

No. 874,377.

PATENTED DEC. 24, 1907.

N. W. AKIMOFF,
PUMP.

APPLICATION FILED JULY 18, 1907.

4 SHEETS—SHEET 1.

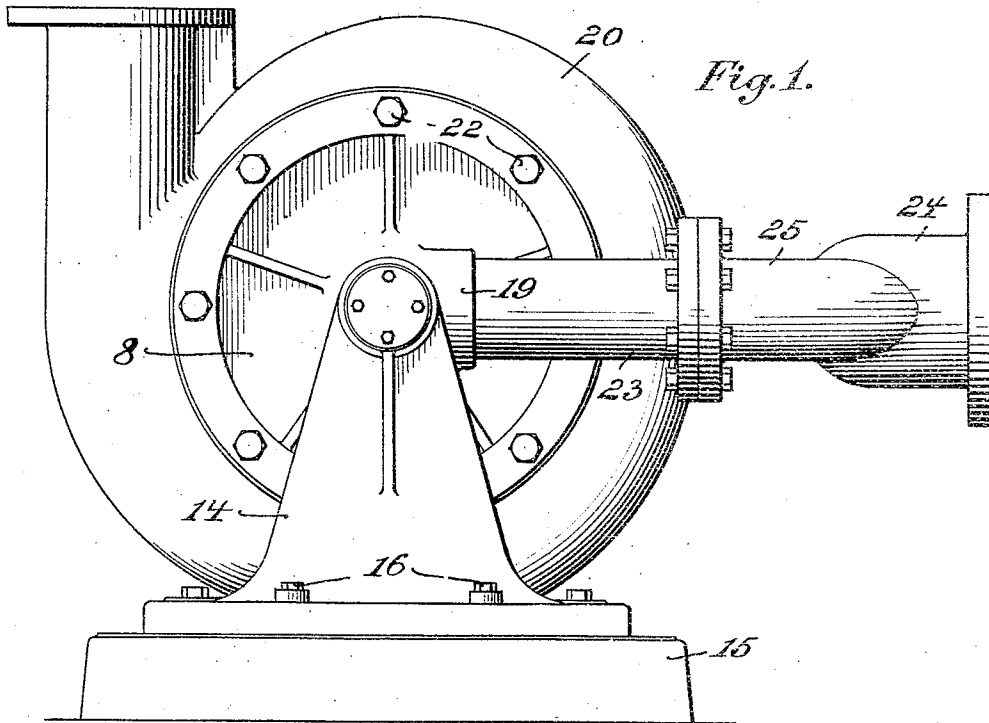


Fig. 1.

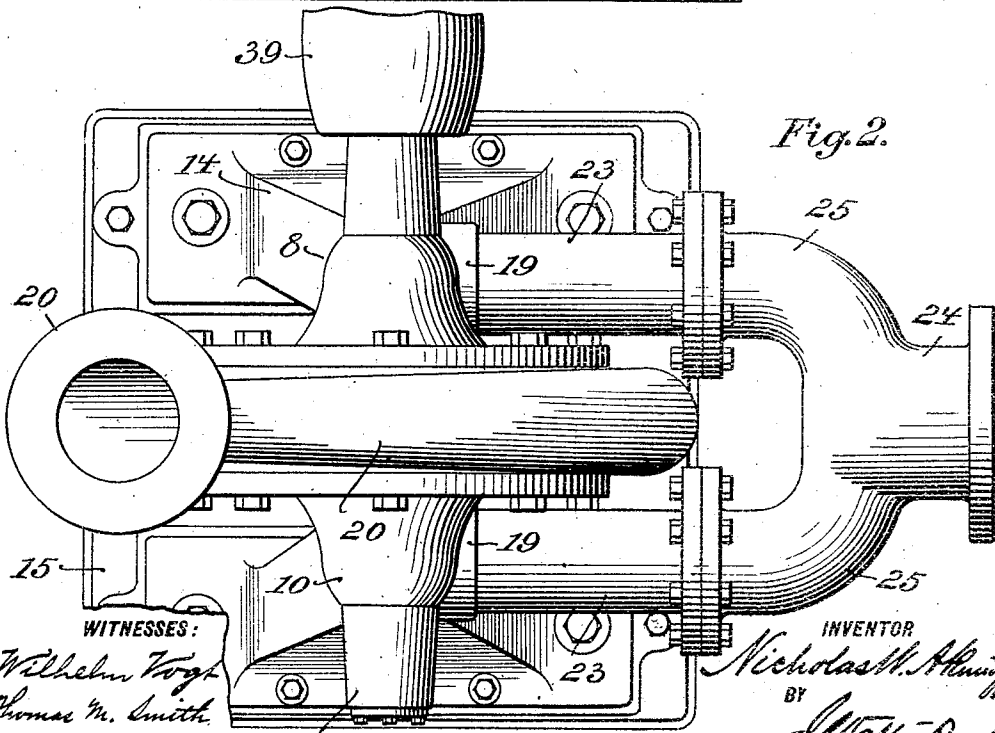


Fig. 2.

WITNESSES:
Wilhelm Topp
Thomas M. Smith

INVENTOR
Nicholas W. Akimoff
BY
J. Walter Douglas
ATTORNEY.

N. W. AKIMOFF.
PUMP.

APPLICATION FILED JULY 18, 1907.

4 SHEETS—SHEET 2.

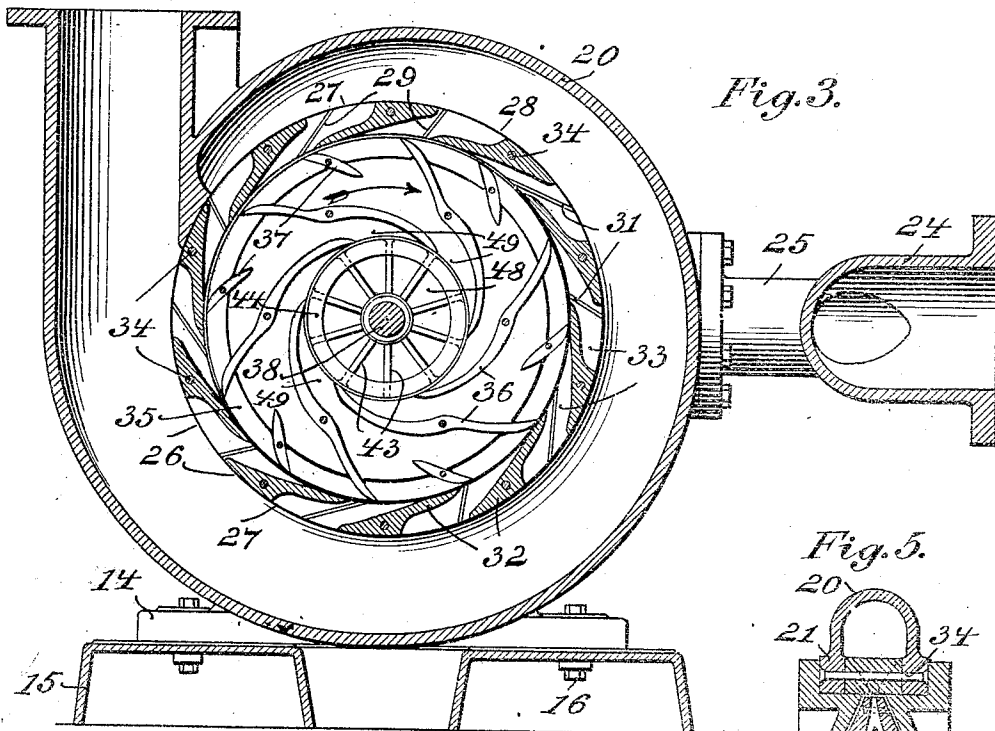


Fig. 3.

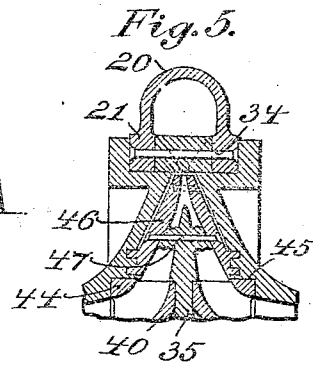


Fig. 5.

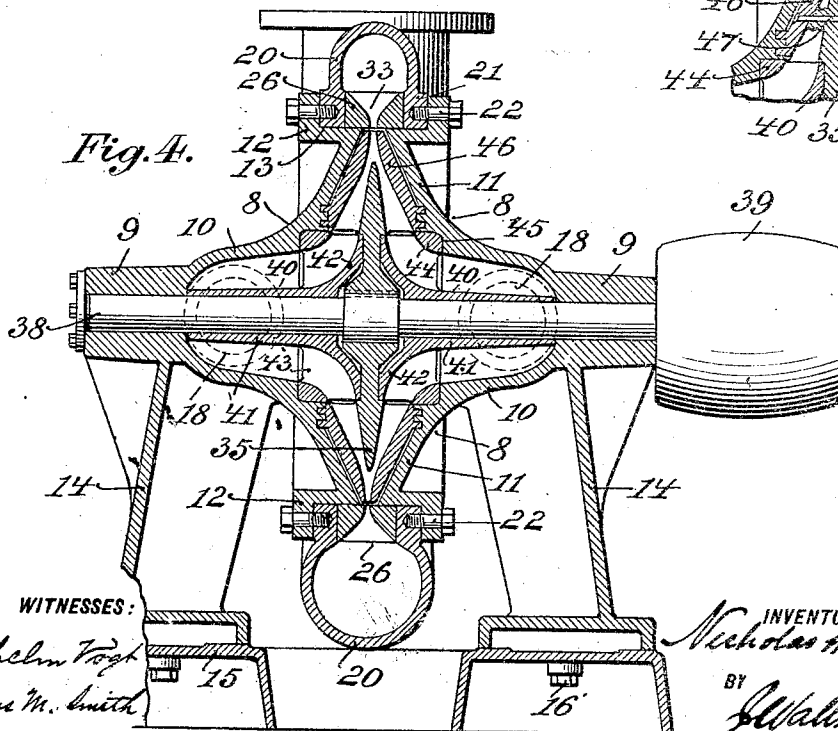


Fig. 4.

WITNESSES:

Wilhelm Vogt
Thomas M. Smith

INVENTOR

Nicholas H. Akimoff

BY

J. Walter Cooper

ATTORNEY.

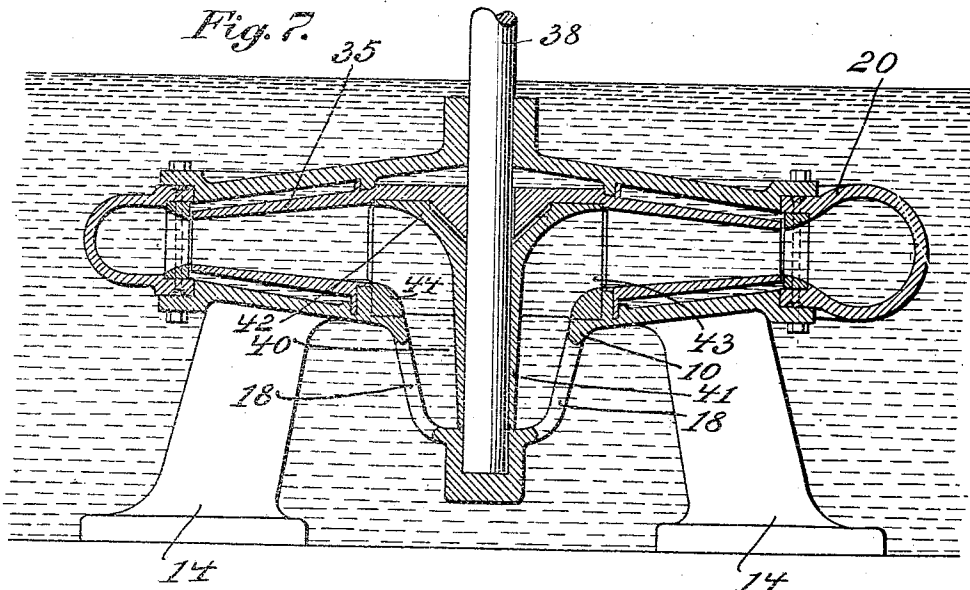
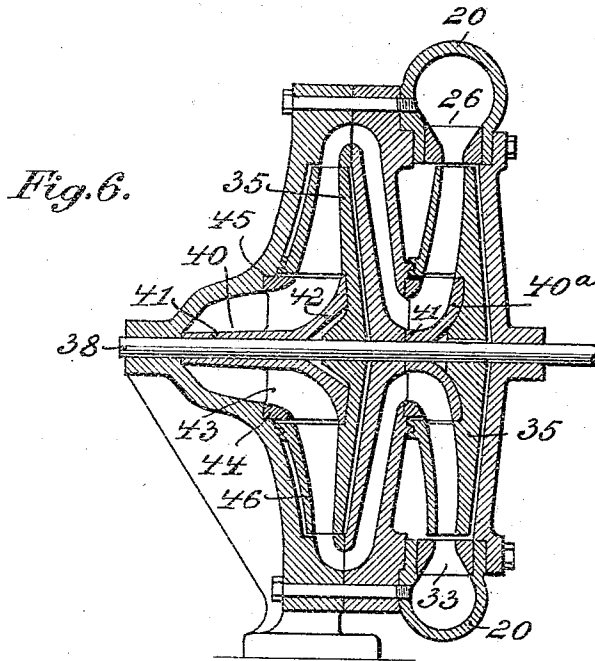
No. 874,377.

PATENTED DEC. 24, 1907.

N. W. AKIMOFF.
PUMP.

APPLICATION FILED JULY 18, 1907.

4 SHEETS—SHEET 3.



WITNESSES:

Wilhelm Vogt
Thomas M. Smith.

INVENTOR
Nicholas H. Akimoff.
BY
J. Wallis Dwyer
ATTORNEY.

N. W. AKIMOFF.

PUMP.

APPLICATION FILED JULY 18, 1907.

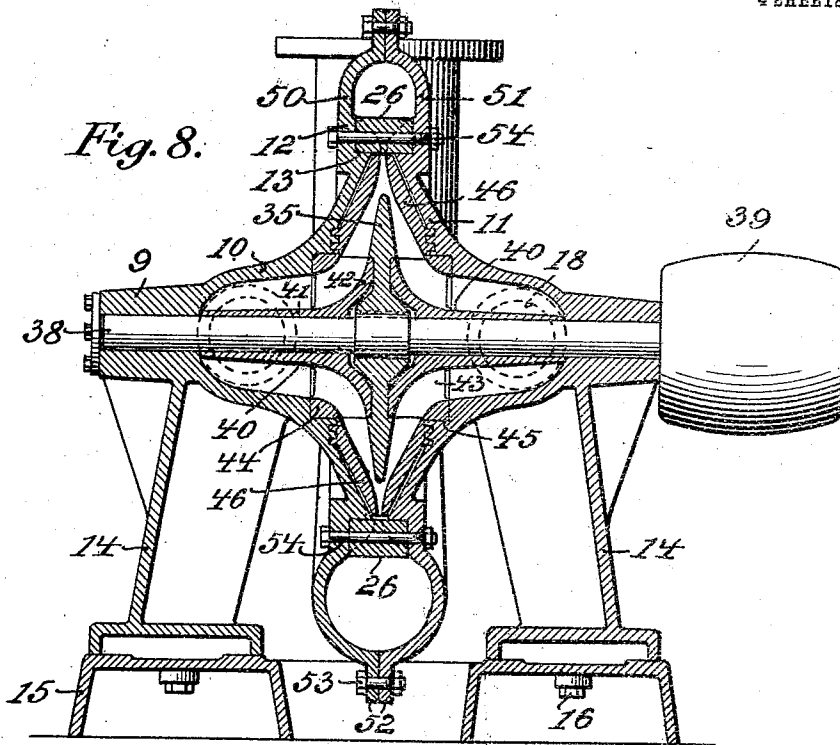


Fig. 8.

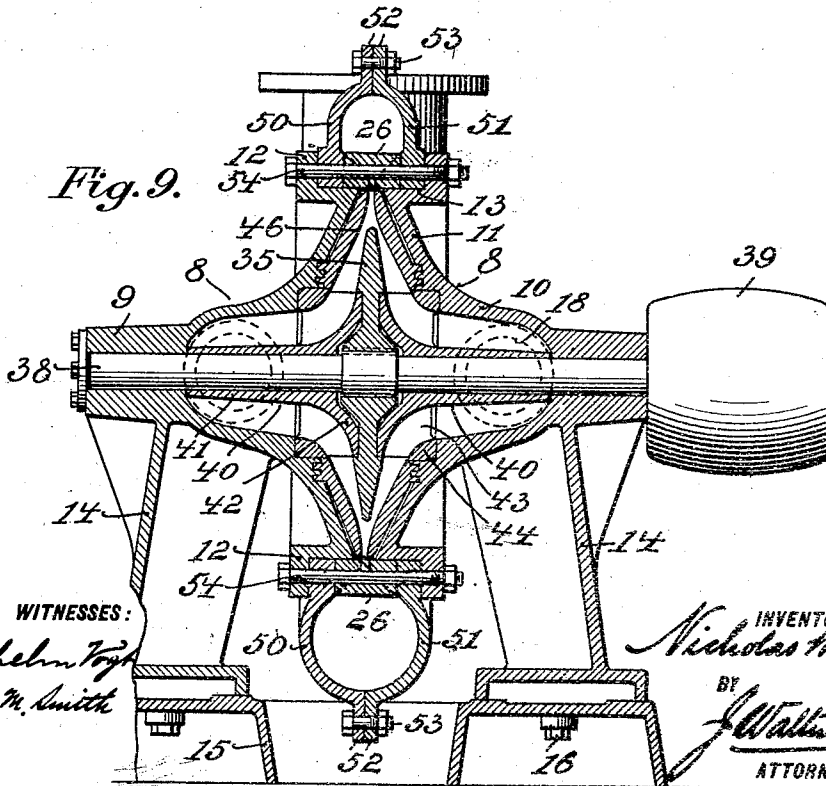


Fig. 9.

WITNESSES:

Wilhelm Foyt
Thomas M. Smith

INVENTOR

Nicholas W. Akimoff

BY

J. W. Allen Douglas

ATTORNEY.

UNITED STATES PATENT OFFICE.

NICHOLAS WLADIMIR AKIMOFF, OF PHILADELPHIA, PENNSYLVANIA.

PUMP.

No. 874,377.

Specification of Letters Patent.

Patented Dec. 24, 1907.

Application filed July 18, 1907. Serial No. 384,343.

To all whom it may concern:

Be it known that I, NICHOLAS WLADIMIR AKIMOFF, a subject of the Czar of Russia, but now residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My invention has relation more particularly to a pump of the turbine type; and in such connection it relates to the provision of means to permit without shock of the entrance of fluid into the impeller and to prevent of a vortex action of the entering fluid.

The principal objects of my invention are, first, to provide a pump of the turbine type with removable suction guide sleeves adapted without shock to deliver fluid to the impeller by changing the course of the flow of the fluid before reaching the impeller, thereby preventing any side thrust thereof, in the delivery of the fluid to the impeller; second to provide each of the suction guide sleeves with a tubular portion surrounding the shaft of the pump and held stationary therein to prevent movement being imparted to the entering fluid by the shaft as well as by the inner tips of the impeller blades; third to provide the suction sleeves with an extension having laterally projecting blades to positively guide the fluid to the impeller and with an annular portion adapted to connect the sleeves with the housing of the pump; fourth to provide the pump within the volute discharge casing thereof with a diffuser to permit of the strengthening of the casing by bolts and at the same time the connection of the diffuser by these bolts with the casing, without obstructing the passage of fluid through channels of the diffuser; and fifth to provide the pump with a housing formed of sections similar in outline to each other and each having a leg supporting a section and an inlet opening for fluid.

The nature and scope of my present invention will be more fully understood from the following description taken in connection with the accompanying drawings forming part hereof, in which

Figures 1 and 2 are views, illustrating respectively, in side elevation and in top or plan, a pump of the turbine type embodying main features of my said invention. Fig. 3 is a view, illustrating partly in central sec-

tion and partly in side elevation, the volute casing of the pump, the shaft, the suction guide sleeve surrounding the same with blades extending therefrom, and supporting a ring, the impeller surrounding one portion of the suction guide sleeve and having curved blades of varying lengths, a diffuser formed of sections, and bolts connecting each of the sections with the volute casing and the ends of the casing with each other. Fig. 4 is a longitudinal central sectional view of the pump. Fig. 5 is a detail view, illustrating the connection of the diffuser sections with the volute casing by bolts, and a similar connection of the impeller with side plates by bolts passing through the impeller, the blades and side plates thereof. Fig. 6 is a view illustrating partly in sections and partly in elevation, a modified form of pump designated as a multi-stage turbo-pump, provided with suction guide sleeves. Fig. 7 is a similar view, illustrating a horizontally arranged turbine pump; and Figs. 8 and 9, are views, illustrating partly in section and partly in elevation, a pump with modified forms of volute discharge casings.

Referring to the drawings 8, represents a sectional housing, each section, consisting of a bearing portion 9, from which extends a cup-shaped portion 10, terminating in an outwardly flaring and inclined dish-shaped portion 11, which is provided with a step-like flange portion 12, and a leg 14, preferably extending from the bearing-portion 9, and cup-shaped portion 10, as shown in Figs. 1 and 4, inclusive. The leg 14, serves to support the section 8, upon a base 15, to which the leg 14, is removably connected by preferably bolts 16. The different portions of each section being thus formed integral with each other and of the same outline will require for their casting one pattern only, which pattern, however, must be so arranged as to permit of the casting of an annular boss 19, and an inlet opening 18, alternately in opposite sides of the cup-shaped portion 10, so that each section 8, is adapted to serve either as a left or a right hand section, as will be readily understood from Fig. 2. The sections 8, so formed serve to support the spiral or volute discharge casing 20, by engaging with their flanged portions 12, from opposite sides, each of which portions form a seat 13, for the reception of flanges 21, of the casing.

The latter by means of bolts 22, passing through the flanges 12, of the sections and engaging the flanges 21, are removably secured to the sections 8. In this instance the housing of the pump is formed of three parts only, the two sections 8, and volute casing 20, which latter serves in the usual manner for an outlet for fluid from the pump, while fluid by means of pipes 23, engaging the bosses 19, of the sections 8, and branches 25, of a pipe 24, is conducted into the same through the openings 18. To permit of the connection of the flanges 21, of the volute casing 20, by rivets or bolts to strengthen the same and to render the casing secure against breakage, this casing is provided with a diffuser 26, consisting of sections 27, having inclined sides 29, arranged parallel to each other, and sections 28, having inclined sides 30, arranged at an angle to the sides 29, thereof.

The sections 27 and 28, of the diffuser 26, are formed by first casting a solid diffuser ring, which is then cut to form the sections 27 and 28. The sections 27 and 28, are so shaped as to permit of the assembling of the diffuser 26, from the inside of the volute casing 20, by first introducing the sections 27, and then introducing between the same, the sections 28. The space formed between the sections 27 and 28, due to the cutting are closed preferably, by distance pieces 31, as shown in Fig. 3. Each of the diffuser sections 27 and 28, is provided with a substantially wedge-shaped solid portion 32, arranged tangentially to an impeller to be hereinafter more fully described and with depressions at each side of the solid portion 32, forming in conjunction with a depression of the adjacent portion channels, 33, to permit of the passage of fluid into the volute or spiral casing 20. Bolts or rivets 34, connect the flanges 21, of the casing 20, with each other, by passing through the solid portion or blades 32, of the sections 27, and 28, of the diffuser 26; so that in no way obstruct the passage of fluid through the channels 33, as will be readily understood from Figs. 3 and 5.

Instead of forming the volute casing 20, of a single casting the same may be divided into sections 50 and 51, each having a flange 52, and bolts 53, connecting the sections with each other, by passing through the flanges 52 thereof, as shown in Fig. 9; or the sections 50 and 51, of the volute casing 20, may be formed integral with the sections 8, of the housing, as shown in Fig. 8. In this instance, the diffuser 26, consists of a solid or uncut ring, which is secured to the sections 8, by bolts 54, passing through the portions 12, of the sections 8, and through the blades 32, of the ring.

The sections 8, form a structure or housing,

in which an impeller 35, is rotated by a shaft 38, supported by the bearings 9, of the sections 8, and driven by a motor or by a pulley 39, as shown in Figs. 2, 4, 8 and 9. In order to permit substantially without shock of the entrance of fluid to the impeller 35, and also to prevent vortex-movement of the fluid entering the pump through the inlets 18, at each side of the impeller 35, and surrounding the shaft 38, is removably arranged a suction guide sleeve 40. Each of the suction guide sleeves 40, consists of a tubular portion 41, loosely surrounding the shaft 38, and terminating in an outwardly flaring extension 42, which is provided with laterally extending blades or vanes 43, connected with each other at their outer free ends by a ring-shaped or annular portion 44, which not only strengthens the blades 43, but by engaging a recess 45, arranged in the section 8, serves to hold the suction guide sleeve 40, so formed, stationary in each section 8.

The impeller 35, rotating between the extensions 42, of the guide sleeves 40, is provided with two sets of long and short blades 36 and 37, of which the longer blades 36, at their inner ends terminate at the outwardly flaring portion 42, of the suction sleeve 40, and the blades 45 thereof. Both sets of blades 36 and 37, serve to support side plates 46, which are secured thereto by rivets or bolts 47, passing through the plates 46, blades 36 and 37, and the impeller 35, as shown in Fig. 5. The impeller 35, when rotated in the direction indicated by the arrow in Fig. 3, by means of the blades 36 and 37, sucks fluid through the inlet openings 18, and forces the same through the channels 33, of the diffuser 26, into the volute casing 20, which conducts the same from the pump. The impact of the fluid entering the sections 8, is first taken up by the tubular portion 41, of the suction sleeve 40, which conducts the same in a direction parallel to the shaft 38, after which the fluid is deflected in a direction substantially at right angles to the shaft 38, by the outwardly flaring portion 42, of the sleeve 40, through the channels 48, formed by the blades 43, thereof. The force of impact and the deflection of fluid in its flow to the impeller 35, is thus completely taken up, by the suction guide sleeves 40, so that the fluid positively guided by the blades 43, to the impeller when entering the channels 49, formed by the blades 36, will be delivered substantially without shock to the impeller, and without side thrust exerted in such delivery to the impeller. Moreover, by covering the shaft 38, by the stationary suction sleeves 40, no rotary or vortex-movement is imparted by the shaft and the inner tips of the impeller blades 36, to the fluid, so that the same enters the channels 49, of the

impeller, without offering resistance to the blades 36. The same results will be obtained by the stationary suction sleeve 40, when applied to a horizontally arranged pump, such as is shown in Fig. 7. In this type of pump the fluid to be raised enters the pump by openings 18, likewise arranged in the cup-shaped extension 10, of one of the sections 8, thereof. The shaft 38, terminates at a point more or less remote from the level of the fluid in which the pump is placed, and is driven by an electric motor or other means, not shown. With equally good results and for the purpose specified the stationary suction sleeves 40, may also be applied to multi-stage turbo pumps, as shown in Fig. 6. In this instance, the tubular portion 41, of the second sleeve 40^a, is shortened in length to adapt the same to such type of pump.

Having thus described the nature and objects of my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a pump of the character described, a housing, a shaft arranged in said housing, an impeller carried by said shaft within said housing, a suction-sleeve removably supported by said shaft and interposed between said impeller and said housing, said suction-sleeve having means engaging said housing so as to prevent transmission of movement from said impeller to said sleeve.

2. In a pump of the character described, a housing having a cup-shaped and outwardly flaring dish-shaped section and an inlet for fluid arranged in the cup-shaped portion of the section, a shaft arranged in said housing, an impeller carried by said shaft within said housing, a suction-sleeve removably supported by said shaft and interposed between said impeller and housing, said suction-sleeve having laterally projecting blades connected at their free ends by a ring-shaped portion and said ring-shaped portion arranged to frictionally engage said housing so as to prevent transmission of movement from said impeller to said sleeve.

3. In a pump of the character described, a housing consisting of sections, each section having a partially cup-shaped and outwardly flaring dish-shaped portion, a shaft supported by said section, an impeller carried by said shaft within said housing, suction-sleeves removably supported by said shaft and respectively arranged between said impeller and said housing, each of said sleeves having means engaging said housing so as to prevent by the same transmission of movement from said impeller to said sleeve.

4. In a pump of the character described, a housing, consisting of sections of uniform outline, each of said sections having a partially cup-shaped and outwardly flaring dish-

shaped portion, a diffuser supported by said sections, a shaft centrally arranged in said sections, a suction-sleeve arranged at each side of said impeller and removably supported by said shaft and each of said sleeves having means engaging the respective section of said housing so as to prevent by the same transmission of movement from said impeller to said sleeves.

5. In a pump of the character described, a housing, a volute casing supported by said housing, a diffuser, consisting of sections removably secured to said casing, each of the sections of said diffuser having ends inclined with respect to the outer and inner faces thereof, to permit of the assembling of the sections from the interior of said casing, a shaft carried by said housing, and an impeller carried by said shaft.

6. In a pump of the character described, a housing, consisting of sections, each section having a bearing portion extending into a partially cup-shaped and outwardly flaring dish-shaped portions surrounded by step-like flanged portions, and a leg projecting from the bearing and cup-shaped portion thereof, a volute casing having ends engaging the flanges of each section, and means for removably connecting the casing with said sections by engaging the ends of the casing and flanges of the sections.

7. In a pump of the character described, a housing, consisting of sections, each section having a bearing portion extending into a partially cup-shaped and outwardly flaring dish-shaped portion surrounded by straight portions terminating in substantially semi-circular portions having flanges, a boss projecting from the cup-shaped portion and communicating with an opening arranged therein and a leg projecting from the bearing and cup-shaped portion thereof and supporting the section so formed and means for removably connecting said sections by engaging the flanges thereof.

8. In a pump of the character described, a housing, a volute casing supported by said housing, a diffuser arranged in said casing, consisting of sections, each having a solid portion forming a blade and a depression forming a passageway for fluid and bolts passing through the solid portions of said sections so as to rigidly connect the same with said casing, a shaft carried by said housing, and an impeller carried by said shaft.

9. In a pump of the character described, a housing, a volute casing supported by said housing, a diffuser arranged in said casing, consisting of sections, each having a solid portion forming a blade and a depression forming a passageway for fluid and bolts passing through the solid portions of said sections so as to rigidly connect the same

with said casing, a shaft carried by said housing, an impeller carried by said shaft, and a suction-sleeve removably supported by said shaft and interposed between said impeller and housing, said suction-sleeve having means engaging said housing so as to hold the same stationary therein.

In testimony whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

NICHOLAS WLADIMIR AKIMOFF.

Witnesses:

J. WALTER DOUGLASS,
THOMAS M. SMITH.