T. H. McDONALD.

OIL AND WATER ELEVATOR.

APPLICATION FILED MAR. 15, 1909.

970,093.

Patented Sept. 13, 1910.

Fig. 1.

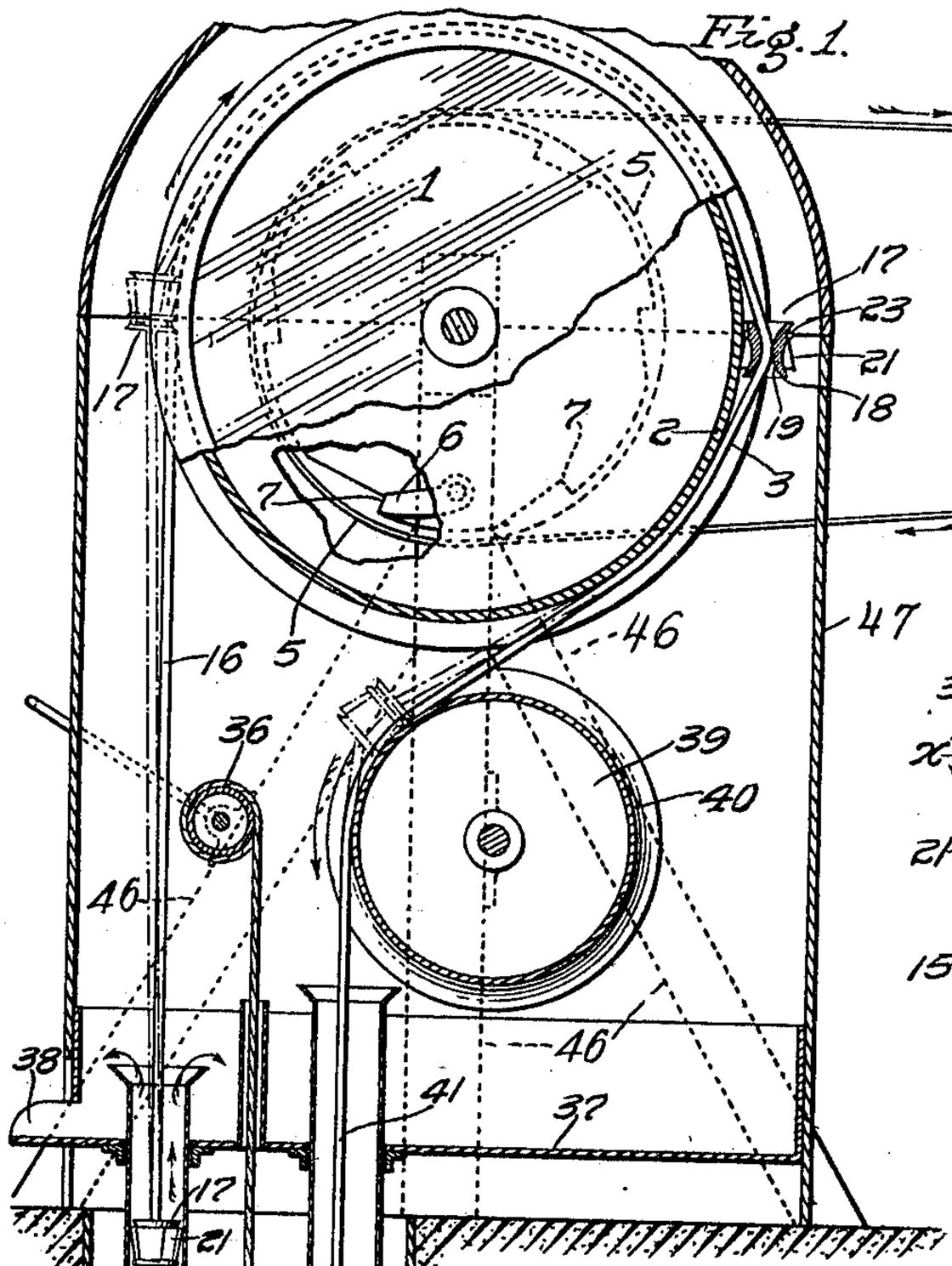


Fig. 5.

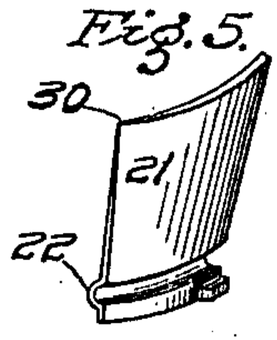


Fig. 3.

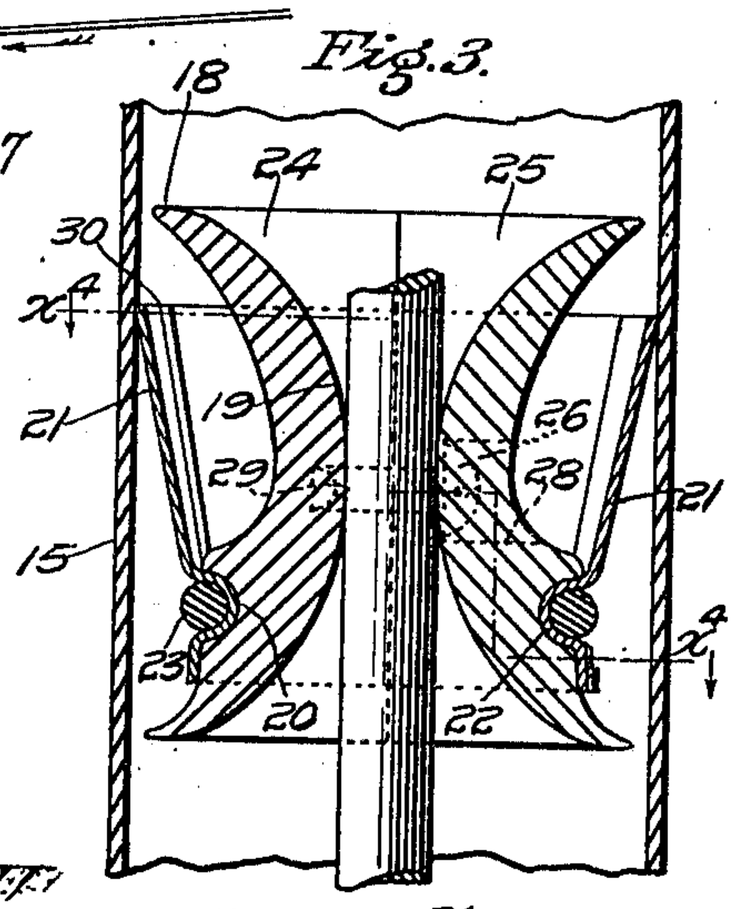


Fig. 4.

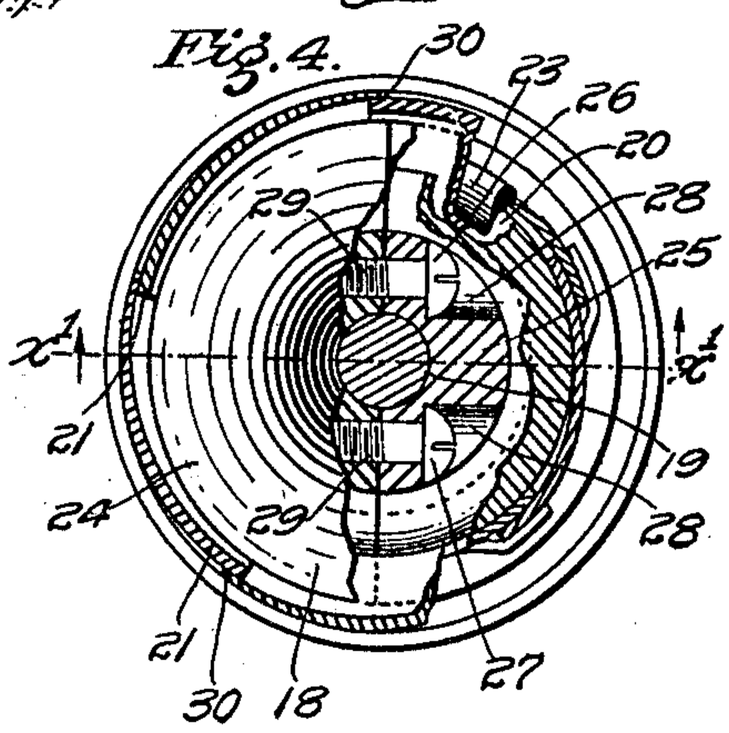
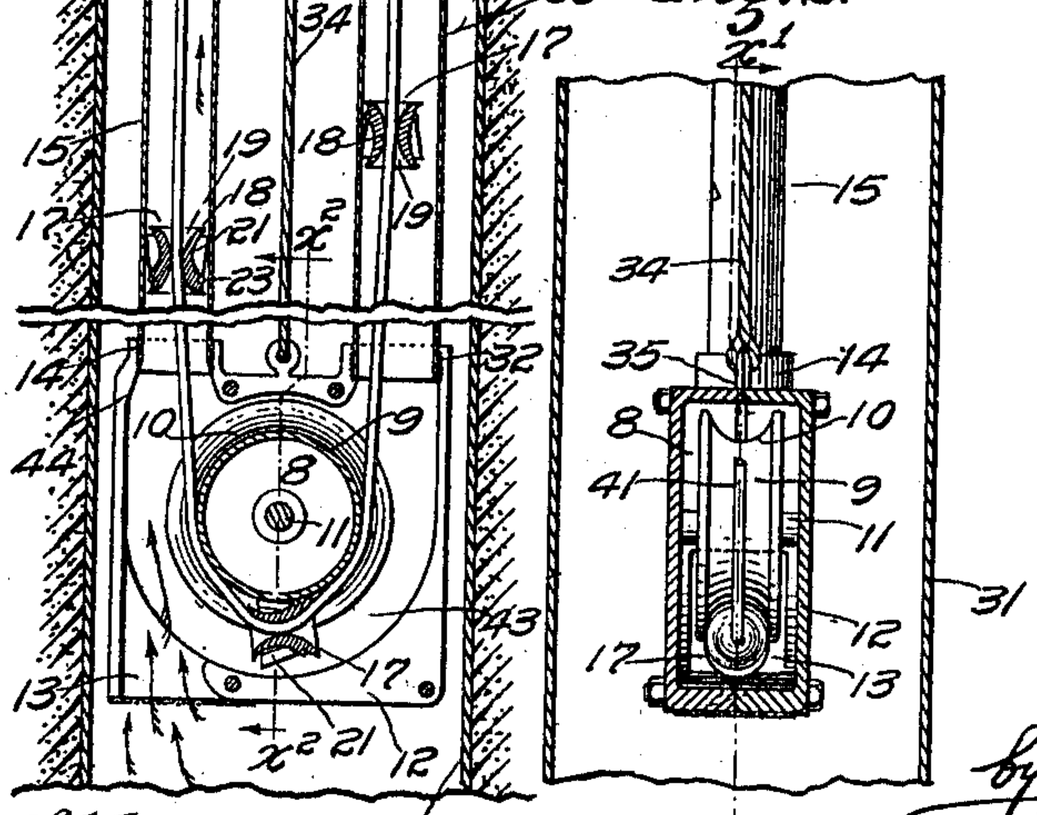


Fig. 2.



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UNITED STATES PATENT OFFICE.

THOMAS HARVEY McDONALD, OF TROPICO, CALIFORNIA, ASSIGNOR TO THE McDONALD OIL AND WATER ELEVATOR COMPANY, OF TROPICO, CALIFORNIA, A CORPORATION OF WASHINGTON.

OIL AND WATER ELEVATOR.

970,093. Specification of Letters Patent. **Patented Sept. 13, 1910.**

Application filed March 15, 1909. Serial No. 483,637.

To all whom it may concern:

Be it known that I, THOMAS HARVEY McDONALD, a citizen of the United States, residing at Tropico, in the county of Los Angeles and State of California, have invented a new and useful Oil and Water Elevator, of which the following is a specification.

An object of this invention is to provide economical means for pumping oil or water whether mixed or not with sand, gravel, or other solids, with great capabilities for varying the speed and for operation in deep wells as well as in shallow wells.

A further object of this invention is to provide an endless chain form of pump which will be durable and economical of power when operated for the purpose of pumping liquid from deep wells; and in this connection the invention comprises a driving pulley, a plurality of buckets and an endless connection for the buckets constructed in such proportions that the endless connection will engage the driving-pulley and be carried thereby throughout a major portion of the period of operation so that the buckets will readily ride over the pulley; their contact therewith being only incidental, so that the destructive action upon the driving-pulley and upon the buckets is minimized; and a large supporting surface is provided for sustaining the weight of the connection, the buckets and the liquid that is being lifted.

An object is to adapt the endless-chain form of pump for deep well service. In this relation I employ a rope in place of the chain heretofore employed, and lead said rope around solid-rimmed wheels which are preferably grooved to guide the rope and yet allow the buckets that are fastened to said rope to engage and ride over the solid rims of the wheels in the operation of the pump; in this way adapting the pump to operate uniformly with different lengths of flexible connection which carries the buckets, and also with the buckets variously spaced apart on said connection.

The invention includes the pump and the various parts and combinations of parts set forth in the subjoined detailed description.

The invention is capable of application in various forms, and I do not limit the same to any specific form.

The accompanying drawings illustrate the invention in the form I at present deem most desirable.

Figure 1 is a fragmental sectional elevation of a deep well pump constructed in accordance with this invention, on line indicated by x^1, Figs. 2 and 4. Fig. 2 is a fragmental section on line x^2, Fig. 1. Fig. 3 is a sectional detail of one of the buckets fixed to the line and inside a fragment of the pump-tube. Fig. 4 is a plan section of the parts shown in Fig. 1, said section being taken on irregular line x^4, Fig. 3. Fig. 5 is a perspective detail of one of the segmental sections of the bucket.

1 is a drive-wheel having a solid circular rim 2 that is preferably provided with a groove 3, the same being driven by suitable means as a belt 4 led around a pulley 5 fixed to the side of the wheel. Means, as a dog 6 engaging ratchet teeth 7 on the wheel, prevents the wheel from turning in the wrong direction.

8 is a foot-wheel having a solid rim 9, and preferably being provided with a groove 10. Said foot-wheel is journaled by an axle 11 in a box or foot 12 which is provided at one side with an inlet 13 above which is a screw-threaded seat 14 for a pump or lifting tube 15 constructed in the usual way and screwed into the seat 14.

16 is a line which may be a rope of wire or other material of suitable diameter depending upon the service to be performed by the pump. Upon said line at intervals therealong that may be determined by the conditions under which the pump is to be operated, are mounted buckets 17 comprising a hollow core 18 having a central bore 19 therein, the ends of which bore flare outwardly so as to allow the line to bend in going around the solid rims of the wheels 1 and 8. Each core 18 is provided with an annular groove 20, and segmental sections 21 are provided with bends 22 to fit in the groove 20 and to receive a band 23 by which the sections may be fastened to the core. The core is formed of two halves 24, 25, fastened together by screws 26, 27; one of said halves 25 being counterbored as at 28 to receive said screws, the same being screwed into seats 29 therefor in the other half. The sections 21 of the buckets are reduced in cross-section at one free corner 30 so that the joint where the sections over-

lap each other shall be as smooth as possible at the rim of the cup formed by the sections 21, the purpose being to make the cup circular at the rim.

The cores 18 are preferably of malleable iron or other strong metal so that they may pass over the driving-wheel 1 without collapsing, and said cores are tapered downwardly toward the center, and the rim of each bucket is spaced apart from the rim of its core to allow sand or gravel which may be carried up by the bucket from the bottom of the well, to drop out after the bucket has passed over the driver 1 into the position shown at the right of said driver in Fig. 1.

The diameter of the foot-wheel 8 will be limited by the diameter of the well-casing 31 in which the pump is to be used, and the foot 12 will be of sufficient dimensions to house the foot-wheel and the buckets as they pass therearound.

The foot 12 is provided with a second screw-threaded pipe-seat 32 on the opposite side from the seat 14 to receive a guiding tube 33 which may be made of sections in the same manner as the pump-tube 15. The sections of tubes 33 and 15 may be screwed on and off in the operation of placing the pump in and removing it from the well.

A foot-supporting connection 34 which may be a line or rod fastened to an eye 35 midway between the pipe-seats 14 and 32 of the foot 12, is led over a windlass 36 by which it may be lowered or drawn up as may be required for lowering or raising the pump-foot 12.

The pump-tube 15 may extend up through the bottom of a trough or discharge box 37 from which the water may be led by a spout 38, and the pump tube itself may also be employed either alone or in conjunction with the line or rod 34, as the means to raise and lower the foot. The foot is preferably open at the base as shown in Fig. 1 so that the oil or other liquid may be carried directly up through the foot to the pump tube when the pump is lowered by means of the pump tube or by the line 34 or by both into a narrow well casing.

39 is an idler provided with a solid grooved rim 40 over which the line is led and which serves to guide the return limb 41 of the line into parallelism with the lifting limb 42 of the line, so that both limbs may be lowered into the well-casing to any desired depth.

The sections 21 are held by the band 23 which may be a wire passed around and twisted at the ends, not shown, in the well-known manner of fastening wire-bands; said sections flaring upwardly and outwardly to a greater diameter than the diameter of the end of the core 18 so as to close the opening in a pipe through which the core will pass freely.

The bore of the descending or guide-pipe 33 and the bucket-way 43 in the foot 12 are of sufficient diameter to accommodate the buckets without engagement with the expanded sections 21, and the outlet 44 from the foot 12 is tapered to guide the sections into the lifting tube 15 which is of less diameter than that of the circle of the expanded sections, so that as the buckets pass up through the pump-tube 15 they close the same tightly, thus to produce suction therein when the water or oil level in the well sinks to a shallow depth above the bottom of the tube. The distance at which the buckets may be spaced apart on the line may vary depending on the submergence of the foot 12 in the water or oil to be pumped; it only being necessary that there shall not be a vent of air from the foot into the lifting tube.

The diameter of the drive-wheel may range from a few inches to many feet, the same being greater for deep wells than for shallow so as to afford the requisite grip on the line for lifting the column of oil or water in the lifting-tube 15; and the speed at which the buckets may be driven will vary within the judgment of the operator, ranging from a minimum speed of a few feet per minute up to 1200 feet or more per minute. The speed that is most efficient will depend on the diameter of the pump-tube.

By this improvement the excessive hydrostatic pressure commonly exerted in deep well pumps to burst the lifting tube at the water or oil level is avoided as the tube at the top of each bucket supports only the liquid between such bucket and the next bucket above; hence the necessity of providing heavy tubing for deep-well pumps is done away with.

The drive wheel 1, windlass 36 and idler 40 are journaled on a suitable frame 46 and may be inclosed in a case 47.

I claim:

1. In a water elevator, a foot having a bucket-way, an inlet to such way and a foot-wheel, jointed tubing secured to the foot and communicating with the way, and means to lower and raise the foot.

2. In a water elevator, a foot, a wheel and pump-tubing carried by the foot, and means connected with the foot to lower and raise the foot.

3. In a water elevator, the combination with a drive-wheel and a foot-wheel, of a line and buckets on said line; both the buckets and the line engaging the wheels in the operation of the elevator, said buckets being bored to receive the line, and the bores of the buckets being flared at their ends to accommodate the flexure of the line when the buckets pass around the wheel.

4. A water elevator bucket composed of a core tapering down from the top toward the

middle and segmental sections secured thereto, the core being provided with an annular groove and with a bore flared at its ends to accommodate a line, and the segments being loosely fitted to the groove and secured to the core by a band and terminating below the top of the bucket.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 2d day of March, 1909.

THOMAS HARVEY McDONALD.

In presence of—

JAMES R. TOWNSEND,

L. BELLE RICE.