No. 705,844. Patented July 29, 1902.

E. M. IVENS, Dec'd.

H. K. IVENS, Administrator.

PUMP MECHANISM.

(Application filed Apr. 20, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

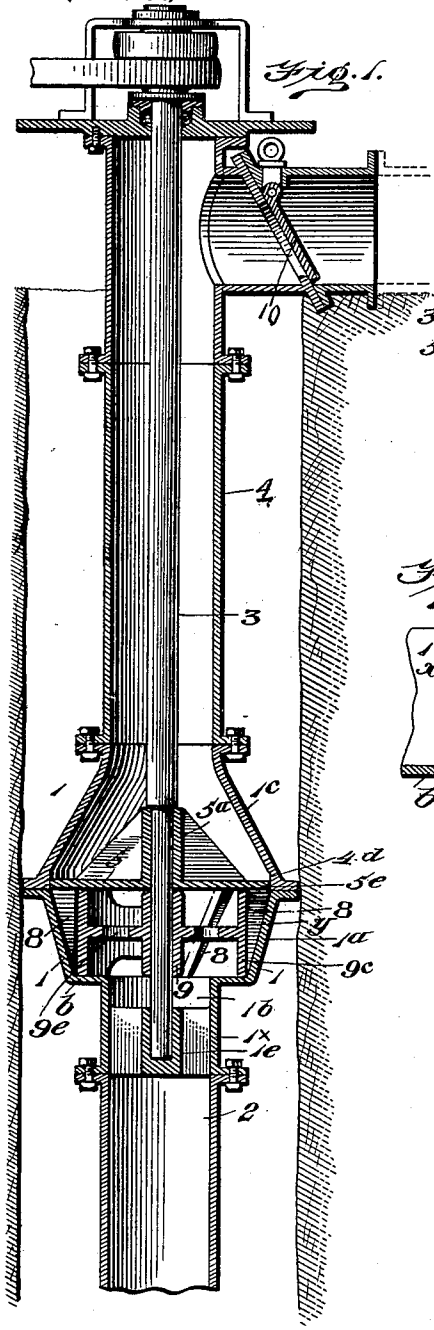


Fig. 2.

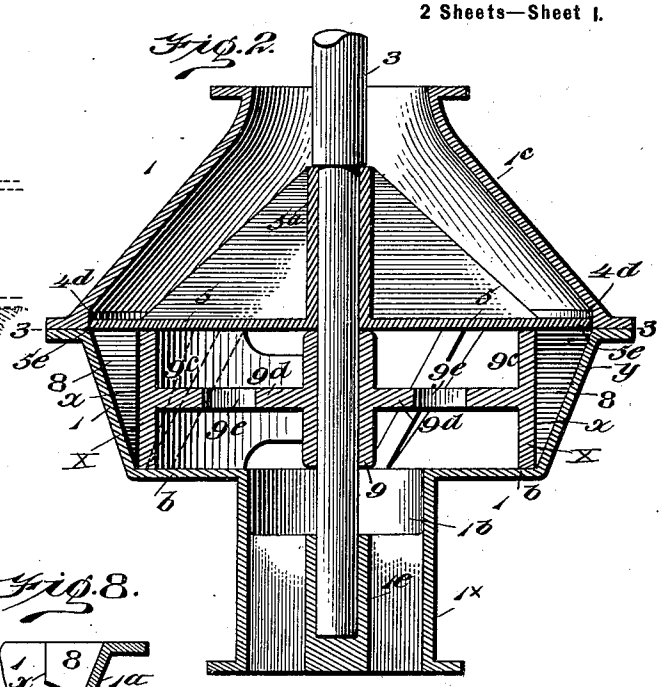


Fig. 8.

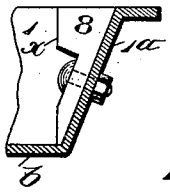
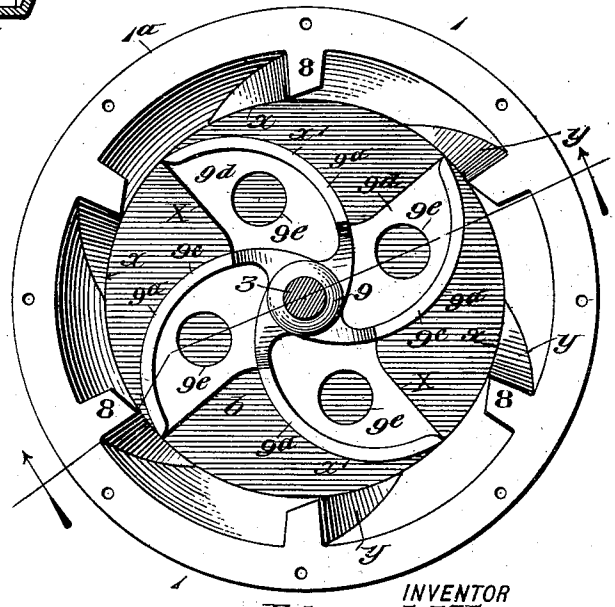


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

Fig. 4.

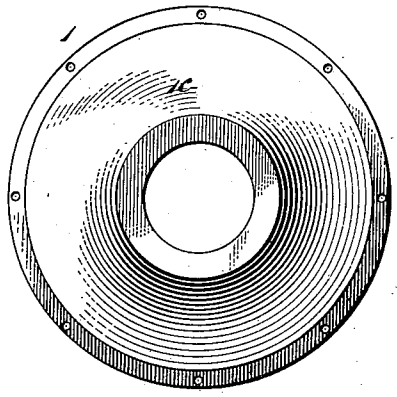


Fig. 5.

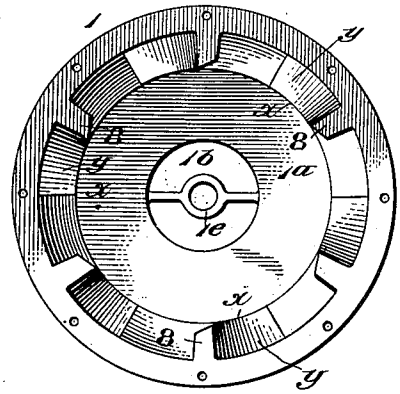


Fig. 6.

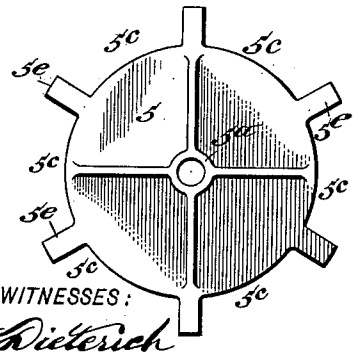
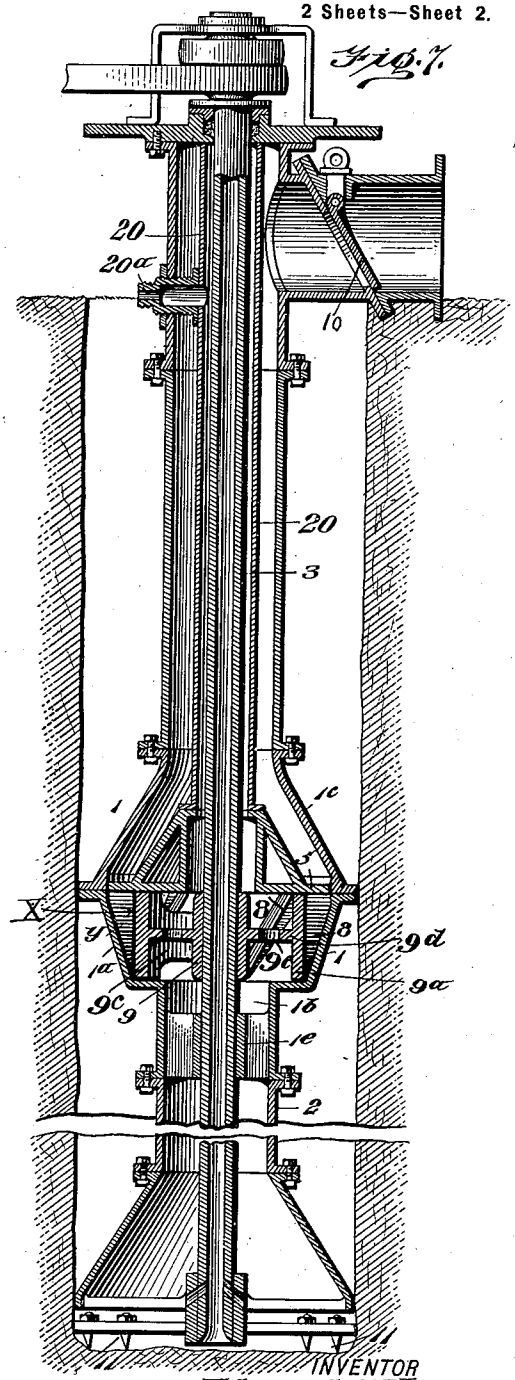


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDMUND MASTERS IVENS, OF NEW ORLEANS, LOUISIANA; HARRY K. IVENS ADMINISTRATOR OF SAID EDMUND MASTERS IVENS, DECEASED.

PUMP MECHANISM.

SPECIFICATION forming part of Letters Patent No. 705,844, dated July 29, 1902.

Application filed April 20, 1901. Serial No. 56,725. (No model.)

To all whom it may concern:

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

My present invention is in the nature of an improved centrifugally-operating pumping mechanism adapted for use in deep wells and for lifting water from bayous and lagoons for irrigating purposes; and it comprehends, generically, a casing having a lift-pipe and a discharge-pipe connected thereto, a centrifugally-operating pump-disk held within the casing, and a specially-arranged means for passing the water through the casing in an annular and upwardly-inclined direction.

My present invention in its more complete make-up also includes a novel construction of casing coöperating with the disk blades to effect a more uniform and capacious lift action than has been heretofore possible with lift-pumps having the ordinary arrangement of turbine or centrifugally-operating suction-disks.

In its more subordinate features my invention consists in certain details of construction and peculiar combination of parts, all of which will hereinafter be fully explained, and particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section showing my pumping mechanism especially designed for a low-lift pump. Fig. 2 is an enlarged vertical section of the casing and the centrifugally-operating pumping devices mounted therein. Fig. 3 is a horizontal section of the casing and the pump-disk, taken practically on the line 3 3 of Fig. 2. Fig. 4 is a plan view of the cap portion of the casing. Fig. 5 is a plan view of the base or receiving portion thereof. Fig. 6 is a plan view of the division bracket-plate that divides the casing into a lower receiving and an upper discharging compartment. Fig. 7 is a sectional elevation of a modified construction of my invention particularly adapted for deep wells. Fig. 8 is a detail view of a modified form of the stops, hereinafter referred to.

Referring to the accompanying drawings, in which like numerals indicate like parts in all the figures, 1 designates a pump-casing, the peculiar construction of which, in combination with the rotary disk operating therein, forms the essential feature of my present invention. The casing 1 in practice is usually of such diameter as to permit its being slid down into the well-bore, and to facilitate its downward movement and for other reasons hereinafter explained its lower or entrant portion is made tapering, preferably on an angle of forty-five degrees to the walls of well-bore, as clearly shown in Fig. 1. The casing 1 consists of three parts—a lower receiving member 1^a, in which the pump-disk operates and which has an inlet 1^b, with which the lift-pipe 2 connects, an upper conical-shaped portion 1^c for leading the fluid to the offtake-pipe 4, and a disk or plate 5, that divides the upper and lower parts of the casing and which also has a bracketed bearing 5^a for the drive-shaft 3. In the preferred construction (best illustrated in Figs. 1 and 2) it will be observed the inlet 1^b has a tubular pendent extension $1^\times$, flanged to join with the lift-pipe and formed with a centrally-disposed step-socket 1^e, in which the lower stepped end of the pump-shaft 3 seats when a solid shaft is used, as shown in Figs. 1 and 2. The socket 1^e is in vertical alinement with the bearing 5^a in the plate 5.

Upon the inner surfaces of the tapering sides of the part 1^a of the casing is formed a number of inwardly-projecting lugs 8, the inner edges x of which are disposed in a vertical plane to oppose the outer vertical edges of the pump-disk, presently described and as best shown in Fig. 2. The front side of the lugs—*i. e.*, the side against which the water is forced by the disk blades—inclines from the bottom of the casing forwardly in the direction of the disk rotation, preferably at an angle of forty-five degrees to the vertical axis of the pump-disk, whereby to produce annularly-inclined ways y (see Fig. 3) to deflect the fluid discharged against the said lugs annularly and upwardly to the discharge-openings 5^e in the division-plate 5, the reason for which will presently appear.

When my improved pumping means is to be used for lifting water from bayous or la-

goons, it is desirable to have the guide-lugs 8 8 removably secured, whereby to provide for fitting on the casing lugs having a greater or less angle than forty-five degrees relatively to the side wall of the pump-casing, so as not to present a too abrupt stop or incline guide-surface, which might impede the passage of the debris that comes up with the water, and to provide for fitting the different lugs 8 8 in place they may be formed as separate members and bolted to the side walls of the casing, as shown in Fig. 8.

The pump-disk comprises a hub 9, held upon the shaft 3 to turn therewith, from which project in a horizontal plane a number (preferably four) of blades, the impact-faces of the pusher portion 9^a of which in transverse elevation snugly fit the spaces between the rim of the inlet, the bottom *b* of the casing part 1^a, the plate 5, and the straight bore or face of the guide-lugs 8 8, and the said portions 9^a join with the hub 9 by a vertically-disposed shank 9^c of reduced area and horizontal webs 9^d, the webs 9^d being, however, apertured, as at 9^e, for a free passage of the fluid therethrough.

The plate 5, before referred to, comprises a body portion having a diameter equal that of the bore in which the disk blades travel, and said plate closes entirely over the pump-disk, it being provided with radial extensions 5^e, that engage the inner vertical annular rim 4^d of the cap-plate, as clearly shown in Figs. 1 and 2, said extensions serving to assist in properly positioning the plate, it being understood such plate is firmly held down by the shaft 3, that passes through its central bearing and the fluid-pressure on the top thereof. The pump-blades have their upper and lower edges held to run close against the plate 5 and the bottom of the casing, and to provide for the more effectively lifting the sand and fluid and thoroughly disintegrating the same and force same by centrifugal action against the wall of the casing the impact or pusher surfaces of the blades are vertical, as shown, and the said blades in horizontal plane are curved on a circle eccentric to the axis of the disk, with their outer or impact surfaces *x'* merging with the circle of the hub, as clearly shown in Fig. 3.

By constructing the pump-disk and the casing in the manner described the water-column reaches the pump-disk perpendicular and then passes off toward the annular casing-wall without a turn, and by reason of the radial inwardly-projecting stops disposed at an angle from the bottom of the casing the fluid is caused to pass up annularly at an angle of forty-five degrees, more or less, toward the outlets and through the said outlets into the conical cap portion, from whence it passes up into the outlet-pipe, which above the ground-line has a discharge-lateral having a back-check valve 10, as shown.

For deep wells and for sinking wells my improved construction of pumping disk and casing can be also advantageously used. For such purpose the casing is slightly modified, as shown in Fig. 7, by reference to which it will be seen the pendent shaft bearing in the lower casing-section is tubular to permit the shaft 3 to pass down through it to the bottom of the well. In this case the hollow drive-shaft 3 also serves as a means for feeding a loosening agent to the bottom of the well, and upon the lower end said shaft carries a disintegrating means consisting of radial toothed arms 11. In this latter form the lower end of the lift-pipe has a conical receiver to guide the mixed sand, gravel, &c., up into the said lift-pipe. When the disintegrator mechanism is used, a supplemental pipe 20 is mounted within the outlet-pipe that discharges into the top of the casing and has a lateral supply-nozzle 20^a, that projects through the outlet-pipe and terminates in a nozzle to receive the water-feed hose or pipe. The object in providing the supplemental pipe 20 is to aid in keeping the material separated from clogging within the casing and pump-disk.

The disintegrating means above referred to have been described in my present application to illustrate the adaptation of my improved mechanism for deep wells, and the said disintegrating means *per se* form no part of my present invention, as they are fully disclosed in and form a part of my Patent No. 682,939, dated September 17, 1901.

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

1. In a pump mechanism as described; a lifting-pipe, and an outlet-pipe, a casing joining the two pipes, having a central inlet at the bottom joined with the lift-pipe, and annularly-disposed outlets discharging into the outlet-pipe, projections on the inner surfaces of the casing, whose inner edges are in a plane vertical with the pump-disk, said projections being inclined in the direction of the movement of the pump-disks from the bottom of the casing up to the outlets, and a centrifugally-acting pump-disk, operating with pump-casing, whose blades have vertically-disposed projecting surfaces, and whose outer extremities are held to travel close up to the vertical face of the casing projections, all being arranged substantially as shown and for the purposes described.

2. In a pump mechanism as described, a pumping-casing, having a central bearing, and annularly-disposed outlets at the top, an offtake-pipe into which all of the outlets discharge, said casing having a single central inlet at the bottom, a shaft engaging the casing-bearing, a centrifugally-operating pump-disk thereon, whose blades have vertical outer edges, and curved impacting surfaces, adapted to throw the fluid toward the casing-wall, guide-lugs projected inwardly from the casing, having their inner face in a vertical plane to oppose the outer vertical edge of the

disk blades, said guide-lugs being inclined from the bottom of the casing up to the annularly-disposed discharge-openings of the casing, substantially as shown and for the purposes described.

3. In a pump mechanism as described, the combination with the casing, and the centrifugally-operating pump-disk held therein, said casing having an outlet in the top, and an inlet in the bottom, an offtake-pipe connected with the outlet, and a water-feed discharging into the top of the casing for mixing up the material lifted by the pump-disk into the casing, for the purposes described.

4. In a mechanism as described, the casing, the centrifugally-operating pump-blades, said casing having an annular outlet and an offtake-pipe at the top, and a central inlet at the bottom, a water-feed pipe held within the offtake-pipe, discharging into the casing, and having a feed-lateral at the upper end, projected outside the offtake-pipe, substantially as shown and described.

5. The combination with the casing, comprising a lower part having converging sides, and a central opening in the bottom, and an annular discharge in the top, an upper or cap member extended over the annular discharge and terminating with an offtake, the upper and lower members having central bearing portions, the casing having a series of inwardly-projecting guide-lugs inclined from the bottom up, and in the direction of the movement of the pump-disk and having straight inner faces; of the shaft 3, and the pump-disk mounted thereon to rotate therewith, said disk having radial webs terminating in blades, filling the lower part of the casing, their outer ends having straight edges to travel in close proximity to the straight faces of the guide-lugs, substantially as shown and for the purposes described.

6. In a pump mechanism, including a casing, joined with the intake and offtake pipes, and a centrifugally-acting pump, operating within the casing; of detachable lugs on the inner wall of the casing for deflecting the water-column upwardly at an angle, and annularly.

7. The combination with the intake and offtake pipes; of the pump-casing, said casing consisting of a bottom section, having its walls converging downwardly, said section having a central opening in the bottom into which the lift-pipe discharges, a series of radially inwardly projecting guide-lugs on the wall of said casing-section, said stops being inclined upwardly at an angle in the direction of the movement of the pump-shaft and having vertical faces, said lower section having an annular discharge with which the said lugs cooperate, said discharge connecting with the offtake; of the shaft 4, the pump-disk mounted thereon, said disk comprising a hub, webs projected radially therefrom, blades forming an integral part of the webs, having their upper and lower edges running close to the top and bottom walls of the lower casing-section, and their vertical edges adapted to run close to the vertical face of the guide-lugs, all being arranged substantially as shown and described.

8. The combination with the intake and offtake pipes, and the drive-shaft; of the pump-casing, consisting of a lower section having a central pendent portion formed with a step-bearing to receive the drive-shaft, said lower section having its vertical wall diverging upwardly, a series of inwardly-projecting lugs on said wall, said lugs extending the full height of the said section, and inclined upwardly in the direction of movement of the shaft, and having their inner faces straight-faced, the pump-disk, having radial blades, whose upper and lower edges are adapted to run close to the top and bottom of the lower section, and its outer edges straight-faced, to run close to the straight faces of the aforesaid lugs, the top wall of the lower section having an annular discharge in line with the said lugs, and an upper casing-section, adapted to receive the fluid discharged from the lower section, and deflect it to the offtake, as set forth.

9. As an improvement in pumps of the character described, a pump-casing comprising a bottom part having a central inlet in the base thereof, a pendent portion joined with the inlet, and adapted to connect with the lift-pipe, said portion having a central bearing member 5, and a solid disk part of a diameter equal that of the pump-disk, and adapted to form the top of the disk-holding chamber of the casing, said member 5 also having radial projections 5^e, to extend over the annular discharge from the disk chamber, a cap member 1^c, the shaft 3, journaled in the bearings 5^a and 1^c, of the member 5 and the pendent portion aforesaid, respectively, the pump-disk having blades, whose upper and lower edges travel close to the plate 5, and the bottom of the disk chamber, and guide-lugs projected radially inward from the walls of the casing into the disk compartment thereof, the inner faces of which oppose the outer vertical edges of the disk blades, all being arranged substantially as shown and for the purposes described.

EDMUND MASTERS IVENS.

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O. L. BOZEMAN.