W. SPARKS.

CENTRIFUGAL PUMP.

APPLICATION FILED FEB. 11, 1913.

1,128,822.

Patented Feb. 16, 1915.

2 SHEETS—SHEET 1.

FIG. 1.

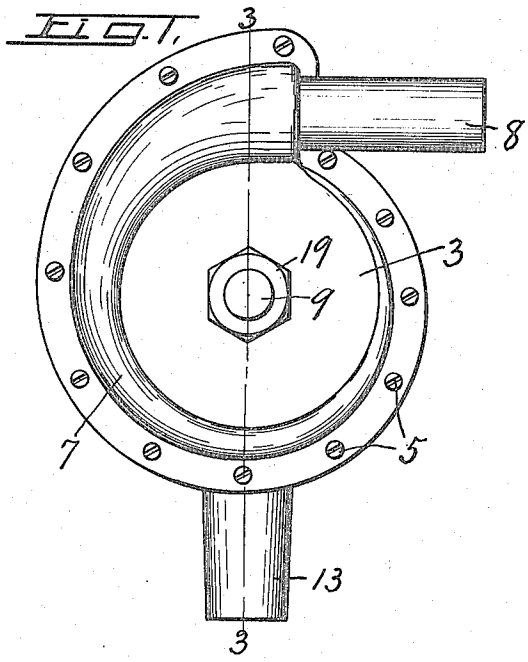


FIG. 2.

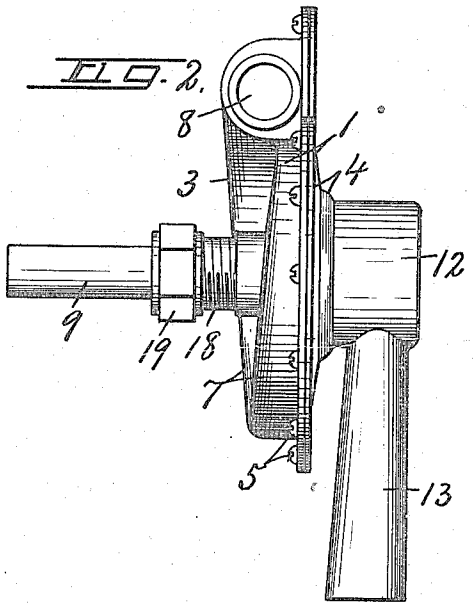


FIG. 4.

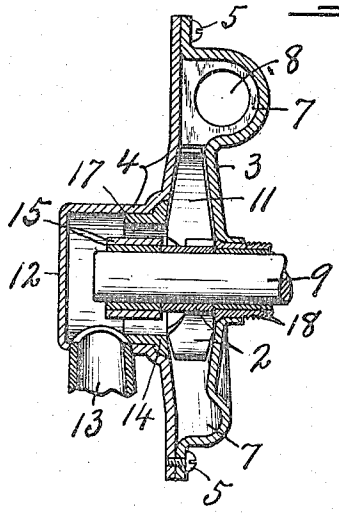
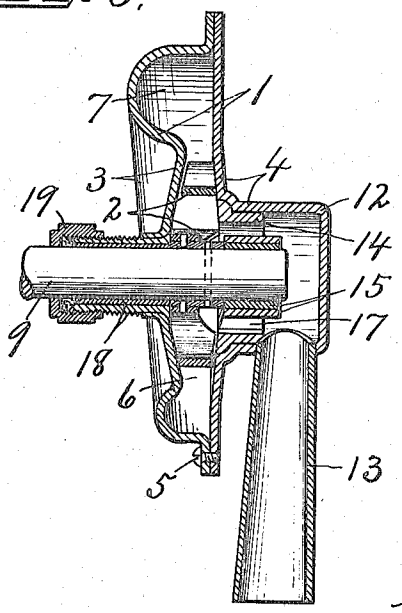


FIG. 3.



WITNESSES:

H. Thurston

H. E. Chase

Wm. Sparks
INVENTOR.

BY

Howard P. Denison
ATTORNEY.

W. SPARKS.

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2 SHEETS—SHEET 2.

FIG. 5.

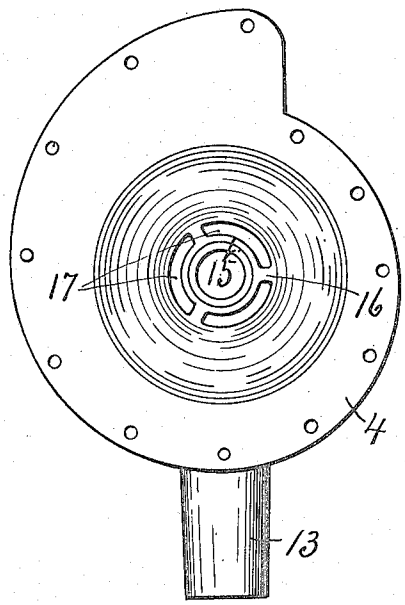


FIG. 6.

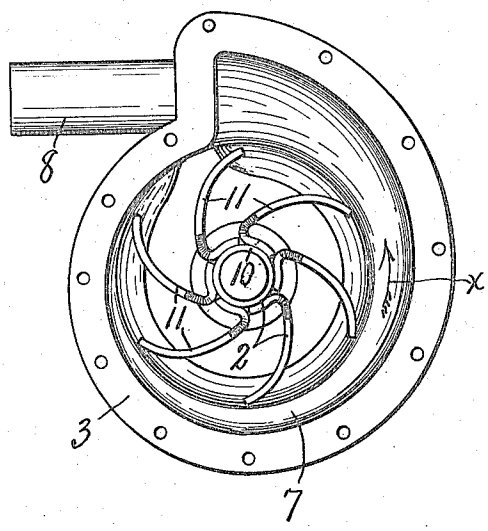


FIG. 7.

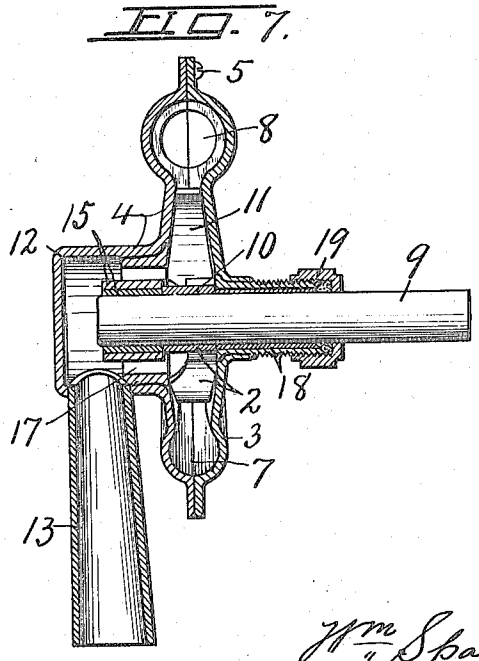
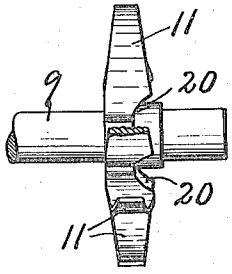


FIG. 8.



Wm. Sparks
INVENTOR.

WITNESSES:
H. Hitt
H. E. Chase

BY
Howard P. Denison
ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM SPARKS, OF JACKSON, MICHIGAN, ASSIGNOR TO THE SPARKS-WITHINGTON COMPANY, OF JACKSON, MICHIGAN, A CORPORATION OF MICHIGAN.

CENTRIFUGAL PUMP.

1,128,822. Specification of Letters Patent. Patented Feb. 16, 1915.

Application filed February 11, 1913. Serial No. 747,632.

To all whom it may concern:

Be it known that I, WILLIAM SPARKS, of Jackson, in the county of Jackson, in the State of Michigan, have invented new and useful Improvements in Centrifugal Pumps, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to certain improvements in centrifugal pumps and, while it is designed more especially for circulating the cooling fluid through the cylinder jackets of external combustion engines of automobiles, motor boats and similar self-propelled vehicles, it is evident that it may be used in other relations and for other purposes where it is desired to transmit fluid from one liquid to another.

The main object is to reduce the weight and cost of manufacture of this class of pumps to a minimum and, at the same time, to increase its strength, durability and power efficiency and still render the device compact so that it may be easily installed for operation within a comparatively small space. In other words, I have sought to produce the desired compactness, lightness, strength and durability by making the entire case and impeller of comparatively thin sheet metal pressed or stamped to the desired form so that the impeller will have a substantially noiseless and close running fit in the impeller chamber so as to yield a maximum power efficiency.

Another object is to dish the sides of the impeller chamber in opposite directions so that they will converge radially toward the perimeter of the case and to similarly taper the longitudinal edges of the impeller blades or wings for establishing inwardly flaring close-running joints between the impeller and the case, thereby increasing the capacity for reducing the resistance to the entrance of the fluid at the center of the impeller chamber and gradually increasing the force of action of the blades upon such liquid as it is spread out and thrown centrifugally toward the periphery of the case or into the involute outlet.

A further object is to cut away portions of the inner ends of the inlet sides of the blades to the diameter of the inlet so as to still further reduce the resistance to the entrance of the fluid to the impeller chamber and to enable the impellers to pick up and throw the fluid centrifugally with greater ease and facility than would be possible if these portions of the blades were in close running contact with the adjacent walls of the inlet.

A still further object is to extend the dish-shape side or running joint radially to the portion of the outlet of greatest radius so as to maintain a close running fit between the blades and sides of the case at this point to establish a closer cut-off and prevent the fluid from being carried back into the case by the blades.

Another object is to gradually increase the width as well as the radial depth of the outlet channel from the point of least radial depth to the point of greatest radial depth of the impeller chamber so that the greater portion of dish-bearings for the sides of the impeller blades are of less radial depth than that of the blades, thereby causing the ends of the blades to travel across portions of the outlet channel to give further impetus to the outgoing fluid without undue resistance.

Other objects and uses will be brought out in the following description.

In the drawings—Figures 1 and 2 are respectively a side elevation and an edge view of a centrifugal pump embodying the various features of my invention. Fig. 3 is a transverse vertical sectional view of the same pump taken on line 3—3, Fig. 1. Fig. 4 is a sectional view similar to Fig. 3 as seen from the opposite direction. Figs. 5 and 6 are nearly face views of the detached casing sections showing the inlet in Fig. 5 and the impeller in Fig. 6. Fig. 7 is a sectional view similar to Fig. 3 showing a slightly modified form of case divided centrally through the outlet passage. Fig. 8 is a face view of a detached impeller.

As shown in Figs. 1 to 6 inclusive, this pump comprises a case —1— and an impeller —2—, the case —1— being composed of opposite sheet metal sections —3— and —4— of comparatively thin sheet metal pressed or stamped to the desired form and secured together end to end by suitable fastening means, as screws or clamping bolts —5—, to form an impeller chamber —6— having an involute channel —7— terminating in a tubular outlet —8—. This channel and outlet are shown in Figs. 1 to 6 inclusive as formed wholly in the case section —3— but may be formed partly in

both sections as shown in Fig. 7, but in either case gradually increases in axial depth from its point of least radius adjacent the outlet to its point of greatest radius at the outlet and is, therefore, somewhat spiral in form as shown more clearly in Figs. 1 and 2.

The central portions of the case sections —3— and —4— within the involute channel —7— and forming the opposite sides of the impeller chamber are dished outwardly or slightly frusto-conical and arranged with their concave sides facing each other and spaced a sufficient distance apart to receive the impeller —2— between them and it, therefore, follows that these dished sides flare toward the center or axis of the impeller or rather converge radially toward the perimeter of the case, thereby affording a relatively large fluid capacity at the center or inlet to compensate for the gradually increasing surface area toward the periphery of the impellers as will be hereinafter more fully described.

The impeller —2— comprises a power driven shaft —9— upon which is mounted a hub —10— carrying a series of, in this instance six-impeller plates —11— which are also formed of sheet metal pressed or stamped to the desired form and preferably curved longitudinally as shown more clearly in Fig. 6. The inner ends of the impeller blades are secured by brazing, welding or other suitable fastening means to the hub —10— while their remaining portions are curved longitudinally and spaced uniform distances apart and are arranged with their convex sides facing in the direction of rotation as indicated by arrow "X". These blades are of uniform size and extend radially a distance substantially equal to the shortest radius of the involute channel and are of sufficient width to fit closely with an easy-running fit against the flaring sides of the impeller chamber and, therefore, their longitudinal edges are preferably tapered to conform to the flare of the central portions of the casing sections as shown more clearly in Figs. 3, 4, 7 and 8.

The casing section —4— is provided with a central outwardly projecting hollow hub —12— integral therewith and provided with a branch inlet pipe —13— adapted to be connected to any available source of supply of cooling liquid to the return of a circulatory system while the outlet pipe —8—, forming a part of the other case section —3—, may be discharged in any suitable receptacle or pipe connected to the outflow pipe of the same circulatory system.

Tightly fitted within the inner end of the hub —12— is a metal bushing —14— having its inner end enlarged to fit snugly within a corresponding recess at the junction of the hub with the main body of the section —4— and forms a continuation of the adjacent side of the impeller chamber. This bushing —14— is provided with a central journal bearing —15— coaxial with and adapted to receive the adjacent end of the shaft —9— and is connected by webs —16— to the main body of the bushing but is otherwise spaced apart from said main body to form a series of inlet passages —17— as shown more clearly in Fig. 5. These passages —17— are concentric with the axis of the shaft and may be termed a central inlet for the inflowing fluid which is admitted to the interior of the hub —12— through the branch pipe —13—. A separate bushing —18— is tightly fitted in a central aperture in the opposite case section —3— and constitutes an additional bearing for the shaft —9— and is threaded externally and provided with a cap —19— which, together with the bushing —18— forms a stuffing box or gland to prevent leakage of the fluid along the shaft. It will be observed that the inner end of the shaft terminates within the hub —12— which is otherwise closed except as to its inlet —13— and passages —14— which communicates with the impeller chamber.

The inner ends of the longitudinal edges of the impeller blades —11— adjacent the inlet —17— are cut away or recessed at —20— to the diameter of the inlet —17— and, therefore, these portions of the blades are of less width than that of the adjacent portion of the impeller chamber to permit free entry of the fluid to said chamber and between the impeller blades for the purpose of aiding the blades in picking up the inflowing fluid and throwing it centrifugally into and through the involute channel —7— and thence through the outlet —8—. It will be seen that the portions of the blades just at the outer edge of the inlet —17— are wider than their extremities which enables said blades to initially take up a quantity of fluid more in proportion to the ability of the remaining portions of the blades to discharge such fluid centrifugally through a larger area or capacity of the impeller chamber, thereby materially increasing the capacity of delivery of the pump without liability of choking. In other words, the capacities at the center and periphery of the impeller chamber are more nearly balanced by increasing the size of the impeller chamber and impellers near the center which implies increased power efficiency as well as fluid delivery efficiency of the chamber.

What I claim is:

1. A centrifugal pump comprising a casing having an outwardly projecting hollow hub, a bushing mounted in said hub, a journal within and spaced from said bushing and connected thereto by webs, a shaft mounted in said journal and a propeller

mounted on said shaft and positioned within the casing.

2. A centrifugal pump comprising a casing having an outwardly projecting hollow hub and a recess adjacent the juncture of the hollow hub and the body of the casing, a bushing mounted in said hub and having a portion seated in said recess, a journal within and spaced from said bushing and connected thereby by webs, a shaft mounted in said journal, and a propeller mounted on said shaft and positioned within the casing.

3. A centrifugal pump comprising a casing having an outwardly projecting hub at one side, a bushing mounted in said hub, a journal spaced from said bushing and connected thereto by webs, the side of said casing opposite that upon which the hub is formed provided with an aperture, a bushing in said aperture, a shaft mounted in said journal and in said last named bushing, and a propeller mounted on said shaft between the journal and the last named bushing.

In witness whereof I have hereunto set my hand this February, 1913.

WILLIAM SPARKS.

Witnesses:
LILLIAN WUNDERLICH,
BERNARD PATCH.