Jan. 8, 1924. 1,480,436

J. A. GRIFFIN

PUMP

Filed April 11, 1921 3 Sheets-Sheet 1

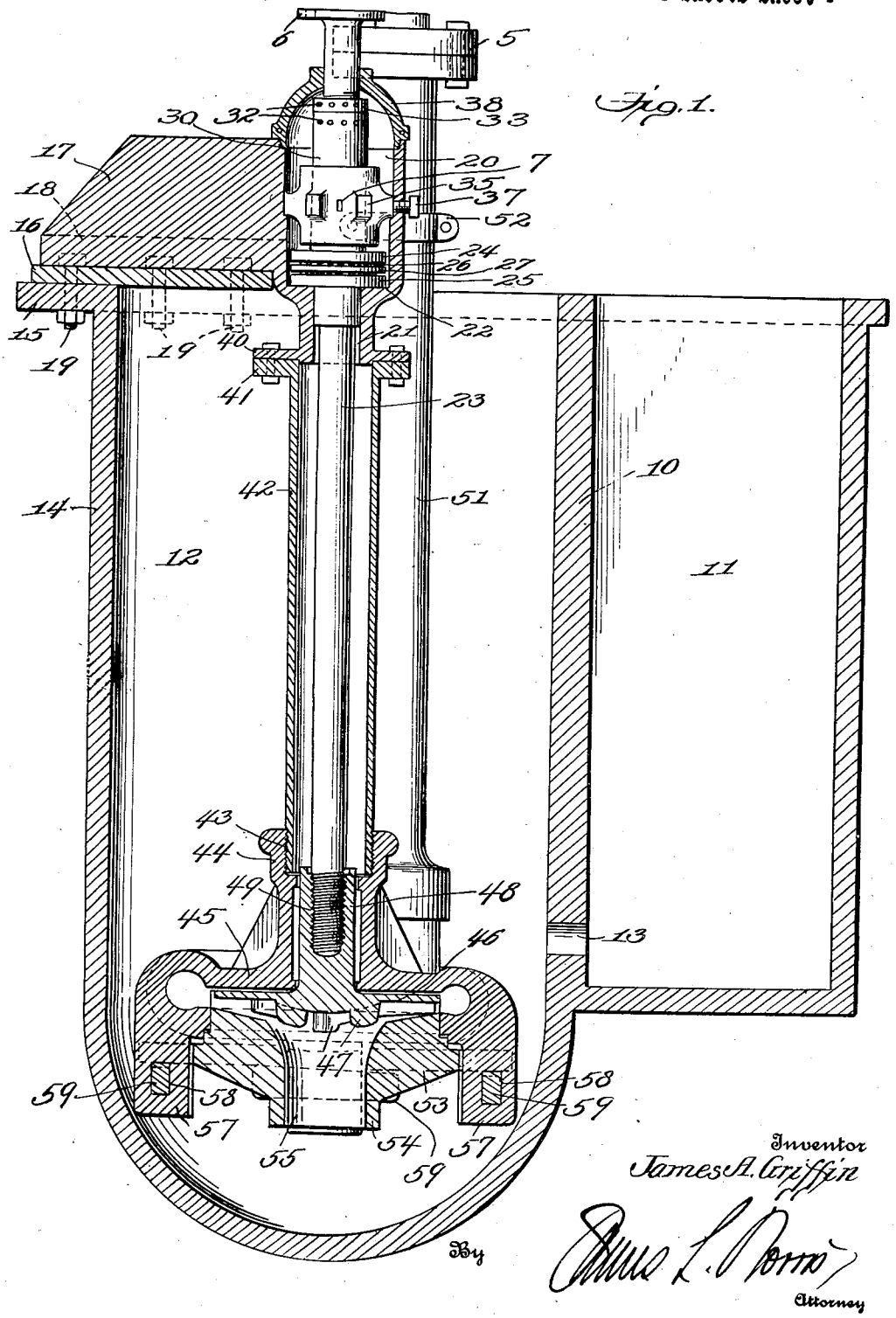


Fig. 1.

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Fig. 2.

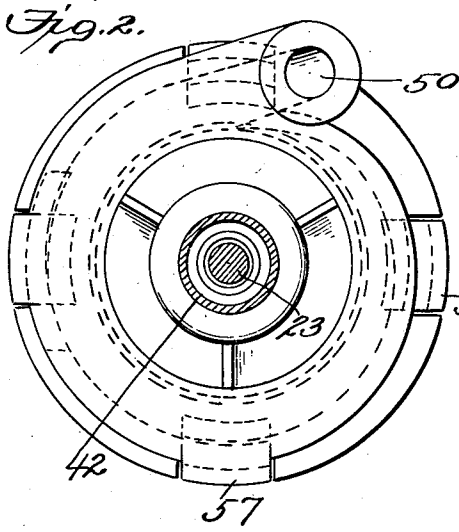
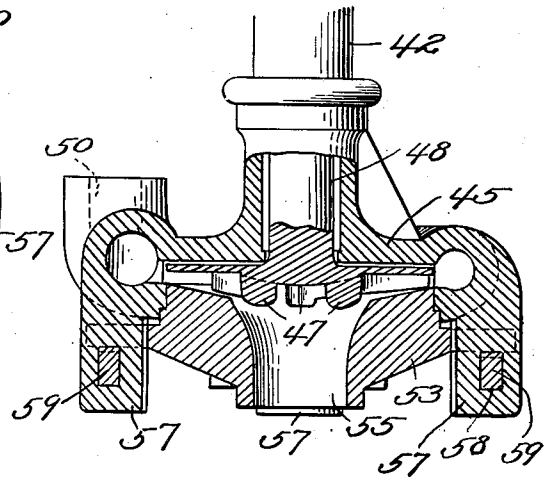


Fig. 3.



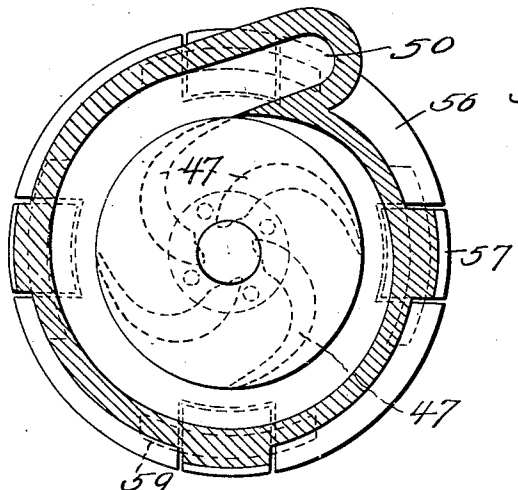


Fig. 5.

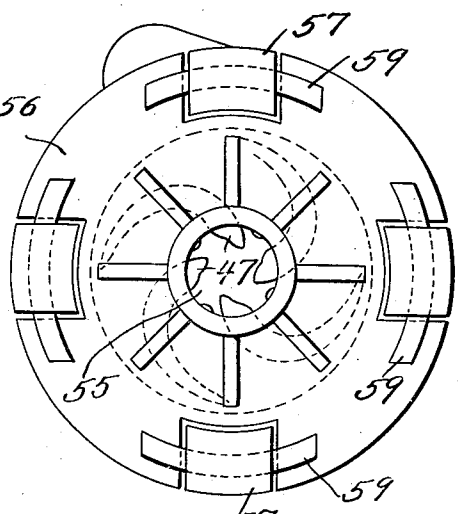


Fig. 4.

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Fig. 6.

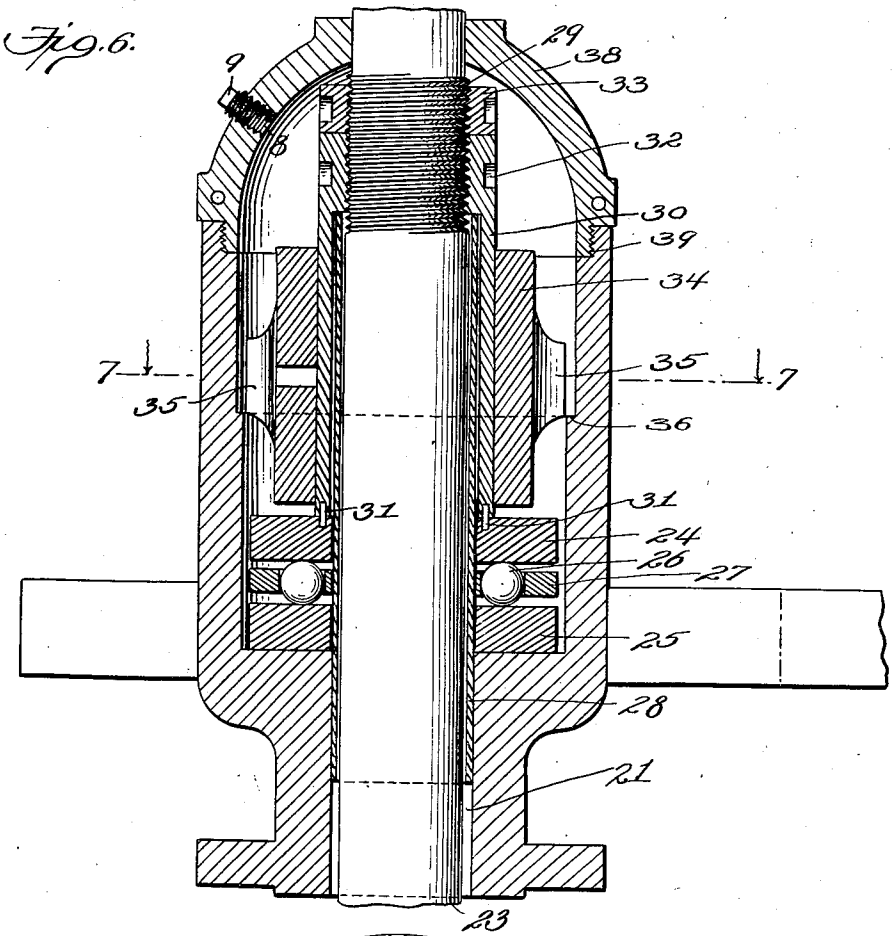
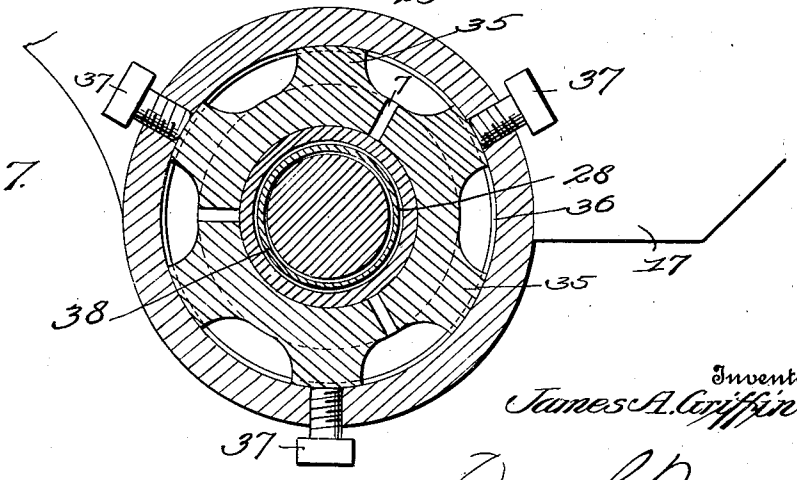


Fig. 7.



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Patented Jan. 8, 1924. 1,480,436

UNITED STATES PATENT OFFICE.

JAMES A. GRIFFIN, OF BALTIMORE, MARYLAND, ASSIGNOR TO F. S. ROYSTER GUANO COMPANY, OF NORFOLK, VIRGINIA, A CORPORATION OF VIRGINIA.

PUMP.

Application filed April 11, 1921. Serial No. 460,267.

To all whom it may concern:

Be it known that I, JAMES A. GRIFFIN, a citizen of the United States, residing at Baltimore, in the county of Baltimore and State of Maryland, have invented new and useful Improvements in Pumps, of which the following is a specification.

This invention relates to pumps and more particularly to that class of centrifugal pumps for pumping acids or acid solutions, especially sulphuric acid.

An object of the invention is to provide a pump of this general character which may be readily assembled and disassembled and which is constructed of materials that resist the corrosive action of the acid.

Another object of the invention is to suspend the pump on a vertical shaft from a novel form of a bearing in such manner that the impeller may be readily adjusted vertically within the pump casing and the bearing protected from the acid and well lubricated.

Other objects of the invention consisting of novel details of construction and arrangement of parts will become apparent on reference to the following specification which describes the invention in connection with the accompanying drawings.

In the drawings:—

Fig. 1 is a central vertical section through the acid boot and pump.

Fig. 2 is a top plan view of the pump casing showing the vertical driving shaft in section.

Fig. 3 is a vertical section of the pump casing with the impeller mounted therein.

Fig. 4 is a bottom plan view of the pump casing.

Fig. 5 is a partial horizontal section and part top plan view of the pump casing.

Fig. 6 is a section of upper bearing and driving shaft taken at right angles to the section of Figure 1.

Fig. 7 is a sectional view on the line 7—7 of Fig. 6 looking in the direction of the arrows.

Like reference numerals represent corresponding parts throughout the several figures of the drawing.

The numeral 10 designates an acid receptacle or boot which is made of cast-iron and contains the acid to be pumped, for example, sulphuric acid. The receptacle 10 is formed with two chambers 11 and 12 which communicate by means of passage 13 formed through an intermediate wall of the receptacle. The outer wall 14 of the receptacle or boot is formed with an annular flange 15 and a plate 16 is disposed across the open top of the reservoir 12 so as to partially close one side of the same. A bearing stand 17 formed with a central web and laterally projecting flanges 18 is secured to the plate 16 by suitable bolts (not shown) and the plate 16 is secured to the flange 15 by bolts 19. The bearing stand 17 is provided with communicating cylindrical passages 20 and 21 of different diameters in axial alignment, the opening 21 being smaller than the opening 20 and separated therefrom by a shoulder 22. The pump drive shaft 23 extends vertically through the cylindrical openings 20 and 21 and is supported therein by means of a ball thrust bearing having the upper and lower steel plates 24, 25 respectively, the latter of which rests upon the shoulder 22. Between the plates 24, 25 are interposed the hardened balls 26 which are mounted in the brass retainer 27 and roll in ball races of the plates 24, 25.

The ball bearing plates 24, 25 are formed with central openings which engage about brass bushing 28 surrounding a vertical shaft 23. The lower end of the bushing 28 tightly engages in the opening 21 of the bearing stand. The shaft 23 is provided with screw threads 29 located slightly above the thrust bearing and these screw threads are engaged by corresponding threads cut on the upper part of a steel sleeve 30 which sleeve has a depending portion surrounding bushing 28. The lower end of the sleeve 30 rests upon the top of the bearing plate 24 and this lower end of the sleeve and plate 24 are formed with registering apertures adapted to receive dowel pins 31 whereby the sleeve and plate are rotatably secured together. The upper part of the sleeve 30 is formed interiorly with screw threads, as above described, and exteriorly with suitable sockets 32 for receiving a spanner wrench. A threaded collar or nut 33 also engages the threads 29 of the shaft and serves to lock the sleeve 30 in adjusted position. In order to take care of side thrust within the cylindrical opening 20 of the bearing stand, a

member 34 of cast iron is provided with a cylindrical opening in which the sleeve 30 is journalled. The guide member 34 is provided with a series of spaced, lateral projections 35 which engage the sides of the cylindrical opening 20 and also rest upon shoulder 36 formed therein and the guide member is restrained from rotation by means of set screws 37. The cylindrical opening 20 is closed by means of a bearing cap 38 having screw threads 39 engaging corresponding threads formed in the bearing stand 17. The bearing cap is also provided with an aperture 8 through which the whole bearing may be supplied with lubricating oil. This aperture 8 is closed by a detachable plug 9. The member 34 is formed with radial openings 7 by means of which the oil finds access to the interior parts of the bearing. The bearing stand 17 terminates about the cylindrical opening 21 in flanges 40 which are adapted to engage flanges 41 on a vertical tubular housing 42 provided with screw threads 43 at its lower end adapted to engage corresponding threads formed in the upper portion 44 of the pump casing 45. The tubular housing and pump casing are preferably of cast iron and the pump casing has an interior chamber for rotatably receiving the impeller 46 having the impeller blades 47 mounted thereon. The impeller is provided with a stem 48 formed with a threaded opening 49 adapted to engage threads formed on the lower end of the vertical steel shaft 23 located coaxially within the tubular housing 42. The impeller and the pump casing are both made of cast iron, the driving shaft 23 being of steel. The pump is of the centrifugal type and is provided with the outlet passage 50 which is attached to a discharge pipe 51 extending vertically above the bearing stand 17 and secured thereto by means of a clamp 52. The pump casing is provided with a cover or closure 53 having a downwardly projecting hollow boss 54 forming the inlet passage 55. This cover is also of cast iron and is provided with spaced integral wings 56 which are interposed between downwardly extending lugs 57 on the pump casing. The lugs 57 are provided with openings 58 in which keepers 59 of wedge shape are inserted for engaging the wings 56 and forcing them tightly against the pump casing.

In operation, the acid fills the chamber 11, 12 to a certain height above the inlet 55. It will be understood that the shaft 23 is connected to a vertically disposed driving motor (not shown) by means of a flexible coupling a part of which is shown by flange 6, whereby the shaft 23 is driven at high speeds and the acid will be pumped by centrifugal force exerted by the impeller and thereby forced through the discharge pipe 51. The vertical shaft 23 being wholly suspended on the ball thrust bearing will rotate with little friction. When the impeller of the pump becomes worm, after long and continued usuage, it is only necessary to loosen the threaded collar 33 and the sleeve 30 which will lower the impeller and the pump will again act in a very efficient manner.

In case it is desired to repair the pump without draining the acid, the shaft 23 may be disconnected at the flexible coupling 6, the discharge pipe at flange connection 5 and by simply disconnecting the bearing stand from plate 16 the pump may be moved as a unit and a new one readily placed on the shaft 23, or repairs may be made by removing the keepers 59, cover 53 and unscrewing impeller 46 or any of the parts may be as readily replaced by new ones.

The materials used in this pump have been discovered after long and expensive experiments and have been found to resist the corrosive action of acid in a very effective manner so that the pump will give efficient service for a long period of time. Furthermore the novel bearing construction and form of pump have found to give very efficient service.

Having decribed my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a device of the class described, the combination of a receptacle containing the fluid to be pumped, a vertical driving shaft suspended from a thrust bearing and extending into said receptacle, a pump immersed in the fluid having an impeller secured to one end of said shaft, a casing for said impeller, having downwardly extending spaced lugs, a closure plate having wings received between and secured to the lugs, and a tubular housing for said driving shaft connected at one end to the pump casing, a bearing standard for supporting said thrust bearing and means for securing the bearing standard to said housing.

2. In an acid pump, the combination of a pump casing of cast iron having dependent lugs, an impeller having curved blades of cast iron rotatably mounted therein, a closure of cast iron detachably connected in the bottom of the casing, said closure having spaced wings received between and secured to said lugs and having an inlet passage formed therein, a receptacle for containing acid, in which said pump casing may be immersed, a steel driving shaft detachably connected to the impeller and a cast iron housing detachably connected to the pump casing for protecting the steel shaft from the acid.

3. In an acid pump, the combination of an acid receptacle, a pump casing of cast iron adapted to be immersed in the acid, said casing having an outlet opening, an

impeller of cast iron rotatably mounted in said casing, a cover of cast iron detachably connected to the casing, said cover having an inlet passage formed therein and positioned so as to open toward the bottom of the receptacle, a steel driving shaft detachably connected to the impeller, a cast iron housing detachably connected to the pump casing for protecting the steel shaft from the acid and a cast iron discharge pipe connected to said outlet and extending through the acid of said receptacle.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JAMES A. GRIFFIN.

Witnesses:
R. S. GRIFFITH,
J. B. GRIFFITH.