No. 632,572. Patented Sept. 5, 1899.

E. M. IVENS.

CENTRIFUGAL PUMP.

(Application filed Dec. 18, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

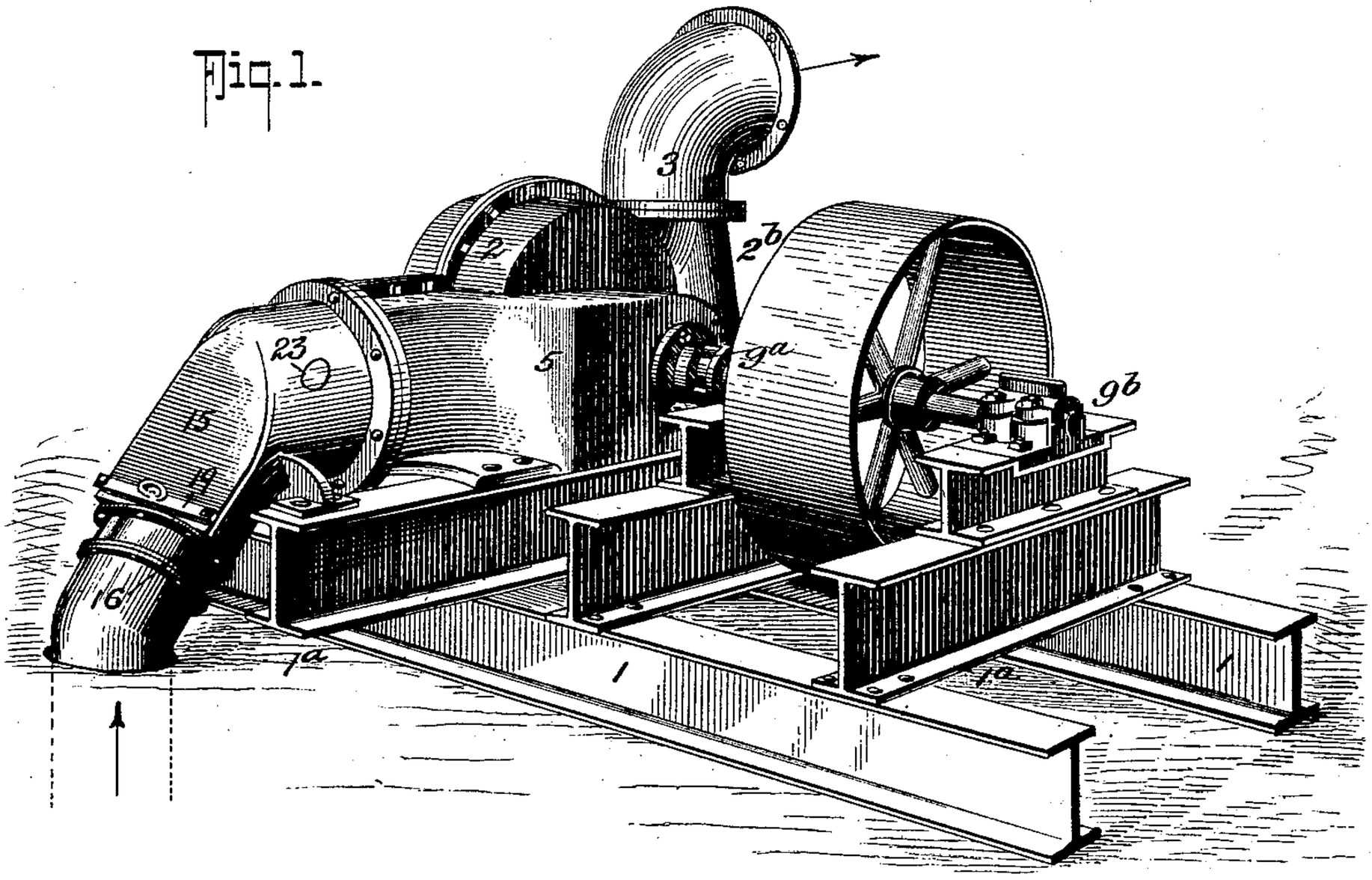

Fig. 4.

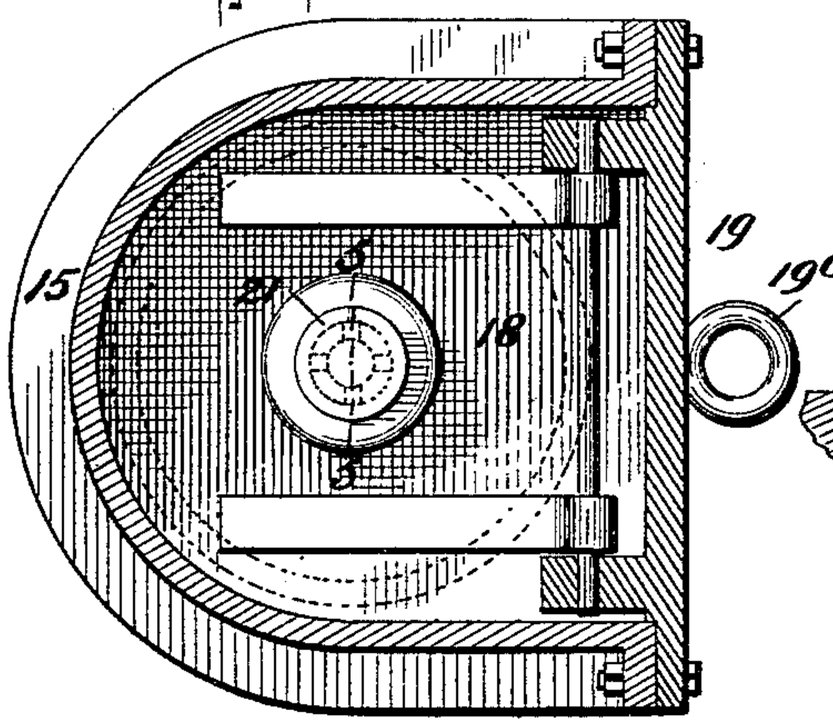

Fig. 5.

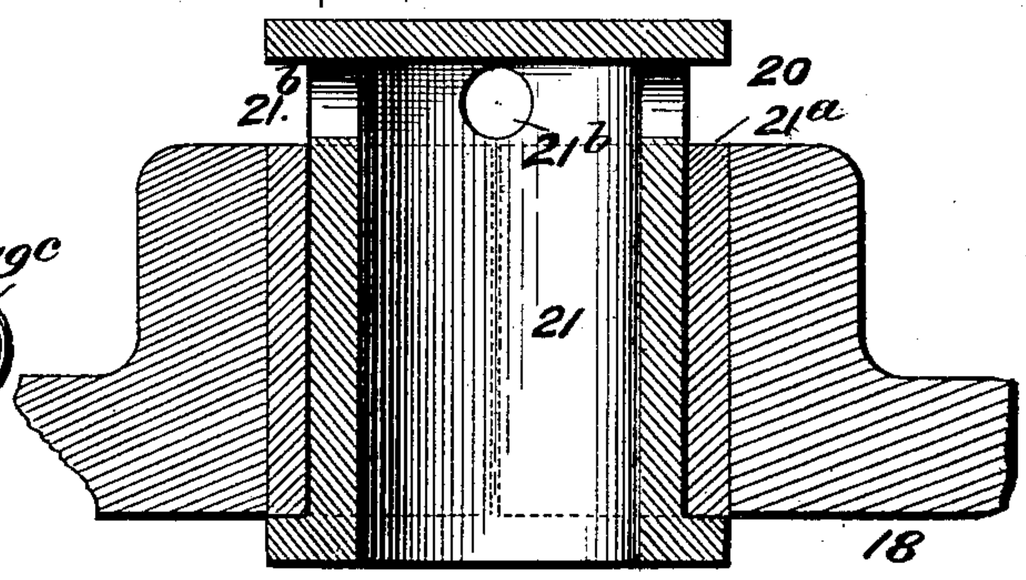

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Fig. 2.

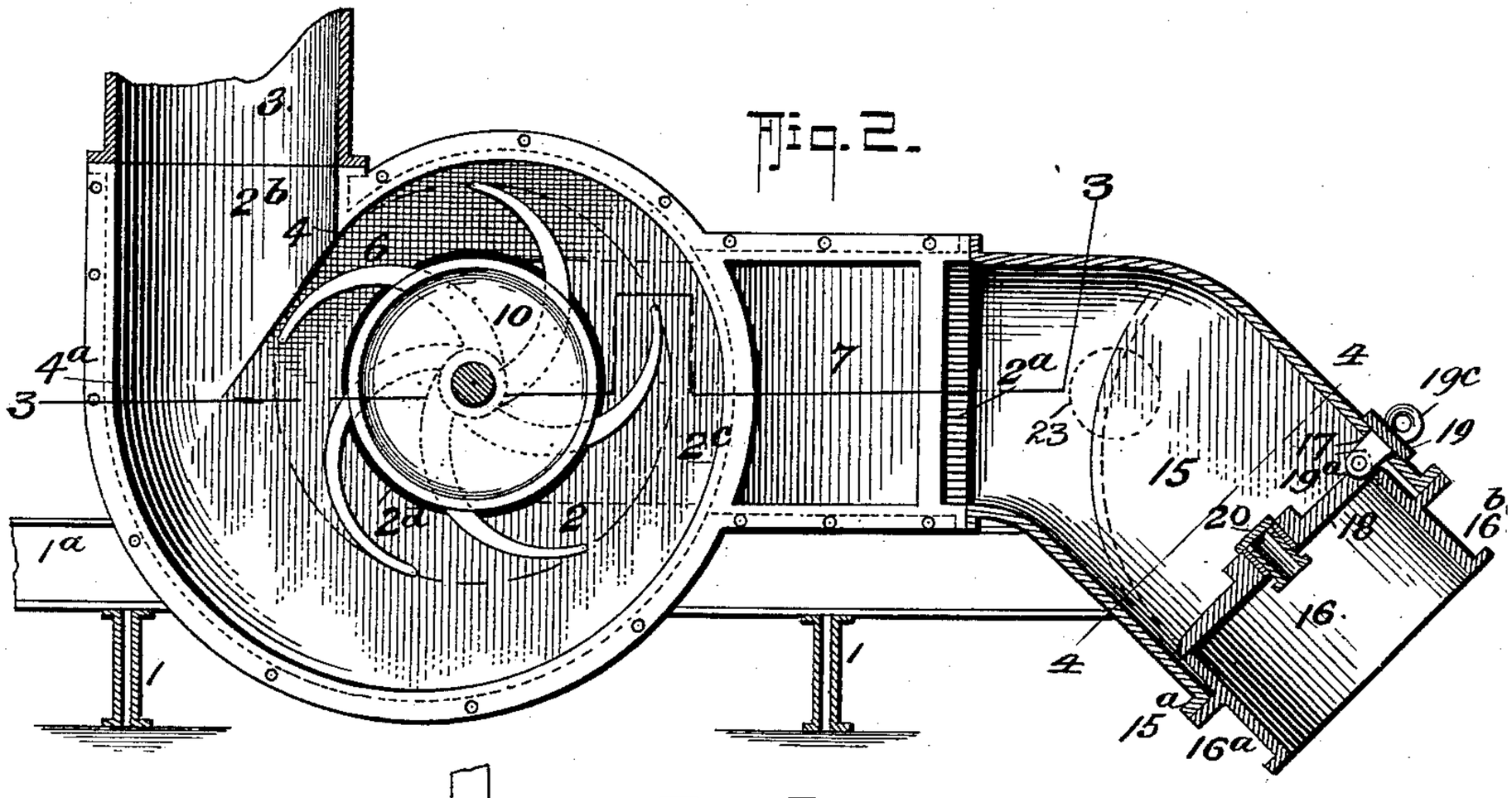

Fig. 3.

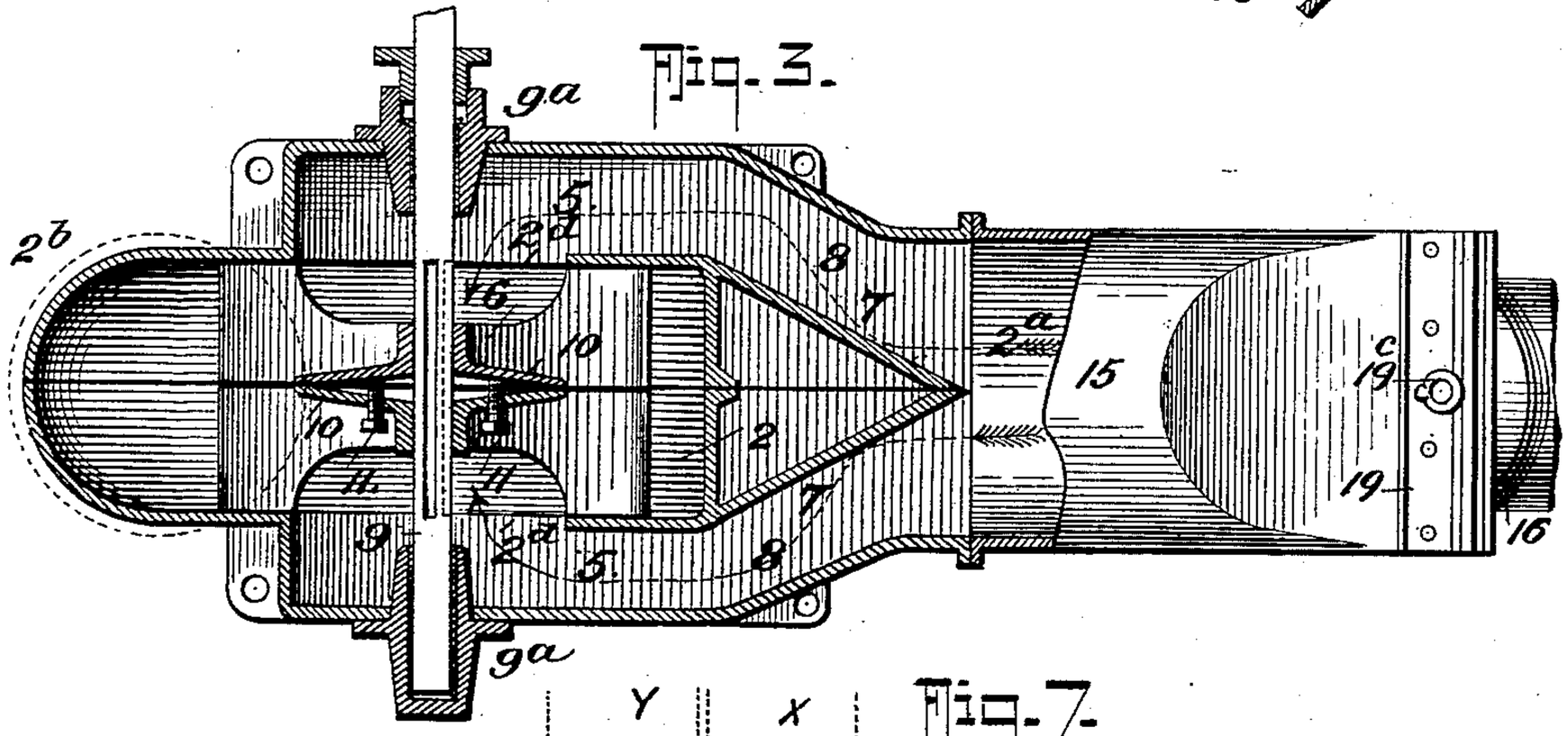

Fig. 7.

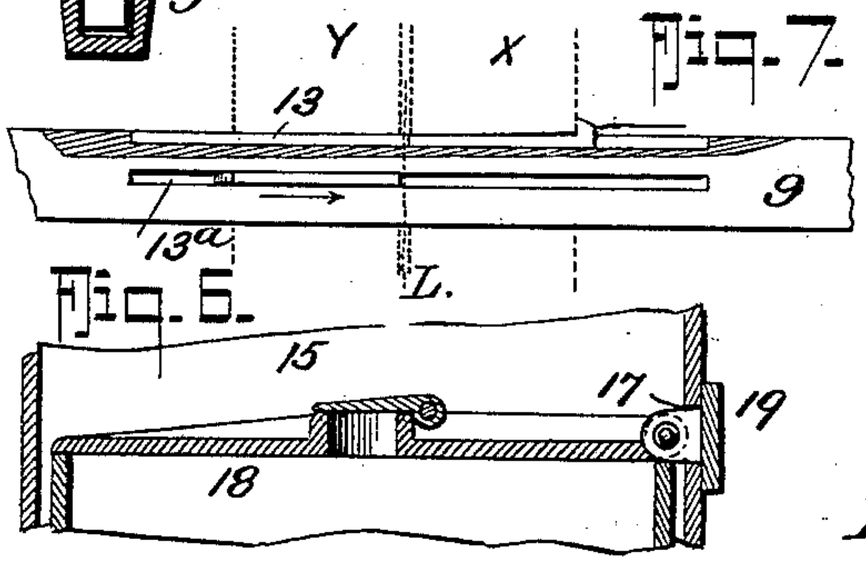

Fig. 6.

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EDMUND M. IVENS, OF NEW ORLEANS, LOUISIANA.

CENTRIFUGAL PUMP.

SPECIFICATION forming part of Letters Patent No. 632,572, dated September 5, 1899.

Application filed December 18, 1897. Serial No. 662,487. (No model.)

To all whom it may concern:

Be it known that I, EDMUND M. IVENS, of New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and Improved Centrifugal Pump, of which the following is a specification.

This invention relates to improvements in centrifugal pumps more especially adapted for use in "hydraulic dredging," and, among other objects, it seeks to provide a pump of this character in which the water is taken in at both sides of the disk in a uniform flow and force, whereby the pressure on such disk from both sides is automatically balanced and a maximum induction action of such disk effected, and in which suitable means are provided for adjusting the said disks whereby to readily take up the wear thereon and hold its edges or wings in close engagement with the sides of the disk or pump chamber, and thereby maintain a more uniform suction or pumping action and reduce the liability of quick wear and obstruction from debris to a minimum.

This invention also comprehends the construction of a pump of this character in which the air held in the suction-pipe is automatically relieved the moment the pump is started without the aid of any supplemental externally-arranged devices, whereby the air is drawn out from the suction and the waterhead below the main valve in the river or other source of supply is instantly lifted to fill the suction-pipe where it was previously filled with air, and thus prime or keep the pump ready for operation automatically at all times after it has been once filled with water to a point between the main valve and the discharge, thereby dispensing with the use of valves, strainers, and primer when the pump is in operation and the use of a jet-pump or other supplemental means for drawing off the air under the main valve at the starting of the pump.

Another object of this invention is to provide in a pump of this character a main valve mechanism adapted to be conveniently set in position for use and easily detached and removed from the valve-chamber without disconnecting any part of such valve-chamber or removing the suction-pipe and in which all the working parts of the pump are adjustably secured above the water and in sight.

Again, this invention seeks to provide a suction-pump taking water at opposite sides of its pumping-disk, having means for parting the water column at its entrance from the suction-pipe and channel-ways receiving the divided column, having an area sufficient to reduce the frictional impact of the divided water column to a minimum as it flows to the inlets at each side of the pump-disk and effect a considerable saving of power.

In its subordinate features this invention embodies the peculiar combination and novel arrangement of parts, such as will be first described in detail and then be specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view illustrating my invention as set up for use. Fig. 2 is a vertical longitudinal section of my improved centrifugal pump. Fig. 3 is a horizontal section of the same on the line 3 3 of Fig. 2. Fig. 4 is a cross-section taken on the line 4 4 of Fig. 2. Fig. 5 is a cross-section on the line 5 5 of Fig. 4, the valve being shown in its open position. Fig. 6 is a view of a modified form of vent-valve. Fig. 7 is a detail view illustrating the manner of keying the disk onto the shaft.

In the practical construction of my pump the same is mounted on a substantial base-frame consisting of the longitudinal and transverse channel-irons 1 1^a.

The pump-casing consists of a central or disk-holding portion 2, one end of which terminates in an induction-compartment 2^a, while the other terminates in an eduction or discharge mouth 2^b, to which the elbow or delivery pipe 3 is bolted in the usual manner. The disk portion 2 in vertical section is of substantially cylindrical shape, its peripheral wall 2^c, however, having a spiral lead, beginning at the inner edge 4 of the discharge-mouth 2^b and terminating at the outer edge 4^a of such discharge, as clearly shown in Fig. 2, by reference to which it will also be observed that the front wall of the said chamber

2 is closed, while the sides of such chamber have inlets 2^d.

On each side of the pump-casing proper is formed a reservoir 5, in practice several times the area of the suction-pipe. These reservoirs communicate with the pump chamber through the openings 2^d and have their ends extended and communicating to form the induction compartment or mouth, which in practice is preferably square, or nearly so, in cross-section.

The front end of the pump-chamber is formed with a forwardly-projecting wedge portion 7, which extends out nearly to the front end of the induction-chamber and divides it into two opposite leads 8 8, which I term the "reservoir-channels."

The drive-shaft 9 is journaled eccentrically of the pumping-chamber and centrally in line of the induction-openings 2^d, the ends thereof extending through the casing and engaging the bearings on the stuffing-boxes 9^a.

The disk 6, the peculiar construction of which and its means of connection with the drive-shaft form an essential feature of this invention, is of the conventional radial-blade shape, its blades being of the full width of the pump-chamber 2 and extending to the edge of the openings 2^d, while the shanks and the hub are of a reduced width to allow for a free ingress of the fluid, such form also providing for an even balance of the wheel, as a practically equal centrifugal fluid action is induced on both sides of the disk. Furthermore, such arrangement of the disk serves, in conjunction with the continuous curved or spiral peripheral way of the casing, to properly direct the movements of the entering water toward the eduction end.

To provide for a simple and effective means for holding the blades of the disk close up against the sides of the casing and to take up wear, such disk is made of two longitudinal sections, each independently keyed upon the shaft 9. Each disk-section has an annular hub-rim 10, which rims abut, as clearly shown in Fig. 3. The rim 10 of one section carries a number of set-screws 11, which bear against the opposite rim. By adjusting such screws 11 the two sections can be readily pushed apart to bring the wings or blades close up to the casing-wall as conditions may make necessary. Each half of the disk is keyed independently on the shaft, and for such purpose the shaft has two key-slots 13 13^a of a length greater than the two disk-hubs combined. In keying the hubs the key for side X is driven toward the center line L, while the key for the other disk-section Y drives into slot 13^a from opposite end of shaft toward L. By this arrangement, as the disk-sections are forced apart they pull tighter on the keys. The keys are backed out by pressing a drift-pin or punch through the free end of slot against the toe of the pin.

To provide for ready access to the interior of the pump, the casing is made of two sections bolted together, as shown.

15 indicates the inlet-valve-chamber section, which has its rear portion square in cross-section. This section is bolted to the flange of the induction-mouth and bracketed to rest on the steel channel-supports 1^a at a suitable distance out from the said flange-mouth. The lower end of the section 15 has a flange 15^a, to which is secured a valve-seat section 16, circular in cross-section, which has a flange 16^a, whereby it is secured to the lower end of the section 15, and a flange 16^b for securing it to the inlet or water-lead pipe.

It will be noticed, particularly in Fig. 2, that the valve-seat end of the section 16 extends within the lower end of section 15, the purpose of which is to allow for securing the meeting ends of the sections 15 and 16 and forming an opening 17 at one side in the section 15, through which the main valve devices can be inserted and withdrawn. The valve devices consist of the main valve proper, 18, which is hinged to the shank portion 19^a, projected inward from a cap or band piece 19, which after the valve is inserted in place is bolted water tight to the outside of the valve-chamber. Thus it will be readily apparent that the valve can readily swing up to the position shown in dotted lines and leave practically an unobstructed passage for the water during the operation of the pump. Furthermore, by simply loosening the bolts which secure the band 19 the entire valve can be withdrawn from the valve-chamber (it having a suitable eyebolt 19^c to facilitate such operation) without detaching the suction-pipe section 16 or any of the other parts of the pump.

The main valve 18 has a supplemental vent-valve 20. In the preferred form this valve consists of a hollow plug 21, held in a sectional spring-metal seat 21^a, having a limited vertical play in the main valve, its upper and lower ends having annular flanges for limiting the movement thereof. The valve 21 has a solid top and a series of air-vents 21^b at the upper end.

By providing the main valve with a supplemental or vent valve it is manifest that in starting the pump when the water-head is below the main valve the vacuum created above the main valve allows such valve 21 to be lifted by the atmospheric pressure beneath the main valve until its vents 21^b open up communication with the induction-chamber, thereby providing for a quick release of the air below the main valve and a consequent lift of the water-head, which in its upward flow raises the main valve to the position shown in dotted lines, thereby leaving the pump clear of every obstruction.

Instead of using a valve as described the supplemental valve may be in the nature of a hinged flap-valve, as shown in Fig. 6. I prefer, however, to employ the valve 21, as

the danger of chips or other debris lodging between the valve and its seat is reduced to a minimum.

The valve-chamber in practice has man-holes 23 for providing access thereto at a point above the valve.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the complete operation and advantages of my invention will be readily understood.

The provision of a wedge impact and reservoir-channels in connection with a main valve having a supplemental vent-valve admits of the separation of the water column as it is drawn against the wedge and the establishing of a partial vacuum, which reduces pressure on the channels and causes the vent-valve to open, the atmosphere causing the water to rise in suction and push air out when full column comes, (which in practice occurs in a few seconds,) opening main valve, the pump at once throwing out a full water column.

The use of a vent-valve for the purposes stated forms an important feature of this invention for the reason that were there no vent-valve the pump would get air past the main valve all at once and in consequence break the water column. On a high lift the elasticity of the air under the main valve would prevent the main valve opening, and hence making the employment of supplemental devices (such as jet-pump) necessary to draw off the air under the main valve.

By arranging the several parts as described all of the working portions are above the water-level in sight and arranged to be readily adjusted.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a centrifugal pump, the combination with a chamber having diametrically opposite inlets, of a disk rotatively supported in said chamber, and involving wings adjustably mounted relatively to each other and overlapping the inlets and means for holding the respective wings in close contact with the inner faces of the opposite walls of the chamber, substantially as specified.

2. In a centrifugal pump, the combination with a chamber, of a pump-disk rotatively supported in said chamber and including two sections each consisting of a hub and wings or blades secured to said hub, and means carried by one hub and engaging the other hub, and operable to maintain both series of blades in contact with the opposite walls of the chamber, substantially as specified.

3. In a centrifugal pump, the combination with a chamber, of a pump-disk rotatively supported in said chamber and including two sections each consisting of a hub and wings or blades secured to said hub, a series of set-screws carried by one hub and located to engage the other hub, whereby on turning the said screws, the respective wings will be forced into close contact with the opposite walls of said chamber, substantially as specified.

4. In a centrifugal pump; in combination with the pumping-chamber having inlets at diametrically opposite sides and an induction-pipe communicating with such inlets and having a discharge-opening, substantially as described; and the pumping-disk; of automatically-operating priming devices located within the induction-pipe, said devices comprising a main valve located above the normal water-head and adapted to be elevated by the water-lift, and an air-operated vent-valve adapted when opened to relieve the air-pressure between the water-head and the main valve in advance of the water-lift as a vacuum is created above it substantially as shown and described.

5. The combination of the casing having an eccentric chamber provided with oppositely-disposed side inlets and a discharge; of the pump-disk held to rotate within the eccentric chamber and having its axis centrally of said inlets, said disk being formed of two longitudinally-separable sections having adjustable means, whereby both sections can be forced apart; a device for fixedly holding the sections to their adjustment and to travel in close relation to the sides of the casing, as specified.

6. In a centrifugal pump, the combination with the central disk and the shaft having two key-slots, of a length greater than the two disk-hubs combined, and the fixedly-movable keys, of a length substantially that of one of the disk-hub sections, substantially as shown and described.

7. A centrifugal pump including a suction-pipe, a main valve disposed within said suction-pump; and a supplemental and air-operated valve carried by the main valve.

8. A centrifugal pump having a disk-chamber provided with eccentrically-disposed inlets at opposite sides, a disk rotatable within said chamber and having its axis located centrally of said inlet-openings and said chamber having a wedge portion extending forward therefrom and serving to separate the water column into two currents; an induction-pipe located in advance of said wedge portion; a main valve disposed in said pipe and an air-operated supplemental valve supported by the main valve.

9. In a centrifugal pump, the combination with a chamber having inlets, of a disk located in said chamber, and involving two sections provided with wings adjustably mounted relatively to each other; means for positively holding the respective wings in close contact with the walls of said chamber; a shaft for carrying the disk; and independent keys for securing the two sections of the disk to the shaft, substantially as specified.

10. In a centrifugal pump, the combination with a pump-casing and with an induction-pipe communicating therewith, said induction-pipe having a valve-inserting opening, of a main valve disposed in said pipe; a valve-carrying member secured to the outside of said pipe and having projections extending into the latter through said opening and to which said valve is hinged; and a second and air-operated valve carried by said first-mentioned valve, substantially as specified.

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Witnesses:
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R. W. BARR.