

976,565.

Patented Nov. 22, 1910.

2 SHEETS-SHEET 2.

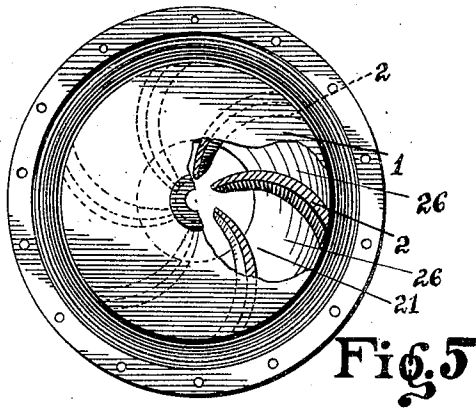


Fig. 5

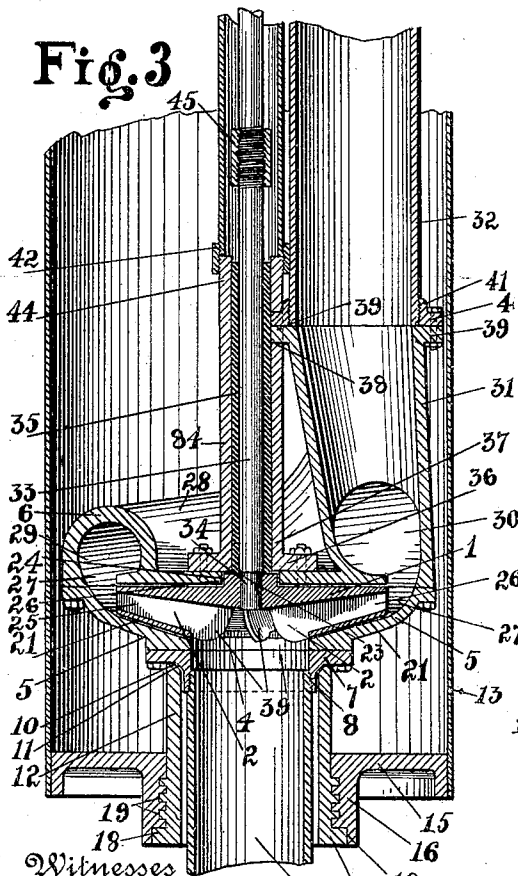


Fig. 3

Witnesses
T. Fitzhugh Knox.
H. H. Babcock

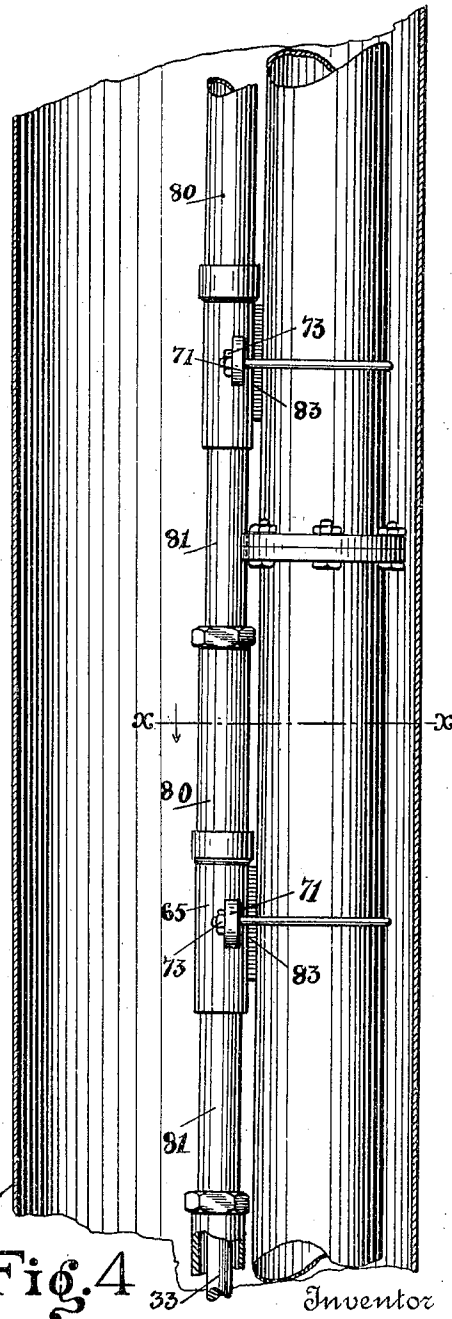


Fig. 4

Inventor
William T. Gray
by W. H. Babcock
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM T. GRAY, OF EL CAMPO, TEXAS, ASSIGNOR TO EL CAMPO MACHINE COMPANY,
A CORPORATION OF TEXAS.

WELL-PUMPING MECHANISM.

976,565.

Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed November 22, 1909. Serial No. 529,336.

To all whom it may concern:

Be it known that I, WILLIAM T. GRAY, a citizen of the United States, residing at El Campo, in the county of Wharton and State of Texas, have invented certain new and useful Improvements in Well-Pumping Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to well pumping mechanism of the kind employing a rotary pump or runner arranged at the bottom of the well or pit, a line shaft extending from the center thereof to the surface of the ground for driving said pump or runner, a tubular casing surrounding said shaft and serving as an oil tube for lubricating the same and said runner and a discharge pipe extending from the casing or shell of said runner or pump proper to the surface of the ground.

The said invention has for its chief objects to facilitate the removal, inspection and repair of the bushing or babbitting, to make the various parts of the mechanism and structure more easily separable, while increasing their strength, to increase the efficiency of the pump; to provide more effectual means of lubrication; to strengthen and simplify the structure at the top and bottom of the pit casing and those next to the pump-casing; to hold the runner at a fixed point above the bottom providing free inlet to its center from the bottom, to prevent all risk of impediment to the discharge and generally to improve the various elements of the mechanism and the fixed pit and tubes.

To these ends my invention consists in the construction and combination of parts hereinafter more particularly set forth and claimed.

Figure 1 represents, in a well, my pumping apparatus and metallic pit, partly in side elevation, partly in vertical section; Figs. 2, 3 and 4 represent respectively, on a larger scale, the uppermost, lowermost, and middle parts of the same, chiefly in vertical section, but showing some features in elevation or broken away. Fig. 5 represents a plan view of the lower section of the pump casing, and of the runner, the latter being broken away; Fig. 6 represents a detail cross-section on

line $x-x$ of Fig. 4; Fig. 7 represents a detail longitudinal section through one of the coupling sleeves 65 and the inclosed bushing, the pump shaft being shown in elevation; Fig. 8 represents a vertical section of said bushing alone and Fig. 9 represents a top plan view of hub 50, the pump-shaft 33 being sectioned.

The rotary pump, runner or propeller 1 is provided with inwardly and downwardly inclined vanes 2, which are broadened at their inner ends and rounded or convex at their lower corners 3, leaving a downwardly flaring central passage between them, which connects with a central inlet bore 4 in the bottom casing-section 5 of the pump casing. This lower section supports the upper section 6, completing said casing and has attached to its bottom an annular plate 7, sometimes known as the suction flange, which is provided with a downward cylindrical extension 8 and a central bore 9, the latter being continued from bore 4 and through said extension. At the junction of the latter with the broader upper part of said suction flange or plate 3, an external annular beveled shoulder 10 is formed, fitting the similarly beveled inner face 11 of the upper end of a tubular cylindrical pedestal 12, which receives the lower end of extension 8 within its upper end and supports the pump-casing and all parts resting thereon, permitting their rotation.

13 designates the metallic casing fitted at its upper end with cylindrical pit-head 14 and at its lower end with cylindrical pit-bottom 15. The latter has around its inner bore, which receives the lower part of tubular pedestal 12, a downward cylindrical extension 16, which is recessed at the bottom at 17 to fit on an annular outward extension 18 of the corresponding part of said pedestal. Above this outward extension and recess the contiguous faces of said pedestal and pit-bottom are provided with interlocking lugs 19. These devices 17, 18 and 19 hold said pedestal fixed in said pit-bottom, the said bottom being also fixed in the lower end of the metallic pit-casing. The part 16 and the corresponding part of the pit-bottom extend lower than the casing into the bottom of the well, affording greater space below the pump and also below the pit-bottom except at the center, thus lessening the upward pressure on said bottom and also

preventing clogging. The bore of said pedestal and said annular plate may, for greater smoothness, be provided with a tubular lining or inlet tube 20. The water
 5 flows up through them to the inlet bore of said pump-casing and so to said runner. The latter is held by the aforesaid tubular supporting and inlet devices 3, 7 and 14 sufficiently above the earth and sand at the
 10 bottom of the well to be in no danger of clogging. It always holds the same position with regard to the bottom of the well and the pit-bottom. The pit-bottom and pit-head may be bolted to the pit-casing so
 15 as to be practically a permanent part of the pit, yet removable from said casing at need.

Of course some wells are much deeper than others, and comparatively few are shallow enough for only a single length of
 20 these parts. Consequently they are made in sections, as has been practiced in well-tubing for many years, these sections being coupled together end to end and of permanent individual length, also without any telescopic
 25 arrangement, extensibility of the joints or other means of extension, except this very old and common addition of new sections.

The vanes 2 of the runner 1 are rigid and ordinarily integral with its inclined lower
 30 plate 21, fitting on the upwardly inclined face of the bowl-shaped interior of the lower section 5 of the pump-casing; also with the upper plate of said runner which is in the form of a broad cone, presented downward
 35 and having an upwardly presented journal 24 of considerable diameter, fitting rotatably in a hole 25 of upper section 6 of said casing, the wall of which hole constitutes the bearing for said journal. This runner
 40 is best manufactured by casting in a single piece; but of course may also be made in separate pieces fastened together, and of wrought metal if preferred.

The shape of the parts hereinbefore described provides a series of upwardly inclined, outwardly tapering radial water passages 26. These receive water from below
 45 at the center of the runner where the shape of the inner ends of the vanes 2, before described, insures a good inlet clearance and copious supply, and discharge it obliquely
 50 upward through their narrow outlet ends, with increased velocity as from a series of nozzles, through a curvilinear slot 27 of upper section 6 into a curved trumpet-form
 55 extension chamber 28 formed in said section, the cross-section of which chamber continually increases from its lesser end 29 to its larger end 30, the latter discharging into
 60 the lower end of an upwardly flaring tubular pedestal 31 for the outlet pipe or discharge pipe 32. The lower part of upper casing-section 6 is flat and offers no impediment to the flat upper face of the runner,
 65 rotating below it. The upper face of said

upper section is flat also, excepting the wall of the expansion chamber, and its central part is in contact with the lower end of the shaft-casing 81. As the central bore of the
 70 latter casing is less in diameter than bearing-hole 25 or journal 24, above mentioned, the inner part of the lower end of said casing overlaps the outer part of the upper end
 75 of said journal and helps to keep the runner steady in its rotation. The lower end of the shaft 33, which turns within the shaft-casing to drive the said runner, is provided
 80 with a reduced part 34, fitting tightly into the central bore 23 of the runner-journal 24, it being of course essential that said shaft and runner should turn together. A suitable Babbitt-metal bushing or lining 35 is
 85 interposed between the lower part of said shaft and the corresponding part of said shaft-casing. The lower end of said bushing or lining is in contact with the top of journal 24. The lower end of the lowest section
 90 84 of said shaft-casing 81 is provided with an annular flat external flange or base 36, more securely bracing the upper runner-casing 6 against the strain of the upwardly
 95 discharged water and the action of the rotating parts and holding said section firmly in place. The said section 37, on which this base 36 is formed, is of greater thickness
 100 than the rest of said shaft-casing, except its uppermost section 44 hereinafter described, being subject to greater strain, and may be considered as a pedestal for the shaft-casing
 105 proper, it corresponding to pedestal 31, which may also be regarded as the lowest section of the discharge pipe. Said part 37 is extended above said part 31, to provide therein space for a lateral opening 38, which
 110 receives the peripheral part of an annular external flange or integral collar 39 on the upper end of pedestal 31, also the corresponding part of a corresponding collar 40, removably attached to the lower end of the
 115 first cylindrical section of the discharge pipe 32 proper. This opening 38 fits the said flanges, so that the material of said section 37 at the upper and lower borders of said opening will hold the flat opposing faces of
 120 said collars or flanges in contact with each other. These collars or flanges in return hold said section 37 against turning, by their contact with the material of the latter at the sides of said opening 38. The collar 40 is internally screw-threaded like a nut, to
 125 engage external screw-threads on its section of the discharge pipe 32. Its central part is extended upward at 41 increasing the length of surface thus engaged and enabling its inner face, which is preferably upwardly and
 130 inwardly rounded as shown, to bear against the exterior of shaft-casing section 37. The upper end of the said section 37 and the lower end of the shaft-casing section next above it are externally screw-threaded, so

that they may be drawn and held together by an ordinary internally right and left screw-threaded coupling collar 42. This fastening is unlike that (hereinafter explained) between some upper sections of the shaft-casing, as at the second and fourth joints; but is found more convenient for attaching the lowest of said sections to pedestal 37 and at alternate section joints above.

The trumpet form curved expansion chamber 28 and the vertical upwardly flaring tubular pedestal 31 connecting at its bottom with the larger end of said chamber, constitute together a continuous, continually expanding passage, which permits the water to expand again after its compression and acceleration in being driven through tapering passages 26 of the rotating fan, so that there may be no obstructive eddies or opposing local currents from its first entry at the bottom of the inlet pedestal 12 to its entry into the cylindrical outlet pipe 31. The latter is of equal diameter throughout and discharges at the top, by means of a goose-neck section 43 obliquely through the pit-head 14 and laterally beyond the same, said pit-head being at or above the surface of the ground. Said goose-neck section is integral with said pit-head and with the uppermost section 44 of the shaft casing. There is no need to fasten the lowest cylindrical section of this outlet pipe to the much thicker pedestal or upwardly flaring bottom-section 31 except by the action of pedestal or lower section 37 of the shaft casing before described, and other devices hereinafter explained, holding in place the several sections of the discharge pipe and shaft casing.

The pump-shaft 33 consists of as many sections as may be needed, which are of equal diameter and screw-threaded at their contiguous ends to receive internally screw-threaded coupling sleeves 45, the sole function of which is to hold the shaft sections together. It is needful that their ends should touch in order that they may brace each other and make the shaft practically integral, though divisible. The shaft 33 is not longitudinally extensible or contractible, there being no need for such provision, as any difference in the depth of the well may be compensated for in the familiar and long practiced way, by adding more sections or unscrewing and removing one or more sections of those already attached. The said shaft is provided with a driving pulley 46, having a sleeve 47, having at its lower end a downwardly extending cylindrical clamping hub 50 in two sections clamped together on said shaft by bolts 48 passing through holes 49 in said sections. The pump-shaft 33 will turn with said sleeve and pulley. Normally this hub fits at the lower end into a short cylindrical bearing box 51, integral

with goose-neck section 43 of the discharge pipe and opening upward. When there is occasion to raise the pulley, the said bolts are loosened and the pulley may then be readily slipped up along the shaft. A longitudinal slot 51 in said sleeve receives a key or projection 52 of said shaft, so that the pulley will be guided when raised and lowered and also that it may have engagement with said shaft at a point above the clamping bolts, thus distributing the rotary strain. This key or projection is preferably removable, so that the pulley may be freed from the shaft at will and allowed to turn thereon, without turning said shaft. In effecting this, the said bolts are first loosened and the said key or projection is withdrawn, so that there is no longer any kind of connection between said sleeve and shaft. The pulley and sleeve then turn together idly under the pull of the belt 53 indicated in dotted lines. This belt of course may extend to, and be driven by, any convenient source of power.

The upper end of pump-shaft 33 is set in a bearing 54, which has an antifriction Bab-bitt-metal bushing 55 and is held by a pair of clamping plates 56 on the inwardly presented upper ends of two frame sections 57, which are mainly vertical, but have their upper parts 58 bent toward each other at right angles and their lower ends singularly bent in forming shorter horizontal bases 59 adapted to be fixed on the flat-pit-head 14, within the space inclosed by its raised peripheral rim 76. This leaves an open frame about the pulley, with abundant room for the belt and for convenient access. The two sections of said frame are bolted independently to said pit-head, facilitating the removal of the upper bearing 54 when this is needed, also the repair or replacing of one frame section without disturbing the other. Said bearing is in the form of a double conoid and the inner faces of plates 56 are recessed correspondingly. In affixing the said frame its angular position on said pit-head must of course be arranged to avoid the goose neck.

The hub 50 carries on its lower side a conoidal hard steel ball bearing plate 60 opposing a similar but upward presented bed plate 61 fixed on the bottom of box 51, conoidal bearing rollers 62 or their equivalents such as ball bearings being interposed between said plates. Through these bearings and plates and said hub and pulley and box the weight of said shaft rests mainly on said pit-head, and said hub and upper bearing plate turn freely on said bearing rollers in said box. The uppermost section 44 of the shaft-casing extends rigidly downward from said box, through the goose-neck section before mentioned, the said pit-head, goose-neck, bearing box and this section 44 being

preferably cast in one piece. A bushing or packing 63 is interposed between this casing section throughout its entire length and shaft 33. The lower end of said section is slightly enlarged and internally screw-threaded at 64 to receive the correspondingly externally screw-threaded upper end of the next lower section of the shaft casing 81. This second section is straight and of the smaller or normal diameter of the shaft casing, whereas the next casing below it, marked 82, is of greater diameter internally and externally, the latter enlargement leaving space for a bushing hereinafter described. These sections 82 of the larger diameter alternate with the smaller sections 81 throughout the length of the casing between the uppermost and lowest sections thereof herein described. For simplicity the number 81 indicates the shaft casing as a whole and also those individual alternating sections which are not enlarged or given any special form but left normal. Each of the cylindrical shaft-casing sections 80 and 81 interposed between this section 44 and the pedestal or lowest section 37 is connected to the next section 80 or 81 by a coupling sleeve 65 which is internally screw-threaded at the ends 66 and 67, to receive the similarly threaded ends of said sections or by a coupling collar 42 as stated. The upper end 66 of each coupling sleeve is enlarged internally and externally, forming an internal annular shoulder 68 just below the screw-threaded part, for supporting an annular flange 69 on the upper end of a bushing 70 of Babbitt-metal into two semi-cylindrical sections, which may be lifted at will independently out of the top of said sleeve. The lower end of the upper shaft casing section of the pair thus coupled normally clamps the divided flange 69 against shoulder 68 and holds both sections of bushing securely in place; so that said upper casing section must be unscrewed from coupling sleeve 65, before the bushing or either of its sections is removable as above. Each sleeve 65 is provided with two lateral integral wings 71, each of which has a perforation 72, for the ends of a strong strap approximately of U-form or staple form adapted to fit around the discharge pipe 32, the said bolt ends of course being screw-threaded to receive nuts 73 on the other side of said wings, by which nuts it is tightened to draw said pipe casing and discharge pipe toward each other on an intermediate plate or block 83. These two tubular parts are parallel and in close proximity throughout their length: and by the means last above described they are clamped together at each alternate joint of said casing, so that they will mutually support and brace each other. The section of said discharge pipe next below the goose-neck is provided with an annular external collar or flange 75 in contact

with, or close juxtaposition to a similar collar 74 on the lower end of said goose-neck section. This collar 75 is also in lateral contact with the pump-shaft casing. A filling plate 83 is between each sleeve 65 and the discharge pipe.

The babbitt bushing 35 and 55 hereinbefore described surrounding the pump-shaft respectively above the fan-casing and just below the pit-head and like bushings 83 within the larger casing sections 81 may also be made in sections if desired, but this is hardly desirable in the case of the upper one and not necessary in the lower one. Of course the Babbitt-metal bushings 35, 55 and 70 are not liquid proof and do not absolutely close the shaft casing, but on the contrary are intended to permit the flow of lubricating liquid material down the whole length of the pump-shaft and over every part of its surface, also over the runner 1 below. Water may also rise along said shaft within said bushing 35 when there is any considerable pressure; but no great quantity will thus ascend, as the interval between the Babbitt-metal and the shaft is always slight, though somewhat increased after this bushing becomes worn. I do not find it practically important to absolutely cut off such upward flow, as the very slight disadvantages resulting therefrom are more than compensated by the freedom of lubrication by oil in the lower parts of the mechanism and the Babbitt-metal causes less friction than a stuffing box or equivalent device for absolute closure. The ends of my shaft sections at all times fit squarely against those of contiguous ones throughout its length, bracing each section at each end and making a strong shaft as a whole.

The operation has been sufficiently explained in describing the mechanism and structure. The shaft, being rotated, turns the runner, draws water up into the center of the latter and forces it out radially with a slight upward inclination, through the gradually enlarging expansion chamber and pedestal 31 to the discharge pipe whence it issues through the goose-neck laterally beyond the pit-head and above ground. The shaft casing protects the shaft and the Babbitt-metal bushings aid therein, especially at the joints, also reducing friction: but these parts do not inclose the shaft in the sense of cutting off liquid therefrom, both oil and water having access thereto as explained. The shaft casing and discharge pipe extend from top to bottom of the casing, each outside of the other and side by side and brace and support each other by means of the connecting devices stated.

The especial construction of the pit head and the parts cast therewith makes the upper end of the pit and pumping mechanism very strong and secure. The same is true of

the pit bottom and proximate structure as to the corresponding lower parts: and also of the upper section of the pump casing and the pedestals or lowest sections of said shaft casing and said discharge pipe. The runner, pump casing and the two tubular pedestals on the latter are of course easily separated from the other parts, when above ground by unscrewing the next cylindrical section of the discharge pipe and the next thin section of the pump-casing therefrom. The pump casing pedestal may thereafter be unbolted and removed and the two sections of the pump-casing may be separated from each other for the removal of the runner or convenient access thereto.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. In combination with a pit bottom, a tubular pedestal extending up through the same, a pump-casing supported by the said pedestal and provided at its bottom with an annular piece fitting into the upper end thereof and a runner turning in said pump-casing, the contiguous faces of said pedestal and pit bottom being provided with overlapping and interlocking parts for the purpose set forth.

2. In combination with a pit bottom, a tubular pedestal extending up through the same, a pump-casing provided with an annular inlet part fitting into the upper end of said pedestal and a runner turning in said casing, the said pedestal having the two functions of admitting water to the interior of said casing and runner and supporting said casing at a fixed point of elevation and the said pit and pedestal having interlocking and overlapping parts to prevent the independent vertical movement of either part.

3. In combination with a pit bottom, a tubular pedestal extending up through and above the same, an annular piece supported on the upper end of said pedestal, a pump-casing fixed on said annular piece and a rotary runner within said casing, the said elements being adapted to allow water to flow up centrally through them into the central part of said runner and the contiguous faces of said pedestal and said pit-bottom being provided with overlapping parts fitting into corresponding recesses substantially as set forth.

4. In combination with a pit-bottom, a tubular pedestal extending up through the same and provided with projecting parts interlocking with said pit-bottom, a pump-casing supported by said pedestal at a fixed height above said pit-bottom and having a central inlet, a rotary runner within said casing, a tube distinct from said pedestal extending up through it and supplying water centrally to the said runner through

said inlet and means for connecting the upper end of said tube to said pump casing and holding it in proper position within said pedestal.

5. In combination with a metallic pit having a cylindrical body and a pit-bottom fixed in the lower end of said body and provided with a central opening, a tubular pedestal fitted into said opening and extending above said pit-bottom, a pump-casing supported by said pedestal at a fixed point above said pit-bottom and a rotary runner arranged within said pump-casing, the said parts permitting water to flow up through them centrally to the said runner and the said pedestal and pit-bottom being provided with overlapping interlocking parts and serving to support the body of the pit substantially as set forth.

6. In combination with a tubular pedestal, a pit-bottom provided with a central opening and a downward tubular extension to receive said pedestal, the contiguous faces of said pedestal and said extension being provided with annular interlocking parts, a pump-casing supported by said pedestal and a rotary runner within said pump casing substantially as set forth.

7. A rotary runner, in combination with means for holding it always at a single point of vertical elevation requiring no adjustment, its driving shaft, a casing for said shaft, a tubular pedestal, a pump-casing containing said runner and provided at its bottom with an annular piece fitting the upper end of said pedestal, and a pit in which said runner, shaft and casings are located, said pit and the means of support for said pump-casing being provided with interlocking parts.

8. A metallic well-pit provided with a pit-head and pit-bottom closing its ends, in combination with a rotary runner, its shaft, bearings therefor, a shaft-casing and a discharge pipe, the uppermost sections of said pipe and said casing and the box for the upper bearings of said shaft being all in one piece with said pit head for the purpose set forth.

9. In combination with a rotary runner and its casing, a tubular pedestal for the discharge pipe provided with an annular flange at its upper end, a cylindrical section of this discharge pipe having a corresponding annular flange arranged to rest thereon and a pedestal or lowest section of the shaft casing having an opening which receives and fits the contiguous parts of said flanges, holding them in contact.

10. A pair of tubular pedestals for supporting respectively the discharge pipe and the shaft casing, in combination with a pump casing on which said sections are rigidly mounted, one of said pedestals hav-

ing a laterally projecting rigid part and the other pedestal being recessed to receive said part, thus locking said pedestals together.

11. A pair of tubular pedestals for supporting respectively the discharge pipe and the shaft casing, in combination with a pump-casing on which said pedestals are rigidly mounted and a section of said discharge pipe which rests on one of said pedestals, the contiguous ends of said section and this pedestal being provided with

annular laterally projecting flanges and the other pedestal being recessed to receive parts of these flanges thus holding them together and interlocking the said pedestals. 15

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM T. GRAY.

Witnesses:

E. H. KOCH,

PHILIP ROLPH.