G. HAUFF.

CENTRIFUGAL PUMP.

APPLICATION FILED FEB. 8, 1908.

904,533. Patented Nov. 24, 1908

3 SHEETS—SHEET 1

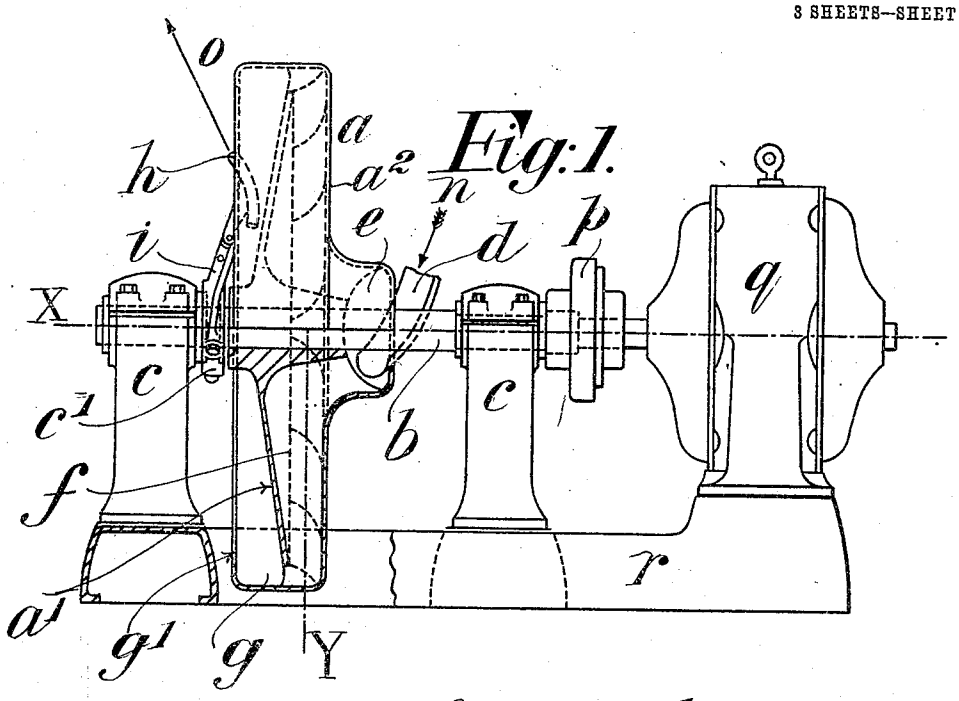


Fig. 1.

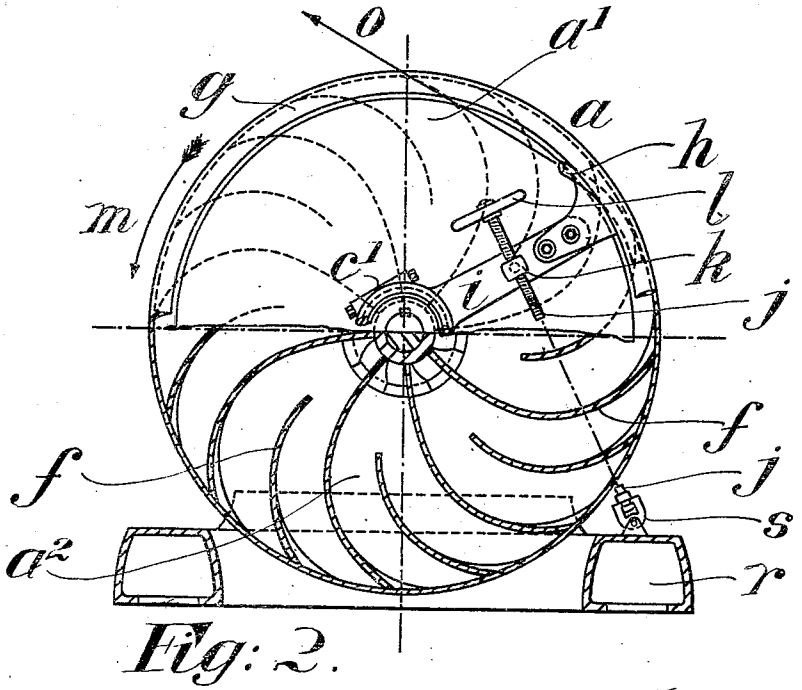


Fig. 2.

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3 SHEETS—SHEET 2.

Fig: 5.

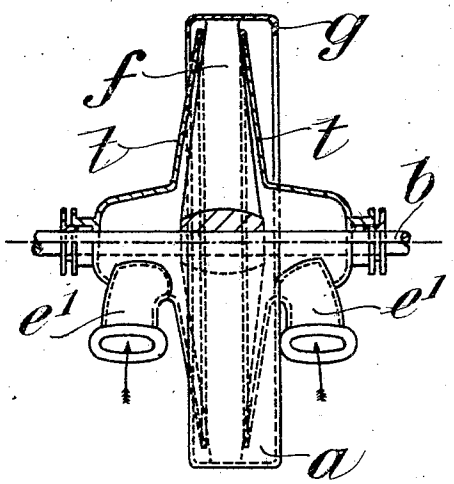
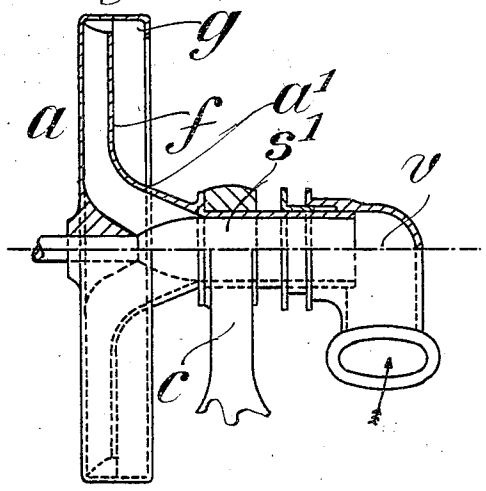


Fig: 6.



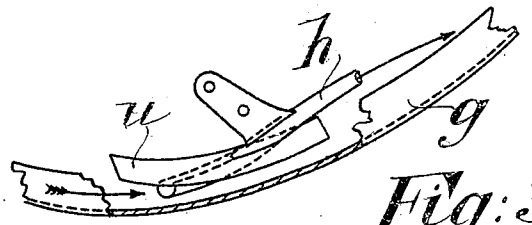


Fig: 3.

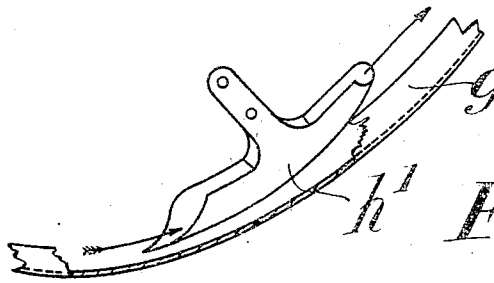


Fig: 4.

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3 SHEETS—SHEET 3.

Fig: 7.

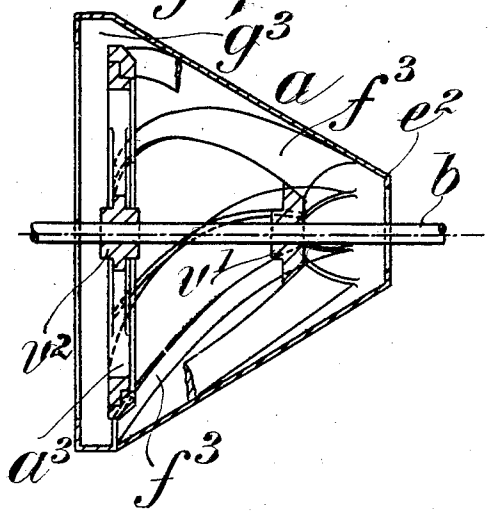


Fig: 8.

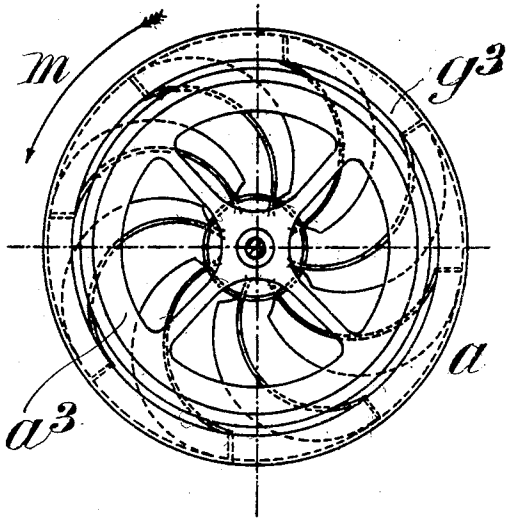


Fig: 9.

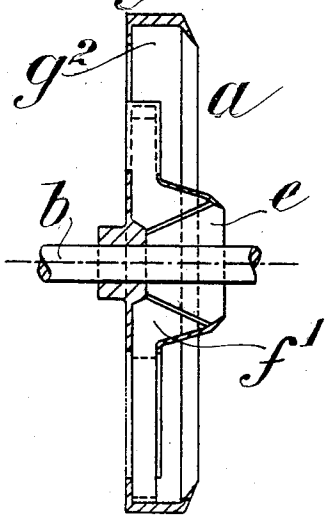
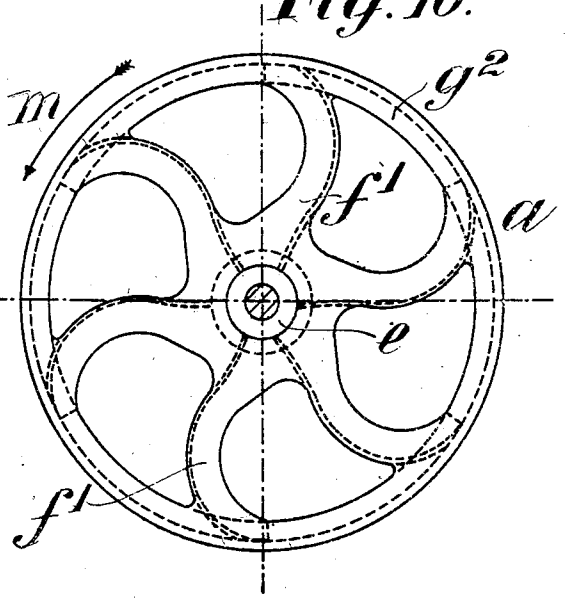


Fig: 10.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL PUMP.

No. 904,533. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed February 8, 1908. Serial No. 414,872.

To all whom it may concern:

Be it known that I, GUSTAV HAUFF, a subject of the King of Norway, residing at 43 Transvaal road, Kimberley, Cape Colony, have invented a certain new and useful Improved Centrifugal Pump, of which the following is a specification.

This invention relates to an improved centrifugal pump which, while it is suitable for pumping water and other liquids and semi-liquids, is specially adapted for pumping tailings, slimes, and such like materials containing solid matter of different specific gravity.

The new pump differs from the ordinary centrifugal pumps in so far as the centrifugal force, created in the pump, is used for the purpose of imparting a gradually increasing tangential velocity to the material being pumped and not, as in the case of the ordinary centrifugal pump, for the purpose of creating a static head in the surrounding pump casing.

The pump consists of a rotating part which is suitably mounted on a shaft driven by power and is provided with a series of vanes curved towards the direction of rotation and not, as in the case of the impeller vanes of an ordinary centrifugal pump, curved in the opposite direction. The rotating part is also provided with a circumferential trough or channel opening inwardly towards the axis of rotation. Dipping into this channel or trough is a non-rotating jet or diverting appliance consisting of a scoop, pipe, or nozzle shaped to suit the nature of the material to be pumped and fitted adjustably in such position that the receiving end of same projects inside the abovementioned channel or trough, while the discharge end points in an oblique direction and clear of the pump.

The material to be pumped enters near the center of the pump, and is preferably made to flow by gravity from an open chute into same, or by the discharge from another independent pump, and the construction of the pump is such that the material to be pumped flows towards the circumference thereof, under the action of the centrifugal force, and in so doing, gradually acquires a higher velocity until, at the circumference, it is discharged tangentially into the revolving channel or trough which opens inwardly towards the axis of rotation. The material now flows in the same direction of rotation as the circular channel containing it and is held within the same by the centrifugal force. The rotating stream of material is diverted by the jet appliance which is held stationary and, as a consequence, the material discharges itself in the form of a jet which will carry to a distance proportionate to the initial velocity imparted to it by the rotation of the pump. The diverting or jet appliance is so fixed that it can be adjusted to any position about the center of the pump and in this way any desired angle of elevation of the discharge jet is conveniently obtained. For the adjustment of the lateral angle of discharge, the pump may easily be arranged to be turned bodily in any direction.

In order that my said invention may be properly understood I have hereunto appended explanatory drawings showing, by way of example, forms of construction of the pump.

Figure 1 is an end view of the pump with the rotating part thereof partly in section. Fig. 2 is a half elevation and half section of the pump, the section being taken on the line X. Y. Fig. 1. Fig. 3 is an enlarged view of the jet or diverting appliance. Fig. 4 is a similar view of another form of jet or diverting appliance. Fig. 5 shows in half section and half elevation the rotating part of pump provided with suction attachment. Fig. 6 shows another arrangement of same. Fig. 7 is a section and Fig. 8 an elevation of a modified construction of the rotating part of the pump. Fig. 9 is a section and Fig. 10 an elevation showing another mode of constructing the rotating part of the pump.

On the drawings the same reference letters wherever repeated indicate the same or similar parts.

The pump shown at Figs. 1 and 2 consists of a main or rotating part or drum a which is fixed on a shaft b running in bearings c suitably supported on a bed plate r. The shaft b is coupled at p to the shaft of an electric motor q which is also carried on the bed plate r. The main or rotating part a is provided with a series of vanes f which are curved in the direction of rotation as shown, and these vanes which extend between the disk a^1 and the side wall a^2 of the drum start from the hub of the rotating part and extend out to the circumference thereof where they merge into a circumferential channel or trough g which latter is

comparatively shallow and also open at the one side (see g^1 left hand side of Fig. 1). The hub of the rotating drum is extended at e and made so as to constitute an annular and somewhat cup shaped inlet chamber around the shaft b, said inlet leading to the spaces between the several vanes. The material to be pumped flows into the inlet chamber e from a chute d. The discharge is effected through a diverting appliance which may consist of a nozzle h, such as shown at Fig. 3, this nozzle at one end dipping into the trough g and at the other end projecting out clear of the rotating drum being securely held in position by an arm i which is turnably mounted on an extension c^1 of the left bearing c (Fig. 1). The arm is adjusted in position, as desired, by means of a screwed rod j with hand wheel l said screwed rod working in a nut k pivotally connected to the arm i said rod being free to turn, at its lower end, in a socket s, which, in this construction, is pivotally connected to the bed plate. The diverting appliance is or may be provided with a depression or guard plate u attached thereto.

The arrow m indicates the direction of rotation, the arrow n the intake and the arrow o the jet discharge from the pump. The rotating part is revolved at a high velocity by means of the motor q and the material being pumped flows in at the center of the drum a through the inlet chamber e and is acted on by the vanes f which carry it round and, at the same time, cause it to flow towards the circumferential channel g from which it is discharged tangentially (see arrow o) through the nozzle h. The channel or trough g is so shaped as to prevent the material being pumped overflowing the edge thereof.

As shown at Fig. 4 the diverting appliance may take the form of a scoop h^1 open at its upper side.

Figs. 5 and 6 show suction arrangements which can be used in connection with the rotating part if so desired.

In Fig. 5, a is the rotating part, f the vanes, and b the driving shaft. The suction attachment consists of side shields t which are stationary and fixed independently of the revolving part of the pump. The circumferential edges of the shields t project into the revolving channel g as shown. e^1, e^1, are inlet branches connected with the shields.

In Fig. 6 the rotating part a^1 of the pump is extended and supported by the bearing c forming a hollow shaft or trunnion s^1 working in a stuffing box at the end of the inlet pipe v which is suitably connected and supported.

In the construction shown at Figs. 7 and 8 the rotating part of the pump is cone shaped. The material enters the small end of the cone e^2, while the large end of the cone is formed into the channel g^2. The inside surface of the cone a is provided with webs, ribs or vanes f^3, which spring from the wheel a^3 which takes the place of the disk a^1, Figs. 1 and 2, and extend to the small end of the cone and are curved towards the direction of rotation (indicated by arrow m). The cone is fixed to the driving shaft b, by means of a suitable hub marked v^1 while the wheel a^3 has a hub v^2 which is keyed to the shaft b. The diverting appliance dips into the trough g^2, as before.

In the modified construction shown at Figs. 9 and 10 the rotating part is made like a wheel with radiating spokes f^1 made as channels open at one side and communicating with a channel shaped rim g^2 from which the material is discharged as before. The inlet chamber e is of conic shape as shown at Fig. 9. All wearing surfaces of pump may be protected by renewable liner plates. The pump may be made in any convenient number of parts joined together by suitable means. The pump is specially adapted for pumping tailings, slimes and the like. Such materials cannot be economically pumped by any of the usual types of pumps owing to the excessive friction in the pipe lines and pumps; the solid matter, when precipitating, clogging the pipes, pump and valves. Under many conditions when pumping large volumes of water or large quantities of material the new pump can be used to much better advantage than previous types of pumps, such, for example, as fire pumps, pumps for spreading water over large areas, and generally in cases where constructional difficulties make the use of a pipe from the pump to the point of delivery undesirable. The pump can be used to produce a jet when required for any desired purpose.

Having now fully described by invention what I claim and desire to secure by Letters Patent is:—

1. In a device of the character described, a driving shaft, a casing thereon having an inlet, a circumferential channel interior of said casing, a disk inclosed by said casing, a plurality of curved blades coöperating with said disk to direct a fluid from said inlet to said channel, an outlet, and tangential discharge means projecting into said channels.

2. A pump having, in combination, a hollow body with a lateral extension at one side thereof, a disk at the interior of the body, a series of curved vanes arranged between the disk and one side of the body, an inlet in the extension, an internal open channel at the circumference of the body, a nozzle projecting into said channel, means for supporting said nozzle and means for adjusting said supporting means.

3. A pump having, in combination, a hol-

low body with a lateral extension at one side thereof, a disk at the interior of the body, a series of curved vanes arranged between the disk and one side of the body, an annular inlet in the extension, an internal and open channel at the circumference of the body, a nozzle which, at one end projects into the circumferential channel and at the other end projects out laterally and tangentially from the rotating body, a support holding said nozzle in position and a screwed rod for adjusting the support.

4. A pump having, in combination, a shaft, means for rotating the shaft, a body fitted on the shaft so as to rotate therewith said body having an inlet at the center and a channel opening inwardly at the circumference, a series of vanes springing from the central inlet and extending to the circumference of the body being curved in the direction of rotation of the body, a disk forming the back of the vanes, an arm mounted on said shaft, a discharge appliance fitted to said arm and projecting into the said channel and means for adjusting the position of the arm and also holding it in place.

5. A pump having, in combination, a shaft, means for rotating the shaft, a body fitted on the shaft so as to rotate therewith said body having an inlet at the center and a channel opening inwardly at the circumference, a series of vanes springing from the central inlet and extending to the circumference of the body being curved in the direction of rotation of the body, a disk forming the back of the vanes, an arm mounted on said shaft, a scoop shaped discharge appliance fitted to said arm and projecting into the said channel and means for adjusting the position of the arm and also holding it in place.

6. In a device of the character described, a driving shaft, a casing thereon, having an inlet, a circumferential channel interior of said casing, a plurality of curved blades between said inlet and said channel, and an outlet nozzle projecting into said circumferential channel.

In testimony whereof I affix my signature in presence of two witnesses.

GUSTAV HAUFF.

Witnesses:
W. BELL,
H. G. ORDING.