T. R. HAYTON.

CENTRIFUGAL PUMP.

APPLICATION FILED JUNE 6, 1910.

1,022,478. Patented Apr. 9, 1912.

Fig. 1.

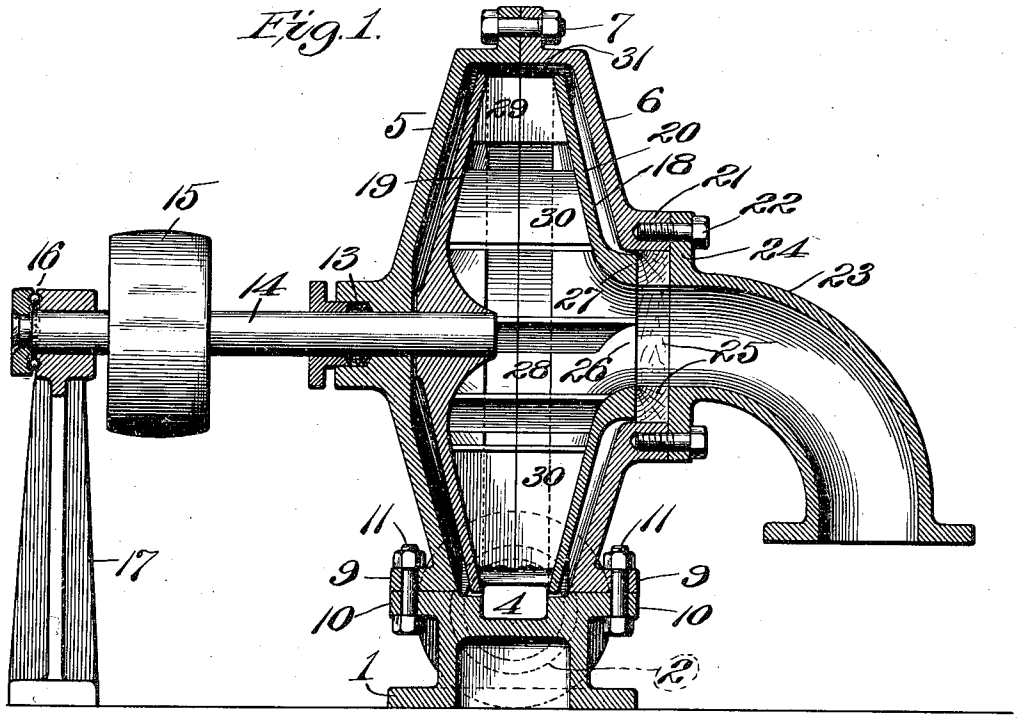
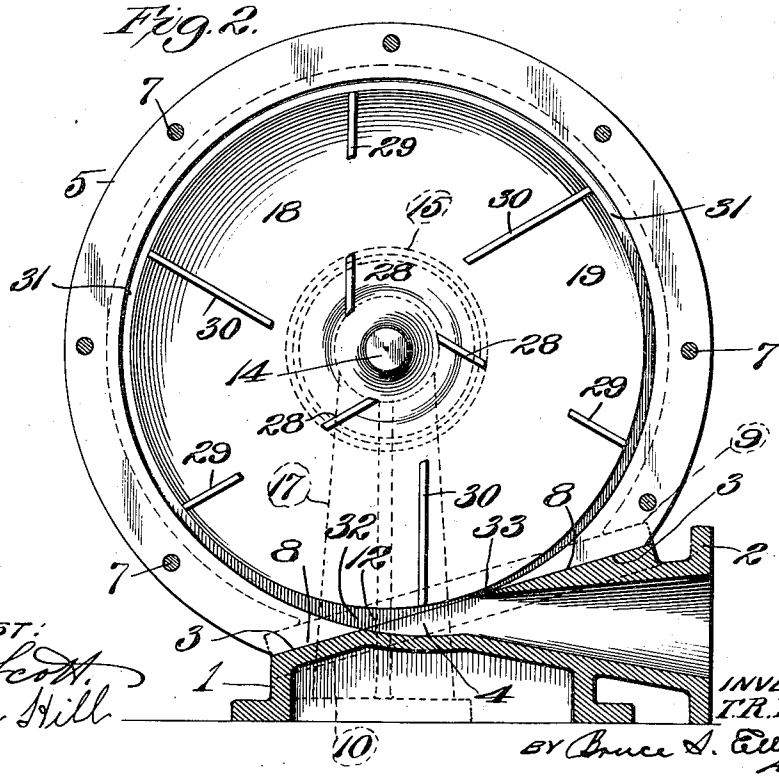


Fig. 2.



ATTEST:

Wm. A. Scott

Stella Hill

INVENTOR:

T. R. Hayton,

BY Bruce A. Elliott

ATT'Y.

UNITED STATES PATENT OFFICE.

THOMAS R. HAYTON, OF HANNIBAL, MISSOURI.

CENTRIFUGAL PUMP.

1,022,478. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed June 6, 1910. Serial No. 565,284.

To all whom it may concern:

Be it known that I, THOMAS R. HAYTON, a citizen of the United States, residing at Hannibal, in the county of Marion and State of Missouri, have invented new and useful Improvements in Centrifugal Pumps, of which the following is a specification.

This invention relates to certain new and useful improvements in centrifugal pumps, and has for its object to provide a pump embodying certain novel features of construction and principles of operation which will insure a higher efficiency in operation than is possible with any pump of this type, of which I am aware.

The invention is illustrated in the accompanying drawing, in which—

Figure 1 is a cross section, partly broken away, of a pump constructed according to my invention; and Fig. 2 is a transverse sectional view thereof.

Referring now to the drawing, the numeral 1 indicates the base of the pump which embodies in its construction a nozzle 2, said base and nozzle being cast as an integral structure and having an inclined upper side 3, which is provided with an opening 4.

5, 6 indicate the two halves of the casing of the pump, the same being connected near their circumference by a series of bolts 7, as usual, and each being provided with a flat side 8 to seat on the incline 3 of the base, and each having a laterally extending flange 9, by means of which it is bolted to a similar flanged extension 10 on the base 1, as indicated at 11. Considering the casing of the pump as an entirety, an opening 12 in the flat side 8 thereof coincides with the flat side 3 in the base and thereby furnishes an outlet from the pump casing to the nozzle 2.

Extending through a stuffing box 13 in the side 5 of the casing is a shaft 14 provided with a pulley 15, and having its outer end journaled in a thrust-bearing 16 mounted on a suitable support 17. On the inner end of the shaft 14 within the casing of the pump is mounted the runner 18. This runner comprises two substantially concaved circular plates 19 and 20 which are united by blades, hereinafter referred to. The section 6 of the casing has a central opening surrounded by a flange 21, to which is secured, by means of bolts 22, an intake pipe 23, which, for the purpose, is provided at the end connected to the pump with a circular flange 24. The diameter of the bore of the pipe 23 is less than the diameter of the opening of the casing of the pump, thereby providing a shoulder against which seats a wooden bearing-ring 25. The side 20 of the runner is provided with a central opening 26, corresponding in diameter with the bore of the pipe 23, and a thickened circular flange 27 surrounding the opening 26 is adapted to bear against the ring 25. The two parts of the runner, as stated, are connected by blades, and the location and arrangement of these blades will now be described.

Extending between the two blades 19 and 20, and arranged tangentially of the opening 26, are a series of short blades 28, three of such blades being shown. If the wall of the opening 26 in the runner be considered to extend backward to the plate 19, it would be found that the blades 28 have their inner edges terminating at the circumference of said opening. Extending inward from the periphery of the runner are a series of short blades 29 in line with the short blades 28. Between each pair of short blades 29 I arrange a relatively long blade 30, which blades terminate at points short of the path traversed by the outer ends of the blades 28. All of the blades are arranged tangentially as respects the opening 26.

An important advantage is gained by the arrangement of the blades described, and particularly of the short blades 28. It will be seen that as the column of water enters the opening 26, and the runner being in motion, the inner edges of said blades 28 will cut into the water almost endwise, and gradually spread or force the water outward while imparting a circular movement thereto. By this arrangement of the blades I obviate the shock, and consequent loss of power, involved in a construction employing radial blades extending from the center of the runner, and meeting the water flatwise. Practically all of the power, therefore, employed in revolving the runner in my pump is utilized, in that the water is immediately started upon its outward and circular course from the moment of contact with the blades 28. There is practically, therefore, no loss of power except that due to friction. The spaces afforded between the blades 28 and 29, and between these blades and the blades

30, afford means of equalizing the pressure in the various parts of the pump, and also permit the flow of the water toward the outlet when the pressure at such point is less than at other points in the pump. When the water passes beyond the short blades 28, it is next acted upon by the blades 30 and 29, and these blades compel the water to move with the same velocity as the runner.

It will be noticed that the casing of the pump throughout the greater part of its inner circumference is concentric with the periphery of the runner 18, a small space 31 being provided between the periphery of the runner and the inner wall of said casing. This space gradually widens toward the bottom of the casing, as indicated at 32, to allow the water to pass through the opening 12. This concentric arrangement of the runner relative to the casing insures that the water shall be confined within the runner and maintained at its maximum velocity until the point is reached where it must be discharged from the pump. The upper forward edge of the opening 4 is formed as a knife edge, and, as indicated at 33, is located in as close proximity as practicable to the outer edge of the runner so that it will, as it were, shave off the water as the runner revolves and cause it to pass into the nozzle 2. A substantially vertical line drawn from the point 33 to the bottom of the nozzle will indicate the point of beginning of the opening proper into the nozzle 2. This opening is rectangular, and in a pump in which the runner is seventeen inches in diameter said opening will be approximately one inch high by three inches wide. The bore of the nozzle 2 gradually increases in diameter outward and also becomes circular in formation. The diameter of the outlet of the nozzle is, in a pump of the size described, approximately five inches. By experiment I have found that the highest efficiency is gained by proportioning the size of the opening of the nozzle at the point 33 to the size and velocity of the runner. In all cases I aim to make this opening of such size that the water shall pass therethrough and into the nozzle 2 at its maximum velocity. By then gradually increasing the diameter of the nozzle outwardly the velocity of the water may be reduced to the proper speed to insure its passage through the pipe connected to the nozzle 2 with the minimum of resistance from friction.

Each of the features I have described as characteristic of my invention is important, but I wish to lay particular stress on the fact that by the construction described I am enabled to discharge the water from the pump into the nozzle at its maximum velocity, this being accomplished by retaining the water within the runner until practically the moment of its discharge into the nozzle. The water, therefore, possesses all the energy that has been imparted to it, at the moment it enters the nozzle at the point 33, and by decreasing its velocity by widening the bore of the nozzle 2, the maximum pressure effect is obtained upon the column of water in the pipe (not shown) connected to the nozzle 2. It will be understood that in the case of my invention being embodied in a pump of larger size than that described herein, I may employ a double intake, in order to better balance the runner, without departing from the spirit of my invention. Also I wish it understood that my invention may be utilized as a blower, instead of as a pump, and it is contemplated that the same may be advantageously employed in connection with cupola and blast furnaces, in mine ventilation, and in other or similar applications where a strong blast of air is required.

I claim:

1. In a centrifugal pump, in combination with a runner having a central opening, a series of short blades at the center thereof arranged tangentially with respect to said opening, a second series of short blades extending inward from the periphery of the runner and in line with the first named set, and a series of relatively long blades extending inward from the periphery of the runner, each long blade being interposed between two short blades.

2. In a centrifugal pump, a runner having a central opening, a series of short, rigid blades arranged about and tangentially with respect to said opening, and extending outward therefrom and from wall to wall of the runner, and a second series of blades extending inward from the periphery of the runner but terminating short of the path described by the outer ends of said short blades, the runner being substantially concentric with the casing and having its outer edge located to rotate in close proximity to the inner edge of the outlet from the pump.

3. In a centrifugal pump, in combination with a casing having a discharge nozzle, a runner mounted in said casing having a central opening, a series of short, rigid blades arranged about and tangentially with respect to said opening and extending outward therefrom and from wall to wall of the runner, a second series of alternate, long and short blades extending inward from the periphery of the runner, the longer blades terminating short of the path described by the outer ends of the blades of the first series, said runner being substantially concentric with the wall of said casing and having its periphery in close proximity thereto, the space between the periphery of the runner and said casing at the bottom of the latter gradually widening until it conforms in size with the opening into said noz-

zle, the nozzle having a gradually enlarged diameter from such inlet opening to its discharge opening and the runner having its outer edge located to rotate in close proximity to the inner edge of the inlet opening of said nozzle.

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

THOMAS R. HAYTON.

Witnesses:
J. F. HICKMAN,
A. BROWN.