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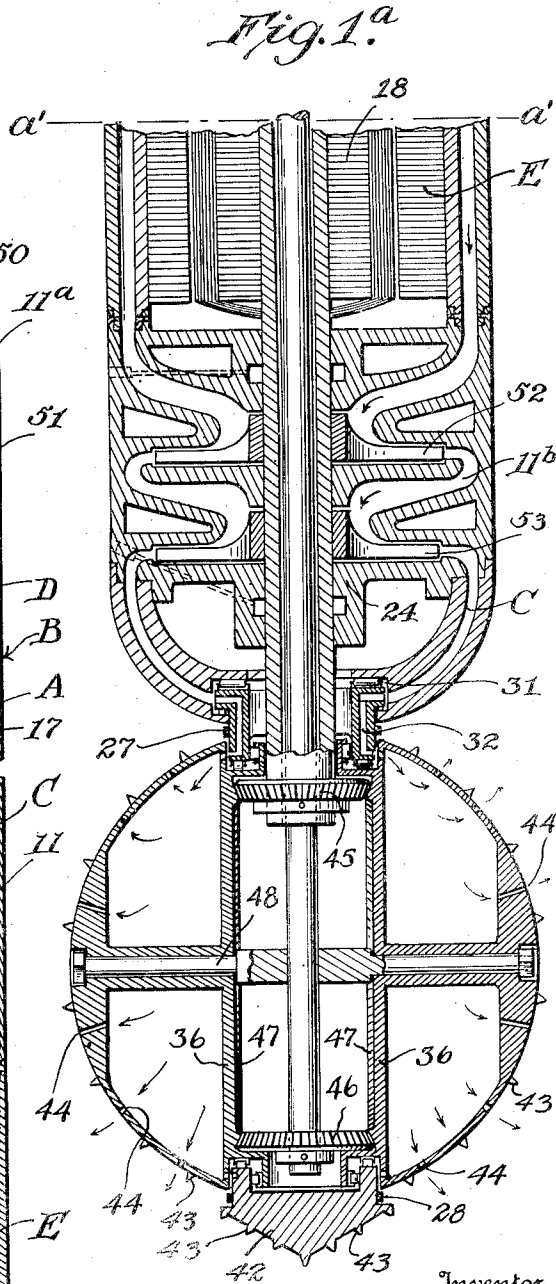
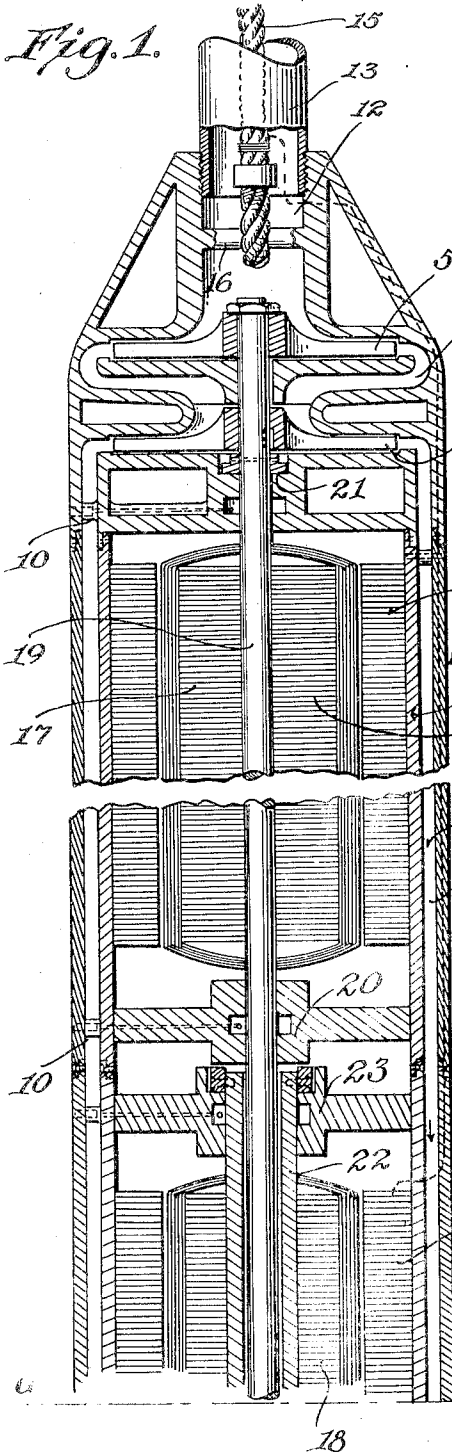
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APPARATUS FOR DRILLING WELLS

Filed Nov. 11, 1931

2 Sheets-Sheet 1



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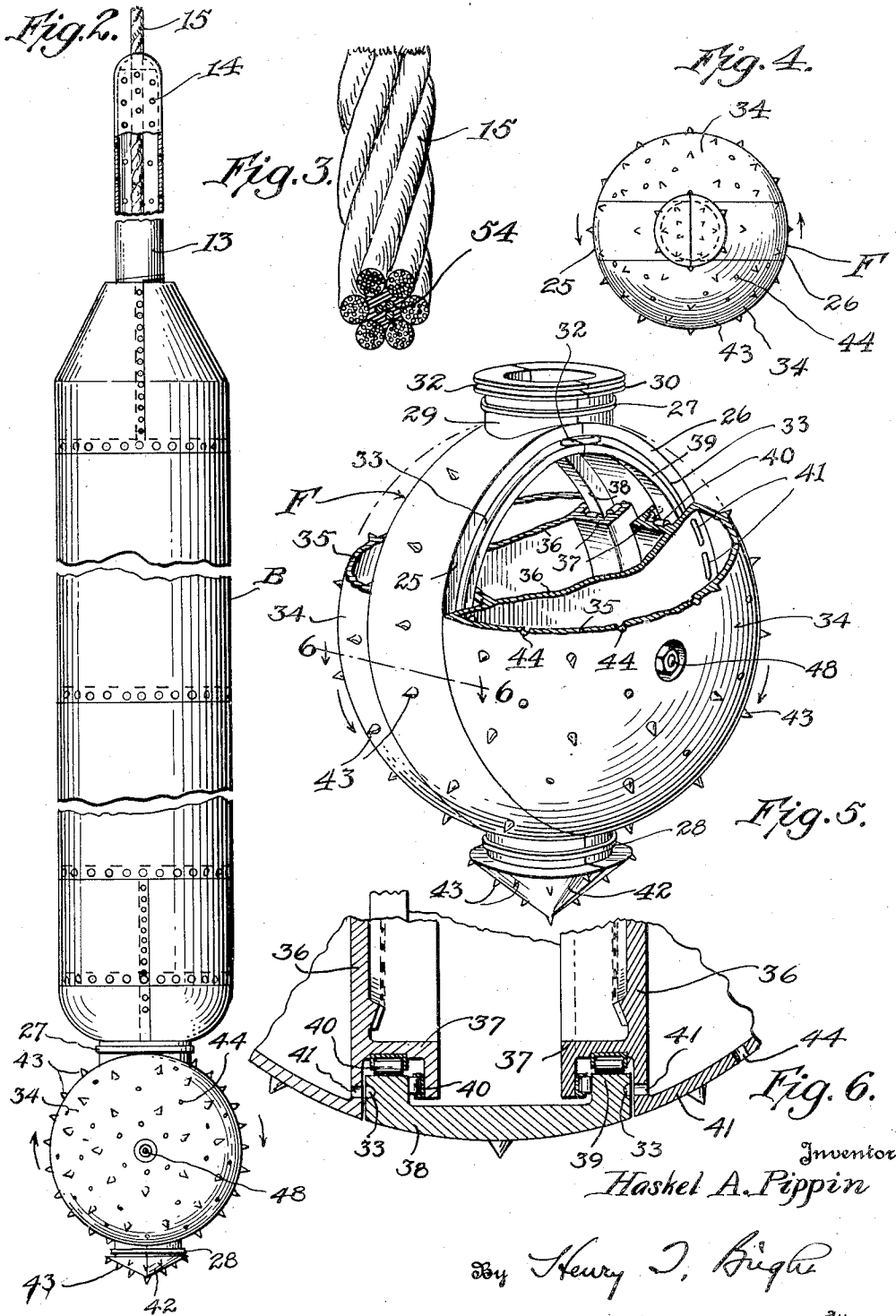
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APPARATUS FOR DRILLING WELLS

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APPARATUS FOR DRILLING WELLS

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My invention relates to improvements in apparatus for drilling wells.

It is the purpose of my present invention to provide an apparatus of the type specified wherein the power plant and the drilling device constitute parts of a unitary structure adapted to advance bodily into the well shaft as the drilling operation proceeds; and wherein means is provided to mix the earth drillings with water, so that the earth drillings thus suspended in liquid can be bailed out through the instrumentality of a suitable bailer.

I will describe my invention in the best form known to me at present, but it will be apparent that the same is susceptible to changes in form and proportions with the exercise of only ordinary mechanical skill without departing from the spirit thereof.

In the drawings chosen to illustrate my invention, the scope whereof is set forth in the appended claims

Figures 1 and 1a show a vertical section of a well drilling apparatus constructed in accordance with my invention;

Figure 2, an elevation of the apparatus with a portion broken away;

Figure 3, a perspective view of a fragment of the cable by which the apparatus is lowered into and removed from the well shaft;

Figure 4, a bottom plan view of the drilling device of the apparatus;

Figure 5, a fragmental perspective view of the drilling device; and

Figure 6, a section on the line 6—6 of Figure 5.

As shown in the drawings my improved well drilling apparatus comprises inner and outer casings A and B respectively, which are assembled in spaced relation by spacing lugs 10, the spaced sides of the casings A and B forming a portion 11 of a water passage C.

The upper end 11a of the passage C is formed by the upper end of the outer casing B, while the lower end 11b of said passage is formed by the lower end of the outer casing, said ends of the casing B being specially shaped interiorly for a purpose to be presently referred to. The interior of the outer

casing B opens through its upper end as at 12 and threaded in this opening is a hollow extension 13 which is closed at its outer end and provided with lateral perforations 14 adapted to place the adjacent end of the passage C in communication with a well shaft being drilled. A lifting and lowering cable 15 passes longitudinally through the extension 13 and is made fast about a cross bar 16 integral with outer casing B and bridging the passage C. Mounted in the casing A are two electric motors D and E having armatures 17 and 18 respectively. The axis of rotation of the armatures coincides with the axis of the casings A and B. The armature 17 has fixed thereto a solid shaft 19 which extends downwardly to the exterior of the casings A and B and upwardly into the casing B. Suitable bearings 20 and 21 are provided for the shaft 19. The armature 18 has fixed thereto a tubular shaft 22 through the bore of which the shaft 19 extends. The shaft 22 extends downwardly to the exterior of the casings A and B and suitable bearings 23 and 24 are provided therefor.

The drilling device of my apparatus is of general spherical form and is shown as comprising an intermediate ring F formed of two sections 25 and 26 held in assembly by collars 27 and 28. The sections 25 and 26 are formed at their upper ends to provide a tubular nipple 29 around which the collar 27 is engaged and through which the shafts 19 and 22 extend into the ring, the shaft 19 a short distance within the ring, and the shaft 22 to a point in close proximity to that portion of the ring which is diametrically opposite the nipple 29. A circumscribing flange 30 is provided on the outer end of the nipple 29 and this flange engages in an annular groove 31 formed in the casing B thus forming a union between the ring and casing B permitting rotation of the ring on the axis of said casing. The nipple 29 is further provided with a passage 32 which at its upper end opens laterally through the flange 30 in communication with the lower end of the passage C as shown in Figure 1a, said passage 32 also extending through the ring F and opening at its lower end into arcuate grooves 33

formed respectively in the ends of the ring, one of said grooves being shown in Figure 5. The drilling device further comprises similar hollow members 34 one at each end of the ring F. Each of these members is formed of a wall 35 having a spherical curvature and a flat wall 36, the latter wall being located adjacent the related end of the ring F. On each flat wall 36 I provide a groove formation 37 in which are engaged respectively ribs 38 and 39 on the interior face of the ring and whereby rotative connections between the members 34 and the ring F are provided, such rotation of the members 34 being on an axis transversely of the casing of the apparatus as will be obvious. Suitable anti-friction elements 40 are interposed between the ribs 38 and 39 and the walls of the formations 37, said elements being shown mounted on the latter. In the flat wall 36 of each member 34 I provide an annular series of openings 41 positioned to overlie the related groove 33 as each member 34 is rotated. On the ring F diametrically opposite the nipple 29 I provide a drill head 42 a part of which is integral with the ring section 25 and a similar part integral with the ring section 26, the neck of said drill head 42 being encompassed by the band 28. It will be apparent that the drill head 42 is rendered effective by rotation of the drilling device as a whole on the axis of the casing. Drill teeth 43 of any desired form are provided on the outer faces of the head 42, ring F and members 34. The walls 35 of the members 34 are provided with numerous perforations 44 for a purpose that will presently appear.

The structure by which the members 34 are rotated in opposite directions on an axis transversely of the casing comprises a bevel pinion 45 fixed on shaft 22, a bevel pinion 46 fixed on shaft 19 and bevel ring gears 47 fixed respectively on the walls 36 of members 34 and with both of which ring gears each pinion 45 and 46 meshes. The motors D and E are constructed to rotate their respective shafts 19 and 22 in opposite directions and by reason of the connections between said shafts and the members 34 just described, such rotation of the shafts 19 and 22 will effect rotation of said members 34 in opposite directions on an axis transversely of the casing. This rotation of the members 34 will, during drilling operation, impart rotation to the drilling device as a whole on an axis in alinement with the axis of the casing as shown by arrows in Figure 4. A tie member 48 axially and loosely connects the members 34 and serves as additional means for maintaining assembly of the parts of the drilling device, it being observed that the shaft 19 extends loosely through said tie member.

The interior wall of the upper and lower ends of the casing B are cast in irregular

shape to permit effective disposition in the passage C of centrifugal pump turbines. By reference to Figure 1 such turbines 50 and 51 are shown fixed on shaft 19 of the armature 17, while in Figure 1a turbines 52 and 53 are shown fixed on the shaft 22 of the armature 18.

By reference to Figure 3 it will be observed that conductor wires leading from a suitable electric source are embedded in the cable 15, such wires being indicated at 54. From the cable 15 these wires are tapped out and connected to the motors D and E as shown in dotted lines in Figure 1.

For convenience in assembling the apparatus the casings A and B are built up of sections having overlapping edges and riveted together at such overlap.

In operation the shafts 19 and 20 will be rotated in opposite directions and through connections previously described will rotate the members 34 in opposite directions on an axis transversely of the casing of the apparatus and at the same time the drilling device will rotate as a whole on the axis of the casing of the apparatus, this last rotation and the simultaneous rotation of the members 34 on an axis transversely of the casing of the apparatus serving to produce a highly effective drilling action. As there is considerable water in the shafts of deep wells as drilling proceeds, the apparatus will be entirely submerged and during its operation such water will pass through the perforations 14 into the extension 13 and thence into the passage C where it is acted on by the centrifugal pump turbines 50, 51, 52 and 53 and forced downwardly through the passage C, passage 32, into grooves 33 and through openings 41 into the interior of the members 34 from whence it is discharged into the well shaft through the perforations 44. This cycle of water movement is continued during the operation of the apparatus and serves not only to clear the drilling device surfaces, but also to suspend the earth drillings in the water and permit their removal by bailing the water carrying the earth in suspension from the shaft.

I claim:

1. A well drilling apparatus comprising a casing, two axially alined motors within the casing having armatures rotatable in opposite directions, shafts connected to said armatures respectively, and located in the axis of the casing, a pair of drilling elements, means for supporting said elements from the lower end of the casing for rotation on a common axis transversely of said shafts, and connections between the shafts and the drilling elements for effecting rotation of the latter in opposite directions.

2. A well drilling apparatus comprising a casing, two axially alined motors within the casing having armatures rotatable in oppo-

site directions, shafts connected to said armatures respectively and located in the axis of the casing, a pair of drilling elements, means for supporting said elements from the lower end of the casing for rotation on a common axis transversely of said shafts and also for bodily revolution about the shafts, and connections between the shafts and drilling elements for effecting rotation of the latter on said common axis in opposite directions.

3. A well drilling apparatus comprising a casing, two axially aligned motors within the casing having armatures rotatable in opposite directions, shafts connected to said armatures respectively and located in the axis of the casing, a ring secured to and depending from the lower end of the casing for rotation on the axis of said casing and into which said shafts project, a drilling element rotatably mounted on each end of the ring, and connections between the shafts and drilling elements for effecting rotation of the latter in opposite directions.

4. A well drilling apparatus comprising a casing, two axially aligned motors within the casing having armatures rotatable in opposite directions, shafts connected to said armatures respectively and located in the axis of the casing, a ring secured to and depending from the lower end of the casing for rotation on the axis of said casing and into which said shafts project, a drilling element rotatably mounted on each end of the ring, and connections between the shafts and drilling elements for effecting rotation of the latter in opposite directions, said connections comprising bevel pinions fixed on the shafts respectively and bevel ring gears fixed on the drilling elements respectively, with both of which latter each of said pinions meshes.

5. A well drilling apparatus comprising a casing, two axially aligned motors within the casing having armatures rotatable in opposite directions, shafts connected to said armatures respectively and located in the axis of the casing, a ring secured to and depending from the lower end of the casing for rotation on the axis of said casing and into which said shafts project, a drilling element rotatably mounted on each end of the ring, connections between the shafts and drilling elements for effecting rotation of the latter in opposite directions, and a drill element fixed to the ring in axial alignment with the casing and said shafts.

6. A well drilling apparatus comprising a casing, two axially aligned motors within the casing having armatures rotatable in opposite directions, shafts connected to said armatures respectively and located in the axis of the casing, a ring secured to and depending from the lower end of the casing for rotation on the axis of said casing, said ring having internal annular ribs at each end, a drilling element at each end of the ring, each of said

drilling element being constituted by a portion of a sphere, annular groove formations at the inner end of each drilling element receiving the adjacent internal rib of the ring to rotatably connect each drilling element to the ring, and connections between the shafts and said drilling elements for effecting rotation of the latter in opposite directions.

7. A well drilling apparatus comprising a casing, a drilling device mounted on one end of the casing for rotation on the axis of the latter and including a ring and cutters of spherical curvature mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, and means for rotating said cutters in opposite directions independently of any rotation of the ring.

8. A well drilling apparatus comprising a casing, a drilling device mounted on one end of the casing for rotation on the axis of the latter and including a ring and cutters of spherical curvature mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, means for rotating said cutters in opposite directions, and means for circulating water from a well being drilled into the drilling device at one series of points in the latter and discharging the same from the drilling device at another series of points.

9. A well drilling apparatus comprising a casing, a drilling device mounted on one end of the casing for rotation on the axis of the latter, said device including a ring and cutters mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, and means for rotating said cutters in opposite directions independently of any rotation of the ring.

10. A well drilling apparatus comprising a casing, a drilling device mounted on one end of the casing for rotation on the axis of the latter, said device including a ring and cutters mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, means for rotating said cutters in opposite directions, and means for circulating water from a well being drilled into the drilling device at one series of points of the latter and discharging the same from the drilling device at another series of points.

11. A well drilling apparatus comprising a casing, a drilling device mounted on one end of the casing for rotation on the axis of the latter, said device including a ring and hollow cutters mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, means for rotating said cutters in opposite directions, and means for circulating water from a well being drilled through the walls of the cutters adjacent the ring and discharging the same through the remaining walls of said cutters.

12. A well drilling apparatus comprising a casing, a drilling device mounted on one end of the casing for rotation on the axis of the latter, said device including a ring
5 and hollow cutters mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, means for rotating said cutters in opposite directions, each of said cutters including a perforated flat
10 wall adjacent the ring and a perforated wall of spherical curvature, and means for circulating water from a well being drilled through the body of the ring and the perforations of the flat walls of the cutters into
15 the latter and thence through the perforations of the walls of the cutters having a spherical curvature.

13. A well drilling apparatus comprising an outer casing and an inner casing assembled in spaced relation and the space between said cases constituting a portion of a water passage, the upper and lower ends of the outer casing being shaped interiorly to constitute the remainder of said water passage predetermined by the casing, a perforated hollow extension secured to the upper
20 end of the outer casing and having its interior in communication with the upper ends of the water passage, pump devices rotated without the inner casing in the upper and lower ends of said water passage, means for operating said pump devices to pump water through said passage in the direction of its lower end, a drilling device mounted on the
30 lower end of the casing for rotation on the axis of the latter, said device including a ring and hollow cutters mounted on the ends of the ring respectively for rotation on an axis transversely of the casing, means for
40 rotating said cutters in opposite directions, means for conveying water from the lower end of said passage into the interior of the cutters, and means permitting discharge of water from the interior of said cutters to the
45 exterior of the drilling device.

In testimony whereof I hereunto affix my signature.

HASKEL A. PIPPIN.

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