of entry of the liquid thereby increasing the capacity and efficiency of the pump.

Another object of the invention is to provide a centrifugal pump having a hollow impeller equipped with a hollow trunnion communicating with the interior thereof and having a gland-packed connection with the casing of the pump.

Another object is to provide a pump of this character the casing of which is provided at its suction end with a stuffing box connected with the suction pipe and with the impeller, the impeller having a hollow trunnion extending into the gland of the stuffing box, the suction inlet of the impeller being of larger diameter than the diameter of the shaft on which the impeller is mounted.

In the accompanying drawings

Figure 1 represents a longitudinal vertical section of a pump constructed in accordance with this invention in the preferred form or embodiment thereof.

Fig. 2 represents a plan view thereof.

Fig. 3 represents an end elevation thereof.

Fig. 4 represents a detail longitudinal section showing a slightly different form of the invention; and

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 4.

In the embodiment illustrated in Figures 1, 2, and 3 the pump proper comprises a stationary casing e with a rotary impeller a disposed therein. The casing e has a detachable head plate k shown bolted thereto and provided with a tubular boss e' having an outturned flange e'' at its outer end for the connection therewith of a gland h, presently to be more fully described.

The body of the pump casing e is provided on its rear face with an annular flanged rest e^2 adapted to be attached to a suitable support here shown in the form of a standard e^3 to which said rest is bolted. The pump casing e is also provided on its rear face with a central tubular boss e^{11} having an outturned flange e^{12} at its outer end and at its inner end with an inturned flange or shoulder e^{13}.

An impeller actuating or driving shaft b extends through a gland stuffing box m mounted in the tubular boss e^{11} and has threaded engagement with a centrally disposed threaded boss e^4 formed on the rear face of the impeller a. The stuffing box m includes two gland rings, m' and m'' having a packing ring m^3 disposed between them, the ring m'' abutting the shoulder e^{13}, and said rings being held in operative position by a flanged sleeve m^4 bolted to flange e^{12} of the casing-carried boss e^{11}. This gland stuffing box m provides a fluid tight connection between the shaft b and the pump casing.

The shaft b is supported in suitable bearings n, n' carried by the supporting structure and is equipped with a thrust collar o which bears against the journal flange n^{11} of bearing n. Belt pulleys p and p' are carried by the shaft or spindle b, the pulley p being keyed to the shaft and pulley p' loose thereon.

The casing e has a tangential outlet f designed to be connected to a delivery pipe, not shown. This casing e is preferably equipped with a guide vane g cast integral with or otherwise attached to the inner walls thereof for baffling the rotation of the liquid in said casing and assisting its passage through outlet f to the delivery pipe.

The impeller a is provided on its front face with a hollow trunnion a' disposed centrally opposite a cone shaped spreader l on its rear face the junction thereof with the body of the impeller and also said spreader being curved as shown clearly in Fig. 1 merging gradually into the interior of the impeller thereby avoiding sudden and severe change in the direction of the inflowing liq-

uid which is drawn in through said trunnion. This hollow trunnion forming the inlet to the impeller permits said inlet to be of any desired diameter less than that of the impeller itself so that a relatively large reservoir may be provided within the impeller about its center by foreshortening the vanes *d* arranged therein and thereby minimize what is commonly known as the "shock of entry" which increases the capacity and efficiency of the pump. The vanes *d* of the impeller provide substantially radial passages for discharging the fluid entering through the trunnion *a'* to the casing *e*. The gland packed trunnion *a'* on the impeller *a* produces a very high vacuum on the suction side of the pump.

Gland rings *i* with compressible packing rings *j* form a watertight and air tight joint between trunnion *a'* and the boss *e'* of the outer vessel *e* and thereby prevent leakage to suction of delivery liquid which is contained under pressure in outer vessel *e* and leakage of air to suction from atmosphere between spigotted flange *h* and boss *e'* of the outer vessel *e*.

In the form shown in Figs. 4 and 5 the construction is the same as that described above except that the stuffing boxes are equipped with screwed gland securing members instead of being bolted to the casing.

It is of course understood that in both forms of the invention the operation is the same the evacuation of the liquid by the impeller operating to create suction which draws in a further supply of liquid through the hollow trunnion from the suction feed pipe not shown.

We claim:

1. In a centrifugal pump the combination of an outer stationary casing having a tangential delivery orifice and provided with an enlarged hollow boss extending outward from its front face and a smaller hollow boss extending outward from its rear face, a shaft rotatable in said rear boss, a rotary impeller disposed within said casing and mounted on the end of said shaft, said impeller being provided with an enlarged hollow trunnion which extends into the rear portion of said enlarged hollow boss and is provided with approximately radial channels which unite in continuous curves with said enlarged hollow trunnion, a tubular member having its inner portion disposed within the outer portion of said enlarged hollow tubular boss in front of said enlarged hollow trunnion, gland packings between said enlarged tubular boss and said enlarged hollow trunnion and said tubular member, said gland covering the joint between said tubular member and said hollow trunnion, and means for adjusting said tubular member in said tubular boss.

2. In a centrifugal pump the combination of an outer stationary casing having a tangential delivery orifice and provided with an enlarged hollow boss extending outward from the front face and a smaller hollow boss extending outward from its rear face, a shaft rotatable in said rear boss, a rotary impeller disposed within said casing and mounted on the end of said shaft, said impeller being provided with an enlarged hollow trunnion which extends into the rear portion of said enlarged hollow boss and is provided with approximately radial channels which unite in continuous curves with said enlarged hollow trunnion, said impeller having an inner conical spreader on its inner face in line with said hollow trunnion, a tubular member having its inner portion disposed within the outer portion of said enlarged hollow tubular boss in front of said enlarged hollow trunnion, gland packings between said enlarged tubular boss and said enlarged hollow trunnion and said tubular member, said gland covering the joint between said tubular member and said hollow trunnion, and means for adjusting said tubular member in said tubular boss.

3. In a pump of the class described, a casing having a tangential discharge orifice and provided in its opposed faces with outwardly extending central tubular bosses, a hollow impeller rotatable in said casing having a central boss on one face provided with an outwardly opening threaded socket, an impeller driving shaft extending through one of the tubular bosses of said casing and having threaded engagement with the tubular socket in said impeller, a gland stuffing box arranged between said shaft and the tubular casing boss, through which it extends, a centrally disposed hollow trunnion carried by said impeller in the face opposite that having the socketed boss, and a gland stuffing box arranged between said trunnion and the other tubular boss of the casing, said impeller having radial passages communicating with the trunnion and opening through the perimeter of the impeller into the casing, said passages and trunnion merging gradually into each other to minimize the shock of entry of the liquid.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOSEPH RICHARD BROADLEY.
JOHN MORTON LEE.

Witnesses:
C. BLUMSOM,
WILLIAM JAS. FERRY.